

**Gardening with Older Adults for
Health and Nutrition**

Teacher/Leader Guide

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Gardening with Older Adults for Health and Nutrition Project Team

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The Garden

*For the garden of your daily living,
Plant three rows of peas:
Peace of mind, peace of heart and peace of soul.*

*Plant four rows of squash:
Squash gossip, squash indifference, squash grumbling and squash
selfishness.*

*Plant four rows of lettuce:
Lettuce be faithful, lettuce be kind, lettuce be happy, lettuce really love one
another.*

*No garden should be without turnips:
Turnip for service when needed, turnip to help one another, turnip the music
and dance.*

*To conclude our garden we must have thyme:
Thyme for fun, thyme for rest, thyme for others, thyme for ourselves.*

*Water freely with patience and cultivate with love.
Your garden is abundant because you reap what you sow.*

-- author unknown

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INTRODUCTION

Welcome to the *Gardening with Older Adults for Health and Nutrition* program. The *Gardening with Older Adults* program is an innovative Family Nutrition Program (FNP) project. This program has been designed for older Kansan adults and emphasizes gardening for physical activity and good nutrition. The program offers education on

- gardening basics,
- gardening adaptations to allow anyone of any ability to garden,
- growing fruits, vegetables, and herbs popular with older Kansans, and
- harvesting, storing, and preparing fresh fruits, vegetables, and herbs.

The *Gardening with Older Adults* program incorporates lessons, hands-on activities, and taste tests that feature vegetables and fruits that grow well in Kansas, and that many older Kansans prefer. The program is supported by a *Gardening with Older Adults* participant's handbook and a teacher/leader guide. Lessons can be held at a senior center, congregate meal site, church or at any other site that can accommodate a group of interested older gardeners. No garden is required at the site to do this program. However, older adult participants should have a place to garden at home such as a patio, balcony, window ledge, or outdoor plot.

The *Gardening with Older Adults* teacher/leader guide is designed to accompany and correspond to the participant handbook. You will choose which pages from this guide that you want to include in your participants' handbook. This teacher/leader guide was developed with Master Gardeners and Master Food Volunteers in mind as potential teachers of the program (for more information about Master Gardeners and Master Food Volunteers contact your county extension office). The teacher/leader guide provides in-depth information on each of the lesson topics as well as resource lists for additional information. A variety of handouts are included with each lesson plan for possible inclusion in your participant handbook.

The *Gardening with Older Adults* program was designed as an eight-week program plus an introductory meeting and a concluding meeting. However, the format of the manual is such that as few as four or five lessons are possible, and certainly, the program can be expanded beyond eight weeks. Each lesson should include gardening information, exercise information and taste testing.

About the Family Nutrition Program

The Family Nutrition Program (FNP) is a nutrition education program for those eligible to receive food assistance. The program is provided by Kansas State University Research and Extension through the support of the Kansas Department of Social and Rehabilitative Services and the United States Department of Agriculture.

PREFACE

Gardening is America's favorite outdoor leisure time activity. Gardening is a source of personal satisfaction and pride, providing pleasure and opportunity for relief from daily stress. Gardening is useful in relieving stress through providing a calming, restorative experience. The sharing of plants, flowers, or produce can open doors of social interaction in welcoming, non-threatening ways.

Gardening provides physical benefits as well. It offers opportunities for mild exercise. Weak muscles can be strengthened and limited joint flexibility ranges can be increased through the lifting and reaching motions of gardening. Physical stamina and other skills including balance and coordination can be improved. The *Gardening with Older Adults* program focuses on two types of physical activities that can help older adults gain health benefits.

First, endurance exercises, such as gardening, get the heart working harder than normal. Endurance exercises should be done for at least 30 minutes on five or more days each week. The 30 minutes can be done all at once, or can be done 10 minutes at a time for three times in a day. Endurance exercises help us stay healthy. By building up endurance, many day-to-day activities will be easier such as climbing stairs, getting groceries, and getting in and out of the bathtub. Endurance exercises also help prevent or delay the onset of diseases that many older people get like diabetes, colon cancer, and heart disease. Endurance exercises can reduce the discomfort and pain associated with arthritis.

Second, stretching exercises are easy to do and help keep the body limber. By stretching regularly, the risk of falling and the chance of injury are lower. Endurance exercises, such as gardening, will be easier to do if stretching is done regularly.

Fruit and vegetable gardening provides nutritional and economical benefits too. Vegetables grown in the home garden are fresher, may have better nutrient values, and usually cost less than vegetables sold in markets. Eating fruits and vegetables helps decrease the risk of having poor health and of getting cancer, heart disease, high blood pressure, pulmonary diseases, stroke, cataracts, age-related macular degeneration of the eye, constipation and diverticulosis.

Most adults would benefit from eating more fruits and vegetables. Kansas adults aged 55-64 years consume less than four servings of fruits and vegetables per day and Kansan adults aged 65 years and older consume less than two servings per day. The recommendation is to have 1 1/2 to 2 1/2 cups of fruits and 2 to 4 cups of vegetables each day.

CHAPTER 1

LESSON PLANS

Each lesson in the *Gardening with Older Adults for Health and Nutrition* program should feature three messages: the importance of physical activity, gardening how-to, and nutrition from the garden. We recommend beginning each session with some stretching exercises. The remaining chapters in this manual include information on gardening and growing a variety of vegetables, fruits, and herbs that do well in Kansas. Dozens of recipes featuring the vegetables, fruits, and herbs covered in the gardening chapters are included in the handouts section of this manual. Use at least one recipe each week with a taste test. The following are some general guidelines we hope will help you in organizing this program for your participants.

Handouts

- There are copy ready handouts on physical activity, gardening, and nutrition (nutrition includes the recipes).
- Each lesson plan includes a list of recommended handouts.
- Copy the handouts on different color paper based on the topic. For example, copy all the gardening handouts on green, the nutrition handouts and recipes on tan, and the physical activity handouts on blue. This will help the participants organize their notebooks.
- 3-hole punch the handouts so the participants can immediately put them in their 3-ring binders.

Organizing Your Program

- Ask your participants prior to starting the program or during the Introductory Meeting (see pages 1-12 to 1-13) about the extent of their gardening knowledge and current gardening activity. This will be helpful in developing your weekly lessons.
- Chapters 2, 3, and 4 include information on the fundamentals of gardening, while chapter 5 covers the specifics of growing the featured vegetables, fruits, and herbs. Select the information most appropriate for your participants from chapters 2, 3, and 4. For example, if they have all gardened extensively, it may be more appropriate to have lessons on intensive gardening methods and gardening adaptations rather than gardening basics. You may cover all the featured vegetables, fruits, and herbs, but again, what you present should depend on the knowledge base of your participants. (see pages 1-14 to 1-18 and 1-19 to 1-21)
- If you have participants with diverse gardening experiences, encourage the more experienced to contribute. This is one strategy to help build group cohesiveness.
- The vegetables, fruits, and herbs are listed alphabetically in the manual. You can teach them in any order you want. Some ideas to consider are:
 - Is your class in the spring? Organize the crops by when they would be planted in the garden or when the seed would be sown.
 - Is your class in the summer or fall? Organize the crops by when they would be harvested.

- Group crops together by how they are used in cooking, such as tomatoes, onions, and green pepper since many dishes use all three.
- Offer a taste test of at least one recipe each week. Practice food safety and sanitation guidelines. (See pages 1-3 to 1-6)
- Consider giving an “assignment” each week to reinforce the message(s) of the lesson such as
 - Ask participants to think about adaptations or changes they have made in how they garden due to changes in their lives over time
 - Ask participants to see what kinds of fruits or vegetables are being harvested right now in local gardens
 - Ask participants to prepare one of the recipes
- Have participants compile a list of local resources in support of their gardening efforts such as
 - Library Resources
 - Bookstores with a good gardening section
 - Local garden centers
 - Local garden clubs

Introduction to the *Fix It Fresh! Fruits and Vegetables Recipes Series*

The *Fix It Fresh! Fruits and Vegetables Recipes Series* includes 17 produce facts sheets and 47 recipes. Each facts sheet includes fun information about a crop, along with information about selecting, measuring, handling, ripening, preserving, preparing and serving it, and selected nutrition information for one standard serving of the crop. *The Fix It Fresh!* facts sheets can be found in the handout section of this manual along with the gardening fact sheet about each crop (see Appendices E, F and G).

The series recipes include 9 main dishes, 16 hot side dishes, 17 cold side dishes, and 5 healthy sweet foods (see Appendix H for the individual recipes). In addition to standard information you would expect with a recipe, such as the yield, ingredients and step-by-step directions, each recipe sheet also includes information about how a child could participate in making the recipe, nutrition claims about the recipe per Food and Drug Administration label standards, nutrition facts information (which is where the serving size is stated), the number of carbohydrate choices per serving (1 choice equals about 15 grams carbohydrate), diabetic exchanges per serving, and in applicable cases, the source of the original recipe.

The tables on pages 1-7 to 1-9 show which recipes we recommend to use when teaching the various lessons in this program.

The recipes tables in Appendix A are for participants and instructors. They list all of the recipes in the series, grouped by four categories (main dishes, hot side dishes, cold side dishes and healthy sweet foods). The tables list the recipe names down the left side of the paper and the type of produce in the recipe across the top of the page. These tables can help you find recipes to use when you have an abundance of garden produce, for instance tomatoes that are in season.

Food Safety & Sanitation

Guidelines for Volunteer Group Social Functions

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Food Safety

If your church, club, group or organization is planning an activity that involves serving a meal, use these guidelines before and when the meal is served.

1. If possible, designate a person familiar with food service experience to coordinate and supervise the activity.

2. Plan food service activities so that most of the food preparation is done in an approved and licensed kitchen. Use kitchens that have commercial equipment, three-compartment sinks, and hand-washing sinks with disposable hand towels or hot air dryers. Kitchens located in churches or clubs are subject to Kansas Department of Health and Environment (KDHE) inspection, if food is prepared totally from the kitchen more than seven days in a year.

3. During food preparation food handlers should:

- Practice good personal hygiene and cleanliness in dress and work habits.
- Always work with clean hands. Wash hands thoroughly with soap and hot water after any work interruption or stoppage. Clean fingernails regularly and cut them short.
- Keep hands away from mouth, nose and hair. Cover coughs and sneezes with a handkerchief or tissue, and never sneeze or cough near food.

- Never work around food with any infection, cut or cold. Prohibit persons affected with a communicable disease or who are carriers of such a disease from preparing and/or serving food.
- Wear plastic gloves over cuts and abrasions and when handling foods that will not be cooked, such as salads or sandwich meats.
- Always wear clean clothing and hair restraints (caps or hair nets). Provide clean aprons for food handlers.
- Never smoke, eat or drink in food preparation or equipment washing areas.
- Never use cooking utensils to taste food. Avoid licking fingers or sampling the food while it is being prepared or served. To taste, place a sample on a clean dish and use a clean spoon – not the cooking spoon.

4. During food display and service:

- Keep a good quality, accurate thermometer (within $\pm 2^{\circ}\text{F}$.) on hand to maintain safe temperatures. Use a bimetallic stemmed thermometer, which can be purchased in an equipment supply store or from a food supplier.
- Plan and arrange food display and service so that potentially hazardous foods (PHF)* are served within two hours of preparation or less.

*NOTE: Potentially hazardous foods are foods

or groups of foods that require temperature control because they support rapid and progressive growth of infectious or toxigenic bacteria. They include any food that consists in whole or part of milk or milk products, raw shell eggs, meats, poultry, fish, shellfish, baked or boiled potatoes, homemade garlic-in-oil mixtures, cut melons, raw seed sprouts, and cooked beans, rice or pasta.

- Prior to serving, maintain hot foods at an internal temperature of 140°F . or above.
- Check temperatures of foods throughout service. Remove cold foods if held above 40°F . and/or hot foods held below 140°F . Check temperatures in the product's center or thickest part.
- For foods that have been cooked, but will be served cold, rapidly cool in an ice water bath to an internal temperature of 40°F . within two hours. When practical,

chill ingredients used in cold food preparation before use.

- Do not allow meat, poultry or turkey dressings, or stuffings to remain at temperatures between 40°F and 140°F. Never serve a turkey that has been stuffed. Prepare stuffing separately from the turkey for group events.
- Avoid cross-contamination of foods. Store raw foods away from cooked foods. Never use the same utensils for raw and ready-prepared cooked products unless washed and sanitized.
- Store and serve high acidic beverages, such as punch and fruit beverages, in containers made from food grade plastic, stainless steel or glass. Aluminum plated, porcelain or enamelware containers should never be used for storage or serving acidic beverages.
- Upon completion of the social function, discard foods that have been served but not consumed.
- Guests who serve themselves should not be allowed to reuse soiled plates. Encourage guests to get a new plate each time they serve themselves.

CLEANING AND SANITIZING

Manual Cleaning and Sanitizing

Washing dishes and pots and pans in a three-compartment sink takes six steps.

- Clean and sanitize the sinks and the work surfaces before each use.

IMPORTANT FACTS TO REMEMBER

1. Be sure food handlers are clean, free of disease, and that they follow safe food-handling practices.
2. Avoid cross-contamination of raw meats, poultry and fish with fresh foods or foods that will not be cooked. Cross-contaminated items may include hands, cooking utensils, and cutting boards.
3. Keep potentially hazardous foods – such as meats, poultry, shellfish, cooked potatoes, cream pies, milk products, eggs, and cream cheese – out of the temperature danger zone – 40° F. to 140° F. Keep hot foods hot and cold foods cold.
4. Use a metal stemmed thermometer accurate to $\pm 2^\circ\text{F}$. to measure temperatures of foods.
5. Never use leftover foods more than once.
6. Cool hot foods quickly (to 40° F. within two hours), using an ice water bath or other quick cooling method, and refrigerate.

- Scrape and presoak items to be cleaned to remove food soil that may reduce the effectiveness of the detergent. Silverware should be presoaked in a hot, soapy water solution.
- Wash in the first sink, using a clean detergent solution, at 120°F. Use a brush or cloth to loosen soil.
- Rinse in the second sink, using clean, potable (drinking) water at 120°F. to remove all traces of food and detergent that may interfere with the sanitizing agent.
- Sanitize in the third sink by immersing items in hot water at 170°F. for 30 seconds or in a chemical sanitizing solution for one minute. Chlorine concentration should be at least 50 parts per million (1 teaspoon per gallon of water). Follow manufacturer's directions for other sanitizers such as quaternary ammonia (QUATS).
- Air dry. Do not wipe dry. Wiping

can re-contaminate all the newly sanitized equipment and utensils.

Machine Cleaning and Sanitizing

- Follow manufacturer's directions.
- Scrape or soak tableware, equipment and utensils before washing.
- Load the dishwasher properly. Overloading or improper loading will result in ineffective cleaning.
- Make sure dishes and utensils are exposed to each phase of the dishwashing cycle (wash, rinse, sanitize).
- Temperature requirements for a hot water machine:

Wash cycle: 150 to 165°F.

Sanitize cycle: 180 to 195°F.

Or Utensil surface temperature: 160°F.

- Requirements for chemical sanitizer machines:
Chlorine solution – 50 ppm minimum concentration
Other chemical sanitizers – follow manufacturer directions
Exposure time – follow instructions for your machine

LEFTOVERS

- Leftovers are foods prepared and served (as on a buffet), but not consumed. Plan so leftovers are kept to a minimum.
- Once served, food should not be reserved or reused. Exceptions to this are non-potentially hazardous foods that are still in the original packaging, such as crackers.

- Keep foods that have not been served above 140°F. or below 40°F. If the foods are not served, they should be cooled to 40°F within four hours and refrigerated within two hours of preparation.
- Cool foods to below 40°F within two hours by:
 - Placing pan in an ice water bath.
 - Increasing surface area by putting in long, shallow pans, 2 to 3 inches deep.
 - Stirring continuously.
- Reuse prepared but unserved food as soon as possible.

Reheating

- Quickly reheat, within two hours, prepared but unserved food to 165°F before serving.
- Do not use reheated food more than once.
- Do not use hot holding equipment, such as a steam table or warmer, to reheat foods. Reheat first on stove top, then transfer to steam table or warming unit.
- Never mix fresh and reused foods.

Bake Sales

Bake sales do not require a prior KDHE permit. However, they do represent a health concern. Organizers and sponsors should ensure that good sanitary practices are followed when planning, organizing or holding a bake sale.

Give care and thought to preparation, transportation, display and the serving of “homemade” varieties of foods commonly associated with bake sales (pies, cakes, breads, cookies). Prohibit potentially hazardous foods, such as cream pies, puddings and sandwiches.

When conducting a bake sale it is recommended that:

- The sponsor maintain a list of contributors to the bake sale.

- The listing include the name, address, and telephone number of the contributor, as well as the type of food donated.
- Food never be solicited or accepted from any person infected by a communicable disease or who is a known carrier of such a disease.
- Food be tightly wrapped or sealed during transport. The vehicle(s) used to transport food should also be clean and maintained in good sanitary condition. Food should not be transported with family pets.

Club/Organization Meetings

Club, organization and church meetings often have members bring food to be eaten during or after the meeting. If potentially hazardous foods – such as sandwiches, cream cheese dips, and deviled eggs – are included, food sources should be noted and refrigeration and heat storage provided. Remember – keep hot foods hot and cold foods cold.

The Buffet

When serving a meal buffet style, use common sense and acceptable food handling practices.

- Be sure each food item has its own serving utensil.
- Serve food items in shallow (2- to 3-inch-deep) containers, and replenish frequently.
- Keep cold food iced (40°F.) or refrigerated.
- Use hot trays for hot foods. Candle type warmers are generally ineffective because they do not produce enough heat to retard bacterial growth.
- Cover hot food as much as possible.
- When using Sterno heating, follow good safety procedures.
- Ensure that a new plate is obtained each time a person goes through the buffet line.

Catered Functions

Before hiring a caterer, ensure that the catering establishment is inspected, approved and licensed by the authorized agency (KDHE). When selecting a caterer, choose one whose facilities and vehicles are inspected and are clean.

Food Transportation

Food must never be transported in any vehicle compartment that is not clean. It must be free from vermin and contaminants, and in good repair. While in transit, all foods must be adequately protected (covered) from sources of contamination, including animals or family pets. Cold foods must be kept cold – below 40°F. – and hot foods hot – 140°F. or above. Insulated carriers, such as coolers, are a good solution. However, they should be used only temporarily, because they will not raise or lower inadequate temperatures. In any event, no vehicle should be used for food transportation if it is not clean and in good repair.

Note: Information in this publication is based on the Kansas Food Code and the FDA 1999 Model Food Code. Refer to standards required in your state for current information.

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Internal Cooking Temperatures

Product	F°
Egg and egg dishes	
Eggs	Cook until yolk and white are firm
Egg casseroles	160
Egg sauces, custards	160
Ground meat and meat mixtures	
Turkey, chicken	165
Beef, veal, lamb, pork	160
Fresh beef, veal, lamb	
Medium rare	145
Medium	160
Well done	170
Fresh pork	
Medium	160
Well done	170
Ham	
Fresh (raw)	160
Fully cooked (to reheat)	140
Roast beef	
Cooked commercially, vacuum sealed and ready-to-eat	140

Product	F°
Poultry	
Chicken, turkey – whole	180
Chicken, turkey – dark meat	180
Poultry – breast	170
Duck and goose	180
Stuffing	
Cooked alone or in bird	165
Sauces, soups, gravies, marinades	
Used with raw meat, poultry or fish	Bring to a boil
Seafood	
Fin fish	Cook until opaque and flakes easily with a fork.
Shrimp, lobster, crab	Should turn red and flesh should become pearly opaque.
Scallops	Should turn milky white or opaque and firm.
Clams, mussels, oysters	Cook until shells open
Leftovers	
165	
This chart has been adapted for home use and is consistent with consumer guidelines from the U.S. Department of Agriculture and U.S. Food and Drug Administration.	

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<i>Gardening with Older Adults</i> Lesson Number	Name of the <i>Gardening with Older Adults</i> Lesson	Name of Recipes in the <i>Fix It Fresh! Fruits and Vegetables Recipes Series</i> To Use with the Lesson	Recipe Category
1, 2, 3, 4, 10, & follow-up lessons	Introductory, How-to-Garden, Wrap-Up & Follow-Up Lessons	Beef, broccoli & cauliflower stir-fry	Main Dishes
		Chicken, fresh vegetables and pasta salad	Main Dishes
		Italian vegetable casserole	Main Dishes
		Tempting tostadas	Main Dishes
		Garden orchard salad	Side Dishes (Cold)
		Tangy crisp vegetable and pasta salad	Side Dishes (Cold)
		Tomato and crusty bread salad	Side Dishes (Cold)
		Vegetable burrito	Side Dishes (Cold)

Name of the Gardening with Older Adults Lesson	Name of Recipes in the <i>Fix It Fresh! Fruits and Vegetables Recipes Series</i> To Use with the Lesson	Recipe Category
Beans	Green beans and peppers with lemony dressing	Side Dishes (Hot)
	Green beans and 'toes	Side Dishes (Hot)
	Seasoned green beans	Side Dishes (Hot)
Berries	Fabulous fruit muffins	Side Dishes (Hot)
	Fresh fruit bowl	Healthy Sweet Foods
	Peach or berry cake	Healthy Sweet Foods
	Peach or berry sauce	Healthy Sweet Foods
Broccoli	Meaty stuffed potatoes	Main Dishes
	Broccoli and corn casserole	Side Dishes (Hot)
	Lemon-dilled broccoli and carrot salad	Side Dishes (Cold)
Brussels Sprouts	Brussels sprouts with mustard butter	Side Dishes (Hot)
Cabbage	Cabbage and garden vegetables	Side Dishes (Hot)
	Coleslaw	Side Dishes (Cold)
Carrots	Cooked carrots with parsley	Side Dishes (Hot)
	Rice with raisins and carrots	Side Dishes (Hot)
	Fresh fruit and carrot salad	Side Dishes (Cold)
	Garlic carrot salad	Side Dishes (Cold)
Cauliflower	Broccoli and cauliflower soup	Side Dishes (Hot)
	Cauliflower salad with citrus dressing	Side Dishes (Cold)
Eggplant	Italian eggplant casserole	Side Dishes (Hot)
Grapes	Chicken, rice and fruit salad	Main Dishes
	Fruit banana split	Healthy Sweet Foods
	Nutty fruit salad	Healthy Sweet Foods
Lettuce	Creamy cucumber salad dressing	Side Dishes (Cold)
	Fresh cucumber salad with mustard chive dressing	Side Dishes (Cold)
Onions	Tangy garden relish	Side Dishes (Cold)
Peas	Saucy vegetable pasta	Side Dishes (Hot)
	Zesty peas with carrots	Side Dishes (Hot)
Peppers, Sweet Bell	Chicken quesadillas	Main Dishes
	Crisp cucumber salad	Side Dishes (Cold)
	Red and yellow pepper dressing	Side Dishes (Cold)

Radishes	Cooked greens and radishes with pasta		Side Dishes (Hot)
	Bulgur garden salad		Side Dishes (Cold)
Spinach	Garden vegetables with beef and rice		Main Dishes
	Potato spinach casserole		Side Dishes (Hot)
	Fresh fruity spinach salad		Side Dishes (Cold)
Tomato	Garden chili		Main Dishes
	Grilled tomato kebabs		Side Dishes (Hot)
	Fresh salsa with black beans		Side Dishes (Cold)
Culinary Herbs— These recipes are also listed above in the specific crops.	Chives	Chicken, fresh vegetables and pasta salad	Main Dishes
		Fresh cucumber salad with mustard chive dressing	Side Dishes (Cold)
	Dill	Creamy cucumber salad dressing	Side Dishes (Cold)
		Lemon-dilled broccoli and carrot salad	Side Dishes (Cold)
	Mint	Bulgur garden salad	Side Dishes (Cold)
		Fruit banana split	Healthy Sweet Foods
		Fresh fruit bowl	Healthy Sweet Foods
	Oregano	Garden vegetables with beef and rice	Main Dishes
		Grilled tomato kebabs	Side Dishes (Hot)
	Parsley	Chicken, rice and fruit salad	Main Dishes
		Cooked carrots with parsley	Side Dishes (Hot)
		Green beans and peppers with lemony dressing	Side Dishes (Hot)
		Garlic carrot salad	Side Dishes (Cold)
	Rosemary	Italian vegetable casserole	Main Dishes
	Sweet basil	Italian eggplant casserole	Side Dishes (Hot)
		Saucy vegetable pasta	Side Dishes (Hot)
		Tomato and crusty bread salad	Side Dishes (Cold)

The following are some general references you may find helpful.

Kansas Garden Guide, S-51 (Revised March 2010) available online at <http://www.ksre.ksu.edu/library/hort2/s51.pdf>

Easy Lifelong Gardening: A practical guide for seniors by John Pierce et al., 1993.

Growing Vegetables in the Great Plains by Joseph R. Thomasson, 1991

Rodale's Successful Organic Gardening by Patricia S. Michalak and Cass Peterson, 1993.

The Essential Kitchen Gardener by Frieda Arkin, 1990

The Harvest Gardener by Susan McClure, 1993

The Enabling Garden by Eugene Rothert, 1994

The Able Gardener by Kathleen Yeomans, 1993

On-line Home Gardening Information

<http://www.gardenforever.com>

Gardening information for people of all ages, abilities, and lifestyles

<http://www.finegardening.com>

The Taunton Press. Container gardening, kitchen gardens, skills, tools, etc.

<http://www.gardenguides.com>

Garden guide with information on flowers, herbs, and vegetables, including some recipes, seeds

<http://smallgarden.freeservers.com>

A small backyard garden (home gardening information for Kansans)

<http://squarefootgardening.com>

The official square foot gardening website

On-line Nutrition (Fruits & Vegetables) Information

<http://www.fruitsandveggiesmorematters.org>

Fruits and Veggies More Matters, Produce for Better Health Foundation

<http://www.fruitsandveggiesmatter.gov>

Fruits and Veggies Matter, CDC

There are many easy stretching exercises designed for older adults.

One video we recommend is described below. You may also download prints and videos of exercise at <http://nihseniorhealth.gov/exercise/toc.html>

*Exercise, a Video from the National Institute on Aging (NIA), 2005, Federal Publication, in English, 48-minutes, shows how to start and stick with a safe, effective program of whole-body stretching, balance, flexibility, toning and strength-training exercises. All are done sitting or standing. Light hand-held weights are used, with ankle weights if desired. It features Margaret Richard, the star of a PBS exercise show named *Body Electric*.*

To order the exercise video from NIA, which is currently out of stock but likely will be available again at the end of 2010, speak to an information specialist at the National Institute on Aging Information Center, at phone number: 800-222-2225, OR check their website, <http://www.nia.nih.gov/HealthInformation/Publications/ExerciseGuide>

To order a 41-minute older (2000) version of this video (item #7474) for \$14.95 plus \$2.99 shipping, contact a public company called Collage Video at www.collagevideo.com or phone: 800-819-7111. The next page has an order form for it.



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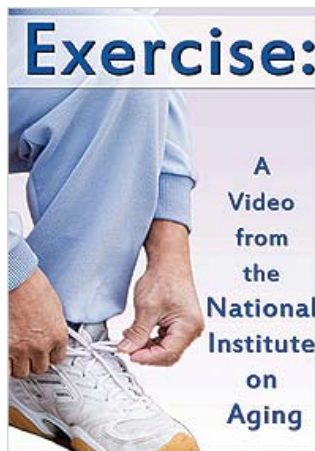
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TESTED 10-JULY



Exercise: A Video from the National Institute on Aging



Add to wish list

Back cover text

Equipment used

- Dumbbells
- Ankle weights

Exercise: A Video from the National Institute on Aging

Level: Intermediate

Toning emphasis: Total body

[Emphasis details](#)

Instructor: Margaret Richard

Customer rating: ★★★★★ (average of 1 customer ratings)

FREE SHIPPING
in orders over \$25

In-stock: Yes Item #7474 \$14.95



WU	SEATED TONING	STAND TONE	ST	MINUTES
3	19	15	4	= 41

By the U.S. Government's National Institute on Aging — a division of the National Institutes of Health — it's a well-presented, well-produced series of total-body muscle-toning routines. Designed to improve strength, balance and flexibility, you get easy-to-follow cuing, careful explanations and even some more-challenging options. No floorwork, all these moves are either seated or standing. 1 to 3 lb. dumbbells are required; 2 to 5 lb. ankle weights are optional. Quiet music. ©2000. Previously titled "50 Plus Exercise with Margaret Richard". DVD has: [Chapter menus](#).

Customer Reviews (or write your own review)

Exercise: A Video from the National Institute on Aging
★★★★★ Best Weight Training Video for Active Age 50 People

I like this video the best for age 50 individuals who are active and wish to complete a good weight resistance program. It's the DVD I buy for others as a gift! - posted by Patricia on 10/14/2007

**The star rating system began in April 2007. Reviews posted before then do not have stars.*

I bought this workout for rehab after an injury. This workout would be much more fun if it had some interesting music. There's some light instrumental music during the warm up and cool down, but virtually nothing in between and Margaret teaches at such a slow, deliberate pace that some interesting music would have helped a great deal. The exercises were fine, but I doubt I'll reach for this one very often because I found it pretty boring. - posted by Tammy on 4/22/2005

Not just for Seniors

This is a great video for people like me who are getting stiffer, as time goes by, because of arthritis. However, the pace does get a little slow once you've worked with it more than 5 times. I still refer to it when I want an easier routine after a hard day. Worth the price. - posted by Lucia on 4/14/2002

Others also bought



ShapelyGirl - Let's Get Moving! 2



Biggest Loser: Weight Loss Yoga



Kelly Coffey's 30 Min. to Fitness: Bootcamp

Introductory Meeting

Objectives

Participants will:

- Get to know each other by doing a fun get acquainted activity.
- Become familiar with the *Gardening with Older Adults* program.
- Observe preparation of a recipe featuring a variety of vegetables and do a taste test. This will take 20 to 30 minutes.

Handouts for the Participants: (see Appendix A)

- *First meeting Participant Survey*
- *Gardening for Health and Nutrition*
- *Gardening – Easy to Do and Good For You, Too!*
- *Eat Plenty of Fruits and Vegetables*
- *Fix it Fresh cover*
- *Recipe Index*
- *Featured Recipe(s)*
- *Fruits and Vegetables Guessing Game, distribute one page per participant so everyone gets a different page (see Appendix I)*
- You can leave these handouts on a table in the room and encourage participants to take a copy of each handout. They should be encouraged to put the handouts in their own three-ring binder (be sure to use a three-hole punch on the handouts).

Session Plan

- 1) It is important to BEGIN the class by introducing yourself. Then distribute the participant survey for the first meeting. Collect completed surveys.
- 2) Plan get-acquainted activities.
 - An example of a get-acquainted activity is below:

i) Alphabetical Roll!

After introducing yourself, create some chaos. Tell the older adult participants that they have three minutes to complete their first activity for the program: "Sort yourselves in alphabetical order by last name." After the initial shock and after they succeed, remind them that they can do anything they set their mind to and, by asking questions, getting help from others, working together, and by trying different strategies that they can "just do it"! Whatever "it" might be, they can do it! Then, have all the participants introduce themselves and answer a question such as "what is your favorite season and why" or "if you were a vegetable, what vegetable would you be". Focus on gardening experiences they have had.

- ii) If desired, also play the Fruits and Vegetables Guessing Game. (See Appendix I) Give each participant a different page. Then ask them, one by one to read clues and have the group guess which crop they are reading about.

- 3) Briefly describe the program, the sessions, and how they will be conducted, including any incentives, taste testing, discussion, activities, etc. Refer to the “Gardening for Health and Nutrition” and “Gardening – Easy to Do and Good for You, too!” handouts. Distribute the 3-ring binders to the participants and explain that there will be handouts on a variety of gardening topics as well as recipes available each week for them to put in their notebooks.
- 4) Have your group decide on a team name. Make sure that you call the group by this team name each and every session. Promoting the name of the team will promote a sense of togetherness in your group of participants, which will encourage everyone to continue attending the program.
- 5) Show one segment of the stretching video.
 - Encourage participants to stretch at home between sessions.
 - Remember to hand out the towels that will be used for stretching to the participants. Collect these towels at the end of the stretching session and, if you can, keep the towels at the site so that participants do not have to remember to bring their towels to each class.
- 6) Prepare and serve 1-2 of the recipes that are included in this manual. While participants are eating, go over the handout titled “Eat Plenty of Fruits and Vegetables.” It is important that participants know why it is important to eat fruits and vegetables and this will get them excited about taste testing the different recipes that will be served during the program.
- 7) Pass out paper and ask each participant to write down one goal they have for the next two months for gardening, for physical activity, and for nutrition. Ask each person to state one of their goals aloud. Have them keep their list in their notebook. (Example – they may want to: learn how to grow an herb; stretch twice a week; and prepare a new kind of salad.) Encourage everyone to contribute and help each other with their gardening, physical activity, and nutrition goals.

Meetings 2, 3, and 4: Gardening Basics, Intensive Gardening, and Gardening Adaptations

The purpose of meetings 2, 3, and 4 is to help the participants develop confidence in their gardening abilities. With beginner gardeners this may mean you focus on information from Chapter 2, while with more advanced gardeners, you may want to focus on information from Chapters 3 and 4. While the how-to of gardening regardless of ability is the primary message during these three meetings, it is important to weave in messages on the nutritional and physical activity benefits of gardening as well.

Overall Meeting Objectives

Participants will

- Stretch to make them limber for when they garden.
- Taste a fruit and/or vegetable dish of the featured recipe(s) for the week.
- Gain confidence in their gardening abilities.

Suggested Basic Gardening Objectives

Participants will learn how to garden for optimum plant growth, production, and food quality by:

- Planning a garden
- Explaining the soil characteristics for their gardening situation
- Developing a fertilizer plan for their garden
- Demonstrating proper seeding and planting techniques
- Maintaining a garden
- Distinguishing between proper and improper watering techniques

Suggested Intensive Gardening Objectives

Participants will

- Identify intensive gardening methods they currently use or have used in the past.
- Determine the feasibility of using intensive gardening methods for their gardening.
- Discuss inexpensive or free sources for gardening materials.

Suggested Adaptive Gardening Methods

Participants will

- Discuss barriers to gardening (i.e., physical health, limited time, inadequate garden space).
- Discuss adaptations they have implemented.
- Develop strategies and plans for overcoming barriers to gardening.

Suggested Handouts for the Participants:

General

- *Recipe(s)*

Basic Gardening Handouts (see Appendix B)

- *Vegetable Crop Information Table*
- *Seeding and Planting Calendar*
- *Planning a Garden*
- *Preparing the Garden*
- *Maintaining the Garden*
- *Ten Ways to Improve Garden Water Use*
- *Checklist of Good Gardening Practices*

Intensive Gardening Handouts (see Appendix C)

- *Raised Bed Gardening*
- *Intensive Planting Techniques*
- *Vertical Gardening*
- *Container Gardening with Vegetables*

Gardening Adaptations Handouts (see Appendix D)

- *Tips to Make Gardening Easier*
- *Choosing the Right Tools*
- *Tips for Gardeners who use Wheelchairs*
- *Easy Tips to Modify Garden Tools for Gardeners with Back Problems*
- *Basic Principles of Prevention of Repetitive Motion Injury*

- You can leave these handouts on a table in the room and encourage participants to take a copy of each handout. They should be encouraged to put the handouts in their own three-ring binder (be sure to use a three-hole punch on the handouts).

Session Plan**1) Show one segment of the stretching video.**

- Encourage participants to stretch at home between sessions.
- Remember to hand out the towels that will be used for stretching to the participants. Collect these towels at the end of the stretching session and, if you can, keep the towels at the site so that participants do not have to remember to bring their towels to each class.

2) Lesson Suggestions:**Basic Gardening**

The primary purpose of this and the next two lessons is to build the participants confidence in their gardening skills. Chapter 2 in your Teacher/Leader Manual provides extensive information on the basics, much more than can be covered in one session. Therefore, it is important to tailor your lesson based on the skill- and knowledge level of your participants. A variety of suggestions are presented below.

PLANNING A GARDEN

- Explain criteria for selecting a good garden site and selecting what to grow
- Have participants plan a garden they might grow, be it one container on a front step to a window box to a sizeable plot in the back yard
- Have participants discuss their plans, why their garden is where it is, why they are growing what they are growing
- Have participants who currently have a garden talk about where they garden and what they are growing, what challenges they are presented with and how they have dealt with them

Suggested materials: seed catalogs, graph paper, paper, pencils

SOILS AND FERTILIZERS

- Explain soil characteristics important for good plant growth, how to have a soil tested, how to improve a soil, unique characteristics of soil-less mixes used in container growing, fertilizing
- Have participants brainstorm on sources of organic matter in their community
- Have participants discuss a soil test report including how they would address any deficiencies the report indicated
- Provide examples of various fertilizers in their containers and have participants find the amount N, P, K in various fertilizers

Suggested materials: examples of organic matter, examples of various fertilizers in their containers and/or fertilizer labels, examples of soil test reports

SEEDING AND PLANTING

- Explain the requirements of seed germination, how to prepare a soil for sowing seed, how to sow seed, and how to care for the sown seed
- Explain the characteristics to look for in purchasing transplants, how to know when seedlings are ready to transplant, and how to care for transplants after planting into the garden
- Provide examples of various seed packages and have participants develop a planting plan including determining what can be planted directly into the garden and what would be started indoors and then transplanted into the garden later
- Provide examples of various vegetable seeds and have participants determine how to sow them, i.e. on the surface or how deep and then sow some in containers
- Provide examples of various transplants and have participants transplant them into containers, emphasizing the proper depth for transplanting

Suggested materials: assorted vegetable seed and transplants, growing mix, containers, paper, pencils

MAINTAINING THE GARDEN

WATERING

- Prepare a demonstration to show improper watering by watering a plant in a container “just a little bit” and another one thoroughly (until water flows out the bottom) for a few weeks prior to the meeting. At the meeting, take the plants out of the pot to show water movement and root development.
- Have participants who currently garden talk about how they water their garden, what challenges they are presented with, and how they have dealt with them.

MULCHING

- Explain the many benefits of using mulch and the many types of mulch that can be used.
- Have participants share their ideas for possible types of mulch and sources of mulch. Many items that can be obtained free can serve as effective mulch.

WEEDING AND CULTIVATING

- Have participants identify potential barriers to weeding their garden (mobility issues, heat, safety) and work together to identify strategies for overcoming the barriers.

Intensive Gardening

- From the first two sessions, you may have identified some intensive gardening methods the participants currently or previously did. Start the session by asking those participants to discuss their method, why they do/did it, what they like/d about it, and the challenges it presented.
- Do a quick review of the various intensive gardening methods presented in Chapter 3 of the Teacher/Leader Manual. Ask participants which methods they would most likely do.
- Talk about resources within the community for materials useful for intensive gardening that are free or inexpensive such as sources of compost or other organic matter (e.g. manure); items that could be used as growing containers such as old tires, drainage pipe; amendments for preparing their own growing mix such as sand, saw dust, Styrofoam pellets; and so on. Have the group do some brainstorming on possible sources for materials.
- Container growing has many benefits as well as challenges. If participants have had little or no experience with container growing, a short “lecture” on the unique aspects of this type of growing – growing mix, watering needs, plant selection, overwintering – may be appropriate.
- Provide the participants with vegetable seed and plant catalogs and have them select plants for an interplanted garden. Have them discuss their selections with each other. A similar exercise could be done in planning succession planting.
- Have participants identify potential barriers to using intensive gardening methods (the level of preparatory work, cost, limited sources for material) and work together to identify strategies for overcoming the barriers.

Gardening Adaptations

- From the previous sessions, you may have identified some adaptive gardening methods the participants currently or previously did. Start the session by asking those participants to discuss their method, why they do/did it, what they like/d about it, and how effective or beneficial it is.
- Do a quick review of the various adaptive gardening methods presented in Chapter 4 of Teacher/Leader Manual. Ask participants which methods they would most likely do.
- Have participants identify potential barriers to gardening and work together to identify strategies for overcoming the barriers.

3) Prepare and serve 1-2 of the recipes that are included in this manual.

4) Encourage everyone to contribute and help each other with their gardening, physical activity, and nutrition goals.

Resources for Additional Information at <http://www.ksre.ksu.edu/library>

- K-State Research and Extension publication *Recommended Vegetable Varieties*, L-41
- K-State Research and Extension publication *Pest Control in Vegetable Gardens*, C-595
- K-State Research and Extension publication *Fertilizing Gardens in Kansas*, MF-2320
- K-State Research and Extension publication *Vegetable Garden Planting Guide*, MF-315

Meetings 5 through 9: Featured Fruits, Vegetables, and Herbs

The featured fruits, vegetables, and herbs covered in Chapter 5 were selected because they can grow well in Kansas, and older Kansans are known to eat them. In meetings 5 through 9, the message should include information on growing, harvesting, storing, and preparing each of the crops, as well as the nutritional benefits of each crop. There are 14 vegetables, 3 fruits, and 10 herbs you need to introduce to the participants during the next 5 meetings. The crops are organized in Chapter 5 first as vegetables, fruits, and herbs, and then within each category they are alphabetized. Plan an order of presentation that is most logical for your program, such as by planting date, harvest date, or use of the crop.

Objectives

Participants will

- Develop an understanding for the unique gardening aspects of the featured crops
- Demonstrate their basic gardening knowledge as it pertains to the featured crops
- Gain knowledge of the nutritional benefits of each of the featured crops

Handouts for the Participants:

Featured Recipe (s)

VEGETABLES (see Appendix E)

- *Beans*
- *Broccoli*
- *Brussels sprouts*
- *Cabbage*
- *Carrot*
- *Cauliflower*
- *Eggplant*
- *Lettuce*
- *Onion*
- *Peas*
- *Peppers*
- *Radish*
- *Spinach*
- *Tomato Growing Tips*
- *Tomato Varieties*
- *Tomatoes*

FRUITS (see Appendix F)

- *Grapes*
- *Raspberry and Blackberry Growing Tips*
- *Bramble Varieties*
- *Strawberries*
- *Berries*

HERBS (see Appendix G)

- *Culinary Herbs*

- You can leave these handouts on a table in the room and encourage participants to take a copy of each handout. They should be encouraged to put the handouts in their own three-ring binder (be sure to use a three-hole punch on the handouts). It would be best if these three-ring binders can be left at the site from week to week so that participants do not have to remember to bring their binders every time.

Session Plan

1) Show one segment of the stretching video.

- Encourage participants to stretch at home between sessions.
- Remember to hand out the towels that will be used for stretching to the participants. Collect these towels at the end of the stretching session and, if you can, keep the towels at the site so that participants do not have to remember to bring their towels to each class.

2) Featured Fruits, Vegetables, and Herb Lesson

Lesson Suggestions:

- Using the crop handouts, review the unique gardening aspects and specific requirements of each crop
- Ask the participants to discuss their successes and challenges of growing each crop
- Ask the participants to share their favorite ways of eating the crop, perhaps including a recipe sharing component to each lesson
- Explain phytochemicals, antioxidants, vitamins, etc., and their role in our health
- Talk about the importance of eating fruits and vegetables daily
- Discuss how to select and store fruit and vegetables safely

3) Prepare and serve 1-2 of the recipes that are included in this manual.

4) Encourage everyone to contribute and help each other with their gardening, physical activity, and nutrition goals.

Meeting 10: Concluding Meeting

Objectives

Participants will:

- Celebrate completing the program
- Share their gardening intentions post-program
- Observe preparation of a recipe featuring a variety of vegetables and do a taste test.

Handouts for the Participants:

- Last meeting Participant Survey
- Remaining recipes

Session Plan

- 1) Distribute the participant survey for the last meeting. (see pages 1-22 to 1-24). Collect completed surveys. Distribute certificates of completion, if desired.
- 2) Hold a potluck or dinner using the favorite recipes used during the program or using recipes not featured during the program
- 3) Encourage everyone to read aloud their gardening, physical activity, and nutrition goals. Discuss what goals were accomplished and celebrate those. Discuss what goals were not accomplished and ways to overcome the obstacles which prevented them from being reached.
- 4) If desired, plan a follow-up meeting for 3-6 months in the future to discuss how the gardening activities are going and to reinforce the program goals.

Complete this survey at the **last** meeting

***Gardening with Older Adults for Health and Nutrition
Participant Survey***

Please help us by answering the following questions. *Check the best answer.*

Date: _____ Your name: _____

1. Do you garden now? Yes _____ No _____
2. What types of fruits, vegetables, or culinary herbs do you grow?
3. How often are you physically active for 30 minutes or more a day?
 Less than 1 day per week _____ 1-2 days per week _____
 3-4 days per week _____ 5 or more days per week _____
4. How often do you eat more than one kind of vegetable or fruit per day?
 Never _____ Sometimes _____ Often _____ Usually _____ Always _____
5. How many cups of fruits and vegetables do you usually eat per day?
 Less than 1 per day _____ 1-2 per day _____ 3-4 per day _____
 4-5 or more per day _____
6. Because of this gardening program, I or my family...
 - a. Grew a fruit or vegetable Yes _____ No _____
 - b. Plan to grow a fruit or vegetable Yes _____ No _____
 - c. Did more physical activity Yes _____ No _____
 - d. Plan to do more physical activity Yes _____ No _____
 - e. Ate more fruits and vegetables than usual Yes _____ No _____
 - f. Plan to eat more fruits and vegetables Yes _____ No _____
 - g. Tasted a new fruit or vegetable Yes _____ No _____

GO TO NEXT PAGE



Complete this survey at the **last** meeting

- h. Bought a fresh fruit or vegetable that I had never tried before
Yes_____ No_____
- i. Learned a new way to prepare or cook fruits or vegetables
Yes_____ No_____
- f. Learned ways to store fresh fruits or vegetables to keep them from spoiling
Yes_____ No_____
7. Approximately how many program meetings did you attend? _____
8. How often do you think you will use the information in this program?
Never_____ Once a year_____ Once a month_____ Once a week_____
Daily_____
9. What did you learn that you did not know or that surprised you?
10. What were your favorite parts of this program, and why?
11. What were your least favorite parts of this program, and why?
12. What additional comments would you like to make regarding the program?
13. How many people are in your household?
One_____ Two_____ More than two_____
14. What is your age?
Younger than 60 years_____ 60-70 years_____ 71-80 years_____
81 years or better_____

GO TO NEXT PAGE



Complete this survey at the **last** meeting

15. What is your gender? Male _____ Female _____

16. What is your race/ethnicity?

White, non-Hispanic _____	White, Hispanic _____
African-American/Black _____	Asian-American _____
Native American _____	Other _____

Thank you for your time! Please return this form to your program leader.

Note to presenter: What county did you teach this program in? _____ Please return surveys to Dr. Mary Meck Higgins, Department of Human Nutrition, 202 Justin Hall, Manhattan, KS 66506 phone 785-532-1671; e-mail: mhiggins@ksu.edu

CHAPTER 2

FRUIT AND VEGETABLE GARDENING: The Basics



The following information has been adapted from the K-State Research and Extension Master Gardener Training Manual. For more information about the Master Gardener Program contact your local Extension specialist.

The Vegetable Garden

Vegetables are an important part of our diet, and millions of Americans are home gardeners. In Kansas alone, home gardeners produce \$10 to 15 million worth of vegetables every year. The retail value of this produce would be near \$18 million.

When planning your garden, it is important to ask a few basic questions.

- *Who will be doing the work?* Will the garden be a group project with family members or friends who will work willingly through the season to a fall harvest, or will you be handling the hoe alone, in between camping and swimming? Remember, a small weed-free garden will produce more than a large weedy mess.
- *What do you and your family like to eat?* Although the pictures in the garden catalog look delicious, there is no value in taking up gardening space with vegetables that no one eats. Make a list of your family's favorite vegetables, ranked in order of preference. This will make a useful guide in deciding how much to plant of each. Successive plantings of certain crops, such as beans, will give a longer period and increase your yield. List recommended varieties and planting dates.
- *How do you plan to use the produce from your garden?* If you plan to can, freeze, dry, or store part of the produce, this will be a factor not only in planning the size of the garden but also in selecting the varieties grown. Some varieties have much better keeping quality than others. Care should be used in choosing the seeds, making sure the varieties you select are adapted to your area and intended use.
- *How much space is available?* That is, how much area can be converted into usable garden space, not simply how much empty ground is available.

Vegetable Crop Information Table

Crop	Type of Planting	Days to First Harvest	Plants or Seeds Per 100' Row	Days to Germinate	Optimum Temperature (F)	Depth of Planting (In.)	Avg. Spacing Within Row (In.)	Avg. Spacing Between Rows (In.)	Frost Resistance
Asparagus	Perennial (Crowns)	2nd Season	75	—	—	8	18	48	Hardy
Asparagus	Seed (Transplant)	4th Season	2 oz.	10-20	65-75	1	3	6	Hardy
Rhubarb	Perennial (Crowns)	2nd Season	30	—	—	1	36	35-48	Hardy
Beans Snap	Seeded	50-60	½ lb.	5-8	70-85	2	3-4	36	Tender
Beans—Lima	Seeded	65-75	½ lb.	5-8	75-85	2	4-8	36	Tender
Beets	Seeded	55-65	2 oz.	7-10	50-60	½	2-4	18	Half-Hardy
Broccoli	Seed or Transplant	60-80*	½ oz. or 75	(6-8)	(50-60)	(½)	18-24	36	Hardy
Brussels Sprouts	Seed or Transplant	85-95*	½ oz. or 100	(6-8)	(50-60)	(½)	12-18	36	Hardy
Cabbage	Seed or Transplant	65-80*	½ oz. or 75	(6-8)	(50-60)	(½)	12-18	36	Hardy
Chinese Cabbage	Seeded	80-90	¼ oz.	5-7	55-70	½	10-12	36	Hardy
Carrots	Seeded	70-80	1 oz.	10-12	55-70	½	2-3	18	Half-Hardy
Cauliflower	Seed or Transplant	85-100*	½ oz. or 75	(6-8)	(55-70)	(½)	18-24	36	Half-Hardy
Cucumbers	Seed or Plants	60-65	½ oz.	5-8	75-85	½-1	10-48	48-72	Very Tender
Eggplant	Transplants	75-90*	50 plants	(8-12)	(75-85)	—	18-24	36	Very Tender
Garlic	Sets	140-160	3 lbs.	—	—	1	4-6	18-36	Hardy
Horseradish	Roots	Fall	75-100 roots	—	—	3-4	12-18	36	Hardy
Kale	Seeded	60-90	1 oz.	6-9	50-60	½	2-4	36	Hardy
Kohlrabi	Seed or Transplant	60-75	½ oz.	(6-8)	(50-60)	(½)	5-6	18-24	Hardy
Lettuce (Seed)	Seeded	45-50	½ oz.	6-8	50-70	¼	2-4	18-24	Half-Hardy
Lettuce (Plants)	Transplants	35-45	100-200 plants	(6-8)	(50-70)	(¼)	2-4	18-24	Half-Hardy
Head Lettuce	Seed or Transplants	60-85*	1½ oz. or 75	6-8	60-70	½	12-15	18-24	Half-Hardy
Muskmelon	Seed or Plants	80-90	½ oz.	7-12	75-85	1-1½	48-72	48-72	Very Tender
Mustard	Seeded	50-60	¼	6-8	50-60	½	2-4	18-24	Hardy
Onion (Sets)	Sets	100-120	2 qts.	—	—	1½-2	3-4	12-24	Hardy
Onion (Plants)	Transplants	100-120*	300 plants	—	—	1½-2	3-4	12-24	Hardy
Okra	Seeded	50-60	2 oz.	6-12	75-85	½	18-24	36	Tender
Parsley	Seeded	60-70	½	8-10	55-70	½	2-4	18-24	Half-Hardy
Parsnip	Seeded	Fall	½ oz.	10-12	55-70	¾-1½	3-4	18-24	Half-Hardy
Peas	Seeded	60-80	1 lb.	7-10	50-65	2	1-2	12-24	Hardy
Peppers	Transplants	65-80*	50 plants	(10-14)	(75-85)	(½)	18-24	36	Tender
Potatoes	Tuber Pieces	70-90	10 lbs.	—	50-60	2-3	8-12	36	Half-Hardy
Pumpkin	Seeded	110-130	1 oz.	7-10	75-85	1	72-90	72-90	Half-Tender
Radish	Seeded	25-30	1 oz.	4-6	50-60	½	2-3	12-18	Hardy
Rutabaga	Seeded	90-120	½ oz.	5-10	50-60	½	4-6	18-24	Hardy
Salsify	Seeded	140-150	1 oz.	8-12	55-70	½	2-3	18-24	Hardy
Spinach	Seeded	40-45	2 oz.	9-12	55-70	1	2-3	12-18	Half-Hardy
Squash—Summer	Seeded	50-55	1 oz.	7-10	75-85	1	36-48	48-72	Very Tender
Squash—Winter	Seeded	50-55	1 oz.	7-10	75-85	1	60-72	96	Very Tender
Sweet Corn	Seeded	80-100	½ lb.	6-8	70-80	2	14-18	36	Tender
Sweetpotatoes	Plants	130-140	75-100 plants	—	—	—	12-16	36-48	Very Tender
Swiss Chard	Seeded	50-60	1 oz.	9-12	55-70	½-1	6-8	18-24	Half-Tender
Tomato	Transplants	70-85	30-60 plants	(7-10)	(75-85)	(½)	24-48	36-48	Tender
Tomato	Direct Seeded	80-95	¼ oz.	7-10	75-85	½	24-48	36-42	Tender
Turnips	Seeded	45-65	1 oz.	5-10	60-70	½	3-4	12-18	Hardy
Watermelon	Seeded	80-90	1 oz.	8-12	80-90	1-2	72-90	72-90	Very Tender

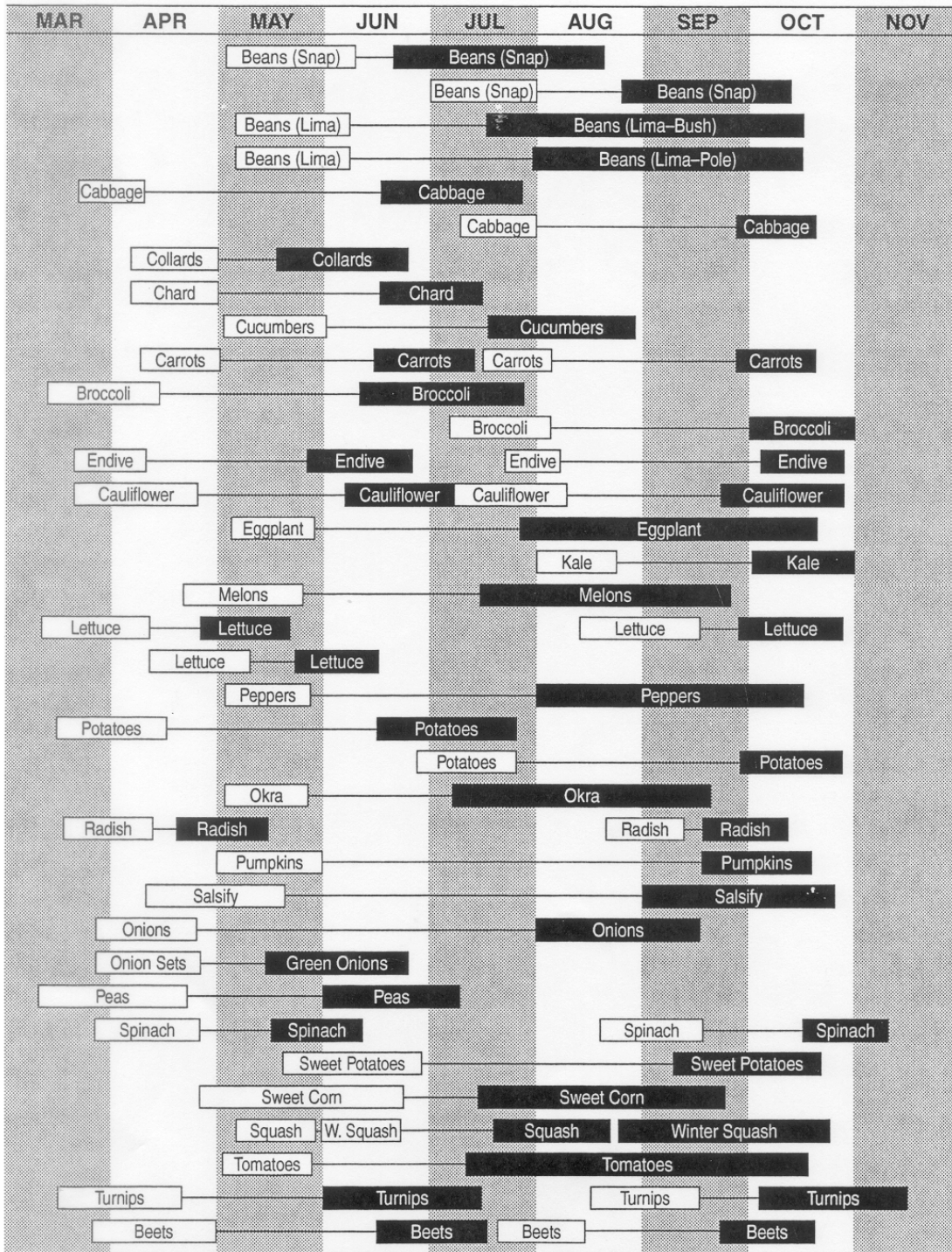
* From date of transplanting.
 () = Seeding information for hotbed; allow 6-8 weeks in hotbed or greenhouse.

Seeding and Planting Calendar

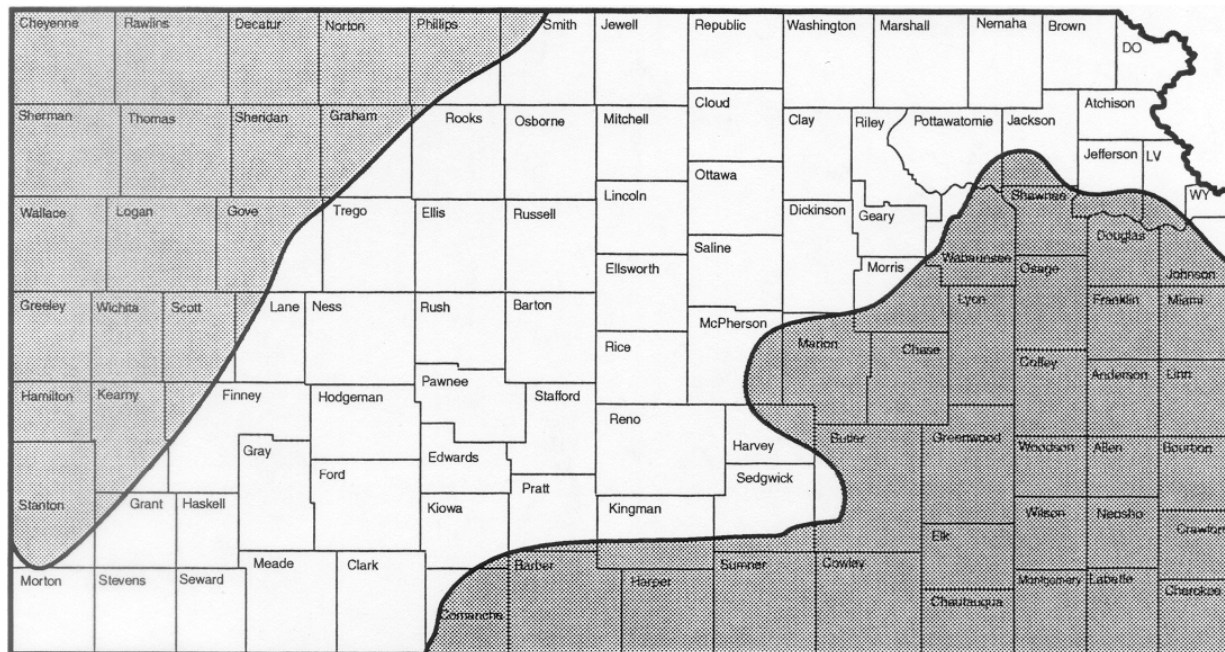





Seeding and Planting Calendar

Plant Harvest



Seeding and Planting Zone Map



-  **Zone I**
-  **Zone II**
-  **Zone III**

	Zone I	Zone II	Zone III
Average Frost-Free Days	160	176	188
Average First Frost (Fall)	October 5–9	October 11–14	October 17–21
	April 29–May 1	April 17–19	April 13–15

Planning a Garden

Locate the garden in an area that will not interfere with the home landscape. A sunny, level area away from large trees is preferable because tree roots compete for soil nutrients and water. A source of water should be accessible for periods when irrigation is necessary.

In many Kansas locations, protection from wind is desirable. Take advantage of fences, small shrubs, or buildings that provide a windbreak.

Soil

Vegetables grow best in well-drained, fertile soil. Sandy loam soils are ideal for vegetables. Most home gardens, however, do not have this soil composition. Compost or manure spread over the garden and worked in with a garden tiller will improve not only fertility but also soil tilth. Adding organic material such as manure or compost is an important practice in successful gardening.

Selecting What to Grow

A wide variety of different vegetables can be grown in Kansas. Space available and individual preferences play an important part in deciding what to grow. Beans, beets, summer squash, peppers, tomatoes, lettuce, onions, radishes, and turnips are well adapted for growth when space is limited.

Sweet corn, vine squash, cucumbers, pumpkins, and melons require more space for growth and should be considered only if adequate space is available. Don't be afraid to experiment with unfamiliar vegetables, but plan to be able to use most of the vegetables you produce.

Most home gardeners have too much produce maturing at the same time. This is desirable if you plan to can or freeze the vegetables. For table use, it is best to stagger plantings. Plant a few radishes every four to five days instead of all at once. This will provide a steady supply of radishes of ideal maturity over a longer period. Also, stagger plantings of lettuce, beans, sweet corn, and peas.

Optimizing Garden Space

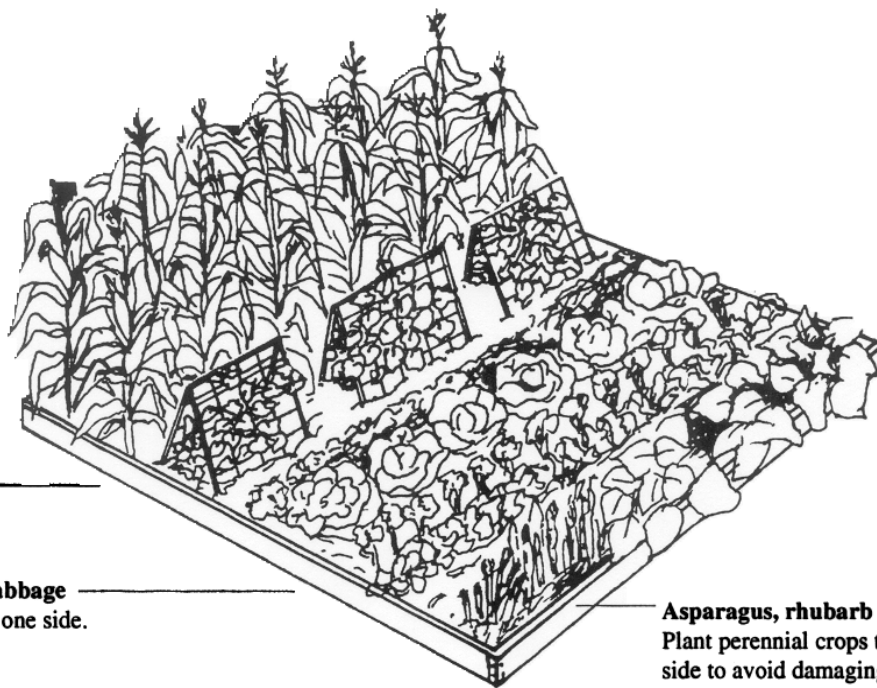
Use the Vegetable Garden Calendar to plan your garden space. Spinach, lettuce, radishes, peas, and green onions can be harvested early in the season. The same space is then available for late-season crops of beans, eggplant, tomatoes, or potatoes. Plant lettuce, radishes, or spinach between potatoes, cabbage, or other cole crops. Before the potatoes or cole crops get very large, the other vegetables will have been harvested.

Making a garden plan

Sweet corn —
Tall crops serve

Cucumbers —
Give vine crops
plenty of room.

Radishes, lettuce, cabbage —
Group early crops to one side.



Asparagus, rhubarb —
Plant perennial crops to one
side to avoid damaging with
annual tillage operations.

Select a place along one side of the garden for crops such as rhubarb, asparagus, strawberries, or bush fruits. These perennials will continue to grow next year without replanting. If planted in the garden, they will be in the way during tilling operations.

Make a Sketch

Draw a scale model of your garden space and plan the garden using the above information. Allow everyone involved to participate by suggesting their favorite vegetables. Take notes on the plan and save it as a reference for next year's garden. You can also use this plan when ordering seeds and plants.

Obtaining Seeds and Plants

In choosing varieties for the home garden, consider factors such as disease resistance, yield, maturity date, size, shape, color, and flavor. Seed companies and state agricultural research stations are constantly developing and testing improved vegetable varieties and procedures. The following sources of information are useful when choosing varieties:

- Ask your local Extension agent or K-State Research and Extension for the publication Recommended Varieties for Kansas.
- Use varieties that have performed well in past years for you or other gardeners you know.

If you plan a special use for a particular vegetable, such as freezing, exhibiting, or canning, check with your local Extension agent or study your seed catalog for recommendations.

Check with your local seed store or garden center for advice on what to plant.

If you do not have a hotbed or cold frame, you may want to buy vegetable transplants for crops that require transplanting to the garden. These can be obtained from local greenhouses or seed and garden centers. Again, make sure the varieties are what you want to produce.

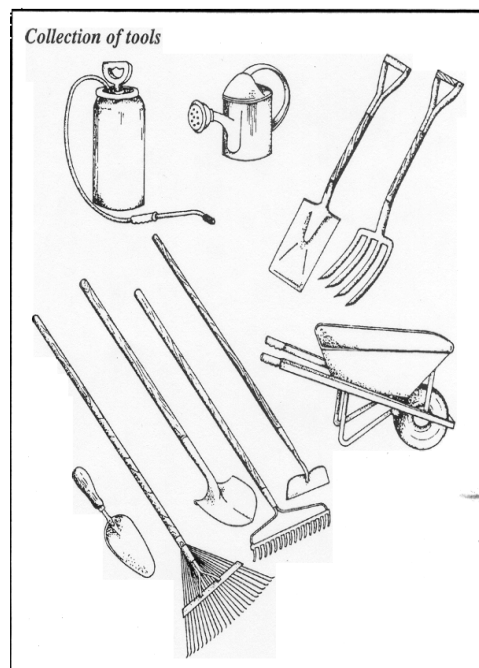
Plan, and then purchase the seeds and plants you want so that you will have them when you need them for your garden.

Tools and Supplies

While several items are essential to raise a garden, it is not necessary to have a lot of equipment. If your friends have gardens, you might share equipment and supplies. Select supplies according to the size of garden you want.

Mini-Garden (less than 100 square feet)

- Spading fork or shovel
- Hoe
- Trowel
- Small sprayer or duster
- Pointed stakes and labels
- String and yardstick
- Fertilizer
- Fungicides and insecticides as desired
- Sprinkling can
- Compost, manure, peat moss, sawdust, or vermiculite



Family Garden (between 100 and 1,000 square feet)

- Garden tiller
- Hoe and trowel
- Small sprayer
- Pointed stakes and labels
- String and yardstick
- Fertilizer
- Fungicides and insecticides as desired
- Hose
- Compost, manure, peat moss, sawdust, or vermiculite

Large Garden (more than 1,000 square feet)

- Garden tractor
- Hoe
- Sprayer or duster
- Wheel cultivator
- Fertilizer spreader
- Wheelbarrow
- Pointed stakes and labels
- String and yardstick
- Fertilizer
- Fungicides and insecticides as desired
- Hose
- Compost, manure, peat moss, sawdust, or vermiculite

Soil Improvement

All garden plants depend on the soil for nutrition. Soil condition and fertility are primary considerations in achieving a successful home garden.

Adding Organic Matter

Organic matter is an effective way of improving all kinds of soil. As mentioned earlier, adding organic matter to the planned garden area is recommended. It is also beneficial to add organic matter every few years.

Organic matter serves the following purposes:

- It loosens tight clay soils.
- It increases water-holding capacity of sandy soils.
- It makes soil easier to till.
- It provides nutrients.

One way of adding organic matter is to seed a cover crop in the fall and turn it under in the spring. This should be done only if you have equipment such as a heavy garden tiller or plow to turn the cover crop under in the spring. Some recommended cover crops include annual ryegrass (1/4 to 1/5 pounds per 100 square feet) or rye (1/2 to 1/4 pounds per 100 square feet) seeded in mid-September. This cover protects the garden from erosion during winter. It adds organic matter when the grass is 6 to 8 inches tall and is turned under in the spring.

However, most home gardeners prefer to add organic matter by using one of the following materials

- Stable manure. Use 50 to 100 pounds per 100 square feet. You may want to add 1/4 to 1/2 pound of superphosphate as well.
- Poultry and sheep manure. Use 10 to 20 pounds per 100 square feet. Again, adding 1/4 to 1/2 pound of superphosphate is beneficial.
- Rotted sawdust. Use sawdust in your compost pile, and then apply it to the garden. Use 3 to 4 bushels per 100 square feet.
- Compost. Compost is decayed plant material. Apply 50 to 100 pounds per 100 square feet of garden space.
- Feedlot Manure. Use 10 to 20 pounds per 100 square feet. Adding 1/4 to 1/2 pound of superphosphate may be beneficial.

Getting a Soil Test

The winter before you begin to garden you will want to get a sample of your garden soil tested to determine the pH and nutrient content. The soil test provides a starting place for a soil improvement program. Unless you know the deficiencies in your garden soil, you are only guessing when you apply fertilizer. The soil test will tell you how much fertilizer you must initially add to your garden. It is then much easier to maintain a high level of fertility as you garden year after year.

Check with your local Extension agriculture or horticulture agent for soil testing information.

Controlling Soil pH

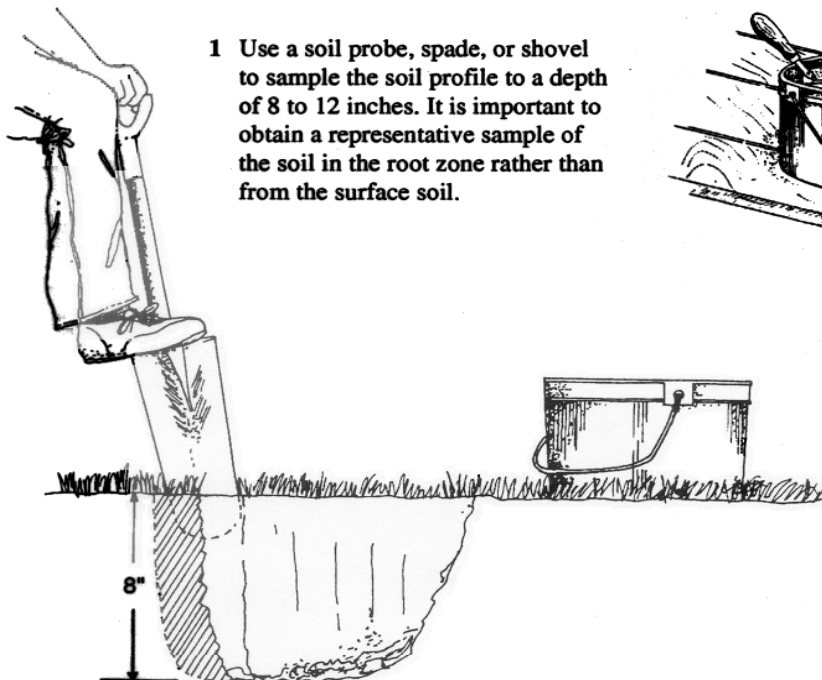
The pH of the soil is a measure of acidity or alkalinity. Most plants grow best in a soil that is neither too acid nor too alkaline. Extremes of acidity or alkalinity are possible in Kansas soils. These extremes may make the soil nutrients unavailable to plants. Because of the parent rock materials, previous fertilizer use, cropping sequence, or other factors, the pH of the soil may differ from the desirable range.

One part of the soil test is measurement of the pH and, if needed, a recommendation of the amount of lime necessary to reduce soil acidity. Some people refer to liming as "sweetening the soil." Sulfur or other materials may be used on alkaline soils to reduce soil pH to the desired level.

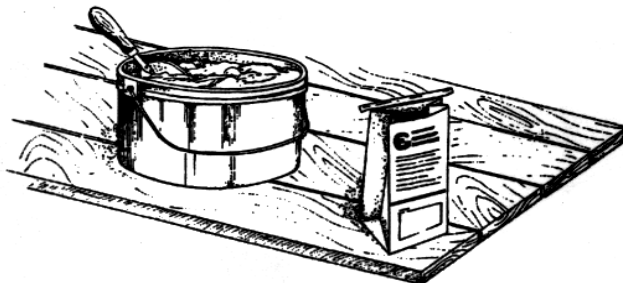
Most eastern and central Kansas gardens may have soils that become too acid, while the soils of western Kansas tend to be alkaline.

Your local Extension agent can recommend the amount of lime or other material needed to correct the soil pH. Often, correcting the soil pH can be as important in improving plant growth as adding fertilizer materials.

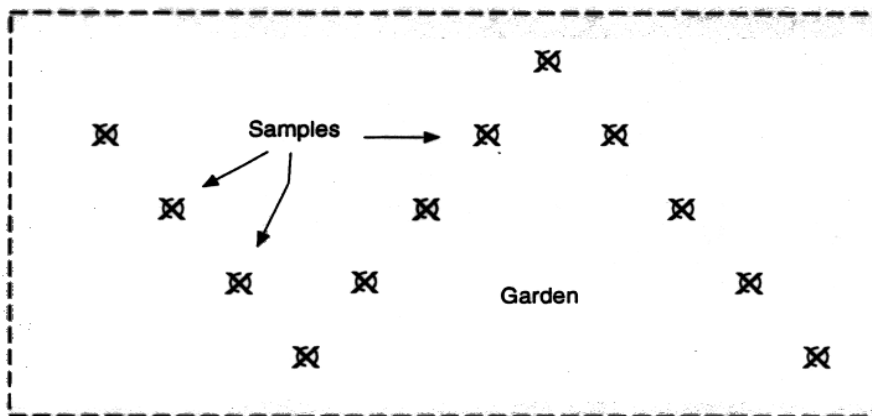
Four steps for taking a soil sample



Slice for sample: 8-12" long by 1-1½" thick.



- 3 From the bucket or pail, select about a pint of soil. Special soil sample containers are available from your county Extension office or a fertilizer supplier. You may use a clean milk carton, ice cream container, or similar package. Label it with your name, address, and information on the garden crops to be grown. If you send more than one sample, be sure to label each plainly.



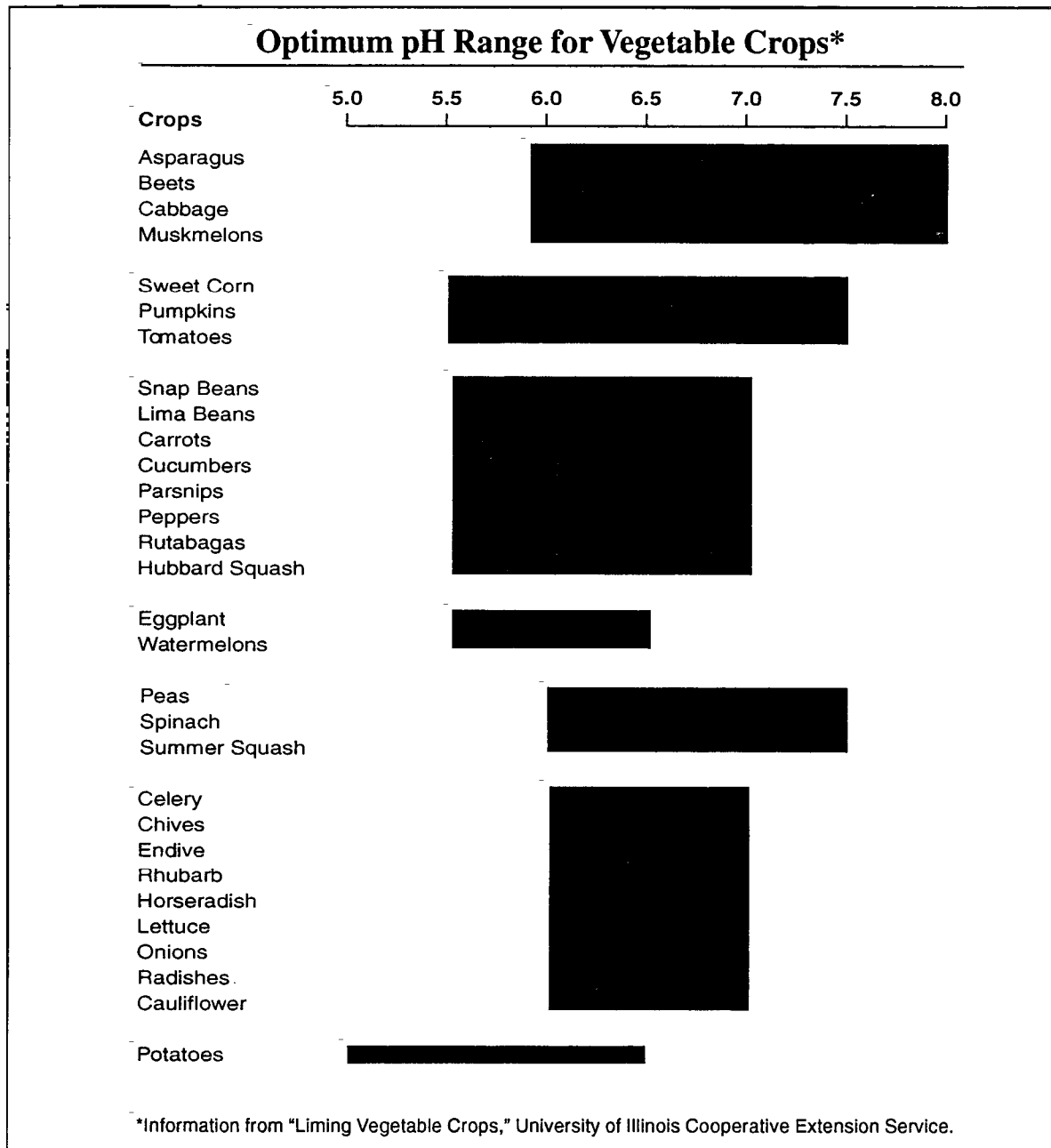
- 4 Your local Extension agriculture or horticulture agent will either test the sample in the county soil lab or send it to the Kansas State University soil testing laboratory. The agent will make recommendations on the amounts of fertilizer to use on your garden. Rely on your local Extension office for information and advice concerning your garden.

Fertilizing the Garden

Fertilizing is an important practice, but it is not a cure-all. Fertilization cannot compensate for:

- poor soil structure which does not allow for adequate drainage or aeration.
- undesirable soil pH or salt content of the soil.
- poor seeds, diseased, or unhealthy plants.
- shade trees or tree roots in or around the garden area.

The addition of organic matter will ensure that some fertilizer nutrients are in the soil. You may need to add commercial fertilizer as well. Most chemical fertilizers are simply rock or mineral materials rich in nutrient elements.



Fertilizer Types

The nutrient elements that plants require can be supplied by either organic or commercial fertilizers. All plants require 16 nutrient elements for growth. Thirteen of these come from the soil. When organic fertilizers are used, they must break down to release these basic fertilizer elements in the soil before the plants can use them.

Regardless of the form of fertilizer -- organic or chemical -- the plant makes no distinction as long as the nutrients are there. However, large quantities of organic materials must be used compared with more concentrated commercial fertilizers.

Organic fertilizers. Organic matter is a vital part of any soil and benefits the soil in several ways. When incorporated into the soil, decaying organic residue serves several useful functions:

- Loosens tight clay soils to provide better drainage.
- Provides for better soil aeration which is necessary for good root growth.
- Increases the water-holding capacity of all soils.
- This is especially helpful on sandy soils.
- Makes soil easier to till and easier for plant roots to penetrate.
- Supplies nutrients for plant growth.

Chemical fertilizers. The nutrients most frequently lacking for growth are nitrogen (N), phosphorus (P), and potassium (K).

- N (Nitrogen) - This nutrient element provides dark green color in plants. It promotes rapid vegetative growth. Plants deficient in nitrogen have thin, spindly stems, pale or yellow foliage, and smaller than normal leaves.
- P (Phosphorus) - This nutrient promotes early root formation, gives plants a rapid, vigorous start, and hastens blooming and maturity. Plants deficient in this element have thin, shortened stems, and leaves often develop a purplish color.
- K (Potassium) - Potassium or potash hastens ripening of fruit. Plant disease resistance as well as general plant health depend on this element. It is also important in developing plump, full seeds. Plants deficient in this element have graying or browning on the outer edges of older leaves.

The content of N, P, and K is specified on bags of chemical fertilizers. The analysis or grade refers to the percent by weight of nitrogen, phosphate, and potash in that order. Thus, a 10-10-10 fertilizer contains 10 percent nitrogen (N), 10 percent phosphate (P_2O_5) and 10 percent potash (K_2O).

Calculating the Amount of Fertilizer Needed

To calculate the amount of fertilizer needed for an area, consider the recommendation for the particular nutrient needed and the analysis.

If you need to add 0.1 pound of N per 100 square feet and you have a 10-10-10 fertilizer, which contains 10 percent N, you will have to add 1 pound of this material per 100 square feet to achieve the needed amount of N.

The relationship of N, P, and K to each other, sometimes referred to as the ratio, indicates the proportion of each element. For example, 1-1-1 means there are equal proportions of N, P_2O_5 , and K_2O , as does 10-10-10. However, a 2-1-1 ratio means there is twice as much N as P_2O_5 and

K₂O, as is true for 10-5-5. The ratio does not indicate the weight of the elements in the fertilizer bag, but only their relationship to each other.

In addition to N, P, and K, 10 other elements that plants require come from the soil. Generally, it is not necessary to add these elements because they are present in sufficient quantities in Kansas soils. However, on occasion addition of one or more of these micronutrients may be required. A common micronutrient element found lacking in high pH soils commonly found in western Kansas is iron. The symptom of iron deficiency is a pale yellow color that develops in plants. This can be corrected by a foliar application of iron or by reducing the soil pH.

- Measure the area of your garden: For example, suppose your garden is 10 feet wide by 20 feet long. Your garden area is 200 square feet.
- Determine the nutrient you need to add per 100 square feet from the table on page 2-14: For example, suppose your test results indicate that you need 0.1 pound N, 0.1 pound P, and .05 pound K. Multiply the amount you need by the number of hundred square feet units in your garden. For example, if your garden is 200 square feet, you would need 2 times the amount above or 0.2 pound N, 0.2 pound P, and 0.1 pound K.
- Because you need equal portions of N and P but less of K, look for a fertilizer that may have the ratio of nutrients in this range. You might not be able to find a fertilizer that provides exactly the ratio you need, so try to get as close as you can. For example, if you find a fertilizer that has 10-10-5, this would provide the exact ratio that you need. To calculate how much of this material to add, divide the amount that you need by the nutrient concentration or analysis of the fertilizer and multiply by 100 because the analysis represents a percentage or fractional value of 100:

$$0.2 \text{ lb needed} \div 10 \times 100 = 2 \text{ lb}$$

of fertilizer material needed to provide the N that you need. This amount of fertilizer will also supply the P and K that you need. Apply 2 pounds of 10-10-5 fertilizer to your 200-square-foot garden.

Most fertilizers that you will find are complete fertilizers with proportions of each major fertilizer element. Some sources supply specific concentrations of a single element only. Some of these are listed in the table on page 2-15. Standard soil tests analyze for N, P, K and pH, while additional soil tests can be made for other fertilizer elements that may be required in unusual cases. Iron, zinc, magnesium, sulfur, or other elements are seldom required to correct a particular soil fertility deficiency. Some of these deficiencies might best be corrected with a foliar application as described on the next page.

Materials to add to correct soil pH

Lime To Increase pH			
Effective Calcium Carbonate—from Soil Test	Lime Required lb/100 sq ft		
5,000	11		
3,000	9		
2,000	7		
1,000	3		
500	1		

Sulfur To Lower pH			
Amount of Sulfur (95%) in lb/100 sq ft			
pH Value from Soil Test	Broadcast To Entire Soil Area (6" Deep)		
	Sandy Soil	Loam Soil	Clay Soil
7.5	1-1½	1 ½-2	2-3
8.0	2-3	3-4	4-5
8.5	4-5	5-6	6-7
9.0	7-8	7-8	7-8

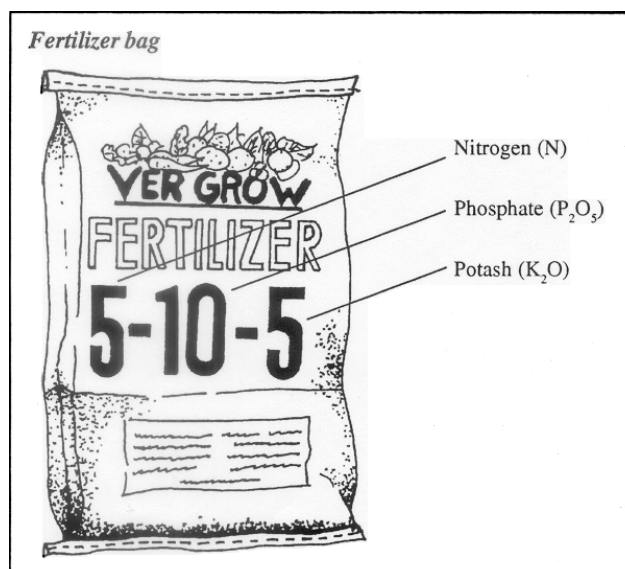
Applying Fertilizers

Row applications provide the most efficient use of fertilizer for row garden crops. As a rule, use about 1 to 2 pounds of the balanced analysis fertilizer per 100 feet of row. The best method of applying fertilizer is to dig a small trench 2 to 3 inches deep on either side of the row before planting. Sprinkle half the total amount of fertilizer in each trench. Cover the trenches and plant in the marked row.

An undesirable feature of row application is that it requires a lot of work. If you do not want to apply fertilizer to each row, you can broadcast or spread fertilizer throughout the garden area. Use 2 to 3 pounds of fertilizer per 100 square feet, spread uniformly over the surface, and incorporate into the soil before planting. For tomatoes, cabbage, or other transplanted crops, as well as for melons or cucumbers planted in hills, use about 2 tablespoons of fertilizer placed 2 to 3 inches below the roots or seeds. Again, after placing the fertilizer, cover with soil and plant as usual.

Starter solutions. For transplanted vegetables such as tomatoes, peppers, eggplant or cabbage, add a starter fertilizer to the water used in setting the plants to get them off to a faster start. Commercial starter fertilizers mix with water or are water-soluble. Follow the label directions, because mixing too much starter fertilizer can burn the plant roots.

You can make your own starter fertilizer solution by adding 2 tablespoons of ordinary fertilizer, such as 5-10-10, 3-12-12, 10-10-10, or similar material, to a gallon of water. Mix well with a stick or stake. While some of the larger fertilizer particles will settle out, enough soluble material will remain in the water. Use about 1 cup of this starter solution for each plant. Commercial soluble fertilizers also can be used as a plant starter. Follow label directions.



Sidedressing. Nitrogen often leaches or washes out of the reach of plant roots, particularly in years when rainfall is abundant and in sandy garden soils. A sidedressing is simply an application of a nitrogen-containing fertilizer alongside the row of growing plants. Apply when corn is 12 to 18 inches high, after first fruits have set on tomatoes, or when plants lack a healthy, dark-green appearance.

It is possible to apply too much nitrogen; use fertilizer sparingly. Use 1/4 pound of ammonium nitrate or 1/5 pound of urea per 100 feet of row. If these materials are not available, use an ordinary balanced fertilizer such as 5-10-10, 8-16-16, or others at the rate of 1 to 2 pounds per 100 feet of row. Don't put the material directly on the plant foliage and, when possible, water after applying the fertilizer.

Foliar Feeding. In an emergency, it may be possible to add certain nutrients to a plant by application to the foliage when nutrient deficiency symptoms develop. It is advisable to make every attempt to add the necessary nutrients to the soil before the symptoms develop because foliar application should be used only as an experimental or emergency treatment. Unless the soil conditions causing the symptoms are corrected, the symptoms will reappear soon.

Using a commercial wetting agent or a few drops of detergent in the solution provides better coverage of foliage. Apply the sprays in early morning or late afternoon, on a cloudy day, or soon after a rain. Mixing of these elements with one another or with a pest control spray may be difficult. Do not attempt to mix foliar nutrients with pest control sprays.

Approximate Composition of Some Organic Fertilizers

Material	Nitrogen	Phosphorus (N)	Potassium (P)	(K)	Percent		
Cow manure, fresh		.5	.1	.4			
Cow manure, dried		1.3	.9	.8			
Horse manure, fresh		.6	.3	.5			
Feedlot manure, fresh		.7	.4	.6			
Feedlot manure, dried		1.3	.7	1.0			
Hen manure, fresh		1.1	.9	.5			
Hen manure, dried, with litter		2.8	2.8	1.5			
Tankage, animal		9.0	6.0	—			
Tankage, processed		7.0	1.0	.1			
Garbage tankage		1.5	2.0	.7			
Sewage sludge		2.0	1.4	.8			
Sewage sludge, activated		6.0	3.0	.1			
Wood ashes		—	.8	5.0			
Cottonseed meal		6.0	3.0	1.0			
Bonemeal, steamed		2.0	22.0	—			

Other commercial or processed fertilizers may be available. Consult the label for nutrient content.

Recommendations for Fertilizer Additions Based on K-State Soil Test Results

Nitrogen*	0–25 ppm	Low
	25–50 ppm	Medium
	50–80 ppm	High
Phosphorus*	0–50 lb	Low
	50–200 lb	Medium
	200+ lb	High
Potassium*	0–250 lb	Low
	250–500 lb	Medium
	500+ lb	High

*If you do not have soil test results, follow recommendations for a medium application level.

Pounds of Actual Element to Add per 100 sq ft

	Nitrogen			Phosphorus			Potassium		
	Low	Med	High	Low	Med	High	Low	Med	High
Intensive or small gardens with successive plantings from spring, summer, and fall	.2	.1	0	.2	.1	0	.1	.05	0
Standard or large gardens with wider row spacings	.1	.05	0	.1	.05	0	.1	.05	0

Fertilizer sources with concentrations of specific elements

		Analysis
Nitrogen sources	Ammonium nitrate	33-0-0
	Ammonium sulfate	20-0-0
	Nitrate of soda	15-0-0
	Nitrate of potash	13-0-44
	Monoammonium phosphate	11-48-0
	Diammonium phosphate	18-46-0
	Urea	45-0-0
Sulfur sources	Elemental sulfur	98% sulfur
	Copper sulfate	20% sulfur
	Ammonium sulfate	24% sulfur
Iron sources*	Iron chelate	6%, 10%, or 12% iron for foliar or soil application
	Iron sulfate	
Zinc sources*	Zinc sulfate	36% zinc
	Zinc chelates	Variable
Magnesium sources**		
	Epsom salts (Mg SO ₄)	10.4% Mg
Boron sources*	Borax	11.3% boron

*Other commercial sources may be available. Consult the label for content.

** Some types of limestone (dolomitic) will also be sources of magnesium.

unique. Use your judgment in evaluating the weather each year.

Many vegetables can be planted so they mature for use in the fall as well as in the spring. Use the Vegetable Garden Calendar as a guide for planting spring and fall vegetables. Some vegetables are more tolerant of frost than others are. Use the last column of the Vegetable Crop Information chart on page 2-2 to guide you in making sure you are able to harvest before frost.

Suggestions for Nutrients as Foliar Fertilizers

Element	Material	oz/3 gal Water per 100 sq ft	Remarks
Iron	Iron chelate	Follow package directions	Iron deficiency found when pH is above 6.8
Magnesium	Magnesium sulfate	4-5	Use more than one application
Nitrogen	Urea	2-3	Most crops
Calcium	Calcium chloride	2	Direct at the growing point
Manganese	Manganese sulfate	1-2	May be needed in soils with high pH

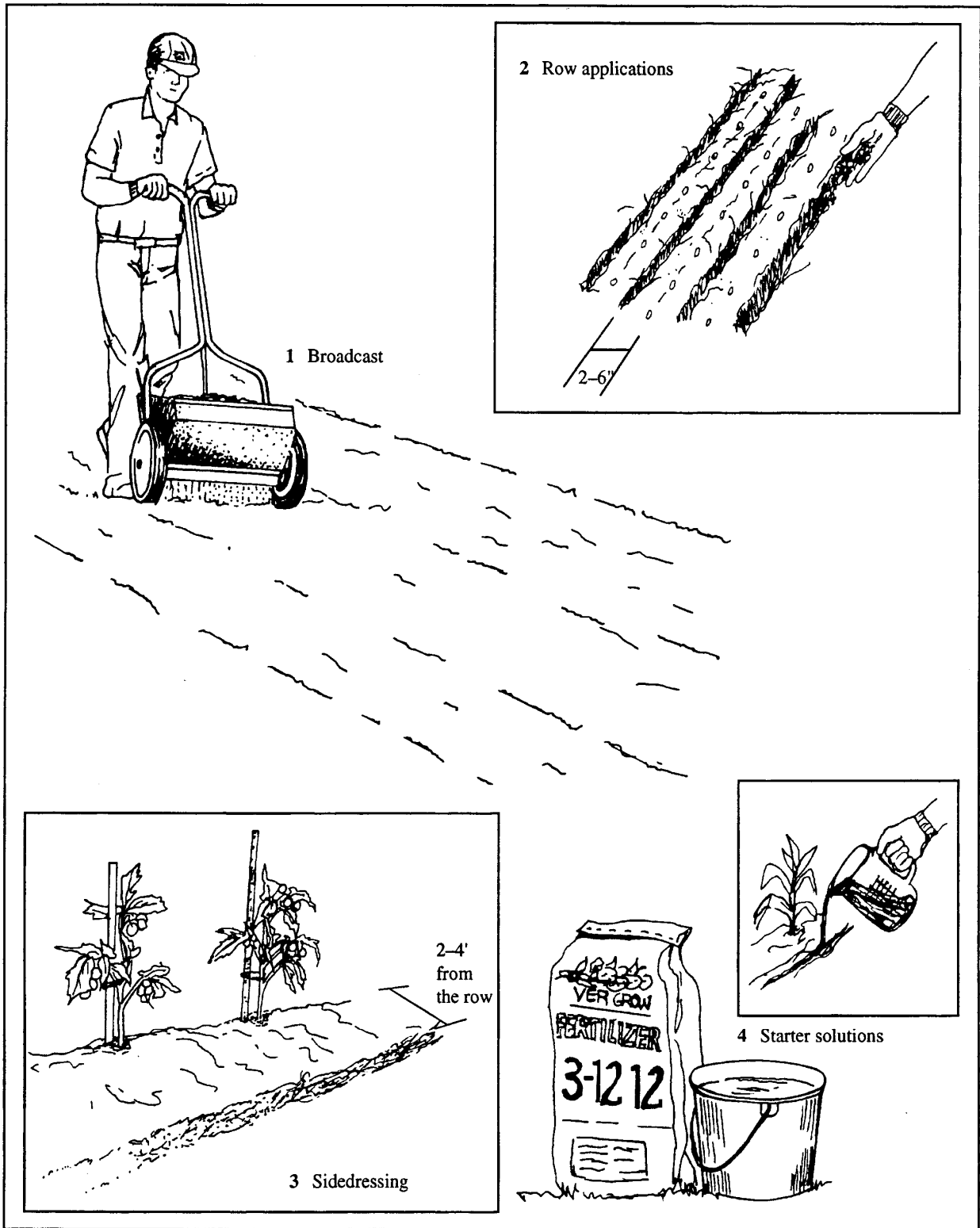
Seeding and Planting

The date to plant is determined by local weather conditions and the nature of the various garden vegetables. Some vegetables require warm soil and air temperatures, while others will grow in colder temperatures. Most home gardeners are eager to have some vegetables early in the season.

When to Plant

Use the Vegetable Garden Calendar as a guide for when to plant various vegetables in your garden.

These dates are based on estimated average temperatures in various locations. There may be unusual years that are either much warmer or much colder than the average. Each year is



Preparing the Seedbed

The condition of the seedbed largely depends on how you prepare it. Work the seedbed as little as possible, but break up most of the larger surface clods.

Most gardeners plow or spade their soil in the spring. In some areas with heavy soils, it may be desirable to plow in the fall to allow winter freezes to mellow the clods. Make sure the soil crumbles well as it is plowed or tilled. Working the soil when it is too wet will cause a poor seedbed and poor soil conditions throughout the season. As a rule, soil is too wet to work if you can press a handful of it into a muddy ball.

For tiny vegetable seeds such as lettuce and carrots, it may be necessary to rake up a seedbed of very fine soil. For most vegetable seeds or plants, it is usually better to have some small surface clods.

Seeds

Seeds should be obtained early in the year so you can get the varieties you want. The Vegetable Crop Information chart will guide you on how much seed to buy. Seeds can be obtained from local dealers and seed catalogs.

Avoid using seed from your previous crops unless you have a special interest such as the continued propagation of an unusual variety. Commercially available seeds are treated for disease and insect resistance and are stored under conditions that ensure health and vigor. It is possible to get atypical plants when you save your own seeds and when the plants are cross-pollinated or hybrid varieties.

Getting the Most From Your Fertilizer

- Select sites with soil well adapted to crop growth because fertilizer will prove more profitable on good soil than on poor soil. Well-adapted soil is well drained, deep, and free from rocks or other debris. It should be fairly level, especially for vegetables.
- Get a soil test. Don't guess about soil fertility or other deficiencies. Find out exactly what your soil needs.
- Add organic matter where practical. It can provide benefits besides soil nutrients.
- Control weeds and use sound cultural practices.
- Select only the best plants and seeds.

Use a string to mark straight rows through the garden. Use the Vegetable Crop Information chart to indicate proper spacing. If you have a mechanical tiller or cultivator, be sure to allow adequate space between rows for cultivating. After seeding at the proper rate and depth, cover gently and water if the seedbed is very dry. If your garden soil tends to crust or the surface becomes hard after a heavy rain, apply a light layer of sand over seeds.

Some Useful Measures

1 acre = 43,560 square foot
 100 pound/acre = approximately
 2 pound/1,000 square foot
 3 tablespoons (level) = 1 ounce
 8 ounces = 1 cup
 2 cups = 1 pint (equals 1 pound of most dried fertilizer materials)

Producing Transplants

Most home gardeners obtain plants from local plant growers or suppliers. In areas where dealers are not available or where the desired varieties cannot be obtained, gardeners may need to produce their own plants.

Transplants are generally started by seeding vegetables in a small box or flat. In order to prevent diseases, a disease-free material such as sphagnum moss, vermiculite, or sand should be used instead of soil. Sow thickly in rows 2 inches apart. Cover lightly with a thin layer of the planting medium and water gently. Place the box or flat in a hotbed or sunny window and keep it moist until the seeds germinate.

As a general rule, it will be six to eight weeks from the time seeds are sown until the plants are ready for transplanting to the garden. Use the Vegetable Garden Calendar to determine the garden planting date.

After the seedlings emerge and have two to four small leaves, they should be replanted in small pots and allowed to grow until transplanted to the garden. Pots should contain soil mixed with peat or sand to loosen it.

Various types of containers can be used. Paper cups, milk cartons, clay pots, peat pots, flats, or other packages can be used. Any container must have a drain hole. Fill containers with the soil mixture and firm slightly. Lift the seedling plants from the flat and grasp the leaves, not the stem, of the small plants. Place one seedling in each pot. Water gently and place in a sunny window or hotbed until transplanting time.

Before transplanting to the garden, plants should be "hardened," or conditioned to outside temperatures. About 10 days before the transplanting date:

- gradually withhold watering so the plants are not wilting but are getting less water than normal.
- gradually expose plants to the outside temperatures by removing the hotbed lids or placing the plants in a protected location outside.
- avoid fertilizing, especially with nitrogen.

If this hardening procedure is followed, the plants will begin to grow soon after transplanting rather than suffer "transplant shock."

Transplanting

- Immediately before transplanting, water plants well.
- Allow as much soil to adhere to the roots as possible when transplanting.
- Water well after transplanting using a starter solution.
- After the water has soaked in, sprinkle some dry soil over the moist soil around the plant.
- Protect the young transplants for the first few days.

When peat pots are used for transplanting, the pot and all can be planted to lessen the transplanting shock. Make sure the pot is well covered, however, because the exposed peat pot acts as a wick to draw moisture from the soil around the transplant.

As the Garden Grows

A lot of effort goes into producing a successful garden. There are many things to do between planting time and harvest. Each of the following cultural practices should be considered.

Thinning

Many small seeded crops need to be thinned. For crops such as beets, carrots, radishes, turnips, and direct-seeded tomatoes or onions, it is necessary to thin some young plants from the thickly seeded row. An advantage of this process is that you can select the best of several plants and remove the poorer ones. This should be done one to two weeks after emergence of the seedlings. The average spacing between plants in a row is indicated in the Vegetable Crop Information chart.

Weeding and Cultivating

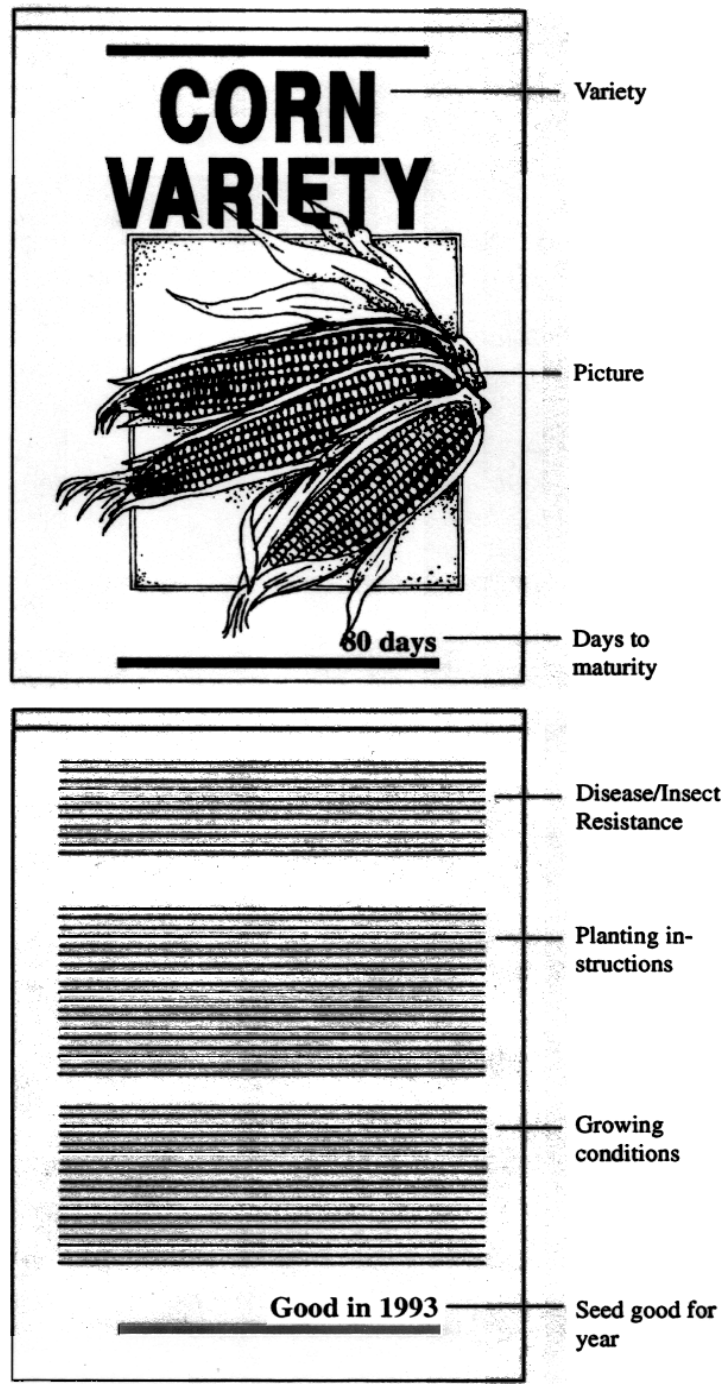
Weeds are a natural garden competitor. They compete with vegetable plants for water, nutrients, and space. The use of mulches and cultivation will help control weeds. Don't allow weeds to get a start. Control them when they are small. Mulching can reduce the time spent in cultivating.

Loosening the soil with a tiller or hoe accomplishes several things:

- It provides for air penetration.
- It promotes better water retention.
- It kills weeds that compete for water and nutrients.

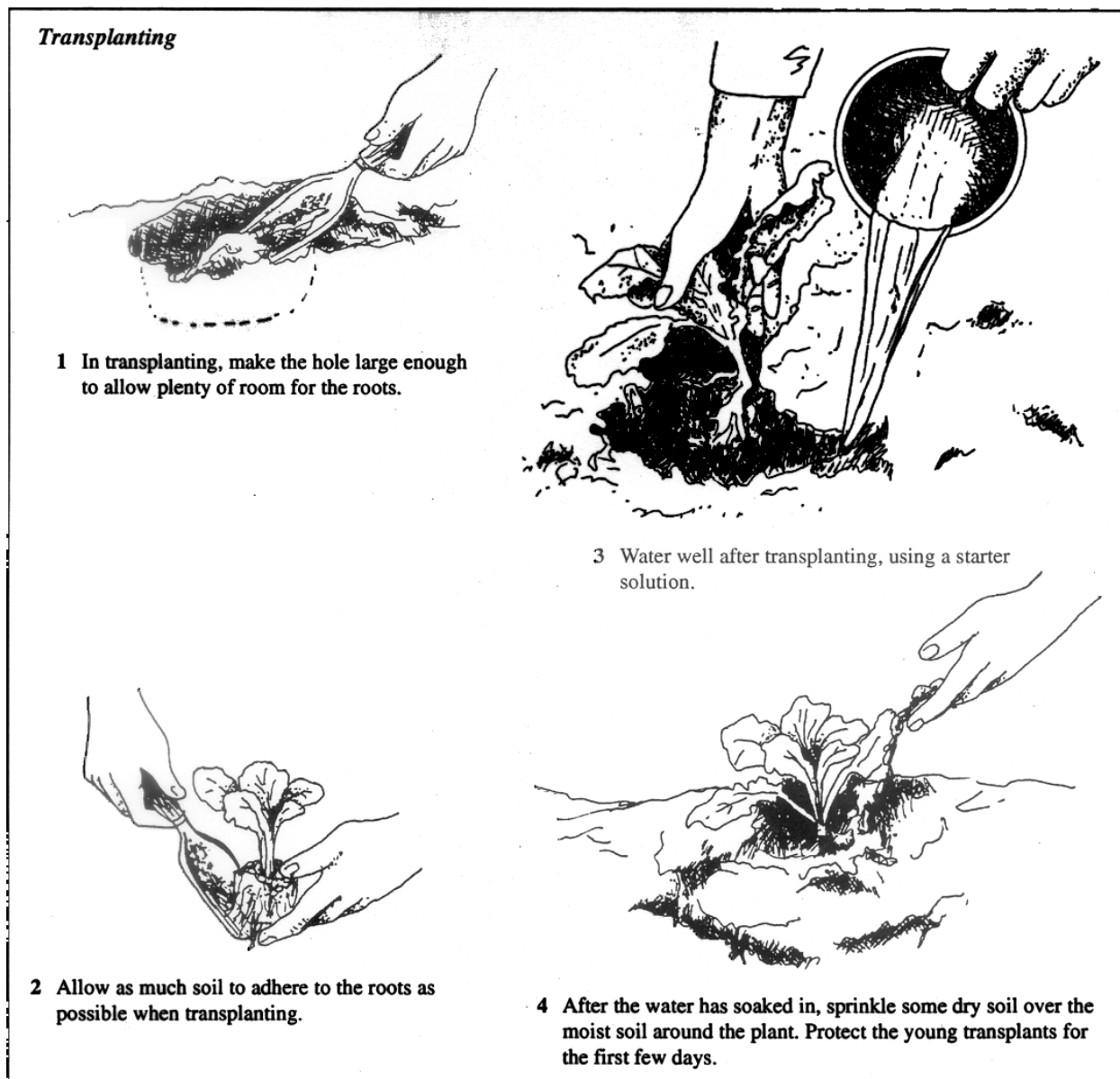
Because most vegetables have roots near the soil surface, use care when cultivating around or near plants. A light surface scraping is sufficient around plants. Deeper tilling should be reserved for areas between rows. A tiller, garden tractor, or high wheel cultivator may be used, but most people rely on the gardener's best friend -- the hoe.

Seed packet



Flower Removal

Removing some of the flowers that form on certain vegetable plants can increase the size of the fruit that develops. This is a standard practice for gardeners who are growing vegetables for exhibit. You may want to try it with tomatoes, squash, melons, and pumpkins. Check with your local Extension agriculture agent for information on how to enter garden vegetables in a county or state fair.



Pruning

Removing some of the vegetative growth on certain plants will admit more light to the plant, improve plant growth habit, and promote early fruit ripening. With tomatoes grown on stakes, it is a common practice to prune suckers or shoots that develop in the angle between the stem and branches. Remove suckers as they form and before they are 1 to 2 inches long.

Staking and Tying

Most home gardeners have limited garden space. Training plants on stakes or trellises makes more efficient use of that space. Tomatoes are generally staked. Cucumbers and cantaloupe can be trained to a trellis or wire frame. Pole lima beans and pole snap beans also can be trained to a stake or trellis. Drive the stakes soon after plants have been set rather than waiting until they are established.

An effective trellis for home gardens can be made from hoops of concrete reinforcement wire or hog wire. Use hoops about 2 feet in diameter for tomatoes and 1 to 1½ feet in diameter for cucumbers and cantaloupe. You may need to put a stake or rod alongside the hoop to prevent it from turning over in strong winds.

Watering the Garden

Reducing home water use has become a major concern. Outdoor water use often comprises more than half the water consumed by the average household and is an area where many significant improvements can be made. Careful planning, proper soil preparation, efficient watering, and use of mulches combine to make the most of every drop of water for your garden.

Watering Efficiently

Two factors influence the general practice of watering: the water available in the soil environment and the rate the plant is using water. The first depends primarily on the soil's water-holding capacity as well as the root mass. The second depends on some special characteristics of plants which allow them to retard water use and, more important, on the weather conditions such as temperature, wind and humidity.

The type of soil you have influences its capacity for holding water. Soil is composed of small particles, the largest particles being classified as sand; medium-sized particles as silt; and fine particles as clay. Varying amounts of each size particles in any soil determine its texture.

Some soils may have different textures at different depths. A layer of clay or hardpan beneath a loamy soil can restrict drainage. The soil texture in many garden areas has been altered by construction activity including the addition of fill soil.

Principles of Plant Water Use

Garden plants use water as part of the photosynthetic process and to move nutrients from the soil to upper parts of the plant. A continuous flow of water moves from the root system up through the plant where it evaporates into the atmosphere. In hot, dry conditions, the loss of water to the air is greater than in cooler or more humid conditions. In addition, as the size and complexity of the plant increase, there is a greater need for water.

In contrast to landscape plants, garden plants need adequate water to encourage rapid, vigorous growth. Crops should never be under prolonged water stress because yield, quality, and pest resistance may be sacrificed.

New seedling plants with a shallow, poorly developed root system may require regular shallow watering, while a mature plant with its extensive root system can use water from a larger area of the soil profile.

Garden crops differ in the size and complexity of their root system. Consider the type of plant root system when determining which water practice would be most efficient.

The following table shows average rooting depths of selected vegetable crops. The development of the root system of garden crops is such that most of the water is absorbed in the upper half of

the root system. Thus, if the effective rooting depth of tomatoes is 48 inches, we could assume that most of the water is absorbed in the upper 24 inches and attempt to manage watering practices to keep an adequate supply in this 2-foot area.

Suggestions for Applying Water

Some vegetables, such as lettuce and corn, have especially sparse, less developed root systems. Other crops, such as pepper and tomato, have fibrous root systems that more effectively remove water from a given area of soil.

Cool-season vegetables, those planted in spring or fall, generally root to a shallower depth than warm-season and perennial vegetables. These crops may need watering more frequently in stressful periods. Because fall and spring are usually characterized by cooler temperatures and more abundant rainfall, watering during these times is usually of less concern.

In many direct-seeded crops, you must be sure that adequate water is available in the root zone to encourage germination of seeds and allow for initial growth and development. Thus, it is often necessary to provide frequent shallow watering during dry seasons until the crop develops beyond the seedling stage. This is especially true of crops planted for fall production.

With transplanted garden crops, providing water at transplanting time is essential to support the plant until it is able to absorb water from the surrounding soil. In general, apply ½ to 1 cup of water with each transplanted vegetable. Water slowly so that it soaks into the area near the plant, or water at the bottom of the transplanting hole. A garden crop needs water throughout its life cycle to survive and grow. There are several periods, however, when adequate water is critical. During these periods, the plant may respond to a lack of water by changes that are irreversible during the remainder of its life. See table on page 2-23.

Methods of Applying Water

The most popular methods of applying water to the root systems of garden crops are flood, sprinkle, and drip/trickle irrigation.

Flood. Many garden crops can be watered by “flooding” or applying a flow of water to the soil surface. This can be done by using a trench or basin near each plant or by running water down a furrow alongside each row.

This method works best in medium-textured soils that are fairly level. Water must flow from one end of the garden to another and must soak into the soil slowly in order to continue to flow in the trench.

Crops are usually planted in a raised bed when using this method so that water runs alongside the bed or row, not down the row itself.

Sprinkler. The sprinkler is by far the most extensively used watering method in home gardens. A sprinkler is inexpensive and can be used to water a diversity of crops in a small area. Distribution of water applied by sprinklers should be considered because more water is usually delivered to the center of the sprinkled area. Placing a few cans in the area to check for uniformity of water application will give you an idea of the pattern of your sprinkler.

One of the disadvantages of sprinklers is that they allow a considerable amount of water to evaporate into the air. Using coarse droplets and lower water pressure can reduce evaporation losses, especially on hot, windy days. Watering in cooler, less windy periods also helps.

When sprinkling garden crops, be sure to apply water in a way that allows plant foliage to dry as soon as possible after watering. Thus, early morning and early evening watering is preferable to late evening watering.

Drip/trickle irrigation. This method of watering is designed to keep a portion of the root zone well supplied by applying water on a daily or every-other-day basis. Drip or trickle tubes are usually laid to the side of the row or between two rows. To wet a continuous strip of soil, required by most vegetable crops, you should have a hole or "dripper" in the line every 10 to 12 inches. Many drip tapes come with the holes at prepunched intervals. Other types of drip tubing are designed to leak over the length of the tube.

Drip systems are usually operated at low pressures (5 to 15 PSI) and may require from one to three hours a day to supply the water lost from the crops during stress periods. Because of the danger of clogging the small pores of drip tape, water filtration is essential for this system. Most garden center dealers have drip irrigation kits with filters, pressure regulators, and water distribution lines. Most can offer assistance in design and layout of a drip system.

At the end of the garden season, the system can be flushed, dried, and stored in a protected location for next year. It may be necessary to replace thin drip tubing each year. Thicker tubing may last for several seasons. Use care in hoeing near drip tubing, and avoid walking on it. These activities may punch holes that interfere with the normal slow dripping of the tape.

Water-Holding Capacity and availability in different soil textures

	Coarse Soils (Sand)	Mixed Coarse/ Fine Soils (Loam)	Fine Soils (Clay)
Water available (gal/cu ft)	½ gal	1 gal	1½
Depth 1" of water penetrates	24"	16"	11"
Infiltration in 1 hour	2"	¾"	¼"

Mulching

Mulching is an important practice that is often overlooked. Mulching can reduce the time spent in cultivating. A mulch can:

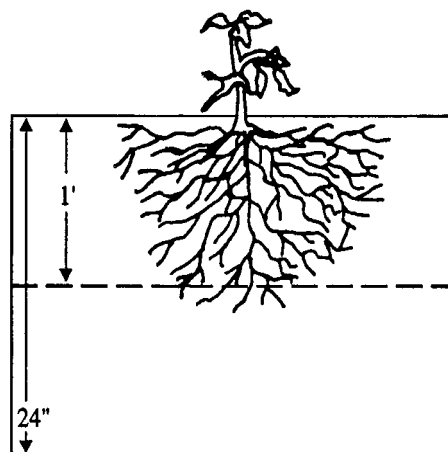
- conserve soil water.
- control weed growth.
- keep soil temperature uniform.
- reduce frost damage to fruit.

One of the most effective ways of reducing the need to apply water to garden plants and conserve natural rainfall is to use garden mulches. Mulches are most appropriately used on summer crops when periods of water use are greatest.

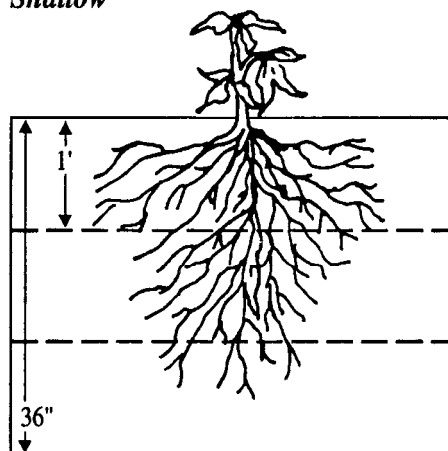
Mulches provide a barrier that helps prevent moisture loss from the soil by evaporation. They also can be useful in maintaining cooler soil temperatures, controlling weeds, reducing soil compaction, and keeping produce cleaner.

Plastic mulches. Black polyethylene mulch is preferred because clear plastic mulch promotes weed growth underneath it. Plastics usually are available in rolls 3 to 4 feet wide. They are placed over the row or bed, the edges covered with soil, and various sized holes cut for the different crops. Black surfaces absorb heat, warming the soil for earlier production. Later, the foliage shades the plastic, reducing the heating of the soil. These mulches work best with warm-season crops such as tomatoes, melons, peppers and eggplant, which are usually established by transplant.

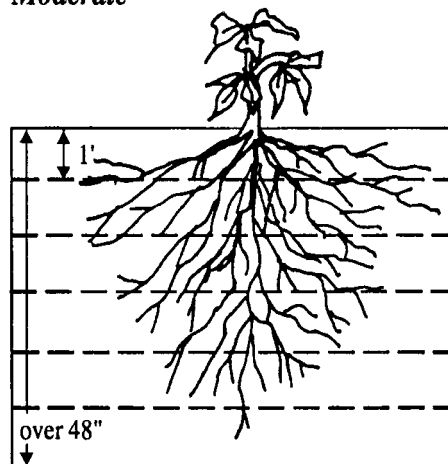
Organic mulches. Common organic materials used in gardens include compost, old hay, straw, leaves, shredded newspapers, peat moss, and grass clippings. Using coarse materials requires a 3- to 4-inch layer while fine materials can be applied in 1- to 2-inch layers. Organic mulches serve as insulation, reducing soil warming in the spring, so later season use is recommended. They can be left in place and tilled into the soil during the fall as a source of organic matter. Organic materials should be dried before use. Old or composted materials are preferable. Fresh materials may form molds or slime and repel water if used when green. Also, make sure that organic materials do not contain weed seeds, insects, or disease organisms that may spread to garden crops.



Shallow



Moderate



Deep

Fall Gardens

Fall is an excellent time for gardening in Kansas. This season is often overlooked in garden planning. A supply of fresh vegetables late in the year extends the gardening season, and the quality of many vegetables is better for fresh use and preserving. Vegetables maturing in the cool, crisp days of fall are often better flavored than those maturing in the hot, dry days of late spring and summer. Many vegetables can be left in the garden and used as needed into the winter months.

What to Plant

Space available and preference will influence the choice of crops to plant for fall production. With attention to watering and pest control, many vegetables that are already growing in the garden will continue to produce into the fall months. Some of these crops are tomatoes, okra, peppers, New Zealand spinach, eggplant, and sweet potatoes.

Crops that are best adapted to fall culture are mainly the cool-season crops, although cucumbers, summer squash, and beans can be grown as fall crops.

Peas aren't adaptable. Most spring vegetables are adaptable to fall gardening, but many Kansas gardeners report little success in growing fall peas. Peas require cool temperatures for germination and do not seem to adapt to the warmer temperatures of the summer planting period. You may want to try peas -- particularly snow peas -- in a mid- to late August planting, but don't expect complete success.

Cabbage, broccoli, cauliflower, and Brussels sprouts make excellent fall crops. Plant seed rather than transplants. When young plants are 1/2 to 3/4 inch tall, thin them to one plant per foot of row.

Beets and carrots require adequate moisture until they emerge. A light cover of sand or compost over the row may prevent soil crusting and improve emergence.

Freshly cut potato seed pieces will rot easily in warm summer soils. Seed should be cut three to four days prior to planting and held at room temperature to heal over. This will prevent seed piece decay. Seed potatoes may be difficult to find in midsummer. Potatoes just harvested should not be used because they will not readily sprout. If you are without a source of seed potatoes, old potatoes from storage or a supermarket can be used. Encourage your plant supply dealer to provide seed potatoes for next year's fall crop planting season.

Various types of lettuce may experience a marginal leaf burn with a light frost. The center leaves may escape damage, allowing lettuce -- especially Bibb or head -- to remain past the first frost forecasted.

Many gardeners report success in "over-wintering" spinach and kale by using leaves in the fall without harvesting the entire plant. A light mulching through the winter should keep the plants alive to begin growth in the spring without replanting a new crop.

Rooting Depths of Selected Vegetable Crops

Shallow (under 24")		Moderate (36–48")		Deep (over 48")	
Broccoli	Cabbage	Beans	Beet	Asparagus	Winter squash
Cauliflower	Corn	Carrot	Cucumber	Tomatoes	Sweetpotato
Lettuce	Potato	Peas	Peppers	Pumpkin	Watermelon
Radishes	Spinach	Summer squash			
Turnip					

Periods of Critical Water Needs in Crops' Life Cycle

Stage	Crop
Germination	Seedlings—especially summer and fall crops
Pod enlargement	Beans, peas
Head development	Cabbage, broccoli, cauliflower
Root enlargement	Carrot, onion, potato, radish
Flowering to early fruit set	Corn, cucumbers, squash
Early fruit development	Melons
Uniform all season	Tomatoes, peppers, eggplant

When to Plant

Planting dates are influenced by how long it takes the crop to develop and how tolerant the crop is of first frosts or freezes. Crops such as potatoes or cabbage require a long period of development, thus a mid-July planting date, while crops such as lettuce or radishes can be planted in early September.

Although it is difficult to predict an exact date, the average first frost in the fall occurs in mid-October in most of central and eastern Kansas. It may occur several weeks earlier in northwestern Kansas and several weeks later in southeastern Kansas. The Vegetable Garden Calendar lists suggested planting dates for most of central and eastern Kansas, with estimated harvest periods. Northwestern Kansas gardeners may need to vary these dates about 10 days to 2 weeks earlier; southeastern Kansas gardeners 10 days to 2 weeks later.

Fertilizing and Soil Preparation

Planting in space used for spring production may require additional fertilizer to support fall crops. Large quantities of fertilizer may damage tender young plants, so use it sparingly at this time of the year. In general, 1 to 2 pounds per 100 square feet of a low-analysis, all-purpose garden fertilizer should be sufficient to produce a successful crop.

Although adding organic matter is an excellent practice, it is not a good idea to add quantities prior to fall planting because this may loosen and dry out soils at a critical time. Save your organic matter for a late fall application.

Extensive soil preparation probably will not be needed for fall planting. Avoid deep tillage because it may dry out soil moisture. A light surface cultivation will loosen the soil to prepare the seedbed.

Additional amounts of fertilizer may be needed later in the season to ensure maximum plant growth and production. Cabbage, broccoli, cauliflower, collards, and kale, plus lettuce, mustard, spinach, and turnip greens will require about 4 tablespoons of a high-nitrogen, all-purpose garden fertilizer per 10 feet of row. It should be sprinkled along the row about 2 weeks after transplanting, or 4 weeks after sowing the seed. This will ensure lush vegetative growth prior to crop development during the cooler fall weather. Other vegetable crops probably will not require any additional fertilization.

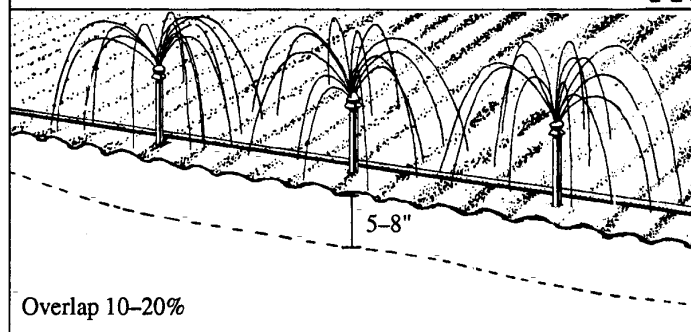
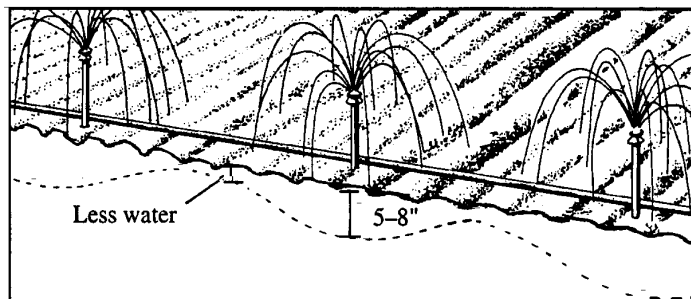
Establishing Vegetables in Summer Heat

Fall gardeners will find that establishing a garden during the summer when soil temperatures are extremely high is difficult. One way to avoid seeding in extremely adverse conditions is to establish plants in containers or pots for transplanting to the garden later in the season as the weather begins to cool. Crops such as cabbage, broccoli, cauliflower, Chinese cabbage, and collards can be grown in a cooler protected area or under lights in a basement growing area for two to four weeks prior to setting in the garden.

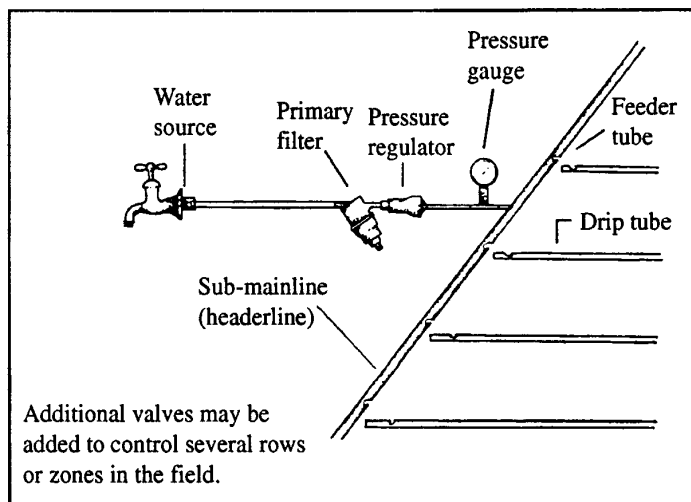
It is important to acclimatize the crops for several days before transplanting directly in the garden. Place the flats in the direct sun, providing adequate water for two to four days to allow the plants to become accustomed to the stronger winds, hot sun, and the harsh environment of the summer garden.



Flood

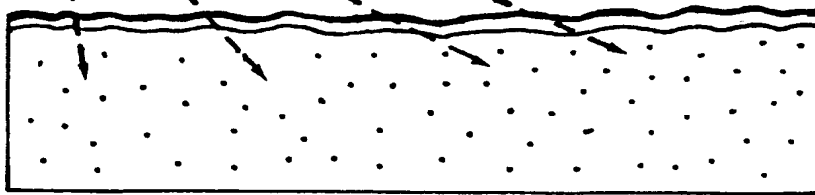


Sprinkler



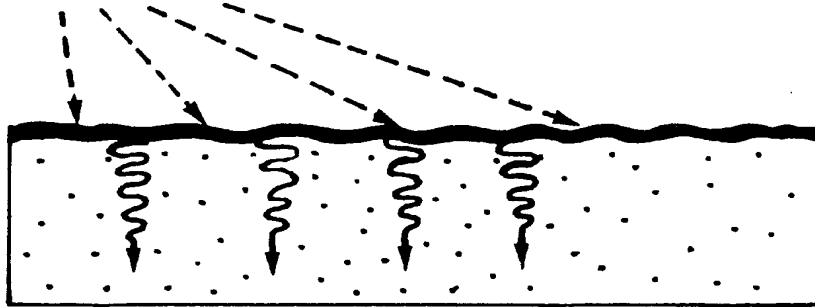
Drip/trickle irrigation

Mulches influence soil temperatures



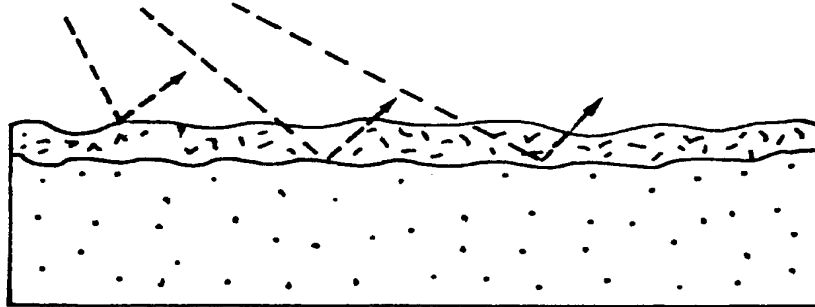
Clear plastic

7-10° warmer



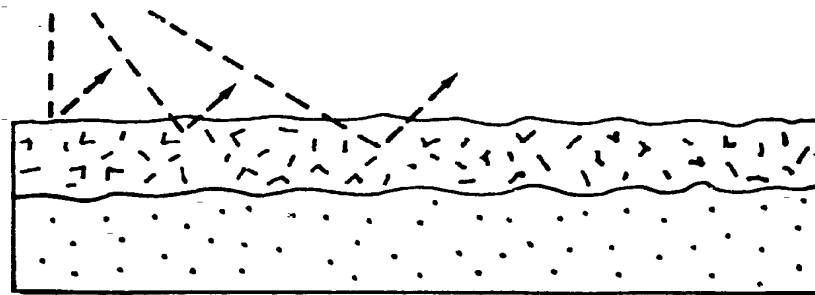
Black plastic

3-5° warmer



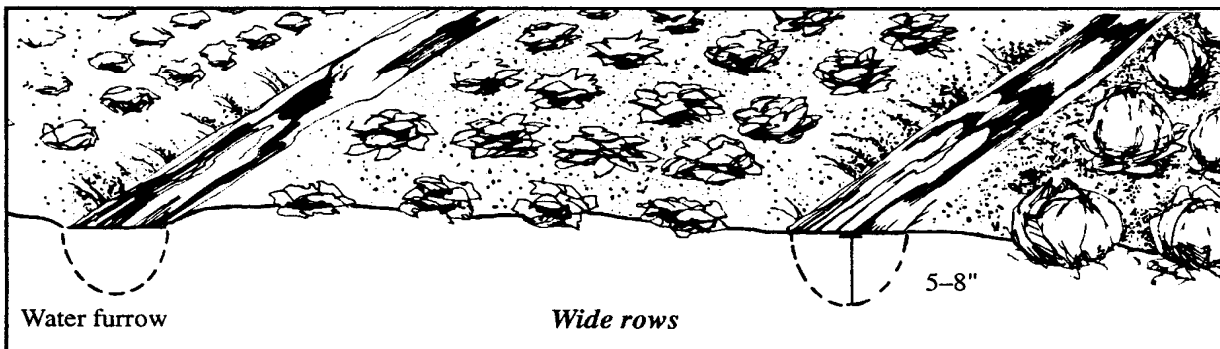
Organic mulches
paper, grass
clippings

2-3° cooler



Coarse organic
mulches
Straw, old hay

5-6° cooler



Crops that are seeded directly should be planted slightly deeper than they would be for a spring garden. This has two benefits-it provides a slight cooling effect, as well as more moisture available at the deeper soil depth. It is probably wise to plant more seed than necessary and to do some thinning later to ensure an adequate stand. With frequent watering and heavy, tight soils, a crust may form in planting fall gardens. This can be overcome by a light sprinkling of peat moss, vermiculite, or compost directly over the row.

Watering

As in the usual gardening season, the availability of water can influence the success of fall gardening in Kansas. Many areas of the state receive adequate rainfall for successful gardening from late August through September and October. However, trying to establish young seedlings in high temperatures during July to mid-August is difficult without a readily available source of water. Many vegetables can develop a tolerance to a hot temperature, but they cannot tolerate a lack of sufficient soil moisture and cannot germinate without it.

Seedlings

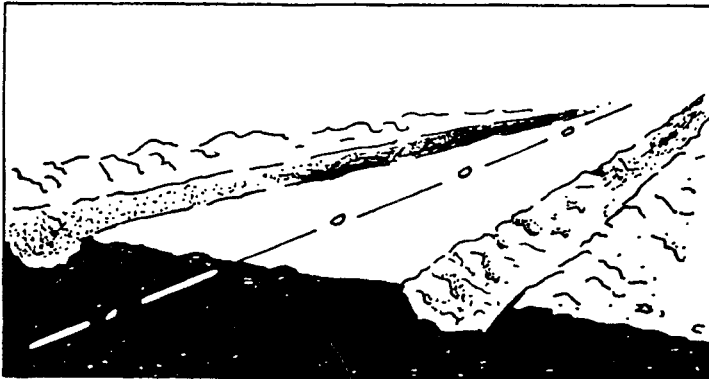
Seeds need adequate moisture to germinate. Germination can be accelerated by soaking seeds overnight before planting. Until seedlings begin to emerge, it may be necessary to supply small quantities of water frequently-perhaps as often as several times a day. In warm summer soil, you will be surprised at how fast many seeds germinate and start to grow. The period of intensive watering lasts only several days.

Before planting a fall garden, apply water until the soil is moist to a 10- to 12-inch depth. This will require about 1 to 1 1/2 inches of water -- equivalent to 1 1/2 inches of rainfall -- immediately prior to planting. Water can be applied by sprinkling, flooding, or drip irrigation.

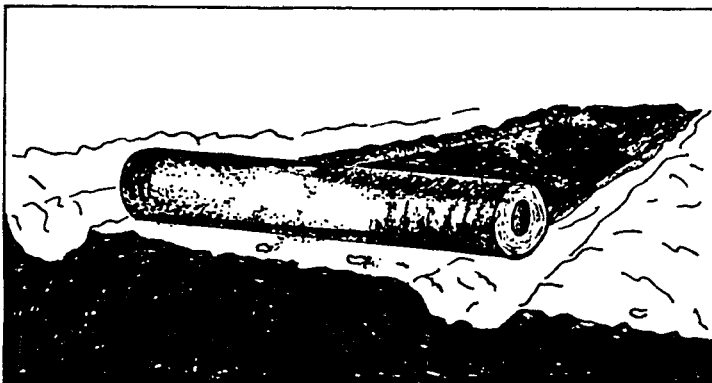
As seedlings emerge, you can gradually reduce the water because the roots penetrate deeper into the soil. In fact, reducing water gradually will encourage deeper rooting of young seedlings, making them more drought tolerant. In certain instances, a temporary windscreen or windbreak may reduce water loss from soil and protect tender seedlings.

Ten Ways to Improve Garden Water Use

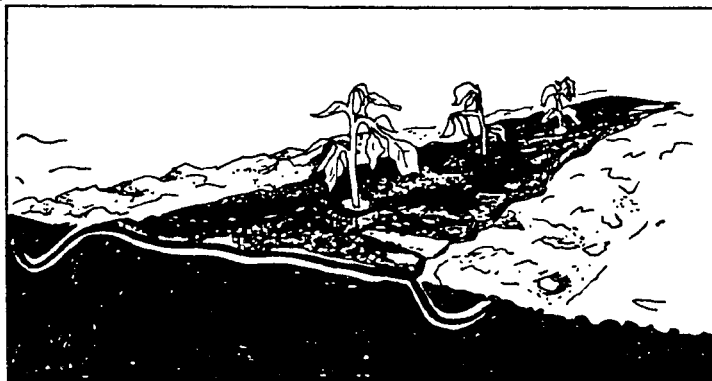
1. Water deeply, but no deeper than the root zone of the plant.
2. Water slowly. Reduce the flow.
3. Water infrequently, but thoroughly. Adjust sprinkler equipment for a larger water droplet size to help reduce evaporation. Frequent shallow watering causes plant roots to concentrate close to the surface, making the plant more susceptible to water fluctuations.
4. Loosen the soil surface and use mulches. Most mulches help to keep soil surfaces loose and receptive to water absorption.
5. Follow directions for operating and maintaining all irrigation systems. Check regularly for leaks, malfunctions, or worn parts.
6. Keep your garden well weeded to eliminate competition for water. Consider removing surplus plants from overcrowded beds to ease water demands.
7. Use wide rows with plants closer together, which reduces soil water evaporation.
8. Avoid watering during windy weather.
9. Water early in the morning when humidity is the highest for reduced evaporation.
10. Locate your garden away from trees which might compete for water.

Applying plastic mulches

Dig trenches 3 to 4 feet apart



Roll on plastic



Hold down with soil

Regardless of the system used, it is essential to provide adequate amounts of water deep into the soil for use by vegetables during the critical period of growth.

Young plants

When plants are small, they may require watering twice a week during dry periods. Try to allow the plants to show slight stress -- become slightly limp -- before applying water. This will encourage deeper rooting. As plants grow, they will require watering less frequently. In late August and September, natural rain generally will replace watering in most years. A general guideline to follow is that plants will require about an inch of water a week if not supplied by rainfall.

As the Fall Garden Grows

Fall gardening requires no special cultural techniques. Weeds may develop, requiring cultivation. The use of mulches is helpful in conserving moisture and reducing weed and disease problems. Insect and disease pests may require specific control measures, but these are situations that can develop in any garden.

Frosts and Freezes

The first frost in the fall will damage some frost-sensitive crops. Others may be slightly damaged but will continue to grow for several weeks until a severe freeze kills them. Other crops are hardy and will stand fairly low temperatures. These can be used into the winter months as needed.

Vegetables can be harvested as they mature. From mid- to late October in most areas of Kansas, the weather forecast will indicate when a frost that will freeze tender vegetation is on the way. Many vegetables will have been producing vigorously for two to four weeks prior to this date; however, it may be possible to continue harvest for an even longer period.

Often, a few nights of low temperatures will be followed by warmer weather for several weeks. If you can protect tender vegetation during these few cold nights, you can continue harvesting vegetables.

Some gardeners attempt to gain more days of growing time by covering plants with baskets, blankets, or plastic at the first frost warning.

Concentrate on saving only the tender vegetables that will be easily damaged by a slight frost. Other vegetables that may be growing in the garden and need protection are peppers, eggplant, tomatoes, and sweet potatoes. Temporary coverings of polyethylene plastic, blankets, or tarpaulins may be stretched over the rows to provide frost protection. A small light bulb burning underneath such coverings can provide protection from freezes to around 25°F. Coverings should be anchored so that they will not damage garden crops if a sudden wind develops. As little foliage as possible should come in contact with the surface of the covering because that foliage will freeze rapidly. After the danger of frost has passed, remove the coverings; be prepared to put them on again if a sudden frost is forecast later.

Sensitivity of Fall-Planted Vegetables to Freezing Temperatures

Tender Crops	Semi-hardy Crops	Hardy Crops
Damaged by First Frost	Can Stand Light Frost	Can Stand Several Frosts, but Should be Used Before Low 20°F Temperatures
Beans	Beets	Cabbage
Cucumbers	Chinese cabbage	Broccoli
Summer squash	Collards	Cauliflower
	Irish potatoes	Brussels sprouts
	Bibb lettuce	Carrots
	Mustard	Turnips
	Radishes	Kale
	Spinach	
	Swiss chard	
	Leaf lettuce	

Semi-hardy vegetables should be harvested if temperatures in the mid- to upper 20s are forecast and hardy vegetables harvested if temperatures in the low 20s seem imminent. Root crops such as beets, carrots, potatoes, and turnips may be mulched and used as needed until the soil begins to freeze, usually in late November to December.

Insect and Disease Control

Control of insects and diseases is essential for successful home gardening and may be part of general management practices you implement for your vegetable garden. Plant symptoms may reflect disease injury from fungi, bacteria, or viruses; insect or mite injury; chemical or herbicide injury; or physical or environmental injury caused by growing conditions, location, soil fertility deficiencies or excesses, or other causes. Your local Extension agent or garden center professional can provide assistance in identifying or recognizing specific symptoms in your garden. It is best to provide a large, representative sample along with information on the variety, when the symptom first appeared, unusual recent weather or growing conditions, and general condition of other vegetables in the neighborhood.

Chemical Methods

Within the last 40 years, numerous natural and synthetic chemical compounds have been developed for control of specific insects and diseases. Recommendations for safe, effective use are on the label. Read the label to determine if the insecticide or fungicide is designed to control the symptoms identified in your garden. Pesticides may vary in concentration, packaging, or formulation under different brands, and some pesticides may contain a combination of ingredients for broad-spectrum control. Sprays are available in liquid or emulsifiable concentrates that must be mixed with water. Wettable powders are designed to be mixed with water for application. Dusts are dry formulations that usually have a low concentration of active ingredient. They are designed to be dusted lightly over the plant surface. A few pesticides are available in aerosol form or other premixed forms ready for immediate use.

Application. Experience has shown that many failures and damages by chemical applications result from using ineffective application equipment or techniques. The goal of any application should be to provide thorough coverage with a thin coating to the entire plant surface that is damaged or subject to damage. Compression sprayers that create a fine spray mist and have a flexible wand, enabling you to spray both upper and lower leaf surfaces, are preferable. Sprayers that attach to a garden hose are less flexible and emit a large quantity of water, wasting a lot of spray material.

Dusts are best applied using a specialized duster that creates a fine dust fog rather than relying on packages with holes in the top. The latter usually result in too much dust being applied to only the upper leaf surface.

Many plants have waxy or hairy leaf surfaces that repel water, and spray materials may bead up or run off rather than cover the leaf surface. Commercial formulations of a wetting agent called a spreader-sticker are available at garden centers, and small quantities can be added to spray materials to keep water from beading up on leaf surfaces. A spreader-sticker can dramatically improve the effectiveness of liquid sprays, resulting in improved control with less material.

Recommendations for chemical control of specific vegetable garden insect and disease problems can be found in the K-State Research and Extension publication *Pest Control in Vegetable Gardens*, C-595, at your local Extension office.

Alternative Pest Control Methods

Interest in exploring alternative pest control measures has increased due to environmental and food safety concerns. A variety of “organic” pest control methods are available for many vegetables commonly grown in Kansas. These methods require regular observations, familiarity with the life cycle of the different pests, and timely, appropriate, and sometimes tedious action.

Remember, pesticides are just one of the many options available to effectively manage pests. Before resorting to use of any pesticide or control measure, consult the following checklist of good gardening practices. By first adopting these practices, you can greatly reduce or eliminate the need for pesticide and control measures.

Checklist of Good Gardening Practices

- Create a "healthy" soil. In the rush to plant, this important step is often overlooked, yet it can make the difference between a productive and a so-so garden. Many insects are attracted to unhealthy, poorly growing plants. Poorly growing plants also recover more slowly from insect injury. Have a soil test and follow the recommendations to supply a full range of nutrients. Adding extra fertilizer won't create healthy soil, because excess nitrogen or phosphorus can promote insect and disease injuries. Add organic matter to the soil each year in the form of soil amendments or mulch.
- Choose pest-resistant or tolerant varieties. Nursery and garden catalogs often identify such varieties. Additional information is available in the K-State Research and Extension publication Recommended Vegetable Varieties for Kansas, L-41.
- Start with quality seeds and healthy plants. Purchase stocky, dark-green transplants, and buy certified virus-free seed potatoes.
- Eliminate competition. Remove weeds and grass from the growing site because they compete for nutrients and water. Keep plants vigorously growing. Rapidly growing vegetables can better tolerate or outgrow insect and disease damage, but they also quickly use up available nutrients. Applying fertilizer and water at critical times during maximum plant growth is essential for producing pest- and disease-resistant plants. Refer to the Soil Improvement section on page 2-7.
- Keep it clean. Remove plants and debris after harvest to avoid harboring insects and diseases. Remove weeds that may provide shelter for pests. Dispose of or burn diseased plants, fruits, and vegetables. Composting is seldom thorough enough to eliminate disease-causing fungi and bacteria.
- Rotate crops. Planting the same crop in the same place year after year invites losses due to soil borne diseases and overwintering pests. Follow a crop rotation of at least three years for the four major vegetable plant families -- solanum (tomato, potato, pepper, eggplant); cucurbit (melons, squash, cucumbers); cruciferous (broccoli, cauliflower, cabbage, Brussels sprouts); and allium (onion, garlic, leeks).
- Choose a sunny location away from large trees. Eight to 10 hours of direct sunlight a day are necessary for proper growth, flowering, and fruiting of most vegetable crops. Sunlight also helps to dry foliage and reduce many fungal and bacterial diseases.
- Water properly. Plants receiving either too much or not enough water will be less vigorous and more susceptible to diseases and pests. Consider using a form of drip irrigation, which keeps foliage dry and helps prevent foliar diseases while using water more efficiently.
- Use mulch. Mulches help control weeds and reduce moisture evaporation from the soil surface. They also help to prevent rot caused when fruit is in contact with bare soil. When tilled under, organic mulches become valuable soil amendments.
- Provide good air circulation. Overcrowding plants can cause weak growth and an increase in foliar diseases. Stakes, cages, trellises, and pruning all help to increase air circulation.

- Plant at the proper time. Seeds planted too early are more susceptible to rot. Delay planting until the soil has warmed to allow rapid germination and growth of the young plants.
- Get to know the major pests in your area. Learn the weaknesses in their life cycle, their habits, and at which stages they are most easily controlled. Refrain from using any pesticide until you have correctly identified a pest. Your local Extension agent can help with positive identification. Grow crops that have fewer pest problems. Plants that have few insect and disease problems include looseleaf lettuce, rhubarb, Swiss chard, garlic, cos lettuce, leeks, parsley, sweet potatoes, okra, beets, snap peas, parsnips, carrots, onions and kale.
- Put up bird feeders and birdhouses. Birds are the leading predators of insects. For instance, more than a dozen species of birds are known to feed on moth larvae.
- Inspect the entire garden at least weekly. Check the undersides of leaves. Discover any symptoms when they first develop so that they can be more easily controlled.
- Be realistic in your expectations. Accept the fact that there may be some damage and even an occasional crop failure. This is also the case in many gardens using conventional pest control methods.

Alternative Pesticides and Control Methods

A pesticide is any substance or mixture of substances intended to prevent, destroy, repel, or mitigate any insects, rodents, nematodes, fungi, weeds, or other forms of life declared to be pests.

Synthetic chemical pesticides provide many benefits to food production and nutrition, but they also pose some hazards. Some synthetic pesticides may leave undesirable residues in food, water, and the environment when not used properly. Low doses of many pesticides are toxic to humans and other animals. As a result, many homeowners, growers, and researchers are seeking less hazardous alternatives to conventional synthetic pesticides.

Integrated Pest Management

The most recent concepts of pest control emphasize integrating preventive management, alternative pest control measures, and chemical controls to deal with the wide variety of pest concerns associated with vegetable growing. Chemicals are used only when considered necessary and in limited concentrations, reducing disruptions of ecological balances. Pest concerns often are specific to one type of vegetable or vegetable relatives. It is difficult to generalize about specific insect or disease concerns because each is distinctly different. Integrated pest management requires good knowledge of the pest, including the following factors:

- The pest's life cycle and dynamics of growth.
- Tolerance levels or how much damage can be tolerated.
- Other symptoms that may result.
- Other crops that may be damaged.
- Climate influences on the pest and control measures.

With knowledge of the pest, specific control measures can be determined. Chemical controls might be reserved for difficult-to-manage pests that can spread to many other plants.

The following steps are suggested in applying the principles of integrated pest management for controlling insects and diseases.

- Grow resistant varieties or choose disease-free or treated seeds and plants.
- Inspect purchased plants carefully. Avoid diseased and injured plants. Many disease and insect symptoms can be present prior to setting the plants in the garden. Rely on reputable sources and avoid highly discounted plants and seeds of poor quality.
- Fertilize and water properly. Some symptoms may be due to fertilizer excesses or deficiencies. Water in moderation. Excess watering at critical times may intensify disease and insect injuries.
- Control weeds. Weeds can be hiding places for pests that may spread to garden plants. Mulch plants. Mulching improves root environments and evens out fluctuations in moisture supply, resulting in healthier plants. There may be a few instances where mulches provide hiding places for certain insects; however, the benefits of mulching certainly outweigh any concerns.
- Remove infested plants to prevent the spread of insects and diseases.
- Rotate. Certain disease and insect concerns can be reduced by moving to a new area of the garden. As a guideline, use a 3- to 4-year rotation. Don't plant the same crop or crop relative in the same location for 3 to 4 consecutive years.
- Be aware of situations you can tolerate versus those that require immediate attention. At the first sign of a symptom, make sure that you get it properly identified. Consult a garden professional at your local garden center or Extension office if you need more information.
- Use pesticides as a last resort. Use specific pest control measures carefully and judiciously. Several general-use disease and insect control measures are available that provide effective control with little environmental disturbance. Always read the label carefully and follow directions for use.
- Apply pesticides properly for effective control. Thorough coverage of the plant surface usually is required. The use of a fine spray mist directed to all plant surfaces usually is the most effective way to ensure proper pesticide action while using or wasting as little material as possible. Any material used in excess or that does not cover the plant may become an environmental contaminant.

Harvesting and Storing

Vegetables from home gardens have the benefits of being harvested just prior to use. This usually means that the product not only is fresher and more flavorful but also is more nutritious. Vegetables are living tissue and these tissues continue to live after harvest. Providing conditions to slow deterioration in quality after harvest is important.

Storage Conditions

Cold, moist. Many vegetables keep best if storage temperatures are low and the humidity level is high. Respiration is kept as low as possible, and crispness is maintained by preventing water loss. Most early spring vegetables and leafy green vegetables are in this category.

Cool, moist. Some crops suffer internal damage if the storage temperatures are too low. They are best kept in a cool storage location -- between 40° to 50° -- with high humidity. Many fruits such as cucumbers, melons, peppers, ripe tomatoes and related crops are in this category. A storage temperature in the 30s may shorten the life, resulting in discoloration of the product and disagreeable flavors.

Cool, dry. Onions require a cool storage location with low humidity. Onions store best in open mesh bags so that excess humidity does not build up near the product.

Warm. Crops such as sweet potatoes, winter squash, and pumpkins store best at cool basement temperatures around 55°F. These temperatures might not be considered warm by human comfort standards, but for produce they are. These crops are subject to internal injury when storage temperatures drop too low. The damage, called “chilling injury,” is as serious as many other types of physical damage.

Select the Best

Nothing improves in storage, and defective produce should be discarded or used immediately so that only the best quality, soundest products are put into storage. Produce must be handled carefully to avoid surface damage, skinning, or bruising. All these types of injury provide entry points for bacteria or fungi that may rot the produce and reduce storage intervals.

Check Storage Areas Regularly

Frequently check on vegetables in storage and discard any that are starting to rot or discolor by gently removing them from the basket or box. Areas that are used for storage, including boxes or baskets used to hold produce, should be disinfected prior to use. Placing the containers or storage racks in bright sunlight for several days is effective. Wiping them with a dilute bleach/water solution using about 1 part laundry bleach to 10 parts water can disinfect as well. Allow containers or racks to dry thoroughly before using.

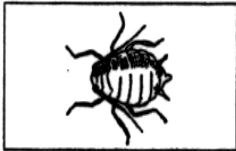




Alternatives in Pest Control

Control	Advantages	Disadvantages
Botanical insecticides: Rotenone, pyrethrum, sabadilla, ryania, neem	Rapid breakdown; rapid action; low toxicity to mammals and plants.	Rapid breakdown, requiring more precise timing of and/or more frequent application; cost and availability; lack of test data; lack of state registration of some materials.
Microbial Insecticides: Bacillus thuringensis (Bt), (Dipel, Thuricide, Attack, Caterpillar Killer), M-One	Selective; nontoxic to wildlife and humans; may establish and provide control in the future.	Control only one species or group of insects; timing is critical; special storage and application procedures may be necessary.
Insecticidal soaps: Safer's Insecticidal Soap	Rapid breakdown; rapid action; low toxicity to mammals and other animals; low toxicity to most plants; selective, doesn't harm most beneficial insects.	Rapid breakdown—effective only against insects that come into direct contact with the spray before it dries; phytotoxic to some ornamental plants and houseplants.
Attractants: Pheromones, lures	Nonhazardous to humans or other animals; no residues; target specific insects while leaving beneficials unharmed.	Variable results due to weather, locations; effectiveness limited to specific adult insect populations; expensive, more useful for monitoring the presence of insects than for control in most cases.
Beneficials: ladybugs, green lacewings, syrphid flies, trichogramma wasps, praying mantis	Nontoxic to mammals and wildlife. If established, may provide control in subsequent pest generations or seasons.	Variable results; careful handling required; some beneficials are limited in the kind of insects they will eat; some pests must be allowed to remain in order to provide a food supply for the beneficials.
Fungicides: sulphur, copper, Bourdeaux mixture	Provide fungicidal action and disease control.	Toxic to mammals, wildlife, and many beneficials. Timing of application is critical. Sulphur should not be used within a month of oil sprays or when temperature is above 80 to 85°F. Unsafe levels may build up in soil after years of use.
Oils: dormant oils, horticultural superior oils, Volck	No residues on fruit when applied prebloom; effectively control many overwintering pests.	Must be applied while tree is dormant, though lighter weight oils are being developed for use in spring and summer. Must be applied when temperatures are above 40°F but below 80°F for several hours to avoid injury.
Traps: Tanglefoot, sticky yellow or white boards	No residues, nontoxic to mammals, wildlife, and beneficials.	Can trap both pests and beneficials; some traps are expensive; must be maintained, cleaned and recoated periodically; effectiveness varies.


Alternatives in Pest Control, Continued

Control	Advantages	Disadvantages
Physical barriers: Row covers, netting	Nontoxic, no residues. Allow water, air, and sunlight to pass through.	Row covers prevent pollination of fruits and vegetables by insects; durability varies from 1 to 3 seasons; considerable damage may result from pests that emerge under row covers.
Diatomaceous earth: Perma-guard	Nontoxic to mammals and birds; works by dehydration rather than poisoning; contains beneficial trace minerals.	Affects beneficials such as ladybugs; complete application required; less effective in humid weather.
Cultivation and Hand Picking:	The least expensive of all control practices.	Must be used long before pest damage becomes apparent and at the proper stage of development of the insect.

Alternative Pesticides and Control Methods for Specific Crops

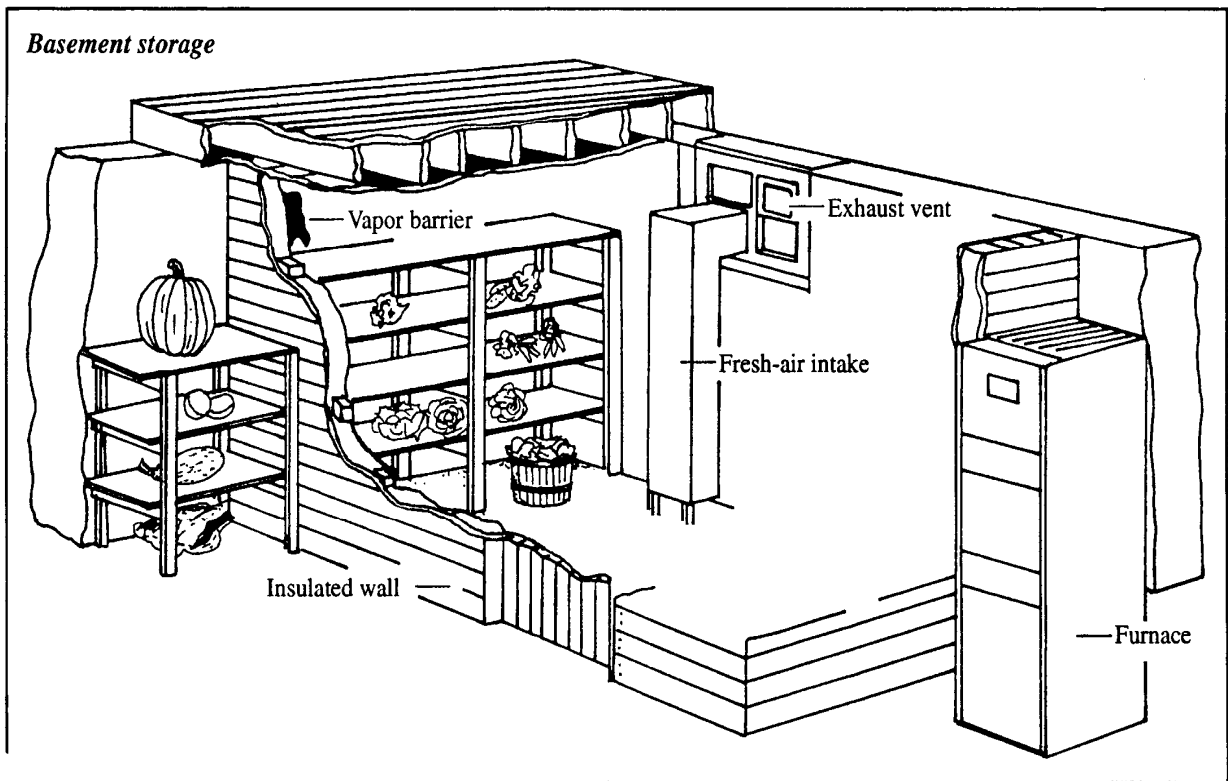
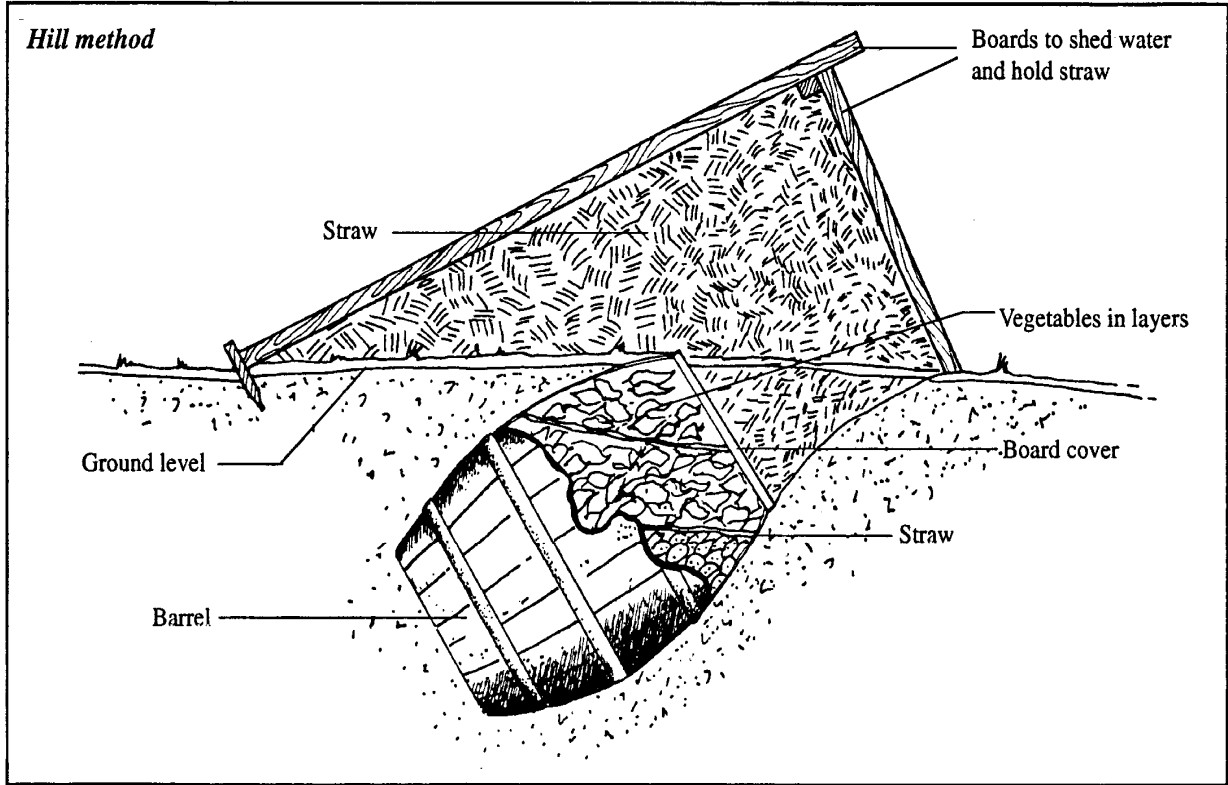
Crop	Pest/Disease	Control
Various crops	Aphids, spider mites, other soft-bodied pests	Insecticidal soaps. Effective only through direct contact with insect before soap dries. Some foliar burn may occur at high temperatures with too concentrated a soap mixture; apply to a few test plants first.
		
Various crops	Flea beetles	Spray or dust with rotenone when damage is first noticed. Use row covers.
		
Asparagus	Asparagus beetle	Hand pick. Use rotenone during cutting season.
		
	Rust	
	Bean leaf beetles	
		Spray or dust with rotenone on underside of leaves. Use row covers.
	Mildew	Improve air circulation with proper spacing. Water early in the day so that foliage will dry quickly.
	Root rots	Rotate crops. Plant in well-drained sites when soil is warm.
	Rust	Avoid wetting foliage. Use drip or soaker hoses to irrigate.
Cabbage, broccoli, cauliflower, Brussels sprouts	Cabbage looper, imported cabbage worm, diamondback moth	Spray or dust thoroughly with <i>Bacillus thuringensis</i> (Bt). Begin when worms are small and repeat as needed throughout the season. Use row covers.
		
	Black rot	Use disease-free seeds and plants. Do not work with wet plants. Use 3- to 4-year rotation. Destroy plants after harvest. Some resistant varieties are available.

Alternative Pesticides and Control Methods for Specific Crops, *Continued*

Crop	Pest/Disease	Control
Peas	Powdery mildew	Water early in the day. Improve air circulation by proper spacing and weed control. Clean up in autumn. At first sign of disease, spray or dust with sulphur.
	Root rot	Practice crop rotation. Plant seed as early as possible. Avoid wet soil and improve soil drainage.
Potatoes	Colorado potato beetle	Apply rotenone when beetle adults or larvae first appear. Repeat as needed. Hand pick. Use row covers. New formulations of <i>Bacillus thuringensis</i> for potato beetle control are relatively unavailable to home gardeners.
		
	Early blight	Water early in the day. Improve air circulation by proper spacing. Clean up in autumn and destroy plant residues. Practice crop rotation.
	Scab	Use certified seed. Practice crop rotation. Lower soil pH to 5.2 to 5.5 with sulphur. Plant resistant varieties (Chieftain, Norland, Russet Burbank, Superior). Avoid lime, manure, and wood ash.
Tomatoes	Blossom end rot	Water during drought. Mulch to keep moisture level constant. Grow on soil high in organic matter. Avoid cultivating close to plants.
	Catfacing	Grow recommended varieties. Provide adequate fertilizer and water for vigorous growth.
		Practice crop rotation. Water early in the day. Improve air circulation by proper spacing. Clean up plant residues in autumn.
	Fusarium wilt	Practice crop rotation. Remove and destroy infected plants. Plant resistant varieties (Pik Red, Better Boy, Supersonic, Jet Star and others).
	Septoria leaf spot	Water early in the day so that foliage can dry quickly. Improve air circulation with cages, pruning, and proper spacing.

Recommended Vegetable Storage Conditions

Vegetable	Storage Temperature	Relative Humidity	Storage Period
<i>Cold-moist group</i>			
Asparagus	32°F	95%	2 weeks
Beet (tops removed)	32°F	95%	1-3 months
Broccoli	32°F	95%	3 weeks
Brussels sprouts	32°F	95%	1 month
Cabbage	32°F	95%	2-3 months
Carrot (tops removed)	32°F	95%	4-6 months
Cauliflower	32°F	95%	2-3 weeks
Kale	32°F	95%	2-3 weeks
Leek	32°F	95%	1-3 months
Lettuce	32°F	95%	2 weeks
Onion, green or scallion	32°F	95%	2-3 weeks
Parsnip	32°F	95%	2-6 months
Radish	32°F	95%	2-3 weeks
Sweet corn	32°F	95%	4-8 days
Turnip, greens	32°F	95%	2-3 weeks
Turnip, roots	32°F	95%	4-5 months
<i>Cool-moist group</i>			
Bean, snap or lima	40-45°F	90-95%	1 week
Cucumber	45-50°F	90-95%	10-14 days
Eggplant	45-50°F	90%	1 week
Pepper	45-50°F	90-95%	2-3 weeks
Potato	40°F	85-90%	4-6 months
Squash, summer	45-50°F	90%	7-10 days
Sweetpotato (after curing 80-90°F for 10 days)	55-60°F	85-90%	4-6 months
Tomato (firm, colored)	60-65°F	85-90%	4-7 days
Tomato (mature, green)	60-65°F	85-90%	1-4 weeks
Watermelon	45-50°F	80-85%	2-3 weeks
<i>Cold-dry group</i>			
Onion, dry	32-35°F	60-70%	2-8 months
Shallot	32-35°F	60-70%	6-8 months
<i>Warm group</i>			
Pumpkin	50-55°F	60-70%	2 months
Squash, winter	50-55°F	60-70%	2-4 months



The Fruit Garden



The following information has been adapted from the KSU Horticulture Report Planning Your Fruit Garden written by Frank Morrison, Extension Horticulturist

Homegrown fruits furnish many rewards to Kansas gardeners including tasty fruits. Fruit should consistently be included in your family diets as they supply essential minerals and carbohydrates.

Some fruit are not readily available to buy fresh, and your fruit gardens can be a source of freshly picked fruit from May to October. Caring for the plants can be a relaxing diversion for many gardeners. An added benefit of the fruit garden is its compliment to the landscape with the spring fruit blossoms, screening effect from closely planted dwarf-type trees or grape and apple trellis and color from the fruit.

The gardener should not overlook the problems of fruit growing. Fruit diseases, insects, birds and weather can cause disappointments and reduce the quality of the fruit. Plant only what you can care for rather than over planting and having more garden work than you have time or care to do.

What to Plant

Fruit preferences. The fruits which your family enjoys growing and eating the most is a good starting point to decide what to plant. Some families may wish to grow only 2 or 3 kinds of fruits such as strawberries and raspberries. Other families may decide to grow bush fruits, grape and tree fruits if they enjoy them all. Some fruits will not grow well in some Kansas locations so you should become familiar with the fruits that are most and least likely to grow well. Your local Extension agent can assist you in determining what fruits grow best in your locale.

Space available. In small lots, limited space may be the main deciding factor and only a few grape or raspberry vines or a small strawberry bed will fill the available space. Where more space is available, a greater number of plants of each kind of fruit can be grown. A general guide for the space required by the different kinds of fruit is included in Table 1, Guide for Planning Fruit Gardens. Some trees are grafted onto dwarfing rootstocks and the number of square feet required for each tree is considerably less than for standard size trees.

Planting site. Fruit plants grow best where the soil characteristics allow soil moisture to drain off. Roots of fruit plants require oxygen and "wet soils" exclude oxygen and are not good fruit soils. Pears are somewhat tolerant of poorly drained soils, but other fruits require good soil moisture drainage. Avoid trying to grow a fruit garden in a soil that is poorly drained of soil moisture. Drainage can be improved on small sites by using railroad ties or other suitable materials and elevate the planting area with a retaining wall.

Low temperatures are a hazard to fruit plants, especially in the early spring during the bloom period. In the movement of air current, cold air moves in about the same pattern as water-from the higher elevations to the lower elevations. Fruit plants growing in sites where cold air accumulates are likely to have blossoms injured.

Hot winds reduce plant yields, especially small fruits, such as blackberries, raspberries, and strawberries. If possible, locate the fruit garden where it is protected by natural barriers or buildings from cold north winds and south summer winds.

Fruit plants require full sunlight for plant growth and fruit development. Try to plant the fruit about 20 to 30 feet from medium size shade trees and 40 to 50 feet from large trees, if possible, to reduce competition for soil moisture and nutrients.

Soil. A deep, rich loam soil is most suitable for a fruit garden. However, in many instances the garden soil may be a heavy clay or a “builder's fill” of sub soil. You can modify the soil so it is more suitable for fruit plants by mixing into the soil generous amounts of compost, manure, old silage, hay, peat or other organic matter. Whatever the soil type, it is usually advisable to add some form of organic matter. A good goal for fruit gardeners is to try to maintain the soil organic matter content above 2 percent.

Soil preparation. Before planting, the garden spot should be plowed and harrowed or rototilled the same as for vegetable gardens. If grass or weeds have been growing in the garden site, the ground should be worked enough (preferably the fall before planting) to kill the grass before setting out the fruit. If the garden area is on a hillside and includes several hundred square feet, it may be advisable to leave grass strips to prevent erosion. During soil preparation is a good time to work organic matter into the soil.

Fertilizing. The fertility of the soil should be determined by a soil analysis. Guidance in taking a soil sample is available through your local Extension Office. The soil analysis is the guide for adding nutrients to the soil. Refer to the references at the end of this publication for information on fertilizing gardens. In fruit gardens, the needed nutrients should be added to the soil and worked in before plants are set out. Fertilizer pellets that can be placed in the bottom of the planting hole are available from nurseries and garden stores.

Make a garden plan

The garden plan is your guide for ordering the fruit plants and the planting plan. Record the varieties. Remember that part of the fruit garden you plant may be cared for by the next generation. Or, if you sell your property, the new owners will likely want a record of the kinds and varieties of fruit in your garden.

Selecting fruit plants. Before you buy, inquire among local residents about the kinds and varieties of fruit that are growing well locally; request from your local Extension Agent a list of fruit varieties recommended for Kansas. Your local nurseryman and good garden store operator are other sources of information about performance of fruit plants.

Be certain to buy your plants from a seller who (1) purchases adapted varieties to retail, and (2) knows how to handle plants to keep them in good condition for the buyers.

Pollination requirements. Some fruit require a second variety for pollination and fruit set while others are self-fertile and a second variety is not necessary for fruit set. There are varietal exceptions, but fruits that are in the self-fertile, partially self-fertile and self-sterile groups are listed in Table 2.

Fruit Garden Planning

- Plant fruit your family enjoys growing and eating.
- Consider the available space.
- Plant what you have time to care for properly.
- Plant fruit garden in a location where water drains and moves downward into sub soil.
- Locate fruit garden in full sunlight. Blackberries and raspberries will tolerate a limited amount of shade.
- Locate garden where cold is least likely to injure fruit buds and blossoms.
- Measure the area, and then sketch the kinds, number of plants, and locations in the garden.
- Carefully plan and buy kinds and varieties of fruit that will grow well in your area.
- Prepare the ground for planting similar to seed bed preparation for vegetables or other small seeds.
- Keep plant roots moist and cool between the buying and planting periods. Plan to carry out a pest (weed, insect, and disease) control program.
- Annually prune tree, vine, and bush fruits to remove weak wood and provide good sunlight on plant leaf area.

DON'T

- Plant fruit your family won't eat.
- Over plant so plants are too crowded.
- Get too ambitious and plant a large garden that is neglected thus producing low quality or no fruit.
- Plant a fruit garden in a poorly drained site.
- Plant fruit garden under shade trees or close to trees so there is competition for soil moisture and nutrients.
- Locate garden in a low spot in relation to surroundings.
- Guess how much area is to be planted and how many plants you need.
- Buy "bargain" plants that are not adapted.
- Plant in grass or uncultivated ground.
- Allow roots to lose any moisture.
- Depend totally upon nature to keep plants healthy.
- Delay pruning so trees develop poor structure and excess wood shades the inner branches.

Care Schedule for Fruit Gardens

FIRST YEAR

Pre-planting: September-March

Determine planting area.
 Take soil sample for soil analysis.
 Apply organic matter.
 Plow.
 Order plants.

Planting: February-April

Fertilize area to be planted.
 Apply organic matter if not done earlier.
 Prepare soil; rototill, harrow or disc soil.
 For strawberries, treat soil for white grubs.
 Hold plants at about 40°F when received if immediate planting is not possible.
 Soak plant roots in water for 4 to 10 hours before planting.
 Prune roots; long, broken ends should be removed.
 Plant; soil around the roots should be moderately firm.
 Water after planting; about 1 pint for strawberry, to 3 to 5 gallons for trees.
 Prune back tops of unpruned plants.

After Planting

Water to maintain soil moisture.
 Control weeds around plants.
 Control insects and diseases as necessary.
 Select scaffold branches on trees.
 Tip-back ends of blackberries and raspberries.
 Mulch strawberries in late November.

January-March (Dormant)

Prune fruit trees, grape vines and bush fruits.
 Read pest control references.
 Apply dormant sprays for pest control.
 Apply mulch and fertilizers.

SECOND YEAR

April-December

Carry out pest control program.
 Remove part of strawberry mulch (by about 2 weeks after growth begins).
 Maintain soil moisture throughout the growing season.
 Renovate strawberries after harvest.
 Tip back new canes on blackberries and raspberries.
 Mulch strawberries-December.

Second Dormant Period

Same as first dormant period.

Table 1. Fruit Planting Guide (a)

Kind of Fruit	Approximate Space Required per Plant (sq. ft.)	Suggested Minimum Spacing	Year of Bearing After Planting	Average Yield for Mature Plants	Years of Expected Life
<i>Small Fruits</i>					
Blackberry					
Erect	20-25	7 x 3 ft.	2nd	1½-2 qt.	10-12
Trailing	40-50	8 x 5 ft.	2nd	3-5 qt.	10-12
Currant	20-30	5 x 5 ft.	2nd	3-5 qt.	10-15
Elderberry	75-85	9 x 8 ft.	2nd	2-4 qt.	15-20
Gooseberry	20-30	6 x 5 ft.	2nd	5-8 qt.	10-15
Grape	60-80	8 x 8 ft.	3rd	10-20 lbs.	25-30
Raspberry					
Red	15-25	6 x 2½ ft.	2nd	1½ qt.	8-10
Black & Purple	15-25	7 x 2½ ft.	2nd	1½-2 qt.	8-10
Strawberry					
June bearing	6-8	4 x 2 ft.	2nd	1 qt.	3-5
Everbearing	6-8	3 x 2 ft.	1st	½ qt.	3-5
<i>Tree Fruits</i>					
Apple					
Dwarf	40-100	8 x 6 ft.	3rd-4th	3-5 bu.	15-20
Semi-Dwarf	250-400	20 x 15 ft.	4th-5th	5-10 bu.	15-20
Standard	700-900	30 x 25 ft.	5th-7th	10-25 bu.	30-40
Apricots	700-900	25 x 25 ft.	5th-6th	2-4 bu.	20-30
Sweet Cherry	600-900	24 x 25 ft.	5th-7th	30-60 qt.	20-30
Tart Cherry					
Genetic Dwarfs	175-225	15 x 15 ft.	3rd	10-15 qt.	12-15
Standard	250-400	20 x 20 ft.	4th	30-50 qt.	15-20
Peach & Nectarine					
Dwarf	40-80	8 x 8 ft.	3rd	1-1½ bu.	8-12
Standard	100-625	20 x 20 ft.	4th	3-5 bu.	10-15
Pear					
Dwarf	200-300	15 x 15 ft.	3rd-4th	1-3 bu.	10-15
Standard	500-700	25 x 25 ft.	5th-7th	4-6 bu.	30-40
Plum					
Dwarf	200-300	15 x 15 ft.	3rd-4th	1-2 bu.	10-15
Standard	500-700	25 x 25 ft.	4th-5th	3-5 bu.	15-20

(a) The values listed are approximations and may vary with varieties, locations, and the care given to the fruit plants. Where space is not limited, plants can be spaced farther apart. The suggested spacing is for space between rows and between plants in the row; for example, blackberries (erect) would be spaced 7 feet apart between rows with plants spaced 3 feet apart in the row.

Table 2. Special Considerations for Kinds of Fruit

Kind of Fruit	Pollination Requirement (a)	Main Bearing Season (b)	Cold Hardiness of Fruit Buds and Tree (c)
<i>Small Fruits</i>			
Blackberry	Self-Fruitful	June–August	Very Sensitive
Currant	Self-Fruitful	July	Hardy
Elderberry	Partially Self-Fruitful	August–September	Hardy
Gooseberry	Self-Fruitful	June–July	Hardy
Grape	Self-Fruitful	August–September	Moderately Hardy
Raspberry	Self-Fruitful	July	Hardy
Strawberry			
June bearing	Self-Fruitful	May–June	Hardy
Everbearing	Self-Fruitful	May–June & September	Hardy
<i>Tree Fruits</i>			
Apple	Partially Self-Fruitful	July–October	Hardy
Apricot	Self-Fruitful	July	Very Sensitive
Sweet Cherry	Self-Sterile	June	Very Sensitive
Tart Cherry	Self-Fruitful	June	Hardy
Nectarine	Self-Fruitful	July–September	Sensitive
Peach	Self-Fruitful	July–September	Sensitive
Pear	Self-Sterile	August–September	Hardy
Plum			
European	Partially Self-Fruitful	August–September	Moderately Hardy
Japanese	Self-Sterile	August	Very Sensitive

(a) Self-Fruitful—Only one variety needed for pollination.

Self-Sterile—Two varieties are needed for pollination; occasional exceptions with some varieties.

Partially Self-Fruitful—Fruits generally set a heavier fruit crop with 2 or more varieties planted together.

(b) Will vary according to varieties planted.

(c) Fruit listed as very sensitive to freezing temperatures are less likely to be productive in northern areas. There are varietal differences in hardiness.

CHAPTER 3

INTENSIVE GARDENING METHODS

Introduction

For some people, a small-sized garden is preferable to a larger one. Smaller gardens require less labor and expense than larger gardens. Decreasing garden size provides more yard space for other activities. The gardener can concentrate soil improvement efforts in a smaller area, and, with careful management, small gardens can produce sufficient vegetables for fresh eating during the growing season, and perhaps extra produce for preserving.

The purpose of an intensively grown garden is to harvest the most produce possible from a given space. Gardens that are more traditional consist of long, single rows of vegetables spaced widely apart. Much of the garden area is taken by the space between the rows. An intensive garden reduces wasted space to a minimum. The practice of intensive gardening is not just for those with limited garden space; rather, an intensive garden concentrates work efforts to create an ideal plant environment, giving better yields with less labor.

Though its benefits are many, the intensive garden may not be for everyone. Some people enjoy the sight of long, straight rows in their gardens. Others prefer machine cultivation. Weeding by hand or with hand tools is required in intensive plantings, although fewer weeds will be present due to the close plant spacing. Growing plants closer together demands particular attention to pest control, fertilization, and training of plants. The intensive gardening ideal is to have something growing in every part of the garden at all times during the growing season.

A good intensive garden requires early, thorough planning to make the best use of time and space. The interrelationships of plants must be considered before planting, including nutrient needs, shade tolerance, above- and below-ground growth patterns, and preferred growing seasons. Using the techniques described below, anyone can develop a high-yielding intensive garden.

The Raised Bed

The raised bed or growing bed is the basic unit of an intensive garden. Raised beds are growing areas whose surface is “raised” above the surrounding area. Raised beds can be temporary or permanent. A system of beds allows the gardener to concentrate soil preparation in small areas, resulting in efficient use of soil amendments and an ideal environment for vegetable growth.

Beds are generally 3'-4' wide and as long as desired. The gardener works from either side of the bed, reducing the incidence of compaction caused by walking on the soil. Soil improvement efforts are focused on the beds alone, not in the paths. Raised beds warm faster and dry earlier in the spring, allowing earlier spring planting. All these factors allow plants in raised beds to be spaced more closely than in normal growing areas.

Soil preparation is the key to successful intensive gardening. Plants compete for available water and nutrients, and an adequate supply must be provided for more closely spaced plantings. Applying extra synthetic fertilizers and irrigation will help, but there is no substitute for deep, fertile soil high in organic matter. Humus-rich soil will hold extra nutrients, and existing elements that are locked up in the soil are released by the actions of earthworms, microorganisms and acids present in a life-filled soil, making them more available for plant use.

If your prepared soil is not deep, double-dig the beds for best results. Remove the top twelve inches of soil from the bed. Insert a spade or spading fork into the next 10"-12" of soil and wiggle the handle back and forth to break up compacted layers. Do this every 6"-8" in the bed. Mix the top soil with a generous amount of compost or manure, and return the mixture to the bed. It should be somewhat fluffy and may be raised a bit. To create a true raised bed, take topsoil from the neighboring pathways and mix it in as well.

This type of soil preparation is a lot of work. Try it in one or two beds for some of your more valuable plants; if you like the results, you can proceed to other beds as you have time. One nice thing about raised-bed gardening is that it breaks the work into units. Instead of gazing desperately at a garden full of weeds, thinking you'll never have time to clean it up, you can look at each bed and say, "I can do that in half an hour today!" Other chores are accomplished with the same ease.

Raised beds can be freestanding or built with more permanent sides to help hold the soil in place. Permanent raised beds have supported sides. A variety of materials including wood or concrete blocks can be used for the sides. Redwood or western red cedar of at least two-inch thickness is long-lasting, or you may use pressure-treated wood.

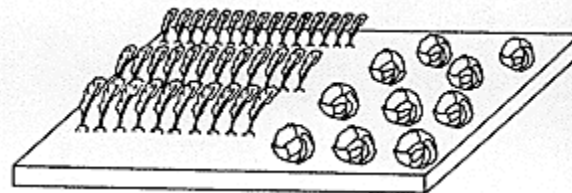
Treated Wood For Plants

- Certain wood preservatives can damage growing plants. Avoid materials which have been treated with creosote or penta (pentachlorophenol). Old railroad ties have been creosote-treated, and may contain enough residue to cause plant injury.
- Safe preservatives include salts of copper, chromium and arsenic (indicated by combinations of initials like CCA or CAC) or by trade names like Osomose and Koppers. Woods treated with these materials are greenish in color.
- The wood should be pressure-treated for the longest life. Use care when handling treated wood. Always handle it with gloves, and wear a mask while sawing it to avoid absorbing any of the preservative residues. Dispose of scraps and sawdust in a landfill. Do not burn scraps or use sawdust in the garden.

By their nature, raised beds are a form of wide-bed gardening, a technique by which seeds and transplants are planted in wide bands of several rows or broadcast in a wide strip. In general, the goal is to space plants at equal distances from each other on all sides, such that leaves will touch at maturity. This saves space, and the close plantings reduce moisture loss from surrounding soil.

Most crops are adaptable to growing in beds, but small-sized vegetables like lettuce, greens, dwarf or bush varieties and cabbage perform the best. Root crops like beets and carrots also will thrive in the looser soils of beds.

Whether raised or not, the advantage of beds is that vegetable plants can be grown more closely together. Space plants by thinning or transplanting so they are evenly spaced in the beds. The spacing should be whatever the seed packet recommends for spacing between plants. For example, if the seed packet says to thin lettuce so plants stand six inches apart in rows two feet apart, ignore the row spacing, and thin all lettuce plants to stand six inches apart. Root crops like carrots and beets still can be sown in rows, but plant two or three rows the length of the growing bed.



Ideas for spacing vegetables in bed plantings

Plants like lettuce and radishes can be sown by lightly sprinkling seed over the bed and gradually thinning young plants to their recommended final spacing.

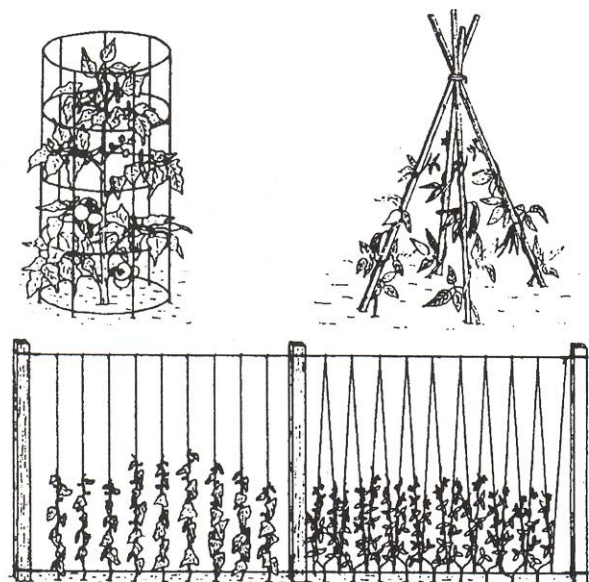
Vertical Gardening

Most gardeners already use vertical growing to save space in the garden. Caging tomatoes and trellising peas are two familiar examples. Besides saving space, vegetables grown this way are easier to pick and may have less rot because the fruit does not contact the soil. Improved air circulation can reduce diseases. Growing plants vertically can mean higher yields per unit area. In addition, vegetable plants can be trained on trellises to provide welcome summer shade or privacy screens, as well as to produce food for the table.

Gardeners reap another benefit of vertical gardening----care and harvesting don't require getting down on the ground. While vertical gardening soothes the backs of all gardeners, it may hold particular appeal for gardeners with impaired balance or coordination and gardeners who use a cane, walker, wheelchair or scooter. Vertical gardens also present clearly defined gardening spaces, which are helpful for gardeners with visual impairments.

Vining and sprawling plants, such as cucumbers, tomatoes, melons, and pole beans are obvious candidates for this type of gardening. Some plants entwine themselves onto the support, while others may need to be tied. Remember that a vertical planting will cast a shadow. Beware of shading sun-loving crops, but plant shade-tolerant crops near the trellises to take advantage of the shade. A high rate of fertilization may be needed, and soil should be deep and well-drained to allow roots to extend vertically rather than compete with others at a shallow level. Several examples of vertical gardening structures are shown below.

Trellising does have some disadvantages, however. Climbing supports must be sturdy, especially in windy sites. Building and installing trellises can involve time and expense. If plants are not naturally twining, they will have to be trained or secured to trellises, and heavy fruit will require additional support. Transpiration is higher in plants growing upright, so they may require extra water. This fast drying is an advantage to those plants susceptible to fungus diseases. Flowers will be more exposed to the wind, which may discourage pollinators like bees, or cause flower abortion.



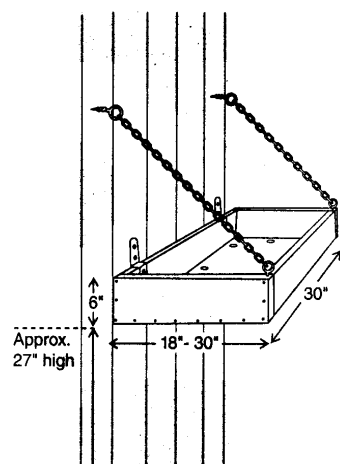
Place Plants within Reach

How high and low do you want to garden? When seated, most people are comfortable with 18 inches as the lowest spot and 60 inches as the highest. If you're standing but want to minimize bending, low is 24 inches and high is 72 inches.

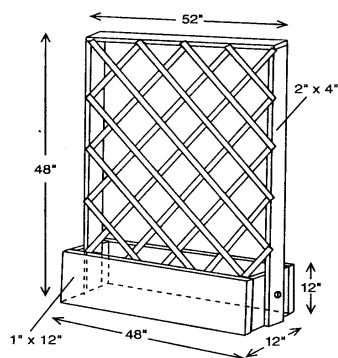
The key is to position plants within these ranges through various vertical gardening techniques. Fences, walls and other vertical structures in your yard should all be considered opportunities to garden vertically.

Easy Ways to Get Started

An ideal way to start a vertical garden is to make use of existing structures. For example, attach a window box to a balcony railing, or add shelves for small pots to a wall or fence. Shallow boxes can be hung with chains at any height, and varying the heights creates a unique and functional plant display.



A simple vertical garden is a shallow box hung with chains from an existing structure.



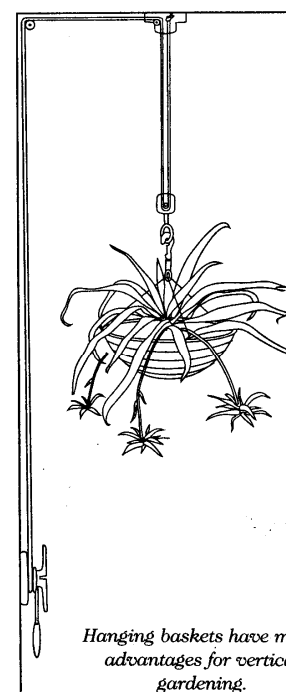
Easy-to-reach trellis planter.

To increase your gardening space, attach trellises or hanging basket brackets to walls and fences. Other ways to garden vertically are as simple as attaching a hanging basket bracket to a light pole. Low, sturdy tree branches may also provide spots for hanging baskets.

Arbors and trellises, which allow naturally vining plants to climb up to you, are stunning when covered with plants such as clematis, pole beans and nasturtiums. With some support, climbing roses and tomatoes will also beautifully and productively blanket an arbor or trellis. More substantial overhead arbors and pergolas are traditionally used for larger-growing, low-maintenance ornamental vines

such as climbing hydrangea, wisteria, trumpet vine, bittersweet and five-leaf akebia.

Use taller structures to support hanging baskets on pulleys. It's easy to water, groom and pick flowers or vegetables from a hanging basket on a pulley system. Simply lower the basket to a comfortable height, do your work and then hoist it back up to its growing position. Using a small winch to raise and lower the basket not only dramatically reduces the force and gripping strength needed but also greatly increases safety. Other sites for hanging baskets on pulleys include house roof overhangs, arbors, fences and walls.



Hanging baskets have many advantages for vertical gardening.

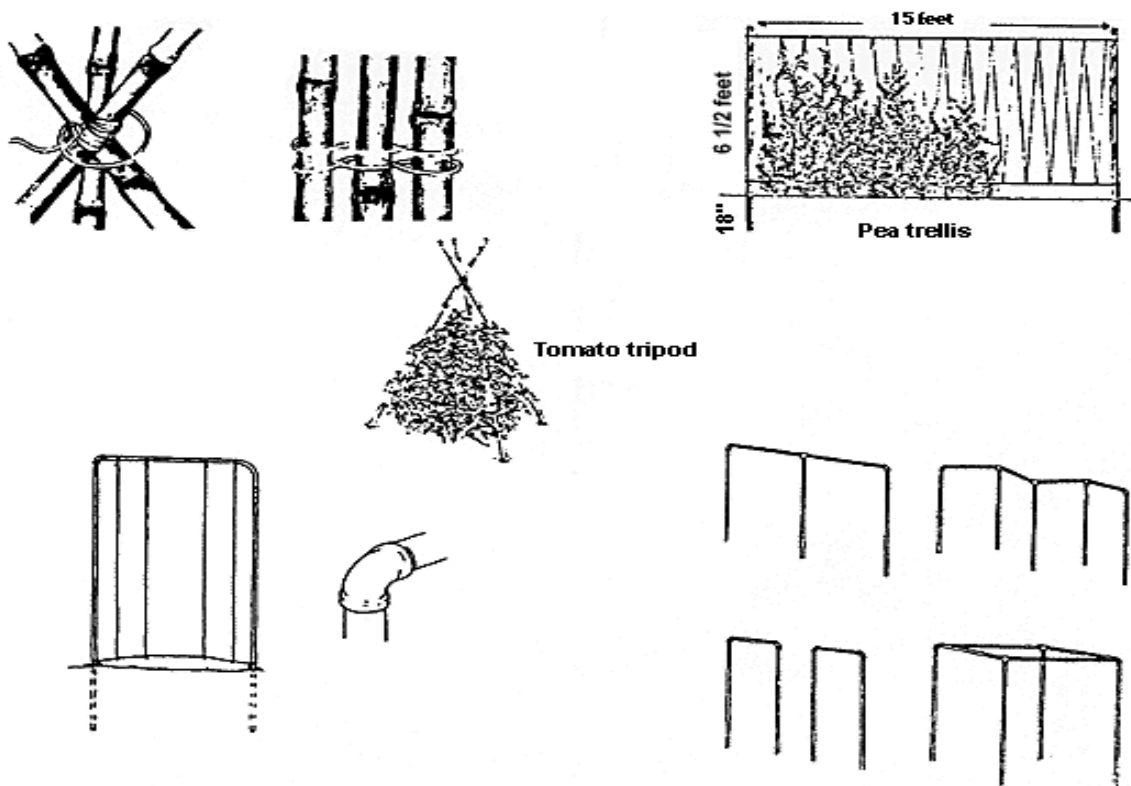
Types and Installation

The type of vegetable determines what kind of trellis used. A wide variety of trellising materials is available. A good rule is to install the sturdiest trellis you can afford. If the trellis is part of your landscaping it should be aesthetically pleasing, too.

Posts or supports for trellises can be made from metal, wood or plastic like PVC pipe. Metal posts will last longer and are easier to install than wooden ones. Wooden posts should be treated with a preservative or they may last only one season.

Posts can be used to support plastic or string mesh, or chicken wire. Plastic and string meshes can be disposed of, plants and all, at clean-up time. Removing dead plants from chicken wire fencing may be frustrating and futile.

Longer poles made of bamboo can be arranged in teepees to support climbing vegetables like pole beans. Trellis examples are shown below.



Above are some trellis examples. You can make a vertical frame of electrical conduit fastened with slip fittings, or 1/2 inch water pipe with threaded elbow couplings (detail). Attach strings to support the plants. You can arrange vertical frames in a number of ways. Run them as a straight fence (upper left), in zigzag pattern (upper right), with space between the frames (lower left), or as an arbor (lower right).

All trellises or climbing supports should be installed while plants still are small. Orient trellises to run in an east-west direction, and locate them on the north side of the garden to avoid shading other plants.



Melons and squashes do not naturally twine and will have to be trained initially by weaving stem ends through mesh openings. Developing fruit can be supported with slings made from used stockings or rags. Insect protection is an extra benefit of using slings, especially if the entire fruit is wrapped.

You can use slings to support fruit as it develops.

Interplanting

Growing two or more types of vegetables in the same place at the same time is known as interplanting. A traditional example of this technique is growing beans and corn together. Making plants share space means the individual plants may yield less, but the total garden yield will be greater because the space is being used more efficiently. Proper planning is essential to obtain high production and quality of the crops planted. This technique has been practiced for thousands of years, but is just now gaining widespread support in this country.

Some interplanting combinations

<i>Some interplanting possibilities</i>			
<i>Combine tall with low/spreading</i>		<i>Combine fast with slower-growing</i>	
caged tomatoes	melons	lettuce	tomatoes
sweet corn	lettuce	radishes	sweet corn
peas	radishes	greens	winter squash
okra	winter squash	beets	pole beans

An interplanted garden does not resemble a traditional garden with all the vegetables planted in straight rows. Rather, interplanted gardens have a mosaic effect with paths oriented around the interplanted areas. Plants can be arranged to take advantage of contrasts in texture and color, making a garden more visually interesting.

To successfully plan an interplanted garden the following factors must be taken into account for each plant: the length of the plant's growth period, its growth pattern (tall, short, below or above ground), possible negative effects on other plants (such as the allelopathic effects of sunflowers and Jerusalem artichokes on nearby plants), preferred season, and light, nutrient, and moisture requirements. Interplanting can be accomplished by alternating rows within a bed (plant a row of peppers next to a row of onions), by mixing plants within a row, or by distributing various species throughout the bed. For the beginner, alternating rows may be the easiest to manage.

Long season (slow maturing) and short season (quick maturing) plants like carrots and radishes, respectively, can be planted at the same time. The radishes are harvested before they begin to crowd the carrots. An example of combining growth patterns is planting smaller plants close to larger plants, (radishes at the base of beans or broccoli). Shade tolerant species like lettuce, spinach, and celery may be planted in the shadow of taller crops. Heavy feeders, such as cabbage family crops, should be mixed with less gluttonous plants. Root, leaf, and soil-building crops (legumes) may be mixed to take advantage of available nutrients.

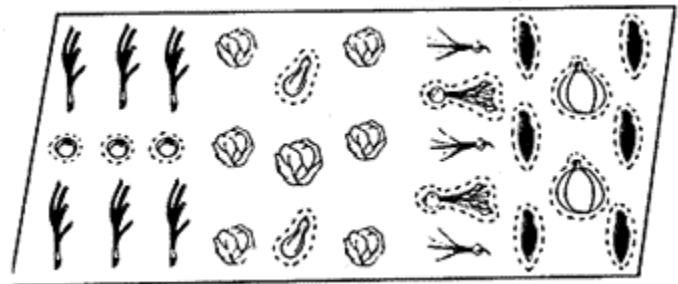
A common error in interplanting is crowding vegetable plants. Crowded plants yield poorly and are more subject to diseases. Consider the eventual harvest size of the vegetables you interplant, and space them so that at maturity they will just be touching each other. Make the interplanted area no wider than what you can easily reach across to keep from trampling plants.

You also can avoid crowding by interplanting fast growing vegetables with slow growing vegetables, for example, radishes or lettuce with tomatoes. By the time the tomato plants are bearing, the lettuce or radishes will be harvested. Or some of the lettuce can be removed in May to make room to sow seed of winter squash. Eventually the winter squash plants will cover the entire lettuce bed.

Similarly, vining squash or melons can be sown between trellised pea plants. The pea plants will be finished bearing about the time the melon or squash needs the trellis. Some other interplanting combinations are illustrated below.

Interplanting can help keep insect and disease problems under control. Pests are fairly crop-specific; that is, they prefer vegetables of one type or family. Mixing families of plants avoids large expanses of the pest-preferred crop, helping to contain early pest damage within a small area, and giving the gardener a little more time to deal with the problem. One disadvantage is that when it does come time to spray for pests, it's harder to be sure that all plants are protected.

A method of interplanting which has received notice recently is known as "square foot gardening." This technique (based on a book of the same name by Mel Bartholomew) involves planting vegetables very intensively. The growing area is divided into square foot sections. In each section, plants or seeds are carefully spaced.



Here are some interplanting designs. Early: scallions, lettuce, radishes. Later (in dotted lines): tomatoes, summer squash, beets, sweetcorn, pumpkins.

For example, in one square foot you can grow 16 radishes, 9 beets, or 1 cabbage plant. This technique may be useful for container growing or where space is extremely limited, but will demand correspondingly more attention by the gardener.

Follow the usual fertilization guidelines for each crop in the interplanting. Amend soil with compost or organic matter before planting, use a starter fertilizer for early spring plantings, and topdress vegetables at the proper stage of growth.

The closer spacing of interplanted vegetables will discourage some weeds. But the weeds that do grow must still be controlled, and rototillers will be too large for the job. Use small tools like onion hoes, or pull weeds by hand. Better yet, use mulches to control weeds; this also reduces watering needs.

All gardeners can grow vegetables more efficiently by using some of the intensive growing techniques described here. Careful management is the key to successful intensive vegetable gardens. The benefits can include greater yields per square foot, and more attractive vegetable plantings.

Succession Planting

Succession planting is an excellent way to make the most of an intensive garden. To obtain a succession of crops, plant something new in the spots vacated by spent plants. Corn after peas is a type of succession. Succession planting demands careful attention to days-to-maturity for each vegetable you plant, and attention to soil fertility to keep the intensively planted vegetables growing well.

Schedule plantings so no area of the garden remains empty for long. Remember that later planted succession crops mature faster than earlier planted ones because growing conditions, especially temperature and light intensity, usually are more favorable. Remove plants once their initial flush of bearing is over. Some vegetables that work well in succession plantings are listed below.

Some vegetables for succession planting

Vegetables for Succession Planting	
Vegetable	Plant every:
Radishes	10 days
Lettuce	2 weeks
Summer squash	3 to 4 weeks
Snap beans	3 weeks
Sweet corn	2 to 3 weeks

Relaying is another common practice, consisting of multiple plantings of one crop to provide a continuous harvest. Sweet corn and bush beans are usually recommended for relaying, but cucumbers or other crops that yield for two weeks or less are also good prospects.

One approach to relaying is to plant one variety several times at about two-week intervals (more time between early plantings in colder soil but only 10 days between the last plantings). Another approach is to make one planting of two or more varieties that differ in maturity time, e.g., 50-day and 60-day beans or early-, mid-, and late-season sweet corn.

Planting a spring, summer, and fall garden is another form of succession planting. Cool season crops (broccoli, lettuce, peas) are followed by warm season crops (beans, tomatoes, peppers), and, where possible, these may be followed by more cool-season plants, or even a winter cover crop.

Starting seeds indoors for transplanting is important for effective gardening. To get the most from your garden plot, a new crop should be ready to take the place of the crop being removed. Several weeks may be gained by having 6" transplants ready to go into a vacated area. Don't forget to recondition the soil for the new plants.

Planning an Intensive Garden

Begin planning your garden early. In January or February when the cold days of winter seem never-ending, pull out last-year's garden records and dig into your new seed catalogs. As with any garden, you must decide which crops you want to grow based on your own likes and dislikes, as well as how much of each you will need. An account of which cultivars were most successful or tasted best is useful in making choices. Use the charts below, and your own experience, to determine which crops are likely combinations.

An intensive garden requires detailed planning, but the time saved in working the garden and the increased yields make it well worthwhile. Good gardening practices such as watering, fertilizing, crop rotation, composting, and sanitation are especially important in an intensive garden.

INTENSIVE SPACING GUIDE

Note: to determine spacing for interplanting, add the inches for the two crops to be planted together, and divide the sum by 2. For example, if radishes are planted next to beans, add 2" + 4" = 6", then 6" divided by 2 = 3". The radishes should be planted 3" from the beans.

Plant	Inches	Plant	Inches
Asparagus	15-18	Lettuce, head	10-12
Beans, lima	4-6	Lettuce, leaf	4-6
Beans, pole	6-12	Melons	18-24
Beans, bush	4-6	Mustard	6-9
Beets	2-4	Okra	12-18
Broccoli	12-18	Onion	2-4
Brussels sprouts	15-18	Peas	2-4
Cabbage	15-18	Peppers	12-15
Cabbage, Chinese	10-12	Potatoes	10-12
Carrots	2-3	Pumpkins	24-36
Cauliflower	15-18	Radishes	2-3
Cucumber	12-18	Rutabaga	4-6
Chard, Swiss	6-9	Southern	pea 3-4
Collards	12-15	Spinach	4-6
Endive	15-18	Squash, summer	18-24
Eggplant	18-24	Squash, winter	24-36
Kale	15-18	Sweet corn	15-18
Kohlrabi	6-9	Tomatoes	18-24
Leeks	3-6	Turnip	4-6

Source: This information was adapted from the Virginia Cooperative Extension publication "Intensive Gardening Methods", written by Diane Relf, Extension Specialist, Environmental Horticulture, the Nebraska Cooperative Extension publication "Intensive Gardening Techniques", written by Betty Besal, Extension Home Gardening Coordinator, and the Chicago Botanic Garden Garden For Life publication series No. 4 "Vertical Gardening". Source of images were also from these publications.

Container Gardening

By

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Container gardens are an answer for persons with limited garden space. Residents of apartments, condominiums, retirement homes, or houses on small lots can still enjoy gardening. Also, containers are mobile, allowing a gardener to take the plants along or move them for an instant splash of color. You can enjoy your plants more fully by locating them on patios, balconies or window boxes. Older gardeners can plant and tend to containers when standard gardening may be too strenuous. And, what better way is there for children to study the miracle of plant growth?

Container gardening, however, is not without its problems, especially in Kansas. A plant growing in an exposed location will be under more stress, and will need more regular watering. The effects of hot, dry winds may be more severe than in conventional gardens. Large containers can be expensive and difficult to move when filled with potting mix. But, the advantages far outweigh the problems, so let's get started growing-container style.

Soil Mixes

Soil is not always best for container gardening. When ordinary soil is saturated with water, the air spaces are filled, removing essential air from the roots. This is why a soil substitute, often called potting mix, is recommended. The mix may contain some soil (called soil mix) or no soil at all (a soilless mix). Additional ingredients such as peat moss, vermiculite, and perlite allow rapid drainage but still hold sufficient water for plant growth.

You can purchase potting mix from nursery or garden stores under a variety of trade names: Jiffy Mix, Pro Mix, Metro Mix, Pro Soil and others. If you have only a few containers you may want to take them to your local greenhouse and have them filled with their greenhouse potting mix (for a fee).

You can also make your own potting soil. Remember to keep it simple; you don't need a different mix for each type of plant. One common formula mixes one part sandy loam soil, one part sphagnum peat moss and one part perlite or builder's sand. There are many variations of this basic recipe. Any mix containing soil has not been pasteurized to kill weeds or disease organisms, so use these mixes for established plants. Potting mixes should be free of disease organisms, insects, or weeds.

Consult references in your local library or K-State Research and Extension office for additional information on container gardening, including recipes for mixing large quantities of potting mix from a variety of ingredients.

Containers

Containers come in a variety of styles and sizes. Of course, you can recycle old buckets, cans, and similar containers. The only essential thing is that the container has holes in the bottom for draining excess water.

Plastic. Plastic containers are available in a variety of sizes, shapes, and styles. Some plastics are breakable and may not hold up well for several seasons's use; others are more durable.

Clay. This old favorite is preferred by many gardeners for the earth tone color it provides. Clay is porous and water is lost from the sides of the container. Clay pots are breakable and may not hold up well if mobility is required.

Wood. Wood is a popular material for containers. Redwood or cedar is relatively rot resistant and can be used without staining or painting. Exterior grade plywood and other types of wood can also be used. Avoid using wood treated with creosote, penta or other phenolic compounds, since vapors can injure some plants. Always use copper-treated lumber if preservative-treated lumber is needed. Wooden containers are excellent for portability and can be purchased or built in a wide variety of sizes, shapes, and styles. Several container garden references offer plans for building attractive containers.

How big should the container be? This question can best be answered by considering the type of plants you plan to grow. There is a balance between the top growth and root systems of plants. Small plants can be grown in fairly small, shallow containers while larger plants need a larger container. Plants in "stressful" locations such as a hot patio exposed to the west or southwest winds, or in elevated locations, may need a slightly larger container than ones less exposed.

Most annual flowers and small vegetables will grow in containers from 6-inch pots to gallon-size containers. Larger vegetables, such as dwarf tomatoes, peppers, or cucumbers will require 1 - to 3-gallon containers. Full-size tomatoes and roses will require at least a 3-gallon container.

Fertilizer

Since potting mixes drain water rapidly, causing fertilizer to be washed out of the containers as you water, you will need to replace lost fertilizer. Lighter mixes will require more frequent fertilizing than heavier mixes containing soil. Remember, you are growing a plant with a small, constricted root system, so regular fertilizing and watering is important.

Many gardeners prefer to apply three dilute fertilizer solution at every other watering. There are several water-soluble fertilizer materials available at your garden supply dealer, including Rapid Gro, Hyponex, Miracle Grow, and other products. If you fertilize at every other watering, use only one fourth the recommended rate unless the instructions state directions for continuous feeding for container gardening.

Controlled release or time-release fertilizers are also becoming widely available. These are pellets designed to release fertilizer gradually over a long period. Use these according to directions on the package label.

Watering

Since containers are usually situated in an exposed location, water is quickly lost from the containers. Also, smaller containers have less of a reservoir for holding water until needed. There is no rule of thumb on how often to water since it will vary with type of plant, potting mix, weather conditions, and type of pot used.

You may find that daily watering is needed during hot, dry periods. One advantage of using potting mix is that it is nearly impossible to over water since the water quickly drains out of the container. Check your plants regularly and look for signs of wilting to indicate a need for water. Another method is to stick your finger into the upper inch or so of the potting mix to feel for dryness. Always apply sufficient water to allow a small amount to come out of the bottom drain hole. This indicates the container is thoroughly saturated with water.

Potting mixes can be easily washed out of the container, so never water with a direct stream of water from a hose. Always use a "breaker" nozzle to break up the stream of water or a sprinkling can to apply water. A sprinkling can is handy for applying fertilizer as you water.

Since containers must be watered regularly, you will need to arrange for plant care when you vacation. Grouping plants together will reduce their water use. Some ingenious gardeners have developed a "trickle" device by punching a small hole in a large container that serves as a water reservoir (see figure). The water can then be channeled to one or more containers. The most reliable method of plant watering while you are away, however, is to arrange for someone to care for your plants. They can water plants as well as check for problems that may develop.



Example of an automatic watering method

Culture and Care

Plants need care and attention throughout the season. Insects and disease can be a problem because plants are growing under more stress and with limited root systems. Control measures will be similar to those used in conventional gardening. Refer to K-State Research and Extension publications for ways of dealing with garden pest problems.

What to Grow

Flowers. Many annual flowers can be grown in containers, especially those that tolerate heat stress. Especially popular are the many types of marigolds, geraniums and periwinkle (vinca). Impatiens will produce flowers in shady locations as will ageratum, begonias and nicotiana.

Vegetables. In recent years, there has been an emphasis on developing varieties suitable for container gardens. Vegetables require sunny locations and will vary in their productivity depending on the type of crop. Check seed catalogs for new varieties developed for this purpose. There are also several types of "ornamental" vegetables adapted for growing in containers. Flowering cabbage and flowering kale are attractive relatives of the standard varieties. Lettuce is available in a variety of colors and leaf textures. Red chard is another popular container plant because of its bright red stalks.

Herbs. Many gardeners like herbs growing near the kitchen where they are handy to use in cooking. Basil, chives, marjoram, and thyme are all easy to grow in containers. Many gardeners keep mint in containers since it is an aggressive plant that spreads over the garden. Some herbs are perennial and can be moved indoors for winter use or held in the container until next year. Many gardeners dig a hole in the garden to store pots of perennial herbs until the next season.

Annual Flowers Suitable for Container Gardening

Alyssum

Carpet of Snow
Royal Carpet
Rosie O'Day

Begonia: Wax Leaf

Glamour
White Christmas
Othello

Browallia

Blue Bells (improved)

Coleus

Red Monarch
Fashion Parade
Magic Lace

Cuphea

Firefly

Geraniums

Numerous varieties available with red, white, pink, salmon, coral and flowers.

Impatiens

Tangelow
Elfin Hybrids
Imp Hybrids
Blitz

Lantana

Yellow compacta
White compacta

Lobelia

Blue Cascade
Sapphire

Marigolds

Dwarf French
Panther
Queen Sophia
Boy Series

Periwinkle (Vinca rosea)

Little Bright Eyes
Little Blanche
Little Pinkie

Nasturtium

Gleam Series

Pansies

Mammoth Giants

Petunias

Cascade Hybrids
Comanche
Bernese Hybrids

Salvia

Carabiniere Hybrids
Saint John's Fire
Victoria

Sanvitalia

Cold Braid

Snapdragons

Floral Carpet

Thunbergia

Susie Mix

Torenia

Mixed colors

Verbena

Amethyst
Blaze
Sparkle Mixed Colors

Zinnias

Button Series
Chippendale bicolor

Vegetables: Dwarf Varieties for Container Gardening

<p>Beets (cool season) Detroit Dark Red Early Wonder</p> <p>Cabbage (cool season) Dwarf Modern Little Leaguer</p> <p>Carrot (cool season) Baby Finger Nantes Goldenhart Little Finger Short 'n Sweet Royal Chantenay or Red Cored Chantenay Tiny Sweet</p> <p>Cucumber (warm season) Bush Whopper Spacemaster Patio Pik Potluck Salty Bush Champion</p> <p>Eggplant (warm season) Morden Midget Mission Bell (standard varieties can be grown in larger 1-3 gallon containers as well)</p>	<p>Lettuce (cool season) <u>Leaf</u> Grand Rapids Oakleaf (heat tolerant) Salad Bowl Ruby (red)</p> <p><u>Butterhead</u> Tom Thumb Bibb Buttercrunch Dark Green Boston</p> <p>Muskmelon (warm season) BushWhopper Minnesota Sweet 'n Early</p> <p>Onions (cool & warm season) Use any standard variety of sets or plants. Best grown for green onions</p> <p>Peppers (warm season) Most varieties do well in larger (1-3 gallon) size containers. Sweet, banana or hot peppers can all be successfully grown in containers.</p> <p>Radish (cool season) Cherrybelle Champion White Icicle</p>	<p>Squash (warm season) Baby Crookneck Creamy Golden Nugget Gold Rush Various zucchini hybrids</p> <p>Tomatoes (warm season) <u>Dwarf</u> Patio (dwarf) Pixie (dwarf) Sweet 100 Tiny Tim (dwarf) Small Fry (larger vine)</p> <p><u>Small-Vined</u> Celebrity Carnival Mt. Spring Mt. Fresh Merced Daybreak Sunmaster</p> <p>Watermelon (warm season) Kengarden Sugar Bush</p>
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Source: Charles W. Marr, *Container Gardening*. Kansas State University, May 1998, at <http://www.ksre.ksu.edu/library/hort2/EP31.pdf>

Container-Grown Fruit

For city-dwellers, folks who live in unfavorable climates, or homeowners with limited space, growing fruit isn't impossible

For folks who want to grow their own fruit, but who don't have adequate space or a suitable climate, growing fruit in containers offers several opportunities. Cherries, peaches, figs, apples, tangerines, lemons, and limes are among the many types of fruit trees that thrive in containers. And, you can grow them in just about any region of the country. Of course, container-grown fruit trees produce fewer fruit than full-grown trees, but fresh limes and lemons on a cold winter day in Vermont, for example, can be very refreshing.

Some container-grown apples and cherries (deciduous, or leaf-dropping, trees) will not fruit properly in some mild-winter areas because they require a long period of cold temperatures. Ask your nursery staff about varieties that require a shorter cold period (also called "low-chill" varieties) and that do well in mild-winter regions.

Where to Buy Container Fruit Trees

Most plant catalogs and nurseries contain a selection of fruit trees that can be grown in containers. Trees ordered from mail-order catalogs are shipped bare-root. You should plant your tree within a day or two of receiving it, but only after soaking the roots overnight in warm water.

Nursery-bought trees will be either in containers or balled and burlapped. Look for trees with branches arranged symmetrically around the trunk and without broken or diseased limbs. Avoid buying root bound trees (roots circling the container), and prune any broken or damaged roots before planting.

Choosing a Container

Containers are available in almost every size, shape, and material. Containers made of untreated, rot-resistant wood are good options, but wood rots eventually. Clay pots dry out faster than wooden ones, and fungi and bacteria can grow in the porous surfaces. Also, old clay pots can build up enough fertilizer and salts to make them impermeable to air and water. Plastic pots, on the other hand, are light in weight, but they heat up in the sun. All containers must have adequate drainage holes.

A good fruit-tree container is a 15-gallon pot, which is large enough for a 5-foot tree. Such a container could weigh between about 70 and 125 pounds, depending on what the pot is made of, the size of the tree, and the type of soil. Weight is no small consideration if you have to move the container with the tree in it.

Soil Mixes

A good container mix ensures thorough soaking and good drainage to nourish and support the plant. When water runs right through or down the edges of the mix, leaving dry places, the plant should be repotted in the same-sized pot or in a larger one.

Here is a good container mix for growing fruit:

- 4 cubic feet of dampened peat moss or rotted pine bark
- 2 cubic feet of sand (washed sand or horticultural sand is fine)
- 2 cubic feet of perlite
- 2 cubic feet of compost
- 1 pound of dolomite lime
- 3 1/2 pounds of Osmocote 17-6-10

Purchased container mix is available in bags of 3 cubic feet. Read the ingredients, and add sand to make the mix heavier if necessary. Pro-Mix, Customblen, and Fafard brand mixes don't contain sand, but Metro-Mix 200 does.

Fertilizing and Watering

Fruit production requires regular fertilizing all year long. Monthly feeding is a good regime to maintain. Cut back the nitrogen in fall and winter to avoid encouraging new growth in those seasons. If your container mix includes a slow-release fertilizer such as Osmocote, it's good for several months. After that time, you have many choices, from the garden store's one-size-fits-all to the specific fertilizers suggested by the tree-supplier. Ask his or her advice, and follow the instructions that came with the fertilizer.

The most important part of watering is proper drainage. Between waterings, the soil should dry well, but it shouldn't dry out completely, because dryness can cause fruit to drop. An outdoor container-plant in the sun can dry out very quickly and needs more than one watering per day. Protection from the sun reduces soil temperature, and burying the container allows rooting into the ground through drainage holes for less dependence on daily waterings. Excess wetness or poor drainage can lead to root-rot (Phytophthora) in susceptible plants. However, you should overwater moderately once a month to leach out fertilizer residues.

Hedge Clipping and Root Pruning

Pruning controls a tree's size and shape, maximizes fruit production, and maintains tree health. Hedge clipping and "cleaning out the inside" are the minimum treatments. To prune, remove all foliage from the inside branches of the tree so that most of the foliage grows on the outside. Pay attention to the fruit location.

During the first few years, you may prune a newly transplanted tree, but allow the tree to increase in size several inches a year. As it approaches mature size, prune to limit its increases to up to 1 inch per year. Most container plants eventually reach an optimum size for a specific container size. Fruit trees, especially citrus, can live more than 75 years, so annual repotting is the best way to maintain the health and vigor of both plant and soil.

In the spring, repot the plants before putting them outdoors for the summer. Remove about an inch of the root ball, and comb the root tangles. Prune a similar amount of foliage at the same time. Additional summer pruning is necessary to limit the tree's size.

As the art of bonsai demonstrates, you can limit almost any tree to any size by careful pruning. Of course, the smaller the pot, the more attention you must pay to watering, fertilizing, root and foliage pruning, and repotting.

Overwintering

Deciduous trees, such as apples and cherries, require a period of temperatures between 32° to 40° F in order to fruit properly the following year. Gardeners in mild-winter regions should look for fruit trees adapted to fewer chill hours.

If you're not in a mild-winter zone, move your fruit trees indoors in winter or protect them outdoors. After their leaves drop in the fall, deciduous trees should be kept moist and moved to an unheated garage. You can also keep them insulated outdoors to prevent freezing and thawing of the roots. To insulate your outdoor trees, tie up the branches, create a wire-mesh cylinder (around the tree and container) 1 foot wider than the tree canopy, fill the cylinder with leaves or straw, wrap the cylinder with burlap, and cover the top with plastic to shed water.

Citrus and tropical trees should be moved to a heated greenhouse or solarium before the first frost to overwinter indoors. Some citrus and tropicals need supplemental light and heat in winter for best fruiting. However, excessively hot and dry conditions can cause citrus to drop fruit. In that case, you should mist the foliage with tepid water. Citrus will often have flowers and fruit at different stages on the same tree, and ripe fruit can be left on the tree for weeks.

Pests, Diseases, and Sanitation

Proper sanitation can prevent or control many problems; but the longer you put it off, the harder it gets. For your trees, a regular shower, a spray with an insecticidal soap such as Safer (an organic treatment), and a gentle scrub all over with a soft brush will control most pest outbreaks. For serious scale infestation, use a light horticultural oil spray once a year or get the appropriate beneficial insect predator, available for most insect pests.

Prevention is the best approach to diseases. Find varieties and rootstocks that are resistant to the microbial problems in your area. It deserves repeating: Sanitation is the most important aspect of container and greenhouse growing; as gardeners say, when in doubt, clean it up, and clean it out. Growing trees in containers can produce an abundance of fruit (and satisfaction) for city-dwellers, people with limited space, or folks who live in unfavorable climates, so don't feel that your location limits your fruit-cultivation options.

Source: William Ross, National Gardening Association,

<http://www.garden.org/subchannels/edibles/nut?q=show&id=99>

Gardening in Raised Beds and Containers for Older Gardeners and Individuals with Physical Disabilities

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Introduction

Gardening is the number one outdoor leisure time activity of America, with 84% of households involved in at least one form of gardening activity. Gardening is a source of personal satisfaction and pride providing esthetic pleasure and opportunity for relief from daily stress. Gardening is an ideal preventative therapy to maintain personal well-being. With a little planning and creativity, it can be available to everyone. Disabled and elderly who have never gardened can acquire a new and rewarding hobby. With proper modification to the site, gardeners who have lost physical ability can continue this valuable activity.

While most gardening is considered part of the traditional landscape or ground level planting, an increasing number of gardeners are discovering the advantages of gardening in planters, containers, and raised beds. These gardening styles can be readily adapted to make gardening easier for disabled and elderly gardeners. They are equally adaptable for gardening in a small backyard, a third floor apartment patio, on top of a hospital, or on the grounds of a retirement home.

Planning the Garden

The first step in planning a raised garden is understanding the needs and abilities of the gardeners. The garden area should be as small as possible to meet these needs adequately. As the garden size increases, the fun of gardening tends to change to drudgery. All of the raised beds or planters should be easily accessible and arranged in a fashion to fit together as an attractive landscape unit. Avoid the tendency to line up little garden plots in rows resembling graveyards. Trees and shrubs can be used to enclose one or more sides of the raised garden site, providing both privacy and a pleasing backdrop, but avoid shading the garden with excessive plantings. Beds and planters can be designed to fit individual needs; however, standard dimensions for raised beds are given in Table 1.

Table 1: Standard dimensions for Raised Beds

	Wheelchair Semi-Ambulatory Ground		
Height	2-2.5 feet	2.5-3 feet	1/2-1 feet
Width (one-sided)	2 feet	2 feet	2 feet
Width (two-sided)	3-4 feet	4 feet	4 feet
Diameter (circle)	3-4 feet	4 feet	4 feet

Raised beds are generally 3'-4' wide and as long as desired. However, depending on the individual's strength and endurance, it would be wise to limit the length of the bed to 10 or 20 feet to prevent over exertion in circling the bed.

Advantages of Gardening in Planters, Containers, and Raised Beds

Due to the many materials available and to the many types of raised planters, adaptability to the disabled individual's needs is great.

1. Planters can be located for easy accessibility and used in areas where plants would not otherwise grow, e.g., downtown on roof gardens.
2. Focusing attention on small, easily managed areas provides success and a feeling of achievement and reduces frustration and feeling of being overwhelmed by a large garden.
3. The planter can be placed at a height that gives the disabled individual maximum gardening space within his normal reach.
4. Raised planters can be either permanent or temporary structures depending on the desires and needs of the gardener.
5. There is a wide choice of plants that can be used in planters. Planters can be built to be mobile if needed to adjust to available sun or move out of the way during other activities.
6. Problems of poor soil or soil borne disease can be easily overcome.
7. Planters drain well, warm quickly, and thus produce early crops.
8. Seedlings can be started in small mobile planters indoors and brought out when the weather is appropriate, thus extending the growing season.
9. Planters offer opportunities for innovative landscape ideas and creative plant structures such as walls of plants.

Location and Cultural Requirements

Full sun or at least six hours of sun a day is recommended for raised planters and containers, 8-10 hours if vegetables are to be grown. If full sun is not available, then choose shade-tolerant plants such as begonias and impatiens.

All raised planters and container gardens will need more watering than a standard garden. A water source should be nearby and the hose should be light, accessible, and easily used by the physically disabled gardener. It may be worth the investment to install automatic or trickle irrigation systems in permanent planters. Attachments that are of value to any gardener include on/off valve at the hose end, extension nozzles, water breakers, and easy to use lever controlled water faucets.

Fertilizer is usually incorporated into the soil at the time the planter is filled. Later applications are based on normal requirements of the plants.

Mulching is a must with most of the larger raised planters as it slows the evaporation of water from the bed and helps keep the soil cool for the roots. Mulching is also an excellent weed deterrent. Weed-free organic material is preferred for mulching so that it enriches the soil as it decays.

Most pest control should be done by hand and without chemicals to avoid the danger presented by working with toxic substances. However, if chemicals are needed, contact your local extension agent for specific recommendations.

Careful observation and prompt action can alleviate most pest problems. If weeds are kept down through mulching and pulling as soon as they are identified, they will not become invasive. Insects can be a big problem with some plants. Make sure all plants are insect-free before planting. Remove by hand any pest that is found. Disease can also be a problem with certain varieties. Use plants that are resistant to problem diseases in the area. If just one portion of the plant is infected, remove and destroy that portion, do not compost. If the whole plant has become excessively damaged, then remove the plant and replace. Only use pesticides if necessary and carefully follow the directions for application amounts and frequency.

Accessibility to the Garden Site

It is essential that the disabled individual be able to reach the garden with a minimum of difficulty. All gates or doors must be wide enough (36 inches) for a wheelchair to pass through without difficulty. Gates and doors should slide rather than swing, and they should be light enough to move easily. Stairs are better for those who walk with aid but ramps are required for those in wheelchairs. Ramps, along with gates, doorways, walks, and space between raised beds, should be a minimum of three feet wide for single-person travel and six feet for two persons. The ramps need to have a slope of no more than 8% and should be edged to prevent the chair from rolling off the ramp's sides. All surfaces should be non-slip and have a 2% slope for water drainage or be made of porous materials. The surface should be continuous and should not have any bumps. Brick walkways are discouraged because they are very susceptible to heaving. If a grassy area is desired, openwork paving stones which have holes for the grass to be seeded through are available. A traditional lawn is too uneven and not appropriate for the person in a wheelchair or with impaired walking.

At the garden site, mobility and access to planting area are equally important. In addition, a place to rest and recover from the walk to the garden may be critical for continued participation and enjoyment by many disabled or elderly gardeners. Provide benches, sturdy chairs, or a flat surface for a wheelchair in a shaded location.

Precautions for Disabled or Elderly Gardeners

Over-exposure to the sun can cause problems for gardeners taking certain prescription drugs so precautions should be taken. In the summertime, the mid-afternoon sun should be avoided and work encouraged in the morning or evening. Hats should be worn to protect the head and eyes. Sunscreen should be used on exposed areas and appropriate beverages provided before and after working in the garden.

Physically disabled and elderly gardeners should avoid over-exertion. One way to avoid this problem is to rotate jobs so that the same activity is not performed for more than half an hour. If the gardener feels tired, then a rest in the shade should be taken before attempting to return to work. The gardener should not attempt to do too much in one work session.

Safety is important in the garden. All debris and equipment (tools, hose) should be removed from paths in order to avoid problems with wheelchairs and walking aids. Gloves and long sleeved shirts should be worn if working with thorny or woody material. If using pesticides, directions on the label should be followed and cautions heeded.

Tools can make gardening tasks easier so it is important not to let them get lost or damaged. Make sure that all tools are brightly marked so that they can be found easily. Have a specific place to store them so that they are there when needed. A bag on the side of the chair or a basket will adapt well for small tools. Close pruners and pocket knives before setting them down. Keep tools such as knives, pruners, and hoes sharp for easy and efficient use.

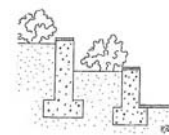
Types of Planters and Beds

Raised Ground Beds. Raised ground beds are only 8-10 inches in height. These beds are especially suited for physically disabled children or adults who prefer to work on mats or dollies. Ground beds are also used to grow more permanent, deep-rooted plants that would be too confined to grow in raised planters. Espaliered dwarf fruit trees are very popular in ground level beds because those in wheelchairs are able to care for these trees. Often long, light-weight tools are used by those who are chair bound or who have difficulty bending while they are working in ground level beds. Truck tires have been used successfully as ground level planters for children.



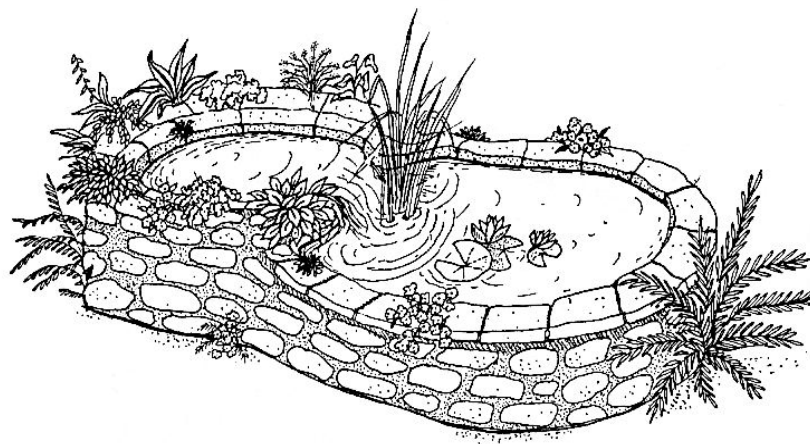
Deep Raised Beds. A deep raised bed can be built at a height and width that will provide the physically disabled individual with easy access from a sitting position. Raised beds can use almost any kind of material and they may be permanent or temporary structures depending on the material used. A border or edge wide enough for a person to sit upon can be helpful to the semi-ambulatory individual who would rather sit than stand while working. Many raised beds are rectangular but they can also be L-shaped, T-shaped, or circular. Combinations of shapes can lend interest to the gardening area. Buttressing may be required in structures longer than four feet. Raised beds are best adapted to annual crops because permanent plantings are vulnerable to winter injury of roots in the exposed raised bed; however, certain rock garden plants are well adapted to this culture. Limited space calls for compact crops. The limited reach of a physically disabled gardener generally requires plants that will not achieve a height of more than two feet.

Terracing and Retaining Walls. Terracing and retaining walls are two ways to tame the sloped areas of the garden while providing growing space for the physically disabled gardener. A retaining wall can be made to the height indicated by the raised garden dimensions and the actual growing space is the same as that for one-sided raised beds. Ground space adjacent to the wall needs to be accessible to the person with the walker or wheelchair. The retaining wall is usually made of brick or stone. If the wall is stone and the dry wall technique is used, then plants can be put into the wall. A terraced garden is a series of small retaining walls or raised ground beds forming steps. The retaining wall and the terraced garden can give advantages of both raised beds and ground beds. The plants grown in these beds depend on the preference of the gardener and the height of the bed.



Elevated Beds. Elevated beds are shallow beds that are raised off the ground upon legs. These beds are especially good for the chair-bound individual who wants to be able to get his legs underneath the bench so that he can work comfortably from his chair. The height from ground level to the bottom of the bed should be as low as is comfortable for the individual. Thirty inches is usually satisfactory for an adult. If the bottom of the bed is much higher, the soil level will be so high as to cause excessive fatigue of the arms while working. However, this bed can be constructed higher for those who prefer to stand. The elevated bed should be at least eight inches deep and is usually made of wood. The plantings within the bed should be shallow-rooted annual vegetables and flowers.

Water Feature/Planters. The water feature/planter is a combination of small pool and planter. This structure is a permanent addition to the garden because of the expense of materials and construction. Dimensions for the planter portion of the structure are the same as those for the one-sided raised bed. Dimensions and shape of the pool will vary. The larger the pool, the more it will cost to build and the harder it will be to maintain. Water evaporation from the pool will create a more humid environment in the direct vicinity of the pool so plants that need moisture can be located there. The pool, if it is large enough, can be planted with aquatic plants; a fountain can be installed; or fish can be added. An important consideration before installing a pool is maintenance. The disabled gardener may want to do it or arrange for others to be responsible. A dirty, unkempt pool will be a distraction, rather than an attractive focal point in the garden.



Containers. Almost anything that can hold enough soil to sustain a plant's growth can be used as a planter. This quality makes container gardening a good starting point for the physically disabled gardener. The major considerations given to container gardening are the size of the container, adequate drainage, and the requirements of the plants. Small containers such as ceramic pots and large institutional food cans can be placed on benches for accessibility. Larger containers such as wheelbarrows, baskets, barrels, old sinks, bathtubs, and even modified hospital carts can act as small raised beds.

Containers are especially good because they can be moved around and even started indoors before the weather is warm outside. Plants suitable for containers include annual vegetables and flowers, indoor plants (if the container is to be taken in during the winter), and strawberries. The plants in the container will need to be watered frequently.

Miniature Gardens. Miniature garden planters can be constructed for persons in wheelchairs that allow them a great deal of individuality in designing landscapes. These miniature gardens can be complete scale models of larger gardens using cuttings from small leaved varieties of boxwood, rosemary, or teucium to prune into hedges or topiaries. They may be planted as a Japanese garden complete with Pagoda. Or the gardener may choose to plant the smallest of vegetables or annual flowers for seasonal display. Pathways, fences, and buildings to scale add interest to these gardens.

Window Boxes. Window boxes may be especially good for the individual who does not have an accessible outside area in which to work or is unable to work outside. Window boxes are usually made of wood but can be made of painted aluminum. It is important that considerations for proper drainage be given in the construction of the box. Plants can be directly planted into the soil in the box or pots can be put into the box to be removed in the winter months. Annuals, herbs, and salad greens are popular plants for window boxes. The path to the window box should not be obstructed by furniture.

Planting Bags. Plastic bags of artificial soil mix specifically designed for culture directly in bag are now available from some garden centers and catalogs. Plant through slits in the side of the bag; water using a watering wand or long nose watering can to fit into the opening; and fertilize weekly. Most small flowers and vegetables perform well, including peppers, broccoli, lettuce, begonias, and salvia. With stakes attached nearby, tomatoes can be grown in the bags. Bags can be placed on ground, benches, or tables of any convenient height. They can be easily moved from one location to another. Although the planting bags are temporary and relatively expensive, they can produce a small garden where other methods are difficult.

Hanging Baskets. Hanging baskets are not much different from any other container in their cultural requirements. However, their small size may require more frequent watering. Normally, hanging baskets are inaccessible to the physically disabled, but a pulley system easily solves this problem. The system needs to be designed so that the rope and its attachment are accessible to the person in a chair or with a walker. The basket must not be too heavy so artificial soil mixes are recommended. This system can be used both indoors and outdoors.

Construction Materials for Planters and Raised Beds

Wood. Wood (aged railroad ties, logs, boards) may be the easiest material to work with and the planters fit well esthetically into the natural environment of the garden.

Problems: For long lasting beds, pressure treated lumber may be desirable. Other wood preservatives have drawbacks: copper sulfate leaches away; copper naphthenate has a gummy residue; creosote and pentachlorophenol damage plants. Some woods such as redwood and cedar are considered relatively rot resistant but expensive. Or you can line a planter that does not come in contact with the ground with plastic, add a few drain holes, and it will last an extra 2 years. Often people are ready to move beds every 3-4 years, and most untreated wood will last that long.

Stone: Stone (blocks, slabs) is another natural material that blends well into many gardens. There is a wide selection of stones and cuts available. Stones may be put together using a dry wall technique or with mortar.

Problems: Due to the heaviness and the skill needed to build stone structures, a contractor's services may be needed. This sort of expense can be prohibitive. A stone structure is likely to be a permanent structure making design an important consideration. Depending on the stone and the cut, the abrasiveness of the material must be considered.

Concrete: Concrete (construction slabs, sewer piping, poured concrete) is a very adaptable material. It is available pre-molded or can be poured at the site. Colors, textures, and materials can be added to concrete to give it variety. Concrete structures can blend tastefully into an urban environment.

Problems: Concrete must have appropriate foundations so that it will not be damaged by natural contractions and expansions of the soil. Pouring concrete takes some skill and the concrete must be properly aged so that it will not crumble. This may call for a contractor's service, which may be expensive. The finish on the concrete is an important consideration due to possible abrasion factors. Preformed concrete is relatively inexpensive and offers satisfactory planters.

Cinder Blocks: These blocks are heavy and large, but relatively easy to work with. They are also relatively cheap. The gray color is not appealing to everyone but they can be painted. Cinder blocks are used in building walls but the holes also make them adaptable for planting.

Problems: Cinder blocks are not the most appealing material and they are bulky. They may take up more gardening space than is desirable but as mentioned earlier the holes can be used for planting spaces themselves. Even painting them can be a problem because they might have to be painted every few years due to peeling and chipping. Soil in them dries rapidly and requires frequent watering.

Bricks: Bricks have the potential of being the nicest looking material to use for construction. They come in a variety of colors and are usually put together with mortar.

Problems: The skill of a bricklayer may be needed to build the planter. Due to the expense of the material and the type of construction needed, brick planters are usually permanent. Bricks may be the most expensive material unless used bricks are available. Make sure any used bricks are suitable for exterior use.

Salvage: Salvage materials (broken sidewalk) result from tearing down some previous construction or scraps from a construction project. The major positive aspect of salvage material is that it is either cheap or free.

Problems: Salvage material is frequently a combination of odd sizes and unfinished jagged edges. There may be both construction and safety problems.

Terra Cotta: Terra Cotta (flues, sewer tiles) is very attractive and can be inexpensive if damaged materials are obtained. Smooth surfaces are advantageous to those with delicate skin.

Problems: The weight of terra cotta materials makes them difficult to handle.

Preparing the Raised Bed and Planter

Soil preparation is the key to successful gardening. To grow close together, plants must have adequate nutrients and water. Providing extra synthetic fertilizers and irrigation will help, but there is no substitute for deep, fertile soil, high in organic matter.

As raised ground beds are only 8-10" deep, double digging the beds will give best results. This is a very strenuous task and may require volunteer or paid labor. Remove the top twelve inches of soil from the bed. Insert a spade or spading fork into the next 10"-12" of soil and wiggle the handle back and forth to break up compacted layers, repeat this motion every 6"-8" in the bed. Mix the topsoil with a generous amount of compost or manure, and return the mixture to the bed. It will be fluffy and several inches higher than ground level. To raise the bed to 8 to 10 inches, take topsoil from neighboring pathways and mix it in as well.

For containers, elevated beds, and deep raised beds, a lightweight soil mix is needed. Soil straight from the garden usually cannot be used because it is too heavy and does not allow proper drainage. Clay soil consists of extremely small (microscopic) particles. In a container, the bad qualities of clay are exaggerated. It holds too much moisture when wet, resulting in too little air for the roots, and it pulls away from the sides of the container when dry. The container medium must be porous in order to support plant growth since roots require both air and water.

Packaged potting soil available at local garden centers is relatively lightweight and may make a good container medium if it is not too high in organic matter. Soilless mixes such as a peat-perlite mix are generally too light for container vegetable gardening, not offering enough physical support to plant roots. If the container is also lightweight, a strong wind can blow plants over, resulting in major damage. Soilless mixes are sterile, thus insect, disease, and weed free. However, no trace elements are available for good plant growth and must be added.

For a large container garden, the expense of pre-packaged or soilless mixes may be quite high. Try mixing your own soil with one part peat moss, one part garden loam, and one part clean coarse builder's sand, and a slow release fertilizer according to container size. Lime may also be needed to bring the pH to around 6.5. A soil test is helpful in determining nutrient and pH needs, just as in a larger garden. Deep raised beds can be filled 1/3 to 1/2 full of broken concrete and stones to reduce the volume of soil required.

Planting the Raised Bed and Planters

By their design, raised beds are a form of wide-bed gardening, a technique by which seeds and transplants are planted in wide bands of several rows or broadcast in a wide strip. The goal is to space plants at equal distances from each other on all sides, such that leaves will touch at maturity. This saves space, and provides shade, which reduces moisture loss from the soil and diminishes weed seed germination.

There are several methods for making the best use of space in wide-bed planting. Growing two or more types of vegetables in the same place at the same time is known as interplanting.

Interplanting. Proper planning is essential to obtain high production and quality of interplanted crops. This technique has been practiced for thousands of years, but is just now gaining widespread support in this country. To successfully plan an interplanted garden, the following factors must be taken into account for each plant: the length of the plant's growth period, its growth pattern (tall, short, below or above ground), possible negative effects on other plants, optimum growth season, and light, nutrient, and moisture requirements. Interplanting can be accomplished by alternating rows within a bed (plant a row of peppers next to a row of onions), by mixing plants within a row, or by distributing various species throughout the bed. For the beginner, alternating rows may be the easiest to manage.

With interplanting, long season (slow maturing) and short season (quick maturing) plants like carrots and radishes, respectively, can be planted at the same time. The radishes are harvested before they begin to crowd the carrots. An example of combining growth patterns is planting small plants close to large plants, (radishes at the base of beans or broccoli). Shade tolerant species like lettuce, spinach, and celery may be planted in the shadow of taller crops. Heavy feeders, such as cabbage family crops, should be mixed with less gluttonous plants. Root, leaf, and soil-building crops (legumes) may be mixed to take advantage of available nutrients.

Interplanting may help reduce insect and disease problems. Pests are usually fairly crop-specific; that is, they prefer vegetables of one type or family. Mixing families of plants helps to break up large expanses of the pest-preferred crop, helping to contain early pest damage within a small area, thus giving the gardener a little more time to deal with the problem. One disadvantage is that when it does come time to spray for pests, it's hard to be sure that all plants are protected.

Individual plants are closely spaced in a raised bed or inter-planted garden. In beds of more than two rows, an equidistant spacing pattern calls for rows to be staggered so that plants in every other row are between the plants in adjacent rows. The distance recommended for plants is the distance from the center of one plant to the center of the next. This spacing results in an efficient use of space and leaves less area to weed and mulch. The close spacing tends to create a nearly solid leaf canopy, acting as a living mulch, decreasing water loss, and keeping weed problems down. However, plants should not be crowded to the point at which disease problems arise or competition causes stunting or reduced yield.

Succession Planting. Succession planting is another excellent way to make the most of an intensive garden. To obtain a succession of crops, plant something new in the spots vacated by spent plants. Squash after peas is a type of succession.

Relaying. Relaying, a common practice to increase yield, consists of overlapping plantings of one vegetable crop with an older planting before the old one is removed; for example, planting squash in the rows between peas several weeks before the peas are removed. This technique can gain several weeks of growing time for a crop but requires good coordination on the part of the gardener to avoid damage to the new crop as spent crops are removed.

Trellising. Trellising or caging of crops can save space. However, it may make harvesting more difficult for some individuals as raising the hand above the head is very tiring. For tough vines such as peas and pole beans, a string trellis could be modified so that the top support bar is suspended from a pulley allowing the vines to be lowered for easy harvest.

Plant Height. Plant height is an important consideration in planning the layout of the planter. Generally the higher the bed, the shorter the plant needs to be. This is to make it possible for the disabled gardener with limited reach to adequately tend the plants. Smaller plants are put at the front of the planting so that they can be easily seen and won't be shaded. Vines and small trees used in raised ground beds are often pruned heavily to maintain small size. Herbaceous vines or other rampant growers should be trained to cages, stakes, or trellises for easy access and for space conservation. If supports are needed, provide them when the plants are very small to avoid root damage later.

These planting techniques can be adapted to planters and other containers as effectively as to raised bed culture. Container crops should be planted at the same time as regular gardens. Clean containers should be filled to within one-half inch of the top with slightly damp soil mixture. Peat moss in the mix will absorb water and mix much more readily if soaked with warm water before putting the mix in the container. Seeds should be sown or transplants set according to instructions on the seed package. Each container should be labeled with the name, variety, and date of planting. After planting, the soil should be gently soaked with water so as not to wash out or displace seeds. When the plants have two or three leaves, the seedlings should be thinned to obtain proper spacing.

To make planting easy, transplants should be strong, healthy, and vigorous to withstand rough handling. They should be watered several hours before transplanting so the soil is damp but no longer wet. Some elderly or disabled individuals may find it helpful to have the plants removed from containers prior to setting them out, particularly if the roots are heavily overgrown. Simple measuring sticks to mark the spacing and depth for seeds or transplants can make the job go smoothly.

Digging tools that fit the hand and strength of the individual gardener are valuable. For someone with arthritis, it is helpful to enlarge the handle size with soft padding. A dibble or tool that simply punches a hole is easier to use than a trowel when setting plants in light potting mixes. Many gardeners prefer to use their hands to dig a hole.

When starting plants from seed, select large seed (nasturtiums) rather than small (begonia) or seed that have been adapted for easy planting, e.g., seed tapes, encapsulated seed. Pregermination of seed is not only easier for some gardeners, it is innovative and leads to interesting discussions. The pregerminated seed can be mixed in a gel medium and dispersed from a squeeze bottle.

Crops for Planters and Raised Beds

Vegetables. Vegetable production provides as rewarding a hobby in raised beds and planters as in traditional gardens. By selecting compact varieties and following the planting and cultural recommendations given earlier, disabled gardeners can take pride and satisfaction in growing food for the table.

The beginning gardener should start with fast and easy crops such as radishes, spring onions, or leaf lettuce. These can be washed and eaten right in the garden and give encouragement to wait for the slower crops such as beans and tomatoes.

The garden can be designed to provide additional activities besides planting, maintenance, and harvest. It can provide food for picnics, holidays, or theme parties. Jack-O'Lantern type pumpkins can be grown in half of a 55-gallon drum if there is patio space for the vine to climb across. Growing sweet potatoes for Thanksgiving and red and green peppers for Christmas add interest to the garden. Produce can be dried, frozen, or canned for future use. Seeds can be saved from some crops for starting next year's garden. Compost can be made to enrich the soil. For wood workers, signs, birdhouses, and whirligigs can enhance the garden.

Herbs. Herbs are plants that are grown for use as seasoning in foods, for medicinal purposes, and for their fragrance in the garden. Most aromatic herbs enjoy full sun and fertile soil. As they are shallow rooted, they fare well in raised beds and containers. Invasive herbs like mint are better in containers where their growth is confined. There are both annual and perennial herbs.

Annual culinary herbs include dill, parsley, summer savory, and sweet basil. Perennial culinary herbs include chives, mint, rosemary, and thyme. Perennials are mulched in late fall to protect roots and rosettes from winter injury. Many herbs grown in containers can be brought inside to provide a fresh supply of herbs during the winter months. Some herbs are harvested, bunched, and dried for later use. A cool well-ventilated dark area is good for drying. Herbs are useful for a multitude of projects from making herb vinegars to sachets and scented pillows.

Culinary herbs can also be ornamental. Some provide color like the purple-leaf basil or texture, like curly parsley. Many herbs have delicate flowers that can be pleasing up close, while others such as chives are quite showy. A border of herbs can make the vegetable planting more pleasant to work in. Mixed with annuals in a window box, herbs become a delightful retreat from household chores.

One attractive way to display herbs is the knot garden, in which the various colors and textures of herbs are used to create the appearance of cords looping over and under each other. Herb plants are closely spaced and trimmed to form low hedges. The knot garden is most effective when viewed from above, especially from a second story window.

Strawberries. Strawberries are a fruit crop treated as an herbaceous perennial crop because they do not have woody stems and they grow low to the ground. Strawberries require moist, fertile soil and protection during the winter months. They are shallow rooted and don't need much soil for growth.

Containers such as hanging baskets, barrels, and wheelbarrows are very attractive planted with strawberries. A planting of strawberries can last for about three to four years if well maintained. The first year, pinch off the blossoms to let the vegetative growth accumulate. The second year production is best.

There are three types of strawberries. The first type is called June bearing. These strawberries are the most productive. They produce for about three weeks in early June and are well suited to ground beds and large raised planters. The second type are day neutral, which means they are not dependant upon day length and produce at six-week intervals throughout the summer. These are best for some of the container planters like barrels and strawberry pots. The third type are everbearing which sporadically produce through the summer. These are the least productive.

Brambles, Grapes, and Other Berries. Many bushes produce edible berries or fruit. Some popular bushes include blueberries, raspberries, blackberries, currants, and gooseberries. Selective pruning must be done to keep the bushes in their designated areas and to enhance fruiting. Blueberries require an acid soil. Raspberries, blackberries, and gooseberries are often thorny and thornless varieties are recommended. The everbearing red raspberry, Heritage, is especially suited to low maintenance gardening because it produces a fall crop on current season growth. This means that the entire patch can be cut to the ground each fall after harvest and the new canes that grow the next spring will yield that fall. Generally grown in traditional ground level beds, all of these fruit give limited production in large containers.

Grape vines are usually trained to wires similar to espaliered fruit trees. The training can be on two wires fixed to heavy posts at approximately 2 and 4 feet from the ground or on overhead arbors. Grapes can be grown in large containers and pruned to the Head system as an interesting, but low yielding, activity. Severe pruning is required to maintain appropriate size and vigor. The vine that is removed can be useful for propagation or for crafts projects such as wreaths and baskets.

Fruit Trees. Fruit production is a long-term and time-consuming activity. Fruit trees will produce for many years if properly maintained. Woody material needs to be heavily pruned to keep the growth within dimensions suitable for a physically disabled gardener. The first few years of training of the plant material are the hardest as the tree acquires its permanent structure. Later, pruning is done just to keep the growth back. Diseases and insects must be monitored in order to keep the plants healthy and fruit quality high. Weeds need to be controlled with mulches.

All fruit trees should either be genetically dwarf or on dwarfing root stocks. The trees need to be selected and pruned to keep them the size desired, ideally no more than 3.5 feet tall. On apples, this can be accomplished by using a combination of dwarfing rootstock, dwarfing interstem, and spur type fruit. Even with the newer cultivars, it may be three or more years before any fruit is produced. These trees lend themselves well to culture in half of a whiskey barrel or half of a 55-gallon drum.

Apples and pears are often trained to cordons and espaliers when grown in ground level beds. Cordons are single stem trees grown at a forty-five degree angle. Many trees like these can be grown in a relatively small space. Espaliers have selected vertical branches trained to wires. Both cordons and espaliers take much pruning and work in the early years but are better suited to limited space than other trees and can be maintained at a height close enough to the ground to be cared for by someone in a wheel chair.

Annual Flowers. Annuals are very popular in gardens for many reasons. They are generally easy to grow, fast blooming plants that can provide quick, if only temporary, color to the garden. Many annuals are shallow rooted, adapting well to the shallow elevated planters. The wide selection within many varieties provides diverse colors, flower types, and sizes from which to choose. An annual can be found to suit almost any garden need, be it a border for a vegetable garden, cut flowers, or a vibrant floral display. Annuals can be used to fill gaps in the blooming sequence of perennial plants and are more desirable in unprotected planters in which perennials could not survive the winter. Some annuals are mistaken as perennials because they can self-seed easily. Most should be dead headed (flower heads removed) after bloom to increase length of flowering period, reduce self-seeding, and keep the plants attractive.

Set out as bedding plants, annuals provide nearly instant gratification and feelings of pride and success. They also provide the opportunity to learn a wide range of cultural skills. Although annuals are associated with summer, activities based on annuals can continue throughout the year with such indoor practices as starting seed, dried flower arranging, and garden planning.

Snapdragons prefer the cool, moist parts of the growing season. Treated with care and snipped back, these plants can be helped through the hot summer months to thrive again in the fall. Portulaca, on the other hand, is a fleshy annual that seems to thrive in the hot, dry weather. Zinnias are also heat tolerant and bloom in late summer and fall. Breeders have developed dwarf varieties of zinnias for the small garden. These are better for raised planters than older varieties that tend to get leggy. Cockscombs come in two different shapes. Both can be used to add colorful texture to the garden and dried for winter crafts. Coleus is grown primarily for their foliage. Pinch off the floral stalks to help keep the coleus from getting too leggy. Coleus is also popular because it tolerates some shading. Impatiens are also shade tolerant and are often grown in areas of a garden in which more sun-loving plants will not thrive. Strawflowers are grown not only as an ornamental addition to the garden but so they can be picked before full bloom in order to be dried and used in fall and winter arrangements. Marigolds are one of the most popular of the annuals. They are very easy to grow. They can be started ahead in seed flats and transplanted, directly seeded in the garden, or bought from nurseries, grocery stores, or garden centers in cell packs. Depending on the variety, marigolds adapt well to use as border plants, as filler in a mixed display or as cut flowers. Their color range extends from the deep, warm shades of red, to bright yellow and orange. These plants are also tolerant of both the warm and cool parts of the growing season and need little special care except some dead heading. Pansies are actually biennials but in most cases, they are treated as annuals. Pansies and their smaller cousin, the viola, are often used to bring blooms into a garden in which other plants have not started flowering. Pansies come in a wide color range and are usually obtained as plants. They are commonly planted early in the growing season but can be planted in the fall if winter protection is available.

Perennial Flowers. Many believe that perennials, because they have the ability to persist for many years, are easy to grow and are very desirable for the raised planter. This is not always true. The biggest problem with perennial plants in the raised planter is over-wintering. Even plants that normally have no trouble surviving winters in standard ground beds may not survive a winter in a raised planter. This is because the soil is more exposed to temperature extremes. This in turn exposes the roots to colder temperatures and to heaving or crushing damage due to the increased freezing and thawing of the soil in the planter. An early thaw or warm spell is more likely to cause a premature growth spurt in a raised planter than in ground soil that acts as a temperature buffer. If perennials are to be grown in raised planters, precautions should be taken to find plants that are very cold tolerant. A good layer of mulch is often used to help protect roots and crowns and the planter should be located so that it is protected as much as possible from cold north winds.

Many perennials need special cultural practices. Woody and semi-woody perennials need pruning in order to keep plants within bounds and to insure maximum bloom. Plants may have to be sprayed to rid them of persistent pest populations even though manual methods of pest control should be tried first.

The herbaceous perennials that are grown from bulbs or bulblike structures are often popular in raised planters. Most spring flowering bulbs will increase in population over the years if good care is provided. Raised planters present the chance to enjoy some of the smaller and more delicate bulbs that are lost within large gardens. Many of the popular bulbs such as tulips and daffodils can be found in miniature varieties. Tulips tend to deteriorate in quality year after year so many gardeners plant new bulbs every fall. Spring bulbs are planted in the fall and summer bulbs are usually planted in the spring after the soil has warmed. Many summer bulbs such as dahlia and gladiolus are not hardy and must be dug up in the fall and stored over the winter until it is time to plant in the spring again. Neither the spring nor summer bulb's foliage should be cut back until the foliage has browned naturally. Some bulbs like the autumn crocus bloom in the fall. They are usually planted in late summer. The planting depths for bulbs depend on the bulb size and will determine their suitability to raised planters.

Some of the popular herbaceous perennials, e.g., bergenia, columbine, astilbe, are not heat or water stress tolerant. Care must be used in placement of these plants so that they won't be exposed to the direct sun during the hot summer months and so that they will be close to a water source.

Many of the popular herbaceous perennials, e.g., iris, yarrow, shasta daisies, need to have their roots divided periodically. Division is a method to increase the population of the plants, to prevent over-crowding, and to prevent the plant from becoming invasive. The job of division can be taxing so sometimes it is better to find species which require little or none of this cultural practice.

Specialty Gardens

Specialty gardens are gardens that center on a specific theme or technique. Examples of this are the English cottage garden, Japanese gardens, and alpine or rock gardens. There are books available and local or national organizations that focus on specific types of gardens. Many botanic gardens and arboretums have classes on starting and maintaining such gardens. With imagination and real interest, even the more physically restricted individual can participate in this activity.

Japanese and alpine gardens are permanent installations with little maintenance once they are established. They are sites where the gardener can rest and contemplate, or spend as much time as desired on small but rewarding tasks of removing dead flowers and leaves, pulling weeds, and otherwise grooming the garden.

Local and National Organizations

There are plant societies and garden associations for most of the popular garden plants and gardening styles. Membership in the organizations and participation in their local chapter activities bring the rewards of new skills and knowledge and new friends. Participation also leads to the exchange of both ideas and plants.

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7931 East Boulevard Drive - Alexandria VA 22308
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(F) 703.768.8700
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NATIONAL GARDENING ASSOCIATION
1100 Dorset Street
South Burlington, VT 05403
(802) 863-5251, (802) 864-6889 (fax)
<http://www.garden.org>
<http://www.kidsgardening.com>

THE HERB SOCIETY OF AMERICA: POTAMIC UNIT
The Herb Society of America
9019 Kirtland Chardon Road
Kirtland, OH 44094
Phone: 440-256-0514
Fax: 440-256-0541
www.herbsociety.org

HOBBY GREENHOUSE ASSOCIATION
<http://www.hobbygreenhouse.org>

AMERICAN BONSAI SOCIETY, INC.
<http://www.absbonsai.org>

HOME ORCHARD SOCIETY, INC.
<http://www.homeorchardsociety.org/>

NORTH AMERICAN FRUIT EXPLORERS
<http://www.nafex.org/>

SEED SAVERS EXCHANGE
Kent Whealy, Director
3076 North Winn Road
Decorah, Iowa 52101
<http://www.seedsavers.org/>

AMERICAN HORTICULTURAL THERAPY ASSOCIATION
<http://www.ahta.org>

THE GARDEN CLUB OF AMERICA

14 East 60th St., 3rd Floor
New York, NY 10022
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<http://www.gcamerica.org/>

MEN'S GARDEN CLUBS OF AMERICA, INC.

The Gardeners of America/Men's Garden Clubs of America
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NATIONAL GARDEN CLUBS

4402 Magnolia Avenue
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CHAPTER 4

GARDENING ADAPTATIONS

A garden can be a meaningful way to have nature nearby and enjoy the value of vine-ripe vegetables, colorful flowers or a well landscaped home. However, changes that occur as we age may make traditional gardening too challenging. It is fortunate that a rethinking of garden design and techniques allows anyone of any ability to garden safely and comfortably for a lifetime.

As you grow older or your physical abilities change, there is no need for you to stop gardening. Enabling gardens focus on minimizing barriers while maximizing people's abilities. One strategy is to adapt the garden with paving, containers, raised beds, and other structures that position plants within easy reach. Another consideration is to adapt the gardener with appropriate tools and equipment. By combining these two strategies with careful plant selection, you can create your own enabling garden - to suit your own abilities, needs, and interests.

Making Gardening Easier

Assessing Your Gardening Abilities

Consider how much time that you have available to garden. This includes the amount of time it takes to reach your garden tools, equipment, water sources, and related garden tasks. To determine if you need to change your gardening habits, ask yourself the following questions.

- Can I get down to the ground and up without assistance? If yes, then ground level gardening may not present problems.
- Can I use my arms to push up on objects or grab hold of objects to pull myself up from low surfaces? If no, consider raised bed gardens, containers, or trellis.
- Can I manage my current watering system? If not, simplify the watering process and consider growing strategies to reduce watering needs such as proper plant selection and mulching.
- Do I walk with assistance or an assistive device; or use a wheelchair? If yes, raise your garden surfaces to a comfortable level and reevaluate garden pathways.

Getting Around

- Locate your garden in an easily accessible location so that no part is difficult to reach and all beds and fruit trees can be tended from a path.
- You can buy a garden cart to carry long handled tools but a plastic garbage pail on wheels works just as well and is cheaper. The wheels are on the back so the can stays in one place when you park it. This means the tools are handy when you need them and they do not fall over in the garden.
- Place stools, garden chairs, or benches at strategic places in the garden so that you have many opportunities to rest as you garden.
- Install pathways wherever you routinely walk - for example, across the lawn to the mailbox, or from the back door to the compost.

Choosing the Right Tools

Many new tools on the market today make gardening tasks much easier. Using good tools in the garden can make your time spent there a pleasure and not a chore. There are also many ways you can adapt tools to meet your own needs. Here are some points to remember.

- **Lightweight tools** are generally easier to use. Tools with plastic, carbon, fiber, or aluminum handles are the lightest. Choose shovels and spades with smaller blades.
- **Balance.** Tools should fit your grip comfortably and should not require great hand strength to hold it and use it.
- When **buying a tool**, it is essential to get one that suits you. Never purchase a tool without having tried it out for weight, balance, and suitability for the job you want it to do.

Choosing the Right Tool

You can purchase special gardening tools, but you can also adapt normal ones. If you adapt tools, keep these considerations in mind: 1) the length of the handle; 2) the weight of the tool; and 3) the special function or adaptability of the tool.

For most gardeners, long-handled and lightweight tools are preferable to those with short, thick, and heavy handles. The extra long handles and light weight reduce stress on weak backs, and enable you to work longer without tiring.

For some persons, however, short-handled tools can be preferable. Short-handled tools can provide leverage and practicality for wheelchair bound or seated gardeners, and extra thick handles can aid arthritic hands or hands with weak grips. An easy way to thicken the grip of a tool is to add foam padding or layers of tape to its handle.

For those with no hand grip, a universal cuff can be used. It attaches to the arm or forearm, and allows a lightweight tool to be attached. A double-handled grip can be purchased to add to your regular hoe or other tool, enabling you to use both hands and reduce pressure on your back.

Some Tools for Special Needs

Short-handled Swan Neck: lets you perform delicate weeding jobs with the precision and ease of a full-sized hoe; easy to maneuver in closely planted areas; great for raised beds and window boxes.

Kneeling Pad: prevents aching joints, wet knees, and compacted soil.

Hand tools with trigger-grip handles and rounded-out thumb rests: virtually indestructible; never rusts, bends, or breaks; rubberized coating makes them easier and more comfortable to hold; bright color makes them easy to locate.

Easy Wheeler: small enough to maneuver down short paths but strong enough to carry a bale of hay; sturdy handle offers support; weighs only 12 pounds.

Flower Gatherer: will cut flowers, remove thorns, and crush stems, for either right-or left-handed use.

Long-reach Pruner: trigger-grip action, very lightweight aluminum; five feet long; good for difficult-to-reach areas.

Body Movement

- Keeping your elbows in close to your body when raking, digging, and shoveling means you will be using more muscles, thus the movement is easier than when your arms are extended.
- Avoid long periods of work in a position where your trunk is flexed forward, such as when weeding with a hoe. This position stretches passive tissues in your back, which require time to return to their original shape once you resume an upright stance.
- When on hands and knees for a long period, such as when weeding or planting, try flexing your abdominal muscles by pulling your stomach in, for a change of muscle tensions.
- Avoid reaching and twisting, move or turn your whole body closer to the object.
- Keep the work as close to your body as possible. The farther away from you body you hold or work with something, the harder it is on your shoulders and back. Reaching overhead with both arms and looking upward can cause back strain or loss of balance.
- Reaching overhead with one arm is safer.

ADAPTIVE GARDENING STRATEGIES FOR SPECIFIC CONDITIONS***Back Problems***

- Keep your back straight when digging. Stay close to the blade when pushing the shovel in to the soil. Do not overload.
- Use long-handled tools.
- Use plastic handle extenders to your tools improve leverage and keep you from having to bend over too far.
- Garden in accessible garden containers such as hanging baskets, table planters, or raised beds.

Hip Problems

- Use long-handled tools to make it easier to bend.
- Garden in raised beds or containers to bring the garden to a more comfortable working height.

Leg and Knee Problems

- It can be more comfortable for a person with knee problems to garden from a chair. A light garden chair is best because it is easier to move as you work.
- Use tools with extended handles to reduce the amount of bending, or to work comfortably from a chair.
- Make carrying easier with a sturdy box or a basket with a handle to collect and hold seeds, plants, tools, and small amounts of fertilizer.
- Convert a small luggage cart to hold the tool basket and to wheel the materials to the garden.
- Ease balance problems by using a sturdy walker with an attachment for holding tools. Once you arrive at the garden, a stool or chair is a welcome part of your equipment- perhaps one that can stay in the garden for continued use.

Arm and Hand Problems

- For grip, strength and movement problems, as well as range of motion difficulties, adaptive tools can be bought or developed at home.
- Children's tools, which are available in any hardware store, are light and can be adapted for use with extensions to lengthen them, or padding to make them easier to grip.
- If the hand is non-functioning, you can strap the tool to the wrist or forearm, allowing the gardener to till soil, cultivate, or plant. For a weak grip, either padding or a T-shaped attachment enables the gardener to grasp more easily.
- When potting plants, use lightweight plastic pots rather than heavier clay, metal, or wooden containers. Another method of lightening the pot's weight is to replace up to one-half of the soil in the pot with packing nubbins (Styrofoam popcorn). Cover the nubbins with a layer of nylon net before putting the soil in the pot. Though you need to fertilize and water more often, those chores are offset by the ease in moving the plants and the excellent drainage.



Decline in Vision

- Paint tools a bright color.
- Select crops with large seeds or use transplants.
- Select plants to please all the senses.
- Use vertical planting.
- Prepare firm, level paths for walking.

A Little Unsteady

- Use raised beds to reduce the need to bend or kneel.
- Provide ledges on raised beds for sitting.
- Use long-handled tools to reduce the amount of reaching and bending.
- Use stools as an intermediate step between standard gardening and raised beds.

Temperature Sensitivity

- Garden early in the morning and late in the day.
- Drink plenty of water.
- Wear light weight, loose fitting clothes and a hat.
- Apply sunscreen.
- Wear gloves.

Joint and Muscle Discomforts

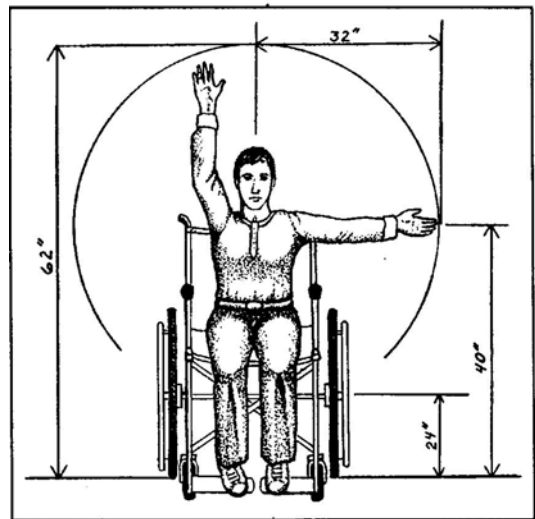
- Use kneepads and padded hand tools.
- Paving considerations, traction, and drainage are increasingly important for mobility.
- Avoid heavier loads. Use plastic containers rather than clay pots. Replace half the soil in a container with Styrofoam packing nubbins.
 1. Place the nubbins in the bottom of the container.
 2. Cover with nylon net or other netting to hold the soil in place without slowing drainage.

3. Use regular potting soil and plant flowers, shrubs, or vegetables as usual.
 4. Since less soil is available to the plants, fertilize regularly. Experiment by fertilizing weekly with regular strength potted plant fertilizer or by watering regularly with a weaker solution. Different plants have different needs. Use trial and error to find out what works. You may need to stake larger plants more firmly than usual because of the shallow soil.
 5. You should water more frequently. Adding Styrofoam provides additional drainage, and the smaller amount of soil will dry faster.
- Perform repetitive tasks such as weeding for shorter lengths of time. Mixing them with less strenuous tasks or simply changing hands and positions frequently can provide protection.

Limited Range of Motion

Raising beds in therapeutic gardening for people with range of motion problems brings the garden to the gardener rather than the gardener to the garden. The garden can be modified to meet the needs of each individual gardener.

- The garden's location and accessibility are of major importance. Can the gardener get to the area at any season and time with little effort? Does the surface support year-round foot or wheel traffic? Are the sunlight requirements of garden plants (at least 6 hours each day) and their need for protection from strong winds being considered?
- The area around the raised beds must offer easy and safe access. The surface must be level, firm, free of obstacles, and wide enough to turn a wheelchair.
- Raised bed construction is based on each gardener's individual needs. The width should not exceed 1/2 the reach of the gardener. The height should be such that it matches the gardener's bending ability.
- The material used to construct the raised beds can be anything that accomplishes the job and remains durable and functional. Examples include 2 x 4's treated with copper, not creosote or penta, bricks, building blocks, railway ties (old enough not to retain creosote odor), concrete culvert sections turned on end, pots on a table or bench, carts with deep trays on top, a vertical system that will hold pots, etc. You are limited only by your imagination.
- Does the gardener need to sit while gardening? Various methods can fill this need like a sitting board on top of a raised bed, benches, etc. Be sure these don't readily tip or break and are easy to move or rearrange.
- Swing-down trellises can be used to bring the crop to the gardener. These are easy to construct from piping or other material and still remain reasonably lightweight. Stakes and containment devices should be easy to install and remove.
- Avoid carrying water to the garden. Consider irrigation systems such as drip gardening systems that are easy to install and efficient in water placement. They should not block access to the garden or be hazardous. Plan ahead to avoid heavy labor requirements.
- Design easy methods for the gardener to bring in new plants, harvest and remove the crop, and remove old material from the site at season's end.



Heart and Lung Problems

- Work up to activities slowly. Warm up with lighter gardening tasks before doing any heavier jobs.
- Work at trunk level. Avoid reaching high or bending low, as these require much more energy. If you must, bend at your knees instead of leaning over at the hips and back with your knees straight. The work surface should not be lower than your fingertips. Sitting and kneeling positions can help accomplish this. If you must use a ladder, it should be high enough for you to work without reaching above your head. In a standing position, use long-handled tools (weeders, spades, bulb planters, grass shears) to reduce reaching and bending.
- Sitting requires less effort than standing. Raising garden beds and arranging containers allows working in a sitting position to conserve energy.
- Avoid lifting or holding anything for too long. Carry an object to where you need it, then put it down. Use a tray or bucket to carry several small objects. Use a wheelbarrow to minimize carrying and to consolidate trips. Spreading soil and digging involve lifting and carrying soil, and should be avoided when possible. Hoeing, raking, and cultivating require less energy, but should still be done gently and slowly for short periods. Raised beds are also helpful in this situation because the soil stays looser without having to be turned.
- Use electric equipment. An electric mower is easier to start than a mower with a pull cord. Walk slowly and pace yourself while mowing. Use an electric power auger instead of a rototiller to turn and mix in soil amendments. This reduces the amount of strain from arm and shoulder movements, which are more taxing than leg movements.
- Having proper lighting is important in conserving energy, as we use one-quarter of our energy to see. With increasing age, we use even more.
- Use a pulley system for hanging plants so the plants can be raised and lowered more easily. Use larger pots for plants, as they require less frequent watering than those in small pots.
- Keep garden beds near the house and tool-storage area.
- Set time limits and pace yourself. Avoid working too long or too hard. Take frequent rests. Complete one small section of a project at a time. Even major projects such as tree removal can be accomplished if you rest often and work slowly.
- People whose activities are quite restricted can still benefit from horticultural activities. Flower arranging and bird feeding can be enjoyed with very little energy output. Cuttings, seedlings, and potted plants stimulate interest and pleasant expectations for the future.

Tips for Gardeners who use Wheelchairs

Grip Tips

- Use gloves with sticky surface.
- Build up handle to make it “fatter” by using bicycle grips, foam, or pipe insulation wrap.
- Support the wrist with cock-up splints; think about enabling garden tools that are ergonomically designed with wrist support.
- Use splints, supports, or assistive devices whenever possible, but ONLY after consulting with your physician or therapist.
- Use a universal cuff to hold garden tools.
- Use smaller lightweight garden tools; use a reacher for picking up and planting.

Reach Tips

- Extend the reach by lengthening handle of your garden tools by using PVC pipe. In an oven heat PVC pipe at 325 for 5 minutes, quickly fit PVC pipe to garden tool, and let cool for several minutes. **Safety tip**: Use caution when handling PVC pipe after heating because it will be hot!
- Use AMES or PRINTO extended handles or child size garden tools.

Raised Bed Garden Tips

- Gardening is easier on your body.
- More accessible and eliminates bending and stooping.
- Customize the garden to fit your needs.
- Great for gardeners who lack space or physical ability.
- Can provide increased visibility for persons with low vision.
- Raised beds and containers should be no more than 4 feet in diameter and width.
- Keep a 20 to 28 inch range and 2 to 2 1/2 feet height.

Vertical Wall Garden Tips

- Wall gardens can be supporting structures, fences, walls, trellises, container trellises, arbors, netting's, or strings.

Hanging Baskets Tips

- Can make own pulley system or use any variety of retractable hangers.
- Use extended handle hose for watering.

Container Garden Tips

- Can be used for flowers, greenery, or even vegetables.
- Provide the gardener with many options.
- Any vessel is suitable for container gardening if it has drainage.
- Provides more stability.
- Provides an opportunity to garden on patios, porches, balconies, decks, and even windowsills.

Pathway Tips

- Should be level and smooth.
- Ramps and other grades should not exceed 5 percent.
- An accessible width will depend upon who is using pathway.
- Should have clear beginning and ending.

- Textured surface for traction and orientation and contrasting colors and textures. Turf is cheap and cool but requires maintenance. Being soft is not user friendly to wheelchairs. Also, turf will die in high traffic areas. One solution, mix it with concrete blocks or paving stones.
- Wood chips, grass, mulch, compacted soil, crushed limestone, and gravel are too soft and need replacement. BUT, will cushion falls.
- Hard paving surfaces meet pathway requirements, but will not cushion falls and can be expensive. Can use concrete, asphalt, power block, patio block (stepping stones) brick, flagstone, or wood.

Take it Easy – Tips to make gardening easier

- Pace yourself. Spread out difficult projects over time.
- Say "no" to projects that will not fit into your time schedule, or that will compromise your physical and mental health.
- Delegate to others tasks that you dislike or that are too difficult.
- Try to let your worries go by doing some gardening. Gardeners typically become absorbed in their work, giving them rest from the normal worries and cares of the day.
- Vary your tasks. A full day of pruning will give any gardener blisters. Remember it is not a race. Take your time, enjoy yourself, smell the roses.
- Do something for the kid in you everyday (i.e. pick some flowers, blow a dandelion blossom).
- Get organized so everything has its place.
- A mailbox can serve the same purpose as a plastic container to hold small hand tools in the garden. Mounted on a pole, this can be the right height for reaching from a wheelchair. There are some great decorative mailboxes on the market to add charm to the garden - or try decorating one yourself.
- Put hanging baskets on pulleys so that they can be easily lowered for maintenance.
- When possible use lightweight pots for the patio or balcony. If using clay, try having them set on a platform with wheels so that you can easily move them around when needed.
- If you have a large garden and are always forgetting tools, try getting a few inexpensive ones and putting them in a plastic-type container (safe from the elements) near the bottom of the garden. This will save steps and allow you to prune and weed as you go.
- Gloves are good for gripping, particularly when they have a ribbed surface.

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“Assessing Your Gardening Abilities,” ([view it now](#))

“Tips for Gardeners who use Wheelchairs” ([view it now](#))

“Easy Tips to Modify Garden Tools for Gardeners with Back Problems” ([view it now](#))

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CHAPTER 5

PRODUCE: VEGETABLES, FRUITS, HERBS

In this chapter, you will find information on how to grow, harvest, and use a variety of vegetables, fruits, and culinary herbs. The first section covers fourteen vegetables that grow well in Kansas, and that older Kansans prefer to eat. The vegetables, listed in alphabetical order, are beans, broccoli, Brussels sprouts, cabbage, carrot, cauliflower, eggplant, lettuce, onion, peas, peppers, radish, spinach, and tomato. Following all the vegetables are the fruits, which are grapes, raspberries and blackberries, and strawberries. The final produce group is the culinary herbs, also listed alphabetically.

BEANS

The bean is a tender, warm season vegetable that ranks second to tomato in popularity in home gardens.

Bush Beans stand erect without support. They yield well and require the least amount of work. Green bush beans were formerly called "string beans" because fiber developed along the seams of the pods. Plant breeders have reduced these fibers through selection and green beans are now referred to as "snap beans."



Pole Beans climb supports and are easily harvested.

Recommended Varieties

Bush Bean Varieties

Blue Lake 274 (58 days to harvest; plump, tender pods; slow-developing seeds; resistant to bean mosaic)

Bush Kentucky Wonder (57 days; long, flattened pods)

Pole Bean Varieties

Blue Lake (65 days to harvest; oval, straight, stringless, juicy and tender pods; resistant to bean mosaic)

Kentucky Wonder (65 days; fine flavor, 9-inch pods in clusters)

When to Plant

Beans are sensitive to cold temperatures and frost. They should be planted after all danger of frost is past in the spring. If the soil has warmed before the average last-frost date, an early planting may be made a week to 10 days before this date. You can assure yourself a continuous supply of snap beans by planting every 2 to 4 weeks until early August.

Spacing and Depth

Plant seeds of all varieties one inch deep. Plant seeds of bush beans 2 to 4 inches apart in rows at least 18 to 24 inches apart. Plant seeds of pole beans 4 to 6 inches apart in rows 30 to 36 inches apart; or in hills (four to six seeds per hill) 30 inches apart, with 30 inches between rows.

Care

Seeds of most varieties tend to crack and germinate poorly if the soil's moisture content is too high. For this reason, never soak bean seed before planting. Instead, water just after planting or plant right before a heavy rain.

Beans have shallow roots and frequent shallow cultivation and hoeing are necessary to control small weeds and grasses. Because bean plants have fairly weak root systems, deep, close cultivation injures the plant roots, delays harvest and reduces yields.

Harvesting

Harvest when the pods are firm, crisp, and fully elongated, but before the seed within the pod has developed significantly. Pick beans after the dew is off the plants, and they are thoroughly dry. Picking beans from wet plants can spread bean bacterial blight, a disease that seriously damages the plants. Be careful not to break the stems or branches, which are brittle on most bean varieties. The bean plant continues to form new flowers and produces more beans if pods are continually removed before the seeds mature.

Common Problems

The **bean mosaic diseases** cause plants to turn a yellowish green and produce few or no pods. The leaves on infected plants are a mottled yellow and are usually irregularly shaped. The only satisfactory control for these diseases is to use mosaic-resistant bean varieties.

Bright yellow or brown spots on the leaves or water-soaked spots on the pods are signs of **bacterial bean blight**. Bacterial blight is best controlled by planting disease-free seed; avoiding contact with wet bean plants; and removing all bean debris from the garden.

Questions and Answers

Q. My beans appear healthy, but not many beans have formed. Why not?

A. The blossoms drop and fail to form pods during periods of hot, dry winds.

Q. Is it a good practice to plant pole beans at the base of corn plant for double cropping?

A. No. Neither crop can reach its maximum potential. Weed control becomes difficult and cornstalks offer weak support when the beans are maturing.

Q. Is it necessary to plant beans in a different area of the garden each year?

A. Yes. Beans are subject to diseases that may carry over in the soil to reinfect the following bean crop.

Q. Will bean varieties cross in my garden?

A. Because the flowers are largely self-pollinated, bean varieties usually do not cross. These crosses show up only when seed is saved from cross-pollinated flowers. In any event, you should obtain new seeds each year to avoid seed borne diseases.

Q. Can I use beans from my garden that have matured past the green, edible stage?

A. Yes. Snap beans (pole or bush) may be harvested for shellouts and for dry beans; and lima beans may be harvested for butter beans.

Q. Why do some snap bean varieties have white seeds?

A. Most bean varieties are developed for the canning and freezing industry. When varieties with colored seeds are used, the cooking water is slightly off-color. White seed is preferred because it does not discolor the cooking water.

Q. What are the fuzzy, bright yellow insects on my bean plants?

A. These are larvae of the Mexican bean beetle. The adult resembles a large ladybug. The larvae do the most damage. They are generally not a serious problem, but they occasionally reach damaging numbers, particularly early in the season.

Selection and Storage

Legume is the prosaic name for beans. It covers all the podded plants. Fresh beans (as opposed to dried) vary in color, shape and length of pod. Fresh beans include green beans, Chinese long beans, tiny green beans (Haricot) and Fava beans, to name a few. This section will focus on bush beans and pole beans, which are common garden varieties.

Harvest fresh beans before they become tough and stinky. If you can see the bulge of a developing bean through the green pod, the bean is over mature. Over mature beans should be shelled (except pole beans). At this stage, the pod is too tough to eat. Planting garden beans in two-week intervals helps to eliminate having all the beans ready for harvest at the same time.

Purchasing Fresh Beans

Look for green beans with a pod that is firm, crisp, straight and long, and that snaps easily. The tip should be flexible. Avoid green beans with large seeds within the pod. If you can see the bulge of a developing bean through the green pod, the pod will probably need to be discarded since it will be too tough to eat, but the seeds can be removed and cooked. Avoid green beans that are thick, tough, stringy, fibrous or wilted, or with pods that look rusty or damaged.

Measuring Fresh Beans

1 pound raw = about 14 ounces ready to eat = 3 cups raw = about 2 1/2 cups cooked
1/2 cup cooked = about 2 1/4 ounces by weight = 63 grams

Storage, Ripening and Preserving

Refrigerate unwashed dry green beans in a plastic bag in the vegetable drawer for up to 3 days.

To freeze, select fresh green beans. Rinse. Remove stem ends. If desired, snap into 1-inch pieces. Place in boiling water for 2 or 3 minutes, depending on size. Drain immediately and place in ice water for 2 or 3 minutes. Drain again. Pack into freezer bags, leaving 3 inches of air space. Squeeze out the air, seal, date, and freeze.

Preparation and Serving

Wash beans under cool running water and drain. Remove the stem ends. Enjoy cooked green beans as a hot side dish or chilled in a salad, or use as directed in recipes. To cook: steam, microwave, boil, or stir-fry them until fork-tender. Boiled fresh green beans cook in about 15-30 minutes. For best results, do not overcook.

Nutrition Facts

Nutrition Facts for 1 serving, or 1/2 cup of cooked green beans:

Calories 22

Protein 1 gram

Carbohydrates 5 grams

Fat 0 grams

Green beans contribute vitamin C, carotenoids (which the body converts to vitamin A), fiber, B vitamins including folic acid, essential minerals and other nutrients, antioxidants and phytochemicals to the diet.

BROCCOLI

Broccoli is a hardy vegetable of the cabbage family that is high in vitamins A and D. It develops best during cool seasons of the year.

When broccoli plants of most varieties are properly grown and harvested, they can yield over an extended period. Side heads develop after the large, central head is removed. Two crops per year (spring and fall) can be grown in Kansas. New heat tolerant varieties allow broccoli to be produced in all but the hottest parts of the season.



Transplants are recommended to give the best start for spring planting, because transplanting gets the plants established more quickly. Thus, they can bear their crop with minimal interference from the extreme heat of early summer. Fall crops may be direct-seeded in the garden if space allows, or may be started in flats to replace early crops when their harvest ends.

Recommended Varieties

Cruiser (58 days to harvest; uniform, high yield; tolerant of dry conditions)

Green Comet (55 days; early; heat tolerant)

Green Goliath (60 days; spring, summer or fall; tolerant of extremes)

When to Plant

Transplant young, vigorously growing plants in late March to early April before the danger of frost has passed. Plants that remain too long in seed flats may produce "button" heads soon after planting. For fall crops, buy or grow your own transplants or plant seeds directly in the garden. For fall planting, start seedlings in midsummer for transplanting into the garden in early August.

Spacing and Depth

Plant seeds 1/4 to 1/2 inch deep or set transplants slightly deeper than they were grown originally. Plant or thin seedlings 18 to 24 inches apart in the row and allow 36 inches between rows. Broccoli plants grow upright, often reaching a height of 2 1/2 feet. Space plants one foot apart in all directions in beds.

Care

Select broccoli plants that are small and stocky. Avoid tall, spindly plants. Weak, tall plants often “bold” or produce a premature head that will never enlarge. Use starter fertilizer for transplants and side-dress with nitrogen fertilizer when the plants are half-grown. Provide ample soil moisture, especially as the heads develop.

Harvesting

The edible parts of broccoli are compact clusters of unopened flower buds and the attached portion of stem. The green buds develop first in one large central head and later in several smaller side shoots. Cut the central head with 5 to 6 inches of stem, after the head is fully developed, but before it begins to loosen and separate and the individual flowers start to open (show bright yellow). Removing the central head stimulates the side shoots to develop for later pickings. These side shoots grow from the axils of the lower leaves. You usually can continue to harvest broccoli for several weeks.

Common Problems

Aphids — Watch for buildup of colonies of aphids on the undersides of the leaves.

Cabbage worms — Three species of cabbage worms (imported cabbage worms, cabbage loopers and diamond back moth worms) commonly attack the leaves and heads of cabbage and related cole crops. Imported cabbage worms are velvety green caterpillars. The moth is white and commonly is seen during the day hovering over plants in the garden. Cabbage loopers (“measuring worms”) are smooth, light green caterpillars. The cabbage looper crawls by doubling up (to form a loop) and then moving the front of its body forward. The moth is brown and is most active at night. Diamondback worms are small, pale, green caterpillars that are pointed on both ends. The moth is gray, with diamond-shaped markings when the wings are closed. The damage caused by diamondback larvae looks like shot holes in the leaf.

The larval or worm stages of these insects cause damage by eating holes in the leaves and cabbage head. The adult moths or butterflies lay their eggs on the leaves but otherwise do not damage the plants. The worms are not easy to see because they are small and blend with the cabbage leaves. Cabbage worms are quite destructive and can ruin the crop if not controlled. They are even worse in fall plantings than in spring gardens because the population has had several months to increase. About the time of the first frost in the fall, moth and caterpillar numbers finally begin to decline drastically.

Questions and Answers

Q. How large should the central head of broccoli grow before cutting?

A. Harvest the central head when the individual florets begin to enlarge and develop and before flowering begins. Size varies with variety, growing conditions and season of growth; but central heads should grow to be 4 to 6 inches in diameter, or even larger. Late side shoots may reach only 1 to 2 inches in diameter.

Q. What causes small plants, poor heading, and early flowering?

A. Yellow flowers may appear before the heads are ready to harvest during periods of high temperatures. Planting too late in the spring or failing to give the plants a good start contributes to this condition. Premature flower development also may be caused by interrupted growth resulting from extended chilling of young plants, extremely early planting, holding plants in a garden center until they are too old or too dry, and severe drought conditions. Small heads that form soon after plants are set in the garden are called "buttons" and usually result from mistreated seedlings being held too long or improperly before sale or planting. Applying a starter fertilizer at transplanting gets the plants off to a good start but cannot correct all the difficulties mentioned.

Selection and Storage

Since broccoli grows best in cool weather, your garden plan should produce a fall and spring harvest. The large central head is the spring harvest and smaller side shoots will be ready in the fall. Harvest when the head is large and firm, with a compact cluster of small flower buds with none open enough to show bright yellow flowers. Look for bright green or purplish-green heads. Yellow flowers and enlarged buds are signs of over-maturity.

Purchasing Fresh Broccoli

Look for broccoli with tender stems and heads that are firm, tight and dark green or purplish-green. Avoid broccoli with wilted, soft, slippery, tough, thick or dry stems. Avoid broccoli with heads that have enlarged buds or yellow areas—those are broccoli flowers and are signs that the head is too old for best flavor.

Measuring Fresh Broccoli

1 pound raw = about 13 ounces ready to eat = about 4 cups raw = about 2 cups cooked
1/2 cup cooked = about 1 1/2 ounces by weight = about 40 grams

Storage, Ripening and Preserving

Refrigerate unwashed, dry broccoli in a perforated plastic bag in the vegetable drawer. It will stay fresh for 3 to 14 days, but for the best nutrition and taste, use during the first few days. Unrefrigerated, it quickly becomes fibrous and woody, and wet broccoli becomes limp and moldy.

To freeze, select tender broccoli. Wash, cut off ends, and peel stalks if tough. If the head has insects, soak it in 4 cups cold water with 1-teaspoon salt for 30 minutes. Place 1-inch pieces in boiling water for 3 minutes. Drain immediately and place in ice water for 3 minutes. Drain again. Pack into freezer bags, leaving 3 inches of air space. Squeeze out the air, seal, date, and freeze.

Preparation and Serving

Wash fresh broccoli under cool running water and cut off the bottom end of each stalk. If the head has insects, soak it in 4 cups cold water with 1-teaspoon salt for 30 minutes. To maintain its nutrients, do not soak longer. If the stem is tough, peel the outer stalk. If the stem is very large, split it or cut it into strips or rounds. Serve raw or cooked broccoli plain or with dips, sauces, pasta or in casseroles.

To cook broccoli: steam, microwave, boil or stir-fry the stems for 1-2 minutes, then add the florets which have been cut into same-sized pieces and cook until fork-tender. For the best taste, color, texture, and nutrition, and to avoid a strong odor, do not overcook.

Nutrition Facts

Nutrition Facts for 1 serving, or 1/2 cup cooked or raw broccoli:

Calories 11

Protein 1 gram

Carbohydrates 2 grams

Fat 0 grams

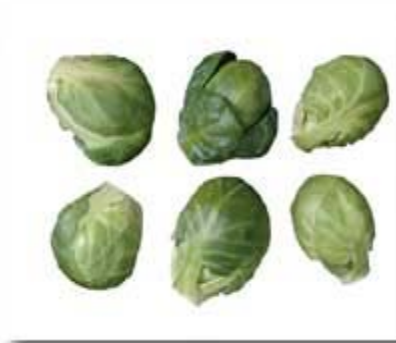
Broccoli contributes fiber, carotenoids (which the body converts to vitamin A), vitamins C and K, and many other nutrients, antioxidants and healthful phytochemicals to the diet.

BRUSSELS SPROUTS

Brussels sprouts is a hardy, slow-growing, long-season vegetable belonging to the cabbage family. In the proper season of the year, it can be grown with fair success in most areas of the country. In mild areas, or where there is deep snow cover, the sprouts may over winter.

Best success in Kansas is to grow the sprouts in the fall season by planting in early July.

The "sprouts" (small heads that resemble miniature cabbages) are produced in the leaf axils, starting at the base of the stem and working upward. Sprouts improve in quality and grow best during cool or even lightly frosty weather. Brussels sprouts require a long growing period, though newer hybrids have greatly reduced this requirement. In all but the most northern states, summers are usually too warm for completely satisfactory production from spring plantings. Plants set out in late spring to early summer grow satisfactorily and mature high-quality sprouts when the fall weather begins to cool.



Recommended Varieties

Hybrid

Bubbles (82 days to harvest, dependable, tolerates warm weather, resistant to rust)

Jade Cross (90 days, resistant to yellows)

Jade Cross E (90 days; sprouts larger, easier to remove from stalk than with original strain)

Oliver (85 days; early; easy-to-pick, attractive sprouts)

Open-pollinated

Long Island Improves (90 days; variable, harder to produce heavy, uniform crop with this variety)

Rubine (105 days; red plants and sprouts; novel, but very late maturing, not nearly as productive as recommended hybrid green types).

When to Plant

The seed should be sown in a protected location in seed flats, 4 to 5 weeks before transplanting. Transplant the seedlings to the permanent garden location when space and time allow; but at least 90 to 100 days before the first frost date for your area. For summer harvest, you must plant transplants of an early, heat-resistant variety in very early spring. Sprouts maturing in hot weather or under dry conditions are more likely to develop bitterness. Fall production is the most practical and rewarding in most parts of the country.

In Kansas, spring-planted crops should be set in late March. Fall crops, more reliable in Kansas, should be started in early July.

Spacing and Depth

Space plants 24 to 36 inches apart in the row, or 24 inches in all directions in beds. Cover seeds 1/4 to 1/2 inch deep and transplant the seedlings when they are about 3 inches tall. Do not allow transplants to become stunted in the flats before transplanting.

Care

Brussels sprouts are grown much like the related cole crops cabbage and broccoli. Apply one side-dress application of nitrogen fertilizer when the plants are 12 inches tall and water to keep the crop growing vigorously during the heat of summer. Without ample soil moisture, the crop fails. Insect control is also very important at this stage to keep the plants growing vigorously. Cultivate shallowly around the plants to prevent root damage. The sprouts form in the axils of the leaves (the space between the base of the leaf and the stem above it).

Commercial gardeners remove the leaves to accelerate harvest, but this practice is not essential in the home garden. Some gardeners believe that the sprouts develop better if the lowermost six to eight leaves are removed from the sides of the stalk as the sprouts develop. Two or three additional leaves can be removed each week, but several of the largest, healthiest, fully expanded upper leaves should always be left intact on top to continue feeding the plant. About 3 weeks before harvest, the plants may be topped (the growing point removed) to speed the completion of sprout development on the lower-stem area.

Harvesting

The small sprouts or buds form heads one to two inches in diameter. They may be picked (or cut) off the stem when they are firm and about one inch in size. The lower sprouts mature first. The lowermost leaves, if they have not been removed already, should be removed when the sprouts are harvested. Harvest sprouts before the leaves yellow.

The plant is quite freeze hardy and can be left in the garden until late November or early December many years for continued harvest. Sprouts developing in hot weather will often be loose and of poor quality.

Common Problems

Aphids, cabbage worms and diseases.

Questions and Answers

Q. Why do my sprouts remain loose tufts of leaves instead of developing into firm heads?

A. When the sprouts develop in hot weather (after spring seeding or during a warm fall), they often do not form compact heads. Use transplants for early plantings and maintain ample soil moisture. You also can cut off the top growing point when the plant reaches 24 to 36 inches in height. This practice stops leaf growth and directs the plant's energy to the developing sprouts. In addition, check the variety you have planted. The newer, faster-maturing varieties are generally more suitable for getting dependable yields.

Selection and Storage

Brussels sprouts, what an odd name for a vegetable that has the appearance of a "cute little baby" cabbage. No one seems to know where Brussels sprouts originated but it is assumed they came from Belgium where Brussels is the capital city. In parts of Europe they are also known as "Brussels cabbage", which seems appropriate since they are a subspecies of the common cabbage.

Most Americans who do not like Brussels sprouts are haunted by childhood memories of smelly, army green, bitter, mushy globs that had to be eaten before dessert. Fresh Brussels sprouts, properly cooked, are deliciously delicate in flavor. Maybe it is time to give Brussels sprouts another chance, this time with a new attitude and a modern cooking spirit.

Like cabbage and cabbage sprouts, Brussels sprouts are a cool weather crop. They should be harvested when the sprouts are small, compact, and bright green. Avoid yellowing sprouts with signs of wilt rot or insect damage. Harvest sprouts when they are no larger than 1 to 1 1/2 inches in diameter.

Purchasing Fresh Brussels Sprouts

Look for bright green, clean, firm, tight, compact, and solid Brussels sprouts. Choose those that are less than two-inches in diameter. Look for sprouts where the stalk end is clean. Avoid Brussels sprouts with leaves that are yellow, loose, wilted, puffy, soft, or with small holes or rot.

Measuring Fresh Brussels Sprouts

1 pound raw = about 12 ounces ready to eat = about 4 cups raw = 2 1/2 cups cooked
 1/2 cup cooked = 3 or 4 medium sprouts = about 2 3/4 ounces by weight = 78 grams

Storage, Ripening and Preserving

Remove damaged outer leaves. Refrigerate unwashed Brussels sprouts in a perforated plastic bag in the vegetable drawer. They keep up to 3 weeks, but for best flavor, use during the first few days.

To freeze, select fresh sprouts. Remove damaged leaves. Rinse. To remove insects, soak in 4 cups cold water with 1-teaspoon salt for 30 minutes. Place small Brussels sprouts in boiling water for 3 minutes, medium sprouts for 4 minutes, and large sprouts for 5 minutes. Drain at once and place in ice water for 3 to 5 minutes, depending on size. Drain again. Pack into freezer bags, leaving 3 inches of air space. Squeeze out the air, seal, date, and freeze.

Preparation and Serving

Remove loose or damaged leaves. Wash sprouts under cool running water. Trim off the end of stalks. To remove insects, soak in 4 cups cold water with 1-teaspoon salt for 30 minutes. To maintain nutrients, do not soak longer. Enjoy cooked Brussels sprouts as a side dish, plain or with a sauce, or use as directed in recipes.

To cook: cut sprouts in half to help them cook more evenly. Steam, microwave, boil, or stir-fry them until fork-tender. For best results, do not overcook.

Nutrition Facts

Nutrition Facts for one serving, or 1/2 cup of cooked Brussels sprouts:

Calories 30

Protein 2 grams

Carbohydrates 7 grams

Fat 0 grams

Brussels sprouts are an excellent source of vitamin C and contribute fiber, B vitamins including folic acid, essential minerals and many other nutrients, antioxidants and phytochemicals to the diet. Eating them helps protect against cancer and other diseases.

CABBAGE

Cabbage is a hardy vegetable that grows especially well in fertile soils in the spring or fall in Kansas. Cabbage is intolerant of our summer heat. There are various shades of green available, as well as red or purple types. Head shape varies from the standard round to flattened or pointed. Most varieties have smooth leaves, but the Savoy types have crinkly textured leaves.



Cabbage is easy to grow if you select suitable varieties and practice proper culture and insect management. Always regarded as a good source of vitamins, cabbage recently has been shown to have disease-preventive properties as well.

Recommended Varieties

Green cabbage is grown more often than the red or Savoy types, but red cabbage has become increasingly popular for color in salads and cooked dishes. The Savoy varieties are grown for slaw and salads. Varieties that mature later usually grow larger heads and are more suitable for making sauerkraut than the early varieties. All the varieties listed here are resistant to **fusarium wilt** ("yellows") unless otherwise indicated. All are hybrid varieties unless marked OP, for open-pollinated variety.

Green Cabbage

Cheers (75 days to harvest; solid round heads; tolerant to black rot and thrips)

King Cole (74 days; large; firm; extremely uniform heads)

Savoy Cabbage

Savoy King (85 days to harvest; dark, green color; very uniform)

Savoy Queen (88 days; 5 pounds; deep green color; good heat tolerance)

Red Cabbage

Red Meteor (75 days to harvest; firm; good for all seasons)

Ruby Ball (71 days; 4 pounds; slow to burst; resists both cold and heat)

When to Plant

Transplant early cabbage soon enough (late March to early April) that it matures before the heat of summer. Many varieties are available and two or three varieties with different maturities can provide harvest over a long period. Hardened plants are tolerant of frosts and can be planted among the earliest of cool-season garden vegetables. Cabbage is easily transplanted from either bare-root or cell-pack-grown plants. Late cabbage must be started during the heat of mid-summer, but it develops its main head during the cooling weather of fall. It may be transplanted (early August) or seeded (early July) directly in the garden. In summer, if possible, place seed flats or seedbeds where some protection from the sun is available, either natural or artificial. Try especially hard during this season to transplant on cloudy, overcast or rainy days for minimizing shock from the direct sun of summer.

Spacing and Depth

Space plants 12 to 24 inches apart in the row, depending upon the variety and the size of head desired. The closer the spacing, the smaller but more numerous the heads. Early varieties are usually planted 12 inches apart in all directions. Early varieties produce 1 to 3 pound heads and later varieties produce 4 to 8 pound heads. Sow cabbage seed 1/4 to 1/2 inch deep. Keep the seeds moist and thin or transplant the seedlings to the desired spacing. The plants removed may be transplanted to another row or flat.

Care

Use starter fertilizer when transplanting and side-dress with nitrogen fertilizer when the plants are half-grown. Cultivate shallowly to keep down weeds. Ample soil moisture is necessary throughout the growing season to produce good cabbage. Irrigation is especially important in fall plantings to help the young plants withstand the intense sunlight and heat of summer and to supply the developing heads with sufficient water to develop quickly.

Harvesting

Cabbage can be harvested anytime after the heads form. For highest yield, cut the cabbage heads when they are solid (firm to hand pressure) but before they crack or split. When heads are mature, a sudden heavy rain may cause heads to crack or split wide open. The exposed internal tissue soon becomes unusable. Harvest and salvage split heads as soon as possible after they are discovered.

In addition to harvesting the mature heads of the cabbage planted in the spring, you can harvest a later crop of small heads (cabbage sprouts). These sprouts develop on the stumps of the cut stems. Cut as close to the lower surface of the head as possible, leaving the loose outer leaves intact. Buds that grow in the axils of these leaves (the angle between the base of the leaf and the stem above it) later form sprouts. The sprouts develop to 2 to 4 inches in diameter and should be picked when firm. Continue control of cabbage worms and other pests. If this control cannot be maintained, remove and destroy or compost the stumps, because they serve as a breeding ground for diseases and insect pests.

Common Problems

Yellow or fusarium wilt is a relatively common disease that causes the leaves of plants to wilt and die. The first sign of the disease is yellowing and browning of the lower leaves. The plants are stunted before wilting occurs. Grow yellows-resistant (YR) or yellows-tolerant varieties. Most modern hybrids have this tolerance or resistance bred into them.

Blackleg and black rot are two diseases that cause severe losses. The plants may be stunted, turn yellow and die. Blackleg is named for the black cankers on the stem. The taproot often rots away. Black rot can be recognized by large, V-shaped, yellow-to-brown areas in the leaves, starting at the leaf edge. The veins turn black. Soft rot usually follows black-rot infection.

Control is essentially the same for blackleg and black rot. Both diseases are spread by seed, transplants, and insects. Buy seed that has been hot water treated to kill the disease organisms. Do not buy transplants that are wilted, an unhealthy shade of green, or have black spots on the stems or leaves.

When you find diseased plants in the garden, collect the leaves, stems and tops; and burn or dispose of them. Do not put diseased plants into the compost pile. Avoid cultural practices (crowding, over watering, planting in poorly drained soil, and inadequate insect control) that support the disease organisms of black rot and blackleg. If possible, grow black-rot-resistant varieties.

Questions and Answers

Q. What can I do to prevent my cabbage heads from splitting?

A. Splitting is caused by the pressure of excessive water taken up after the heads are solid. Cutting the roots (spading on two sides of the plant) or breaking the roots (lifting and twisting the head to one side) can often reduce excessive splitting or bursting, but it also damages the plant and requires that the head be harvested relatively soon.

Q. What causes cabbage to develop seedstalks rather than solid heads?

A. Cabbage plants "bolt" (form premature seedstalks) when they are exposed to low temperatures (35 to 45 degrees F) for extended periods. Such chilling may happen if plants are set out too early or if an unseasonable blast of cold assaults the garden. After the plants have stems as large as a pencil, they are subject to this "cold conditioning," that initiates the flowering response.

Q. What is flowering cabbage?

A. Nonheading varieties of cabbage (similar to flowering kale) have been developed for ornamental uses. They have colorful white, pink, or red rosettes of leaves surrounded by green or purple outer leaves. Most colorful during cool fall weather, they should be started in early summer to midsummer and set out with fall and winter plantings of regular, heading varieties of cabbage. Flowering cabbage (and flowering kale) are edible as well as ornamental.

Q. Why do butterflies fly around my cabbage plants?

A. Those butterflies (white or brown) are probably the moths of cabbage worms. They lay eggs on the plants. The eggs hatch into the worms that cause considerable damage unless controlled. Most control strategies are aimed at the developing larvae rather than the mature moths themselves.

Q. What causes large, lumpy swellings of my cabbage roots? The plants also are stunted.

A. Swellings and distorted roots on stunted, wilted plants may be symptoms of clubroot disease. This disease is caused by a fungus that remains in the garden soils for many years once it becomes established. It is spread by movement of infested soil and infected transplants. Other related cole crops (like broccoli and cauliflower) also may become infected. If you suspect that you have clubroot disease in your garden, ask your local Extension office for help. If, in fact, you have clubroot in a location, destroy infected plant parts (including the roots) and for at least 4 years avoid planting any member of the cabbage family there, including radishes, turnips and ornamental relatives of cabbage

Selection and Storage

Harvest large, unsplit heads of green cabbage. Look for tight, heavy heads, free of insects and decay. Fresh, uncut heads of cabbage can be stored in the refrigerator for up to two weeks. Cover loosely with a plastic bag or use perforated bags. Do not wash cabbage before storing; the extra moisture will hasten deterioration.

Green cabbage — Green cabbage is sometimes called Dutch White. The outer leaves are dark green and the inner leaves are smooth and pale to medium green. If you plan to eat the cabbage raw, use within a few days. Cabbage that you plan to cook can be stored in the refrigerator for about two weeks.

Savoy cabbage — Crinkly, with waves of blue-green leaves, Savoy cabbage is a beautiful sight growing in the garden. These thin, richly flavored leaves are ideal served raw in salads or cooked. Cooked Savoy do not have the strong sulfur odor of green cabbage. Savoy only keeps for about 4 days in the refrigerator so buy it when you plan to use it.

Red cabbage — This variety is usually smaller and denser than heads of green cabbage. The flavor of red cabbage is slightly peppery and it is very susceptible to color change. Cook red cabbage with vinegar (or other acidic ingredient) or it will turn an ugly blue-gray color. Always use stainless steel knives and cookware when preparing red cabbage to prevent color changes.

Purchasing Fresh Cabbage

Look for green or red/purple cabbage heads that are solid, heavy, tight, and firm, with outer leaves that are smooth and fresh. With Savoy cabbage, look for flexible, crumpled, dark green or blue/green leaves forming a loosely packed head. Avoid cabbage that is wilted, discolored, blemished, cracked or split, insect-infested or decayed.

Measuring Fresh Cabbage

1 medium head green cabbage = about 2 pounds as purchased = about 8 cups ready-to-eat, raw, shredded = about 4 cups cooked, shredded

1 cup raw or 1/2 cup cooked = about 2 1/2 ounces by weight = 75 grams

Storage, Ripening and Preserving

Refrigerate unwashed, uncut cabbage in a perforated plastic bag in the vegetable drawer. Store Savoy and green or red cabbage that will be eaten raw for up to 4 days, and green or red cabbage that will be eaten cooked for up to 4 weeks.

To freeze: Rinse the head and discard outer leaves. Shred, cut into thin wedges, or separate the layers of leaves. Place in boiling water for 1 1/2 to 3 minutes, depending on the size of the pieces. Remove immediately and place in ice water for 1 1/2 to 3 minutes. Drain. Place in freezer bags, squeeze out the air, seal, date, and freeze.

Preparation and Serving

Rinse cabbage. Discard the outer leaves. For best results, use stainless steel knives and pans when preparing cabbage. Cook by boiling, steaming, stir-frying, or microwaving, but do not overcook. Cook red cabbage with an acidic ingredient, such as vinegar, to prevent undesirable color changes.

Nutrition Facts

Nutrition facts for one serving, or 1 cup raw, or 1/2 cup cooked, shredded cabbage:

Calories 17

Protein 1 gram

Carbohydrates 4 grams

Fat 0 grams

Cabbage provides vitamins C and K, B vitamins and essential minerals, and helps protect against heart disease and cancer.

CARROT

Carrot is a hardy, cool-season biennial that is grown for the thickened root it produces in its first growing season. Although carrots can endure summer heat in many areas, they grow best when planted in early spring. Midsummer plantings that mature quickly in cool fall weather will produce tender, sweet "baby" carrots that are much prized. Carrots are eaten both raw and cooked and they can be stored for winter use. They are rich in carotene (the source of vitamin A) and high in fiber and sugar content.



Recommended Varieties

Small, Round

Thumbelina (60 days; 1992 AAS winner; round roots; good for planting in containers and in heavy, shallow or rocky soil)

Baby

Little Finger (65 days; tiny tender roots; 5-inch roots, 1/2 inch thick; golden orange, sweet, and crisp)

Short 'n Sweet (68 days; rich, sweet flavor; 4-inch roots, broad at shoulder, tapered to a point; good for heavy or poor soil)

Chantenay

Red-Cored Chantenay (70 days; heavy yield; good flavor; short, thick roots, broad at the shoulder, tapered to blunt tip)

Royal Chantenay (70 days; broad-shouldered, tapered roots; bright orange; good for heavy or shallow soils)

Nantes

Scarlet Nantes (70 days; bright orange, slightly tapered, 6-inch roots; crisp, tender and flavorful; standard for high quality carrots)

When to Plant

Carrots are usually planted with other frost tolerant vegetables as soon as the soil mellows in the spring (mid to late April in Kansas). They may be planted earlier in gardens with sandy soil. The soil should be plowed and prepared to a depth of 8 to 9 inches to allow full development of the carrot roots and the seedbed should be worked uniformly to break up clumps and clods that prevent penetration of the roots. Varieties with extremely long roots (Imperator and Tendersweet) usually are recommended only for home gardens with deep, sandy soil. Excess organic debris worked into the soil just before planting also may affect root penetration, causing forked and twisted roots. Fall carrots are excellent for growing in Kansas. Plant seeds in late July to early August.

Spacing and Depth

Plant seeds 1/4 to 1/2 inch deep (no more than two or three seeds per inch) in early spring. Later sowings may be planted 1/2 to 3/4 inch deep when the soil is dryer and warmer. Space rows 12 to 18 inches apart. A single radish seed planted every 6 to 12 inches can mark the row. Germination requires as long as two weeks and the seedlings may not emerge uniformly. If heavy rains occur after sowing, packing the soil surface, no seedlings may emerge. Thin the seedlings when they are about one inch tall to no more than three seedlings per inch for finger carrots; one or two seedlings per inch for carrots that will be harvested young; and one seedling per 1 to 2 inches for larger varieties like Danvers and Chantenay that will be allowed to develop to full size and be harvested mature for canning or freezing.

Care

Carrots germinate best in warm, moist soil. Covering the row with clear polyethylene film warms the soil and conserves moisture. Remove the film immediately when seedlings appear. To assure germination of successive plantings during the late spring and summer months, it may be necessary to supply water by sprinkling. In the heat of summer, some shade may be necessary to keep the tiny seedlings from burning off at the soil line.

Young carrot seedlings are weak and grow slowly. It is essential to keep weeds under control for the first few weeks. Cultivate shallowly with a knife blade cultivator or hoe. Deep cultivation may injure the roots.

Harvesting

Carrots can be harvested or "pulled" when the roots are at least 1/2 inch in diameter. Under usual conditions, carrot tops may not be strong enough to withstand actually being pulled from the ground and digging helps to remove the roots without damage. Finger carrots are usually ready to harvest within 50 to 60 days. Other varieties should be allowed to grow until they have reached a diameter of at least 3/4 inch (about 60 to 70 days after planting). They then may be harvested over a 3 to 4 week period. Summer planted carrots may be left in the ground until a killing frost. Some gardeners place straw mulch over the row so that carrots can be harvested until the ground freezes solid. In many areas, heavy mulch allows harvest of carrot roots throughout the winter. For carrots to be stored, cut off the tops one inch above the root and place in storage at 32°F with high humidity. Carrots may be placed in a refrigerator, buried in lightly moist sand in an underground cellar, or stored in the garden in a pit insulated with straw. Under proper storage conditions, carrots keep 4 to 6 months.

Questions and Answers

Q. What causes my carrots to turn green on the crown (top) of the root?

A. This condition is called "sunburning." It causes an off flavor and dark green pieces in the cooked product. Cut away the green portion and use the rest of the root. When the tops are healthy, sunburning can be avoided by pulling a small amount of loose soil up to the row when the roots are swelling (about 40 to 50 days after planting).

Q. Why are my carrots misshapen, with forked and twisted roots?

A. Forking may result from attacks of root-knot nematodes, from stones, from deep and close cultivation or (more frequently) from planting in a soil that was poorly prepared. Twisting and intertwining result from seeding too thickly and inadequate thinning of seedlings.

Q. What causes my carrots to have fine hairy roots, poor color and a bitter taste?

A. These conditions are caused by a viral disease known as "aster yellows."

Selection and Storage

Carrots can be harvested at various stages of development. Carrot thinnings can be added to fresh salads and eaten green tops and all. "Thinnings" are immature carrots pulled from overcrowded rows to make room for others to grow. Finger-size carrots may be dwarf carrots or immature average ones. They can be very tender and sweet. Harvest carrots before they are over mature, about 1 to 1 1/2 inches in diameter. Hugh overgrown carrots are less tasty, and they may have a tough woody core that may need to be removed.

Purchasing Fresh Carrots

Choose short or long carrots, but ones that are no more than 1 1/2 inches around. Look for smooth, firm, crisp carrots with a small core and a deep orange color from top to bottom. Avoid oversized carrots because they have less flavor and may be tough and woody. Avoid wilted, soft, or slimy carrots.

Measuring Fresh Carrots

1 pound = about 5 medium carrots = 4 cups shredded = about 2 1/2 cups diced cooked
 1/2 cup diced cooked = a little less than 3 ounces by weight = about 80 grams

Storage, Ripening and Preserving

Cut off the green leafy tops close to the top of the carrot. If you plan to cook the leafy tops, such as in soup or a stew, refrigerate them separately and use within 1 or 2 days; they spoil quickly. Brush off any loose dirt. Refrigerate unwashed carrots in a perforated plastic bag in the vegetable drawer, away from fruits. Crispness is maintained by preventing water loss. Carrots usually stay fresh for several weeks, and at times for up to 6 months.

To freeze, select tender carrots. Cut off ends, wash, and peel. Place small whole carrots in boiling water for 5 minutes. Cut larger carrots into thin slices, cubes, or strips and boil for 2

minutes. Drain immediately and place them in ice water for 5 minutes. Drain and package into freezer bags or containers, with 3 inches of air space. Seal, date, and freeze.

Preparation and Serving

Scrub carrots under cold running water with a vegetable brush to remove all dirt. Cut off ends, and areas that are green instead of orange near the top. Peel if desired. Carrots are a popular, naturally sweet vegetable. They add lots of nutrition and color, but few calories. Raw or cooked, carrots are easy to serve. Try them whole, shredded, chopped, juiced, boiled, steamed, stir-fried, baked, roasted, or grilled. Grate and add to salads, main dishes, sandwiches, baked goods, etc.

Nutrition Facts

Nutrition Facts for one serving, or 1/2 cup sliced raw or cooked carrots:

Calories 30-35

Protein 1 gram

Carbohydrates 6-8 grams

Fat 0 grams

One serving provides large amounts of the healthful antioxidant beta carotene, which is converted into vitamin A after being eaten. Carrots contribute other nutrients to the diet, too.

CAULIFLOWER

Cauliflower is a cool-season vegetable and is more difficult to grow than other members of the cabbage family, such as cabbage and broccoli. It is also fairly intolerant of summer heat and drought.



Recommended Varieties

Hybrid

Candid Charm (65 days, large head, excellent protection)

Snow Crown (60 days; resistant to yellows; tolerant of heat, cold)

Snow Grace (65 days, 8 inch head, tight curd, improved Snow Crown type)

Snow King (50 days; 8 to 9 inch heads; very early; heat tolerant)

White Corona (30 days; 3 to 4 inch heads; exceptionally early; good for small gardens and short season)

"Broccoflower"

Chartreuse Hybrid II (62 days; no tying; greenish yellow curd)

Green Goddess Hybrid (65 days, no tying; lime green, good taste, easy to grow).

When to Plant

Cauliflower is best started from transplants for both spring and fall crops. Do not transplant sooner than 2 to 3 weeks before the average frost-free date in the spring (early to mid-April in Kansas). Cauliflower is more sensitive to the cold than its cabbage-family relatives. It is important to start cauliflower early enough that it matures before the heat of the summer but not so early that it is injured by the cold. In some seasons, that compromise may be almost impossible to achieve. Transplant autumn cauliflower about the same time as fall cabbage (early August). Use starter fertilizer when transplanting. Start the transplants so that they grow actively until transplanting and never cease growth. Always use young, active transplants. Never buy stunted plants started in flats and held too long before transplanting; results with inferior plants are almost always disappointing.

Spacing and Depth

Space plants 18 to 24 inches apart in the row. Use the wider spacing for fall plantings. The plant is larger than cabbage or broccoli and needs more space.

Care

Cauliflower plants should be kept growing vigorously from the seedling stage through harvest. Any interruption (extreme cold, heat, drought or plant damage) can abort development of the edible portion. Large plants that never develop a head are extremely disappointing. Cauliflower must have a consistent and ample supply of soil moisture. Side-dress nitrogen fertilizer when the plants are half grown.

When the head begins to form (shows 2 to 3 inches of white curd at the growing point), it is ready to blanch. Tie the outer leaves together over the center of the plant to protect the head from sunburn and to keep it from turning green and developing an off-flavor. The variety Self-Blanche is named for its natural tendency to curl its leaves over its head. Several other varieties possess this trait, especially when maturing in the fall. Under cool conditions, these varieties blanch very well and tying is unnecessary.

Harvesting

The cauliflower head's curd develops rapidly under proper growing conditions. It grows 6 to 8 inches in diameter and is ready to harvest within 7 to 12 days after blanching begins. The mature heads should be compact, firm and white. Harvest the heads by cutting the main stem. Leave a few green outer leaves attached to protect the heads. Cut the heads before they become overmature and develop a coarse, "ricey" appearance. Once individual florets can be seen, quality deteriorates rapidly. Because cauliflower does not ordinarily develop side shoots, plants may be disposed of or composted after heads are harvested.

Questions and Answers

Q. What causes leaves in the head and separation of the head into loose, smaller curds?

A. These conditions are caused when cauliflower matures during hot weather. Try to time maturity dates of cauliflower to minimize the risk of extreme heat as the heads form.

Q. Why does my late cauliflower fail to make satisfactory heads?

A. Late plantings are sometimes difficult to grow. The young plants often do not become well established under hot, dry summer conditions. Give the plants ample water and do not plant late cauliflower plants too close together.

Q. Is purple cauliflower grown in the same way as regular cauliflower?

A. Purple cauliflower is actually a type of broccoli that is purple. It resembles cauliflower in overall appearance and does not require blanching. The purple head turns green when cooked.

Q. What causes browning of the curd?

A. This condition is caused by downy mildew. Downy mildew, which is brought on by wet conditions, can be controlled through the use of a suggested fungicide. Raised-bed culture and any other cultural measures that encourage good soil and air drainage also help minimize the risk from this disease.

Selection and Storage

In cool conditions, a slight purplish color may prevail in the heads and is normal. Some varieties also may produce a few leaves that will protrude through the head. Store cauliflower in a cold, moist location for 2-3 weeks.

Purchasing Fresh Cauliflower

Look for a head that is clean, firm, tight, compact, solid, and heavy. Any outer leaves should be fresh and green. Avoid cauliflower heads that are light brown, or that have spread out or have a coarse appearance that looks like rice, and those with soft, wilted, or discolored spots.

Measuring Fresh Cauliflower

1 pound raw = about 10 ounces ready to eat = about 3 cups raw = 1 1/2 cups cooked
1 medium head = about 50 to 75 florets = about 6 cups raw
1/2 cup cooked = about 2 1/4 ounces by weight = 62 grams

Storage, Ripening and Preserving

Refrigerate unwashed, dry cauliflower in a perforated plastic bag in the vegetable drawer. It will stay fresh from 2 days through 4 weeks. **To freeze**, select a fresh head. Wash, cut out any dark spots, and trim off leaves. If the head has insects, soak it in 4 cups cold water with 1 teaspoon each vinegar and salt for 30 minutes. Place 1-inch pieces of cauliflower in 1-gallon boiling water mixed with 3 tablespoons lemon juice (added to prevent darkening) for 3 minutes. Drain immediately and place in ice water for 3 minutes. Drain again. Pack into freezer bags, leaving 3 inches of air space. Squeeze out the air, seal, date, and freeze.

Preparation and Serving

Wash fresh cauliflower under cool running water. Trim off leaves and any dark spots. If the head has insects, soak it in 4 cups cold water with 1 teaspoon each vinegar and salt for 30 minutes. To maintain its nutrients, do not soak longer. Serve raw or cooked cauliflower plain or with dips or sauces or in salads and casseroles. To cook cauliflower: cut the florets into same-sized pieces and steam, microwave, boil or stir-fry them until fork-tender. For best quality, do not overcook.

Nutrition Facts

Nutrition Facts for 1 serving, or 1/2 cup cooked or raw cauliflower:

Calories 14

Protein 1 gram

Carbohydrates 3 grams

Fat 0 grams

Cauliflower contributes fiber, vitamin C, B vitamins including folic acid, and many other nutrients, antioxidants and healthful phytochemicals to the diet.

EGGPLANT

Eggplant is a cold-sensitive vegetable that requires a long warm season for best yields. The culture of eggplant is similar to that of bell pepper, with transplants being set in the garden after all danger of frost is past. Eggplants are slightly larger plants than peppers and are spaced slightly farther apart. Eggplant requires careful attention for a good harvest. Small-fruited, exotic-colored, and ornamental varieties can be grown in containers and used for decorations.



Recommended Varieties

Large Oval Fruit

Black Magic (72 days)

Black Beauty (OP-80 days)

Burpee Hybrid (80 days)

Elongated Fruit

Ichiban (70 days)

Slim Jim (OP-70 days; lavender, turning purple when peanut-sized; good in pots)

Little Fingers (OP-68 days; 6 to 8 inch, long, slim fruit in clusters).

When to Plant

Eggplant is best started from transplants. Select plants in cell packs or individual containers. It is important to get the plants off to a proper start. Do not plant too early. Transplant after the soil has warmed and the danger of frost has passed (early to mid-May in most of Kansas). Eggplants are more susceptible than tomato plants to injury from low temperatures and do not grow until temperatures warm.

Spacing and Depth

Space plants 18 to 24 inches apart in the row, or even closer for small fruited types. Three to six plants are usually sufficient for most families unless eggplant is a favorite vegetable, eaten often. Allow 30 to 36 inches between rows or space plants 24 inches apart in all directions in raised beds.

Care

Use starter fertilizer for transplanting. Side-dress nitrogen fertilizer when the plants are half grown and again immediately after harvest of the first fruits. Given sufficient moisture and fertility, eggplant thrives in the heat of summer. The plants tolerate dry weather after they are well established but should be irrigated during extended dry periods for continued peak production.

Harvesting

Harvest the fruits when they are 6 to 8 inches long and still glossy. Use a knife or pruning shears rather than breaking or twisting the stems. Many eggplant varieties have small prickly thorns on the stem and calyx, so exercise caution or wear gloves when harvesting. Leave the large (usually green) calyx attached to the fruit.

When the fruits become dull or brown, they are too mature for culinary use and should be cut off and discarded. Overmature fruits are spongy and seedy and may be bitter. Even properly harvested fruits do not store well and should be eaten soon after they are harvested. Large, vigorous plants can yield as many as four to six fruits at the peak of the season.

Questions and Answers

Q. I planted my eggplants early, but they did not grow very well.

A. They probably were planted while the soil was too cold. It is better to hold the plants (but keep them growing) until the soil warms. If necessary, repot into larger containers to maintain vigor. Mulching with black plastic film can help warm the soil, especially in northern areas. Floating row covers can help with cool, early seasons as well as bar harmful insects from succulent young plants.

Selection and Storage

Harvest eggplants when they are young. Size is not always an indication of maturity. To test, hold the eggplant in your palm and gently press it with your thumb. If the flesh presses in but bounces back, it is ready for harvesting. If the flesh is hard and does not give, the eggplant is immature and too young to harvest. If the thumb indentation remains, the eggplant is over mature and may be completely brown inside and bitter with large tough seeds.

Eggplants have a dimple at the blossom end. The dimple can be very round or oval. The round ones seem to have more seeds and tend to be less meaty, so select the oval dimpled eggplant.

Eggplants bruise easily so harvest gently. Always cut the eggplant with the cap and some of the stem attached. Eggplants do not like cool temperatures so they do not store well. Harvest and use them immediately for best flavor. If you must store them, wrap them in plastic or use plastics and store for 1 to 2 days in the refrigerator. Be careful as it will soon develop soft brown spots and become bitter. Use them while the stem and cap are still greenish and rather fresh looking.

Purchasing Fresh Eggplant

Look for a firm eggplant that is 6 to 8 inches long. Choose one with tender, smooth, glossy skin. Also, look for one that, when it is gently pressed, yields to the pressure but the dent disappears. Look for an eggplant with an oval, not round, dimple at the blossom end. Select one where the stem and cap are still greenish and fresh looking. Avoid eggplants that have hard flesh, as well as ones where the dent remains in the flesh after it is gently pressed, because it is likely to be brown and spongy inside, taste bitter, and have large tough seeds. Avoid those with a round dimple on the blossom end, since they may have more seeds and be spongier. Avoid eggplant that is dull, discolored, soft, shriveled, or split. Avoid those with dark brown spots, which are a sign of decay.

Measuring Fresh Eggplant

1 medium eggplant = about 1 1/4 pounds as purchased = about 1 pound ready-to-cook = about 4 cups diced, raw or cooked

1/2 cup cooked = about 1 3/4 ounces by weight = about 50 grams

Storage, Ripening and Preserving

Refrigerate unwashed eggplant in a perforated plastic bag in the vegetable drawer for up to 1 week. Handle gently to avoid bruises. It develops a bitter taste during storage in the refrigerator.

To freeze: Rinse off dirt. Cut off ends. Peel if skin is tough. Dice, or slice into 1/3-inch thick rounds. Immediately place them in a mixture of 1 gallon boiling water with 1/2 cup lemon juice for 2 to 4 minutes. Remove and place in ice water for 2 to 4 minutes. Drain. Place in freezer bags, leaving 3 inches of air. Squeeze out the air, seal, date, and freeze.

Preparation and Serving

Rinse off dirt. Cut off the ends. Peel if the skin is tough. Young tender eggplant may be cooked with the peel left on. Cook eggplant by baking, grilling, steaming or frying it. Use as directed in recipes, but do not overcook. Eggplant has a mild flavor that is enhanced by culinary herbs and other vegetables.

Nutrition Facts

Nutrition Facts for one serving, or 1/2 cup steamed eggplant:

Calories 13

Protein 1 gram

Carbohydrates 3 grams

Fat 0 grams

LETTUCE

Lettuce is a fairly hardy, cool-weather vegetable that thrives when the average daily temperature is between 60 and 70°F. It should be planted in early spring or late summer. At high temperatures, growth is stunted, the leaves may be bitter and the seedstalk forms and elongates rapidly. Some types and varieties of lettuce withstand heat better than others.



There are five distinct types of lettuce: **leaf** (also called loose-leaf lettuce), **Cos** or **romaine**, **crisphead**, **butterhead** and **stem** (also called asparagus lettuce).

Leaf lettuce, the most widely adapted type, produces crisp leaves loosely arranged on the stalk. Nearly every garden has at least a short row of leaf lettuce, making it the most widely planted salad vegetable. Cos or romaine forms an upright, elongated head and is an excellent addition to salads and sandwiches. The butterhead varieties are generally small, loose-heading types that have tender, soft leaves with a delicate sweet flavor. Stem lettuce forms an enlarged seedstalk that is used mainly in stewed, creamed, and Chinese dishes.

Crisphead varieties, the iceberg types common at supermarkets all over the country, are adapted to northern conditions and require the most care. In areas without long, cool seasons, they generally are grown from transplants, started early, and moved to the garden as soon as the soil can be worked. They are extremely sensitive to heat and must mature before the first hot spell of summer to achieve high-quality heads. If an unseasonably early heat wave hits before they have matured, they almost certainly fail. In many locations, crisphead lettuce plants started in late summer to mature in the cooler weather of fall have a much better chance of success.

Recommended Varieties

Green Leaf

Grand Rapids (frilly edges; good for coldframes, greenhouse, garden)

Red Leaf

Red Sails (slowest bolting red leaf lettuce)

Ruby (darkest red of all; resistant to tipburn)

Cos or Romaine

Green Towers (early; dark green, large leaves)

Paris Island (long-standing)

Heading or Crisphead

Great Lakes (standard, holds well in warm weather)

Butterhead

Bibb

Buttercrunch

When to Plant

Leaf, Cos and Butterhead lettuce can be planted anytime in the spring when the soil is dry enough to rake the surface. Two or more successive plantings at 10 to 14 day intervals provide a continuous supply of lettuce. In Kansas, lettuce seed can be sown beginning in mid-March and plants can be set in early April. Lettuce does not withstand hot summer days well and spring planting should be completed at least a month before the hot days of early summer begin. Plantings started in late summer mature during cool fall weather. Sow seeds for a fall crop in mid- to late August for leaf or Bibb types, or in late July to early August for head or romaine types. Watering is essential for seed germination and establishment of seedlings. Some shade may also benefit summer sowings. Heat-tolerant varieties (mainly loose-leaf types) may be grown in the shade of taller crops through most of the summer if extra care is taken about irrigation and soil selection.

Head lettuce must be transplanted in most locations and requires more care than other types of lettuce. Start transplants for a spring crop indoors or in a cold frame and set them in the garden as early in the spring as the weather settles. Harden transplants outdoors so that they become acclimated to the conditions under which they will be grown, but do not allow growth to stop entirely. Cos, butterhead, and leaf varieties can be transplanted for earlier harvest. In the heat of summer, lettuce seedlings started in a protected location in the shade can be transplanted later into moderate sites for some limited success.

Spacing and Depth

Plant seeds 1/4 to 1/2 inch deep (10 seeds per foot) in single, double or triple rows 12 to 18 inches apart. Thin seedlings to 4 inches apart for leaf lettuce and 6 to 8 inches apart for Cos or Butterhead. The seedlings removed may be transplanted or eaten. Transplant Crisphead seedlings 10 to 12 inches apart in the row.

Care

Because lettuce has shallow roots, it should be hoed or cultivated carefully. Frequent light watering causes the leaves to develop rapidly, resulting in high-quality lettuce. Overwatering, especially in heavy soils, can lead to disease, soft growth and scalding or burning of the leaf margins. Organic mulches can help moderate soil temperature and the microenvironment to produce quality lettuce in less than ideal weather conditions.

Harvesting

Leaf lettuce may be cut whenever it is large enough to use. Cutting every other plant at ground level gives the remaining plants more space for growth. Leaf lettuce reaches maximum size (6 to 12 ounces) in 50 to 60 days. Butterhead varieties form small, loose heads that weigh 4 to 8 ounces at harvest (60 to 70 days). The innermost leaves, that tend to blanch themselves, are a delicacy. Cos varieties have an upright growth habit and form a long, medium-dense head. Cut the heads of heading types slightly above ground level and remove damaged, dirty, or excess leaves.

To store lettuce, wash, drip dry and place in a plastic bag in the refrigerator. Lettuce keeps best at 32°F and high (96%) humidity.

Common Problems

Aphids — Watch for buildup of colonies of aphids on the undersides of the leaves.

Tipburn is a physiological condition that causes lettuce to "die back" at the edges of the leaves. It results from a change in the moisture relationship between the soil and the plant. Clip off any brown leaf tissue and use the remainder of the leaf. Frequent light watering helps to prevent tipburn. Some varieties are resistant to this condition.

Foliage rots can be a problem, especially in hot or wet seasons. Providing good soil and air drainage for the lettuce bed can help to minimize damage in most years.

Questions and Answers

Q. Why didn't my lettuce seeds germinate?

A. Failure of seeds to germinate is caused by insufficient moisture or old seed. Lettuce seed does not keep well and it is advisable to obtain new seed each spring. Store seed for fall gardens in a sealed container in the refrigerator. Some lettuce varieties (especially the white-seeded types) have seed that requires light for germination. These types should not be covered with soil but merely pressed into good contact with finely prepared soil. Care then must be taken to keep the seedbed moist, but not soggy, until the seedlings emerge.

Q. Seedstalks have appeared in the center of my lettuce plants. What should I do?

A. The formation of seedstalks is caused by a combination of long days, warm temperatures and age. When seedstalks begin to form, harvest your lettuce immediately and store it in the refrigerator.

Q. My lettuce tastes bitter. What can I do?

A. Lettuce may become bitter during hot weather and when seedstalks begin to form. Wash and store the leaves in the refrigerator for a day or two. Much of the bitterness will disappear.

Selection and Storage

Iceberg lettuce is the most popular lettuce in the United States. It is a head lettuce that is also low in nutritional value and flavor. Because of its superior shipping qualities, iceberg has been most available which accounts for its popularity. The most abundant nutrient in iceberg lettuce is water. Dark green lettuce leaves always indicate higher fiber, flavor, and nutritional value.

Lettuce is a cool weather crop. It can be divided into two categories; head lettuce and leaf lettuce.

Growing lettuce in your garden will give you first hand opportunity to taste fresh flavorful leaves that (unlike iceberg) need little or no dressing. Leaf lettuce and romaine provide flavor and crunch and are excellent salad and sandwich selections.

Lettuce leaves should be free of wilt, rot, and rust. Harvest crisp green leaves. Wrap fresh, unwashed leaves in plastic wrap and store in the refrigerator for a few days if necessary. Cooler temperature will keep lettuce fresh longer. The coolest part of most refrigerators is usually on the first shelf against the rear wall.

Avoid storing lettuce with apples, pears or bananas. These fruits release ethylene gas, a natural ripening agent that will cause the lettuce to develop brown spots and decay quickly. Toss lettuce that looks slimy or has black spots. The slime is the residue of bacterial decomposition and the black spots are usually mold.

Purchasing Fresh Lettuce

Look for crisphead-type lettuces, such as iceberg, and cos, or romaine, lettuce that have crisp leaves. Romaine lettuce forms a long medium-dense head. Leaf (or loose-leaf) lettuce should have crisp leaves loosely arranged on the stalk. Look for butterhead lettuce, such as Boston or Bibb, that has a small loose head with tender, soft leaves (the inner leaves have an oily or buttery feel). Avoid lettuce that is dry or wilted, or that has soft decay spots or looks rusty or discolored.

Measuring Fresh Lettuce

1 head = about 2 pounds = about 20 to 24 ounces ready to eat = about 10 or 12 cups

1 cup shredded or chopped = about 2 ounces by weight = 55 grams

Storage, Ripening and Preserving

Refrigerate unwashed dry lettuce for up to 2 weeks in a perforated plastic bag in the coolest part of the refrigerator, which is the top shelf against the rear wall, or in the vegetable drawer. Avoid storing lettuce near apples, pears, or bananas since they release a natural ripening gas, ethylene, which causes lettuce to develop brown spots and decay quickly. Leaf and head lettuce do not freeze well.

Preparation and Serving

Wash lettuce leaves under cool running water and drain. Pat dry with a clean towel or dry with a salad spinner. Restore limp leaves by soaking them in ice water for a few minutes. Tear leaves into pieces. For best nutrition and appearance, do not cut or slice lettuce in advance. Use all types of lettuce as a salad, on sandwiches, as a garnish, or as directed in recipes. Iceberg, leaf and romaine lettuce provide flavor and crunch. Butterhead lettuce has a delicate sweet flavor. Peel the uncommon stem-type or asparagus lettuce and use raw, like celery, or cooked.

Nutrition Facts

Nutrition Facts for 1 serving, or 1 cup raw lettuce:

Calories 7-10

Protein 1 gram

Carbohydrates 1 to 2 grams

Fat 0 grams

Nutritional value varies, with darker-colored leaves contributing more nutrients. Iceberg lettuce has very low levels of all nutrients. Romaine, leaf and butterhead lettuce contribute vitamins C and K, carotenoids (which the body converts to vitamin A), the B vitamin folic acid, essential minerals such as chromium, and other nutrients, antioxidants and phytochemicals.

ONION

Onion is a cool-season vegetable that can be grown successfully throughout most of temperate North America. Onions may be grown from sets, transplants, or seeds.

Onions start bulb formation when the day length is of the proper duration and different varieties of onions require different day lengths to initiate bulbing. In general, most common varieties fall into one of two classes, long-day (for northern latitudes) and short-day (for southern latitudes). For this reason, onion varieties that are grown in the South are not adaptable to the North and vice versa. Late plantings of the suggested varieties also result in small bulbs or lack of bulbing altogether in any location.



High temperatures and low humidity are advantageous during bulbing and curing. Onions have shallow roots and compete poorly with weeds and grasses. Timely shallow hoeing and cultivation are important, especially when the onions are small.

Onions may be eaten raw, broiled, boiled, baked, creamed, steamed, fried, french fried and pickled. They are used in soups, stews, and in combination with vegetables and meats.

Onions from Sets

Growing green onions from sets is probably the simplest method for the home gardener. The plants are quickly established and become vigorous and strong. Onion sets may be used to produce both green onions and dry onion bulbs, though production of really premium dry onions requires methods described in the following section.

Onions from Transplants

Transplanting young onion seedlings is the method of growing that most regularly produces large, dry, attractive onions for slicing (as shown in catalog pictures). Transplants are purchased in bundles (usually 60 to 80 plants) from garden stores and through seed and nursery catalogs (though mail-order onion plants often cost as much as buying the 60 to 80 full-size mature bulbs they may produce).

Recommended Varieties

Several varieties are used for onion sets. All of these varieties are widely adaptable. The home gardener has little choice of varieties at the store, however, because sets are seldom sold under varietal names, merely by color: yellow, white, or red. Yellow sets are sometimes sold as the varieties *Ebenezer* or *Stuttgarter*.

Purchase firm, dormant sets early - before they begin growth in heated salesrooms. Store sets in a cool, dry, dark environment if planting must be delayed after purchase. Divide the sets into two sizes before planting. Large sets (larger than a dime in diameter) are best used for green onions. If allowed to grow, these sets may "bolt" and form flower stalks. The small sets (smaller than a dime in diameter) produce the best bulbs for large, dry onions; and they usually do not "bolt." Extremely cold weather during early season growth also may condition onions from sets to flower.

Round onion sets produce flat onions; elongated or torpedo-shaped sets mature into round onions. Most gardeners prefer white sets for green onions, although red or yellow sets are also acceptable.

Onions from Transplants

Gardeners should try to match varieties to their location. Long-day onions are bred for best performance in the North and short-day varieties perform best in southern locations. Short-day varieties may perform acceptably in the North if the plants can be set out very early in the season. Long-day types may not get the bulbing signal in the Deep South and so should be avoided there.

The normal garden center may offer *Yellow and White Sweet Spanish* (long-day varieties), *Yellow and White Bermuda* (short-day varieties and a red variety that may or may not be named *Southport Red Globe*, perhaps; a long-day variety). Catalog shoppers may choose from a slightly wider variety selection, which may include *Texas Grano* (short-day), *Vidalia Sweet* (really a Granex hybrid, short-day), *Red Hamburger* (short-day), *Walla Walla Sweet* (long-day) and *Texas 1015Y Supersweet* (short-day). Prices normally are two to three times as high through catalog sales and may be as much as ten times as high. Only individual consumers can judge if this cost is justified for trying a new variety.

When to Plant

Onions can be planted as soon as the garden can be tilled in the spring, usually late March or early April in prime regions for producing onions. Good fertility, adequate soil moisture, and cool temperatures aid development. Plant sets in mid-March, plants, or seed in early April.

Spacing and Depth

To produce green onions, plant the larger sets 1 – 1 1/2 inches deep and close enough to touch one another (green onions are harvested before crowding becomes a problem). To produce dry onions, plant the smaller sets 1 inch deep, with 2 to 4 inches between sets. Allow 12 to 18 inches between rows. If sets are 2 inches apart, harvest every other plant as green onions so that bulb development of the remaining sets is not impeded by neighboring plants.

Onions from Transplants

Plant in fertile soil in early spring. Space the plants 4 to 5 inches apart in the row to produce large-sized bulbs (closer spacing significantly decreases bulb size) or space 2 to 2 1/2 inches apart and harvest every other plant as a green onion. Allow 12 to 18 inches between rows or space onions 6 to 8 inches apart in all directions in beds. Set the transplants 1 to 1 1/2 inches deep and apply 1 cup per plant of a starter-fertilizer solution.

Care

Keep onions free from weeds by shallow cultivation and hoeing. To develop long, white stems for green onions, slightly hill the row by pulling the loose soil toward the onions with a hoe when the tops are 4 inches tall. Do not hill onions that are to be used as dry onions. Hilling may cause the necks of the stored bulb to rot.

Onions from Transplants

Weeds and grass compete with the onion plants for nutrients and moisture during the growing season. Remove all weeds and grass by diligent and repeated shallow cultivation and hoeing. Side-dressing with fertilizer may be necessary.

Harvesting

Pull green onions anytime after the tops are 6 inches tall. Green onions become stronger in flavor with age and increasing size. They may be used for cooking when they are too strong to eat raw. Though leaves are traditionally discarded, all parts above the roots are edible.

Remove any plants that have formed flower stalks and use immediately. They do not produce good bulbs for dry storage. Harvest in late July or early August, when most of the tops have fallen over. Allow the plants to mature and the tops to fall over naturally. Breaking over the tops early interrupts growth, causing smaller bulbs that do not keep as well in storage.

Pull the mature onions in the morning and allow the bulbs to air-dry in the garden until late afternoon. On especially hot, bright, sunny days, the bulb may sunburn. On days when this is likely, remove onions to a shaded location and allow them to dry thoroughly. Then, before evening dew falls, place them under dry shelter on elevated slats or screens or hang them in small bunches. Tops may be braided or tied with string before hanging. Full air circulation for 2 to 3 weeks is necessary for complete drying and curing. Keep the dry wrapper scales as intact as possible on the bulbs, as they enhance the keeping ability.

After the bulbs dry, cut the tops 1 1/2 to 2 inches long (at or above the narrow spot where the stem bent over), and place the bulb in dry storage with good air circulation. Do not try to store bulbs that are bruised, cut or diseased, or those with green tops or thick necks. Store under cool, dry conditions. Dry onions may keep until late winter, but check them regularly and use or discard those that begin to soften or rot.

Onions from Transplants

The earlier varieties are usually ready to harvest in July, with later varieties maturing into August. When most of the tops have fallen over, the onions may be pulled and dried (refer back to Harvesting under "Onions from Sets"). The length of storage time varies with the variety, with the sweeter varieties usually being the poorer keepers.

Common Problems

Above 40 degrees north latitude, *root maggots* may attack the roots of onion plants.

Questions and Answers

Q. I harvested my onions in late summer and they began to rot by fall. Why?

A. Onions may rot at either the base or neck. Rotting at the base may be caused by soilborne fungi or carelessness in harvesting and handling, but it is usually caused by damage from root maggots. If onion bulbs rot at the neck, they have been cured insufficiently before storage or the leaves have been severely infected by fungi during the growing season. Onions that were "hilled" or covered with soil before harvest often start to rot soon after harvest. Many of the "sweet" varieties are very poor keepers and should be enjoyed fresh soon after harvest, as no method of storage keeps them from rotting for very long.

Q. What happens when onions are broken over?

A. They stop bulb development at that point and may be immature. As a result, they do not cure or dry properly. In some cases, the rings also separate, yielding bulbs of poor quality.

Q. My parents came from Europe, where they braided the tops of onions. Why are onions braided.

A. Onions are braided for curing and storage. After the tops are air dried, they are braided and the onions are hung in a dry, sheltered location with good air circulation. Incorporating twine with the braiding adds strength. Individual onions may be cut from the braided "rope" as needed, leaving the rest of the braid intact.

Q. My grandparents grew winter onions. Can I grow these?

A. Yes. Hardy through most of the country, winter onions (Egyptian or walking onions) are planted from sets formed at the tops of the plant in place of flowers. Plant the sets 1 inch deep during August. Space sets 4 to 5 inches apart. The clump also may be divided in early spring (March or April) and transplanted in the same manner as other onion plants. In either case, be sure to place the winter onion bed at the side or end of your garden because these onions are perennials. Sets are available from a limited number of seed houses and can usually be obtained from other gardeners in the area.

Q. How do I grow multiplier onions?

A. Multiplier onions (sometimes referred to as "potato onions") are planted and handled in exactly the same manner as shallots. True multiplier onions, like winter onions, are difficult to obtain, though some specialty seed houses have begun to stock these old-style crops again. They are not normally grown from seeds.

Selection and Storage

Scallions and Green Onions

Scallions can be harvested any time they look tall enough to use. Gently pull or dig well below the slender white portion when the leaves are 8 to 10 inches high. True scallions have no bulb. Select healthy bright green tops that look crisp.

Green onions or spring onions are a step above scallions although the terms are often used interchangeably. They have a 1-2 inch bulb with green tops. The smaller bulbs are sweet while the larger ones are more pungent. Left in the ground longer, the bulb will develop and become larger.

Scallions and green onions are best harvested as you use them. For longer storage, rinse soil from bulbs and dry, peeling away the first layer if necessary, trim roots, and store in the refrigerator for up to a week in perforated plastic bags.

Mature Onions

Mature garden onions are ready for harvesting when the green top withers, falls over, and starts to turn brown. This usually happens in mid to late summer. Be sure to harvest before the fall rains, mature onions will rot quickly in cool, wet soil.

Lay mature onions in a single layer on newspaper in a warm, well-ventilated place to cure for a few days. Leave undisturbed until the outer skin becomes papery and crispy dry. Select unbruised onions, rub off the stringy roots, and braid the tops. Hang in bunches or place in mesh bags and hang away from moisture. If stored in a dry cool place (50 to 60 degrees), they will keep for months.

Purchasing Fresh Onions

Green onions have a sweeter, milder taste than mature onions. Look for green onions or scallions with several inches of white, crisp flesh at the root end and fresh tender green tops. Avoid those that are wilted, discolored, or decayed. If selecting mature bulb onions, look for ones that are firm, dry and small at the top and with layers of papery outer skins. Avoid those that are split or wet, are sprouting, or that have decay, soft spots, or green areas which indicates sunburn.

Measuring Fresh Onions

1 pound green onions = about 2 1/2 cups ready to eat, sliced, with tops = about 1 cup ready to eat, sliced, without tops.

1 pound mature onions = about 3 large or 4 or 5 medium onions = about 2 1/2 cups ready to eat, raw = about 2 cups cooked onion

1/2 cup steamed onions = about 3 3/4 ounces by weight = 105 grams

Storage, Ripening and Preserving

Refrigerate unwashed green onions for up to 4 weeks in a perforated plastic bag in the vegetable drawer. Store mature onions for up to 4 months on a counter in a cool, dry, well-ventilated place, but not in a plastic container.

To freeze onions, peel, rinse, and chop spring or bulb onions. Pack into freezer bags, leaving 3 inches of air space. Or place onion pieces in a single layer on a tray, freeze, and then pack into freezer bags. Squeeze out the air, seal, date, and freeze. Use in cooked products.

Preparation and Serving

Peel off the dry and colored outer layers. Rinse under cool running water and drain. The sulfur-containing compound in onions can bring tears to your eyes. To limit your tears, chill the onion before cutting it, and cut into the root end of the onion last. Use onions raw, or boil, steam, microwave, grill, stir-fry or bake them.

Nutrition Facts

Nutrition Facts for 1 serving, or 1/2 cup onions:

Calories 40

Protein 1 gram

Carbohydrates 9 grams

Fat 0 grams

Onions contain the antioxidant quercetin, and organosulfur compounds, which help protect against chronic diseases.

PEAS

Pea is a frost-hardy, cool-season vegetable that can be grown throughout most of the United States, wherever a cool season of sufficient duration exists. For gardening purposes, peas may be classified as garden peas (English peas), snap peas, and snow peas (sugar peas). Garden pea varieties have smooth or wrinkled seeds. The smooth-seeded varieties tend to have more starch than the wrinkled-seeded varieties. The wrinkled-seeded varieties are generally sweeter and usually preferred for home use. The smooth-seeded types are used more often to produce ripe seeds that are used like dry beans and to make split-pea soup. Snap peas have been developed from garden peas to have low-fiber pods that can be snapped and eaten along with the immature peas inside. Snow peas are meant to be harvested as flat, tender pods before the peas inside develop at all. The Southern pea (cowpea) is an entirely different warm-season vegetable that is planted and grown in the same manner as beans.



Recommended Varieties

The following varieties (listed in order of maturity) have wrinkled seeds and are resistant to **fusarium wilt** unless otherwise indicated.

Main Season

Sparkle (60 days to harvest; 18 inches tall; good for freezing)

Little Marvel (63 days; 18 inches tall; holds on the vine well)

Green Arrow (68 days; 28 inches tall; pods in pairs; resistant to fusarium and powdery mildew)

Sugar

Dwarf Gray Sugar (65 days; 24 to 30 inches)

When to Plant

Peas thrive in cool, moist weather and produce best in cool, moderate climates. Early plantings normally produce larger yields than later plantings. Peas may be planted whenever the soil temperature is at least 45°F, and the soil is dry enough to till without its sticking to garden tools. In Kansas, plant seed in early to mid-March. Peas are not well adapted for fall garden because seed usually fails to germinate well in warm soil.

Spacing and Depth

Plant peas 1 to 1-1/2 inches deep and one inch apart in single or double rows. Allow 18 to 24 inches between single or pairs of rows. Allow 8 to 10 inches between double rows in pairs.

Care

The germinating seeds and small seedlings are easily injured by direct contact with fertilizer or improper cultivation. Cultivate and hoe shallowly during the early stages of growth. Most dwarf and intermediate varieties are self-supporting. The taller varieties (Green Arrow) are most productive and more easily picked when trained to poles or to a fence for support; but they are no longer popular. Peas can be mulched to cool the soil, reduce moisture loss, and keep down soil rots. Some of the snap and sugar peas are vining types with heights of 6 feet or more that require fencing or other supports.

Harvesting

Garden Peas

When the pea pods are swollen (appear round) they are ready to be picked. Pick a few pods every day or two near harvest time to determine when the peas are at the proper stage for eating. Peas are of the best quality when they are fully expanded but immature, before they become hard and starchy. Peas should be picked immediately before cooking because their quality, especially sweetness (like that of sweet corn), deteriorates rapidly. The pods on the lower portion of the plant mature earliest. The last harvest (usually the third) is made about one week after the first. Pulling the entire plant for the last harvest makes picking easier.

Sugar Snap Peas

Snap peas should be harvested every 1 or 3 days, similarly to snow peas to get peak quality. Sugar snaps are at their best when the pods first start to fatten but before the seeds grow very large. At this point, the pods snap like green beans and the whole pod can be eaten. Some varieties have strings along the seams of the pod that must be removed before cooking. Sugar snaps left on the vine too long begin to develop tough fiber in the pod walls. These must then be shelled and used as other garden peas, with the fibrous pods discarded. Vining types of both sugar snap and snow peas continue to grow taller and produce peas as long as the plant stays in good health and the weather stays cool.

Snow Peas

These varieties are generally harvested before the individual peas have grown to the size of BBS, when the pods have reached their full length but are still quite flat. This stage is usually reached 5 to 7 days after flowering. Snow peas must be picked regularly (at least every other day) to assure sweet, fiber-free pods. Pods can be stir-fried, steamed or mixed with oriental vegetables or meat dishes. As soon as overgrown pods missed in earlier pickings are discovered, remove them from the plants to keep the plants blooming and producing longer. Enlarging peas inside these pods may be shelled and used as garden peas. Fat snow pea pods (minus the pea enlarging inside) should be discarded. Fibers that develop along the edges of larger pods, along with the stem and blossom ends, are removed during preparation. Pea pods lose their crispness if

overcooked. The pods have a high sugar content and brown or burn quickly. Do not stir-fry over heat that is too intense.

Pea pods can be stored in a plastic bag in the refrigerator for two weeks. Unlike fresh green peas, pea pods deteriorate only slightly in quality when stored.

Common Problems

The first signs of **fusarium wilt** and **root-rot disease** are the yellowing and wilting of the lower leaves and stunting of the plants. Infection of older plants usually results in the plants producing only a few poorly filled pods. These diseases are not as prevalent on well-drained soils. Double-dug raised beds amended with abundant organic matter can greatly improve soil aeration and drainage. Fusarium wilt can be avoided by growing wilt-resistant varieties.

Questions and Answers

Q. Should I inoculate my peas with nitrogen-fixing bacteria before planting?

A. When peas are planted on new land, you may increase the yield by inoculating peas with a commercial formulation of nitrogen-fixing bacteria. In an established garden, however, inoculation is less necessary. If you are in doubt, inoculation is a relatively inexpensive process that is easy to do and ensures better plant-nutrient status.

Selection and Storage

There are two common varieties of peas, green garden peas that need shelling and edible-pod peas that are eaten whole. Snow peas, sugar snap peas Chinese pea pods and many others fall into this category. They are low fiber pods with small wrinkled peas inside. The entire pod is eaten, cooked, or raw.

Green garden peas are legumes just like dried peas, except they are eaten at the immature stage.

They are a cool weather, early spring crop. Harvest edible-pod peas when they are flat. Use both hands. Holding the plant stem in one hand use the other hand to pull off the pod. Using one hand, you can easily pull up the entire plant.

The smaller pods are sweeter and more tender. Use them for eating raw and cook the larger ones. The shelled peas should be plump but not large. Check one until you become familiar with the appearance. The plumpest peas should be gathered before the pod starts to wrinkle on the stem. Old peas taste starchy and mealy.

Purchasing Fresh Peas

Look for firm, crisp pea pods with a bright green color and a soft, velvety feel. Avoid those with limp, wrinkled, fibrous, discolored, or decayed pods. Green peas are best when they have fully expanded pods filled with large round peas. Choose edible-pod snow and sugar snap peas that have flat tender pods 1 1/2 to 3 inches long, with undeveloped seeds inside. Small pods are sweeter and more tender. If an edible-pod pea is too fibrous, remove the pod and use just the pea seeds inside.

Measuring Fresh Peas

1 pound green peas = about 6 ounces shelled = about 1 cup, raw or cooked

1/2 cup cooked green or edible-pod peas = about 3 ounces by weight = 80 grams

Storage, Ripening and Preserving

Refrigerate unshelled, unwashed peas in a perforated plastic bag. For best quality, since their sugar quickly turns to starch, eat green peas as soon as possible and within 5 days. Edible pod peas will keep up to two weeks.

To freeze: Select fresh tender peas. Rinse dirt off. Remove the ends and strings from all peas, and the pods from green peas. Place 1 cup peas in boiling water for 2 minutes. Remove immediately and place in ice water for 2 minutes. Drain. Pack into freezer bags, leaving 3 inches of air space. Squeeze out the air, seal, date, and freeze.

Preparation and Serving

Rinse dirt from peas. Shell green peas. For edible- pod peas, remove the ends and strings from both sides of the pod. Edible-pod peas may be eaten raw. For best quality, do not overcook peas.

Nutrition Facts

Nutrition Facts for one serving, or 1/2 cup cooked green peas:

Calories 67

Protein 4 grams

Carbohydrates 13 grams

Fat 0 grams

In contrast, 1/2 cup cooked edible-pod peas provides 34 calories and 6 grams carbohydrates.

Peas contribute vitamin C and K, B vitamins, fiber and essential minerals to the diet.

PEPPERS

Pepper is a tender, warm-season vegetable. Pepper plants require somewhat higher temperatures, grow more slowly, and are smaller than most tomato plants. Brightly colored, sweet bell pepper varieties have recently burst onto the scene. A vast range of other garden peppers (pimiento, Tabasco, cayenne, chili, and paprika) may be grown for food, spices or as ornamentals.



The sweet varieties of peppers, especially the bells, traditionally have been by far the most popular in the United States. They are eaten green or ripe and are used for salads, stuffing, soup, stews, relishes, and pickling. New developments in color and form have done nothing to dull the popularity of sweet peppers. Hot pepper varieties have also enjoyed a rebirth of popularity recently, mainly due to various ethnic cuisines that use their unique flavors and heat creatively.

Recommended Varieties

Hybrid Bell

Bell Boy (70 days to harvest; goes green to red)

Lady Bell (72 days; goes green to red)

Purple Belle (70 days; immature purple, black to red)

Sweet Frying or Salad Type

Gypsy (65 days to harvest; pale yellow to orange to red)

Sweet Banana (70 days; pale yellow to orange to red)

Hot Peppers

Jalapeno (70 days)

Red Chili (84 days)

When to Plant

Peppers are best started from seeds indoors in late winter and then transplanted into the garden after the soil and air have warmed in the spring, about 1-2 weeks after setting tomatoes. The plants cannot tolerate frost and do not grow well in cold, wet soil. When night temperatures are below 50° to 55°F, the plants grow slowly, the leaves may turn yellow, and the flowers drop off. Raised beds, black plastic mulch, and floating row covers may be used to advantage with peppers to warm and drain the soil and enhance the microenvironment of the young pepper plants in spring, when cool weather may persist.

Spacing and Depth

Set transplants 18 to 24 inches apart in the row, or 14 to 18 inches apart in all directions in beds. A dozen plants, including one or two salad and hot types, may provide enough peppers for most families; but with so many colors, flavors and types available, more may be necessary for truly devoted pepper lovers or for devotees of ethnic cuisines.

Care

Peppers thrive in a well-drained, fertile soil that is well supplied with moisture. Use a starter fertilizer when transplanting. Apply supplemental fertilizer (side-dressing) after the first flush of peppers is set. Because a uniform moisture supply is essential with peppers, especially during the harvest season, irrigate during dry periods. Hot, dry winds and dry soil may prevent fruit set or cause abortion of small immature fruits.

Harvesting

Fruits may be harvested at any size desired. Green bell varieties, however, are usually picked when they are fully-grown and mature — 3 to 4 inches long, firm, and green. When the fruits are mature, they break easily from the plant. Less damage is done to the plants, however, if the fruits are cut rather than pulled off. The new, colored bell pepper fruits may be left on the plant to develop full flavor and ripen fully to red, yellow, orange or brown; or they may be harvested green and immature. Some (including "white," light yellow, lilac and purple) are colors that develop in the immature fruit and that should be harvested before actually ripening, when they turn red.

Hot peppers are usually harvested at the red-ripe stage; but "green chiles," the immature fruits, are also required for some recipes. Some dishes may actually call for a specific variety of chile to be authentic. Hot pepper flavor varies more from variety to variety than was previously appreciated.

To dry chiles, individual fruits can be picked and strung in a "ristras" or entire plants can be pulled in the fall before frost and hung in an outbuilding or basement to dry. Always exercise caution when handling hot varieties, because skin, noses, and eyes may become painfully irritated. Plastic or rubber gloves may be helpful when picking or handling hot peppers.

Common Problems

People who use tobacco should wash their hands with soap and water before handling pepper plants to prevent spread of tobacco mosaic disease. Grow resistant varieties if possible.

Watch for accumulation of aphids on the underside of the leaves, especially near growing branch tips. When a large aphid population is present, sticky "honeydew" appears on the lower leaves and fruit. If this situation occurs, apply a suggested insecticide. Bacterial diseases may be transported on purchased transplants, so look over potential purchases carefully for any leaf spotting or stem cankers.

Questions and Answers

Q. Why do my pepper plants grow large but not develop fruits? They are dark green and do not appear to be diseased.

A. Several weather conditions can reduce fruit set of peppers. Early in the season, extreme cold may prevent fruit set. The most common problems later in the season are hot, dry winds and warm nights (above 70°F). Periods of extreme heat, with or without wind, may prevent fruit set, especially in some varieties. Although over fertilization, especially with nitrogen, is often suspected in these cases because the growth is luxuriant, peppers can actually produce fruit quite well under almost ridiculously high fertility programs. Pepper plants that have no developing fruit attached normally maintain a greener, healthier appearance because all the nutrients can go into producing leaves and stems instead of fruit.

Q. What causes small, dry, sunken black areas near the ends of the peppers?

A. This condition is blossom-end rot, a condition more commonly associated with tomato. It is caused by drought, uneven water availability, or pruning roots through improper cultivation. Blossom-end rot is more severe on some varieties of peppers than on others. Remove infected fruits and throw them away. Irrigation and mulching can help to prevent blossom-end rot. Though the condition is caused by a calcium deficiency in the affected fruit tissue, addition of calcium to the soil seldom alters the condition. The problem is one of calcium mobility in the plant, not lack of calcium in the soil.

Selection and Storage

Recent years have brought a remarkable surge in the popularity for peppers. With literally hundreds of varieties to select from, there is a pepper to suit everyone's taste. As easy to cultivate as tomatoes, chili peppers and sweet peppers are favorites of the small-plot-gardener. For practical purposes, in this section, peppers will be divided into two (2) categories: sweet peppers and chili peppers.

Sweet peppers

Sweet green bell-shaped peppers are the most popular garden variety. Left to ripen, they turn red, purple, orange, or yellow and gain various levels of sweetness depending on the variety. Although the paler green and yellow tapering varieties have more flavor, all sweet peppers are similar in flavor and texture. They are crisp and refreshing raw, and pleasantly assertive when cooked to tenderness.

Green bell peppers are a main ingredient in Louisiana Creole and Cajun cuisine as well as Italian and Mediterranean cooking. Peppers can be harvested from July to October. They are delicious in the green stage, the sweeter ripe stage or anywhere in between.

Chili peppers

Chili peppers are famous throughout the world from the fiery cuisines of Mexico, India, Thailand, and Africa to the subtle flavor enhancement of the most delicate dishes. The hot varieties can also be picked at any color stage, but are hottest if allowed to ripen fully. Chili peppers ripen through a wide range of colors from yellow, orange, purple, and even brown. Some chili peppers turn bright red, which is more often an indication of ripeness rather than hotness.

Chili peppers are perennial subshrubs native to South America, which are grown as annuals in our colder climate. They range in hotness from mild to fiery hot. The burning sensation is attributed to chemical compounds called capsaicinoids, which are stored in the light-colored veins, on the walls, and surrounding the seeds. Capsaicin acts on the pain receptors in the mouth, not the taste buds. Experts agree that long hot dry summers produce the best (hottest) chili peppers.

Purchasing Fresh Peppers

Choose crisp, firm peppers that are 3 to 4 inches long, glossy and bright in color. Sweet bell peppers can be green, red, orange, yellow, brown, white, light yellow, lilac or purple. Avoid peppers with shriveled or wrinkled skin; with thin or flimsy walls; or with soft, watery, or sunken spots.

Measuring Fresh Peppers

1 pound = 2 to 3 medium whole = 3 1/2 cups

raw sliced = 2 3/4 cups cooked sliced

1/2 cup raw, sliced = about 2 1/2 ounces by weight = about 75 grams

Storage, Ripening and Preserving

Store unwashed peppers in a plastic bag to hold in moisture. They usually store well for up to ten days. Peppers keep best between 40-50° F, so put them in the vegetable bin rather than the main part of the refrigerator. Colder storage temperatures may result in discoloration and disagreeable flavors. Peppers do not ripen after harvest. Bell peppers freeze well. Wash, core, and cut them up, as desired, then spread in a single layer on a tray and freeze. Soon after they are frozen, loosen pieces and store in a sealed freezer bag. Upon thawing, the peppers will still be crisp and can be used raw, or in cooked dishes.

Preparation and Serving

Rinse peppers under cold running water to remove dirt. Cut off bruises and decay. Remove the stem, center membrane parts, and seeds. Peppers are delicious raw, as a relish or in salads. Or enjoy peppers grilled, roasted, baked, steamed, microwaved, boiled, pan-fried or stir-fried. Use as directed in a recipe.

Nutrition Facts

Nutrition Facts for one serving, or 1/2 cup chopped raw sweet bell pepper:

Calories 20

Protein 1 gram

Carbohydrates 5 grams

Fat 0 grams

All sweet peppers are very high in vitamin C. Red sweet peppers are also very high in vitamin A.

RADISH

Radish is a cool-season, fast-maturing, easy-to-grow vegetable. Garden radishes can be grown wherever there is sun and moist, fertile soil, even on the smallest city lot. Early varieties usually grow best in the cool days of early spring, but some later-maturing varieties can be planted for summer use. The variety French Breakfast holds up and grows better than most early types in summer heat if water is supplied regularly. Additional sowings of spring types can begin in late summer, to mature in the cooler, more moist days of fall. Winter radishes are sown in midsummer to late summer, much as fall turnips. They are slower to develop than spring radishes; and they grow considerably larger, remain crisp longer, are usually more pungent, and hold in the ground or store longer than spring varieties.



Recommended Varieties

Spring

Cherry Bell (22 days; round, red)

Early Scarlet Globe (23 days; globe-shaped, small taproot, bright red)

Easter Egg (25 days; large, oval; color mix includes reddish purple, lavender, pink, rose, scarlet, white)

For Spring or Summer Use

Icicle (25 days; long, slim, tapered white)

When to Plant

Spring radishes should be planted from as early as the soil can be worked (mid- to late March in Kansas) until mid-spring. Make successive plantings of short rows every 10 to 14 days. Plant in spaces between slow-maturing vegetables (such as broccoli and Brussels sprouts) or in areas that will be used later for warm-season crops (peppers, tomatoes and squash). Spring radishes also can be planted in late winter in a protected cold frame, window box, or container in the house or on the patio. Later-maturing varieties of radishes (Icicle or French Breakfast) usually withstand heat better than the early maturing varieties and are recommended for late spring planting for

summer harvest. Winter radishes require a much longer time to mature than spring radishes and are planted at the same time as late turnips (usually midsummer to late summer).

Spacing and Depth

Sow seed 1/4 to 1/2 inch deep. Thin spring varieties to 1/2 to 1 inch between plants. Winter radishes must be thinned to 2 to 4 inches, or even farther apart to allow for proper development of their larger roots. On beds, radishes may be broadcast lightly and thinned to stand 2 to 3 inches apart in all directions.

Care

Radishes grow well in almost any soil that is prepared well, is fertilized before planting and has adequate moisture maintained. Slow development makes radishes hot in taste and woody in texture.

Radishes mature rapidly under favorable conditions and should be checked often for approaching maturity. Harvest should begin as soon as roots reach edible size and should be completed quickly, before heat, pithiness, or seed stalks can begin to develop.

Harvesting

Pull radishes when they are of usable size (usually starting when roots are less than 1 inch in diameter) and relatively young. In loose soil, radishes can easily be pulled, especially if the soil is moist. For elongated radishes in heavy soil, a spading fork may be necessary. Radishes remain in edible condition for only a short time before they become pithy (spongy) and hot. Proper thinning focuses the harvest and avoids disappointing stragglers that have taken too long to develop.

Winter varieties mature more slowly and should be harvested at considerably larger size. Once they reach maturity, they maintain high quality for a fairly long time in the garden, especially in cool fall weather. Size continues to increase under favorable fall conditions. *Daikon* or *Chinese radish*, can achieve particularly large size and still maintain excellent quality. Winter radishes can be pulled before the ground freezes and stored in moist cold storage for up to several months.

Common Problems

Root maggots may tunnel into radishes. These insects are more common above 40 degrees north latitude. Apply a suggested soil insecticide before planting if this insect previously has been a problem.

Questions and Answers

Q. What causes my radishes to crack and split?

A. The radishes are too old. Pull them when they are younger and smaller. A flush of moisture after a period of relative dryness also may cause mature roots to burst and split. Try to avoid uneven moisture availability.

Q. Why do my radishes grow all tops with no root development?

A. There may be several reasons: seed planted too thickly and plants not thinned (though some roots along the outside of the row usually develop fairly well even under extreme crowding), weather too hot for the spring varieties that do best in cool temperatures (planted too late or unseasonable weather) and too much shade (must be really severe to completely discourage root enlargement).

Q. What causes my radishes to be too "hot"?

A. The "hotness" of radishes results from the length of time they have grown rather than from their size. The radishes either grew too slowly or are too old.

Selection

Summer Radish

Radishes have often been dismissed as decoration and garnish. They are actually members of the cruciferous vegetable family so eat the greens. Because they vary in keeping quality, radishes are classified as winter or summer. Summer radishes are the small ones of bold red, pink, purple, white or red and white. They may be globe-shaped or elongated, fiery hot or mild.

Harvest summer radishes when they are small and tender for optimal flavor. Oversize summer radishes can become tough, woody, hollow and strong in flavor. To check a large radish squeeze gently, if it yields to pressure it is likely to be fibrous. These will do well in the compost heap.

Winter Radish

Harvest winter radishes when they are large and mature. Winter radishes may be white, black or green. Black radishes have a pungent flavor and should be used sparingly. Remove greens and roots before storing black radishes. Chinese radishes, round and fat, are milder in flavor. Remove greens before storing; remove roots just before preparing.

The word daikon means "great root" in Japanese. In cool weather, daikon growth is quick and steady. The fully mature daikon can grow up to about 18 inches long and weighs 5 or 6 pounds. There are several varieties. Some are thin and long, while others are short and round. All radish greens are edible.

Purchasing Fresh Radishes

Look for spring radishes that are 1/2 to 1 inch wide and are firm, smooth, and shiny. Avoid large spring radishes that yield to pressure; they are fibrous, spongy, tough or woody and their flavor is hot. If the radish top is attached, look for fresh green leaves. Avoid radishes that are limp or dull in appearance, or that have wilted, yellow or decayed tops.

Measuring Fresh Radishes

1 pound raw without tops =
about 15 ounces ready to eat = about 90 small radishes or 50 medium radishes = about 3 1/2 cups of raw slices

1/2 cup raw slices = about 2 ounces by weight = 58 grams

Storage, Ripening and Preserving

Cut off the leafy radish top and refrigerate it unwashed in a separate plastic bag; cook within 1 or 2 days. Brush off any dirt clods from the radish and refrigerate unwashed, dry radishes in a plastic bag in the vegetable drawer for 1 to 4 weeks. (Winter radishes keep longer than spring radishes do.) Radishes do not freeze well, but may be pickled. Use pickling salt as directed by the recipe, since table salt may make the brine cloudy and the pickles an off-color.

Preparation and Serving

Cut off the root. Scrub off all dirt under cool running water. Peel daikon radishes but not spring radishes. Enjoy radishes raw or cooked; whole, sliced, diced or shredded; plain or in a recipe.

Nutrition Facts

Nutrition Facts for 1 serving or 1/2 cup raw sliced spring radishes:

Calories 12

Protein 0 grams

Carbohydrates 2 grams

Fat 0 grams

Radishes are an excellent source of vitamin C and contribute other nutrients, antioxidants and phytochemicals to the diet.

SPINACH

Spinach growing in the garden is a welcome sign of spring. It is a source of Vitamin A. It is rich in iron, calcium, and protein. Spinach can be grown as a spring and a fall crop. Crinkled leaved varieties tend to catch soil during rainfalls. Plant a plain leaved variety to avoid a "gritty" spinach when chewed.



Recommended Varieties

Crinkled-Leaf

Bloomsdale Long Standing (48 days to harvest; thick, very crinkly, glossy dark green leaves)

Hybrid Savoy

Indian Summer (39 days; semi-savoy; resistant to downy mildew races 1 and 2, tolerant to spinach blight)

Melody (42 days; lightly crinkled; resistant to downy mildew, mosaic; good spring or fall)

Plain-Leaf

Giant Nobel (43 days; large, smooth leaves; long-standing).

Plain-Leaf Hybrid

Olympia (46 days; slow to bolt; spring, summer harvest).

When to Plant

The first planting can be made as soon as the soil is prepared in the spring. If the soil was prepared in the fall, seeds can be broadcast over frozen ground or snow cover in late winter and they will germinate as the soil thaws. Plant successive crops for several weeks after the initial sowing to keep the harvest going until hot weather. Seed spinach again in late summer for fall and early winter harvest. Chill seeds for summer or fall plantings in the refrigerator for 1 or 2 weeks before planting. In southern locations, immature spinach seedlings survive over winter on well-drained soils and resume growth in spring for early harvest. With mulch, borderline gardeners should be able to coax seedlings through the winter for an early spring harvest. Spinach can be grown in hotbeds, sunrooms, or protected cold frames for winter salads.

Spacing and Depth

Sow 12 to 15 seeds per foot of row. Cover 1/2 inch deep. When the plants are one inch tall, thin to 2 to 4 inches apart. Closer spacing (no thinning) is satisfactory when the entire plants are to be harvested. The rows may be as close as 12 inches apart, depending upon the method used for keeping weeds down. In beds, plants may be thinned to stand 4 to 6 inches apart in all directions. Little cultivation is necessary.

Care

Spinach grows best with ample moisture and a fertile, well-drained soil. Under these conditions, no supplemental fertilizer is needed. If growth is slow or the plants are light green, side-dress with nitrogen fertilizer.

Harvesting

The plants may be harvested whenever the leaves are large enough to use (a rosette of at least five or six leaves). Late thinnings may be harvested as whole plants and eaten. Cut the plants at or just below the soil surface. Spinach is of best quality if cut while young. Two or three separate seedings of short rows can provide harvest over an extended period. Some gardeners prefer to pick the outer leaves when they are 3 inches long and allow the younger leaves to develop for later harvest. Harvest the entire remaining crop when seedstalk formation begins because leaves quickly deteriorate as flowering begins.

Common Problems

Cucumber mosaic virus causes a condition in spinach called blight.

Questions and Answers

Q. What causes spinach to develop flower stalks (seedstalks) before a crop can be harvested?

A. Spinach bolts quickly to seed during the long days in late spring or summer. Warm temperatures accelerate this development. Varieties that are "long standing" or slow to bolt are best adapted for spring planting.

Q. What causes yellowing, stunting and early death of plants?

A. These conditions are caused by blight disease (cucumber mosaic virus). Grow resistant varieties.

Purchasing Fresh Spinach

Look for fresh, crisp dark green leaves and tender stems. Smooth leaf varieties are easier to clean. Avoid spinach with wilted, yellow, discolored, damaged, or slimy leaves, or with long or tough stems.

Measuring Fresh Spinach

1 pound raw = about 14 ounces ready to eat = about 13 cups chopped, raw = about 2 cups cooked
1/2 cup cooked = about 3 1/2 ounces by weight = 95 grams

Storage, Ripening and Preserving

Refrigerate in a perforated plastic bag in the vegetable drawer. Spinach may stay fresh up to 14 days, but when possible use during the first few days.

To freeze, select tender fresh leaves. Rinse off dirt. Remove stems if tough. Place a handful of spinach in boiling water for 1 1/2 minutes. Drain immediately and place in ice water for 1 1/2 minutes. Drain again. Pack into freezer bags, leaving 3 inches of air space. Squeeze out the air, seal, date, and freeze.

Preparation and Serving

Rinse dirt from spinach leaves and dry with clean paper towels or in a salad spinner. Serve raw or cooked spinach plain, or use as directed in recipes. Spinach may be used in cold and hot salads, casseroles including egg dishes, soups, dips, etc. To cook spinach: steam, microwave, boil, or stir-fry until tender. For the best taste, color, texture, and nutrition, do not overcook.

Nutrition Facts

Nutrition Facts for 1 serving, or 1 cup raw or 1/2 cup cooked spinach:

Calories 21

Protein 3 grams

Carbohydrates 3 grams

Fat 0 grams

For 1 cup raw spinach: Calories 7; Protein 1 gram; Carbohydrates 1 gram; Fat 0 grams. Spinach contributes fiber, carotenoids (which the body converts to vitamin A), vitamins C and K, B vitamins including folic acid, iron, and many other nutrients to the diet.

TOMATO

Tomato is the most popular garden vegetable in America. For many years, however, tomatoes (then called "love apples") were considered poisonous and were grown solely for their ornamental value. Tomatoes are usually easy to grow and a few plants provide an adequate harvest for most families. The quality of fruit picked in the garden when fully ripe far surpasses anything available on the market, even in season. The tomato plant is a tender, warm-season perennial that is grown as an annual in summer gardens all over the continental United States. Spring and fall freezes limit the outdoor growing season.



Recommended Varieties

Hundreds of varieties of tomatoes are now available for the home gardener. They range widely in size, shape, color, plant type, disease resistance, and season of maturity. Catalogs, garden centers, and greenhouses offer a large selection of tomato varieties and choosing the best one or two varieties can be extremely difficult. Evaluate your needs, then choose the varieties best suited to your intended use and method of culture.

Tomato plants fall into one of two types that affect ultimate plant height and cultural requirements. Tomatoes are **determinate** if they eventually form a flower cluster at the terminal growing point, causing the plant to stop growing in height. Plants that never set terminal flower clusters, but only lateral ones and continue indefinitely to grow taller are called **indeterminate**. Older varieties are almost all indeterminate. These can be counted upon to produce abundant foliage and to ripen flavorful fruit. They may, however be extremely late in maturing. The first determinate varieties developed had real problems with inadequate foliage cover and taste, but they ripened very early. Newer determinates produce better foliage, may grow taller, and ripen fruit of similar quality to modern indeterminate varieties. They still tend to ripen their fruit over a shorter period of time, so successive plantings may be desirable with determinates to keep the harvest coming through the entire season. Determinate vines are easier to control and support during the growing season. Some of the extreme dwarf types are determinate as well as dwarf, producing some truly tiny mature plants.

Guide to Abbreviations found on Seed Packages or in Seed Catalogs

A=Alternaria

F=Fusarium

N=nematodes

T=Tobacco mosaic virus

V=Verticillium

OP=Open Pollinated

AAS=All America Selection

First-Early Red (60 or fewer days to harvest)

These varieties have more compact plant growth than the main-season varieties and sun burning of the fruit is a problem in hot weather. The main crop varieties are generally far superior for summer long harvest. First early varieties are better suited for northern areas, where the growing seasons are shorter and the summers cooler. They have small to medium-sized red fruit and are usually not suitable for pruning.

Early Girl (54 days; 5 ounces; earliest full size; indeterminate; resistant to V)

Medium-Early Red (60 to 69 days)

These varieties are intermediate between the extreme earliness of the first earliest and the sounder plant type and production characteristics of the main crop types. Fruit size is improved, as is quality. The real tomato harvest season begins with the medium early varieties.

Mountain Spring (65 days; 9 ounces; globe, very smooth; determinate; resistant to VF)

Main-Crop Red

Most of the main crop varieties bear medium sized to large fruit, have adequate foliage cover, and are relatively free from fruit cracking and other deformities. They are suitable for growing on mulch, in wire cages or on trellises. Many of them can be pruned and trained to stakes. As the name implies, they should make up the bulk of the main crop harvest because they have superior yield, better staying power in the garden and fruit of high quality.

Celebrity (70 days to harvest; 10 ounces; large, productive; determinate; resistant to VFFNT)

Mountain Delight (70 days; 10 ounces; no green shoulders; determinate; resistant to VF)

Extra-Large Red

These varieties are relatively late maturing. The fruits may be extremely large but also can be misshapen, with rough scar tissue ("cat-facing") on the blossom end. When this scar tissue must be cut away, some of the advantage of extra-large size is lost. Large size, though, is almost never about total yield, but more often about the novelty of huge size.

Some of the newer hybrid large types like Supersteak and Beefmaster have fruit with much more consistent shape.

Beefmaster (81 days; 1 to 2 lb.; large Beefsteak type; indeterminate; resistant to VFN)

Yellow or Orange

Contrary to popular belief, yellow and orange fruited varieties are not significantly lower in acid content than red tomatoes, and they are equally safe to can or process. They "taste" sweeter than red varieties, because they have higher sugar content. Current varieties in this classification have much earlier maturity and better plant growth characteristics than older yellows and oranges, which tended to be big, sprawling, and late maturing.

Mountain Gold (OP) (70 days to harvest; 8 ounces; deep tangerine orange; determinate; resistant to VF)

Other Colors and Types

Although odd colors and types have been around for a long time, they have experienced a resurgence of popularity, fueled in part by the upscale salad bar. As these outlets have competed to offer the newest and brightest assortment of produce, some almost-forgotten tomatoes have been "rediscovered."

Long Keeper (OP) (78 days; 6 ounces; orange skin, orange-red flesh; solid, keeps for weeks; indeterminate)

Red Paste Types

Paste tomatoes are usually used for making catsup, paste, and sauces and for canning whole. Their solid, meaty, low-moisture flesh makes processing these products less complicated. Recently, some of them are becoming trendy and popular for eating fresh. These usually short plant types tend to set up a large load of fruit in a short time and then ripen a large proportion of this fruit at once. With tomatoes used fresh, it is usually seen as an advantage to have fruit ripening over an extended season on individual plants, but ripening most of the crop in a short period has been a bonus for paste tomatoes because processing activities are best done in fairly large lots.

Roma (OP) (75 days; 2 ounces; standard red plum, tolerant to early blight; determinate; resistant to VF)

Small-Fruited/Salad

These varieties are generally vigorous growing and productive. They vary in size from 1 to 1-1/2 inches in diameter and are usually suitable for pruning. Production per plant is very high, to the point that picking may become tedious. Whole clusters may sometimes be picked at one time to speed the harvest. Splitting seems to be more of a problem with cherries, though newer hybrids have attempted to lessen the problem. These types are usually described as especially sweet and tasty.

Super Sweet 100 (70 days to harvest; 1 inch; red, cherry-sized fruit in large clusters; indeterminate; resistant to VF)

Large Red Cherry (OP) (70 days; 1-1/2 inch; solid, deep red, tasty fruit; indeterminate)

Dwarf/Container

These tomatoes are popular for use in containers, hanging baskets and garden or patio locations where space is limited. Because more people now live where traditional vegetable gardening is not possible, container and patio gardens have become more popular. Their ornamental value is an added benefit and their fruit quality has recently been improved as well. They have fruit in red and some other colors and are not suitable for pruning (except the new Husky hybrids).

Tiny Tim (45 days to harvest; 1 inch; very dwarf, red cherry fruit; determinate)

Pixie Hybrid II (52 days; 2 ounces; compact dwarf plants; determinate)

Patio Hybrid (65 days; 3 ounces; strong dwarf plants, relatively large fruit, ideal container plant; determinate)

Small Fry (72 days; 1 inch; red, good in hanging baskets; determinate)

Greenhouse

Gardeners interested in growing greenhouse tomatoes should know that specific varieties have been developed for this environment. Some catalogs now routinely list these types, which should be used for the most satisfactory results. Consult catalogs for varieties available.

Heirloom

A particularly large number of heirloom tomato varieties are available today, mainly because tomatoes normally do not cross-pollinate. Seed saved from fruits of non-hybrid varieties produce plants fairly identical to the parent plant. Many of the odder colors and types that have resurfaced lately have their origins in these older, self-saved varieties. The plant type is usually large, sprawling and late compared to current commercial varieties. Disease resistance may also be suspect. If, however, the gardener wants to try a few truly weird or tasty types, these usually mature some fruits almost anywhere except in the shortest-season areas. Specialty seed houses and exchanges are a source of the widest variety of heirloom tomatoes imaginable.

When to Plant

Buying transplants or starting seeds indoor early, gets tomatoes off to the best start in the garden when warm weather finally arrives and it saves several weeks in growing time. Some gardeners transplant their tomatoes soon after the soil is prepared for spring gardening, when there is a high risk of damage from freezing. Be prepared to cover early set plants overnight to protect them from frost. For best results with very early plantings, consider black plastic mulch and floating row covers for heat accumulation and frost protection. For best results with minimal risk, plant when the soil is warm, soon after the frost-free date is past. Early May is the common spring planting time. For a later harvest, tomatoes can be planted as late as early June.

For fall harvest and early winter storage of tomatoes, late plantings may be made from late spring until mid-summer, depending on the length of the growing season. These plantings have the advantage of increased vigor and freedom from early diseases, and they often produce better quality tomatoes than later pickings from early spring plantings. Time late plantings for maximal yield before killing freezes in your area (up to 100 days from transplanting for most varieties).

Spacing and Depth

The space required depends upon the growth pattern of the variety and method of culture. Space dwarf plants 12 inches apart in the row, staked plants 15 to 24 inches apart and trellised or ground bed plants 24 to 36 inches apart. Some particularly vigorous indeterminate varieties may need 4 feet between plants and 5 to 6 feet between rows to allow comfortable harvest room.

Care

Apply starter fertilizer when transplanting. Hoe or cultivate shallowly to keep down weeds without damaging roots. Mulching is recommended, especially for gardeners who wish to maintain their plants for full season harvest. Black plastic or organic materials are suitable for mulching. Delay application of organic materials until after the soil has warmed completely in early summer so that growth is not retarded by cool soil temperatures early in the season.

Water the plants thoroughly and regularly during prolonged dry periods. Plants confined in containers may need daily or even more frequent watering. Side-dress nitrogen fertilizer (ammonium nitrate) at the rate of one pound per 100 feet of row (equivalent to 1 tablespoon per plant) after the first tomatoes have grown to the size of golf balls. (If ammonium nitrate is not available, use 3 pounds of 10-10-10 fertilizer.) Make two more applications 3 and 6 weeks later. If the weather is dry following these applications, water the plants thoroughly. Do not get fertilizer on the leaves.

Many gardeners train their tomato plants to stakes, trellises, or cages with great success. Not all varieties, however, are equally suitable for staking and pruning.

Tomato cages may be made from concrete-reinforcing wire, woven-wire stock fencing, or various wooden designs. Choose wire or wooden designs that have holes large enough to allow fruit to be picked and removed without bruising. The short, small, narrow type often sold at garden centers is useless for anything but the smallest of the dwarf types. Most modern determinate tomatoes easily grow 3 to 4 feet tall and indeterminates continue to get taller until frozen in the fall, easily reaching at least 6 feet in height. Use cages that match in height the variety to be caged and firmly anchor them to the ground with stakes or steel posts to keep the fruit-laden plants from uprooting themselves in late summer windstorms.

Trellis-weave systems have recently been developed for commercial operations and can work just as well in a garden planting. Tall stakes are securely driven into the tomato row about every two or three plants in the row. Make sure the stakes are tall enough to accommodate the growth of your tomato varieties and make sure they are driven very securely into the ground to prevent wind damage. (The woven rows of tomatoes can catch much wind.) As the tomatoes grow upward, strings are attached to the end posts and woven back and forth between the supports, holding the tops of the plants up and off the ground. This operation is repeated about as often as the tomatoes grow another 6 inches, until the plants reach maturity. The fruit is held off the ground as with staked or caged plants; but the foliage cover is better than with staked plants, and the fruit is more accessible than with cages.

Harvesting

Tomatoes should be firm and fully colored. They are of highest quality when they ripen on healthy vines and daily summer temperatures average about 75°F. When temperatures are high (air temperature of 90°F or more), the softening process is accelerated and color development is retarded, reducing quality. For this reason, during hot summer weather, pick your tomatoes every day or two; harvest the fruits when color has started to develop and ripen them further indoors (at 70 to 75°F). On the day before a killing freeze is expected, harvest all green mature fruit that is desired for later use in the fall. Wrap the tomatoes individually in paper and store at 60 to 65°F. They continue to ripen slowly over the next several weeks. Whole plants may be uprooted and hung in sheltered locations, where fruit continues to ripen.

Common Problems

Tomato hornworms are large (2 to 3 inch long when fully grown), green caterpillars with white stripes on the body. A horn protrudes from the top rear end of the worm. Tomato hornworms feed on the leaves and fruit. Several worms on one plant can quickly defoliate it and ruin developing fruit. Because their green coloring so closely resembles tomato foliage and stems, they are difficult to see. Handpick in cooler parts of the day or use suggested biological insecticides. If you see hornworms with small, white cocoons protruding, leave them alone. These structures are the pupae of parasitic insects that help control the hornworm population and the individual wearing them is already doomed.

Verticillium and **fusarium wilts** are soil borne diseases that cause yellowing of the leaves, wilting and premature death of plants. These diseases persist in gardens where susceptible plants are grown. Once they build up, the only practical control is the use of resistant (VF) varieties.

Early blight is characterized by dead brown spots that usually start on the lower leaves and spread up the plant. Upon close inspection, you can see concentric rings within the spots. Although early blight is most severe on the leaves, it sometimes occurs on the stems and can cause severe defoliation. Certain varieties (Roma and Supersonic) are more tolerant of early blight than others are.

Septoria leafspot is characterized by numerous small black spots on the leaves. The centers of these spots later turn white and tiny black dots appear in the white centers. The disease starts on the bottom leaves and may become severe in wet weather.

Blossom-end rot is a dry, leathery brown rot of the blossom end of the fruit that is common in some seasons on tomatoes. It is caused by the combination of a localized calcium deficiency in the developing fruit and wide fluctuations of soil moisture. The problem is especially bad in hot weather. Soil applications of calcium seldom help, though foliar calcium sprays may minimize the occurrence of the problem. Make sure the formulation is designed for foliar application or severe damage could result. Pruning causes stress to the plants that may increase the incidence of blossom-end rot. Some tomato varieties are much more susceptible to this condition than others are. Mulching and uniform watering help to prevent blossom-end rot. Once the blackened ends appear, affected fruits cannot be saved. They are best removed and destroyed so that healthy fruit setting later can develop more quickly.

Poor color and **sunscauld** occur when high temperatures retard the development of full red color in tomatoes exposed directly to the hot sun. Sunscald occurs as a large, whitish area on the fruit during hot, dry weather. It becomes a problem when foliage has been lost through other diseases such as early blight or on early varieties that normally have poor foliage cover as the fruit ripens.

Questions and Answers

Q. What causes the lower leaves of my tomato plants to roll up?

A. Leaf roll (curling of the leaflets) is a physiological condition that occurs most commonly when plants are trained and pruned. It should not affect fruiting or quality.

Q. What causes the flowers to drop off my tomato plants?

A. During unfavorable weather (night temperatures lower than 55°F, or day temperatures above 95°F with drying hot winds), tomatoes do not set and flowers drop. The problem usually disappears as the weather improves.

Q. What can I do to prevent my tomatoes from cracking?

A. Cracking varies with the variety. Many of the newer varieties are resistant to cracking. Severe pruning increases cracking. Keep soil moisture uniform as the tomatoes develop and plant resistant varieties to minimize this problem.

Q. What causes small, irregular, cloudy white spots just under the skin of my tomatoes.

A. These spots on green or ripe fruits are caused by the feeding of stink bugs.

Q. What causes the young leaves of my plants to become pointed and irregular in shape? I notice some twisting of the leaves and stems after spraying the plants for the first time.

A. Judging from the description, it seems likely that your tomato plants have been injured by 2,4-D or a similar growth regulator weed killer. Never use the same sprayer in your vegetable garden that you use for weed control in your lawn. Drift from herbicides originating 1/2 mile or more away also can injure your tomato plants. For this reason, use extreme caution when applying lawn care chemicals near vegetable or fruit plantings.

Q. What is a tree tomato?

A. The treelike plant sold as a "tree tomato," is a different species from garden tomatoes. It is a woody tree that grows 8 feet or taller and bears after 2 years. The tree tomato is a tropical plant and does not overwinter outside anywhere the temperature drops below freezing. The fruits are small (1 to 2 inches in diameter) and are used primarily in stews or preserves rather than in salads. Some of the common, vigorous, indeterminate garden tomato varieties that are suitable for training and pruning (such as Ponderosa) are also sold as climbing or "tree tomatoes" by some seed stores.

Q. What is a "potomato"?

A. Although both potato and tomato plants can be integrated, the "potomato" (sometimes called "topato") commonly advertised is simply a tomato seed inserted into a potato tuber and planted together, producing both a tomato plant and a potato plant in the same hill. The results are not likely to be particularly successful.

Q. My grandpa grew a heart shaped, dark pink tomato that was thick and meaty, yet juicy with great flavor. Grandpa's gone and I can't find a source for the seed. What can I do?

A. Fortunately, there are a number of seed exchanges like Seed Savers Exchange, RR#3, Box 239, Decorah, IA 52101, which have been finding and rescuing old varieties. More old and heirloom varieties are also available from conventional seed sources these days. Perhaps, by doing some homework and contacting one or several of these sources, you can find a variety that is exactly (or very nearly) like those you remember from your grandfather's garden. As a guess, the variety sounds like one called Oxheart, which used to be fairly common and has recently become rare.

Selection and Storage

Tomatoes are a favorite among small plot gardeners and nothing tastes better than one that is truly vine ripened. Although tomatoes are available year round, vine-ripened tomatoes are only available during the growing season.

Dozens of varieties of tomatoes are available in seed catalogs and as transplants. They come in a wide range of sizes, colors, and shapes. A single tomato plant will grow well in a large flowerpot or bucket. The point is, if you do not plant anything else, plant a tomato, and eat fresh tomatoes often. Tomatoes generally fall into three categories, slicing round tomatoes, plum tomatoes, and small cherry tomatoes. Variety selection should be suited to how you will use them.

Slicing tomatoes are large round varieties, which hold more juice and seeds. They are perfect for eating raw in a wide variety of ways. Plum tomatoes are meaty, eggplant-shaped, and may be red or yellow. They are excellent for sauce making, canning, and pizzas. Small cherry-type tomatoes are generally served whole, although they can be cut in half and sautéed in any dish. They contain a great deal of seeds and juice.

Purchasing Fresh Tomatoes

Look for tomatoes with bright, shiny skins and firm flesh. Avoid those with blemishes, cracks or soft spots, or that are lacking in color. Roma & plum tomatoes are fleshy, with less juice and fewer seeds than other kinds of tomatoes.

Measuring Fresh Tomatoes

1 pound = 2 or 3 medium full-sized = 2 1/4 cups raw diced
1/2 cup raw chopped = about 3 ounces by weight = about 90 grams

Storage, Ripening and Preserving

Handle gently. Store unwashed ripe tomatoes on a counter between 60-80°F., away from direct sunlight, for up to 3 days. Refrigerate tomatoes, uncovered, only if you want to keep them from ripening further. When temperatures are above 90°F, pick tomatoes while still pink.

To ripen tomatoes, place tomatoes, stem end up, in a paper bag with several holes in it, fold the top over, store at 60-80°F., and check them daily.

To freeze tomatoes for use in cooked dishes: Wash tomatoes and drop a few into 1 gallon boiling water for only 30 seconds, or longer if using firm tomatoes. Remove immediately and cool in a bowl of ice water. Skin will pull away easily if they were in the boiling water long enough. Core and cut into pieces. Cook on a stovetop or in a microwave oven until tender. Pour into a shallow container and place in ice water until tomatoes are cool. Pack cooked tomatoes into freezer containers and leave 1 inch of air space before sealing.

Preparation and Serving

Rinse tomatoes under cold running water to remove dirt. Cut out the core and any damaged areas. Cut lengthwise from stem to blossom end to retain more juice in each slice. Enjoy tomatoes fresh (served at room temperature) or grilled, stewed, baked, steamed, microwaved, boiled, pan-fried or stir-fried. Tomatoes cook in less than 15 minutes. Use as directed in a recipe.

Nutrition Facts

Nutrition Facts for one serving, or 1/2 cup raw chopped red or green tomatoes, not peeled:
Calories about 20
Protein 1 gram
Carbohydrates 4 grams
Fat 0 grams.

Tomatoes are high in vitamin C and provide fiber and healthful pigments and antioxidants, such as the carotenoids beta-carotene and lycopene, to the diet.

GRAPES

Grapes can be grown in fruit gardens throughout Kansas. They are easy to grow, bear early and regularly, and are long-lived plants that do not require a large area. A well cared for vine should produce at least 10 pounds, and may produce 20 pounds or more of grapes.



Recommended Varieties

The American bunch grape varieties as well as French-American hybrid grapes are the most productive for Kansas. The varieties most temperature hardy can be grown throughout the state, while less hardy varieties may be grown most successfully in south central and southeast Kansas. European grapes are used primarily for table grapes and raisins. They require a long growing season and mild winter temperatures and generally are not adapted to Kansas.

American types

Niagara White; table use and wine; large size fruit with good flavor; vigorous and hardy plant

Steuben Blue; table use and wine; concord type; vigorous plants

Fredonia Blue; extra large fruit and thick skin; juicy and good quality; vigorous and hardy vines

Concord Blue-black fruit, the quality standard for juice, jam, and jelly; medium clusters of medium to large berries; greatest problem in Kansas in uneven ripening during hot summers or heavy crop loads.

Reliance Seedless; red; excellent raisins; ripens early mid-season; vigorous and winter-hardy

French-American Hybrids

Foch Blue; wine use; very vigorous and winter hardy

Aurore White; table or wine; vines are hardy and productive

When to Plant

Grape vines should be planted in late March to early April or at least before hot dry summer weather arrives.

Spacing and Depth

Plant them about the same depth as they grew in the nursery, and prune to a single stem three or four buds long.

Space the plants about 8-10 feet apart in the row, close spacing (six feet for example) will result in canes from two or three vines becoming entangled, making pruning difficult. Set two or three vines between wooden posts. Do not set vines against posts that have been treated with a wood preservative. Vines that are set directly under the trellis can be cared for easier with tillage equipment than vines in a crooked row.

Care

Grapes grow well in many different soils, but fertile, deep, and well-drained loams are best. Avoid extremely wet or dry soils. Good drainage is essential. If the soil is not well drained, it is not good grape soil regardless of other desirable characteristics.

Training and Pruning

Grapes require severe annual pruning early each spring to remain productive. Understanding grapevine terminology may be helpful.

Trunk. The main perennial part of the vine.

Cordon (only on Single Curtain system). A horizontal extension of the trunk that can bear spurs and canes.

Shoot. A current season's growth of green wood. Shoots originate from buds on trunk, cordons, canes, or spurs. A shoot always produces leaves and tendrils; it may bear fruit. After leaf fall, mature woody shoots are called canes.

Tendrils. A long, slender, curled structure on shoots that wraps tightly around trellis wire, posts, or other shoots.

Bud. A compressed shoot in a nonactive state. Shoots grow from dormant buds in spring.

Cane. A mature woody shoot after leaf fall. During the dormant season canes are pruned to fruiting canes, fruiting spurs, and renewal spurs, or removed entirely.

Fruiting spur. A cane pruned to three to five buds that produce fruitful shoots. Fruiting spurs are removed in the dormant season following fruiting.

Renewal spur. A cane pruned to one or two buds that produce nonfruitful shoots that will be used as fruiting canes or spurs in the following season.

Grapes flower and produce fruit only on one-year-old canes. The most productive wood is on the 6 to 8 buds closest to the base of the cane. Canes with moderate vigor and about the diameter of a pencil are most productive. So pruning is needed to encourage new canes to develop, eliminate unproductive canes, train fruiting canes, and limit the number of buds on the vine. When done properly, pruning often removes 80 to 90 percent of the wood. Pruning is suggested after the coldest part of winter but before buds swell. February and early March are good times.

Three training systems are recommended for Kansas gardens – the Single Curtain, the Umbrella Kniffin system, and the Four-Cane Kniffin system. All three systems require a two-wire trellis.

The Single Curtain system is best adapted for vigorous grape varieties having good winter hardiness. Less vigorous varieties or those more susceptible to winter injury should be trained to the Umbrella Kniffin system. Both systems are easy to develop and maintain with proper pruning. Also, both systems result in more foliage being exposed to higher light intensity, thus greater production, than the Four-Cane Kniffin system.

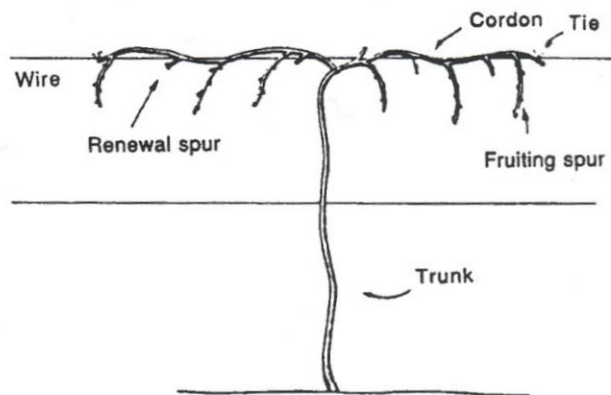


Figure 1. Single Curtain system.

Training begins during the first growing season. After vines are planted and before growth starts, cut back the cane leaving only two buds. Each bud will produce a vigorous shoot. Provide support for the shoots by driving in a seven-foot stake near the vine and loosely tying the shoots to it. The purpose of the first-year training is to develop as strong, straight trunk for the vine. To do this, pinch off the tips of the side shoots as they develop so that all of the plant's energy is directed to the two vertical shoots, one of which will become the trunk. A straight trunk is achieved by tying the shoots to the stake every 8 to 10 inches as they grow. The shoots should also be tied to the lower trellis wire as they reach it. Beginning the second growing season, training practices differ for the three systems. For further information on the training systems refer to the K-State Horticulture Report titled *Grapes* by Frank Morrison or your local extension specialist.

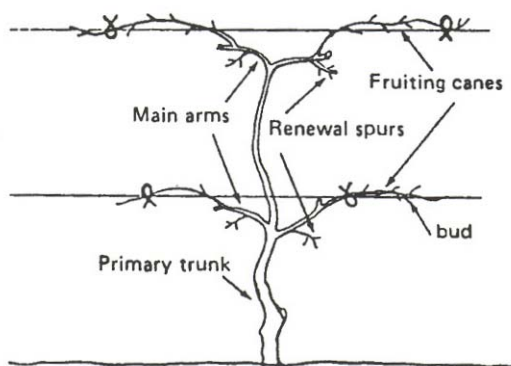


Figure 2. Four-Cane Kniffin system.

Harvesting

Grapes should not be picked until they are fully ripe because they will not develop full flavor if harvested before they are completely mature. There are several indicators of grape maturity. Color, size, sweetness, and flavor of the berry are the most useful indicators.

Depending on the variety, berry color changes from green to blue, red, or white as the grapes approach maturity. Color alone, however, should not be the sole basis for harvesting grapes. Berries of many varieties change color long before they are fully ripe. At maturity, individual berries are full size and slightly less firm to the touch. As a final test, taste a few grapes for sweetness when berry size and color indicate the fruit is approaching maturity.

Cut each cluster from the vine with a knife or pruning shears, handling them as little as possible. Lay the clusters in a basket or other container, using care to avoid crushing. Unlike most small fruits, grapes will keep for several weeks if they are picked carefully and stored in a very cool, well-ventilated place.

Keep grapes away from other kinds of produce because they readily absorb odors.

Purchasing Fresh Grapes

Look for firm, plump, smooth, sweet grapes with a uniform bright color, tender skins, and pleasant aroma. Look for market grapes that have been protected in covered containers. Avoid grapes with blotches of color or that are wet, mushy, wrinkled, shriveled, scarred, leaky or moldy.

Measuring Fresh Grapes

1 pound = about 15 ounces ready to eat = about 2 1/2 cups of grapes

1/2 cup = about 15 to 20 grapes = about 3 ounces by weight = about 80 grams

Storage, Ripening and Preserving

Handle grapes gently so they do not bruise. Refrigerate (preferably at 32° F.) unwashed grapes as soon as possible in a perforated plastic bag. Grapes absorb odors, so store them away from strong-smelling foods. Grapes do not ripen further after harvest. For best quality, use during the first few days.

To freeze: Select fresh grapes. Rinse off dirt. Remove stems. Leave seedless grapes whole, but cut others in half and remove seeds. Pack into freezer bags or containers, leaving 1/2 inch of air. If desired, cover with a cold syrup made with 1 cup water and 2/3 cup sugar. Squeeze out air, seal, date, and freeze.

Preparation and Serving

Just before use, rinse grapes under cool running water. Remove those with bruises and decay. Enjoy them plain! Or serve with other foods, such as cheese, yogurt and cereal. Use as directed in a recipe, such as for a cold salad, dessert, or main dish.

Nutrition Facts

Nutrition facts for one serving, or 12 fresh grapes or 1/4 cup raisins:

Calories 43

Protein 1/2 gram

Carbohydrates 11 grams

Fat 0 grams

Nutrition facts for 1/4 cup raisins:

Calories 124

Protein 1 gram

Carbohydrates 33 grams

Fat 0 grams

Grapes and raisins contribute fiber, B vitamins and essential minerals to the diet. Grapes contain many healthful antioxidants, phytochemicals, and pigments. Eating grapes or grape products can help protect against heart disease and cancer.

RASPBERRIES AND BLACKBERRIES

Raspberries and blackberries are not as available from farm markets and grocery stores as many other fruits, making the fresh fruits a welcome addition to the fruit garden or home landscape. Raspberries and blackberries, also called brambles, begin to bear fruit the year following planting. The roots and crowns live for several years and each year produce a new crop of canes. These canes grow the first summer, bear fruit the second summer, then die. Everbearing plants are an exception in that some fruit will develop the first year. Under favorable conditions and with proper care, bramble plantings may be productive for 8 – 10 years or longer.



Recommended Varieties

Weather conditions should be considered in selecting the kinds of brambles to plant as well as the cultivars (varieties). Black and purple raspberries will grow in all areas of Kansas. Blackberries do not survive extreme low temperatures and may be severely damaged by subzero temperatures, especially thornless and trailing types. All brambles are self-fruitful, thus one cultivar will be adequate for pollination. Purchase certified virus-free stock whenever possible.

Red Raspberry cultivars

Latham Red, medium berry size; medium yields; spring crop; good fruit quality; very cold hardy

Heritage Fruit medium size, firm and holds together; canes strong, upright, and vigorous; canes bear in the fall and again in the spring

Yellow Raspberry cultivars

Fall Gold Medium to large, sweet fruits; amber color, primocane fruiting

Goldie Medium-size, round, firm berries, deep yellow color with pink, blush; little if any sunscald; primocane fruiting; multiple uses

Purple Raspberry cultivars

Brandywine Large, firm, tart, good quality berries; plants are vigorous productive and hardy

Royalty Purple fruit, very large berry size; good quality, sweeter than Brandywine; productive and vigorous; spring crop, late ripening, good cold, hardiness, but buds and wood are tender after buds break

Black Raspberry cultivars

Jewel Large, glossy black fruit, very productive; very vigorous and winter hardy; highly resistant to diseases

Blackberries

Shawnee Thorny, very large fruit, good quality, very productive; early ripening, good cold-hardiness; vigorous; erect canes do not require support

Black Satin Thornless, large fruit, good quality; very productive; late ripening; not cold-hardy; vigorous; canes require support

Chester Thornless Large fruit, good quality; very productive, late ripening, best cold-hardiness of the thornless types; vigorous; canes require support

When to Plant

Blackberries and raspberries are typically planted in early spring.

Spacing and Depth

Red raspberries are planted about 2 feet apart in the row. The row width is generally 6-8 feet apart. When planted in the hill system, the plants are usually set 5-6 feet apart each direction. Black and purple raspberries generally need more space than reds, and are set about 3 feet apart in the row, in rows 8-10 feet apart. If they are planted in hills, the spacing can be 6 feet by 6 feet. Erect blackberries can be spaced the same as black and purple raspberries, whether planted in rows or hills.

Care

While planting, hold the plants in a bucket of water to keep roots from drying out. Set red raspberry plants about 2-3 inches deeper than they were in the nursery row. Other brambles should be planted about an inch deeper. A dark gray line on the upper root and lower stem area indicates the nursery planting depth.

Brambles are usually sold as bare rootstock, so inspect the root system, removing any broken or damaged roots. Spread the roots out when placing them into the planting hole.

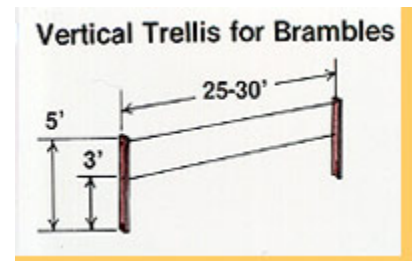
After planting, cut red raspberries down to about an 8 to 12 inch height. Purple and black raspberries should be cut to ground level and the material removed from the growing site for disease control concerns. Blackberries should be cut back to about 6 inches. If the plants were produced by tissue culture, no pruning is needed after planting.

Fertilize about 10 to 14 days after planting. Apply about two ounces of a 5-10-5 fertilizer around each plant. Starting the second season and annually thereafter, fertilize in early spring before growth begins. Apply a balanced fertilizer, such as a 10-10-10, at a rate of 15 to 20 pounds of fertilizer per 1,000 square feet of planting. If using the hill system, apply about one-half cup per plant. Don't fertilize in late summer or early fall as it may force new growth that does not harden off properly for winter.

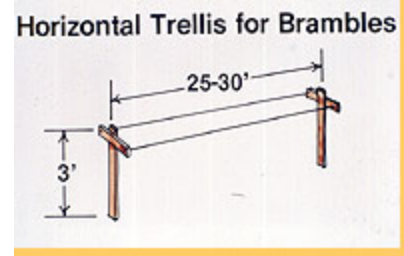
Brambles grow best when some type of support is provided for the canes. Plants may be planted in hills or hedgerows. Red raspberries will readily spread by root suckers while purple and black do not. If using the hill system, plants are grouped around a strong stake or pole, and then trained to grow on the support.

Brambles can also be grown on trellises in rows. One method is to run 2 wires about 18 inches apart horizontally between posts with cross bars. This set of wires should be about three feet off the ground. The plants then grow up between the wires and are supported. This creates a hedge about 18 inches wide or so. This method is popular and does not require any tying of the canes to the supports.

Another option is to run two wires about two feet apart vertically between posts, and the canes are tied to the wire supports. The lower wire should be about three feet off the ground.



Raspberries must be pruned on a regular basis to stay productive. The basic rule to remember is fruit is produced on the cane in the second year of the cane's growth, then that cane dies and should be removed. Pruning needs vary with the type of raspberry being grown, however. Red and yellow raspberries should be pruned twice a year. Early spring pruning should remove weak canes and then a second pruning should be done right after harvest to remove canes that have fruited. Do not summer prune, or what is often called topping, red or yellow raspberries. Another option with everbearing cultivars, such as 'Heritage,' is to grow them for a fall crop only. These types will fruit the first fall of the canes' growth, then further down on the cane the following season. All canes can be removed in late fall so only the fall crop is used. Often yields and berry quality is superior when following this method for these types of raspberries.



Purple and black raspberries require pruning three times a year. In addition to the spring and after harvest pruning mentioned above, they also require summer topping to encourage development of lateral shoots off the canes. All new shoots should be pinched back in summer 3 to 4 inches once they have reached desired height. Lateral branches then develop that will produce fruit.

Regular pruning helps reduce cane blight and other disease concerns. Viruses are also a potential major disease problem. Plants infected with virus will appear stunted, dwarfed, and will be unproductive. Remove and destroy these plants as soon as they are noticed. Always purchase certified nursery stock to help reduce potential virus problems. Do not share plants with other gardeners that have been dug out of gardens and keep wild brambles in the area under control.

Harvesting

In blackberries, the “core” comes off with the fruit, while in raspberries it stays on the plant. The best gauges of maturity are fruit color and ease of separation. Full color often develops before the berries separate easily. If the berries are picked too soon, berry size and flavor will be reduced.

Fresh berries harvested at their peak of quality surpass by far those purchased at retail outlets. Ripe berries will separate easily from the plant. To ensure that none of the fruit gets too ripe, berries should be picked every two or three days. Because hot weather ripens berries quickly, it is sometimes necessary to pick every day.

To harvest, use the thumb, index, and middle fingers to pick the berries. They should be placed (not dropped) directly in a basket or other container. Harvested berries should be handled as little as possible and kept in the shade until they can be placed in cool storage. Under ideal conditions (31° to 32°F and 90 to 95 percent humidity) the fruit will keep for a day or two.

Purchasing Fresh Berries

Look for clean, firm, tender, and plump berries with uniformly bright colored flesh and a natural shine. Look for berries that have been protected in covered containers. Avoid those with blotches of color or that are wet, mushy, shriveled, leaky or moldy.

Measuring Fresh Berries

1 1/2 pounds = 2 pints or 1 quart

1 small basket = 1 pint = 3 1/4 cups whole = 2 1/4 cups sliced = 1 2/3 cup pureed

1 cup sliced = about 5 ounces by weight = about 150 grams

Storage, Ripening and Preserving

(preferably at 32° F.) unwashed berries. They do not ripen further after harvest. Cover and refrigerate

To freeze berries rinse and drain, spread a single layer on shallow trays, and when frozen, package them promptly into containers.

Preparation and Serving

Just before use, rinse berries under cold running water. Delicious fresh! Use as directed in a recipe.

Nutrition Facts

Nutrition facts for 1 serving, or 1/2 cup fresh berries:

Calories 25

Protein 1/2 gram

Carbohydrates 6 grams

Fat 0 grams

All kinds of berries are excellent sources of vitamin C. A good source of dietary fiber and manganese, berries contain many healthful pigments and phytochemicals.

STRAWBERRIES

Green foliage, white flowers, and bright red fruit make strawberries an ornamental addition to a garden. Although strawberries are relatively easy to grow, success depends on careful attention to cultural practices. If proper careful practices are followed, 1 foot of row will produce at least a quart of berries.



Recommended Varieties

Two types are available; spring (June) bearing and everbearing. The best use of everbearing varieties would be for container gardening. In general, they do not produce as well as spring bearing varieties. In choosing spring bearing varieties, consider not only dessert quality but also disease resistance.

Choosing a variety depends on the local environmental conditions. Varieties grown in northeast Kansas may not produce as well in other areas of the state. New varieties should be tested locally before large numbers of plants are ordered.

Spring-bearing varieties are usually the most productive for home gardens and commercial fields. The plants produce one crop per year over a period from mid-May to mid-June, depending on the environment and location. Plant more than two varieties – an early, a mid, and a late season variety – to insure ripe fruits over a longer harvest period.

Earliglow Early season; medium size fruit; excellent flavor; very good berry quality; good freezer quality

Allstar Mid-to late season; large size fruit; good flavor; very good berry quality; good freezer quality

Ever-bearing varieties produce one crop during the normal harvest season and a second crop during late summer and fall. Because of the typically hot weather in July and August, fruit quality may be poor.

Tribute Medium to large size fruit; very good flavor; good freezing quality

Tristar Medium to large size fruit; very good flavor; good freezing quality

When to Plant

Strawberries should be planted in spring as soon as the soil can be worked (mid-March to early April in Kansas).

Spacing and Depth

Try to plant strawberries on a cloudy day or during the late afternoon. Set the strawberry plant in the soil so that the soil is just covering the tops of the roots. Do not cover the crown. After four or five weeks, the plants will produce runners and new daughter plants.



The center plant is set correctly, with the soil just covering the tops of the roots. The plant on the left is set too shallow; the plant on the right too deep.

PLANTING SYSTEMS

The most popular method of growing June-bearing strawberries in Kansas is called the **matted-row system**. Strawberries are planted 18 to 30 inches apart in rows 3 to 4 feet apart. These new daughter plants are allowed to grow into a matted row up to about 2 feet wide. Plants growing beyond this boundary should be removed.

Another growing method, which requires more care, is called the **spaced-row system**. With this system, the daughter plants are spaced no closer than 4 inches apart, with all others pulled out or cut from the mother plant. Yields may be higher and berries may be larger with this system because rows may get too dense in the matted-row method.

When growing everbearing strawberries, the **hill system** is suggested. With this method, all runners are removed so only the mother plant remains. Removing the runners causes the mother plant to develop more crowns and flower stalks. Multiple rows are arranged in groups of two, three, or four plants with a two-foot walkway between each group of rows. Plants are set about one foot apart in multiple rows. Another method of growing everbearing strawberries is to plant them in terraced beds, pyramids, or barrels. These methods will not be as productive as conventional systems, but they have ornamental value.

Care

Strawberries are among the most widely grown fruit in the home garden. Strawberries prefer a well-drained soil, high in organic matter. They need full sun for the highest yields, at least 6 hours per day. Do not plant strawberries where peppers, tomatoes, eggplant, and potatoes have been grown. These plants could harbor *verticillium* wilt, a serious strawberry disease. Strawberries need about one inch of water per week during the growing season.

For the first season, remove flowers as they appear on strawberry plants. This helps develop more runners and a better crop in future years.

Weed control is necessary when growing strawberries. Methods include carefully hoeing, cultivating, and mulching. Cultivate frequently but shallow to avoid damaging roots. Straw can be used as mulch. Herbicides are usually not suggested for small gardens. If using an herbicide, make sure it is labeled for use on strawberries.

Strawberries are best fertilized in early to mid August to stimulate plant growth and increase fruit bud development for the next year's crop. Use ammonium nitrate (33 percent nitrogen) at a rate of 4 to 6 pounds of fertilizer per 1,000 square feet. Do not over fertilize. Overfertilization will cause excessive vegetative growth, reduce yields; increase losses from frost and foliar disease and result in winter injury.

Mulching is suggested in late fall to protect strawberry plants for the winter. Severe cold and frost heaving are two potential problems mulching can help prevent. Apply straw to the planting in late November at a rate of about 2 to 4 bales per 1,000 square feet. This gives a depth of 3 to 4 inches over the planting. Gradually rake straw between the rows as weather warms in spring, but be ready to cover plants if a late frost occurs.

Strawberry plantings will need to be renovated periodically to keep them productive. Immediately after harvest, mow down all the foliage with a power mower so leaves are cut about one inch above the crowns. Rake away all the foliage and debris and remove it from the site to avoid any disease problems. Then spread 10 to 15 pounds of a balanced fertilizer, such as a 10-10-10 or 12-12-12, per each 1,000 square feet of planting area. Using a cultivator, narrow the row of plants to 6 to 12 inches wide. Remove any weeds. If the weather is dry, irrigate the plantings. Make sure to start the renovation process within 7 to 10 days after harvest has finished.

Harvesting

Fruit is ready to pick when it is completely red. White areas on the fruit indicate that it is not fully ripe. The green cap should be left on to keep the fruit firm.

Berries should be picked every other day for best quality. Daily picking may be needed during hot weather, because the fruit will mature quickly and become soft. Berries should be picked early in the day when it is cool and placed in a cool, shady place immediately. Strawberries deteriorate rapidly after picking, so berries not used immediately should be stored at 32 to 40F to retain quality.

Purchasing Fresh Berries

Look for clean, firm, tender, and plump berries with uniformly bright colored flesh and a natural shine. Caps should be fresh, green and intact. Look for berries that have been protected in covered containers. Avoid those with blotches of color or that are wet, mushy, shriveled, leaky or moldy.

Measuring Fresh Berries

1 1/2 pounds = 2 pints or 1 quart

1 small basket = 1 pint = 3 1/4 cups whole = 2 1/4 cups sliced = 1 2/3 cup pureed

1 cup sliced = about 5 ounces by weight = about 150 grams

Storage, Ripening and Preserving

Cover and refrigerate (preferably at 32° F.) unwashed berries. They do not ripen further after harvest.

To freeze berries rinse and drain, spread a single layer on shallow trays, and when frozen, package them promptly into containers.

Preparation and Serving

Just before use, rinse berries under cold running water. Cut off bruises and decay. Remove green leaves and small stem before eating. Delicious fresh! Or slice and enjoy with foods you already eat, such as cheese, yogurt, salads, pancakes, desserts and cereal. Use as directed in a recipe.

Nutrition Facts

Nutrition facts for 1 serving, or 1/2 cup sliced fresh strawberries:

Calories 25

Protein 1/2 gram

Carbohydrates 6 grams

Fat 0 grams

All kinds of berries are excellent sources of vitamin C. A good source of dietary fiber and manganese, berries contain many healthful pigments and phytochemicals.

CULINARY HERBS

Culinary herbs are different from spices. Generally, culinary herbs are fresh or dried leaves while spices are seeds, roots, fruits, flowers, and bark. Culinary herbs usually have a mild flavor while spices tend to have a stronger, pungent flavor.

Most herbs are relatively easy to grow. They require little care and space, have few insect and disease problems, and generally require only moderate fertility levels. Many herbs do very well in containers such as basil, chives, major, and thyme.

Listed below are some of the most popular culinary herbs that do well in Kansas. There are many others, however, that can be grown in Kansas.

Basil

Description

This popular annual herb has dark green or purple leaves and may reach a height of 12 –24 inches. By mid summer, small white flowers are produced on spikes. The beautiful foliage has made this plant a popular addition to the home landscape.



How to Grow

Basil prefers both warm soil and air. It should not be planted in the garden until all danger of frost has passed. It may be easily started from seed. It is also available as small transplants. You can increase your number of plants by rooting basil stems in water. Be sure to thin plants to a spacing of 10–12 inches apart. To promote bushy plants, pinch back growing tips. Also, remove flowers before seed matures.

Harvesting

For fresh use, wait six weeks after planting to begin harvesting the leaves. Make your final harvest before the first frost in fall. For drying, harvest leaves just before the plant produces flowers.

You may want to try potting up a few plants in potting mix and over-wintering them as houseplants in a bright south or west window.

Chives

Description

The chive, a long-lasting perennial, is a member of the onion family. It grows in clumps and reaches a height of 6–12 inches. It produces narrow, hollow leaves and attractive violet, globe-shaped flowers in May or June.



How to grow

This bulbous plant can be propagated by dividing clumps (keep 4–6 bulblets per clump), planting seed, or planting bulbs similar to onion sets. Chives are perennial and will grow for many years. To prevent overcrowding, divide established plants every 2–3 years. Flowers can be removed to encourage foliage growth. In fall, transplant a clump into fresh potting mix and place indoors on a south or west window to enjoy fresh chives throughout the winter months. Allow chive plants to experience a freeze before digging clumps and potting. The resulting plants will be of better quality.

Though this plant is commonly used as a border plant for an herb garden, it is more interesting to group them in clumps rather than in straight rows.

Harvesting

Green leaves give a mild onion-like flavor to many foods and often are blended with other herbs for salads, soups and omelets. Snip leaves throughout the growing season. They may be used fresh, dry, or frozen. The flowers may be harvested too. The bulbs are not used.

Dill**Description**

Dill is an annual plant that reaches 2–4 feet tall with blue-green feathery leaves. The small yellow flowers are arranged in clusters called umbels.

**How to grow**

Dill is easy to grow and will do well in many different soils, though it prefers a well-drained, fertile spot. Grow dill in full sun. Sow seed directly into the garden. Once the seedlings have reached 1–2 inches tall, thin plants to 8–10 inch spacing. Or plant small transplants. Dill self-seeds readily.

Dill will self-sow for the next season if a few plants are left to scatter seeds. Dill provides a soft, lacy background for some of the smaller herbs.

Harvesting

The leaves, flowers, and seed may be used for cooking and flavoring. To harvest flowers, cut when flower heads are in full bloom and allow them to dry. To collect seed, allow plant and flowers to mature, usually 2-3 weeks after flowering. Cut stems with flowers, hang upside down, and collect the seed by placing paper beneath the hung bunches. Dill leaves may be used fresh or dried. Harvest and chop fresh leaves into salads, cottage cheese, dips, soups, and stews. To dry dill, cut stems and leaves before flower set. Use the bag drying or tray drying method. Once leaves are brittle and completely dried, remove stems and store leaves in an airtight container.

Lavender

Description

Lavender, known for its fragrance, is a perennial that may reach 1–3 feet tall with narrow, gray-green foliage. The lavender, violet or pink flower spikes appear in June and July. This popular herb is used for potpourri, sachets, and perfumes and for flavoring some cakes and sweets. It can be effective in ornamental plantings too.



How to grow

Purchase garden transplants, divide established plants, or root stem cuttings (non-flowering side shoots). Choose a sunny, well-drained site in a protected location in the garden. Lavender prefers alkaline, dry soil and it can be left undisturbed for many years. It will not do well in shade. Lavender may need mulching to help it overwinter successfully. Lavender tends to be a short-lived perennial in Kansas.

Harvesting

Cut flower spikes as blossoms begin to open. They may be used in fresh bouquets or dried for potpourri, sachets, and perfume.

Mint

Peppermint, Spearmint, Apple Mint, Pineapple Mint

Description

Mint is an easy to grow perennial plant. There are many kinds of mint. Peppermint has dark green leaves with a reddish stem and lavender flowers. Spearmint has lighter green, pointy leaves and pink flowers. Apple mint has light green foliage and pineapple mint has green leaves that are banded with white. All can grow up to two feet tall and become quite invasive. Their scent is released when brushed against or bruised. Mints are used primarily for flavorings and garnishes.



How to Grow

Mint will grow well in full sun to partial shade and can easily take over a garden, crowding out other plants. For this reason, it is better to plant mint in a separate garden bed or plant it in containers above ground. Space plants two feet apart. Frequent cutting will promote branching. Propagate by dividing clumps.

Harvesting

Just prior to flowering, cut stems one inch above the soil. You may harvest mint two or three times in one growing season.

Oregano

Description

Oregano is a hardy perennial that may need winter protection to survive. It may grow two feet tall with a rounded, sprawling spread of 18 inches. White or pinkish-purple flower spikelets appear in mid to late summer. The cultivar 'Aureum' has golden yellow leaves and develops into an 8–10 inch mound. Use oregano in Spanish, Italian, and Mexican cooking.



How to Grow

Plant oregano in full sun and well-drained soil. The gold leaf variety needs partial shade to help prevent leaf scorch. Plants may be started from seed, cuttings, or crown division. Seed grown plants may not have good flavor. Propagate oregano by stem cuttings or crown division. Space plants 10–12 inches apart. Plants respond well to clump division every 2–3 years. This helps restore vigor and improve flavor.

Harvesting

Leaves can be snipped as needed. For best flavor, harvest leaves just as flower buds form. To dry, cut stems and bag dry or tray dry. When leaves are brittle, remove and separate them from the stem and store in an airtight container.

Parsley

Description

Parsley is a biennial that is usually treated as an annual. This popular, widely grown herb is easy to grow in gardens, containers, and hanging baskets. Parsley forms dense mounds, 6–12 inches tall and 12–15 inches wide. With its bright green leaves and compact growth, parsley is useful in landscape beds too.



There are two forms. The moss-curved or triple-curved parsley is frequently used as a garnish, and the flat-leaf or Italian parsley is used for flavoring. Both are edible and high in vitamins.

How to Grow

Start plants from seed or purchase transplants. Seed should be started very early indoors or in a coldframe. The seed germinates better if it is soaked in water for 24 hours before planting. Parsley will grow well in full sun or partial shade. Plants should be spaced 8 inches apart.

Harvesting

Leaves can be snipped anytime during the growing season. They can be used fresh or dried for future use.

Rosemary

Description

Rosemary is a small, perennial evergreen shrub that is not hardy in Kansas. The plant is very fragrant and valuable in cooking and scenting. The narrow, leathery evergreen leaves are dark green above and gray underneath. It produces clusters of pale blue, white, or pink flowers in spring.



How to Grow

Purchase garden transplants or propagate from stem tip cuttings. Plant rosemary in a sunny, well-drained site and space them one foot apart. Rosemary also grows well in a container. Keep plants evenly moist. Do not allow them to dry out. In fall, plant in fresh potting mix and bring indoors to enjoy throughout the winter.

Harvesting

Prune stems throughout the season as needed. Use fresh or dried leaves in cooking. It is often mixed with other herbs.

Sage

Description

Sage is a shrubby perennial that may reach 18–24 inches tall, with a sprawling growth habit. Common sage has gray-green, wooly leaves. There are several cultivars: 'Tricolor' has white and purple marbled leaves with pink margins, 'Icterina' has variegated gold and green leaves, and 'Purpurascens' has purple foliage. Lilac blue flowers appear in early to midsummer, typically the second year. Because of its attractive flowers and foliage, it is a good companion plant to lavender, silver thyme, and lady's mantle.



How to Grow

Sage can be grown from seed, stem cuttings or crown division. Divided plants may take a long time to recover. Plant sage in a sunny location with well-drained soil. Root rot can be a problem in heavy, wet soils. Space plants 15–18 inches apart.

Harvesting

Leaves can be harvested before blooming begins. Or cut stems 6–8 inches long and allow to dry.

Thyme, Common

Description

Thyme is a widely used culinary herb. There are several varieties, but the most popular is common thyme. It is a short perennial, growing 4–8 inches tall with stiff woody stems and small gray-green leaves. In summer, fragrant, lilac-pink flowers appear in clusters, which attract many bees.



How to Grow

For best results, plant thyme in full sun in loose and well-drained soil. Thyme becomes woody and often needs to be replaced every 3–4 years. Upper stems may be damaged over the winter and should be pruned back to new growth in spring.

Harvesting

During full bloom, cut 5–6 inch stems and allow them to air dry. You may harvest more than once in a growing season. After leaves are thoroughly dry and brittle, remove them from the stem and store in an airtight container. Thyme is often mixed with other herbs.

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APPENDIX A

HANDOUTS FOR INTRODUCTORY MEETING

Complete this survey at the **first** meeting.



***Gardening with Older Adults for Health and Nutrition
Participant Survey***

Please help us by answering the following questions. *Check the best answer.*

Date: _____ Your name: _____

1. Do you garden now? Yes _____ No _____

2. What types of fruits, vegetables or culinary herbs do you grow?

3. How often are you physically active for 30 minutes or more a day?
Less than 1 day per week _____ 1-2 days per week _____
3-4 days per week _____ 5 or more days per week _____

4. How often do you eat more than one kind of vegetable or fruit per day?
Never _____ Sometimes _____ Often _____ Usually _____ Always _____

5. How many cups of fruits and vegetables do you usually eat per day?
Less than 1 per day _____ 1-2 per day _____ 3-4 per day _____
4-5 or more per day _____

6. How many people are in your household?
One _____ Two _____ More than two _____

7. What is your age?
Younger than 60 years _____ 60-70 years _____ 71-80 years _____
81 years or better _____

8. What is your gender? Male _____ Female _____

9. What is your race/ethnicity?
White, non-Hispanic _____ White, Hispanic _____
African-American/Black _____ Asian-American _____
Native American _____ Other _____

Thank you for your time! Please return this form to your program leader.

Note to presenter: What county did you teach this program in? _____ Please return surveys to Dr. Mary Meck Higgins, Department of Human Nutrition, 202 Justin Hall, Manhattan, KS 66506 phone 785-532-1671; e-mail: mhiggins@ksu.edu

Gardening for Health and Nutrition



Have you noticed how just being around plants makes you feel better? Or how excited you are when you pick the season's first vine-ripened tomato? How do you feel when you share a bouquet of flowers from your garden with a friend? With a little planning and creativity, everyone can garden.

Gardening is a source of personal satisfaction and pride, providing pleasure and opportunity for relief from daily stress. Gardening is useful in relieving stress through providing a calming, restorative experience. The sharing of plants, flowers, or produce can open doors of social interaction in welcoming, non-threatening ways.

Gardening provides physical benefits as well. It offers opportunities for mild exercise. Weak muscles can be strengthened and limited joint flexibility ranges can be increased through the lifting and reaching motions of gardening. Physical stamina and other skills including balance and coordination can be improved.

Fruit and vegetable gardening provides nutritional and economical benefits, too. Vegetables grown in the home garden are fresher, may have better nutrient values, and usually cost less than vegetables sold in markets.

Yes, you can do it!

Changes that occur as we age may make traditional gardening too challenging. By rethinking your garden design and techniques, you can garden safely and comfortably for a lifetime. Focus on minimizing barriers in your garden, while maximizing your abilities. One strategy is to adapt the garden with paving, containers, raised beds, trellises, and other structures that position plants within easy reach. Another is to use adaptive tools and equipment. By combining these two strategies with careful plant selection, you can create a garden that suits your own abilities, needs, and interests. Here are a few examples to consider:

- If getting around is difficult, locate your garden in an easily accessible area so that all parts are easy to reach and your plants can be tended from a path.
- Place stools, garden chairs, or benches at strategic places in the garden, so that you have many opportunities to rest as you garden.
- Make gardening tasks much easier by choosing the right tools for you, such as lightweight ones. Purchase brightly colored tools, or paint them with bright colors, so they are easier to see.
- Consider a vertical garden! Avoid stooping and bending by growing climbing, rambling plants—such as cucumbers and squash—on trellis-type supports.
- Use raised beds to reduce the need to bend or kneel. Provide ledges on raised beds for sitting.

Contact your county extension office for information on gardening in your area. Visit your library and the Internet for more resources on how to adapt your garden.

Prepared by Candice A. Shoemaker, Ph.D., Associate Professor, Department of Horticulture, Forestry, and Recreation Resources and Mary Meck Higgins, Ph.D., R.D., L.D., CDE, Assistant Professor, Department of Human Nutrition. August 2003. **Kansas State University Agricultural Experiment Station and Cooperative Extension Service, Manhattan, Kansas.** Contents of this publication may be reproduced for educational purposes. All other rights reserved. For more information about healthy eating, contact your local extension office. Kansas State University is an equal opportunity provider & employer. This material was funded by USDA's Food Supplemental Nutrition Assistance Program. **The Food Assistance Program can help people of all ages with low income buy nutritious foods for a better diet. To find out more, call 1-888-369-4777.**



Gardening – Easy to Do and Good for You too!



Gardening is a type of physical activity that is good for people of any age. This gardening program is going to focus on two types of physical activities that can help older adults, like yourself, gain health benefits.

1) Endurance exercises, such as gardening, get your heart working harder than normal. When doing endurance exercises you should feel like you are breathing harder than when you are at rest but you should still be able to carry on a conversation. You should do

endurance exercises, like gardening, for at least 30 minutes on 5 or more days each week. You don't have to do the 30 minutes all at once though. You can do 10 minutes at a time for 3 times in your day – it is that easy to do!

Endurance exercises help keep you healthy. By building up your endurance, many other things in your life will be easier to do. For example, you will have an easier time climbing stairs, carrying groceries, and getting in and out of the bathtub. Endurance exercises also help prevent or delay the onset of diseases such as diabetes, colon cancer, and heart disease. Endurance exercises can help you feel better if you have arthritis.

The bottom line is that endurance exercises, like gardening, are very good for you and your health. So, be active for 30 minutes on at least 5 days of the week. Remember, being active for 30 minutes each day is easy – you don't have to do it all at once!

2) Stretching exercises are easy to do and help keep your muscles and joints limber. By stretching regularly, your risk of falling and the chance of getting injured are lowered. You will be better able to do endurance exercises, like gardening, if you are limber. A simple, easy-to-use guide for tips on how to be a regular stretcher is shown on the reverse side.

Getting Your Body Ready to Garden

Question	Answer
Why should I stretch?	<ul style="list-style-type: none"> • Stretch to keep your muscles and joints limber so that you can do all types of gardening that you enjoy. • Stretch to lower your risk of falling and getting injured.
How do I stretch?	<ul style="list-style-type: none"> • Move slowly into your stretch. • <u>Do not jerk</u> into position. • <u>Do not bounce</u> when you stretch. • <u>DO</u> hold your stretch at the point that you feel mild discomfort.
Should I feel pain when I stretch?	<ul style="list-style-type: none"> • Absolutely <u>not</u> – you should only feel mild discomfort when you stretch.
How long should I hold a stretch?	<ul style="list-style-type: none"> • Hold each stretch for 15 seconds. Repeat two times.
How many times in a week should I stretch?	<ul style="list-style-type: none"> • Stretch 3 to 7 times a week.
What equipment do I need to stretch?	<ul style="list-style-type: none"> • Only a towel and a chair are needed to stretch.

Prepared by Nancy Gyurcsik, Ph.D., Assistant Professor, Department of Kinesiology and Community Health Institute. August 2003. **Kansas State University Agricultural Experiment Station and Cooperative Extension Service, Manhattan, Kansas.** Contents of this publication may be reproduced for educational purposes. All other rights reserved. For more information about healthy eating, contact your local extension office. Kansas State University is an equal opportunity provider & employer. This material was funded by USDA's Food Supplemental Nutrition Assistance Program. **The Food Assistance Program can help people of all ages with low income buy nutritious foods for a better diet. To find out more, call 1-888-369-4777.**



Eat Plenty of Fruits and Vegetables



Fruits and vegetables provide many unique health benefits. Plus, you get to enjoy their wonderful tastes, textures and colors. Choose brightly colored fruits and vegetables and eat a variety.

Good Nutrition Value

Most fruits and vegetables are naturally low in calories and fat, and high in carbohydrates. They contain no cholesterol. Some are good sources of soluble and in-soluble fiber.

Fruits and vegetables have many healthful vitamins and minerals. Other chemicals are in plants that promote health and decrease the risk of many diseases. The term given to these compounds is phytochemicals (phyto means plant). Phytochemicals differ from vitamins or minerals, since a lack of them does not cause a deficiency disease.

Health Benefits

Eating fruits and vegetables helps decrease the risk of having poor health and of getting cancer, heart disease, high blood pressure, pulmonary diseases, stroke, cataracts, age-related macular degeneration of the eye, constipation and diverticulosis.

Eating fruits and vegetables may help people live longer, because the antioxidants these foods contain help slow down the aging process. Antioxidant-rich fruits and vegetables help protect cells from damage. Eating fruits and vegetables may also help protect mental capacity in older adults.

Fruits and vegetables with high levels of antioxidants include prunes, raisins, blueberries, blackberries, garlic, kale, strawberries, spinach, raspberries, Brussels sprouts, plums, alfalfa sprouts, broccoli florets, beets, oranges, red grapes, red bell peppers, cherries, kiwi fruit, pink grapefruit, white grapes, onion, corn, eggplant, cauliflower, and peas.

Eat Plenty of Fruits and Vegetables

Enjoy Many Servings Daily

- Each day, try to have two to four cups of vegetables and 1 1/2 to 2 1/2 cups of fruits.
- Try choosing a vitamin C-rich and a high fiber fruit or vegetable each day, a vitamin A-rich serving every other day, and several servings of cruciferous (cabbage-family) vegetables each week.
- Even when eating a meal away from home, order a portion or two of fruits and vegetables.
- When cooking vegetables, remove them from heat just when they are tender enough to chew. You will retain more nutrients if you do not overcook them. If you have trouble chewing, try chopping or shredding your vegetables.
- The sodium content of most canned vegetables is high. Buy "no added salt" varieties if you are trying to reduce your sodium intake.
- The fiber content of fruits and vegetables changes depending on how they are prepared. For example: a piece of fresh fruit with skin has more fiber than the same fruit without skin, the same kind of fruit that is cooked or canned has less fiber, and its juice would have the least fiber.



Eat Plenty of Fruits and Vegetables

Reduce Waste and Expense

- Buy fresh fruits and vegetables in season, in the amount you will use in three to six days. Buy both ripe and not-so-ripe ones, so that they will last a few days longer.
- Compare prices. Buy the cheapest brand.
- Buy canned, frozen or dried fruits and vegetables, and 100% juices, for later use, after you've eaten the fresh ones.
- Store fruits and vegetables where you will see them, so you will remember to eat them.

Handle Produce Safely

- Rinse fresh fruits and vegetables under running water. Before you eat the outer skin or peeling, you may want to scrub it with a clean dish brush. Do not use soap.
- Throw away the outer leaves of leafy vegetables, such as lettuce and cabbage.
- Store cut, peeled fruits and vegetables in the refrigerator.
- Avoid eating fruits and vegetables that look brownish, slimy or dried out.
- Wash your hands with warm water and soap for at least 20 seconds before and after handling fresh fruits or vegetables.

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Prepared by Mary Meck Higgins, Ph.D., R.D., L.D., CDE, Assistant Professor, Department of Human Nutrition. **Kansas State University Agricultural Experiment Station and Cooperative Extension Service, Manhattan, Kansas.** Contents of this publication may be reproduced for educational purposes. All other rights reserved. For more information about healthy eating, contact your local extension office. Kansas State University is an equal opportunity provider & employer. This material was funded by USDA's Food Supplemental Nutrition Assistance Program. **The Food Assistance Program can help people of all ages with low income buy nutritious foods for a better diet. To find out more, call 1-888-369-4777.**



Fix it Fresh!



Fix it Fresh!



Recipes for Main Dishes																	
Recipe Name from the <i>Fix It Fresh! Fruits and Vegetables Recipes Series</i>	Specific fruit, vegetable or culinary herb used in the recipe																
	Beans	Berries	Broccoli	Brussels sprouts	Cabbage	Carrots	Cauliflower	Culinary herbs	Eggplant	Grapes	Lettuce	Onions	Peas	Peppers, Sweet Bell	Radishes	Spinach	Tomatoes
Beef, broccoli & cauliflower stir-fry			•				•					•		•			
Chicken, fresh vegetables and pasta salad								Chives; parsley			•	•				•	•
Chicken quesadillas														•			
Chicken, rice and fruit salad								parsley		•	•						
Garden chili												•		•			•
Garden vegetables with beef and rice						•		oregano				•				•	•
Italian vegetable casserole			•			•		oregano; rosemary				•				•	
Meaty stuffed potatoes			•			•						•					
Tempting tostadas						•					•	•					•

Recipes for Side Dishes (Hot)

Recipe Name from the <i>Fix It Fresh! Fruits and Vegetables Recipes Series</i>	Specific fruit, vegetable or culinary herb used in the recipe																
	Beans	Berries	Broccoli	Brussels sprouts	Cabbage	Carrots	Cauliflower	Culinary herbs	Eggplant	Grapes	Lettuce	Onions	Peas	Peppers, Sweet Bell	Radishes	Spinach	Tomatoes
Green beans and peppers with lemony dressing	•							parsley				•	•				
Green beans and 'toes	•																•
Grilled tomato kebabs								oregano									•
Italian eggplant casserole								Basil; oregano	•								•
Potato spinach casserole												•	•		•	•	
Rice with raisins and carrots						•						•					
Saucy vegetable pasta						•		basil				•	•				•
Seasoned green beans	•											•	•				
Zesty peas with carrots						•						•	•				

Recipes for Side Dishes (Cold)

Recipe Name from the <i>Fix It Fresh! Fruits and Vegetables Recipes Series</i>	Specific fruit, vegetable or culinary herb used in the recipe																
	Beans	Berries	Broccoli	Brussels sprouts	Cabbage	Carrots	Cauliflower	Culinary herbs	Eggplant	Grapes	Lettuce	Onions	Peas	Peppers, Sweet Bell	Radishes	Spinach	Tomatoes
Bulgur garden salad								Parsley; mint				•		•	•		•
Cauliflower salad with citrus dressing							•				•			•		•	
Coleslaw					•	•						•					
Creamy cucumber salad dressing								dill				•					
Crisp cucumber salad														•			
Fresh cucumber salad with mustard chive dressing								chives			•			•		•	•
Fresh fruit and carrot salad						•											
Fresh fruity spinach salad		•										•				•	
Fresh salsa with black beans												•		•			•

Recipes for Side Dishes (Cold)																	
Recipe Name from the <i>Fix It Fresh! Fruits and Vegetables Recipes Series</i>	Specific fruit, vegetable or culinary herb used in the recipe																
	Beans	Berries	Broccoli	Brussels sprouts	Cabbage	Carrots	Cauliflower	Culinary herbs	Eggplant	Grapes	Lettuce	Onions	Peas	Peppers, Sweet Bell	Radishes	Spinach	Tomatoes
Garden orchard salad			•			•	•					•					
Garlic carrot salad						•		parsley				•					
Lemon-dilled broccoli and carrot salad			•			•		dill									
Red and yellow pepper dressing											•			•		•	
Tangy crisp vegetable and pasta salad			•			•						•		•	•		•
Tangy garden relish												•		•			
Tomato and crusty bread salad								basil				•		•			•
Vegetable burrito			•			•	•					•		•			

APPENDIX B

HANDOUTS FOR LESSONS ON BASIC GARDENING

Vegetable Crop Information Table

Crop	Type of Planting	Days to First Harvest	Plants or Seeds Per 100' Row	Days to Germinate	Optimum Temperature (F)	Depth of Planting (In.)	Avg. Spacing Within Row (In.)	Avg. Spacing Between Rows (In.)	Frost Resistance
Asparagus	Perennial (Crowns)	2nd Season	75	—	—	8	18	48	Hardy
Asparagus	Seed (Transplant)	4th Season	2 oz.	10-20	65-75	1	3	6	Hardy
Rhubarb	Perennial (Crowns)	2nd Season	30	—	—	1	36	35-48	Hardy
Beans Snap	Seeded	50-60	½ lb.	5-8	70-85	2	3-4	36	Tender
Beans—Lima	Seeded	65-75	½ lb.	5-8	75-85	2	4-8	36	Tender
Beets	Seeded	55-65	2 oz.	7-10	50-60	½	2-4	18	Half-Hardy
Broccoli	Seed or Transplant	60-80*	½ oz. or 75	(6-8)	(50-60)	(½)	18-24	36	Hardy
Brussels Sprouts	Seed or Transplant	85-95*	½ oz. or 100	(6-8)	(50-60)	(½)	12-18	36	Hardy
Cabbage	Seed or Transplant	65-80*	½ oz. or 75	(6-8)	(50-60)	(½)	12-18	36	Hardy
Chinese Cabbage	Seeded	80-90	¼ oz.	5-7	55-70	½	10-12	36	Hardy
Carrots	Seeded	70-80	1 oz.	10-12	55-70	½	2-3	18	Half-Hardy
Cauliflower	Seed or Transplant	85-100*	½ oz. or 75	(6-8)	(55-70)	(½)	18-24	36	Half-Hardy
Cucumbers	Seed or Plants	60-65	½ oz.	5-8	75-85	½-1	10-48	48-72	Very Tender
Eggplant	Transplants	75-90*	50 plants	(8-12)	(75-85)	—	18-24	36	Very Tender
Garlic	Sets	140-160	3 lbs.	—	—	1	4-6	18-36	Hardy
Horseradish	Roots	Fall	75-100 roots	—	—	3-4	12-18	36	Hardy
Kale	Seeded	60-90	1 oz.	6-9	50-60	½	2-4	36	Hardy
Kohlrabi	Seed or Transplant	60-75	½ oz.	(6-8)	(50-60)	(½)	5-6	18-24	Hardy
Lettuce (Seed)	Seeded	45-50	½ oz.	6-8	50-70	½	2-4	18-24	Half-Hardy
Lettuce (Plants)	Transplants	35-45	100-200 plants	(6-8)	(50-70)	(½)	2-4	18-24	Half-Hardy
Head Lettuce	Seed or Transplants	60-85*	1½ oz. or 75	6-8	60-70	½	12-15	18-24	Half-Hardy
Muskmelon	Seed or Plants	80-90	½ oz.	7-12	75-85	1-1½	48-72	48-72	Very Tender
Mustard	Seeded	50-60	¼	6-8	50-60	½	2-4	18-24	Hardy
Onion (Sets)	Sets	100-120	2 qts.	—	—	1½-2	3-4	12-24	Hardy
Onion (Plants)	Transplants	100-120*	300 plants	—	—	1½-2	3-4	12-24	Hardy
Okra	Seeded	50-60	2 oz.	6-12	75-85	½	18-24	36	Tender
Parsley	Seeded	60-70	½	8-10	55-70	½	2-4	18-24	Half-Hardy
Parsnip	Seeded	Fall	½ oz.	10-12	55-70	½-½	3-4	18-24	Half-Hardy
Peas	Seeded	60-80	1 lb.	7-10	50-65	2	1-2	12-24	Hardy
Peppers	Transplants	65-80*	50 plants	(10-14)	(75-85)	(½)	18-24	36	Tender
Potatoes	Tuber Pieces	70-90	10 lbs.	—	50-60	2-3	8-12	36	Half-Hardy
Pumpkin	Seeded	110-130	1 oz.	7-10	75-85	1	72-90	72-90	Half-Tender
Radish	Seeded	25-30	1 oz.	4-6	50-60	½	2-3	12-18	Hardy
Rutabaga	Seeded	90-120	½ oz.	5-10	50-60	½	4-6	18-24	Hardy
Salsify	Seeded	140-150	1 oz.	8-12	55-70	½	2-3	12-18	Half-Hardy
Spinach	Seeded	40-45	2 oz.	9-12	55-70	1	2-3	12-18	Half-Hardy
Squash—Summer	Seeded	50-55	1 oz.	7-10	75-85	1	36-48	48-72	Very Tender
Squash—Winter	Seeded	50-55	1 oz.	7-10	75-85	1	60-72	96	Very Tender
Sweet Corn	Seeded	80-100	½ lb.	6-8	70-80	2	14-18	36	Tender
Sweetpotatoes	Plants	130-140	75-100 plants	—	—	—	12-16	36-48	Very Tender
Swiss Chard	Seeded	50-60	1 oz.	9-12	55-70	½-1	6-8	18-24	Half-Tender
Tomato	Transplants	70-85	30-60 plants	(7-10)	(75-85)	(½)	24-48	36-48	Tender
Tomato	Direct Seeded	80-95	¼ oz.	7-10	75-85	½	24-48	36-42	Tender
Turnips	Seeded	45-65	1 oz.	5-10	60-70	½	3-4	12-18	Hardy
Watermelon	Seeded	80-90	1 oz.	8-12	80-90	1-2	72-90	72-90	Very Tender

* From date of transplanting.
 () = Seeding information for hotbed or greenhouse.



Seeding and Planting Calendar

Plant **Harvest**

MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV
		Beans (Snap)	Beans (Snap)	Beans (Snap)	Beans (Snap)	Beans (Snap)		
		Beans (Lima)	Beans (Lima)	Beans (Lima-Bush)	Beans (Lima-Bush)			
		Beans (Lima)	Beans (Lima-Pole)	Beans (Lima-Pole)				
Cabbage		Cabbage	Cabbage	Cabbage			Cabbage	
Collards	Collards	Collards						
Chard	Chard	Chard						
	Cucumbers	Cucumbers	Cucumbers	Cucumbers				
Carrots	Carrots	Carrots	Carrots	Carrots			Carrots	
Broccoli	Broccoli	Broccoli	Broccoli	Broccoli			Broccoli	
Endive	Endive	Endive	Endive	Endive			Endive	
Cauliflower	Cauliflower	Cauliflower	Cauliflower	Cauliflower			Cauliflower	
	Eggplant	Eggplant	Eggplant	Eggplant				
		Kale	Kale	Kale			Kale	
	Melons	Melons	Melons	Melons				
Lettuce	Lettuce	Lettuce	Lettuce	Lettuce			Lettuce	
	Lettuce	Lettuce						
	Peppers	Peppers	Peppers	Peppers				
Potatoes	Potatoes	Potatoes	Potatoes	Potatoes			Potatoes	
	Okra	Okra	Okra	Okra				
Radish	Radish	Radish	Radish	Radish			Radish	
	Pumpkins	Pumpkins	Pumpkins	Pumpkins			Pumpkins	
	Salsify	Salsify	Salsify	Salsify			Salsify	
Onions	Onions	Onions	Onions	Onions				
Onion Sets	Green Onions	Green Onions						
Peas	Peas	Peas	Peas					
Spinach	Spinach	Spinach	Spinach	Spinach			Spinach	
	Sweet Potatoes	Sweet Potatoes	Sweet Potatoes	Sweet Potatoes			Sweet Potatoes	
	Sweet Corn	Sweet Corn	Sweet Corn	Sweet Corn				
	Squash	W. Squash	Squash	Squash	Winter Squash			
	Tomatoes	Tomatoes	Tomatoes	Tomatoes	Tomatoes			
Turnips	Turnips	Turnips	Turnips	Turnips	Turnips		Turnips	
	Beets	Beets	Beets	Beets	Beets		Beets	

PLANNING A GARDEN



Selecting the Garden Site

- Vegetable plants grow best in well-drained, fertile soil. Compost or manure spread over the garden area will improve fertility and soil structure.
 - Level areas are preferable.
 - Vegetable plants like plenty of sun.
 - Site the garden near to your home if possible.
-
- Avoid:
 - Windy locations
 - Locations too near structures or trees that will shade your garden or tree roots that will compete for water and nutrients
 - Low spots or areas at the base of a hill – these areas tend to collect cold air and are often flooded after rain.

Selecting What to Grow

- What do you and your family like to eat? Make a list of your family's favorites, ranked in order of preference to use as a guide in deciding what and how much to plant.
- How much space is available? Some plants such as beans, peppers, tomatoes, lettuce, and radish are well adapted for growth when space is limited. Others such as sweet corn, cucumbers, pumpkins, and melons require more space for growth.
- Successive plantings of some crops such as beans will give you a longer harvest period and increase your yield.
- Late season crops can be planted where early season crops had been.
- Select seed appropriate for Kansas (hardiness zone 5).
- Use varieties that have performed well in past years for you or other gardeners you know.
- Consider factors such as disease resistance, yield, maturity date, size, shape, color, and flavor when choosing varieties.

Designing the Layout

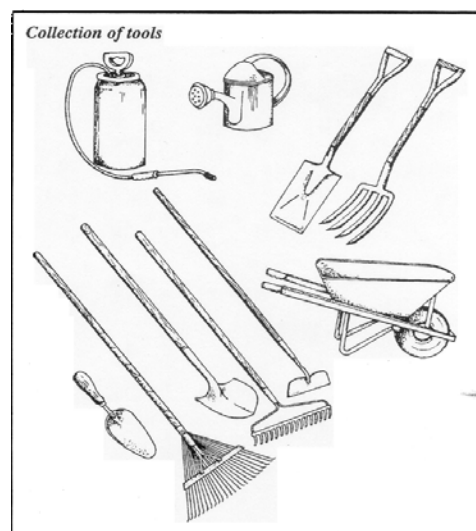
Draw your garden space, to scale (ordinary graph paper works well), and plan the garden based on what you selected to grow. Remember you may use the same space for two crops if you grow early season and late season crops. Having a plan is also helpful when ordering seeds and plants.

Prepare a Planting Guide

- The *Seeding and Planting Calendar* and *Vegetable Crop Information Table* handouts are useful tools in preparing a planting guide. Another excellent source of information is the seed pack itself.
- Make a list of your crops and indicate when seeds should be sown either indoors prior to transplanting out in the garden or directly in the garden, and which you will start from purchased transplants.

Tools and Supplies

- While several items are essential to raise a garden, it is not necessary to have a lot of equipment.
- If your friends have gardens, you might share equipment and supplies.
- Select supplies according to the size of your garden.
- Suggested tools for the gardener are a spading fork or shovel, hoe, trowel, small sprayer, wheelbarrow, and sprinkling can.
- General gardening supplies include stakes, labels, string, yardstick, fertilizer, and compost or manure.



References and tool image: Kansas State University Research and Extension Master Gardener Manual

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PREPARING THE GARDEN



Soil Testing

The first step in preparing your garden is having a soil test done to determine the pH and nutrient content. Check with your local Extension specialist for soil testing information.

Soil Improvement with Organic Matter

Organic matter is an effective way of improving all kinds of soil. It is beneficial to add organic matter every few years. Commonly used materials are:

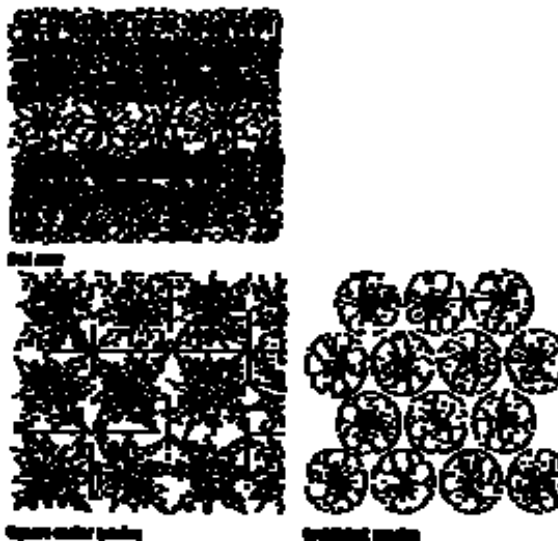
- Stable manure at 50 to 100 pounds per 100 square feet.
- Poultry and sheep manure at 10 to 20 pounds per 100 square feet.
- Rotted sawdust. Use sawdust in your compost pile, and then apply it to the garden at 3 to 4 bushels per 100 square feet.
- Compost. Compost is decayed plant material. Apply 50 to 100 pounds per square feet.
- Feedlot manure at 10 to 20 pounds per 100 square feet.

Tilling the Soil

- Most gardeners plow or spade their soil in the spring. If you have heavy soils (a lot of clay), you may want to till in the fall to allow winter freezes to mellow the clods.
- Remember – don't work your soil when it is too wet! As a rule, soil is too wet to work if you can press a handful of it into a muddy ball. Working a soil when it is too wet can destroy soil structure.
- Be sure to till and add any fertilizers, lime, sulfur, or other amendments several weeks prior to planting to allow time for proper incorporation into the soil.

Planting Methods

- Traditional row planting is common with large garden areas.
- If space is limited (or even if it isn't) more intensive planting practices should be considered such as
 - Square foot spacing uses a grid like pattern of squares each holding one plant at the center of the square
 - Banded rows or beds have rows laid out as wide bands, usually 3 to 4 feet wide maximum to allow for ease in working or harvesting
 - Vertical gardening is an efficient way to get a lot into a small area since the plants grow up instead of out. Vegetables such as pole beans, cucumbers, etc. can be grown on lines, poles, netting, or trellises
- Interplanting is simply planting two or more compatible crops in the same row, bed, or area at the same time. A good example of this method is the "three sisters" method used by the Iroquois Indians. 4 to 5 corn stalks are planted in a hill, when a few inches tall 3-5 pole type bean seeds are planted in each hill along with two pumpkin or squash vines. As the corn grows, the beans use it for climbing supports. The beans add nutrients in the form of nitrogen back into the soil and the pumpkin or squash choke out most of the weeds.



References: Kansas State University Research and Extension Master Gardener Manual; Planning and Preparing and Maintaining a Vegetable Garden

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MAINTAINING THE GARDEN



Watering the Garden

- As a general rule, vegetable plants need about one inch of water each week. BUT the stage of growth – seed, seedling, fruiting plant – and rooting depth are important to consider when watering.
- Apply the needed amount of water all at one watering instead of a little each day.

A little each day only wets the surface and doesn't encourage deeper roots.

- Allowing the top couple of inches of soil to dry out before watering again encourages deeper roots too.
- A wide range of equipment is available including watering cans, garden hose with fan nozzle or sprinkler nozzle, soaker hose, sprinklers, drip irrigation, or trickle equipment. What you use depends on your preference and how much you would like to spend.
- Watering in the morning instead of evening allows the leaves to dry faster thus reducing disease problems since wet plants promote fungus infections.

Mulching

Mulching is an important practice that is often overlooked. A mulch can:

- conserve soil water.
- control weed growth.
- keep soil temperature uniform.
- reduce frost damage to fruit.
- add organic material to the soil.

Types of materials often used as mulch are:

- straw
- grass clippings
- compost
- leaves
- shredded newspapers
- black plastic



Weeding and Cultivating

Weeds are a natural garden competitor. They compete with vegetable plants for water, nutrients, and space.

Control methods include:

- cultivation which disrupts the weeds life cycle
- hand weeding
- mulching between rows to prevent their growth
- close spacing of the vegetable plants or intensive gardening methods which tends to choke the weeds out.

Herbicides are not recommended for the home gardener. Different herbicides will kill different plants and while safe for use on the weeds affecting one crop they may be deadly to the plant next door.

Fertilization

The addition of organic matter will ensure that some fertilizer nutrients are in the soil. You may need to add commercial fertilizer as well. The nutrients most frequently lacking for growth are nitrogen (N), phosphorous (P), and potassium (K).

- N – This nutrient element provides dark green color in plants. It promotes rapid vegetative growth.
- P – This nutrient promotes early root formation, gives plants a rapid, vigorous start, and hastens blooming and maturity.
- K – This nutrient hastens ripening of fruit, aids in disease resistance, and promotes general plant health.

References: Kansas State University Research and Extension Master Gardener Manual; Planning and Preparing and Maintaining a Vegetable Garden

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TEN WAYS TO IMPROVE GARDEN WATER USE

1. *Water deeply*, but no deeper than the root zone of the plant.
2. *Water slowly*. Reduce the flow.
3. *Water infrequently*, but thoroughly. Adjust sprinkler equipment for a larger water droplet size to help reduce evaporation. Frequent shallow watering causes plant roots to concentrate close to the surface, making the plant more susceptible to water fluctuations.
4. Loosen the soil surface and *use mulches*. Most mulches help to keep soil surfaces loose and receptive to water absorption.
5. Follow directions for operating and maintaining all irrigation systems. Check regularly for leaks, malfunctions, or worn parts.
6. Keep your garden well weeded to eliminate competition for water. Consider removing surplus plants from overcrowded beds to ease water demands.
7. Use wide rows with plants closer together, which reduces soil water evaporation.
8. Water early in the morning when humidity is the highest for reduced evaporation.
9. Avoid watering during windy weather.
10. Locate your garden away from trees that might compete for water.

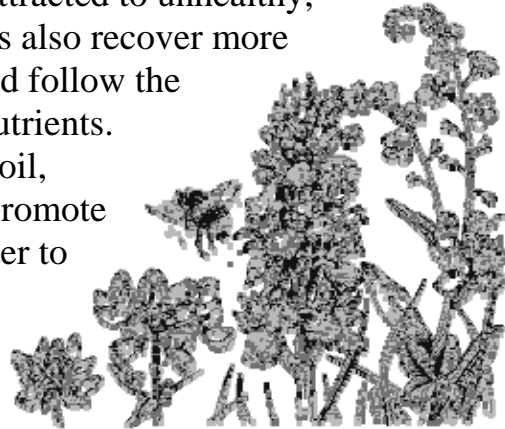


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CHECKLIST OF GOOD GARDENING PRACTICES

- **Create a "healthy" soil.** Many insects are attracted to unhealthy, poorly growing plants. Poorly growing plants also recover more slowly from insect injury. Have a soil test and follow the recommendations to supply a full range of nutrients. Adding extra fertilizer won't create healthy soil, because excess nitrogen or phosphorus can promote insect and disease injuries. Add organic matter to the soil each year in the form of soil amendments or mulch.
- **Choose pest-resistant or tolerant varieties.** Nursery and garden catalogs often identify such varieties. Additional information is available in the K-State Research and Extension publication Recommended Vegetable Varieties for Kansas, L-41.
- **Start with quality seeds and healthy plants.** Purchase stocky, dark-green transplants, and buy certified virus-free seed potatoes.
- **Eliminate competition.** Remove weeds and grass from the growing site because they compete for nutrients and water.
- **Keep plants growing vigorously.** Rapidly growing fruits and vegetables can better tolerate or outgrow insect and disease damage, but they also quickly use up available nutrients. Applying fertilizer and water at critical times during maximum plant growth is essential for producing pest- and disease-resistant plants.
- **Keep it clean.** Remove plants and debris after harvest to avoid harboring insects and diseases. Remove weeds that may provide shelter for pests. Dispose of or burn diseased plants, fruits, and vegetables. Composting is seldom thorough enough to eliminate disease-causing fungi and bacteria.
- **Rotate crops.** Planting the same crop in the same place year after year invites losses due to soil borne diseases and overwintering pests. Follow a crop rotation of at least three years for the four major vegetable plant families -- solanum (tomato, potato, pepper, eggplant); cucurbit (melons, squash, cucumbers); cruciferous (broccoli, cauliflower, cabbage, Brussels sprouts); and allium (onion, garlic, leeks).
- **Choose a sunny location away from large trees.** Eight to 10 hours of direct sunlight a day are necessary for proper growth, flowering, and fruiting of most



vegetable crops. Sunlight also helps to dry foliage and reduce many fungal and bacterial diseases.

- **Water properly.** Plants receiving either too much or not enough water will be less vigorous and more susceptible to diseases and pests. Consider using a form of drip irrigation, which keeps foliage dry and helps prevent foliar diseases while using water more efficiently.
- **Use mulch.** Mulches help control weeds and reduce moisture evaporation from the soil surface. They also help to prevent rot caused when fruit is in contact with bare soil. When tilled under, organic mulches become valuable soil amendments.
- **Provide good air circulation.** Overcrowding plants can cause weak growth and an increase in foliar diseases. Stakes, cages, trellises, and pruning all help to increase air circulation.
- **Plant at the proper time.** Seeds planted too early are more susceptible to rot. Delay planting until the soil has warmed to allow rapid germination and growth of the young plants.
- **Get to know the major pests in your area.** Learn the weaknesses in their life cycle, their habits, and at which stages they are most easily controlled. Refrain from using any pesticide until you have correctly identified a pest. Your local Extension agent can help with positive identification.
- **Grow crops that have fewer pest problems.** Some plants that have few insect and disease problems include: Fruit – persimmons, elderberry, pawpaw, juneberry, jujube, strawberries, and bush fruits; Vegetables – looseleaf lettuce, rhubarb, Swiss chard, garlic, cos lettuce, leeks, parsley, sweet potatoes, okra, beets, snap peas, parsnips, carrots, onions and kale.
- **Put up bird feeders and birdhouses.** Birds are the leading predators of insects. For instance, more than a dozen species of birds are known to feed on moth larvae.
- **Inspect the entire garden at least weekly.** Check the undersides of leaves. Discover any symptoms when they first develop so that they can be more easily controlled.
- **Be realistic in your expectations.** Accept the fact that there may be some damage and even an occasional crop failure.

Source: Kansas State University Research and Extension Master Gardener Manual

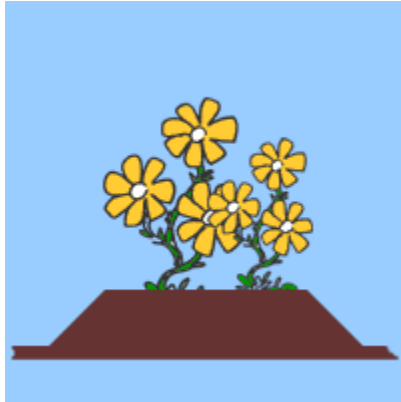
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APPENDIX C

HANDOUTS FOR LESSONS ON INTENSIVE GARDENING

RAISED BED GARDENING



Raised beds are growing areas whose surface is “raised” above the surrounding area. Raised beds can be temporary or permanent. A system of beds allows the gardener to concentrate soil preparation in small areas, resulting in efficient use of soil amendments and an ideal environment for vegetable growth.

Advantages to Using Raised Beds

- Soil raised above ground level warms up more quickly in the spring, which allows for earlier planting dates.
- The preparation required means the beds are usually filled with high-quality soil, which improves drainage and increases yield.
- The smaller size of raised beds when compared to traditional gardens makes them easier for most people to maintain.
- The denser plantings usually found in a raised bed helps reduce weed infestations.
- The closer plantings reduce moisture loss from surrounding soil, thus extending the time between irrigating.

Types of Raised Beds

- *Raised Ground Beds.* Raised ground beds are only 8 to 10 inches in height. These beds are especially suited for adults who prefer to work on mats or dollies.
- *Deep Raised Beds.* A deep raised bed can be built at a height and width that will provide the optimum access, particularly for individuals who prefer to work in a sitting position. A border or edge wide enough to sit upon can be helpful.
- *Terracing and Retaining Walls.* The actual growing space with terracing and retaining walls is the same as that for one-sided raised beds. Ground space adjacent to the wall needs to be accessible to the person with the walker or wheelchair. The retaining wall and the terraced garden can give advantages of both raised beds and ground beds.
- *Elevated Beds.* Elevated beds are shallow beds that are raised off the ground upon legs. These beds are especially good for the chair-bound individual who wants to be able to get his legs underneath



the bench so that he can work comfortably from his chair. However, this bed can be constructed higher for those who prefer to stand.

Location

- In full sun for best production
- Near a water source
- Protected from wind

Soil

- Soil preparation is the key for successful raised bed gardening.
- For ground beds, a deep, fertile soil high in organic matter is the goal. If the soil is not deep, double-dig the beds for best results.
- For above ground beds, a soil mixture with additional ingredients such as peat moss, vermiculite, and perlite is best.

Watering

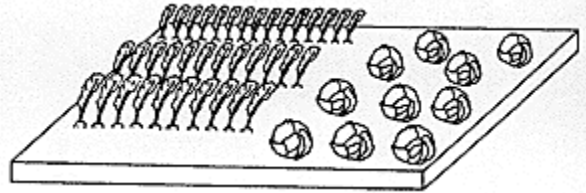
- It is best to water when the soil dries slightly. One or more inches of water per week is the general recommendation.

Fertilization

- Fertilization needs of a raised bed garden are the same as a traditional garden.

Planting

- The goal is to space plants at equal distances from each other on all sides, such that leaves will touch at maturity. Gone are the long straight rows and wide spacing between rows.

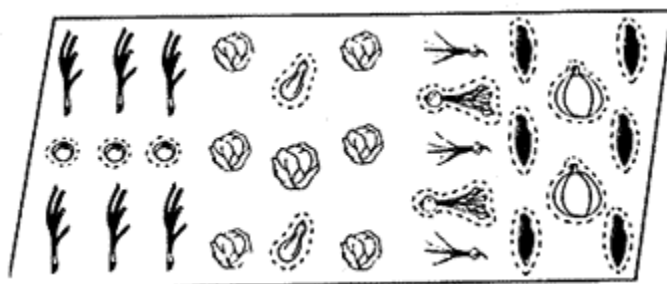


References: Virginia Cooperative Extension publication “Intensive Gardening Methods” by Diane Relf and Kansas State University Horticulture Report “Container Gardening” by Charles W. Marr.

Images: www.urbanext.uiuc.edu/.../images/raised-bed.gif; NebGuide G89-902-A “Intensive Gardening Techniques” by Betty Besal; Virginia Cooperative Extension publication “Intensive Gardening Methods” by Diane Relf

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INTENSIVE PLANTING TECHNIQUES



Interplanting

Growing two or more types of vegetables in the same place at the same time is known as interplanting. A traditional example of this technique is growing beans and corn together.

An interplanted garden does not resemble a traditional garden with all the vegetables planted in straight rows. Rather, interplanted gardens have a mosaic effect.

Proper planning is essential to obtain high production and quality of interplanted crops. To successfully plan an interplanted garden the following factors must be taken into account for each plant: the length of the plant's growth period, its growth pattern (tall, short, below or above ground), possible negative effects on other plants, optimum growth season, and light, nutrient, and moisture requirements.

Interplanting can be accomplished by alternating rows within a bed (plant a row of peppers next to a row of onions), by mixing plants within a row,

or by distributing various species throughout the bed. For the beginner, alternating rows may be the easiest to manage.

<i>Some interplanting possibilities</i>			
<i>Combine tall with low/spreading</i>		<i>Combine fast with slower-growing</i>	
caged tomatoes	melons	lettuce	tomatoes
sweet corn	lettuce	radishes	sweet corn
peas	radishes	greens	winter squash
okra	winter squash	beets	pole beans

Succession Planting

Succession planting is an excellent way to make the most of an intensive garden. To obtain a succession of crops, plant something new in the spots vacated by spent plants. Corn after peas is a type of succession. Schedule plantings so no area of the garden remains empty for long. Remember that later planted succession crops mature faster than earlier planted ones because growing conditions, especially temperature and light intensity, usually are more favorable. Some vegetables that work well in succession plantings are listed below.

Refer to the chart below to help plan your succession of crops:

Perennial Crops	Crops that occupy the ground only the first part of the season	Crops that occupy the ground the major portion of the season	Crops to be planted in July or later for fall and winter gardens
Asparagus Rhubarb Chives Horseradish Winter Onions	Early Beets Early Cabbage Lettuce Onion Sets Peas Radishes Early Spinach Mustard Turnips	Bush and Pole Beans Lima Beans Cabbage Celery Sweet Corn Cucumbers Eggplant Muskmelons Okra Peppers Potatoes Pumpkin Squash Tomatoes Watermelon Swiss Chard	Bush Beans Beets Broccoli Chinese Cabbage Carrots Cauliflower Endive Kale Kohlrabi Radishes Spinach Turnips Collards Lettuce

Information and Image Sources: Virginia Cooperative Extension publication “Intensive Gardening Methods” by Diane Relf and Nebraska Cooperative Extension publication “Intensive Gardening Techniques” by Betty Besal.

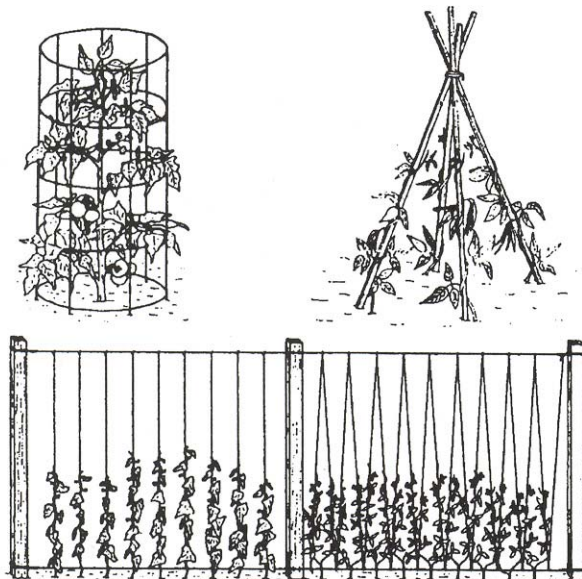
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VERTICAL GARDENING

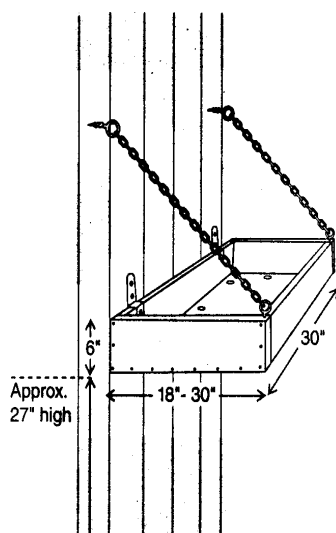
Most gardeners already use vertical growing to save space in the garden. Caging tomatoes and trellising peas are two familiar examples.

Advantages of Vertical Gardening

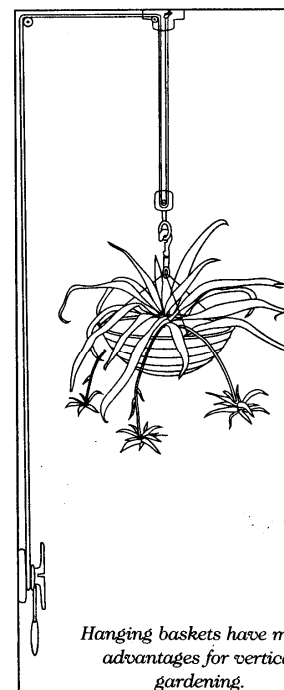
- Space saving
- Vegetables are easier to pick
- Produce may have less rot because the fruit does not contact the soil.
- Reduced disease problems due to improved air circulation



Easy Ways to Get Started



- An ideal way to start a vertical garden is to make use of existing structures. For example, attach a window box to a balcony railing, or add shelves for small pots to a wall or fence.
- Shallow boxes can be hung with chains at any height, and varying the heights creates a unique and functional plant display.
- Attach a hanging basket bracket to a light pole or use low, sturdy tree branches.



Hanging baskets have many advantages for vertical gardening.

Place Plants within Reach

How high and low do you want to garden? When seated, most people are comfortable with 18 inches as the lowest spot and 60 inches as the highest. If you're standing but want to minimize bending, low is 24 inches and high is 72 inches.

The key is to position plants within these ranges through various vertical gardening techniques.

Location

- In full sun for best production
- Near a water source
- Protected from wind

Soil

- A soilless mixture with ingredients such as peat moss, vermiculite, and perlite is recommended. These mixes are generally lighter and retain moisture better, yet provide good drainage because they contain no soil.

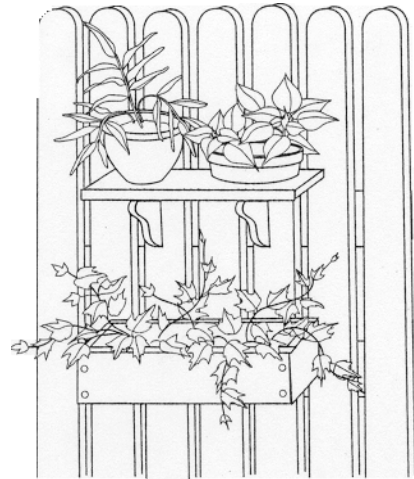
Watering

- It is best to water when the soil dries slightly. One or more inches of water per week is the general recommendation.

Fertilization

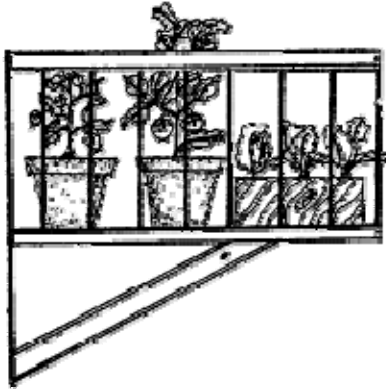
Since soilless potting mixes drain well, fertilizer is easily washed out of containers, thus you will need to replace lost fertilizer. Using a water-soluble fertilizer such as Miracle Grow at every other watering is effective. Controlled release or time-release fertilizers are also becoming widely available.

Information and Image Sources: Virginia Cooperative Extension publication "Intensive Gardening Methods" by Diane Relf and Chicago Botanic Gardens Garden for Life Series No. 4 "Vertical Gardening".



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CONTAINER GARDENING WITH VEGETABLES



Container gardens are useful for persons with limited space, poor soil conditions, or when standard gardening is too strenuous. A windowsill, a patio, a balcony, or a doorstep will provide sufficient space for a productive mini-garden.

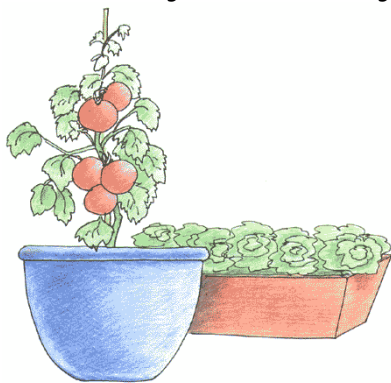
Almost any vegetable that will grow in a typical backyard garden will also do well as a container-grown plant. Several varieties suitable for container gardens have been developed by seed companies so check seed catalogs for varieties developed for container growing.

Recommended Vegetable Varieties for Container Gardening

- Carrot:** Baby Finger Nantes, Goldenhart, Little Finger, Short 'n Sweet, Tiny Sweet
- Cucumbers:** (Bush) Whopper, (Bush) Champion, Patio Pik, Spacemaster, Salty
- Eggplant:** Black Beauty, Morden Midget, Mission Bell
- Green Beans:** Kentucky Wonder, (Bush) Blue Lake, Greencrop
- Green Onions:** Beltsville Bunching, Crysal Wax, Evergreen Bunching
- Leaf Lettuce:** Grand Rapids, Oakleaf (heat tolerant), Salad Bowl, Ruby (red)
- Parsley:** Evergreen, Moss Curled
- Peppers:** Most varieties do well in larger (1 – 3 gallon) size containers. Sweet, banana, or hot peppers can all be successfully grown in containers.
- Radishes:** Cherrybelle, (White) Icicle, Scarlet Globe
- Squash:** Baby Crookneck, Creamy, Golden Nugget, Gold Rush, various zucchini hybrids
- Tomatoes:** Patio, Pixie, Tiny Tim, Small Fry, Sweet 100

Growing Mixture

A "soilless" potting mix works best. These mixes may contain sawdust, wood chips, peat moss, perlite, vermiculite, or almost any other type of media. A quality potting mix holds moisture and nutrients but drains well, is lightweight, and is disease and weed seed free. These mixes can be purchased from garden centers in various sizes under many different brand names or you can mix your own.



Containers

Almost any type of container can be used as long as there are holes in the bottom for drainage. The size of the container will vary according to the crop selection and space available. Small plants can be grown in fairly small, shallow containers while large plants need a larger container.

Fertilizer

Regular fertilization applications using a complete analysis should be followed since potting mixes drain water rapidly, causing fertilizer to wash out as you water. There are many kinds of specially formulated fertilizers available.

Watering

Proper watering is essential for a successful container garden. Some vegetables need watering every day, depending on container size and weather conditions. Always apply enough water to allow some to come out of the bottom drainage holes.

Sunlight

A minimum of 5 hours of direct sunlight each day is needed, however vegetable plants will perform better with 8 to 10 hours. Generally, leafy vegetables can tolerate the most shade, while root crops will need more sun.

Sources: KSU Horticulture Report EP-31 *Container Gardening* by Charles W. Marr, Texas A&M University Extension *Vegetable Gardening in Containers* by Sam Cotner.

Image Source: ag.arizona.edu/.../mg/vegetable/images/p47.gif

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APPENDIX D

HANDOUTS FOR LESSONS ON ADAPTIVE GARDENING

TIPS TO MAKE GARDENING EASIER



Gardening is America's favorite leisure outdoor activity, enjoyed by more than 78 million people, according to the National Gardening Association. For most of us, gardening provides a welcome sojourn in the natural world, a sanctuary that promises relief from the challenges of life. Yet many feel the need to give it up as they become less physically able. Gardening can enrich the life of the senior gardener in many ways - physically, mentally, and spiritually. Gardening can be made easier and more pleasurable for the senior gardener.

The following tips for modifying tools and gardening techniques can make all the difference.

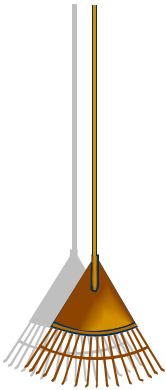
- Pace yourself. Spread out difficult projects over time.
- Grow plants that heighten the sense of touch or smell.
- Say "no" to projects that will not fit into your time schedule, or that will compromise your physical and mental health.
- Use a vertical garden. This allows the senior gardener to plant and weed without stooping or bending.
- Build and design raised beds that provide a place to sit and garden.
- Try using a stool, chair, or bench to avoid constant stooping or squatting.
- Use the right length tools. Long handled or curved handled tools provide better grips and more leverage.
- Wear lightweight clothing, long sleeved shirt, eye protection, sunscreen, a big hat to shade face, and gardening gloves.
- Delegate to others tasks that you dislike or that are too difficult.
- Try to let your worries go, by doing some gardening. Gardeners typically become absorbed in their work, giving them rest from the normal worries and cares of the day.

- Vary your tasks. A full day of pruning will give any gardener blisters. Remember it is not a race. Take your time, enjoy yourself, smell the roses.
- Do something for the kid in you everyday (i.e. pick some flowers, blow a dandelion blossom).
- Get organized so everything has its place.
- A mailbox can serve the same purpose as a plastic container to hold small hand tools in the garden. Mounted on a pole, this can be the right height for reaching from a wheelchair. There are some great decorative mailboxes on the market to add charm to the garden - or try decorating one yourself.
- Put hanging baskets on pulleys so that they can be easily lowered for maintenance.
- When possible use lightweight pots for the patio or balcony. If using clay, try having them set on a platform with wheels so that you can easily move them around when needed.
- If you have a large garden and are always forgetting tools, try getting a few inexpensive ones and putting them in a plastic-type container (safe from the elements) near the bottom of the garden. This will save steps and allow you to prune and weed as you go.
- Gloves are good for gripping, particularly when they have a ribbed surface.

Image Source: [www.niams.nih.gov/.../ graphics/gardening.jpg](http://www.niams.nih.gov/.../graphics/gardening.jpg)

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Choosing the Right Tools

Many new tools on the market today make gardening tasks much easier. Using good tools in the garden can make your time spent there a pleasure and not a chore. There are also many ways you can adapt tools to meet your own needs. Here are some points to remember.

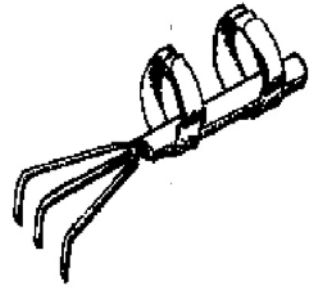
- **Lightweight tools** are generally easier to use. Tools with plastic, carbon, fiber, or aluminum handles are the lightest. Choose shovels and spades with smaller blades.
- **Balance.** Tools should fit your grip comfortably and should not require great hand strength to hold it and use it.
- When **buying a tool**, it is essential to get one that suits you. Never purchase a tool without having tried it out for weight, balance, and suitability for the job you want it to do.

You can purchase special gardening tools, but you can also adapt normal ones. If you adapt tools, keep these considerations in mind: 1) the length of the handle; 2) the weight of the tool; and 3) the special function or adaptability of the tool.

For most gardeners, long-handled and lightweight tools are preferable to those with short, thick, and heavy handles. The extra long handles and light weight reduce stress on weak backs, and enable you to work longer without tiring.

For some persons, however, short-handled tools can be preferable. Short-handled tools can provide leverage and practicality for wheelchair bound or seated gardeners, and extra thick handles can aid arthritic hands or hands with weak grips. An easy way to thicken the grip of a tool is to add foam padding or layers of tape to its handle.

For those with no hand grip, a universal cuff can be used. It attaches to the arm or forearm, and allows a lightweight tool to be attached. A double-handled grip can be purchased to add to your regular hoe or other tool, enabling you to use both hands and reduce pressure on your back.



Some Tools for Special Needs

Short-handled Swan Neck: lets you perform delicate weeding jobs with the precision and ease of a full-sized hoe; easy to maneuver in closely planted areas; great for raised beds and window boxes.

Kneeling Pad: prevents aching joints, wet knees, and compacted soil.

Hand tools with trigger-grip handles and rounded-out thumb rests: virtually indestructible; never rusts, bends, or breaks; rubberized coating makes them easier and more comfortable to hold; bright color makes them easy to locate.

Easy Wheeler: small enough to maneuver down short paths but strong enough to carry a bale of hay; sturdy handle offers support; weighs only 12 pounds.

Flower Gatherer: will cut flowers, remove thorns, and crush stems, for either right-or left-handed use.

Long-reach Pruner: trigger-grip action, very lightweight aluminum; five feet long; good for difficult-to-reach areas.

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OUTREACH & EXTENSION
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Tips for Gardeners who use Wheelchairs

Agricultural Engineering Extension: Karen Funkenbusch, MA
University of Missouri-Columbia, Department of Occupational Therapy,

School of Health Related Professions, in the School of Medicine: Diana Baldwin, MA, OTR/L, FAOTA

Grip Tips

- Use gloves with sticky surface.
- Build up handle to make it “fatter” by using bicycle grips, foam, or pipe insulation wrap.
- Support the wrist with cock-up splints; think about enabling garden tools that are ergonomically designed with wrist support.
- Use splints, supports, or assistive devices whenever possible, but **ONLY** after consulting with your physician or therapist.
- Use a universal cuff to hold garden tools.
- Use smaller lightweight garden tools; use a reacher for picking up and planting.

Reach Tips

- Extend the reach by lengthening handle of your garden tools by using PVC pipe. In an oven heat PVC pipe at 325 for 5 minutes, quickly fit PVC pipe to garden tool, and let cool for several minutes. **Safety tip:** Use caution when handling PVC pipe after heating because it will be hot!
- Use AMES or PRINTO extended handles or child size garden tools.

Vertical Wall Garden Tips

- Wall gardens can be supporting structures, fences, walls, trellises, container trellises, arbors, netting's, or strings.
- For additional information on vertical wall garden contact your local Extension Service or Master Gardeners.

Raised Bed Garden Tips

- Gardening is easier on your body.
- More accessible and eliminates bending and stooping.
- Customize the garden to fit your needs.
- Great for gardeners who lack space or physical ability.
- Can provide increased visibility for persons with low vision.
- Raised beds and containers should be no more than 4 feet in diameter and width.
- Keep a 20 to 28 inch range and 2 to 2 1/2 feet height.
- For more information on raised bed gardening contact your local Extension Service or Master Gardeners.

Hanging Baskets Tips

- Can make own pulley system or use any variety of retractable hangers.
- Use extended handle hose for watering.
- For additional information on hanging baskets contact your local Extension Service or Master Gardeners.

Container Garden Tips

- Can be used for flowers, greenery, or even vegetables.
- Provide the gardener with a lot of options.
- Any vessel is suitable for container gardening if it has drainage.
- Provides more stability.
- Provides an opportunity to garden on patios, porches, balconies, decks, and even windowsills.
- For recommendations on container garden tips contact your local Extension Service or Master Gardeners.

Pathway Tips

- Should be level and smooth.
- Ramps and other grades should not exceed 5 percent.
- An accessible width will depend upon who is using pathway.
- Should have clear beginning and ending.
- Textured surface for traction and orientation and contrasting colors and textures.
- Turf is cheap and cool but requires maintenance. Being soft is not user friendly to wheelchairs. Also, turf will die in high traffic areas. One solution, mix it with concrete blocks or paving stones.

- Wood chips, grass, mulch, compacted soil, crushed limestone, and gravel are too soft and need replacement. BUT, will cushion falls.
- Hard paving surfaces meet pathway requirements, but will not cushion falls and can be expensive. Can use concrete, asphalt, power block, patio block (stepping stones) brick, flagstone, or wood.

For additional information contact your local Outreach and Extension Center or the Missouri AgrAbility Project, University of Missouri-Columbia at 1.800.995.8503.

This material is based upon work supported by the Cooperative State Research, Education, and Extension Service (CSREES), U.S. Department of Agriculture under special project number 97-EDFA-1-0116 and the U.S. Department of Education's National Institute on Disability and Rehabilitation Research under special project number H133B980022.

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Easy Tips to Modify Garden Tools for Gardeners with Back Problems

Agricultural Engineering Extension: Karen Funkenbusch, MA
University of Missouri-Columbia, Department of Physical Therapy,
School of Health Related Professions, in the School of Medicine: Carmen Abbott, MA, PT

Gardening with a bad back has its problems. However, the good news is, with simple tools modifications you can still garden. Garden tools can be adapted to alleviate the strain and stress on your back.

Gardeners with back problems should keep in mind the following suggestions:

- Keep your back straight while digging.
- Use long-handled tools.
- Use handle extenders to improve leverage.
- Try to customize your own gardening and planting devices.
- Garden in accessible garden containers:

Raised beds are large bottomless boxes that contain soil and permit drainage below.

Boxes and containers of various sizes provide successful ways to grow vegetables and flowers. Be sure to pick a container that will allow for healthy root development.

Hanging baskets can create planting space where none exists. Or, combined with a container garden, can give a double-decker growing area. Also, you can make your own pulley system by using steel hooks or rings clamped/mounted to railings or walls.

Table planters are shallow soil-filled trays supported on legs. Remember, 27 inches is needed for knee clearance to comfortably allow chair to fit underneath.

Deep boxes, barrel, and tubs can be used to create small raised beds for flowers, vegetables, and herbs. These containers work well for annual plants. Use a stool, 5 gallon bucket, small folding chair, or bench when you need to rest.

- Use a stool, 5 gallon bucket, small folding chair, or bench when you need to rest.
- Grow flowers, plants, vegetables, or edibles that are easy to manage without much stooping or manual labor.
- Plot out your garden tasks. Avoid numerous trips and don't overload yourself with a lot of tools or garden equipment.
- Make hauling your garden tools easier by using a golf bag on wheels, sturdy box, apron with large and small pockets, or basket with a variety of handles that can hold tools, plants, seeds, and other related garden supplies.

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Basic Principles of Prevention of Repetitive Motion Injury

Agricultural Engineering Extension: Karen Funkenbusch, MA
University of Missouri-Columbia, Department of Occupational Therapy,
School of Health Related Professions, in the School of Medicine: Diana Baldwin, MA, OTR/L, FAOTA

Most Common Injuries:

- Carpal Tunnel Syndrome
- Tennis Elbow
- Bursitis of Shoulder, Hips, and/or Knees
- Tendinitis

A common factor in all injuries is inflammation of tissue. Synovial tissue in carpal tunnel syndrome, muscle tissue in tennis elbow, tissue surrounding muscles and tendons as they pass over bony prominence in bursitis, and tendon sheaths or tendons in tendinitis.

Cause of Inflammation

- Overuse
- Repeated Pressure on a Site
- Strenuous Repeated Motions
- Continuous Forceful Gripping
- Acute Trauma

Basic Principles of Prevention of Repetitive Motion Injury

- Work load should be close
- Use best ergonomic position possible
- Match the tool to the job
- Decrease resistance
- Spread the load over multiple joints or larger joints
- Pace the activity

HOW TO APPLY PREVENTION PRINCIPLES TO GARDENING!!

STRETCH - STRETCH - STRETCH - STRETCH

Remember, just as in exercising, you need to prepare your joints and muscles for activity. Any stretching or warming-up exercise program will work. If you experience stiffness in the morning, take a warm shower or bath to loosen up before heading out to the garden.

Work Load

If you cannot get down to the work load, bring the work load **UP** to you. When standing, do not over reach and maintain an upright posture. The longer the handle the more force it takes to use and lift that garden tool. To decrease this effect, lighten the weight of the tool, use only sharp tools, and match the tool to the job.

Ergonomic Position

Position yourself so the muscles can be used at their maximum efficiency. When standing, **don't lock your joints**. Also, sitting in a supported squat or at 90 degrees is hard on the joints and difficult to get up from. The straighter your elbow and the farther away it is from the body, the less efficient your position. You can increase efficiency by selecting the right tool, decreasing resistance, and using multiple joints. Place thumb and index finger together, making a circle. This is your most efficient grip size.

Match the Tool

One-purpose tools are generally the best, when you cannot easily carry around several tools. Limit yourself to two or three tools.

Decrease Resistance

Keep tools sharp. Small work surface, i.e., pointed hoe, narrow rake or shovel allows tool to move with less resistance. Use the most efficient grip size and nonslip surface to reduce force of grip required. Power, if used safely, is wonderful. Variety of watering systems eliminates the need to drag a hose. Plant in a peat moss mixture instead of soil.

Spread the Load

You are spreading the load by putting an extra handle on a shovel, extending a hand tool onto the forearm, turning a sprayer from a hand-held carry to a backpack, or using a two-wheel garden cart instead of a wheel barrel.

Pace the Activity

The risk of injury is greater when you forget to stop and take breaks. Take your time, gardening is not a race. By working slowly, sitting back, and reflecting on the beauty that surrounds you allows your muscles time to recover. Break a heavy load up by stopping every 30 minutes and doing a light activity. Be organized, reduce the number of trips needed for supplies.

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APPENDIX E

HANDOUTS ON VEGETABLES

BEANS

The bean is a tender, warm season vegetable that ranks second to tomato in popularity in home gardens.

Bush Beans stand erect without support. They yield well and require the least amount of work. Green bush beans were formerly called "string beans" because fiber developed along the seams of the pods. Plant breeders have reduced these fibers through selection and green beans are now referred to as "snap beans."



Pole Beans climb supports and are easily harvested.

RECOMMENDED VARIETIES	DAYS TO HARVEST
Bush Bean Varieties	
Blue Lake 274	58 days to harvest; plump, tender pods; slow-developing seeds; resistant to bean mosaic
Bush Kentucky Wonder	57 days; long, flattened pods
Pole Bean Varieties	
Blue Lake	65 days; oval, straight, stringless, juicy and tender pods; resistant to bean mosaic
Kentucky Wonder	65 days; fine flavor, 9 inch pods in clusters

GROWING TIPS

When to Plant

- Spring-planted crops should be planted after all danger of frost is past
- Fall beans can be planted in early August
- Planting every 2 to 4 weeks from spring until early August will provide a continuous supply of beans into the fall

Spacing and Depth

- Plant seeds 1 inch deep in rows 18 inches apart
- A plant every 3 – 5 inches is desirable, so drop seed about every 2 – 4 inches

- Plant pole beans 6 – 12 inches apart in rows 30 to 36 inches apart; or in hills (4 – 6 seeds per hill) 30 inches apart, with 30 inches between rows

Care

- Do not soak bean seed before planting, rather plant seed in moist soil
- Beans have shallow roots so require frequent cultivation and hoeing to control weeds
- Topping of cutting the top most bud from the plant when the plant is 2 – 2 ½ feet tall will speed the development of sprouts

HARVESTING

- Pick beans when the pods are firm, crisp, and fully elongated, but before the seeds enlarge significantly
- Do not harvest in early morning when dew is on the plants as this may spread disease
- Be careful not to break the stems or branches. The bean plant continues to form new flowers and produces more beans if pods are continually removed before the seeds mature.

Sources: University of Illinois Extension “Watch your Garden Grow” by Ron Wolford and Drusilla Banks (www.urbanext.uiuc.edu/veggies/index.html) and K-State Horticulture Report “Kansas Garden Guide” (S-51) by Charles Marr.

Prepared by Candice A. Shoemaker, Ph.D., Associate Professor, Department of Horticulture, Forestry, and Recreation Resources. September 2003. **Kansas State University Agricultural Experiment Station and Cooperative Extension Service, Manhattan, Kansas.** Contents of this publication may be reproduced for educational purposes. All other rights reserved. For more information about healthy eating, contact your local extension office. Kansas State University is an equal opportunity provider & employer. This material was funded by USDA’s Food Supplemental Nutrition Assistance Program. **The Food Assistance Program can help people of all ages with low income buy nutritious foods for a better diet. To find out more, call 1-888-369-4777.**





Green Beans

Snap Beans • String Beans



Fun Facts: Some types of green beans are purple, but turn green when cooked.

Yellow or wax beans are closely related to green beans. Green beans are the immature pod and beans of dried legumes. Green beans used to be called "string beans" because of the stringy fiber that grew along the seam of the bean pod. Newer green bean varieties do not have this stringy fiber. Green beans are one of the top 20 vegetables eaten in the U.S.

Selecting Fresh Green Beans: Look for green beans with a pod that is firm, crisp, straight and long, and that snaps easily. The tip should be flexible. Avoid green beans with large seeds within the pod. If you can see the bulge of a developing bean through the green pod, the pod will probably need to be discarded since it will be too tough to eat, but the seeds can be removed and cooked. Avoid green beans that are thick, tough, stringy, fibrous or wilted, or with pods that look rusty or damaged.



Measuring Fresh Green Beans:

1 pound raw = about 14 ounces ready to eat = 3 cups raw = about 2 1/2 cups cooked
1/2 cup cooked = about 2 1/4 ounces by weight = 63 grams

Handling and Preserving: Refrigerate unwashed dry green beans in a plastic bag in the vegetable drawer for up to 3 days. **To freeze,** select fresh green beans. Rinse. Remove stem ends. If desired, snap into 1-inch pieces. Place in boiling water for 2 or 3 minutes, depending on size. Drain immediately and place in ice water for 2 or 3 minutes. Drain again. Pack into freezer bags, leaving 3 inches of air space. Squeeze out the air, seal, date and freeze.

Preparation and Serving: Wash beans under cool running water and drain. Remove the stem ends. Enjoy cooked green beans as a hot side dish or chilled in a salad, or use as directed in recipes. To cook: steam, microwave, boil or stir-fry them until fork-tender. Boiled fresh green beans cook in about 15-30 minutes. For best results, do not overcook.

Nutrition Facts One serving = 1/2 cup green beans. Each 1/2 cup of cooked green beans has: Calories 22; Protein 1 gram; Carbohydrates 5 grams; Fat 0 grams. Green beans contribute vitamin C, carotenoids (which the body converts to vitamin A), fiber, B vitamins including folic acid, essential minerals and other nutrients, antioxidants and phytochemicals to the diet.

References: www.urbanext.uiuc.edu/veggies; ESHA Food Processor; www.oznet.ksu.edu/library/fntr2/mf1179.pdf; Food for Fifty, 11th edition, 2001, by M. Molt, Prentice Hall; www.fda.gov/fdac/special/foodlabel/raw.html

Prepared by Mary Meck Higgins, Ph.D., R.D., L.D., CDE, Assistant Professor, Department of Human Nutrition. Oct. 2003.

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BROCCOLI

Broccoli is a hardy vegetable of the cabbage family that is high in vitamins A and D. It develops best during cool seasons of the year.

When broccoli plants of most varieties are properly grown and harvested, they can yield over an extended period. Side heads develop after the large, central head is removed. Two crops per year (spring and fall) can be grown in Kansas. New heat tolerant varieties allow broccoli to be produced in all but the hottest parts of the season.



Transplants are recommended to give the best start for spring planting, because transplanting gets the plants established more quickly. Thus, they can bear their crop with minimal interference from the extreme heat of early summer. Fall crops may be direct-seeded in the garden if space allows, or may be started in flats to replace early crops when their harvest ends.

RECOMMENDED VARIETIES	DAYS TO HARVEST
Cruiser	58 days to harvest; uniform, high yield; tolerant of dry conditions
Green Comet	55 days; early; heat tolerant
Green Goliath	60 days; spring, summer or fall; tolerant of extremes

GROWING TIPS

When to Plant

- Transplant in late March to early April before the danger of frost has passed
- For fall planting, start seedlings in midsummer for transplanting into the garden in early August or direct seed in early July

Spacing and Depth

- 18 to 24 inches apart in the row and 36 inches between rows, or 12 inches apart in all directions

Care

- Use a starter fertilizer when transplanting
- Apply supplemental fertilizer along the row every 2-3 weeks as the crop develops
- Provide adequate water as the head starts to develop

HARVESTING

- Cut the head before the flowers start to open or before yellow centers of the flowers start to show along with 4-5 inches of stem
- Continue to cut small side heads until hot weather causes them to be strongly flavored

COMMON PROBLEMS

Aphids – watch for buildup of aphids on the undersides of the leaves

Cabbage worms – the larval or worm stages (green caterpillar) of these insects cause damage by eating holes in the leaves and flower head. The adult moth (white, brown, or gray) lay their eggs on the leaves but otherwise do not damage the plants. Cabbage worms are more of a problem in fall plantings than in spring gardens.

Sources: University of Illinois Extension “Watch your Garden Grow” by Ron Wolford and Drusilla Banks (www.urbanext.uiuc.edu/veggies/index.html) and K-State Horticulture Report “Recommended Vegetable Varieties” (L41) by Charles Marr.

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Broccoli



Fun Facts: Broccoli is the eighth most frequently eaten vegetable in the U.S. and is the most popular of the cabbage, or cruciferous, family of vegetables. The part we eat is the unopened flower buds, along with the top portion of the stem. Eating broccoli helps protect health against heart disease and cancer. Sulfur contributes to broccoli's flavor.

Selecting Fresh Broccoli: Look for broccoli with tender stems and heads that are firm, tight and dark green or purplish-green. Avoid broccoli with wilted, soft, slippery, tough, thick or dry stems. Avoid broccoli with heads that have enlarged buds or yellow areas—those are broccoli flowers and are signs that the head is too old for best flavor.

Measuring Fresh Broccoli:

1 pound raw = about 13 ounces ready to eat = about 4 cups raw = about 2 cups cooked
1/2 cup cooked = about 1 1/2 ounces by weight = about 40 grams

Handling and Preserving: Refrigerate unwashed, dry broccoli in a perforated plastic bag in the vegetable drawer. It will stay fresh for 3 to 14 days, but for the best nutrition and taste, use during the first few days. Unrefrigerated, it quickly becomes fibrous and woody, and wet broccoli becomes limp and moldy. **To freeze,** select tender broccoli. Wash, cut off ends, and peel stalks if tough. If the head has insects, soak it in 4 cups cold water with 1 teaspoon salt for 30 minutes. Place 1-inch pieces in boiling water for 3 minutes. Drain immediately and place in ice water for 3 minutes. Drain again. Pack into freezer bags, leaving 3 inches of air space. Squeeze out the air, seal, date and freeze.

Preparation and Serving: Wash fresh broccoli under cool running water and cut off the bottom end of each stalk. If the head has insects, soak it in 4 cups cold water with 1 teaspoon salt for 30 minutes. To maintain its nutrients, do not soak longer. If the stem is tough, peel the outer stalk. If the stem is very large, split it or cut it into strips or rounds. Serve raw or cooked broccoli plain or with dips, sauces, pasta or in casseroles. To cook broccoli: steam, microwave, boil or stir-fry the stems for 1-2 minutes, then add the florets which have been cut into same-sized pieces and cook until fork-tender. For the best taste, color, texture and nutrition, and to avoid a strong odor, do not overcook.

Nutrition Facts 1 serving = 1/2 cup cooked or raw broccoli. Each 1/2 cup cooked chopped broccoli has: Calories 11; Protein 1 gram; Carbohydrates 2 grams; Fat 0 grams. Broccoli contributes fiber, carotenoids (which the body converts to vitamin A), vitamins C and K, and many other nutrients, antioxidants and healthful phytochemicals to the diet.

References: www.urbanext.uiuc.edu/veggies; ESHA Food Processor; www.fda.gov/fdac/special/foodlabel/raw.html; Food for Fifty, 11th edition, 2001, by M. Molt, Prentice Hall; www.oznet.ksu.edu/library/fntr2/MF1181.pdf

Prepared by Mary Meck Higgins, Ph.D., R.D., L.D., CDE, Assistant Professor, Department of Human Nutrition. Oct. 2003.

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BRUSSELS SPROUTS

Brussels sprouts is a hardy, slow-growing, long-season vegetable belonging to the cabbage family. In the proper season of the year, it can be grown with fair success in most areas of the country. In mild areas, or where there is deep snow cover, the sprouts may over winter.



Best success in Kansas is to grow the sprouts in the fall season by planting in early July.

The "sprouts" (small heads that resemble miniature cabbages) are produced in the leaf axils, starting at the base of the stem and working upward. Sprouts improve in quality and grow best during cool or even lightly frosty weather. Brussels sprouts require a long growing period, though newer hybrids have greatly reduced this requirement. In all but the most northern states, summers are usually too warm for completely satisfactory production from spring plantings. Plants set out in late spring to early summer grow satisfactorily and mature high-quality sprouts when the fall weather begins to cool.

RECOMMENDED VARIETIES	DAYS TO HARVEST
Hybrid	
Bubbles	82 days, dependable, tolerates warm weather, resistant to rust
Jade Cross	90 days, resistant to yellows
Jade Cross E	90 days, sprouts larger, easier to remove from stalk than with original strain
Oliver	85 days, early, easy-to-pick, attractive sprouts
Open-pollinated	
Long Island Improves	90 days, variable, harder to produce heavy, uniform crop with this variety
Rubine	105 days, red plants and sprouts, novel, but very late maturing not nearly as productive as recommended hybrid green types

GROWING TIPS

When to Plant

- Spring-planted crops should be set in late March
- Fall crops, more reliable in Kansas, should be started in early July

Spacing and Depth

- 24 to 36 inches apart in the row and 3 feet between rows, or 24 inches apart in all directions

Care

- Apply one application of nitrogen fertilizer along the row when the plants are 12 inches tall
- Provide adequate water to keep the crop growing vigorously during the heat of summer
- Topping or cutting the top most bud from the plant when the plant is 2 – 2 ½ feet tall will speed the development of sprouts

HARVESTING

- Pick or cut the sprouts when they are an inch in diameter. More sprouts will develop on the stem above.

COMMON PROBLEMS

Cabbage worms – the larval or worm stages (green caterpillar) of these insects cause damage by eating holes in the leaves and flower head. The adult moth (white, brown, or gray) lay their eggs on the leaves but otherwise do not damage the plants. Cabbage worms are more of a problem in fall plantings than in spring gardens.

Sources: University of Illinois Extension “Watch your Garden Grow” by Ron Wolford and Drusilla Banks (www.urbanext.uiuc.edu/veggies/index.html) and K-State Horticulture Report “Recommended Vegetable Varieties” (L41) by Charles Marr.

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Brussels Sprouts

Fun Facts: Brussels sprouts look like little cabbage heads. Indeed, they are in the cabbage, or cruciferous, family of vegetables. They most likely are named for Brussels, the capital city of Belgium. In Europe, some people call them "Brussels cabbage." Brussels sprouts are one of the least commonly eaten vegetables in the U.S. Many people have not yet discovered the unique taste of lightly-cooked, nutritious Brussels sprouts.

Selecting Fresh Brussels Sprouts: Look for bright green, clean, firm, tight, compact and solid Brussels sprouts. Choose those that are less than two-inches in diameter. Look for sprouts where the stalk end is clean. Avoid Brussels sprouts with leaves that are yellow, loose, wilted, puffy, soft, or with small holes or rot.



Measuring Fresh Brussels Sprouts:

1 pound raw = about 12 ounces ready to eat = about 4 cups raw = 2 1/2 cups cooked
1/2 cup cooked = 3 or 4 medium sprouts = about 2 3/4 ounces by weight = 78 grams

Handling and Preserving: Remove damaged outer leaves. Refrigerate unwashed Brussels sprouts in a perforated plastic bag in the vegetable drawer. They keep up to 3 weeks, but for best flavor, use during the first few days. **To freeze,** select fresh sprouts. Remove damaged leaves. Rinse. To remove insects, soak in 4 cups cold water with 1 teaspoon salt for 30 minutes. Place small Brussels sprouts in boiling water for 3 minutes, medium sprouts for 4 minutes, and large sprouts for 5 minutes. Drain at once and place in ice water for 3 to 5 minutes, depending on size. Drain again. Pack into freezer bags, leaving 3 inches of air space. Squeeze out the air, seal, date and freeze.

Preparation and Serving: Remove loose or damaged leaves. Wash sprouts under cool running water. Trim off the end of stalks. To remove insects, soak in 4 cups cold water with 1 teaspoon salt for 30 minutes. To maintain nutrients, do not soak longer. Enjoy cooked Brussels sprouts as a side dish, plain or with a sauce, or use as directed in recipes. To cook: cut sprouts in half to help them cook more evenly. Steam, microwave, boil or stir-fry them until fork-tender. For best results, do not overcook.

Nutrition Facts One serving = 1/2 cup Brussels sprouts. Each 1/2 cup of cooked Brussels sprouts has: Calories 30; Protein 2 grams; Carbohydrates 7 grams; Fat 0 grams. Brussels sprouts are an excellent source of vitamin C and contribute fiber, B vitamins including folic acid, essential minerals and many other nutrients, antioxidants and phytochemicals to the diet. Eating them helps protect against cancer and other diseases.

References: www.urbanext.uiuc.edu/veggies; ESHA Food Processor; www.oznet.ksu.edu/library/fntr2/C648.pdf; Food for Fifty, 11th edition, 2001, by M. Molt, Prentice Hall; <http://aem.cornell.edu/research/researchpdf/rb0207.pdf>

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CABBAGE

Cabbage is a hardy vegetable that grows especially well in fertile soils in the spring or fall in Kansas. Cabbage is intolerant of our summer heat. There are various shades of green available, as well as red or purple types. Head shape varies from the standard round to flattened or pointed. Most varieties have smooth leaves, but the Savoy types have crinkly textured leaves.

Cabbage is easy to grow if you select suitable varieties and practice proper culture and insect management. Always regarded as a good source of vitamins, cabbage recently has been shown to have disease-preventive properties as well.



RECOMMENDED VARIETIES	DAYS TO HARVEST
Green Cabbage	
Cheers	75 days; solid round heads; tolerant to black rot and thrips
King cole	74 days; large; firm; extremely uniform heads
Savoy Cabbage	
Savoy King	85 days; dark, green color; very uniform
Savoy Queen	88 days; 5 pounds; deep green color; good heat tolerance
Red Cabbage	
Ted Meteor	75 days; firm; good for all seasons
Ruby Ball	71 days; 4 pounds; slow to burst; resists both cold and heat

GROWING TIPS

When to Plant

- Set cabbage plants in late March to early April for a spring crop
- Transplant autumn cabbage in early August
- Cabbage is easily transplanted by choosing stocky, dark green plants with strong root systems

Spacing and Depth

- 12 to 18 inches apart in 3 to 4 foot rows
- Closer spacing will result in smaller, but more numerous heads

Care

- Use starter fertilizer when transplanting and side-dress with nitrogen fertilizer every 2 to 3 weeks during the growing season
- Side-dress nitrogen fertilizer when the plants are half grown
- Irrigation is critical when heads are small and enlarging
- Cultivate carefully to avoid damaging shallow roots

HARVESTING

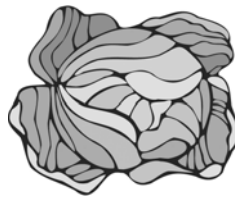
- Heads are ready to harvest when the head is fully formed and dense (firm to hand pressure)
- Waiting too long may result in heads that split, especially after rainfall or irrigation

Sources: University of Illinois Extension “Watch your Garden Grow” by Ron Wolford and Drusilla Banks (www.urbanext.uiuc.edu/veggies/index.html) and K-State Horticulture Report “Kansas Garden Guide” (S-51) by Charles Marr.

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Cabbage



Fun Facts: Cabbage is the ninth most frequently eaten vegetable in the U.S. The top of a green cabbage head is more tender and shreds easier than the bottom half. Most cabbage has smooth leaves, but Savoy cabbage leaves are crinkly. Savoy cabbage is more tender and milder in flavor than green or red cabbage. It may be substituted for either of them in a recipe. Bok choy, napa and pe-tsai cabbage form oblong-shaped heads that have a crisp texture similar to lettuce yet have the flavor of cabbage. Cabbage family vegetables are called cruciferous vegetables. Sulfur contributes to the distinctive flavor and smell of cabbage. Sauerkraut and kimchee are pickled cabbage dishes.

Selecting Fresh Cabbage: Look for green or red/purple cabbage heads that are solid, heavy, tight and firm, with outer leaves that are smooth and fresh. With Savoy cabbage, look for flexible, crumpled, dark green or blue/green leaves forming a loosely-packed head. Avoid cabbage that is wilted, discolored, blemished, cracked or split, insect-infested or decayed.

Measuring Fresh Cabbage:

1 medium head green cabbage = about 2 pounds as purchased = about 8 cups ready-to-eat, raw, shredded = about 4 cups cooked, shredded

1 cup raw or 1/2 cup cooked = about 2 1/2 ounces by weight = 75 grams



Handling and Preserving: Refrigerate unwashed, uncut cabbage in a perforated plastic bag in the vegetable drawer. Store Savoy and green or red cabbage that will be eaten raw for up to 4 days, and green or red cabbage that will be eaten cooked for up to 4 weeks. **To freeze:** Rinse the head and discard outer leaves. Shred, cut into thin wedges, or separate the layers of leaves. Place in boiling water for 1 1/2 to 3 minutes, depending on the size of the pieces. Remove immediately and place in ice water for 1 1/2 to 3 minutes. Drain. Place in freezer bags, squeeze out the air, seal, date and freeze.

Preparation and Serving: Rinse cabbage. Discard the outer leaves. For best results, use stainless steel knives and pans when preparing cabbage. Cook by boiling, steaming, stir-frying or microwaving it, but do not overcook. Cook red cabbage with an acidic ingredient, such as vinegar, to prevent undesirable color changes.

Nutrition Facts One serving = 1 cup raw, or 1/2 cup cooked, shredded cabbage and has: Calories 17; Protein 1 gram; Carbohydrates 4 grams; Fat 0 grams. Cabbage provides vitamins C and K, B vitamins and essential minerals, and helps protect against heart disease and cancer.

References: www.urbanext.uiuc.edu/veggies; www.fda.gov/fdac/special/foodlabel/raw.html; ESHA Food Processor; Food for Fifty, 11th edition, 2001, by M. Molt, Prentice Hall; www.msue.msu.edu/imp/mod01/01600060.html

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CARROT

Carrot is a hardy, cool-season biennial that is grown for the thickened root it produces in its first growing season. Although carrots can endure summer heat in many areas, they grow best when planted in early spring. Midsummer plantings that mature quickly in cool fall weather will produce tender, sweet "baby" carrots that are much prized. Carrots are eaten both raw and cooked and they can be stored for winter use. They are rich in carotene (the source of vitamin A) and high in fiber and sugar content.



RECOMMENDED VARIETIES	DAYS TO HARVEST
Small, Round	
Thumbelina	60 days, 1992 All American Selection winner, round roots, good for planting in containers and in heavy, shallow or rocky soil
Baby	
Little Finger	65 days, tiny tender roots, 5-inch roots, ½ inch thick, golden orange, sweet, and crisp
Short 'n Sweet	68 days, rich, sweet flavor, 4-inch roots, broad at shoulder, tapered to a point, good for heavy or poor soil
Chantenay	
Red-Cored Chantenay	70 days, heavy yield, good flavor, short, thick roots, broad at the shoulder, tapered to blunt tip
Royal Chantenay	70 days, broad-shouldered, tapered roots, bright orange, good for heavy or shallow soils
Nantes	
Scarlet Nantes	70 days, bright orange, slightly tapered, 6-inch roots, crisp, tender and flavorful, standard for high quality carrots

GROWING TIPS

When to Plant

- Plant in mid- to late April before the last freeze
- Make sure the soil is well tilled or loosened to an 8- to 9-inch depth before planting
- Fall crops, excellent for growing in Kansas, should be started in late July to early August

Spacing and Depth

- 1 to 2 inches apart in the row and 12 inches between rows
- Plant seeds ¼ - ½ inch deep – deeper for fall planting – in moist soil
- Thin carrots to the desired spacing when the plants are small

Care

- Young carrots are weak and grow slowly. It is essential to keep weeds under control for the first few weeks.
- Water is required as roots are enlarging

HARVESTING

- Dig or pull the roots when they are the desired diameter
- Fall-planted carrots can be mulched with straw and harvested as needed until the ground freezes solid in mid-December

Sources: University of Illinois Extension “Watch your Garden Grow” by Ron Wolford and Drusilla Banks (www.urbanext.uiuc.edu/veggies/index.html) and K-State Horticulture Report “Recommended Vegetable Varieties” (L41) by Charles Marr.

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Carrots



Fun Facts: Carrots can get sunburned while growing. The sunburned area turns green. When carrots were first grown in France, they were not eaten but instead their feathery leaves on top were used in women's hair, hats and clothing.

Selecting Fresh Carrots: Choose short or long carrots, but ones that are no more than 1 1/2 inches around. Look for smooth, firm, crisp carrots with a small core and a deep orange color from top to bottom. Avoid oversized carrots because they have less flavor and may be tough and woody. Avoid wilted, soft or slimy carrots.

Measuring Fresh Carrots

1 pound = about 5 medium carrots = 4 cups shredded = about 2 1/2 cups diced cooked
1/2 cup diced cooked = a little less than 3 ounces by weight = about 80 grams

Handling and Preserving: Cut off the green leafy tops close to the top of the carrot. If you plan to cook the leafy tops, such as in soup or a stew, refrigerate them separately and use within 1 or 2 days; they spoil quickly. Brush off any loose dirt. Refrigerate unwashed carrots in a perforated plastic bag in the vegetable drawer, away from fruits. Crispness is maintained by preventing water loss. Carrots usually stay fresh for several weeks, and at times for up to 6 months. **To freeze,** select tender carrots. Cut off ends, wash, and peel. Place small whole carrots in boiling water for 5 minutes. Cut larger carrots into thin slices, cubes or strips and boil for 2 minutes. Drain immediately and place them in ice water for 5 minutes. Drain and package into freezer bags or containers, with 3 inches of air space. Seal, date and freeze.

Preparation and Serving: Scrub carrots under cold running water with a vegetable brush to remove all dirt. Cut off ends, and areas that are green instead of orange near the top. Peel if desired. Carrots are a popular, naturally sweet vegetable. They add lots of nutrition and color, but few calories. Raw or cooked, carrots are easy to serve. Try them whole, shredded, chopped, juiced, boiled, steamed, stir-fried, baked, roasted or grilled. Grate and add to salads, main dishes, sandwiches, baked goods, etc.

Nutrition Facts for one serving, or 1/2 cup sliced raw or cooked carrots: Calories 30-35; Protein 1 gram; Carbohydrates 6-8 grams; Fat 0 grams. One serving provides large amounts of the healthful antioxidant, beta carotene, which is converted into vitamin A after being eaten. Carrots contribute other nutrients to the diet, too.

References: www.urbanext.uiuc.edu; Food for Fifty, 11th edition, 2001, by M. Molt, Prentice Hall; ESHA Food Processor; www.oznet.ksu.edu/library/hort2/mf661.pdf; www.aboutproduce.com; www.oznet.ksu.edu/library/fntr2/MF1181.pdf



Prepared by Mary Meck Higgins, Ph.D., R.D., L.D., CDE, Assistant Professor, Department of Human Nutrition. July 2003.

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CAULIFLOWER

Cauliflower is a cool-season vegetable and is more difficult to grow than other members of the cabbage family, such as cabbage and broccoli. It is also fairly intolerant of summer heat and drought.



RECOMMENDED VARIETIES	DAYS TO HARVEST
Hybrid	
Candid Charm	65 days; large head, excellent protection
Snow Crown	60 days; resistant to yellows; tolerant of heat, cold
Snow Grace	65 days; 8 inch head, tight curd, improved Snow Crown type
Snow King	50 days; 8 to 9 inch heads; very early; heat tolerant
White Corona	30 days; 3 to 4 inch heads; exceptionally early; good for small gardens and short season
“Broccoflower”	
Chartreuse Hybrid II	62 days; no tying; greenish yellow curd
Green Goddess Hybrid	65 days; no tying; lime green, good taste, easy to grow

GROWING TIPS

When to Plant

- Spring-planted crops should be set in early to mid-April in Kansas
- Transplant autumn cauliflower in early August
- Cauliflower is best started from transplants for both spring and fall crops

Spacing and Depth

- 18 to 24 inches apart in the row, use the wider spacing for fall plantings

Care

- Plants should be kept growing vigorously from the seedling stage through harvest
- Use starter fertilizer when transplanting
- Side-dress nitrogen fertilizer when the plants are half grown
- Cauliflower must have a consistent and ample supply of soil moisture
- Tie the outer leaves together over the center of the plant when the head begins to form to keep it from turning green and developing an off-flavor

HARVESTING

- Heads are ready to harvest within 7 to 12 days after tying the leaves
- Harvest the heads by cutting the main stem
- Dispose of or compost plants after heads are harvested since plants do not ordinarily develop side shoots

Sources: University of Illinois Extension “Watch your Garden Grow” by Ron Wolford and Drusilla Banks (www.urbanext.uiuc.edu/veggies/index.html) and K-State Horticulture Report “Recommended Vegetable Varieties” (L41) by Charles Marr.

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Cauliflower

Fun Facts: Most cauliflower is white or creamy colored. Purple cauliflower looks like cauliflower, but is really a type of broccoli that turns green when cooked. White cauliflower heads turn green if they get sunburned. Cauliflower is in the cabbage, or cruciferous, family of vegetables. It is the 12th most frequently eaten vegetable in the U.S. Eating white or purple cauliflower helps protect against heart disease and cancer.

Selecting Fresh Cauliflower: Look for a head that is clean, firm, tight, compact, solid and heavy. Any outer leaves should be fresh and green. Avoid cauliflower heads that are light brown, or that have spread out or have a coarse appearance that looks like rice, and those with soft, wilted or discolored spots.

Measuring Fresh Cauliflower:

- 1 pound raw = about 10 ounces ready to eat = about 3 cups raw = 1 1/2 cups cooked
- 1 medium head = about 50 to 75 florets = about 6 cups raw
- 1/2 cup cooked = about 2 1/4 ounces by weight = 62 grams

Handling and Preserving: Refrigerate unwashed, dry cauliflower in a perforated plastic bag in the vegetable drawer. It will stay fresh from 2 days through 4 weeks. **To freeze,** select a fresh head. Wash, cut out any dark spots, and trim off leaves. If the head has insects, soak it in 4 cups cold water with 1 teaspoon each vinegar and salt for 30 minutes. Place 1-inch pieces of cauliflower in 1 gallon boiling water mixed with 3 tablespoons lemon juice (added to prevent darkening) for 3 minutes. Drain immediately and place in ice water for 3 minutes. Drain again. Pack into freezer bags, leaving 3 inches of air space. Squeeze out the air, seal, date and freeze.

Preparation and Serving: Wash fresh cauliflower under cool running water. Trim off leaves and any dark spots. If the head has insects, soak it in 4 cups cold water with 1 teaspoon each vinegar and salt for 30 minutes. To maintain its nutrients, do not soak longer. Serve raw or cooked cauliflower plain or with dips or sauces or in salads and casseroles. To cook cauliflower: cut the florets into same-sized pieces and steam, microwave, boil or stir-fry them until fork-tender. For best quality, do not overcook.

Nutrition Facts 1 serving = 1/2 cup cooked or raw cauliflower. Each 1/2 cup cooked cauliflower has: Calories 14; Protein 1 gram; Carbohydrates 3 grams; Fat 0 grams. Cauliflower contributes fiber, vitamin C, B vitamins including folic acid, and many other nutrients, antioxidants and healthful phytochemicals to the diet.

References: www.urbanext.uiuc.edu/veggies; ESHA Food Processor; www.fda.gov/fdac/special/foodlabel/raw.html; Food for Fifty, 11th edition, 2001, by M. Molt, Prentice Hall; www.oznet.ksu.edu/library/fntr2/MF1181.pdf

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EGGPLANT

Eggplant is a unique vegetable that is a close relative of pepper and tomato. Eggplant is a cold-sensitive vegetable that requires a long warm season for best yields. The culture of eggplant is similar to that of bell pepper, with transplants being set in the garden after all danger of frost is past. Eggplants are slightly larger plants than peppers and are spaced slightly farther apart. Eggplant requires careful attention for a good harvest. Small-fruited, exotic-colored, and ornamental varieties can be grown in containers and used for decorations.



RECOMMENDED VARIETIES	DAYS TO HARVEST
Large Oval Fruit	
Black Magic	72 days
Black Beauty	80 days
Burpee Hybrid	80 days
Elongated Fruit	
Ichiban	70 days
Slim Jim	70 days; lavender, turning purple when peanut-sized; good in pots
Little Fingers	68 days; 6 to 8 inch, long, slim fruit in clusters

GROWING TIPS

When to Plant

- Eggplant is best started from transplants
- Transplant in early to mid-May in most of Kansas
- Eggplant is sensitive to cold temperatures and will not row well in cool conditions

Spacing and Depth

- 24 inches apart in rows at least 3 feet apart or in all directions

Care

- Use starter fertilizer when transplanting and side-dress with nitrogen fertilizer when plants are half grown and again immediately after harvest of the first fruits
- Eggplant thrives in hot dry conditions but irrigate during extended dry periods for continued peak production
- Insects are especially damaging to eggplant foliage so inspect plants regularly and insect control measures are usually necessary

HARVESTING

- Select firm, fully sized fruit that have a slightly soft touch with a bright and glossy skin
- Use a pruning shears to cut the fruit loose rather than breaking or twisting the stems
- When fruits become dull or brown, they are too mature for eating and should be cut off and discarded

Sources: University of Illinois Extension “Watch your Garden Grow” by Ron Wolford and Drusilla Banks (www.urbanext.uiuc.edu/veggies/index.html) and K-State Horticulture Report “Kansas Garden Guide” (S-51) by Charles Marr.

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Eggplant

Fun Facts: Fashionable high-society Chinese women used to use eggplant skins to stain their teeth black. The most common type of eggplant eaten in the U.S. is the large, dark-purple Italian eggplant. Less common are the slender lavender and small white types of eggplants. Eggplant is one of the least-frequently eaten vegetables in the U.S.

Selecting Fresh Eggplant: Look for a firm eggplant that is 6 to 8 inches long. Choose one with tender, smooth, glossy skin. Also look for one that, when it is gently pressed, yields to the pressure but the dent disappears. Look for an eggplant with an oval, not round, dimple at the blossom end. Select one where the stem and cap are still greenish and fresh-looking. Avoid eggplants that have hard flesh, as well as ones where the dent remains in the flesh after it is gently pressed, because it is likely to be brown and spongy inside, taste bitter, and have large tough seeds. Avoid those with a round dimple on the blossom end, since they may have more seeds and be spongier. Avoid eggplant that is dull, discolored, soft, shriveled or split. Avoid those with dark brown spots, which are a sign of decay.

Measuring Fresh Eggplant:

- 1 medium eggplant = about 1 1/4 pounds as purchased = about 1 pound ready-to-cook = about 4 cups diced, raw or cooked
- 1/2 cup cooked = about 1 3/4 ounces by weight = about 50 grams



Handling and Preserving: Refrigerate unwashed eggplant in a perforated plastic bag in the vegetable drawer for up to 1 week. Handle gently to avoid bruises. It develops a bitter taste during storage in the refrigerator. **To freeze:** Rinse off dirt. Cut off ends. Peel if skin is tough. Dice, or slice into 1/3-inch thick rounds. Immediately place them in a mixture of 1 gallon boiling water with 1/2 cup lemon juice for 2 to 4 minutes. Remove and place in ice water for 2 to 4 minutes. Drain. Place in freezer bags, leaving 3 inches of air. Squeeze out the air, seal, date and freeze.

Preparation and Serving: Rinse off dirt. Cut off the ends. Peel if the skin is tough. Young tender eggplant may be cooked with the peel left on. Cook eggplant by baking, grilling, steaming or frying it. Use as directed in recipes, but do not overcook. Eggplant has a mild flavor that is enhanced by culinary herbs and other vegetables.

Nutrition Facts One serving = 1/2 cup steamed eggplant. It provides: Calories 13; Protein 1 gram; Carbohydrates 3 grams; Fat 0 grams.

References: www.aboutproduce.com; <http://aem.cornell.edu/research/researchpdf/rb0207.pdf>; ESHA Food Processor; Food for Fifty, 11th edition, 2001, by M. Molt, Prentice Hall; www.urbanext.uiuc.edu/veggies; www.oznet.ksu.edu/library/FNTR2/MF1181.PDF

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LETTUCE



Lettuce is a hardy, cool-weather vegetable that thrives when the average daily temperature is between 60 and 70°F. There are five distinct types of lettuce:

Leaf types: widely adapted, produces crisp leaves loosely arranged on the stalk; matures rapidly and is the most reliable type of lettuce to grow in Kansas, especially from seed.

Cos or Romaine types: forms an upright, elongated head with thick stronger flavored leaves; takes longer to develop than leaf lettuce.

Butterhead types: are generally small, loose-heading types that have tender, soft leaves with a delicate sweet flavor; takes longer to grow than leaf lettuce and can be started and planted as transplants as well as direct seeded.

Stem lettuce types: are an enlarged seedstalk that is used mainly in stewed, creamed, and Chinese dishes; also called asparagus lettuce.

Head or Crisphead types: the iceberg types common at supermarkets all over the country, are adapted to northern conditions and require the most care; most reliably grown using transplants: best time to grow in Kansas is fall.

RECOMMENDED VARIETIES	DAYS TO HARVEST
Green Leaf	
Grand Rapids	Frilly edges; good for coldframes, greenhouse, garden
Red Leaf	
Red Sails	Slowest bolting red leaf lettuce
Ruby	Darkest red of all; resistant to tipburn
Cos or Romaine	
Green Towers	Early; dark green, large leaves
Paris Island	Long-standing
Heading or Crisphead	
Great Lakes	Standard, holds well in warm weather
Butterhead	
Buttercrunch	Thick crumpled, dark green leaves

GROWING TIPS

When to Plant

- Sow lettuce seed in mid-March or set plants in early April
- So weeds for a fall crop in mid- to late August for leaf or Bibb types, or in late July to early August for head or cos types

Spacing and Depth

- Sow seeds thinly ¼ inch deep, and water consistently until the lettuce emerges
- This to a plant every 6 to 8 inches, or set transplants at this spacing
- Rows may be as close as 15 inches apart

Care

- Cultivate carefully since lettuce is shallow rooted
- Regular watering and fertilizing are necessary

HARVESTING

- Cut the heads of heading types slightly above ground level
- Select full-sized leaves of leaf lettuce individually so that the plant will continue to produce
- Store lettuce in a plastic bag in a refrigerator immediately after harvest

Sources: University of Illinois Extension “Watch your Garden Grow” by Ron Wolford and Drusilla Banks (www.urbanext.uiuc.edu/veggies/index.html) and K-State Horticulture Report “Kansas Garden Guide” (S-51) by Charles Marr.

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Lettuce



Leaf Lettuce • Head Lettuce • Stem Lettuce



Fun Facts: Lettuce is 95% water. Iceberg lettuce is the second most-frequently vegetable eaten in the U.S., while leaf lettuce is among the top 13 vegetables eaten. Americans eat almost five times more lettuce now than they ate in the early 1900s.

Selecting Fresh Lettuce: Look for crisphead-type lettuces, such as iceberg, and cos, or romaine, lettuce that have crisp leaves. Romaine lettuce forms a long medium-dense head. Leaf (or loose-leaf) lettuce should have crisp leaves loosely arranged on the stalk. Look for butterhead lettuce, such as Boston or Bibb, that has a small loose head with tender, soft leaves (the inner leaves have an oily or buttery feel). Avoid lettuce that is dry or wilted, or that has soft decay spots or looks rusty or discolored.

Measuring Fresh Lettuce:

1 head = about 2 pounds = about 20 to 24 ounces ready to eat = about 10 or 12 cups

1 cup shredded or chopped = about 2 ounces by weight = 55 grams

Handling and Preserving: Refrigerate unwashed dry lettuce for up to 2 weeks in a perforated plastic bag in the coolest part of the refrigerator, which is the top shelf against the rear wall, or in the vegetable drawer. Avoid storing lettuce near apples, pears or bananas since they release a natural ripening gas, ethylene, which causes lettuce to develop brown spots and decay quickly. Leaf and head lettuce do not freeze well.

Preparation and Serving: Wash lettuce leaves under cool running water and drain. Pat dry with a clean towel or dry with a salad spinner. Restore limp leaves by soaking them in ice water for a few minutes. Tear leaves into pieces. For best nutrition and appearance, do not cut or slice lettuce in advance. Use all types of lettuce as a salad, on sandwiches, as a garnish, or as directed in recipes. Iceberg, leaf and romaine lettuce provide flavor and crunch. Butterhead lettuce has a delicate sweet flavor. Peel the uncommon stem-type or asparagus lettuce and use raw, like celery, or cooked.

Nutrition Facts One serving = 1 cup raw lettuce. 1 cup chopped lettuce has: Calories 7-10; Protein 1 gram; Carbohydrates 1 to 2 grams; Fat 0 grams. Nutritional value varies, with darker-colored leaves contributing more nutrients. Iceberg lettuce has very low levels of all nutrients. Romaine, leaf and butterhead lettuce contribute vitamins C and K, carotenoids (which the body converts to vitamin A), the B vitamin folic acid, essential minerals such as chromium, and other nutrients, antioxidants and phytochemicals.

References: www.urbanext.uiuc.edu/veggies; www.fda.gov/fdac/special/foodlabel/raw.html; www.aboutproduce.com; www.ianr.unl.edu/pubs/horticulture/g71.htm; ESHA Food Processor; Food for Fifty, 11th edition, 2001, by M. Molt, Prentice Hall

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ONION

Onion is a cool-season vegetable that can be grown successfully throughout most of temperate North America. Onions may be grown from sets, transplants, or seeds.

Onions start bulb formation when the day length is of the proper duration and different varieties of onions require different day lengths to initiate bulbing. In general, most common varieties fall into one of two classes, long-day (for northern latitudes) and short-day (for southern latitudes). For this reason, onion varieties that are grown in the South are not adaptable to the North and vice versa. Late plantings of the suggested varieties also result in small bulbs or lack of bulbing altogether in any location.



High temperatures and low humidity are advantageous during bulbing and curing.

Onions from Sets

Growing green onions from sets is probably the simplest method for the home gardener. The plants are quickly established and become vigorous and strong. Onion sets may be used to produce both green onions and dry onion bulbs.

Onions from Transplants

Transplanting young onion seedlings is the method of growing that most regularly produces large, dry, attractive onions for slicing (as shown in catalog pictures). Transplants are purchased in bundles (usually 60 to 80 plants) from garden stores and through seed and nursery catalogs (though mail-order onion plants often cost as much as buying the 60 to 80 full-size mature bulbs they may produce).

VARIETIES

Several varieties are used for onion sets. All of these varieties are widely adaptable. The home gardener has little choice of varieties at the store, however, because sets are seldom sold under variety names, merely by color: yellow, white, or red.

GROWING TIPS

When to Plant

- Plant sets in mid-March or plants or seed in early April

Spacing and Depth

- Space plants 2 to 4 inches in the row, 15 inches between rows
- Plant sets and transplants 1 to 1 ½ inches deep

Care

- Regular watering and fertilizing are necessary for best results
- Weed control is essential since onions compete poorly with weeds

HARVESTING

- Onions are ready to harvest when the tops begins to weaken and naturally fall over
- Pull or dig the onions and store in a warm, dry, shaded location for 2-4 weeks until the tops and necks are completely dry. After the tops are dry, cut them, trim the roots, and store in a cool dry location

Sources: University of Illinois Extension “Watch your Garden Grow” by Ron Wolford and Drusilla Banks (www.urbanext.uiuc.edu/veggies/index.html) and K-State Horticulture Report “Kansas Garden Guide” (S-51) by Charles Marr.

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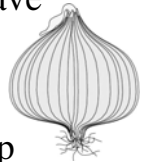


Onions



Fun Facts: Onions can be yellow, red or white, but the most common type is yellow. Green onions, also called scallions and spring or summer onions, are called ‘green’ because they are immature. If they are left in the ground to grow for a longer time, they mature into bulb or storage onions. Garlic, asparagus, leeks, chives, shallots and onions are in the same family of plants. Onions are the fourth most-frequently eaten vegetable in the U.S. On average, each American ate 18 pounds in 2002, up from the 12 pounds eaten in 1982. Residents of Libya eat the most onions, almost 4 times as many as people in the U.S.

Selecting Fresh Onions: Green onions have a sweeter, milder taste than mature onions. Look for green onions or scallions with several inches of white, crisp flesh at the root end and fresh tender green tops. Avoid those that are wilted, discolored, or decayed. If selecting mature bulb onions, look for ones that are firm, dry and small at the top and with layers of papery outer skins. Avoid those that are split or wet, are sprouting, or that have decay, soft spots, or green areas which indicates sunburn.



Measuring Fresh Onions:

- 1 pound green onions = about 2 1/2 cups ready to eat, sliced, with tops = about 1 cup ready to eat, sliced, without tops.
- 1 pound mature onions = about 3 large or 4 or 5 medium onions
- 1/2 cup steamed onions = about 3 3/4 ounces by weight = 105 grams

Handling and Preserving: Refrigerate unwashed green onions for up to 4 weeks in a perforated plastic bag in the vegetable drawer. Store mature onions for up to 4 months on a counter in a cool, dry, well-ventilated place, but not in a plastic container. **To freeze onions,** peel, rinse and chop spring or bulb onions. Pack into freezer bags, leaving 3 inches of air space. Or place onion pieces in a single layer on a tray, freeze, and then pack into freezer bags. Squeeze out the air, seal, date and freeze. Use in cooked products.

Preparation and Serving: Peel off the dry and colored outer layers. Rinse under cool running water and drain. The sulfur-containing compound in onions can bring tears to your eyes. To limit your tears, chill the onion before cutting it, and cut into the root end of the onion last. Use onions raw, or boil, steam, microwave, grill, stir-fry or bake them.

Nutrition Facts One serving = 1/2 cup. 1/2 cup steamed onions has: Calories 40; Protein 1 gram; Carbohydrates 9 grams; Fat 0 grams. Onions contain the antioxidant quercetin, and organosulfur compounds, which help protect against chronic diseases.

References: www.urbanext.uiuc.edu/veggies; www.onions-usa.org; www.fda.gov/fdac/special/foodlabel/raw.html; www.aboutproduce.com; ESHA Food Processor; Food for Fifty, 11th edition, 2001, by M. Molt, Prentice Hall; www.oznet.ksu.edu/library/fntr2/C648.pdf

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PEAS

Peas are one of the most cold-tolerant plants grown in Kansas gardens. For gardening purposes, peas may be classified as garden peas (English peas), snap peas, and snow peas (sugar peas). Garden pea varieties have smooth or wrinkled seeds. The smooth-seeded varieties tend to have more starch than the wrinkled-seeded varieties. The wrinkled-seeded varieties are generally sweeter and usually preferred for home use.



The smooth-seeded types are used more often to produce ripe seeds that are used like dry beans and to make split-pea soup. Snap peas have been developed from garden peas to have low-fiber pods that can be snapped and eaten along with the immature peas inside. Snow peas are meant to be harvested as flat, tender pods before the peas inside develop at all. The Southern pea (cowpea) is an entirely different warm-season vegetable that is planted and grown in the same manner as beans.

RECOMMENDED VARIETIES	DAYS TO HARVEST
Main Season	
Sparkle	60 days to harvest; 18 inches tall; good for freezing
Little Marvel	63 days; 18 inches tall; holds on the vine well
Green Arrow	68 days; 28 inches tall; pods in pairs; resistant to fusarium and powdery mildew
Sugar	
Dwarf Gray Sugar	65 days; 24 to 30 inches

GROWING TIPS

When to Plant

- Plant seed in early to mid-March when soil is dry enough to work
- Peas are not well adapted for fall gardens because seed usually fails to germinate well in warm soil

Spacing and Depth

- Plant see 2 to 4 inches apart with rows 12 inches apart

Care

- Peas prefer cool soil and need water during stress periods
- A trellis may be needed to support the flimsy vines

HARVESTING

- Garden peas: when pea pods are swollen (appear round) they are ready to be picked; pick immediately before cooking because quality deteriorates rapidly
- Sugar Snap peas: harvest when the pods first start to fatten but before the seeds grow very large, at this point the pods snap like green beans and the whole pod can be eaten
- Snow peas: harvest when the individual peas are about the size of bb pellets, when the pods are full length but are still quite flat

Sources: University of Illinois Extension “Watch your Garden Grow” by Ron Wolford and Drusilla Banks (www.urbanext.uiuc.edu/veggies/index.html) and K-State Horticulture Report “Kansas Garden Guide” (S-51) by Charles Marr.

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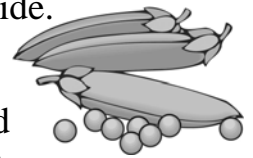


Peas: Green and Edible-Pod



Fun Facts: Do you know any identical twins who are “as alike as two peas in a pod”? Green peas, also called garden or English peas, are eaten after the outer pod is removed. Removing the pod is called “shelling” the peas. To do this, pinch off the ends, pull the string down on the inside of the pod and squeeze upward quickly to pop the peas out. Green peas have either smooth or wrinkled seeds. Wrinkled seed peas are sweeter and are usually eaten when tender and immature, or “green”. Smooth-seeded peas have more starch and are often allowed to ripen, then are eaten in split-pea soup, etc., when mature. Edible-pod peas include snow, sugar snap and Chinese peas.

Selecting Fresh Peas: Look for firm, crisp pea pods with a bright green color and a soft, velvety feel. Avoid those with limp, wrinkled, fibrous, discolored or decayed pods. Green peas are best when they have fully-expanded pods filled with large round peas. Choose edible-pod snow and sugar snap peas that have flat tender pods 1 1/2 to 3 inches long, with undeveloped seeds inside. Small pods are sweeter and more tender. If an edible-pod pea is too fibrous, remove the pod and use just the pea seeds inside.



Measuring Fresh Green Peas:

1 pound green peas = about 6 ounces shelled = about 1 cup, raw or cooked
1/2 cup cooked green or edible-pod peas = about 3 ounces by weight = 80 grams

Handling and Preserving: Refrigerate unshelled, unwashed peas in a perforated plastic bag. For best quality, since their sugar quickly turns to starch, eat green peas as soon as possible and within 5 days. Edible pod peas will keep up to two weeks. **To freeze:** Select fresh tender peas. Rinse dirt off. Remove the ends and strings from all peas, and the pods from green peas. Place 1 cup peas in boiling water for 2 minutes. Remove immediately and place in ice water for 2 minutes. Drain. Pack into freezer bags, leaving 3 inches of air space. Squeeze out the air, seal, date and freeze.

Preparation and Serving: Rinse dirt from peas. Shell green peas. For edible-pod peas, remove the ends and strings from both sides of the pod. Edible-pod peas may be eaten raw. For best quality, do not overcook peas.

Nutrition Facts for one serving, or 1/2 cup cooked green peas: Calories 67; Protein 4 grams; Carbohydrates 13 grams; Fat 0 grams. In contrast, 1/2 cup cooked edible-pod peas provides 34 calories and 6 grams carbohydrates. Peas contribute vitamin C and K, B vitamins, fiber and essential minerals to the diet.



References: ESHA Food Processor; www.oznet.ksu.edu/library/fntr2/MF1181.pdf; www.urbanext.uiuc.edu; www.aboutproduce.com

Prepared by Mary Meck Higgins, Ph.D., R.D., L.D., CDE, Assistant Professor, Department of Human Nutrition. Nov. 2003.
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PEPPERS

Pepper is a tender, warm-season vegetable. Pepper plants require somewhat higher temperatures, grow more slowly, and are smaller than most tomato plants.



The sweet varieties of peppers, especially the bells, traditionally have been by far the most popular in the United States. They are eaten green or ripe and are used for salads, stuffing, soup, stews, relishes, and pickling. New developments in color and form have done nothing to dull the popularity of sweet peppers. Hot pepper varieties have also enjoyed a rebirth of popularity recently, mainly due to various ethnic cuisines that use their unique flavors and heat creatively.

RECOMMENDED VARIETIES	DAYS TO HARVEST
Hybrid Bell	
Bell Boy	70 days; goes green to red
Lady Bell	72 days; goes green to red
Purple Belle	70 days; immature purple, black to red
Sweet Frying or Salad Type	
Gypsy	65 days; pale yellow to orange to red
Sweet Banana	70 days; pale yellow to orange to red
Hot Peppers	
Jalapeno	70 days
Red Chili	84 days

GROWING TIPS

When to Plant

- Start seeds indoors in late winter
- Transplant into the garden after the soil and air have warmed in the spring
- Plants will grow slowly with night temperatures below 50 degrees F

Spacing and Depth

- 18 to 24 inches apart in the row, or 14 to 18 inches apart in all directions

Care

- Use a starter fertilizer when transplanting
- Apply supplemental fertilizer after the first flush of peppers is set
- Peppers do best with a uniform moisture supply. Hot dry winds and dry soil may prevent fruit set or cause fruits to abort.

HARVESTING

- Fruits may be harvested at any size desired however, desired flavor and planned use may influence when they are harvested.
- **Green Bell Varieties:** pick when fully-grown and mature – 3 to 4 inches long, firm, and green.
- **Colored Bell Varieties:** may be harvested green and immature, or allowed to ripen fully to red, yellow, orange, or brown.
- **Hot Peppers:** usually harvested at the red-ripe stage but for “green chiles” harvest the immature fruits.

Sources: University of Illinois Extension “Watch your Garden Grow” by Ron Wolford and Drusilla Banks (www.urbanext.uiuc.edu/veggies/index.html) and K-State Horticulture Report “Recommended Vegetable Varieties” (L41) by Charles Marr.

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Sweet Bell Peppers



Fun Facts: All bell peppers start out green, but some are left on the plant longer before being harvested, so that other colors -- and a sweeter, more mellow flavor -- develop. Unlike sweet bell peppers, spicy peppers provide a burning sensation because they contain capsaicinoids, which act on pain receptors in the mouth -- not on our taste buds! These compounds are stored in the light-colored veins, on the walls, and around the seeds of hot peppers. Hot, spicy varieties include pimiento, tabasco, cayenne, chili and paprika peppers, and they should be handled with caution.

Selecting Fresh Peppers: Choose crisp, firm peppers that are 3 to 4 inches long, glossy and bright in color. Sweet bell peppers can be green, red, orange, yellow, brown, white, light yellow, lilac or purple. Avoid peppers with shriveled or wrinkled skin; with thin or flimsy walls; or with soft, watery, or sunken spots.

Measuring Fresh Peppers

1 pound = 2 to 3 medium whole = 3 1/2 cups raw sliced = 2 3/4 cups cooked sliced
1/2 cup raw, sliced = about 2 1/2 ounces by weight = about 75 grams

Handling and Preserving: Store unwashed peppers in a plastic bag to hold in moisture. They usually store well for up to ten days. Peppers keep best between 40-50° F, so put them in the vegetable bin rather than the main part of the refrigerator. Colder storage temperatures may result in discoloration and disagreeable flavors. Bell peppers freeze well. Wash, core, and cut them up, as desired, then spread in a single layer on a tray and freeze. Soon after they are frozen, loosen pieces and store in a sealed freezer bag. Upon thawing, the peppers will still be crisp and can be used raw, or in cooked dishes.

Preparation and Serving: Rinse peppers under cold running water to remove dirt. Cut off bruises and decay. Remove the stem, center membrane parts, and seeds. Delicious raw as a relish or in salads. Or enjoy peppers grilled, roasted, baked, steamed, microwaved, boiled, pan-fried or stir-fried. Use as directed in a recipe.

Nutrition Facts for one serving, or 1/2 cup chopped raw sweet bell pepper: Calories 20; Protein 1 gram; Carbohydrates 5 grams; Fat 0 grams. All sweet peppers are very high in vitamin C. Red sweet peppers are also very high in vitamin A.

References: ESHA Food Processor; www.aboutproduce.com; www.urbanext.uiuc.edu; Food for Fifty, 11th edition, 2001, by M. Molt, Prentice Hall; www.oznet.ksu.edu/library/FNTR2/MF1186.PDF

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RADISH

Radish is a cool-season, fast-maturing, easy-to-grow vegetable. Garden radishes can be grown wherever there is sun and moist, fertile soil, even on the smallest city lot. Early varieties usually grow best in the cool days of early spring, but some later-maturing varieties can be planted for summer use. Additional sowings of spring types can begin in late summer, to mature in the cooler, more moist days of fall. Winter radishes are sown in midsummer to late summer, much as fall turnips. They are slower to develop than spring radishes; and they grow considerably larger, remain crisp longer, are usually more pungent, and hold in the ground or store longer than spring varieties.



RECOMMENDED VARIETIES	DAYS TO HARVEST
Spring	
Cherry Belle	22 days; round, red
Early Scarlet Globe	23 days; globe-shaped, small taproot, bright red
Easter Egg	25 days; large, oval; color mix includes reddish purple, lavender; pink, rose, scarlet, white
For Spring or Summer Use	
Icicle	25 days; long, slim, tapered white



Radishes



Fun Facts: Radishes are one of the top 20 most-frequently eaten vegetables in the U.S. Radishes are a member of the cabbage, or cruciferous, family of vegetables. You can make radishes into edible shapes by cutting them not quite all the way through and placing them in ice water so they fan out. Some radishes are thin and long, others are short and round. There are spring and winter radishes. **Spring radishes** can be red, pink, purple, white, or red and white, and some have a hot taste while others are mild. **Winter radishes** are large and can be black, white or green. Black radishes have a strong, pungent flavor. Daikon or Chinese radishes are milder and bigger than black radishes; they can grow to be 18 inches and 6 pounds.

Selecting Fresh Radishes: Look for spring radishes that are 1/2 to 1 inch wide and are firm, smooth and shiny. Avoid large spring radishes that yield to pressure; they are fibrous, spongy, tough or woody and their flavor is hot. If the radish top is attached, look for fresh green leaves. Avoid radishes that are limp or dull in appearance, or that have wilted, yellow or decayed tops.

Measuring Fresh Spring Radishes:

- 1 pound raw without tops = about 15 ounces ready to eat = about 90 small radishes or 50 medium radishes = about 3 1/2 cups of raw slices
- 1/2 cup raw slices = about 2 ounces by weight = 58 grams



Handling and Preserving: Cut off the leafy radish top and refrigerate it unwashed in a separate plastic bag; cook within 1 or 2 days. Brush off any dirt clods from the radish and refrigerate unwashed, dry radishes in a plastic bag in the vegetable drawer for 1 to 4 weeks. (Winter radishes keep longer than spring radishes do.) Radishes do not freeze well, but may be pickled. Use pickling salt as directed by the recipe, since table salt may make the brine cloudy and the pickles be off-color.

Preparation and Serving: Cut off the root. Scrub off all dirt under cool running water. Peel daikon radishes but not spring radishes. Enjoy radishes raw or cooked; whole, sliced, diced or shredded; plain or in a recipe.

Nutrition Facts One serving = 1/2 cup radishes. In each 1/2 cup of raw sliced spring radishes there are: Calories 12; Protein 0 grams; Carbohydrates 2 grams; Fat 0

References: www.urbanext.uiuc.edu/veggies; www.aboutproduce.com; www.fda.gov/fdac/special/foodlabel/raw.html; ESHA Food Processor; Food for Fifty, 11th edition, 2001, by M. Molt, Prentice Hall

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SPINACH

Spinach growing in the garden is a welcome sign of spring. It is a source of Vitamin A. It is rich in iron, calcium, and protein. Spinach can be grown as a spring and a fall crop. Crinkled leaved varieties tend to catch soil during rainfalls. Plant a plain leaved variety to avoid a "gritty" spinach when chewed.



RECOMMENDED VARIETIES	DAYS TO HARVEST
Crinkled-Leaf	
Bloomsdale Long Standing	45 days; thick, very crinkly, glossy dark green leaves
Hybrid Savoy	
Indian Summer	39 days; semi-savoy; resistant to downy mildew, tolerant to spinach blight
Melody	42 days; lightly crinkled; resistant to downy mildew, mosaic; good spring or fall
Plain-Leaf	
Giant Nobel	43 days; large, smooth leaves; long-standing
Plain-Leaf Hybrid	
Olympia	46 days; slow to bolt; spring, summer harvest

GROWING TIPS

When to Plant

- The first planting can be made as soon as the soil is prepared in the spring, mid- to late March is a common planting time
- Fall spinach can be planted in mid-August to early September
- Plant successive crops for several weeks after the initial sowing to keep the harvest going until hot weather

Spacing and Depth

- Plant seeds about an inch apart in rows as close as 5-6 inches, or scatter seed uniformly about an inch apart in a wide row or bed planting

Care

- Spinach needs a fertile well-drained location
- If growth is slow or the plants are light green, side-dress with nitrogen fertilizer

HARVESTING

- Clip spinach leaves as soon as they are big enough to use
- By clipping individual leaves the plant will continue to develop and produce more leaves
- To harvest mature plants, cut the plant at the soil level

Sources: University of Illinois Extension “Watch your Garden Grow” by Ron Wolford and Drusilla Banks (www.urbanext.uiuc.edu/veggies/index.html) and K-State Horticulture Report “Kansas Garden Guide” (S-51) by Charles Marr.

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Spinach

Fun Facts: A recipe with the word “florentine” means it contains spinach. The expression honors the French queen, Catherine de Medici, who loved spinach and was from Florence, Italy. New Zealand spinach is a leafy green vegetable, but it is not really spinach. It can, however, be used in similar ways. Spinach is extremely high in healthful antioxidants. Eating spinach helps protect health against many diseases, including heart disease, cancer and age-related macular degeneration. Spinach is closely related to beets and Swiss chard. On average, Americans eat about 2 1/2 pounds of spinach per year.

Selecting Fresh Spinach: Look for fresh, crisp dark green leaves and tender stems. Smooth leaf varieties are easier to clean. Avoid spinach with wilted, yellow, discolored, damaged or slimy leaves, or with long or tough stems.

Measuring Fresh Spinach:

1 pound raw = about 14 ounces ready to eat = about 13 cups chopped, raw
= about 2 cups cooked

1/2 cup cooked = about 3 1/2 ounces by weight = 95 grams



Handling and Preserving: Refrigerate in a perforated plastic bag in the vegetable drawer. Spinach may stay fresh up to 14 days, but when possible use during the first few days. **To freeze**, select tender fresh leaves. Rinse off dirt. Remove stems if tough. Place a handful of spinach in boiling water for 1 1/2 minutes. Drain immediately and place in ice water for 1 1/2 minutes. Drain again. Pack into freezer bags, leaving 3 inches of air space. Squeeze out the air, seal, date and freeze.

Preparation and Serving: Rinse dirt from spinach leaves and dry with clean paper towels or in a salad spinner. Serve raw or cooked spinach plain, or use as directed in recipes. Spinach may be used in cold and hot salads, casseroles including egg dishes, soups, dips, etc. To cook spinach: steam, microwave, boil or stir-fry until tender. For the best taste, color, texture and nutrition, do not overcook.

Nutrition Facts 1 serving = 1 cup raw or 1/2 cup cooked spinach. Each 1/2 cup steamed spinach has: Calories 21; Protein 3 grams; Carbohydrates 3 grams; Fat 0 grams. For 1 cup raw spinach: Calories 7; Protein 1 gram; Carbohydrates 1 gram; Fat 0 grams. Spinach contributes fiber, carotenoids (which the body converts to vitamin A), vitamins C and K, B vitamins including folic acid, iron, and many other nutrients to the diet.

References: ESHA Food Processor; Food for Fifty, 11th edition, 2001, by M. Molt, Prentice Hall; www.aboutproduce.com/; www.oznet.ksu.edu/library/FNTR2/C648.PDF; http://agecoext.tamu.edu/publications/ag_news/2002/jan/01-30-02.pdf; www.ces.ncsu.edu/depts/hort/hil/hil-8017.html

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TOMATO GROWING TIPS

Tomatoes are the most popular home garden vegetable. For many years, however, tomatoes (then called "love apples") were considered poisonous and were grown solely for their ornamental value.



Tomatoes are an excellent plant for the beginner gardener since they are easy to grow and thrive under a variety of growing conditions. Tomatoes do well in containers so those wanting to garden at their doorstep, this is a plant to select.

Transplants

Since a few plants provide an adequate harvest for most families, most gardeners prefer to buy transplants from the local nursery rather than start plants from seed. Choose plants that are dark green, short and compact, with sturdy stems about the size of a pencil.

Planting

To grow tomatoes successfully, plant them where they will get full sun for a half day or more. Tomatoes are sensitive to frost and do not thrive in cold garden soils.

- In extreme southeastern Kansas transplant in early to mid-April
- In eastern and central Kansas transplant in late April to early May
- In extreme northwest Kansas, transplant in mid-May

If there is danger of frost after plants are set, be sure to cover them with a temporary protective cover.

Fertilizing

Apply starter fertilizer when transplanting. Avoid using fertilizers with too much nitrogen because excessive nitrogen fertilization can cause spindly plants and few fruits.

Spacing and Depth

Spacing depends on plant size and whether or not plants will be staked. Small-vined types can be spaced 15 to 18 inches apart and staked vines 18 to 24 inches. Unstaked plants should have 30 inches of space between them. If planting several rows, place them about 4 feet apart. Set plants in the ground slightly deeper than they were growing in the flat or pot.

Staking

In small garden areas, tomatoes can be staked to conserve space. This usually produces earlier tomatoes because vines are pruned to promote fruit growth. Many Kansas gardeners prefer to use a "cage" or trellis for each plant (See figure). This keeps tomatoes and foliage off the ground and conserves garden space.

Watering

Tomatoes require about 1 inch of water per week. Plants grown in containers may need daily or even more frequent watering.

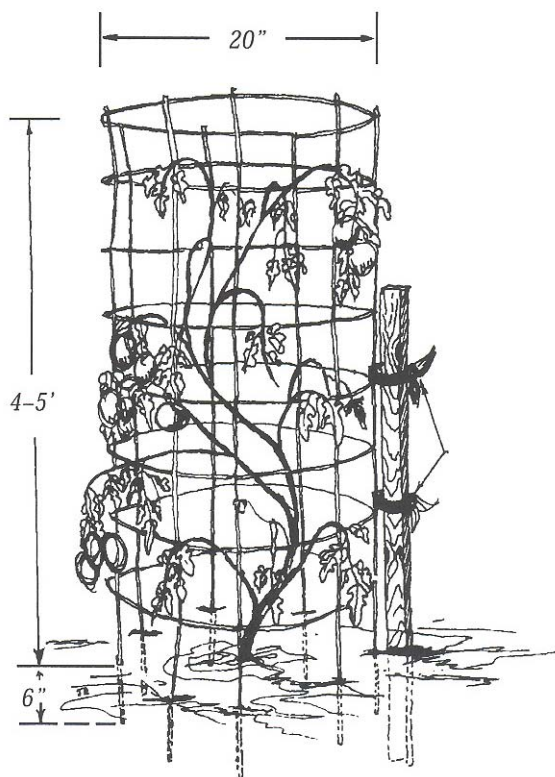


Figure 1. Cut off bottom horizontal wire and stick resulting prongs into the ground approximately 6 inches.

Sources: University of Illinois Extension "Watch your Garden Grow" by Ron Wolford and Drusilla Banks (www.urbanext.uiuc.edu/veggies/index.html) and K-State Horticulture Report "Tomatoes" (MF-312) by Charles Marr.

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TOMATO VARIETIES

Hundreds of varieties of tomatoes are now available for the home gardener. They range widely in size, shape, color, plant type, disease resistance, and season of maturity. Catalogs, garden centers, and greenhouses offer a large selection of tomato varieties and choosing the best one or two varieties can be extremely difficult. Evaluate your needs, then choose the varieties best suited to your intended use and method of culture.



Tomato plants fall into one of two types that affect ultimate plant height and cultural requirements.

Tomatoes are **determinate** if they eventually form a flower cluster at the terminal growing point, causing the plant to stop growing in height. Plants that never set terminal flower clusters, but only lateral ones and continue indefinitely to grow taller are called **indeterminate**. Older varieties are almost all indeterminate. These can be counted upon to produce abundant foliage and to ripen flavorful fruit. They may, however be extremely late in maturing. Determinate vines are easier to control and support during the growing season. Some of the extreme dwarf types are determinate as well as dwarf, producing some truly tiny mature plants.

Many varieties are available that are resistant to one or more of the major disease and insect problems of tomato. The following abbreviations may be found on seed packages or in seed catalogs.

A = Alternaria; **F** = Fusarium; **N** = Nematodes; **T** = Tobacco mosaic virus;
V = Verticillium; **OP** = Open Pollinated; **AAS** = All America Selection

The following table describes tomato varieties popular with Kansas Gardeners.

RECOMMENDED VARIETIES	VINE SIZE	FRUIT SIZE
Garden Tomatoes		
Sun Start	Medium	Medium-large
Sunny	Medium	Medium-large
Daybreak	Medium	Medium
Mt Spring	Small-medium	Medium
Mt Fresh	Small-medium	Large
Celebrity	Medium	Medium
Floralina	Medium	Large
Merced	Medium	Large
Jet Star	Large	Medium-large
Sunmaster	Medium	Large
Sun Leaper	Small-medium	Large
Carolina Gold	Small-medium	Large
Cherry		
Cherry Grande	Medium	1 oz
Mt Belle	Medium	1 oz
Sweet Chelsea	Large	1 oz
Paste/Roma		
Roma	Medium	
Plum Dandy	Small-medium	
Super Marzano	Large	

For information on growing tomatoes see the Garden for Life publication titled "Tomato Growing Tips".

Sources: University of Illinois Extension "Watch your Garden Grow" by Ron Wolford and Drusilla Banks (www.urbanext.uiuc.edu/veggies/index.html) and K-State Horticulture Report "Tomatoes" (MF-312) by Charles Marr.

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Tomatoes



Fun Facts: Tomatoes, one of the top five favorite vegetables, used to be called love apples. In 1893, the U.S. Supreme Court ruled that tomatoes are a vegetable. Ripe tomatoes can be red, yellow or orange, and can be full-, cherry- or grape size.

Selecting Fresh Tomatoes: Look for tomatoes with bright, shiny skins and firm flesh. Tomatoes are best when ripened on the vine at temperatures below 90°F. Avoid those with blemishes, cracks or soft spots, or that are lacking in color. Roma & plum tomatoes are fleshy, with less juice and fewer seeds than other kinds of tomatoes.

Measuring Fresh Ripe Tomatoes:

1 pound = 2 or 3 medium full-sized = 2 1/4 cups raw diced

1/2 cup raw chopped = about 3 ounces by weight = about 90 grams



Handling, Ripening and Preserving: Handle gently. Store unwashed ripe tomatoes on a counter between 60-80°F., away from direct sunlight, for up to 3 days. Refrigerate tomatoes, uncovered, only if you want to keep them from ripening further. When temperatures are above 90°F, pick tomatoes while still pink. **To ripen tomatoes,** place tomatoes, stem end up, in a paper bag with several holes in it, fold the top over, store at 60-80°F., and check them daily. **To freeze tomatoes for use in cooked dishes:** Wash tomatoes and drop a few into 1 gallon boiling water for only 30 seconds, or longer if using firm tomatoes. Remove immediately and cool in a bowl of ice water. Skin will pull away easily if they were in the boiling water long enough. Core and cut into pieces. Cook on a stovetop or in a microwave oven until tender. Pour into a shallow container and place in ice water until tomatoes are cool. Pack cooked tomatoes into freezer containers and leave 1 inch of air space before sealing.

Preparation and Serving: Rinse tomatoes under cold running water to remove dirt. Cut out the core and any damaged areas. Cut lengthwise from stem to blossom end to retain more juice in each slice. Enjoy tomatoes fresh (served at room temperature) or grilled, stewed, baked, steamed, microwaved, boiled, pan-fried or stir-fried. Tomatoes cook in less than 15 minutes. Use as directed in a recipe.

Nutrition Facts for one serving, or 1/2 cup raw chopped red or green tomatoes, not peeled: Calories about 20; Protein 1 gram; Carbohydrates 4 grams; Fat 0 grams. Tomatoes are high in vitamin C and provide fiber and healthful pigments and antioxidants, such as the carotenoids beta-carotene and lycopene, to the diet.



References: ESHA Food Processor; www.about.produce.com; www.urbanext.uiuc.edu; Food for Fifty, 11th edition, 2001, by M. Molt, Prentice Hall; www.oznet.ksu.edu/library/FNTR2/MF1185.PDF; www.fda.gov/fdac/special/foodlabel/raw.html

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APPENDIX F

HANDOUTS ON FRUITS

GRAPES

Grapes can be grown in fruit gardens throughout Kansas. They are easy to grow, bear early and regularly, and are long-lived plants that do not require a large area. A well cared for vine should produce at least 10 pounds, and may produce 20 pounds or more of grapes.



RECOMMENDED VARIETIES

The American bunch grape varieties as well as French-American hybrid grapes are the most productive for Kansas. The varieties most temperature hardy can be grown throughout the state, while less hardy varieties may be grown most successfully in south central and southeast Kansas. European grapes are used primarily for table grapes and raisins. They require a long growing season and mild winter temperatures and generally are not adapted to Kansas.

American types

Niagara White; table use and wine; large size fruit with good flavor; vigorous and hardy plant

Steuben Blue; table use and wine; concord type; vigorous plants

Fredonia Blue; extra large fruit and thick skin; juicy and good quality; vigorous and hardy vines

Concord Blue-black fruit, the quality standard for juice, jam, and jelly; medium clusters of medium to large berries; greatest problem in Kansas in uneven ripening during hot summers or heavy crop loads

Reliance Seedless; red; excellent raisins; ripens early mid-season; vigorous and winter-hardy

French-American Hybrids

Foch Blue; wine use; very vigorous and winter hardy

Aurore White; table or wine; vines are hardy and productive

GROWING TIPS

When to Plant

- Plant in late March or early April or at least before hot summer weather arrives

Spacing and Depth

- Plant them about the same depth as they grew in the nursery, and prune to a single stem three or four buds long
- Space the plants about 8 to 10 feet apart in the row

Care

- Grapes grow well in many different soils
- Avoid extremely wet or dry soils. Good drainage is essential.

Training and Pruning

Grapes require severe annual pruning early each spring to remain productive. Grapes flower and produce fruit only on one-year-old canes. The most productive wood is on the 6 to 8 buds closest to the base of the cane. Canes with moderate vigor and about the diameter of a pencil are most productive. So pruning is needed to encourage new canes to develop, eliminate unproductive canes, train fruiting canes, and limit the number of buds on the vine. When done properly, pruning often removes 80 to 90 percent of the wood. Pruning is suggested after the coldest part of winter but before buds swell. February and early March are good times.

Three training systems are recommended for Kansas gardens – the Single Curtain, the Umbrella Kniffin system, and the Four-Cane Kniffin system. All three systems require a two-wire trellis.

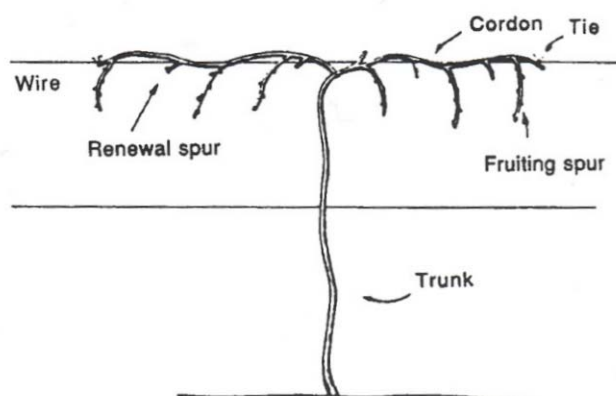


Figure 1. Single Curtain system.

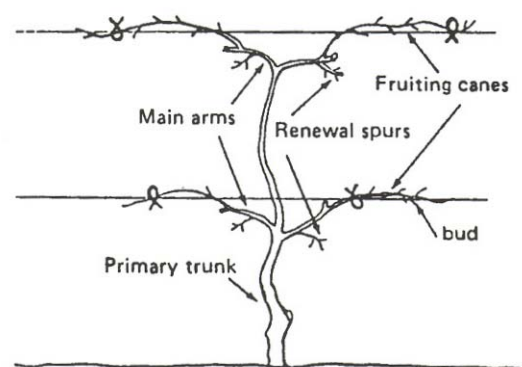
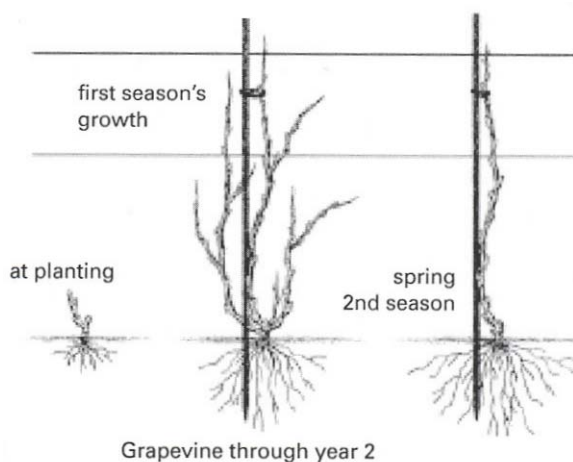


Figure 2. Four-Cane Kniffin system.

For further information on the training systems refer to the K-State Horticulture Report titled *Grapes* by Frank Morrison or your local extension specialist.



Training begins during the first growing season. After vines are planted and before growth starts, cut back the cane leaving only two buds. Each bud will produce a vigorous shoot. Provide support for the shoots by driving in a seven-foot stake near the vine and loosely tying the shoots to it. The purpose of the first-year training is to develop as strong, straight trunk for

the vine. To do this, pinch off the tips of the side shoots as they develop so that all of the plant's energy is directed to the two vertical shoots, one of which will become the trunk. A straight trunk is achieved by tying the shoots to the stake every 8 to 10 inches as they grow. The shoots should also be tied to the lower trellis wire as they reach it. Beginning the second growing season, training practices differ for the three systems.

HARVESTING

- Harvest when fully ripe. Grapes will not develop full flavor if harvested before they are completely mature.
- Color, size, sweetness, and flavor of the berry are the most useful indicators to determine ripeness
- Cut each cluster from the vine with a knife or pruning shears, handling them as little as possible

Sources: Iowa State University Extension "Growing Grapes in the Home Garden" by Richard Jauron, Gail Nonnecke, Donald Lewis, and Mark Gleason and K-State Horticulture Report "Grapes" (MF-635) by Frank Morrison.

Prepared by Candice A. Shoemaker, Ph.D., Associate Professor, Department of Horticulture, Forestry, and Recreation Resources. September 2003. **Kansas State University Agricultural Experiment Station and Cooperative Extension Service, Manhattan, Kansas.** Contents of this publication may be reproduced for educational purposes. All other rights reserved. For more information about healthy eating, contact your local extension office. Kansas State University is an equal opportunity provider & employer. This material was funded by USDA's Food Supplemental Nutrition Assistance Program. **The Food Assistance Program can help people of all ages with low income buy nutritious foods for a better diet. To find out more, call 1-888-369-4777.**



Grapes



Fun Facts: Grapes can be green or white, red, blue, blue-black or purple. Some have seeds while others are seedless. Grapes are among the top six most-frequently eaten fruits in the U.S. On average, each person eats about 8 pounds of fresh grapes and 2 pounds of dried grapes, or raisins, per year, in addition to jelly, jam, juice and wine.

Selecting Fresh Grapes: Look for firm, plump, smooth, sweet grapes with a uniform bright color, tender skins, and pleasant aroma. Look for market grapes that have been protected in covered containers. Avoid grapes with blotches of color or that are wet, mushy, wrinkled, shriveled, scarred, leaky or moldy.

Measuring Fresh Grapes

1 pound = about 15 ounces ready to eat = about 2 1/2 cups of grapes

1/2 cup = about 15 to 20 grapes = about 3 ounces by weight = about 80 grams



Handling and Preserving: Handle grapes gently so they do not bruise.

Refrigerate (preferably at 32° F.) unwashed grapes as soon as possible in a perforated plastic bag. Grapes absorb odors, so store them away from strong-smelling foods.

Grapes do not ripen further after harvest. For best quality, use during the first few days.

To freeze: Select fresh grapes. Rinse off dirt. Remove stems. Leave seedless grapes whole, but cut others in half and remove seeds. Pack into freezer bags or containers, leaving 1/2 inch of air. If desired, cover with a cold syrup made with 1 cup water and 2/3 cup sugar. Squeeze out air, seal, date and freeze.

Preparation and Serving: Just before use, rinse grapes under cool running water. Remove those with bruises and decay. Enjoy them plain! Or serve with other foods, such as cheese, yogurt and cereal. Use as directed in a recipe, such as for a cold salad, dessert or main dish.

Nutrition Facts: One serving = 12 fresh grapes or 1/4 cup raisins. 12 grapes provide: Calories 43; Protein 1/2 gram; Carbohydrates 11 grams; Fat 0 grams. 1/4 cup raisins provide: Calories 124; Protein 1 gram; Carbohydrates 33 grams; Fat 0 grams. Grapes and raisins contribute fiber, B vitamins and essential minerals to the diet. Grapes contain many healthful antioxidants, phytochemicals and pigments. Eating grapes or grape products can help protect against heart disease and cancer.

References: ESHA Food Processor; www.fda.gov/fdac/special/foodlabel/raw.html; www.aboutproduce.com; <http://nfapp.east.asu.edu/Outlook02/Grapes.htm>; <http://www.msue.msu.edu/imp/mod01/01600324.html>

Prepared by Mary Meck Higgins, Ph.D., R.D., L.D., CDE, Assistant Professor, Department of Human Nutrition. Oct. 2003.

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RASPBERRY AND BLACKBERRY GROWING TIPS

Raspberries and blackberries are not as available from farm markets and grocery stores as many other fruits, making the fresh fruits a welcome addition to the garden. Raspberries and blackberries, also called brambles, begin to bear fruit the year following planting. The roots and crowns live for several years and each year produce a new crop of canes. These canes grow the first summer, bear fruit the second summer, then die. Everbearing plants are an exception in that some fruit will develop the first year. Under favorable conditions and with proper care, bramble plantings may be productive for 8 – 10 years or longer.



PLANTING

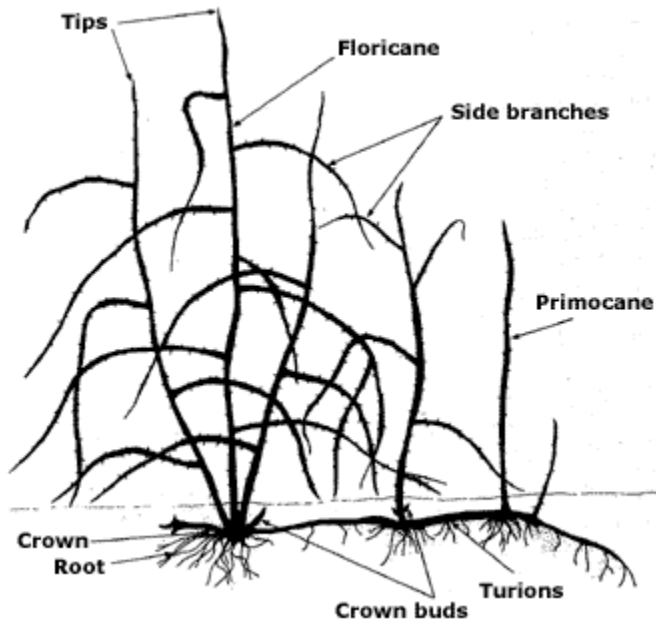
- Order plants in fall or early winter for early spring planting
- Red raspberries are planted about 2 feet apart in the row with 6-8 feet between rows, or if planted in the hill system set 5-6 apart in each direction
- Black and purple raspberries and blackberries are planted 3 feet apart in rows 8-10 feet apart, or 6 feet in each direction in the hill system
- Plant in full light away from trees and buildings
- Spread the roots out when placing them into the planting hole
- Set red raspberry plants about 2-3 inches deeper than they were in the nursery row. Other brambles set about an inch deeper
- After planting, cut red raspberries to an 8-12 inch height, blackberries to 6 inches, and purple and black raspberries to the ground

CARE

- Apply 2-4 ounces of a 5-10-5 fertilizer around each plant 2-3 weeks after planting
- Annually apply $\frac{3}{4}$ - 1 pound per 100 square feet of fertilizer in early spring before growth begins
- Keep the area between rows weed free, till or hoe no more than 2-3 inches deep to avoid root injury
- Irrigate frequently during the summer months, apply enough water to wet the soil to a depth of 10 inches

PRUNING AND TRAINING

The growth and fruiting habits of blackberries and raspberries are the

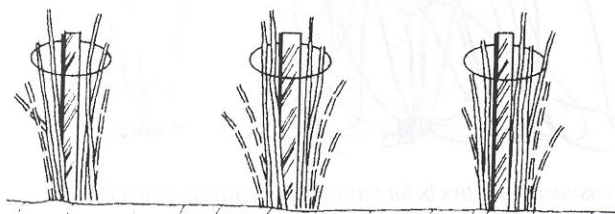


same. The root system is perennial and lives for many years, sending up a new crop of shoots (**primocanes**) each year. The shoots are biennial. They complete their growth in the first season (after which they are **floricanes**), bear fruit the following summer, and die shortly after fruiting.

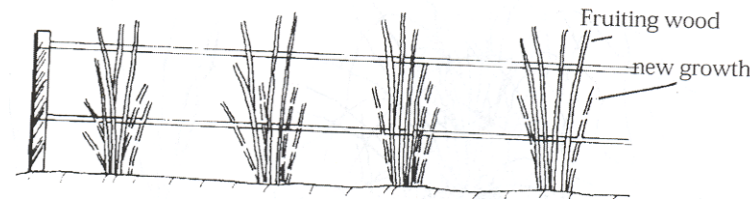
Shoots may arise from two sources – from buds at the base of the canes and from buds on the roots. Red

raspberries and blackberries produce shoots from both sources. Those coming from the roots are called suckers. Purple and black raspberries do not produce suckers.

Support Systems



Plants grown in a **hill system** can be supported by a single stake 2-4 inches in diameter. Five to eight canes are tied to the stake in one or two places in the spring after dormant pruning.



Plants grown in a **trellis system** can be supported between horizontal wires, with top wires about 3 ¼ feet above the ground. A

lower set of wires can be used for support at about 2 ½ feet above ground.

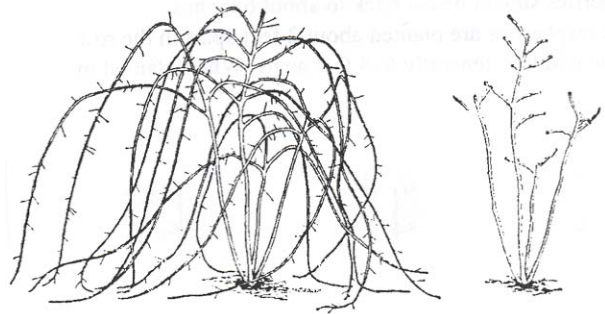
Pruning Red and Yellow Raspberries



Red and yellow raspberries should be pruned twice a year. Early spring pruning should remove weak canes and then a second pruning should be done right after harvest to remove canes that have fruited. The figure to the left shows red raspberry plants before and after dormant pruning.

Pruning Black and Purple Raspberries and Blackberries

Purple and black raspberries and blackberries require pruning three times a year. In addition to the spring and after harvest pruning mentioned above, they also require summer topping to encourage growth of side shoots. All new shoots should be pinched back in summer 3 to 4 inches once they have reached desired height. The figure above shows black raspberry plants before and after pruning. Purple raspberries and erect blackberries are pruned in a similar manner.



HARVESTING

In blackberries, the “core” comes off with the fruit, while in raspberries it stays on the plant. The best measures of maturity are fruit color and ease of separation. Full color often develops before the berries separate easily. If the berries are picked too soon, berry size and flavor will be reduced. Ripe berries will separate easily from the plant. To ensure that none of the fruit gets too ripe, berries should be picked every two or three days. Because hot weather ripens berries quickly, it is sometimes necessary to pick every day.

To harvest, use the thumb, index, and middle fingers to pick the berries. They should be placed (not dropped) directly in a basket or other container. Harvested berries should be handled as little as possible and kept in the shade until they can be placed in cool storage. Under ideal conditions (31° to 32°F and 90 to 95 percent humidity) the fruit will keep for a day or two.

For information on varieties to grow in Kansas see the Garden for Life publication “Raspberry and Blackberry Varieties”.

Source: K-State Horticulture Report “Raspberries and Blackberries” (MF-720) by Frank Morrison and University of Illinois Extension “Raspberries & More” (www.urbanext.uiuc.edu/raspberries/pruning.html).

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RASPBERRY AND BLACKBERRY VARIETIES

Raspberries and blackberries are not as available from farm markets and grocery stores as many other fruits, making the fresh fruits a welcome addition to the fruit garden or home landscape.

Raspberries and blackberries, also called brambles, begin to bear fruit the year following planting. The roots and crowns live for several years and each year produce a new crop of canes. These canes grow the first summer, bear fruit the second summer, then die. Everbearing plants are an exception in that some fruit will develop the first year. Under favorable conditions and with proper care, bramble plantings may be productive for 8 – 10 years or longer.



Weather conditions should be considered in selecting the kinds of brambles to plant as well as the cultivars (varieties). Black and purple raspberries will grow in all areas of Kansas. The fruit of some red raspberry cultivars may sunscald, but the problem generally is less severe in northeast Kansas. Blackberries do not survive extreme low temperatures and may be severely damaged by subzero temperatures, especially thornless and trailing types. All brambles are self-fruitful, thus one cultivar will be adequate for pollination. Purchase certified virus-free stock whenever possible.

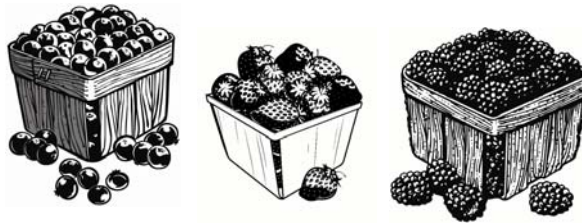
The following table lists bramble varieties that do well in Kansas.

VARIETIES	FRUIT CHARACTERISTICS
Red Raspberry types	
Latham	Red, medium berry size; medium yields; spring crop; good fruit quality; very cold hardy
Heritage	Fruit medium size, firm and holds together; canes strong, upright, and vigorous; canes bear in the fall and again in the spring
VARIETIES	FRUIT CHARACTERISTICS
Yellow Raspberry types	
Fall Gold	Medium to large, sweet fruits; amber color, primocane fruiting
Goldie	Medium-size, round, firm berries, deep yellow color with pink, blush; little if any sunscald; primocane fruiting; multiple uses
Purple Raspberry cultivars	
Brandywine	Large, firm, tart, good quality berries; plants are vigorous productive and hardy
Royalty	Purple fruit, very large berry size; good quality, sweeter than Brandywine; productive and vigorous; spring crop, late ripening, good cold, hardiness, but buds and wood are tender after buds break
Black Raspberry cultivars	
Jewel	Large, glossy black fruit, very productive; very vigorous and winter hardy; highly resistant to diseases
Blackberries	
Shawnee	Thorny, very large fruit, good quality, very productive; early ripening, good cold-hardiness; vigorous; erect canes do not require support
Black Satin	Thornless, large fruit, good quality; very productive; late ripening; not cold-hardy; vigorous; canes require support
Chester Thornless	Large fruit, good quality; very productive, late ripening, best cold-hardiness of the thornless types; vigorous; canes require support

Source: K-State Horticulture Report "Raspberries and Blackberries" (MF-720) by Frank Morrison.

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Berries



**Blackberries • Blueberries • Dewberries • Gooseberries •
Mulberries • Raspberries • Strawberries**

Fun Facts: Raspberries can be red, orange, yellow, black or purple. Strawberries are the first fruit to ripen in the spring. They are the only fruit with seeds on the outside rather than the inside, and on average, each has 200 tiny seeds.

Selecting Fresh Berries: Look for clean, firm, tender and plump berries with uniformly bright colored flesh and a natural shine. On strawberries, caps should be fresh, green and intact. Look for berries that have been protected in covered containers. Avoid those with blotches of color or that are wet, mushy, shriveled, leaky or moldy.

Measuring Fresh Berries

1 1/2 pounds = 2 pints or 1 quart

1 small basket = 1 pint = 3 1/4 cups whole = 2 1/4 cups sliced = 1 2/3 cup pureed

1 cup sliced = about 5 ounces by weight = about 150 grams

Handling, Ripening and Preserving: Cover and refrigerate (preferably at 32° F.) unwashed berries. They do not ripen further after harvest. Berries may be frozen: rinse and drain, spread a single layer on shallow trays, and when frozen, package them promptly into containers.

Preparation and Serving: Just before use, rinse berries under cold running water. Cut off bruises and decay. Remove green leaves and small stem before eating. Delicious fresh! Or slice and enjoy with foods you already eat, such as cheese, yogurt, salads, pancakes, desserts and cereal. Use as directed in a recipe.

Nutrition Facts: Serving Size = 1/2 cup sliced fresh strawberries. Calories 25; Protein 1/2 gram; Carbohydrates 6 grams; Fat 0 grams. All kinds of berries are excellent sources of vitamin C. A good source of dietary fiber and manganese, berries contain many healthful pigments and phytochemicals.

References: ESHA Food Processor; www.urbanext.uiuc.edu; www.aboutproduce.com; www.oznet.ksu.edu/library/FNTR2/MF1178.PDF

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STRAWBERRIES

Green foliage, white flowers, and bright red fruit make strawberries an ornamental addition to a garden. Although strawberries are relatively easy to grow, success depends on careful attention to cultural practices. If proper careful practices are followed, 1 foot of row will produce at least a quart of berries.



RECOMMENDED VARIETIES

Two types are available; spring (June) bearing and everbearing. The best use of everbearing varieties would be for container gardening. In general, they do not produce as well as spring bearing varieties. In choosing spring bearing varieties, consider not only dessert quality but also disease resistance.

Choosing a variety depends on the local environmental conditions. Varieties grown in northeast Kansas may not produce as well in other areas of the state. New varieties should be tested locally before large numbers of plants are ordered.

Spring-bearing varieties are usually the most productive for home gardens. The plants produce one crop per year over a period from mid-May to mid-June. Plant more than two varieties – an early, a mid, and a late season variety – to insure ripe fruits over a longer harvest period.

Earliglow Early season; medium size fruit; excellent flavor; very good berry quality; good freezer quality

Allstar Mid-to late season; large size fruit; good flavor; very good berry quality; good freezer quality

Ever-bearing varieties produce one crop during the normal harvest season and a second crop during late summer and fall. Because of the typically hot weather in July and August, fruit quality may be poor.

Tribute Medium to large size fruit; very good flavor; good freezing quality

Tristar Medium to large size fruit; very good flavor; good freezing quality

GROWING TIPS

When to Plant

- Plant as soon as the ground can be worked in the spring

Spacing and Depth

- Set the strawberry plant in the soil so that the soil is just covering the tops of the roots



The center plant is set correctly, with the soil just covering the tops of the roots. The plant on the left is set too shallow; the plant on the right too deep.

Planting Systems

The most popular method of growing June-bearing strawberries in Kansas is called the **matted-row system**. Strawberries are planted 18 to 30 inches apart in rows 3 to 4 feet apart. These new daughter plants are allowed to grow into a matted row up to about 2 feet wide. Plants growing beyond this boundary should be removed.

The **spaced-row system** limits the number of daughter plants that grow from a mother plant. Spacing of the mother plants is the same as the matted-row system. Daughter plants are spaced to root no closer than 4 inches apart. Yields may be higher and berries may be larger with this system because rows may get too dense in the matted-row method.

When growing everbearing strawberries, the **hill system** is suggested. With this method, all runners are removed so only the mother plant remains. Removing the runners causes the mother plant to develop more crowns and flower stalks. Multiple rows are arranged in groups of two, three, or four plants with a two-foot walkway between each group of rows. Plants are set about one foot apart in multiple rows.

General Care

- Strawberries need full sun for the highest yields
- For the first season, remove flowers as they appear
- Control weeds
- Fertilize in early to mid August with ¼ to 1/3 pound urea (44-0-0) or ¾ to 1 pound of 12-12-12 per 25 feet of row
- Mulch in late fall with straw for freeze protection. Rake straw between the rows as weather warms in spring.
- Renovate after harvest by mowing down all the foliage with a power mower to about 1 inch above the crown. Remove all debris. Spread 10 to 15 pounds of a balanced fertilizer (12-12-12) per each 1,000 square feet of planting area. Using a cultivator, narrow the row of plants to 6 to 12 inches wide.

HARVESTING

- Pick when fruit is completely red
- Keep the green cap on the keep the fruit firm
- Pick every other day for best quality
- Pick early in the day when it is cool

Sources: University of Illinois Extension “Strawberries & More (www.urbanext.uiuc.edu/strawberries/growing.html) and K-State Horticulture Report “Strawberries” (MF-598) by Sorkel Kadir.

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APPENDIX G

HANDOUTS ON CULINARY HERBS

CULINARY HERBS



Culinary herbs are different from spices. Generally, culinary herbs are fresh or dried leaves while spices are seeds, roots, fruits, flowers, and bark. Culinary herbs usually have a mild flavor while spices tend to have a stronger, pungent flavor.

Most herbs are relatively easy to grow. They require little care and space, have few insect and disease problems, and generally require only moderate fertility levels. Many herbs do very well in containers such as basil, chives, and thyme.

Listed below are some of the most popular culinary herbs that do well in Kansas. There are many others, however, that can be grown in Kansas.

HERB	HOW TO GROW	HARVESTING
Annuals		
Basil	Plant after all danger of frost has passed; space 10-12 inches apart; do well in containers; bring a pot indoors throughout the winter months	For fresh use, harvest the leaves six weeks after planting; for drying, harvest before flowering
Dill	Grow in full sun in a well-drained soil; space 8-10 inches apart; self-seeds readily	Cut flower heads when in full bloom and allow to dry; seed can be collected about 2-3 weeks after flowering
Parsley	Soak seed in water for 24 hours before planting; can tolerate partial shade; space 8 inches apart	Leaves can be snipped anytime during the growing season

HERB	HOW TO GROW	HARVESTING
Perennials		
Chives	Can plant seed or bulbs similar to onion sets; divide established plants every 2-3 years; do well in containers and indoors for the winter months	Snip leaves throughout the growing season; may be used fresh, dry, or frozen
Lavender	Plant in sunny, well-drained site; mulch in winter	Cut flower spikes as blossoms begin to open
Mint	Rather aggressive so plant in containers or a separate garden bed; will grow in full sun to partial shade; space 2 feet apart	Just prior to flowering, cut stems one inch above the soil
Oregano	Plant in full sun and well-drained soil; space 10-12 inches apart; mulch in winter	Snip leaves as needed; for best flavor, harvest leaves just as flower buds form
Rosemary	Plant in full sun and well-drained soil; space 12 inches apart; do well in containers and indoors	Prune stems as needed
Sage	Plant in full sun and well-drained soil; space 15-18 inches apart	Leaves can be harvested before blooming begins
Thyme	Plant in full sun and well-drained soil; can become woody so replace every 3-4 years	During full bloom, cut 5-6 inch stems and allow them to air dry

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Culinary Herbs

Locally grown culinary herbs include:

anise, basil, borage, chervil, chives, coriander or cilantro, dill, fennel, oregano, parsley, rosemary, sage, sweet marjoram, tarragon and thyme.

Fun Facts: Culinary herbs (pronounced “erb” with the h being silent) are soft-stemmed plants where the leaves, flowers, roots or seeds are used to flavor foods or beverages. Parsley, the most widely used and popular herb, is usually used as a garnish.

Selecting Freshly Cut Culinary Herbs: Choose fresh clean herbs that are not discolored or damaged. Avoid herbs with bruised, limp, brown or black leaves.

Measuring Culinary Herbs: 2 to 3 tablespoons fresh herbs = 1 tablespoon dried crushed herbs = 1 1/2 teaspoons ground herbs

Handling and Preserving:

Handle herbs gently to avoid bruising. Refrigerate unwashed fresh herbs in an open or a perforated plastic bag in the vegetable bin for use within a few days. To extend freshness for a week or more, snip off the stem end diagonally, place herbs in a tall glass with an inch of water, cover them loosely with a plastic bag, and refrigerate, changing the water daily.

Refrigerate homemade oil-based herb mixtures for up to 2 days and commercial mixtures up to 3 weeks. **To freeze** herbs for use in cooked dishes, rinse under cool running water, shake, drain, pat dry, and wrap a few sprigs or leaves in freezer wrap, place in a freezer bag, seal, label and freeze for up to 6 months.

Preparation and Serving:

Rinse herbs under cool running water to remove dirt, shake off excess moisture, and pat with clean paper towels. Unless your recipe gives other directions, mince herb leaves very fine before cooking to release more flavor. Chop with a knife, or snip them with kitchen scissors, discarding stems. Mild or savory herbs impart a delicate flavor to foods, while stronger or pungent herbs add zest. When using culinary herbs, start with small amounts to discover what you like. Add

fresh herbs to refrigerated foods several hours before serving, so the flavors have time to blend. When cooking, preserve the delicate flavor of basil, chervil, chives, coriander or cilantro, dill leaves, mint, parsley and sweet marjoram by adding them just minutes before the end of cooking, or sprinkle them on the food just before serving. Oregano, rosemary, tarragon and thyme have stronger flavors and can be added during the last half hour of cooking.





Ideas for Using Culinary Herbs:

Anise – stewed fruit, soups, beverages, pork, poultry, fish

Basil – beans, Brussels sprouts, carrots, cauliflower, cucumbers, eggplant, peas, potatoes, salads, spinach, squash, tomatoes, zucchini, rice, eggs, meats, poultry, fish, Italian/Spanish dishes

Borage – salads, fruit beverages, soups

Chervil – potatoes, salads, soups, eggs, French dishes

Chives – baked potatoes, salads, tomatoes, steamed vegetables, soups, spreads, fish, Chinese dishes

Coriander/Cilantro – tomatoes, African/Caribbean/Chinese/Mexican dishes

Dill – beans, beets, broccoli, Brussels sprouts, cabbage, carrots, cauliflower, cucumbers, peas, potatoes, salads, tomatoes, soups, sauces, cottage cheese, rice, breads, fish, German dishes

Fennel – carrots, cucumbers, squash, tomatoes, breads, eggs, fish, marinades, African/German dishes

Oregano – beans, carrots, eggplant, onions, peas, potatoes, salads, spinach, squash, sweet bell peppers, tomatoes, turnips, soups, sauces, cheeses, meats, Greek/Italian/Mexican dishes

Parsley – beans, carrots, cauliflower, eggplant, onions, potatoes, salads, tomatoes, zucchini, soups, meats, poultry, fish, Caribbean/French/Greek/Italian/Spanish dishes

Rosemary – beans, Brussels sprouts, cabbage, carrots, cauliflower, peas, roasted potatoes, squash, tomatoes, turnips, soups, rice, cheese, pork, poultry, lamb, fish, marinades, Greek/Spanish dishes

Sage – Brussels sprouts, eggplant, lima beans, onions, peas, tomatoes, stuffing, soups, meat, poultry, fish

Sweet marjoram – beans, carrots, eggplant, mushrooms, peas, salads, spinach, squash, tomatoes, soups, eggs, breads, meats, Caribbean/French dishes

Tarragon – asparagus, beans, broccoli, cabbage, cauliflower, cucumbers, salads, tomatoes, yogurt, sauces, eggs, poultry, fish

Thyme – beans, beets, broccoli, Brussels sprouts, carrots, eggplant, lima beans, mushrooms, onions, potatoes, squash, tomatoes, soups, breads, eggs, meat, poultry, fish, Caribbean/French dishes

Nutrition Facts: Culinary herbs contribute virtually no calories, protein, fat or carbohydrates to the diet, but are plentiful in healthful antioxidants and pigments. Two sprigs of parsley provide 11 mcg. vitamin K, or 14% of an adult's need for this nutrient.

References: www.oznet.ksu.edu/library/4h_y2/4H712.pdf; www.aboutproduce.com; www.oznet.ksu.edu/dp_hfrr/extensn/Hort_Tips/Vegetable_Crops/herbs.htm; <http://lancaster.unl.edu/food/ftapr03.htm>; <http://ohioline.osu.edu/hyg-fact/5000/5520.html>; www.oznet.ksu.edu/dp_hfrr/Teaching_and_Courses/Courses/Hort560/Herbs_files/v3_document.htm



Prepared by Mary Meck Higgins, Ph.D., R.D., L.D., CDE, Assistant Professor, Department of Human Nutrition. June 2003.

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APPENDIX H

RECIPES

Beef, Broccoli, and Cauliflower Stir-fry *(continued)*

4. In a separate container, combine broccoli, cauliflower and onion and set aside.
5. In a third container, cut beef into bite size strips. Set aside.
6. In a jar with a tight fitting lid, combine juice, water, soy sauce, cornstarch and black pepper. Shake well. Set aside.
7. Heat oil in a large skillet or wok over high heat. When hot, add beef strips. In about 4-5 minutes, or when brown on both sides, place beef into a clean bowl. Do not drain skillet. Set meat aside.
8. Add broccoli, cauliflower and onions to hot skillet and cook about 3-5 minutes, turning vegetables frequently.
9. Stir in sweet pepper, nuts and cooked beef. Reduce heat to low.
10. Shake cornstarch mixture again and stir into skillet mixture until well-blended. Stirring constantly, cook until sauce thickens.
11. Serve hot beef and vegetable mixture over rice.
12. Cover and refrigerate leftovers within 2 hours.

Fix It Fresh! Fruits and Vegetables Recipes Series

Recipe Category: Main Dishes



A child could wash the vegetables and shake the mixture.



Chicken, Fresh Vegetables and Pasta Salad

Yield: 3 servings

- 1 cup cooked, cooled short noodles, such as macaroni, penne, rotini or bow-tie noodles (cooked without salt)
- 6 ounces (about 1 1/4 cups) chopped, cooked, cooled plain chicken or turkey (no skin or bones)
- 1/2 cup bite size ripe tomato chunks
- 1/2 cup chopped, peeled and seeded cucumber
- 1/4 cup chopped green onions
- 2 tablespoons sliced almonds or shelled unsalted peanuts
- 2 ounces black olives, rinsed and drained
- 1 clove finely minced garlic
- 2 tablespoons fresh (or 2 teaspoons dried) chopped parsley
- 1 tablespoon fresh (or 1 teaspoon dried) chives
- 1 tablespoon salad oil
- 2 teaspoons vinegar
- 1 teaspoon lemon juice
- 1 teaspoon sugar
- 1/4 teaspoon ground black pepper
- 1 cup clean, torn lettuce and/or fresh spinach leaves, in bite size pieces

(continued on reverse side)

This low-sodium cold main dish salad is high in vitamin C and is a good source of vitamin A and iron. (If made with spinach instead of iceberg lettuce, it would be high in vitamin A.)

Nutrition Facts

Serving Size 1 1/2 cups (226g)
Servings Per Container 3

Amount Per Serving

Calories 290 **Calories from Fat** 130

% Daily Value*

Total Fat 15g **23%**

Saturated Fat 3g **15%**

Trans Fat 0g

Cholesterol 50mg **17%**

Sodium 270mg **11%**

Total Carbohydrate 21g **7%**

Dietary Fiber 3g **12%**

Sugars 3g

Protein 19g

Vitamin A 15% • Vitamin C 25%

Calcium 6% • Iron 15%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:

Fat 9 • Carbohydrate 4 • Protein 4

1 1/2 carbohydrate choices per serving

Diabetic exchanges per serving: 1 starch, 1 vegetable, 2 lean meat and 1 1/2 fat

Recipe by Mary Meck Higgins, Ph.D., R.D., L.D., CDE, Assistant Professor, Department of Human Nutrition. **Kansas State University Agricultural Experiment Station and Cooperative Extension Service, Manhattan, KS.** Contents of this publication may be reproduced for educational purposes. All other rights reserved. For more information about healthy eating, contact your local extension office. Kansas State University is an equal opportunity provider and employer. This material was funded by USDA's Supplemental Nutrition Assistance Program. **The Food Assistance Program can help people of all ages with low income buy nutritious foods for a better diet. To find out more, call 1-888-369-4777.**

July 2003; revised July 2010

Chicken, Fresh Vegetables and Pasta Salad *(continued)*

1. Wash your hands and work area.
2. In a serving bowl, combine cooled noodles, cooked chicken, fresh tomatoes, cucumber, onion, nuts, olives, garlic, parsley and chives.
3. In a jar with a tight fitting lid, combine oil, vinegar, juice, sugar and pepper. Shake well.
4. Pour dressing over chicken mixture and toss gently.
5. Serve cold on a bed of lettuce and/or fresh spinach leaves.
6. Cover and refrigerate leftovers within 2 hours.

Fix It Fresh! Fruits and Vegetables Recipes Series

Recipe Category: Main Dishes



A child could wash the vegetables and measure the toppings.



Chicken Quesadillas

Yield: 3 servings

3 flour tortillas, 7 inches each
chopped cilantro leaves, to taste
6 ounces (about 1 1/4 cups) cooked chopped chicken,
without skin or bones
3/4 cup shredded cheddar cheese
3/4 cup raw chopped red and green sweet bell peppers
prepared salsa, as desired

1. Wash your hands and work area.
2. Spray a skillet with non-stick cooking spray and heat over medium heat.
3. Place a tortilla in the skillet.
4. Top with a dash of cilantro leaves and 1/3 each of the chicken, cheese and peppers.
5. Cook in the pan until cheese begins to melt, about 1 minute. Fold tortilla in half.
6. Continue to cook on both sides until crispy, another 1-2 minutes.
7. Repeat with remaining tortillas.
8. Serve warm, with prepared salsa, if desired.
9. Cover and refrigerate leftovers within 2 hours.

Original recipe from Month of Menus, developed by Lisa Martin, Shawnee County Extension Agent

This hot main dish is an excellent source of vitamin C and calcium. The use of salsa will change the nutrition facts.

Nutrition Facts

Serving Size 1 quesadilla (146g)
Servings Per Container 3

Amount Per Serving

Calories 320 **Calories from Fat** 130

% Daily Value*

Total Fat 15g **23%**

Saturated Fat 7g **35%**

Trans Fat 0g

Cholesterol 80mg **27%**

Sodium 450mg **19%**

Total Carbohydrate 18g **6%**

Dietary Fiber 1g **4%**

Sugars 2g

Protein 27g

Vitamin A 15% • Vitamin C 50%

Calcium 25% • Iron 10%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:

Fat 9 • Carbohydrate 4 • Protein 4

1 carbohydrate choice per serving

Diabetic exchanges per serving: 1 starch, 1/2 vegetable, 3 lean meat, 1 fat

Recipe modified by Mary Meck Higgins, Ph.D., R.D., L.D., CDE, Assistant Professor, Department of Human Nutrition. **Kansas State University Agricultural Experiment Station and Cooperative Extension Service, Manhattan, KS.** Contents of this publication may be reproduced for educational purposes. All other rights reserved. For more information about healthy eating, contact your local extension office. Kansas State University is an equal opportunity provider and employer. This material was funded by USDA's Supplemental Nutrition Assistance Program. **The Food Assistance Program can help people of all ages with low income buy nutritious foods for a better diet. To find out more, call 1-888-369-4777.**

July 2003; revised July 2010



A child could wash the fruit and help remove the seeds.



Chicken, Rice and Fruit Salad

Yield: 3 servings

- 1 cup cooked, plain, white or brown* rice, without added salt, or enough uncooked rice to yield 1 cup cooked
- 2 tablespoons fresh (or 2 teaspoons dried) finely chopped parsley
- 1/2 teaspoon ground black pepper
- 1/4 clove finely chopped garlic
- 1 tablespoon fat-free Ranch or French dressing
- 2 tablespoons fat-free mayonnaise
- 1 cup bite size fresh cantaloupe/muskmelon or apple chunks
- 1/3 cup red or purple grape halves, with seeds removed
- 1/2 cup chopped celery
- 6 ounces (about 1 1/4 cups) cooked, cooled chicken (no bones or skin), cut into bite-size pieces
- 6 lettuce leaves, if desired

(continued on reverse side)

*Note: Try using instant brown rice, a quick-cooking whole grain, instead of white rice in this recipe to add extra color, flavor, texture and nutrients.

This healthy cold main dish salad is low in calories, fat and sodium. It is high in vitamins A and C if made with cantaloupe/muskmelon, and is a good source of vitamin C if made with apples. It is a good source of fiber if made with brown rice.

Nutrition Facts

Serving Size 1 1/4 cups (243g)
 Servings Per Container 3

Amount Per Serving

Calories 210 **Calories from Fat 25**

% Daily Value*

Total Fat 3g **5%**

Saturated Fat 0.5g **3%**

Trans Fat 0g

Cholesterol 50mg **17%**

Sodium 210mg **9%**

Total Carbohydrate 26g **9%**

Dietary Fiber 2g **8%**

Sugars 8g

Protein 20g

Vitamin A 45% • Vitamin C 40%

Calcium 4% • Iron 6%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:

Fat 9 • Carbohydrate 4 • Protein 4

2 carbohydrate choices per serving

Diabetic exchanges per serving: 1 starch, 1 fruit and 2 lean meat

Chicken, Rice and Fruit Salad *(continued)*

1. Wash your hands and work area.
2. If not using leftover or “planned-over” plain rice on hand, cook rice according to package directions, without added salt. Chill.
3. In a serving bowl, mix parsley, black pepper, garlic, dressing and mayonnaise together.
4. Add cooled rice, cantaloupe, grapes, celery and chicken. Stir gently.
5. Serve cold, on a bed of clean lettuce leaves, if desired.
6. Cover and refrigerate leftovers within 2 hours.

Garden Chili *(continued)*

4. Add beans, corn, tomato sauce, chopped tomatoes, pepper, garlic and chili powder
5. Cook mixture over low heat for 20 minutes.
6. Serve hot in bowls. Or serve as a dip with baked tortilla chips or on a bun.
7. Cover and refrigerate leftovers within 2 hours.

Garden Vegetables with Beef *(continued)* **and Rice**

3. Meanwhile, if using raw ground beef, place it in a skillet sprayed with non-stick cooking spray. Brown meat over medium-high heat until it is no longer pink, stirring occasionally to break it into pieces. Drain fat and blot meat with paper towels. Transfer beef into a colander and rinse with very hot water to further remove fat. Set aside.
4. Spray a wide skillet or saucepan that has a cover with non-stick cooking spray. Cook onion, celery and carrot over medium heat until tender.
5. Stir in tomatoes, garlic, pepper and oregano. Bring to a boil.
6. Stir in cooked meat and rice. After mixture begins to boil again, reduce heat to low.
7. Stir in spinach or other greens. Cover pan and let mixture steam until tender and hot, about 5-10 minutes.
8. Serve hot. Sprinkle each portion with 2 teaspoons Parmesan cheese.
9. Cover and refrigerate leftovers within 2 hours.



A child could wash the vegetables, stir the cheese mixture and sprinkle the mozzarella.



This low calorie, lean main dish is high in vitamins A and C and in calcium and is a good source of iron and fiber.

Italian Vegetable Casserole

Yield: 6 servings

- 4 ounces dry (or 3 cups cooked, cooled) spaghetti or egg noodles
- 1 minced garlic clove
- 1 1/2 teaspoons fresh finely chopped (or 1/2 teaspoon dried) rosemary
- 1 1/2 teaspoons fresh (or 1/2 teaspoon dried) finely chopped oregano
- 16 ounces no- salt- added tomato sauce
- 1 1/2 cups diced zucchini
- 1 cup coarsely chopped broccoli
- 1/2 cup chopped onion
- 1 cup firmly packed fresh spinach leaves, coarsely chopped
- 1 cup grated carrots
- 8 ounces part-skim cottage cheese
- 2 eggs
- 2 tablespoons grated Parmesan cheese
- 2 cups (8 ounces) part-skim shredded mozzarella cheese

1. Wash your hands and work area.
2. If not using already-cooked noodles, cook according to package directions only with no added salt. Drain. Rinse in cool water. Drain again. Cut spaghetti noodles into short pieces.

(continued on the reverse side)

Nutrition Facts

Serving Size 2 1/2" x 4" (282g)

Servings Per Container 6

Amount Per Serving

Calories 290 **Calories from Fat** 90

% Daily Value*

Total Fat 10g **15%**

Saturated Fat 3g **15%**

Trans Fat 0g

Cholesterol 75mg **25%**

Sodium 410mg **17%**

Total Carbohydrate 26g **9%**

Dietary Fiber 3g **12%**

Sugars 8g

Protein 21g

Vitamin A 90% • Vitamin C 50%

Calcium 8% • Iron 10%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

		Calories:	2,000	2,500
Total Fat	Less than	65g	80g	
Saturated Fat	Less than	20g	25g	
Cholesterol	Less than	300mg	300mg	
Sodium	Less than	2,400mg	2,400mg	
Total Carbohydrate		300g	375g	
Dietary Fiber		25g	30g	

Calories per gram:

Fat 9 • Carbohydrate 4 • Protein 4

2 carbohydrate choices per serving

Diabetic exchanges per serving:
1 starch, 2 vegetable, 2 lean meat and 1/2 fat

Italian Vegetable Casserole *(continued)*

3. Preheat oven to 350° F.
4. Meanwhile, mix garlic, rosemary, oregano and tomato sauce. Set aside.
5. Cook zucchini, broccoli and onion in a skillet sprayed with non-stick cooking spray, over medium heat with 1/4 cup water until crisp-tender. (Or cook in microwave without water.)
6. Add spinach to vegetable mixture. Cook until just warm. Remove from heat. Stir in carrots. Set aside.
7. In a medium bowl, mix cottage cheese, egg, and Parmesan. Set aside.
8. In an 8 x 8" baking pan, sprayed with non-stick cooking spray, place noodles, then add cottage cheese mixture, followed by the cooked vegetable mixture, then tomato sauce mixture.
9. Sprinkle mozzarella over top.
10. If desired, cover, refrigerate and cook casserole later today or tomorrow.
11. Cover with aluminum foil and bake at 350° for 30-40 minutes, or until hot and bubbly. Remove cover and bake 10 minutes longer, or until the layer of cheese is light brown.
12. Remove casserole from oven. Wait 10 minutes before serving. Cut into 6 pieces. Serve hot.
13. Cover and refrigerate leftovers within 2 hours.



A child could wash the vegetables.



Meaty Stuffed Potatoes

Yield: 3 servings

- 3 medium potatoes*
- 5 ounces (about 1 cup) cooked plain diced meat, with bones, skin or fat removed (such as turkey, chicken, beef or pork)
- 1 cup coarsely chopped broccoli
- 1/2 cup chopped onion
- 1/2 cup thinly sliced carrots
- 3/4 cup hot water
- 3/4 cup skim milk
- 1 tablespoon flour
- 1/4 teaspoon ground black pepper
- 1/2 cup (2 ounces) shredded low-fat yellow cheese

1. Wash your hands and work area.
2. Scrub potatoes. Remove any bad spots. Do not peel. Cut each in half.
3. In a covered saucepan, boil potatoes in just enough water to cover the pieces. When they are fork-tender, in about 15-20 minutes, remove from heat and drain. Set aside. (Or pierce whole potatoes with a knife or fork in several places and cook in microwave without water until fork-tender, then cut each in half.)

*Note: For variety, you may wish to substitute potatoes with 1 1/2 cups cooked white or brown rice.

(continued on the reverse side)

This healthy, lean hot main dish is low in calories, cholesterol and sodium. It is high in vitamins A and C, and in fiber and calcium.

Nutrition Facts

Serving Size 2/3 cup sauce & 1 potato (441g)
Servings Per Container 3

Amount Per Serving

Calories 320 **Calories from Fat** 20

% Daily Value*

Total Fat 2.5g **4%**

Saturated Fat 1g **5%**

Trans Fat 0g

Cholesterol 45mg **15%**

Sodium 210mg **9%**

Total Carbohydrate 49g **16%**

Dietary Fiber 6g **24%**

Sugars 8g

Protein 26g

Vitamin A 80% • Vitamin C 90%

Calcium 20% • Iron 15%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:

Fat 9 • Carbohydrate 4 • Protein 4

3 carbohydrate choices per serving

Diabetic exchanges per serving: 2 1/2 starch, 1/2 skim milk, 1 vegetable and 2 lean meat

Recipe by Mary Meck Higgins, Ph.D., R.D., L.D., CDE, Assistant Professor, Department of Human Nutrition. **Kansas State University Agricultural Experiment Station and Cooperative Extension Service, Manhattan, KS.** Contents of this publication may be reproduced for educational purposes. All other rights reserved. For more information about healthy eating, contact your local extension office. Kansas State University is an equal opportunity provider and employer. This material was funded by USDA's Supplemental Nutrition Assistance Program. **The Food Assistance Program can help people of all ages with low income buy nutritious foods for a better diet. To find out more, call 1-888-369-4777.**

Meaty Stuffed Potatoes *(continued)*

4. Meanwhile, in a skillet sprayed with non-stick cooking spray, combine cooked meat, broccoli, onion, carrots and water. Boil until vegetables are fork-tender, about 5 minutes. Reduce heat to low.
5. In a jar with a tight fitting lid, combine milk, flour and pepper. Shake well.
6. Stir flour mixture into meat mixture until well-blended.
7. Stir in cheese. Cook over low heat about 5 minutes longer or until sauce thickens, stirring frequently.
8. To serve, place 2 potato halves on each plate and mash the middle somewhat. Spoon about 1/3 cup meat mixture over each potato half.
9. Cover and refrigerate leftovers within 2 hours.

Tempting Tostadas *(continued)*

5. Bake until cheese melts, about 2 minutes.
6. Top each tortilla with 2 tablespoons each sour cream, onions, tomatoes, and carrots, 4 tablespoons lettuce, and 1 tablespoon salsa. Serve immediately.
7. Cover and refrigerate leftovers within 2 hours.

Original recipe from K-State Research & Extension Family Nutrition Program, Kids a Cookin'



A child could wash the vegetables and shake the milk mixture.



This healthy low fat, low cholesterol soup is high in vitamin C and is a good source of vitamin A and calcium.

Broccoli and Cauliflower Soup

Yield: 4 servings

- 1 cup chopped broccoli
- 1 cup chopped cauliflower
- 1/4 cup chopped onion
- 1/2 cup chicken broth, low fat, low sodium
- 1 cup skim milk, divided
- 1 teaspoon cornstarch
- 1/4 cup (about 1 1/2 ounces) finely chopped cooked lean ham
- 1/8 teaspoon ground black pepper
- 2 tablespoons shredded Swiss or cheddar cheese

1. Wash your hands and work area.
2. In a covered saucepan, boil broccoli, cauliflower, and onion gently in the chicken broth until tender, about 3 minutes. Remove from heat.
3. Pour half of the mixture and 1/2 cup skim milk into a blender. Hold lid down and blend until smooth. Return blended mixture to pan.
4. In a jar with a tight fitting lid, place 1/2 cup skim milk. Add cornstarch and shake well. Pour into soup mixture.
5. Add ham and pepper to mixture. Boil over medium heat about 5 minutes, stirring occasionally.
6. Blend in cheese and stir until melted. Serve hot.
7. Cover and refrigerate leftovers within 2 hours.

Original recipe from Jan/Feb 1999 Nutrition Spotlight, K-State Research and Extension, Department of Human Nutrition

Nutrition Facts

Serving Size 1/2 cup (158g)
Servings Per Container 4

Amount Per Serving

Calories 70 Calories from Fat 15

% Daily Value*

Total Fat 2g **3%**

Saturated Fat 1g **5%**

Trans Fat 0g

Cholesterol 10mg **3%**

Sodium 190mg **8%**

Total Carbohydrate 7g **2%**

Dietary Fiber 1g **4%**

Sugars 4g

Protein 7g

Vitamin A 15% • Vitamin C 50%

Calcium 10% • Iron 2%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

		Calories: 2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

1/2 carbohydrate choice per serving.

Diabetic exchanges per serving: 1/4 skim milk, 1 vegetable and 1/2 lean meat



A child could wash the vegetables and crush the crackers.



This healthy hot side dish is low in fat, cholesterol and sodium. It is high in vitamin C.

Broccoli and Corn Casserole

Yield: 3 servings

- 3/4 cup coarsely chopped broccoli
- 3/4 cup whole kernel corn, without added salt
- 1 tablespoon chopped onion
- 2 tablespoons shredded (1/2 ounce) Swiss cheese
- 1 tablespoon milk
- 1/8 teaspoon ground black pepper
- 2 tablespoons crushed saltine crackers

1. Wash your hands and work area.
2. In a covered saucepan, boil broccoli, corn and onion in a small amount of water until just tender. Drain. (Or cook covered in a microwave without water.)
3. Stir in cheese, milk and pepper. Using low heat, cook until cheese melts, stirring occasionally.
4. Sprinkle crushed crackers over the top.
5. Serve hot.
6. Cover and refrigerate leftovers within 2 hours.

Original recipe from Meal time/Family time, K-State Research and Extension, www.oznet.ksu.edu/humannutrition/mft/mftford.htm

Nutrition Facts

Serving Size 1/2 cup (96g)
Servings Per Container 3

Amount Per Serving

Calories 80 **Calories from Fat 20**

% Daily Value*

Total Fat 2g **3%**

Saturated Fat 1g **5%**

Trans Fat 0g

Cholesterol 5mg **2%**

Sodium 60mg **3%**

Total Carbohydrate 14g **5%**

Dietary Fiber 2g **8%**

Sugars 2g

Protein 4g

Vitamin A 15% • Vitamin C 45%

Calcium 6% • Iron 4%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:

Fat 9 • Carbohydrate 4 • Protein 4

1 carbohydrate choice per serving

Diabetic exchanges per serving: 1 starch

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A child could wash the vegetables.



Brussels Sprouts with Mustard Butter

Yield: 2 servings

4 ounces (about 7 medium, or 1 cup bite size pieces) Brussels sprouts
 1 teaspoon margarine
 2 teaspoons Dijon-style mustard
 dash of ground black pepper, to taste

1. Wash your hands and work area.
2. Trim stem and peel off any discolored leaves from Brussels sprouts. Cut each sprout into two or more pieces, depending on size.
3. In a covered saucepan, boil sprouts in just enough water to cover the pieces. When they are fork-tender, in about 5 minutes, drain. (Or cook covered in a microwave without water.) Place in a serving bowl. Set aside.
4. Using medium heat, melt margarine in the saucepan. Mix in mustard and cook about 30 seconds, stirring constantly. (Or cook covered in a microwave.)
5. Add sprouts to sauce and stir briefly to coat well with the mustard mixture. Shut off heat. Add black pepper to taste.
6. Serve hot.
7. Cover and refrigerate leftovers within 2 hours.

Original recipe from Watch Your Garden Grow, University of Illinois Extension, www.urbanext.uiuc.edu

This full-flavored hot side dish is low in fat and sodium. It is high in vitamin C.

Nutrition Facts

Serving Size 1/2 cup (64g)
 Servings Per Container 2

Amount Per Serving

Calories 40 **Calories from Fat 20**

% Daily Value*

Total Fat 2g **3%**

Saturated Fat 0g **0%**

Trans Fat 0g

Cholesterol 0mg **0%**

Sodium 100mg **4%**

Total Carbohydrate 4g **1%**

Dietary Fiber 2g **8%**

Sugars 1g

Protein 1g

Vitamin A 10% • Vitamin C 60%

Calcium 2% • Iron 4%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:

Fat 9 • Carbohydrate 4 • Protein 4

0 carbohydrate choices per serving

Diabetic exchanges per serving: 1 vegetable and 1/2 fat



A child could wash the vegetables.



This healthy fat-free hot side dish is low in calories and sodium. It is high in vitamin C.

Cabbage and Garden Vegetables

Yield: 6 servings

- 1/4 head green cabbage (about 8 ounces), rinsed and drained
- 1/2 cup water or low-sodium, low-fat chicken, beef or vegetable stock
- 1/4 medium onion, or 2 green onions with green tops, chopped
- 1/2 cup chopped firm summer squash, such as zucchini or yellow crookneck
- 1/2 medium coarsely chopped red sweet bell pepper
- dash crushed red pepper flakes (optional)
- 1/2 clove finely chopped garlic
- 1/8 teaspoon salt
- 1/8 teaspoon black pepper

1. Wash your hands and work area.
2. Cut cabbage into quarters and shred thinly.
3. In a saucepan with a lid, heat water or stock.
4. Add two handfuls of cabbage and stir for about 30 seconds. Continue adding cabbage and stirring at 30 second intervals until all of the cabbage is in the pot.
5. Cover immediately and continue cooking for about 15 minutes until cabbage is tender. Stir occasionally to keep from sticking.

(continued on reverse side)

Nutrition Facts

Serving Size 1/2 cup (83g)
Servings Per Container 6

Amount Per Serving

Calories 15 **Calories from Fat 0**

% Daily Value*

Total Fat 0g **0%**

Saturated Fat 0g **0%**

Trans Fat 0g

Cholesterol 0mg **0%**

Sodium 60mg **3%**

Total Carbohydrate 4g **1%**

Dietary Fiber 1g **4%**

Sugars 2g

Protein 1g

Vitamin A 8% • Vitamin C 50%

Calcium 2% • Iron 2%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

		Calories:	2,000	2,500
Total Fat	Less than	65g	80g	
Saturated Fat	Less than	20g	25g	
Cholesterol	Less than	300mg	300mg	
Sodium	Less than	2,400mg	2,400mg	
Total Carbohydrate		300g	375g	
Dietary Fiber		25g	30g	

Calories per gram:

Fat 9 • Carbohydrate 4 • Protein 4

0 carbohydrate choices per serving

Diabetic exchanges per serving: 1 vegetable

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Cabbage and Garden Vegetables *(continued)*

6. Meanwhile, spray a skillet with non-stick cooking spray. Over medium high heat cook onions, summer squash and bell peppers until tender. Stir occasionally.
7. Add crushed red pepper, garlic, salt, and pepper. Continue to cook and stir for 15 seconds. Do not allow garlic to brown.
8. Combine mixtures and serve hot.
9. Cover and refrigerate leftovers within 2 hours.

*Original recipe from Watch Your Garden Grow, University of Illinois Extension,
www.urbanext.uiuc.edu*



A child could wash the carrots.



This healthy hot side dish is low in fat. It is very high in vitamin A.

Cooked Carrots with Parsley

Yield: 5 servings

- 1 pound raw carrots
- 1 cup beef broth, low-sodium, low-fat
- 1 teaspoon honey
- 2 teaspoons margarine
- 2 tablespoons fresh (or 2 teaspoons dried) finely chopped parsley

1. Wash your hands and work area.
2. Scrub and peel carrots. Cut into pieces 2 to 3 inches long. Cut upper portions in half or quarters so that all pieces are about the same diameter.
3. In a medium saucepan, bring beef broth to a boil. Add carrots, honey, margarine and parsley. Cover and boil gently for 4 to 5 minutes until carrots are tender. Do not overcook.
4. Remove carrots to a warm plate. Continue to boil liquid, uncovered, stirring occasionally, until thickened (about 15 to 20 minutes.)
5. Return carrots to mixture and stir gently. Serve warm.
6. Cover and refrigerate leftovers within 2 hours.

Original recipe from Watch Your Garden Grow, University of Illinois Extension, www.urbanext.uiuc.edu

Nutrition Facts

Serving Size 1/2 cup (134g)
 Servings Per Container 5

Amount Per Serving

Calories 50 **Calories from Fat 15**

% Daily Value*

Total Fat 1.5g **2%**

Saturated Fat 0g **0%**

Trans Fat 0g

Cholesterol 0mg **0%**

Sodium 160mg **7%**

Total Carbohydrate 9g **3%**

Dietary Fiber 2g **8%**

Sugars 5g

Protein 1g

Vitamin A 270% • **Vitamin C 10%**

Calcium 2% • **Iron 2%**

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

		Calories:	2,000	2,500
Total Fat	Less than	65g	80g	
Saturated Fat	Less than	20g	25g	
Cholesterol	Less than	300mg	300mg	
Sodium	Less than	2,400mg	2,400mg	
Total Carbohydrate		300g	375g	
Dietary Fiber		25g	30g	

Calories per gram:

Fat 9 • Carbohydrate 4 • Protein 4

1/2 carbohydrate choice per serving

Diabetic exchanges per serving: 1 1/2 vegetable and 1/2 fat

Recipe modified by Mary Meck Higgins, Ph.D., R.D., L.D., CDE, Assistant Professor, Department of Human Nutrition, Kansas State University Agricultural Experiment Station and Cooperative Extension Service, Manhattan, KS. Contents of this publication may be reproduced for educational purposes. All other rights reserved. For more information about healthy eating, contact your local extension office. Kansas State University is an equal opportunity provider and employer. This material was funded by USDA's Supplemental Nutrition Assistance Program. The Food Assistance Program can help people of all ages with low income buy nutritious foods for a better diet. To find out more, call 1-888-369-4777.

July 2003; revised July 2010

Fix It Fresh! Fruits and Vegetables Recipes Series
Recipe Category: Side Dishes (Hot)



A child could rinse the vegetables and sprinkle the cheese.



Cooked Greens and Radishes with Pasta

Yield: 4 servings

- 1/2 cup uncooked short pasta, such as macaroni, penne or shells
- 4 cups firmly packed fresh radish tops, spinach leaves and/or other coarsely chopped greens
- 1 cup thinly sliced (about 10-12 whole) radishes
- 1/2 medium onion
- 2 teaspoons salad oil
- dash of salt
- 1/4 teaspoon ground black pepper
- 3 tablespoons grated Parmesan cheese

1. Wash your hands and work area.
2. Cook pasta as directed on package, except do not add salt. When done, drain and set aside.
3. Meanwhile, separate radishes from green tops. Rinse radishes and tops and/or other greens thoroughly to remove dirt. Discard any decayed greens. Trim radishes and slice thinly. Chop greens coarsely. Set aside.
4. Chop onion. Set aside.
5. Heat oil in a large skillet over medium-high heat. Add chopped onion and cook until it begins to soften.
6. Reduce heat to low. Add radish slices. Cover and let cook 3 minutes.
7. Add greens and cook 2 minutes, or until greens wilt and radishes look almost translucent.

(continued on the reverse side)

This hot side dish is high in vitamins A and C.

Nutrition Facts

Serving Size 3/4 cup (92g)
Servings Per Container 4

Amount Per Serving

Calories 100 Calories from Fat 35

% Daily Value*

Total Fat 4g 6%

Saturated Fat 1g 5%

Trans Fat 0g

Cholesterol 5mg 2%

Sodium 170mg 7%

Total Carbohydrate 13g 4%

Dietary Fiber 2g 8%

Sugars 2g

Protein 4g

Vitamin A 60% • Vitamin C 25%

Calcium 8% • Iron 8%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:

Fat 9 • Carbohydrate 4 • Protein 4

1 carbohydrate choice per serving

Diabetic exchanges per serving: 1/2 starch, 1 vegetable and 1/2 fat

Recipe by Mary Meck Higgins, Ph.D., R.D., L.D., CDE, Assistant Professor, Department of Human Nutrition. Kansas State University Agricultural Experiment Station and Cooperative Extension Service, Manhattan, KS. Contents of this publication may be reproduced for educational purposes. All other rights reserved. For more information about healthy eating, contact your local extension office. Kansas State University is an equal opportunity provider and employer. This material was funded by USDA's Supplemental Nutrition Assistance Program. The Food Assistance Program can help people of all ages with low income buy nutritious foods for a better diet. To find out more, call 1-888-369-4777.

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Cooked Greens and Radishes with Pasta *(continued)*

8. Remove from heat. Add salt, pepper, and drained pasta. Mix gently.
9. Serve hot. Sprinkle about 2 teaspoons cheese over each serving.
10. Cover and refrigerate leftovers within 2 hours.



A child could wash the fruit and measure the ingredients.



The nutrient content of these muffins depends to some extent on the fruit used. For instance, they are high in vitamin C if strawberries are used.

Fabulous Fruit Muffins

Yield: 9 muffins

- 1 1/4 cups flour
- 1/4 cup sugar
- 1 teaspoon baking powder
- 1/2 teaspoon baking soda
- 3/4 cup buttermilk*
- 2 tablespoons melted margarine
- 1 egg, slightly beaten
- 1/2 teaspoon vanilla flavoring
- 1 cup fresh coarsely chopped fruit, such as berries or peaches

1. Wash your hands and work area.
2. Heat oven to 400° F. Spray muffin tin with nonstick cooking spray.
3. In a large bowl, combine flour, sugar, baking powder, and baking soda. Stir well until all ingredients are blended.

*Note: To substitute for buttermilk, use 3/4 cup skim milk minus 2 teaspoons, and add 2 teaspoons lemon juice or vinegar, then allow to stand for 5-10 minutes.

(continued on reverse side)

Nutrition Facts

Serving Size 1 muffin (70g)

Servings Per Container 9

Amount Per Serving

Calories 130 **Calories from Fat** 35

% Daily Value*

Total Fat 3.5g **5%**

Saturated Fat 1g **5%**

Trans Fat 0g

Cholesterol 25mg **8%**

Sodium 190mg **8%**

Total Carbohydrate 20g **7%**

Dietary Fiber 1g **4%**

Sugars 6g

Protein 3g

Vitamin A 4% • **Vitamin C** 20%

Calcium 4% • **Iron** 6%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

		Calories:	2,000	2,500
Total Fat	Less than		65g	80g
Saturated Fat	Less than		20g	25g
Cholesterol	Less than		300mg	300mg
Sodium	Less than		2,400mg	2,400mg
Total Carbohydrate			300g	375g
Dietary Fiber			25g	30g

Calories per gram:

Fat 9 • Carbohydrate 4 • Protein 4

1 1/2 carbohydrate choices per serving

Diabetic exchanges per serving: 1 starch, 1/2 fruit, and 1/2 fat

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Fabulous Fruit Muffins *(continued)*

4. In another bowl, combine buttermilk, margarine, egg, and vanilla. Pour liquid mixture into the dry ingredients.
5. Using a large spoon, gently stir ingredients just until moist. (Do not overmix.) Add fruit and stir gently. (Do not overmix.)
6. Spoon the batter evenly into 9 muffin cups.
7. Bake 20 to 25 minutes or until golden brown.
8. Serve hot or cold.
9. Muffins may be frozen for later use.

Original recipe from "Small Fruit Crops for the Backyard" University of Illinois Extension, www.urbanext.uiuc.edu



A child could wash the vegetables and shake the mixture.



This healthy hot side dish is low in calories, fat and sodium. It is high in vitamin C.

Green Beans and Peppers with Lemony Dressing

Yield: 5 servings

- 2 cups (about 8 ounces) green beans
- 1/2 cup red sweet bell pepper, cut into bite size strips
- 2 teaspoons minced fresh (or 3/4 teaspoon dried) parsley
- 1 tablespoon lemon juice
- 1 tablespoon fat-free plain yogurt
- 1 tablespoon finely chopped chives or finely chopped green onions with green tops
- 1/4 teaspoon black pepper
- 2 teaspoons salad oil

1. Wash your hands and work area.
2. Wash green beans and remove ends. Snap into bite size pieces.
3. Cook in boiling water for 3 minutes or until crisp tender. Drain immediately.
4. Toss with red pepper.
5. In a jar with a tight fitting lid, combine parsley, lemon juice, yogurt, chives, pepper and oil. Shake well.
6. Toss green beans and red peppers with dressing to coat vegetables and serve.
7. Cover and refrigerate leftovers within 2 hours.

Original recipe from Watch Your Garden Grow, University of Illinois Extension, www.urbanext.uiuc.edu

Nutrition Facts

Serving Size 1/2 cup (64g)
 Servings Per Container 5

Amount Per Serving

Calories 35 **Calories from Fat 15**

% Daily Value*

Total Fat 2g **3%**

Saturated Fat 0g **0%**

Trans Fat 0g

Cholesterol 0mg **0%**

Sodium 5mg **0%**

Total Carbohydrate 4g **1%**

Dietary Fiber 2g **8%**

Sugars 1g

Protein 1g

Vitamin A 15% • Vitamin C 35%

Calcium 2% • Iron 4%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:

Fat 9 • Carbohydrate 4 • Protein 4

0 carbohydrate choices per serving

Diabetic exchanges per serving: 1 vegetable and 1/2 fat

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A child could wash the vegetables.



Green Beans and 'Toes

Yield: 4 servings

- 1 cup (about 4 ounces) fresh green beans
- 1 fresh small white potato, cubed but not peeled
- 1/2 cup water
- 1/4 teaspoon salt
- 1/4 teaspoon ground black pepper
- 1/4 cup chopped onion
- 1 large chopped ripe tomato
- 1/2 clove minced garlic

1. Wash your hands and work area.
2. Rinse vegetables and let drain.
3. Trim ends of green beans and snap into bite size pieces.
4. Combine green beans, potato, water, salt and pepper in a saucepan.
5. Cover and boil gently for 15 minutes or until potato is tender.
6. Meanwhile, spray skillet with non-stick cooking spray. Add onions and cook for one minute.
7. Add tomatoes and garlic. Cook for 1-2 more minutes.
8. Combine mixtures and serve hot.
9. Cover and refrigerate leftovers within 2 hours.

Original recipe from Watch Your Garden Grow, University of Illinois Extension, www.urbanext.uiuc.edu

This healthy fat-free hot side dish is an excellent source of vitamin C and a good source vitamin A.

Nutrition Facts

Serving Size About 1/2 cup (146g)
Servings Per Container 4

Amount Per Serving

Calories 50 Calories from Fat 0

% Daily Value*

Total Fat 0g **0%**

Saturated Fat 0g **0%**

Trans Fat 0g

Cholesterol 0mg **0%**

Sodium 150mg **6%**

Total Carbohydrate 11g **4%**

Dietary Fiber 2g **8%**

Sugars 2g

Protein 2g

Vitamin A 10% • Vitamin C 25%

Calcium 2% • Iron 4%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:

Fat 9 • Carbohydrate 4 • Protein 4

1 carbohydrate choice per serving

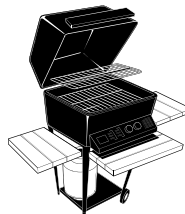
Diabetic exchanges per serving: 1/2 starch and 1 vegetable

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July 2003; revised July 2010



A child could wash the tomatoes.



Grilled Tomato Kebabs

Yield: 6 servings

24 small tomatoes, cherry sized
 2 teaspoons salad oil
 1/2 teaspoon ground black pepper
 1 tablespoon fresh (or 1 teaspoon dried) oregano
 Six wooden or metal skewers (If you are using wooden skewers, soak them for 30 minutes in cold water before using)

1. Wash your hands and work area.
2. Start soaking skewers, if needed.
3. Rinse and drain tomatoes. Using a paper towel, dry each or spread on towels and allow to air dry so the oil will stick to the skins.
4. Place the dry tomatoes in a large bowl. Add oil, black pepper and oregano. Toss to coat tomatoes.
5. Thread 4 tomatoes, spaced at least an inch apart, on each of the 6 skewers.
6. Brush hot grill grate with oil to prevent sticking. Arrange skewers on grate.
7. Grill 2 to 4 minutes. Turn and grill the other side for 1 to 2 minutes.
8. Serve hot.
9. Cover and refrigerate leftovers within 2 hours.

Original recipe from Watch Your Garden Grow, University of Illinois Extension, www.urbanext.uiuc.edu

This flavorful hot side dish is low in calories and fat, and is sodium-free. It is a good source vitamin C.

Nutrition Facts

Serving Size 1 Kebab (71g)
 Servings Per Container 6

Amount Per Serving

Calories 25 **Calories from Fat 15**

% Daily Value*

Total Fat 1.5g **2%**

Saturated Fat 0g **0%**

Trans Fat 0g

Cholesterol 0mg **0%**

Sodium 0mg **0%**

Total Carbohydrate 3g **1%**

Dietary Fiber 1g **4%**

Sugars 2g

Protein 1g

Vitamin A 10% • Vitamin C 15%

Calcium 2% • Iron 2%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:

Fat 9 • Carbohydrate 4 • Protein 4

0 carbohydrate choices per serving

Diabetic exchanges per serving: 1/2 vegetable and 1/2 fat

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A child could wash the vegetables, layer the vegetable slices, and sprinkle the cheese.



Italian Eggplant Casserole

Yield: 4 servings

- 1/2 medium onion, cut in half or quarters and sliced thinly
- 1/2 clove minced garlic
- 1/2 cup coarsely chopped tomatoes
- 2 teaspoons fresh (or 3/4 teaspoon dried) basil
- 2 teaspoons fresh (or 3/4 teaspoon dried) oregano
- 1 small eggplant, cut into 1/4" thick slices
- 1 large tomato, sliced very thin
- 1 cup (4 ounces) shredded part-skim mozzarella cheese

1. Wash your hands and work area.
2. Preheat oven to 425° F.
3. In a medium skillet sprayed with non-stick cooking spray, cook onion over medium heat until tender, about 2-3 minutes.
4. Add garlic and cook for 1 minute. Add chopped tomatoes, basil and oregano. Cook gently over low heat for 10 minutes.
5. Spread half of the mixture over the bottom of a 5 x 9 inch baking pan sprayed with non-stick cooking spray.
6. Add half of the eggplant slices then half of the tomato slices. Sprinkle half of the mozzarella cheese over the top.
7. Repeat layers.

(continued on the reverse side)

This hot side dish pleases people who do not usually enjoy eating eggplant! It is high in calcium, and vitamin C and is a good source of vitamin A and fiber.

Nutrition Facts

Serving Size 2 1/4" thick slice (180g)
 Servings Per Container 4

Amount Per Serving

Calories 110 **Calories from Fat** 45

% Daily Value*

Total Fat 5g **8%**

Saturated Fat 3g **15%**

Trans Fat 0g

Cholesterol 20mg **7%**

Sodium 180mg **8%**

Total Carbohydrate 9g **3%**

Dietary Fiber 3g **12%**

Sugars 4g

Protein 8g

Vitamin A 15% • Vitamin C 20%

Calcium 25% • Iron 2%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:

Fat 9 • Carbohydrate 4 • Protein 4

1/2 carbohydrate choice per serving

Diabetic exchanges per serving: 1 1/2 vegetable, 1/2 lean meat and 1 fat

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Italian Eggplant Casserole *(continued)*

8. Cover with aluminum foil and bake 25 minutes or until vegetables are tender.
9. Uncover and bake 10-15 minutes, or until the layer of cheese is light brown.
10. Cut into 4 servings. Serve hot.
11. Cover and refrigerate leftovers within 2 hours.

Original recipe from the National Diabetes Education Program Recipe and Meal Planner Guide, http://ndep.nih.gov/get-info/recipe/en_lasagna.htm



A child could wash the vegetables and stir the mixtures.



Potato Spinach Casserole

Yield: 6 servings

- 12 ounces frozen country style hash browns, thawed
- 1/2 cup chopped green sweet bell pepper
- 1/2 cup finely chopped onion, divided
- 1/2 teaspoon salt
- 1/2 teaspoon ground black pepper, divided
- 12 ounces canned evaporated skimmed milk
- 3/4 cup egg whites or egg substitute
- 1/2 cup shredded reduced fat sharp Cheddar cheese
- 1/2 cup shredded reduced fat Monterey Jack cheese
- 1 cup packed fresh spinach, washed and chopped
- 1/2 cup chopped fresh tomatoes

1. Preheat oven to 425 degrees.
2. Wash your hands and work area.
3. In large bowl, combine hash browns, green pepper, 1/4 cup onion, salt, and 1/4 teaspoon pepper.
4. Spray a 8 x 8" baking dish with non-stick cooking spray. Press potato mixture into bottom.
5. Bake until lightly browned around edges, 20-25 minutes.

(continued on reverse side)

This hot side dish is low in cholesterol. It is high in calcium and in vitamins A and C.

Nutrition Facts

Serving Size 2 1/2" x 4" (204g)
Servings Per Container 6

Amount Per Serving

Calories 170 **Calories from Fat** 35

% Daily Value*

Total Fat 4g **6%**

Saturated Fat 2.5g **13%**

Trans Fat 0g

Cholesterol 15mg **5%**

Sodium 480mg **20%**

Total Carbohydrate 20g **7%**

Dietary Fiber 1g **4%**

Sugars 8g

Protein 14g

Vitamin A 20% • Vitamin C 25%

Calcium 45% • Iron 2%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:

Fat 9 • Carbohydrate 4 • Protein 4

1 1/2 carbohydrate choices per serving

Diabetic exchanges per serving: 1/2 starch, 1/2 skim milk, 2 vegetables and 1 lean meat

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Potato Spinach Casserole *(continued)*

6. In large bowl, stir together evaporated milk, egg whites, 1/4 teaspoon pepper, cheeses, spinach, remaining 1/4 cup onion, and tomatoes.
7. Reduce oven temperature to 350 degrees.
8. Pour mixture over potato crust. Bake uncovered until center is set, 40-45 minutes.
9. Cover and let stand for 10 minutes. Cut into 6 pieces. Serve hot.
10. Cover and refrigerate leftovers within 2 hours.

*Original recipe from Jan/Feb 1997 Food and Nutrition Digest,
K-State Research and Extension, Department of Human Nutrition.*



A child could wash the vegetables and sprinkle the raisins and carrots.



Rice with Raisins and Carrots

Yield: 4 servings

- 3/4 cup chopped green onions or scallions
- 1 tablespoon salad oil
- 2/3 cup uncooked white or brown rice (not instant)
- 1 1/3 cups broth, low fat, low sodium (beef, chicken, or vegetable)
- 1/4 teaspoon black pepper
- 1/4 cup raisins
- 2 medium raw carrots, cut into thin slices

1. Wash your hands and work area.
2. In a saucepan with a lid, cook onion in oil until soft.
3. Stir in rice, broth, and pepper.
4. Cover and simmer over low heat for 15 minutes.
5. Sprinkle raisins and carrots on top of rice.
6. Cover and cook for about 15 minutes more. Serve hot.
7. Cover and refrigerate leftovers within 2 hours.

Original recipe from Commodity Foods, developed by Meredith Stroh, Extension Specialist, Expanded Food and Nutrition Education Program.

This hot side dish is low in sodium and is very high in vitamin A. It is a good source of vitamin C and iron.

Nutrition Facts

Serving Size 3/4 cup (174g)
Servings Per Container 4

Amount Per Serving

Calories 200 **Calories from Fat** 35

% Daily Value*

Total Fat 4g **6%**

Saturated Fat 0g **0%**

Trans Fat 0g

Cholesterol 0mg **0%**

Sodium 45mg **2%**

Total Carbohydrate 37g **12%**

Dietary Fiber 2g **8%**

Sugars 8g

Protein 4g

Vitamin A 100% • Vitamin C 20%

Calcium 2% • Iron 15%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

		Calories:	2,000	2,500
Total Fat	Less than	65g	80g	
Saturated Fat	Less than	20g	25g	
Cholesterol	Less than	300mg	300mg	
Sodium	Less than	2,400mg	2,400mg	
Total Carbohydrate		300g	375g	
Dietary Fiber		25g	30g	

Calories per gram:

Fat 9 • Carbohydrate 4 • Protein 4

2 1/2 carbohydrate choices per serving

Diabetic exchanges per serving: 1 1/2 starch, 1/2 fruit, 1 vegetable and 1/2 fat

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A child could wash the vegetables.



Saucy Vegetable Pasta

Yield: 3 servings

- 1/2 cup (about 2 ounces) uncooked short pasta (such as macaroni, bow tie, twists, etc.)
- 1 1/2 cups edible pea pods or shelled peas
- 2 tablespoons sliced green onions
- 1/2 cup sliced fresh mushrooms
- 1 clove minced garlic
- 1/2 cup thinly sliced raw carrots
- 1/2 cup skim milk
- 1 tablespoon flour
- 1/4 cup water
- 1/4 cup chicken broth, low fat, low sodium
- 1 1/2 teaspoons chopped fresh (or 1/2 teaspoon dried) basil leaves
- 1/8 teaspoon ground black pepper
- 1/2 cup grated Parmesan cheese

1. Wash your hands and work area.
2. Cook pasta as directed on package, except do not add salt. Do not overcook. Drain and place in a covered serving bowl.
3. Meanwhile, gather remaining ingredients. Rinse vegetables and let drain.
4. Trim peas. Chop onions, mushrooms and garlic. Set aside.

(continued on reverse side)

This hot side dish is an excellent source of vitamins A and C and of calcium, and is a good source of iron.

Nutrition Facts

Serving Size 1 cup (185g)
Servings Per Container 3

Amount Per Serving

Calories 180 **Calories from Fat 40**

% Daily Value*

Total Fat 4.5g **7%**

Saturated Fat 2.5g **13%**

Trans Fat 0g

Cholesterol 15mg **5%**

Sodium 280mg **12%**

Total Carbohydrate 24g **8%**

Dietary Fiber 2g **8%**

Sugars 5g

Protein 11g

Vitamin A 80% • Vitamin C 40%

Calcium 25% • Iron 10%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:

Fat 9 • Carbohydrate 4 • Protein 4

1 1/2 carbohydrate choices per serving

Diabetic exchanges per serving: 1 starch, 1 1/2 vegetable and 1 lean meat

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Saucy Vegetable Pasta *(continued)*

5. Chop carrots and set aside.
6. In a jar with a tight-fitting lid, combine milk and flour. Shake well. Set aside.
7. In a saucepan or a skillet, bring water to a boil. Add carrot slices and let boil for 1 minute. Add peas, onions, mushrooms and garlic. Boil 3 to 4 minutes, or until crisp-tender. (Or use a microwave oven to cook the vegetables, without added water.)
8. Drain vegetables and add to pasta.
9. Shake milk and flour mixture again. Using the same saucepan or skillet, combine milk-flour mixture and chicken broth. Over medium high heat, bring to a boil, stirring constantly. After sauce thickens, remove from heat.
10. Stir in basil, pepper and cheese.
11. Pour sauce over pasta and vegetables. Stir gently.
12. Serve hot.
13. Cover and refrigerate leftovers within 2 hours.

Original recipe from May/June 1994 Food and Nutrition Digest, K-State Research and Extension, Department of Human Nutrition



A child could wash the vegetables.



Seasoned Green Beans

Yield: 5 servings

- 2 cups (about 8 ounces) green beans
- 1/4 cup chopped red or yellow sweet bell peppers
- 1/4 cup chopped onion
- 1 tablespoon catsup or barbeque sauce
- 1/4 teaspoon ground black pepper

1. Wash your hands and work area.
2. Rinse beans and remove ends. Snap into bite sized pieces.
3. Boil green beans until crisp tender (or cook in microwave oven). Do not overcook.
4. In a skillet sprayed with non-stick cooking spray, cook peppers and onion until soft, about 10 minutes.
5. Add green beans, catsup or barbeque sauce, and pepper.
6. Heat until warm. Serve.
7. Cover and refrigerate leftovers within 2 hours.

This healthy, fat-free hot side dish is low in calories and very low in sodium. It is high in vitamin C and is a good source of vitamin A.

Nutrition Facts

Serving Size 1/2 cup (63g)
Servings Per Container 5

Amount Per Serving

Calories 20 Calories from Fat 0

% Daily Value*

Total Fat 0g **0%**

Saturated Fat 0g **0%**

Trans Fat 0g

Cholesterol 0mg **0%**

Sodium 35mg **1%**

Total Carbohydrate 5g **2%**

Dietary Fiber 2g **8%**

Sugars 2g

Protein 1g

Vitamin A 15% • Vitamin C 30%

Calcium 2% • Iron 4%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

		Calories: 2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:

Fat 9 • Carbohydrate 4 • Protein 4

1/2 carbohydrate choice per serving

Diabetic exchanges per serving: 1 vegetable

Recipe by Mary Meck Higgins, Ph.D., R.D., L.D., CDE, Assistant Professor, Department of Human Nutrition. Kansas State University Agricultural Experiment Station and Cooperative Extension Service, Manhattan, KS. Contents of this publication may be reproduced for educational purposes. All other rights reserved. For more information about healthy eating, contact your local extension office. Kansas State University is an equal opportunity provider and employer. This material was funded by USDA's Supplemental Nutrition Assistance Program. The Food Assistance Program can help people of all ages with low income buy nutritious foods for a better diet. To find out more, call 1-888-369-4777.



A child could wash the vegetables.



This hot side dish is low in fat and sodium. It is high in vitamin A and is a good source of vitamin C and fiber.

Zesty Peas with Carrots

Yield: 4 servings

- 1 1/2 cups shelled green peas
- 1/4 cup grated carrot
- 1/4 cup minced shallots, green onion, or white onion
- 1 teaspoon sugar
- dash of ground black pepper
- 2 tablespoons prepared Italian salad dressing

1. Wash your hands and work area.
2. In a covered saucepan, boil peas, carrots and shallots/onion in a small amount of water until just tender. Remove from heat and drain. (Or cook covered in a microwave without water.)
3. Stir in sugar, pepper and dressing. Using low heat, cook briefly until heated through.
4. Serve hot.
5. Cover and refrigerate leftovers within 2 hours.

Nutrition Facts

Serving Size 1/2 cup (77g)
Servings Per Container 4

Amount Per Serving

Calories 80 **Calories from Fat 20**

% Daily Value*

Total Fat 2g **3%**

Saturated Fat 0g **0%**

Trans Fat 0g

Cholesterol 0mg **0%**

Sodium 95mg **4%**

Total Carbohydrate 12g **4%**

Dietary Fiber 3g **12%**

Sugars 5g

Protein 3g

Vitamin A 35% • Vitamin C 15%

Calcium 2% • Iron 6%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

Calories: 2,000 2,500

Total Fat Less than 65g 80g

Saturated Fat Less than 20g 25g

Cholesterol Less than 300mg 300mg

Sodium Less than 2,400mg 2,400mg

Total Carbohydrate 300g 375g

Dietary Fiber 25g 30g

Calories per gram:

Fat 9 • Carbohydrate 4 • Protein 4

1 carbohydrate choice per serving

Diabetic exchanges per serving: 1 starch and 1/2 fat

Recipe by Mary Meck Higgins, Ph.D., R.D., L.D., CDE, Assistant Professor, Department of Human Nutrition, Kansas State University Agricultural Experiment Station and Cooperative Extension Service, Manhattan, KS. Contents of this publication may be reproduced for educational purposes. All other rights reserved. For more information about healthy eating, contact your local extension office. Kansas State University is an equal opportunity provider and employer. This material was funded by USDA's Supplemental Nutrition Assistance Program. The Food Assistance Program can help people of all ages with low income buy nutritious foods for a better diet. To find out more, call 1-888-369-4777.



A child could wash the vegetables.



This fat free whole grain cold side dish is high in vitamin C and is a good source of fiber.

Bulgur Garden Salad

Yield: 6 servings

- 1/2 cup dry bulgur
- 1 cup warm water
- 1 cup peeled and diced cucumber
- 3/4 cup diced tomatoes
- 1/4 cup thinly sliced green onions
- 1/4 cup diced green sweet bell pepper
- 5 radishes, diced
- 1/4 cup minced fresh (or 2 tablespoons dried) parsley
- 1/2 teaspoon salt
- 1/8 teaspoon black pepper
- 3 tablespoons lemon juice
- 2 teaspoons minced fresh (or 1/2 teaspoon dried) mint or cilantro leaves (optional)

1. Wash your hands and work area.
2. Combine bulgur and water. Let stand until bulgur is soft, about 30 minutes. Drain excess liquid.
3. In a large salad bowl, toss together all ingredients.
4. Refrigerate until serving.
5. Cover and refrigerate for 2 hours or more to allow flavors to blend. Serve cold.
6. Cover and refrigerate leftovers within 2 hours.

Original recipe from July/Aug 1999 Nutrition Spotlight, K-State Research and Extension, Department of Human Nutrition

Nutrition Facts

Serving Size 1/2 cup (127g)
Servings Per Container 6

Amount Per Serving

Calories 50 Calories from Fat 5

% Daily Value*

Total Fat 0g **0%**

Saturated Fat 0g **0%**

Trans Fat 0g

Cholesterol 0mg **0%**

Sodium 210mg **9%**

Total Carbohydrate 12g **4%**

Dietary Fiber 3g **12%**

Sugars 2g

Protein 2g

Vitamin A 10% • Vitamin C 30%

Calcium 2% • Iron 4%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:

Fat 9 • Carbohydrate 4 • Protein 4

1 carbohydrate choice per serving

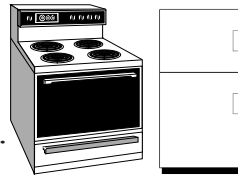
Diabetic exchanges per serving: 1/2 starch and 1 vegetable

Recipe modified by Mary Meck Higgins, Ph.D., R.D., L.D., CDE, Assistant Professor, Department of Human Nutrition. **Kansas State University Agricultural Experiment Station and Cooperative Extension Service, Manhattan, KS.** Contents of this publication may be reproduced for educational purposes. All other rights reserved. For more information about healthy eating, contact your local extension office. Kansas State University is an equal opportunity provider and employer. This material was funded by USDA's Supplemental Nutrition Assistance Program. **The Food Assistance Program can help people of all ages with low income buy nutritious foods for a better diet. To find out more, call 1-888-369-4777.**

July 2003; revised July 2010



A child could wash the vegetables and shake the mixture.



This colorful cold side dish is very low in sodium and is high in vitamin C. (If made with spinach instead of iceberg lettuce, it is also high in vitamin A.)

Cauliflower Salad with Citrus Dressing

Yield: 3 servings

- 1/2 cup coarsely chopped cauliflower
- 2 tablespoons chopped green sweet bell pepper
- 2 tablespoons chopped red sweet bell pepper
- 1 tablespoon minced green onion or scallion
- 2 tablespoons orange juice
- 1 1/2 tablespoons lemon juice
- 1 1/2 tablespoons water
- 1 tablespoon salad oil
- 1/8 teaspoon ground black pepper
- 1 1/2 cups torn lettuce and/or fresh spinach leaves

1. Wash your hands and work area.
2. In a covered saucepan, boil cauliflower in a small amount of water until just tender, about 2 minutes. (Or cook covered in a microwave without water.) Drain immediately and let cool in a shallow dish, such as an 8 x 8 inch pan.
3. Add bell peppers and onion.
4. In a jar with a tight fitting lid, combine juices, water, oil and black pepper. Shake well.
5. Pour dressing over vegetable mixture. Stir gently.
6. Cover and refrigerate 2 or more hours to allow flavors to blend.
7. Before serving, combine chilled mixture with torn lettuce or fresh spinach and mix gently. Serve cold.
8. Cover and refrigerate leftovers within 2 hours.

Nutrition Facts

Serving Size 3/4 cup (113g)
Servings Per Container 3

Amount Per Serving

Calories 60 **Calories from Fat 40**

% Daily Value*

Total Fat 4.5g **7%**

Saturated Fat 0.5g **3%**

Trans Fat 0g

Cholesterol 0mg **0%**

Sodium 15mg **1%**

Total Carbohydrate 6g **2%**

Dietary Fiber 2g **8%**

Sugars 3g

Protein 1g

Vitamin A 8% • Vitamin C 60%

Calcium 2% • Iron 2%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:

Fat 9 • Carbohydrate 4 • Protein 4

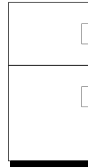
1/2 carbohydrate choice per serving

Diabetic exchanges per serving: 1 vegetable and 1 fat

Recipe by Mary Meck Higgins, Ph.D., R.D., L.D., CDE, Assistant Professor, Department of Human Nutrition. **Kansas State University Agricultural Experiment Station and Cooperative Extension Service, Manhattan, KS.** Contents of this publication may be reproduced for educational purposes. All other rights reserved. For more information about healthy eating, contact your local extension office. Kansas State University is an equal opportunity provider and employer. This material was funded by USDA's Supplemental Nutrition Assistance Program. **The Food Assistance Program can help people of all ages with low income buy nutritious foods for a better diet. To find out more, call 1-888-369-4777.**



A child could rinse the vegetables and stir the mixture.



This cold side dish is low in calories and is fat-free. It is high in vitamin A and is a good source of vitamin C.

Coleslaw

Yield: 6 servings

- 1/8 medium head cabbage, rinsed and drained
- 1/2 medium carrot, scrubbed and peeled
- 3 medium green onions, bulbs and green tops
- 2 tablespoons fat-free mayonnaise
- 2 teaspoons milk
- 2 teaspoons vinegar
- 2 teaspoons sugar
- 1/4 teaspoon salt
- 1/4 teaspoon ground black pepper

1. Wash your hands and work area.
2. Chop or shred cabbage. Grate carrot. Chop onions.
3. In a shallow dish such as an 8 x 8 inch pan, mix mayonnaise, milk, vinegar, sugar, salt and pepper.
4. Add chopped vegetables. Mix well.
5. Cover and refrigerate for 2 hours or more to allow flavors to blend.
6. Serve cold.
7. Cover and refrigerate leftovers within 2 hours.

Nutrition Facts

Serving Size 1/2 cup (42g)
Servings Per Container 6

Amount Per Serving

Calories 20 Calories from Fat 0

% Daily Value*

Total Fat 0g **0%**

Saturated Fat 0g **0%**

Trans Fat 0g

Cholesterol 0mg **0%**

Sodium 150mg **6%**

Total Carbohydrate 4g **1%**

Dietary Fiber 1g **4%**

Sugars 3g

Protein 1g

Vitamin A 20% • Vitamin C 15%

Calcium 2% • Iron 2%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:

Fat 9 • Carbohydrate 4 • Protein 4

Original recipe from Month of Menus, developed by Lisa Martin, Shawnee County Extension Agent

0 carbohydrate choices per serving

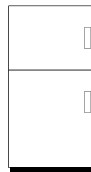
Diabetic exchanges per serving: 1 vegetable

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August 2003; revised July 2010



A child could wash the vegetables.



This salad dressing is low in calories, fat and sodium.

Creamy Cucumber Salad Dressing

Yield: 4 servings

- 3 tablespoons peeled, chopped cucumber
- 1 tablespoon chopped onion
- 3 tablespoons plain nonfat yogurt
- 1/2 teaspoon salad oil
- 1/2 teaspoon vinegar
- 1/2 teaspoon chopped fresh (or 1/8 teaspoon dried) dill
- 1 clove finely minced or pressed garlic
- 1/8 teaspoon salt

1. Wash your hands and work area.
2. Rinse, peel, seed, and coarsely chop cucumber.
3. Blend all ingredients in a blender until creamy and smooth.
4. Pour mixture into a jar with a tight fitting lid.
5. Cover and refrigerate for 2 hours or more to allow flavors to blend.
6. Serve cold over a tossed green leafy salad.
7. Cover and refrigerate leftovers within 2 hours.

Nutrition Facts

Serving Size 2 tablespoons (22g)
Servings Per Container 4

Amount Per Serving

Calories 15 **Calories from Fat 5**

% Daily Value*

Total Fat 0.5g **1%**

Saturated Fat 0g **0%**

Trans Fat 0g

Cholesterol 0mg **0%**

Sodium 80mg **3%**

Total Carbohydrate 2g **1%**

Dietary Fiber 0g **0%**

Sugars 1g

Protein 1g

Vitamin A 2% • Vitamin C 2%

Calcium 2% • Iron 0%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

		Calories: 2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:

Fat 9 • Carbohydrate 4 • Protein 4

Original recipe from *Watch Your Garden Grow*, University of Illinois Extension, www.urbanext.uiuc.edu

0 carbohydrate choices per serving

Diabetic exchanges per serving: This is a “free food”

Recipe modified by Mary Meck Higgins, Ph.D., R.D., L.D., CDE, Assistant Professor, Department of Human Nutrition, **Kansas State University Agricultural Experiment Station and Cooperative Extension Service, Manhattan, KS.** Contents of this publication may be reproduced for educational purposes. All other rights reserved. For more information about healthy eating, contact your local extension office. Kansas State University is an equal opportunity provider and employer. This material was funded by USDA’s Supplemental Nutrition Assistance Program. **The Food Assistance Program can help people of all ages with low income buy nutritious foods for a better diet. To find out more, call 1-888-369-4777.**

July 2003; revised July 2010

Fix It Fresh! Fruits and Vegetables Recipes Series

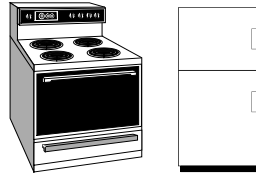
Recipe Category: Side Dishes (Cold)



A child could wash the vegetables.

Crisp Cucumber Salad

Yield: 4 servings



This healthy low calorie cold side dish is fat-free and low in sodium. It is high in vitamin C.

- 1 tablespoon sugar
- 1/8 teaspoon salt
- 2 tablespoons vinegar
- 1 medium cucumber, not peeled, sliced lengthwise, seeded and thinly sliced
- 1 shallot, thinly sliced, or 2 tablespoons thinly sliced onions
- 1/4 cup bite-size red sweet bell pepper strips
- 5 whole cilantro leaves, chopped coarsely

1. Wash your hands and work area.
2. In a small saucepan, combine sugar, salt and vinegar. Heat and stir until sugar has dissolved, but do not boil.
3. Set saucepan in cold water to cool the mixture.
4. Rinse vegetables and chop. Combine vegetables and cilantro leaves in a serving bowl.
5. Pour cooled mixture over cucumber mixture and stir gently.
6. Cover and refrigerate for 2 hours or more to allow flavors to blend. Serve cold.
7. Cover and refrigerate leftovers within 2 hours.

Original recipe from *Watch Your Garden Grow*, University of Illinois Extension, www.urbanext.uiuc.edu

Nutrition Facts

Serving Size 1/2 cup (97g)
Servings Per Container 4

Amount Per Serving

Calories 30 **Calories from Fat** 0

% Daily Value*

Total Fat 0g **0%**

Saturated Fat 0g **0%**

Trans Fat 0g

Cholesterol 0mg **0%**

Sodium 75mg **3%**

Total Carbohydrate 7g **2%**

Dietary Fiber 1g **4%**

Sugars 5g

Protein 1g

Vitamin A 8% • Vitamin C 20%

Calcium 2% • Iron 2%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:

Fat 9 • Carbohydrate 4 • Protein 4

1/2 carbohydrate choice per serving

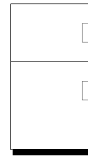
Diabetic exchanges per serving: 1 vegetable

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July 2003; revised July 2010



A child could wash the vegetables and shake the mixture.



Fresh Cucumber Salad with Mustard Chive Dressing

Yield: 4 servings

- 1/2 medium cucumber, sliced into rounds
- 1/2 medium red sweet bell pepper, cut into bite size strips
- 8 cherry tomatoes or bite size tomato wedges
- 2 teaspoons grainy mustard, Dijon-style
- 1/4 cup finely chopped fresh (or 1 1/2 tablespoons dried) chives
- 1 tablespoon vinegar
- 1 teaspoon honey
- 1 1/2 tablespoons salad oil
- 1/8 teaspoon salt
- 1/8 teaspoon ground pepper
- 3 cups cleaned, torn lettuce and/or fresh spinach leaves

1. Wash your hands and work area.
2. Rinse and prepare cucumber, bell pepper and tomatoes. Combine in a small bowl.
3. In a jar with a tight fitting lid, combine remaining ingredients except lettuce/spinach, and shake well.
4. Pour dressing over vegetable mixture. Cover and refrigerate for 2 hours or more to allow flavors to blend.
5. Just before serving, arrange 3/4 cup torn lettuce and/or spinach leaves in each of 4 serving bowls or small plates.

(continued on reverse side)

This low sodium tossed salad is high in vitamins C and A. (The nutrition facts label shows nutrients when iceberg lettuce is used. It has even more nutrients if made with fresh spinach.)

Nutrition Facts

Serving Size 1 cup (157g)
Servings Per Container 4

Amount Per Serving

Calories 80 **Calories from Fat 45**

% Daily Value*

Total Fat 5g	8%
Saturated Fat 0.5g	3%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 115mg	5%
Total Carbohydrate 7g	2%
Dietary Fiber 2g	8%
Sugars 5g	

Protein 1g

Vitamin A 25% • Vitamin C 50%

Calcium 2% • Iron 4%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

		Calories:	2,000	2,500
Total Fat	Less than	65g	80g	
Saturated Fat	Less than	20g	25g	
Cholesterol	Less than	300mg	300mg	
Sodium	Less than	2,400mg	2,400mg	
Total Carbohydrate		300g	375g	
Dietary Fiber		25g	30g	

Calories per gram:

Fat 9 • Carbohydrate 4 • Protein 4

1/2 carbohydrate choice per serving

Diabetic exchanges per serving: 1 vegetable and 1 fat

Recipe modified by Mary Meck Higgins, Ph.D., R.D., L.D., CDE, Assistant Professor, Department of Human Nutrition. **Kansas State University Agricultural Experiment Station and Cooperative Extension Service, Manhattan, KS.** Contents of this publication may be reproduced for educational purposes. All other rights reserved. For more information about healthy eating, contact your local extension office. Kansas State University is an equal opportunity provider and employer. This material was funded by USDA's Supplemental Nutrition Assistance Program. **The Food Assistance Program can help people of all ages with low income buy nutritious foods for a better diet. To find out more, call 1-888-369-4777.**

Fresh Cucumber Salad with Mustard Chive Dressing *(continued)*

6. Using a slotted spoon, serve vegetable mixture over leaves. Drizzle more dressing on to taste.
7. Cover and refrigerate leftovers within 2 hours.

Original recipe from Watch Your Garden Grow, University of Illinois Extension, www.urbanext.uiuc.edu

Fix It Fresh! Fruits and Vegetables Recipes Series

Recipe Category: Side Dishes (Cold)



A child could wash the apple and stir the mixture.



Fresh Fruit and Carrot Salad

Yield: 6 servings

- 1 apple, cored and chopped but not peeled
- 1 banana, sliced
- 1/3 cup lemon juice
- 2 cups shredded carrots
- 3 tablespoons sugar
- 1/3 cup packed seedless raisins
- 1/3 cup fat-free mayonnaise
- 3 tablespoons chopped dry-roasted, unsalted nuts

1. Wash your hands and work area.
2. In a mixing bowl, stir together apple, banana and lemon juice. Set aside.
3. Grate carrots into a serving bowl. Add sugar and raisins.
4. Drain apples and bananas. Add them to carrot mixture. Stir.
5. Stir in mayonnaise.
6. Stir in nuts, if desired.
7. Cover and refrigerate for 2 hours or more to allow flavors to blend.
8. Serve cold.
9. Cover and refrigerate leftovers within 2 hours.

Original recipe from K-State Research and Extension Family Nutrition Program, Kids a Cookin'

This healthy low-fat, low sodium cold side dish is high in vitamin A and is a good source of vitamin C and fiber.

Nutrition Facts

Serving Size 1/2 cup (129g)
Servings Per Container 6

Amount Per Serving

Calories 140 **Calories from Fat** 25

% Daily Value*

Total Fat 3g **5%**

Saturated Fat 0g **0%**

Trans Fat 0g

Cholesterol 0mg **0%**

Sodium 140mg **6%**

Total Carbohydrate 29g **10%**

Dietary Fiber 3g **12%**

Sugars 15g

Protein 2g

Vitamin A 120% • Vitamin C 15%

Calcium 2% • Iron 2%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:

Fat 9 • Carbohydrate 4 • Protein 4

2 carbohydrate choices per serving

Diabetic exchanges per serving: 1/2 starch, 1 fruit, 1 vegetable and 1/2 fat

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August 2003; revised July 2010

Fix It Fresh! Fruits and Vegetables Recipes Series

Recipe Category: Side Dishes (Cold)



A child could wash the fruit and vegetables, tear the spinach, and shake the mixture.

Fresh Fruity Spinach Salad

Yield: 2 servings

- 2 cups fresh spinach
- 1 cup fresh peaches or berries
- 1 minced green onion
- 1 tablespoon sugar
- 1/4 teaspoon Worcestershire sauce
- 2 teaspoons salad oil
- 2 teaspoons vinegar

1. Wash your hands and work area.
2. Rinse spinach and remove large tough stems. Drain. Tear leaves into small pieces. Place in a serving bowl.
3. Rinse peaches or berries. Slice into bite size pieces. Combine with spinach. Add onion.
4. Combine the remaining ingredients in a jar with a tight fitting lid. Shake well.
5. Pour dressing over spinach mixture. Toss. Serve cold.
6. Cover and refrigerate leftovers within 2 hours.

Original recipe from "Small Fruit Crops for the Backyard" University of Illinois Extension, www.urbanext.uiuc.edu

This low-sodium tossed salad is high in vitamins A and C and is a good source of iron.

Nutrition Facts

Serving Size 1 cup (151g)
Servings Per Container 2

Amount Per Serving

Calories 110 **Calories from Fat 45**

% Daily Value*

Total Fat 5g **8%**

Saturated Fat 0.5g **3%**

Trans Fat 0g

Cholesterol 0mg **0%**

Sodium 50mg **2%**

Total Carbohydrate 16g **5%**

Dietary Fiber 2g **8%**

Sugars 13g

Protein 2g

Vitamin A 100% • Vitamin C 35%

Calcium 6% • Iron 10%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:

Fat 9 • Carbohydrate 4 • Protein 4

1 carbohydrate choice per serving

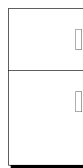
Diabetic exchanges per serving: 1 fruit, 1/2 vegetable and 1 fat

Recipe modified by Mary Meck Higgins, Ph.D., R.D., L.D., CDE, Assistant Professor, Department of Human Nutrition. **Kansas State University Agricultural Experiment Station and Cooperative Extension Service, Manhattan, KS.** Contents of this publication may be reproduced for educational purposes. All other rights reserved. For more information about healthy eating, contact your local extension office. Kansas State University is an equal opportunity provider and employer. This material was funded by USDA's Supplemental Nutrition Assistance Program. **The Food Assistance Program can help people of all ages with low income buy nutritious foods for a better diet. To find out more, call 1-888-369-4777.**

July 2003; revised July 2010



A child could wash the vegetables and stir the mixture.



This fat-free cold side dish is high in vitamin C and is a good source of fiber.

Fresh Salsa with Black Beans

Yield: 8 servings

- 1/2 cup corn, fresh cut off the cob or frozen
- 1 can (15 ounces) black beans, drained and rinsed
- 1 cup diced fresh tomatoes
- 1/2 cup diced onion
- 1/2 cup diced green sweet bell pepper
- 2 tablespoons lime juice
- 2 cloves finely chopped garlic
- 1/2 cup picante sauce

1. Wash your hands and work area.
2. If using fresh corn, cook it as desired. If using frozen corn, let it thaw.
3. Combine all ingredients in a large bowl. Stir.
4. Cover and refrigerate for 2 hours or more to allow flavors to blend.
5. Serve cold with low fat baked tortilla chips or with baked potatoes or baked meat, fish or chicken.
6. Cover and refrigerate leftovers within 2 hours.

Original recipe from K-State Research & Extension Family Nutrition Program, Kids a Cookin'

Nutrition Facts

Serving Size 1/2 cup (101g)
Servings Per Container 8

Amount Per Serving

Calories 60 Calories from Fat 5

% Daily Value*

Total Fat 0g **0%**

Saturated Fat 0g **0%**

Trans Fat 0g

Cholesterol 0mg **0%**

Sodium 130mg **5%**

Total Carbohydrate 13g **4%**

Dietary Fiber 4g **16%**

Sugars 2g

Protein 3g

Vitamin A 6% • Vitamin C 20%

Calcium 2% • Iron 4%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

1 carbohydrate choice per serving

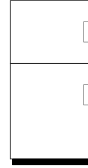
Diabetic exchanges per serving: 1/2 starch and 1 vegetable

Fix It Fresh! Fruits and Vegetables Recipes Series

Recipe Category: Side Dishes (Cold)



A child could wash the vegetables and apple and stir the mixture.



This cold side dish is low in sodium. It is high in vitamins A and C and is a good source of fiber.

Garden Orchard Salad

Yield: 4 servings

- 1 1/2 cups raw broccoli florets, chopped coarsely
- 1/2 cup raw grated carrots
- 1/2 cup raw cauliflower, chopped coarsely
- 1/2 cup chopped apple, cored and diced but not peeled
- 1/4 cup sliced green onion
- 1/2 cup nonfat vanilla yogurt
- 1/4 cup chopped dry-roasted, unsalted peanuts

1. Wash your hands and work area.
2. Mix all ingredients together in serving bowl.
3. Cover and refrigerate for 2 hours or more to allow flavors to blend. Serve cold.
4. Cover and refrigerate leftovers within 2 hours.

Original recipe from Sept/Oct 2001 Nutrition Spotlight, K-State Research and Extension Department of Human Nutrition

Nutrition Facts

Serving Size 3/4 cup (112g)
Servings Per Container 4

Amount Per Serving

Calories 110 Calories from Fat 40

% Daily Value*

Total Fat 4.5g 7%

Saturated Fat 0.5g 3%

Trans Fat 0g

Cholesterol 0mg 0%

Sodium 45mg 2%

Total Carbohydrate 13g 4%

Dietary Fiber 3g 12%

Sugars 8g

Protein 5g

Vitamin A 60% • Vitamin C 60%

Calcium 8% • Iron 4%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

Calories: 2,000 2,500

Total Fat Less than 65g 80g

Saturated Fat Less than 20g 25g

Cholesterol Less than 300mg 300mg

Sodium Less than 2,400mg 2,400mg

Total Carbohydrate 300g 375g

Dietary Fiber 25g 30g

Calories per gram:

Fat 9 • Carbohydrate 4 • Protein 4

1 carbohydrate choice per serving

Diabetic exchanges per serving: 1/2 fruit, 1 vegetable and 1 fat

Recipe modified by Mary Meck Higgins, Ph.D., R.D., L.D., CDE, Assistant Professor, Department of Human Nutrition. **Kansas State University Agricultural Experiment Station and Cooperative Extension Service, Manhattan, KS.** Contents of this publication may be reproduced for educational purposes. All other rights reserved. For more information about healthy eating, contact your local extension office. Kansas State University is an equal opportunity provider and employer. This material was funded by USDA's Supplemental Nutrition Assistance Program. **The Food Assistance Program can help people of all ages with low income buy nutritious foods for a better diet. To find out more, call 1-888-369-4777.**

August 2003; revised July 2010



A child could wash the vegetables and shake the mixture.



This cold side dish is very high in vitamin A. It is a good source of vitamin C and fiber.

Garlic Carrot Salad

Yield: 4 servings

- 1 pound raw carrots
- 3 tablespoons lemon juice
- 1/2 teaspoon Dijon mustard or other grainy mustard
- 2 tablespoons salad oil
- 1 green onion (include green top)
- 1 tablespoon fresh (or 1 teaspoon dried) finely chopped parsley
- 1/2 clove garlic, crushed
- dash of salt
- dash of pepper

1. Wash your hands and work area.
2. Scrub and peel carrots. Cut into thin slices.
3. Cook carrots in 1 quart boiling water for 2-4 minutes (or cook in a microwave oven) until just tender. Drain.
4. In a jar with a tight-fitting lid, combine lemon juice, mustard, oil, onion, parsley, garlic, salt, and pepper. Shake well.
5. Pour sauce over carrots. Stir gently.
6. Cover and refrigerate for 2 hours or more to allow flavors to blend. Serve cold.
7. Cover and refrigerate leftovers within 2 hours.

Original recipe from Watch Your Garden Grow, University of Illinois Extension, www.urbanext.uiuc.edu

Nutrition Facts

Serving Size About 1/2 cup (135g)
 Servings Per Container 4

Amount Per Serving

Calories 110 **Calories from Fat** 60

% Daily Value*

Total Fat 7g **11%**

Saturated Fat 1g **5%**

Trans Fat 0g

Cholesterol 0mg **0%**

Sodium 160mg **7%**

Total Carbohydrate 12g **4%**

Dietary Fiber 3g **12%**

Sugars 6g

Protein 1g

Vitamin A 380% • Vitamin C 20%

Calcium 4% • Iron 2%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:

Fat 9 • Carbohydrate 4 • Protein 4

1 carbohydrate choice per serving

Diabetic exchanges per serving: 2 vegetable and 1 1/2 fat

Fix It Fresh! Fruits and Vegetables Recipes Series

Recipe Category: Side Dishes (Cold)



A child could wash the vegetables and shake the mixture.



This cold side dish is low in sodium. It is very high in vitamins A and C and is a good source of fiber.

Lemon-Dilled Broccoli and Carrot Salad

Yield: 6 servings

2 cups (about 1 pound) raw broccoli florets and stems

2 large raw carrots, scrubbed, peeled and sliced thinly

2 tablespoons salad oil

2 teaspoons lemon juice

1/4 teaspoon black pepper

2 teaspoons fresh (or 1/2 teaspoon dried) finely chopped dill

1. Wash your hands and work area.
2. Wash and trim stems from broccoli. Peel and cut stems into thin slices. Cut broccoli florets into small uniform pieces and set aside.
3. Cook carrots and broccoli in 1 quart boiling water for one minute. (Or cook in a microwave oven). Do not overcook. Drain and rinse under cold running water. Place in a large bowl.
4. In a jar with a tight-fitting lid, combine the remaining ingredients. Shake well.
5. Pour dressing over vegetables and stir gently.
6. Cover and refrigerate for 2 hours or more to allow flavors to blend. Serve cold.
7. Cover and refrigerate leftovers within 2 hours.

Original recipe from *Watch Your Garden Grow*, University of Illinois Extension, www.urbanext.uiuc.edu

Nutrition Facts

Serving Size 1/2 cup (106g)
Servings Per Container 6

Amount Per Serving

Calories 70 **Calories from Fat 45**

% Daily Value*

Total Fat 5g **8%**

Saturated Fat 0.5g **3%**

Trans Fat 0g

Cholesterol 0mg **0%**

Sodium 40mg **2%**

Total Carbohydrate 6g **2%**

Dietary Fiber 3g **12%**

Sugars 1g

Protein 3g

Vitamin A 130% • Vitamin C 120%

Calcium 4% • Iron 4%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:

Fat 9 • Carbohydrate 4 • Protein 4

1/2 carbohydrate choice per serving

Diabetic exchanges per serving: 1 vegetable and 1 fat

Recipe modified by Mary Meck Higgins, Ph.D., R.D., L.D., CDE, Assistant Professor, Department of Human Nutrition, **Kansas State University Agricultural Experiment Station and Cooperative Extension Service, Manhattan, KS.** Contents of this publication may be reproduced for educational purposes. All other rights reserved. For more information about healthy eating, contact your local extension office. Kansas State University is an equal opportunity provider and employer. This material was funded by USDA's Supplemental Nutrition Assistance Program. **The Food Assistance Program can help people of all ages with low income buy nutritious foods for a better diet. To find out more, call 1-888-369-4777.**

July 2003; revised July 2010



A child could wash the vegetables and shake the mixture.

Red and Yellow Pepper Dressing

Yield: 6 servings

- 1 small finely chopped yellow sweet bell pepper (about 1/2 cup)
- 1 small finely chopped red sweet bell pepper, (about 1/2 cup)
- 3 tablespoons vinegar
- 2 tablespoons salad oil
- 2 teaspoons warm water
- 1/2 teaspoon sugar
- dash of salt
- ground black pepper to taste

1. Wash your hands and work area.
2. In a jar with a tight-fitting lid, combine ingredients. Shake well.
3. Serve over fresh salad greens or baked fish or chicken.
4. Cover and refrigerate leftovers within 2 hours.

Original recipe from Watch Your Garden Grow, University of Illinois Extension, www.urbanext.uiuc.edu

This colorful dressing for tossed salads or meats is low in sodium and very high in vitamin C.

Nutrition Facts

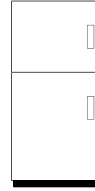
Serving Size 2 tablespoons (46g)	
Servings Per Container 6	
Amount Per Serving	
Calories 50	Calories from Fat 40
% Daily Value*	
Total Fat 4.5g	7%
Saturated Fat 0.5g	3%
Trans Fat 0g	
Cholesterol 0mg	0%
Sodium 50mg	2%
Total Carbohydrate 2g	1%
Dietary Fiber 0g	0%
Sugars 1g	
Protein 0g	
Vitamin A 8%	• Vitamin C 90%
Calcium 0%	• Iron 0%
*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:	
	Calories: 2,000 2,500
Total Fat	Less than 65g 80g
Saturated Fat	Less than 20g 25g
Cholesterol	Less than 300mg 300mg
Sodium	Less than 2,400mg 2,400mg
Total Carbohydrate	300g 375g
Dietary Fiber	25g 30g
Calories per gram:	
Fat 9 • Carbohydrate 4 • Protein 4	

0 carbohydrate choices per serving

Diabetic exchanges per serving: 1 fat



A child could wash the vegetables.



This healthy cold side dish is fat-free and low in sodium. It is high in vitamins A and C.

Tangy Crisp Vegetable and Pasta Salad

Yield: 6 servings

- 1/2 cup uncooked pasta, such as shells, macaroni, etc.
- 1/4 cup vinegar
- 2 tablespoons sugar
- 1/8 teaspoon salt
- 1/2 teaspoon garlic powder
- 1/8 teaspoon ground black pepper
- 1/2 medium cucumber, peeled, seeded and coarsely chopped
- 1/2 medium raw carrot, thinly sliced
- 1/2 medium coarsely chopped ripe tomato
- 1/4 coarsely chopped green sweet bell pepper
- 1/2 cup raw broccoli florets, coarsely chopped
- 1/2 cup thinly sliced radishes
- 2 tablespoons coarsely chopped green or red onion

1. Wash your hands and work area.
2. Cook pasta according to package directions but do not add salt to cooking water. Drain, rinse with cool water, and drain again.
3. Meanwhile, in a small saucepan, combine vinegar, sugar, salt, garlic powder and black pepper. Stir and heat over medium heat until sugar is dissolved, but do not boil. Let cool.

(continued on reverse side)

Nutrition Facts

Serving Size 1/2 cup (88g)
Servings Per Container 6

Amount Per Serving

Calories 60 Calories from Fat 0

% Daily Value*

Total Fat 0g **0%**

Saturated Fat 0g **0%**

Trans Fat 0g

Cholesterol 0mg **0%**

Sodium 60mg **3%**

Total Carbohydrate 12g **4%**

Dietary Fiber 1g **4%**

Sugars 5g

Protein 2g

Vitamin A 25% • Vitamin C 25%

Calcium 2% • Iron 2%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:

Fat 9 • Carbohydrate 4 • Protein 4

1 carbohydrate choice per serving

Diabetic exchanges per serving: 1/2 starch and 1 vegetable

Recipe by Mary Meck Higgins, Ph.D., R.D., L.D., CDE, Assistant Professor, Department of Human Nutrition. **Kansas State University Agricultural Experiment Station and Cooperative Extension Service, Manhattan, KS.** Contents of this publication may be reproduced for educational purposes. All other rights reserved. For more information about healthy eating, contact your local extension office. Kansas State University is an equal opportunity provider and employer. This material was funded by USDA's Supplemental Nutrition Assistance Program. **The Food Assistance Program can help people of all ages with low income buy nutritious foods for a better diet. To find out more, call 1-888-369-4777.**

Tangy Crisp Vegetable and Pasta Salad *(continued)*

4. Rinse, drain and chop remaining ingredients.
Combine in a shallow container, such as an 8 x 8 inch pan.
5. Add cooled pasta, and vinegar mixture. Mix gently.
6. Cover and refrigerate overnight to allow flavors to blend.
7. Serve cold using a slotted spoon.
8. Cover and refrigerate leftovers within 2 hours.



A child could wash the vegetables and shake the mixture.



This healthy fat-free cold relish is full of flavor. It is low in calories and very low in sodium, and is high in vitamin C.

Tangy Garden Relish

Yield: 4 servings

- 3 tablespoons vinegar
- 1 1/2 teaspoons confectioners' (powdered) sugar
- 1/4 cup finely diced red sweet bell pepper
- 1/2 cup thinly sliced scallions or green onions
- 1/4 cup finely chopped celery
- 1/8 teaspoon red pepper flakes (optional)

1. Wash your hands and work area.
2. In a jar with a tight fitting lid combine the vinegar and sugar until the sugar dissolves.
3. Add sweet red pepper, onions, celery and red pepper flakes. Shake well until combined.
4. Cover and refrigerate 2 hours or more to allow flavors to blend.
5. Serve very cold on sandwiches, or with baked or grilled fish or meats.
6. Cover and refrigerate leftovers within 2 hours.

Nutrition Facts

Serving Size 2 tablespoons (40g)
Servings Per Container 4

Amount Per Serving

Calories 10 **Calories from Fat 0**

% Daily Value*

Total Fat 0g **0%**

Saturated Fat 0g **0%**

Trans Fat 0g

Cholesterol 0mg **0%**

Sodium 5mg **0%**

Total Carbohydrate 3g **1%**

Dietary Fiber 1g **4%**

Sugars 2g

Protein 0g

Vitamin A 10% • Vitamin C 25%

Calcium 2% • Iron 2%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

0 carbohydrate choices per serving

Diabetic exchanges per serving: 1/2 vegetable

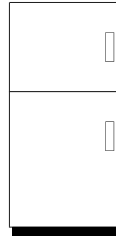
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Fix It Fresh! Fruits and Vegetables Recipes Series

Recipe Category: Side Dishes (Cold)



A child could wash the vegetables and mix the salad.



Tomato and Crusty Bread Salad

Yield: 6 servings

- 1 1/2 cups diced ripe tomatoes
- 1 cup diced green sweet bell peppers
- 1/4 cup thinly sliced red onion
- 1/2 cup shredded mozzarella cheese
- 2 ounces Spanish or black olives, rinsed and drained
- 7 large fresh basil leaves or 1 tablespoon dried basil
- 1 1/2 tablespoons vinegar
- 1/4 teaspoon black pepper
- 2 1/2 cups (3 ounces) cubed day-old bread (sourdough, French, or Italian bread preferred)

1. Wash your hands and work area.
2. In a large serving bowl, combine tomatoes, sweet peppers, onion, cheese and olives.
3. Wash, dry, and cut basil leaves into strips. Add to mixture.
4. Sprinkle vinegar and black pepper over salad. Mix well.
5. Cover and refrigerate.
6. Meanwhile, preheat oven to 300^o F.
7. Place cubed bread on baking sheet and bake for 8-10 minutes, until slightly crisp, stirring occasionally. Shut off oven.
8. Just before serving, toss bread cubes with salad mixture.
9. Cover and refrigerate leftovers within 2 hours.

Original recipe from Kansas Wheat Commission, published in May/June 2002 Nutrition Spotlight. K-State Research and Extension, Department of Human Nutrition.

This cold side dish is high in vitamins C and A, and is a good source of calcium.

Nutrition Facts

Serving Size 1 cup (112g)
Servings Per Container 6

Amount Per Serving

Calories 110 **Calories from Fat** 35

% Daily Value*

Total Fat 4g **6%**

Saturated Fat 1.5g **8%**

Trans Fat 0g

Cholesterol 5mg **2%**

Sodium 230mg **10%**

Total Carbohydrate 14g **5%**

Dietary Fiber 2g **8%**

Sugars 3g

Protein 5g

Vitamin A 25% • Vitamin C 60%

Calcium 10% • Iron 6%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:

Fat 9 • Carbohydrate 4 • Protein 4

1 carbohydrate choice per serving

Diabetic exchanges per serving: 1/2 starch, 1 vegetable and 1/2 fat

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July 2003; revised July 2010



A child could wash the vegetables and stir the mixture.

Vegetable Burrito

Yield: 4 servings

- 1/2 cup raw chopped green sweet bell pepper
- 1/2 cup raw shredded carrots
- 1/2 cup raw chopped broccoli
- 1/2 cup raw chopped cauliflower
- 1/4 cup raw chopped onions
- 3/4 cup shredded low fat yellow cheese or pepper cheese
- 1/4 cup nonfat ranch salad dressing
- 3/4 teaspoon chili powder
- 4 flour tortillas, 7 inches each

1. Wash your hands and work area.
2. In a mixing bowl, combine peppers, carrots, broccoli, cauliflower and onions with cheese, dressing and chili powder.
3. Lay tortillas flat and spoon 1/2 cup vegetable mixture down center. Wrap each tortilla around vegetable mixture. Serve cold.
4. Cover and refrigerate leftovers within 2 hours.

Original recipe from K-State Research and Extension's Mission Nutrition

This cold side dish makes a tasty snack too! It is high in vitamins A and C and is a good source of fiber, calcium and iron.

Nutrition Facts

Serving Size 1 burrito (140g)
 Servings Per Container 4

Amount Per Serving

Calories 200 **Calories from Fat 45**

% Daily Value*

Total Fat 5g **8%**

Saturated Fat 1.5g **8%**

Trans Fat 0g

Cholesterol 5mg **2%**

Sodium 510mg **21%**

Total Carbohydrate 29g **10%**

Dietary Fiber 3g **12%**

Sugars 3g

Protein 10g

Vitamin A 60% • Vitamin C 50%

Calcium 15% • Iron 10%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:

Fat 9 • Carbohydrate 4 • Protein 4

2 carbohydrate choices per serving

Diabetic exchanges per serving: 1 1/2 starch, 1 vegetable, and 1/2 lean meat

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July 2003; revised July 2010



A child could wash the fruit.



Fresh Fruit Bowl

Yield: 6 servings

- 1/2 medium cantaloupe
- 1/2 medium banana, peeled and sliced*
- 1/2 cup bite size honeydew melon cubes
- 1/2 cup bite size watermelon cubes
- 1/2 cup sliced fresh peaches
- 1/2 cup sliced strawberries
- 1/4 cup blueberries
- 1 tablespoon honey
- 2 tablespoons lemon juice
- 2 tablespoons thawed orange juice concentrate, not diluted
- 6 fresh mint leaves, if desired

1. Wash your hands and work area.
2. Rinse fruits under cold running water. Let drain.
3. Hollow out most of the cantaloupe from the rind, being careful not to make a hole in the rind. Set the rind aside to use as the serving bowl.
4. Reserve 1/2 cup bite size cantaloupe cubes. Use remaining cantaloupe for another use.

(continued on reverse side)

*Note: This recipe is easy to change. If you do not have all of the fruits listed, you may omit a few of them, or substitute with another favorite, or use fruit canned in juice and drained. The nutrition facts will change if you do this.

This festive healthy sweet food is fat-free and very low in sodium. It is high in vitamins C and A.

Nutrition Facts

Serving Size 1/2 cup (133g)
Servings Per Container 6

Amount Per Serving

Calories 70 **Calories from Fat 0**

% Daily Value*

Total Fat 0g **0%**

Saturated Fat 0g **0%**

Trans Fat 0g

Cholesterol 0mg **0%**

Sodium 15mg **1%**

Total Carbohydrate 19g **6%**

Dietary Fiber 1g **4%**

Sugars 16g

Protein 1g

Vitamin A 35% • Vitamin C 70%

Calcium 2% • Iron 2%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:

Fat 9 • Carbohydrate 4 • Protein 4

1 carbohydrate choice per serving

Diabetic exchanges per serving: 1 fruit

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Fresh Fruit Bowl *(continued)*

5. In a mixing bowl, add reserved cantaloupe, banana, honeydew melon, watermelon, peaches, strawberries and blueberries. Stir gently.
6. In a small bowl, mix honey, lemon juice and orange juice. Pour over the fruit mixture.
7. Place fruit mixture and sauce in the cantaloupe rind. Garnish with mint, if desired.
8. Place cantaloupe “bowl” on a small platter or a plate. Cover and refrigerate for two hours or more to allow flavors to blend.
9. Use a slotted spoon to serve.
10. Cover and refrigerate leftovers within 2 hours.

Original recipe from Produce for Better Health Foundation, at www.about-produce.com

Fix It Fresh! Fruits and Vegetables Recipes Series

Recipe Category: Healthy Sweet Foods



A child could wash the fruit and sprinkle the toppings.

Fruit Banana Split

Yield: 3 large servings

- 3 fresh small bananas, peeled and sliced in half lengthwise
- 3 tablespoons orange juice
- 6 scoops fresh watermelon, cantaloupe, or honeydew melon
- 3 tablespoons each of 4 different chopped fruits, such as: watermelon, cantaloupe, honeydew melon, peaches, blueberries, raspberries, strawberries, blackberries, grapes, oranges, or pineapple
- 3 tablespoons chopped salt-free nuts, such as pecans, walnuts, toasted almonds or peanuts
- 3 tablespoons fat-free whipped topping, if desired
- 3 maraschino cherries, or 3 fresh mint leaves, if desired

1. Wash your hands and work area.
2. Place 2 banana halves on each of 3 decorative dessert plates.
3. Drizzle 1/2 tablespoon orange juice over each banana half to prevent it from turning dark.
4. Using an ice cream scoop or similar spoon, place two scoops of melon between banana halves.
5. Sprinkle each serving with 4 tablespoons of a variety of fruit.

(continued on reverse side)

This festive sweet food is very low in sodium, is high in vitamin C, and is a good source of fiber. Depending upon the fruit chosen, it can also be a good source of vitamin A.

Nutrition Facts

Serving Size 1/3 recipe (222g)
Servings Per Container 3

Amount Per Serving

Calories 200 **Calories from Fat** 60

% Daily Value*

Total Fat 6g **9%**

Saturated Fat 1g **5%**

Trans Fat 0g

Cholesterol 0mg **0%**

Sodium 5mg **0%**

Total Carbohydrate 38g **13%**

Dietary Fiber 4g **16%**

Sugars 23g

Protein 2g

Vitamin A 6% • Vitamin C 40%

Calcium 2% • Iron 4%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:

Fat 9 • Carbohydrate 4 • Protein 4

2 1/2 carbohydrate choices per serving

Diabetic exchanges per serving: 2 1/2 fruit and 1 fat

Recipe modified by Mary Meck Higgins, Ph.D., R.D., L.D., CDE, Assistant Professor, Department of Human Nutrition. **Kansas State University Agricultural Experiment Station and Cooperative Extension Service, Manhattan, KS.** Contents of this publication may be reproduced for educational purposes. All other rights reserved. For more information about healthy eating, contact your local extension office. Kansas State University is an equal opportunity provider and employer. This material was funded by USDA's Supplemental Nutrition Assistance Program. **The Food Assistance Program can help people of all ages with low income buy nutritious foods for a better diet. To find out more, call 1-888-369-4777.**

July 2003; revised July 2010

Fruit Banana Split *(continued)*

6. Sprinkle each serving with 1 tablespoon nuts.
7. Top with whipped topping and cherries or mint, if desired. Serve cold.
8. Cover and refrigerate leftovers within 2 hours.

Original recipe from Produce for Better Health Foundation and the American Cancer Society, at www.aboutproduce.com

Fix It Fresh! Fruits and Vegetables Recipes Series

Recipe Category: Healthy Sweet Foods



A child could wash the fruit and add the nuts.

Nutty Fruit Salad

Yield: 3 servings

- 1 cup bite-size cantaloupe chunks
- 1/2 cup bite size strawberry chunks
- 1/2 cup seedless grape halves
- 1/4 cup chopped salt-free nuts, such as almonds, peanuts, or shelled natural raw pistachios
- 2 tablespoons orange juice

1. Wash your hands and work area.
2. Combine ingredients in a bowl. Stir gently. Serve cold.
3. Cover and refrigerate leftovers within 2 hours.

Original recipe from Produce for Better Health Foundation, at www.aboutproduce.com

This healthy sweet food is very low in sodium. It is high in vitamins C and A.

Nutrition Facts

Serving Size 2/3 cup (124g)
Servings Per Container 3

Amount Per Serving

Calories 90 Calories from Fat 35

% Daily Value*

Total Fat 4g **6%**

Saturated Fat 0g **0%**

Trans Fat 0g

Cholesterol 0mg **0%**

Sodium 10mg **0%**

Total Carbohydrate 14g **5%**

Dietary Fiber 2g **8%**

Sugars 11g

Protein 2g

Vitamin A 35% • Vitamin C 60%

Calcium 4% • Iron 4%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

Calories: 2,000 2,500

Total Fat Less than 65g 80g

Saturated Fat Less than 20g 25g

Cholesterol Less than 300mg 300mg

Sodium Less than 2,400mg 2,400mg

Total Carbohydrate 300g 375g

Dietary Fiber 25g 30g

Calories per gram:

Fat 9 • Carbohydrate 4 • Protein 4

1 carbohydrate choice per serving

Diabetic exchanges per serving: 1 fruit and 1 fat

Recipe modified by Mary Meck Higgins, Ph.D., R.D., L.D., CDE, Assistant Professor, Department of Human Nutrition, **Kansas State University Agricultural Experiment Station and Cooperative Extension Service, Manhattan, KS.** Contents of this publication may be reproduced for educational purposes. All other rights reserved. For more information about healthy eating, contact your local extension office. Kansas State University is an equal opportunity provider and employer. This material was funded by USDA's Supplemental Nutrition Assistance Program. **The Food Assistance Program can help people of all ages with low income buy nutritious foods for a better diet. To find out more, call 1-888-369-4777.**

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A child could wash the fruit and arrange it over the cake.

Peach or Berry Cake

Yield: 4 servings

- 1/4 of a 7 inch prepared angel food cake, or 1/4 of an unfrosted prepared white cake
- 1/2 cup low fat vanilla or fruit-flavored yogurt
- 1 cup sliced fresh peaches or berries
- 4 tablespoons non-fat whipped topping, if desired

1. Wash your hands and work area.
2. Cut the portion of cake into 4 slices. Place each slice on a small serving plate.
3. Cover each piece of cake with 2 tablespoons yogurt.
4. Cover each piece with 1/4 cup fruit. Top with whipped topping, if desired.
5. Serve immediately.
6. Cover and refrigerate leftovers within 2 hours.

The nutrition facts for this recipe will change depending on the ingredient choices. If made with strawberries, it is high in vitamin C. If made with white cake, it has more fat.

Nutrition Facts

Serving Size 1 portion (112g)
Servings Per Container 4

Amount Per Serving

Calories 150 **Calories from Fat** 5

% Daily Value*

Total Fat 1g **2%**

Saturated Fat 0g **0%**

Trans Fat 0g

Cholesterol 0mg **0%**

Sodium 310mg **13%**

Total Carbohydrate 32g **11%**

Dietary Fiber 1g **4%**

Sugars 8g

Protein 4g

Vitamin A 2% • Vitamin C 4%

Calcium 10% • Iron 2%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

2 carbohydrate choices per serving

Diabetic exchanges per serving: With angel food, 1 1/2 starch and 1/2 fruit. With white cake, 1 1/2 starch and 1/2 fruit, and 1 1/2 fat.

Recipe modified by Mary Meck Higgins, Ph.D., R.D., L.D., CDE, Assistant Professor, Department of Human Nutrition, **Kansas State University Agricultural Experiment Station and Cooperative Extension Service, Manhattan, KS.** Contents of this publication may be reproduced for educational purposes. All other rights reserved. For more information about healthy eating, contact your local extension office. Kansas State University is an equal opportunity provider and employer. This material was funded by USDA's Supplemental Nutrition Assistance Program. **The Food Assistance Program can help people of all ages with low income buy nutritious foods for a better diet. To find out more, call 1-888-369-4777.**



A child could wash the fruit and stir the mixture.



Peach or Berry Sauce

Yield: 3 servings

- 1 tablespoon sugar
- 2 teaspoons water
- 1 cup sliced peaches or berries, divided
- 1/2 teaspoon lemon juice

1. Wash your hands and work area.
2. Place sugar and water in a small saucepan. Stir and bring to a boil, then simmer until the sugar is completely dissolved.
3. Allow syrup mixture to cool completely, about 10 minutes. (Set pan in a shallow bowl of ice water to cool it faster.)
4. Place 1/2 cup peaches or berries in a blender. Add lemon juice and the cooled syrup. Blenderize until smooth.
5. Pour mixture into a small serving bowl or pitcher.
6. Coarsely chop remaining fruit. Add to fruit mixture and stir.
7. If desired, serve over sugar-free, nonfat frozen yogurt, or warm pancakes or waffles.
8. Cover and refrigerate leftovers within 2 hours.

*Original recipe from "Small Fruit Crops for the Backyard"
University of Illinois Extension, www.urbanext.uiuc.edu*

This healthy low-calorie fruit sauce is fat-free and sodium-free. If made with strawberries, it is high in vitamin C.

Nutrition Facts

Serving Size 1/4 cup (60g)
Servings Per Container 3

Amount Per Serving

Calories 35 **Calories from Fat 0**

% Daily Value*

Total Fat 0g **0%**

Saturated Fat 0g **0%**

Trans Fat 0g

Cholesterol 0mg **0%**

Sodium 0mg **0%**

Total Carbohydrate 9g **3%**

Dietary Fiber 1g **4%**

Sugars 8g

Protein 0g

Vitamin A 4% • Vitamin C 6%

Calcium 0% • Iron 0%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs:

	Calories:	2,000	2,500
Total Fat	Less than	65g	80g
Saturated Fat	Less than	20g	25g
Cholesterol	Less than	300mg	300mg
Sodium	Less than	2,400mg	2,400mg
Total Carbohydrate		300g	375g
Dietary Fiber		25g	30g

Calories per gram:
Fat 9 • Carbohydrate 4 • Protein 4

1/2 carbohydrate choice per serving

Diabetic exchanges per serving: 1/2 fruit

APPENDIX I

FRUITS AND VEGETABLES GUESSING GAME

Fruits and Vegetables Game Key

Apples -- 20
Berries -- 7
Broccoli -- 18
Brussels sprouts -- 12
Cabbage -- 2
Carrots -- 5
Cauliflower --16
Cucumbers -- 8
Eggplant -- 4
Grapes -- 21
Green beans -- 10
Lettuce -- 17
Onions -- 15
Peaches -- 14
Peas -- 6
Radish -- 9
Spinach -- 11
Summer squash -- 3
Sweet bell peppers -- 19
Sweet potatoes -- 13
Tomatoes -- 1

- 1 Tomatoes
- 2 Cabbage
- 3 Summer squash
- 4 Eggplant
- 5 Carrots
- 6 Peas
- 7 Berries
- 8 Cucumbers
- 9 Radish
- 10 Green beans
- 11 Spinach
- 12 Brussels sprouts
- 13 Sweet potatoes
- 14 Peaches
- 15 Onions
- 16 Cauliflower
- 17 Lettuce
- 18 Broccoli
- 19 Sweet bell peppers
- 20 Apples
- 21 Grapes

Guess Who? 7



Fun Facts: Xxxxxs can be red, orange, yellow, black or purple. Xxxxxs are the first fruit to ripen in the spring. They are the only fruit with seeds on the outside rather than the inside, and on average, each has 200 tiny seeds.

Selecting Fresh Xxxxxs: Look for clean, firm, tender and plump xxxxs with uniformly bright colored flesh and a natural shine. On xxxxs, caps should be fresh, green and intact. Look for xxxxs that have been protected in covered containers. Avoid those with blotches of color or that are wet, mushy, shriveled, leaky or moldy.

Measuring Fresh Xxxxxs

1 1/2 pounds = 2 pints or 1 quart

1 small basket = 1 pint = 3 1/4 cups whole = 2 1/4 cups sliced = 1 2/3 cup pureed

1 cup sliced = about 5 ounces by weight = about 150 grams

Handling, Ripening and Preserving: Cover and refrigerate (preferably at 32° F.) unwashed xxxxs. They do not ripen further after harvest. Xxxxxs may be frozen: rinse and drain, spread a single layer on shallow trays, and when frozen, package them promptly into containers.

Preparation and Serving: Just before use, rinse xxxxs under cold running water. Cut off bruises and decay. Remove green leaves and small stem before eating. Delicious fresh! Or slice and enjoy with foods you already eat, such as cheese, yogurt, salads, pancakes, desserts and cereal. Use as directed in a recipe.

Nutrition Facts: Serving Size = 1/2 cup sliced fresh xxxxs.
Calories 25; Protein 1/2 gram; Carbohydrates 6 grams; Fat 0 grams.
All kinds of xxxxs are excellent sources of vitamin C. A good source of dietary fiber and manganese, xxxxs contain many healthful pigments and phytochemicals.

Guess Who? 18



Fun Facts: Xxxxx is the eighth most frequently eaten vegetable in the U.S. and is the most popular of the cabbage, or cruciferous, family of vegetables. The part we eat is the unopened flower buds, along with the top portion of the stem. Eating xxxxx helps protect health against heart disease and cancer. Sulfur contributes to xxxxx's flavor.

Selecting Fresh Xxxxx: Look for xxxxx with tender stems and heads that are firm, tight and dark green or purplish-green. Avoid xxxxx with wilted, soft, slippery, tough, thick or dry stems. Avoid xxxxx with heads that have enlarged buds or yellow areas—those are xxxxx flowers and are signs that the head is too old for best flavor.

Measuring Fresh Xxxxx:

1 pound raw = about 13 ounces ready to eat = about 4 cups raw = about 2 cups cooked
1/2 cup cooked = about 1 1/2 ounces by weight = about 40 grams

Handling and Preserving: Refrigerate unwashed, dry xxxxx in a perforated plastic bag in the vegetable drawer. It will stay fresh for 3 to 14 days, but for the best nutrition and taste, use during the first few days. Unrefrigerated, it quickly becomes fibrous and woody, and wet xxxxx becomes limp and moldy. **To freeze,** select tender xxxxx. Wash, cut off ends, and peel stalks if tough. If the head has insects, soak it in 4 cups cold water with 1 teaspoon salt for 30 minutes. Place 1-inch pieces in boiling water for 3 minutes. Drain immediately and place in ice water for 3 minutes. Drain again. Pack into freezer bags, leaving 3 inches of air space. Squeeze out the air, seal, date and freeze.

Preparation and Serving: Wash fresh xxxxx under cool running water and cut off the bottom end of each stalk. If the head has insects, soak it in 4 cups cold water with 1 teaspoon salt for 30 minutes. To maintain its nutrients, do not soak longer. If the stem is tough, peel the outer stalk. If the stem is very large, split it or cut it into strips or rounds. Serve raw or cooked xxxxx plain or with dips, sauces, pasta or in casseroles. To cook xxxxx: steam, microwave, boil or stir-fry the stems for 1-2 minutes, then add the florets which have been cut into same-sized pieces and cook until fork-tender. For the best taste, color, texture and nutrition, and to avoid a strong odor, do not overcook.

Nutrition Facts 1 serving = 1/2 cup cooked or raw xxxxx. Each 1/2 cup cooked chopped xxxxx has: Calories 11; Protein 1 gram; Carbohydrates 2 grams; Fat 0 grams. Xxxxx contributes fiber, carotenoids (which the body converts to vitamin A), vitamins C and K, and many other nutrients, antioxidants and healthful phytochemicals to the diet.

Guess Who? 12



Fun Facts: Xxxxxs look like little cabbage heads. Indeed, they are in the cabbage, or cruciferous, family of vegetables. They most likely are named for Xxxxxx, the capital city of Belgium. In Europe, some people call them "Xxxxx cabbage." Xxxxxs are one of the least commonly eaten vegetables in the U.S. Many people have not yet discovered the unique taste of lightly-cooked, nutritious Xxxxxs.

Selecting Fresh Xxxxxs: Look for bright green, clean, firm, tight, compact and solid Xxxxxs. Choose those that are less than two-inches in diameter. Look for xxxxs where the stalk end is clean. Avoid Xxxxxs with leaves that are yellow, loose, wilted, puffy, soft, or with small holes or rot.

Measuring Fresh Xxxxxs:

1 pound raw = about 12 ounces ready to eat = about 4 cups raw = 2 1/2 cups cooked
1/2 cup cooked = 3 or 4 medium xxxxs = about 2 3/4 ounces by weight = 78 grams

Handling and Preserving: Remove damaged outer leaves. Refrigerate unwashed Xxxxxs in a perforated plastic bag in the vegetable drawer. They keep up to 3 weeks, but for best flavor, use during the first few days. **To freeze,** select fresh xxxxs. Remove damaged leaves. Rinse. To remove insects, soak in 4 cups cold water with 1 teaspoon salt for 30 minutes. Place small Xxxxxs in boiling water for 3 minutes, medium xxxxs for 4 minutes, and large xxxxs for 5 minutes. Drain at once and place in ice water for 3 to 5 minutes, depending on size. Drain again. Pack into freezer bags, leaving 3 inches of air space. Squeeze out the air, seal, date and freeze.

Preparation and Serving: Remove loose or damaged leaves. Wash xxxxs under cool running water. Trim off the end of stalks. To remove insects, soak in 4 cups cold water with 1 teaspoon salt for 30 minutes. To maintain nutrients, do not soak longer. Enjoy cooked Xxxxxs as a side dish, plain or with a sauce, or use as directed in recipes. To cook: cut xxxxs in half to help them cook more evenly. Steam, microwave, boil or stir-fry them until fork-tender. For best results, do not overcook.

Nutrition Facts One serving = 1/2 cup Xxxxxs. Each 1/2 cup of cooked Xxxxxs has: Calories 30; Protein 2 grams; Carbohydrates 7 grams; Fat 0 grams. Xxxxxs are an excellent source of vitamin C and contribute fiber, B vitamins including folic acid, essential minerals and many other nutrients, antioxidants and phytochemicals to the diet. Eating them helps protect against cancer and other diseases.

Guess Who? 2

Fun Facts: Xxxxx is the ninth most frequently eaten vegetable in the U.S. The top of a green xxxxx head is more tender and shreds easier than the bottom half. Most xxxxx has smooth leaves, but Savoy xxxxx leaves are crinkly. Savoy xxxxx is more tender and milder in flavor than green or red xxxxx. It may be substituted for either of them in a recipe. Bok choy, napa and pe-tsai xxxxx form oblong-shaped heads that have a crisp texture similar to lettuce yet have the flavor of xxxxx. Xxxxx family vegetables are called cruciferous vegetables. Sulfur contributes to the distinctive flavor and smell of xxxxx. Sauerkraut and kimchee are pickled xxxxx dishes.

Selecting Fresh Xxxxx: Look for green or red/purple xxxxx heads that are solid, heavy, tight and firm, with outer leaves that are smooth and fresh. With Savoy xxxxx, look for flexible, crumpled, dark green or blue/green leaves forming a loosely-packed head. Avoid xxxxx that is wilted, discolored, blemished, cracked or split, insect-infested or decayed.

Measuring Fresh Xxxxx:

1 medium head green xxxxx = about 2 pounds as purchased = about 8 cups ready-to-eat, raw, shredded = about 4 cups cooked, shredded

1 cup raw or 1/2 cup cooked = about 2 1/2 ounces by weight = 75 grams

Handling and Preserving: Refrigerate unwashed, uncut xxxxx in a perforated plastic bag in the vegetable drawer. Store Savoy and green or red xxxxx that will be eaten raw for up to 4 days, and green or red xxxxx that will be eaten cooked for up to 4 weeks. **To freeze:** Rinse the head and discard outer leaves. Shred, cut into thin wedges, or separate the layers of leaves. Place in boiling water for 1 1/2 to 3 minutes, depending on the size of the pieces. Remove immediately and place in ice water for 1 1/2 to 3 minutes. Drain. Place in freezer bags, squeeze out the air, seal, date and freeze.

Preparation and Serving: Rinse xxxxx. Discard the outer leaves. For best results, use stainless steel knives and pans when preparing xxxxx. Cook by boiling, steaming, stir-frying or microwaving it, but do not overcook. Cook red xxxxx with an acidic ingredient, such as vinegar, to prevent undesirable color changes.

Nutrition Facts One serving = 1 cup raw, or 1/2 cup cooked, shredded xxxxx and has: Calories 17; Protein 1 gram; Carbohydrates 4 grams; Fat 0 grams. Xxxxx provides vitamins C and K, B vitamins and essential minerals, and helps protect against heart disease and cancer.

Guess who? 5



Fun Facts: Xxxxxs can get sunburned while growing. The sunburned area turns green. When xxxxxs were first grown in France, they were not eaten but instead their feathery leaves on top were used in women's hair, hats and clothing.

Selecting Fresh Xxxxxs: Choose short or long xxxxxs, but ones that are no more than 1 1/2 inches around. Look for smooth, firm, crisp xxxxxs with a small core and a deep orange color from top to bottom. Avoid oversized xxxxxs because they have less flavor and may be tough and woody. Avoid wilted, soft or slimy xxxxxs.

Measuring Fresh Xxxxxs

1 pound = about 5 medium xxxxs = 4 cups shredded = about 2 1/2 cups diced cooked
1/2 cup diced cooked = a little less than 3 ounces by weight = about 80 grams

Handling and Preserving: Cut off the green leafy tops close to the top of the xxxxx. If you plan to cook the leafy tops, such as in soup or a stew, refrigerate them separately and use within 1 or 2 days; they spoil quickly. Brush off any loose dirt. Refrigerate unwashed xxxxxs in a perforated plastic bag in the vegetable drawer, away from fruits. Crispness is maintained by preventing water loss. Xxxxxs usually stay fresh for several weeks, and at times for up to 6 months. **To freeze,** select tender xxxxxs. Cut off ends, wash, and peel. Place small whole xxxxxs in boiling water for 5 minutes. Cut larger xxxxxs into thin slices, cubes or strips and boil for 2 minutes. Drain immediately and place them in ice water for 5 minutes. Drain and package into freezer bags or containers, with 3 inches of air space. Seal, date and freeze.

Preparation and Serving: Scrub xxxxxs under cold running water with a vegetable brush to remove all dirt. Cut off ends, and areas that are green instead of orange near the top. Peel if desired. Xxxxxs are a popular, naturally sweet vegetable. They add lots of nutrition and color, but few calories. Raw or cooked, xxxxxs are easy to serve. Try them whole, shredded, chopped, juiced, boiled, steamed, stir-fried, baked, roasted or grilled. Grate and add to salads, main dishes, sandwiches, baked goods, etc.

Nutrition Facts for one serving, or 1/2 cup sliced raw or cooked xxxxxs: Calories 30-35; Protein 1 gram; Carbohydrates 6-8 grams; Fat 0 grams. One serving provides large amounts of the healthful antioxidant, beta carotene, which is converted into vitamin A after being eaten. Xxxxxs contribute other nutrients to the diet, too.

Guess Who? 16



Fun Facts: Most xxxxx is white or creamy colored. Purple xxxxx looks like xxxxx, but is really a type of broccoli that turns green when cooked. White xxxxx heads turn green if they get sunburned. Xxxxx is in the cabbage, or cruciferous, family of vegetables. It is the 12th most frequently eaten vegetable in the U.S. Eating white or purple xxxxx helps protect against heart disease and cancer.

Selecting Fresh Xxxxx: Look for a head that is clean, firm, tight, compact, solid and heavy. Any outer leaves should be fresh and green. Avoid xxxxx heads that are light brown, or that have spread out or have a coarse appearance that looks like rice, and those with soft, wilted or discolored spots.

Measuring Fresh Xxxxx:

- 1 pound raw = about 10 ounces ready to eat = about 3 cups raw = 1 1/2 cups cooked
- 1 medium head = about 50 to 75 florets = about 6 cups raw
- 1/2 cup cooked = about 2 1/4 ounces by weight = 62 grams

Handling and Preserving: Refrigerate unwashed, dry xxxxx in a perforated plastic bag in the vegetable drawer. It will stay fresh from 2 days through 4 weeks. **To freeze,** select a fresh head. Wash, cut out any dark spots, and trim off leaves. If the head has insects, soak it in 4 cups cold water with 1 teaspoon each vinegar and salt for 30 minutes. Place 1-inch pieces of xxxxx in 1 gallon boiling water mixed with 3 tablespoons lemon juice (added to prevent darkening) for 3 minutes. Drain immediately and place in ice water for 3 minutes. Drain again. Pack into freezer bags, leaving 3 inches of air space. Squeeze out the air, seal, date and freeze.

Preparation and Serving: Wash fresh xxxxx under cool running water. Trim off leaves and any dark spots. If the head has insects, soak it in 4 cups cold water with 1 teaspoon each vinegar and salt for 30 minutes. To maintain its nutrients, do not soak longer. Serve raw or cooked xxxxx plain or with dips or sauces or in salads and casseroles. To cook xxxxx: cut the florets into same-sized pieces and steam, microwave, boil or stir-fry them until fork-tender. For best quality, do not overcook.

Nutrition Facts 1 serving = 1/2 cup cooked or raw xxxxx. Each 1/2 cup cooked xxxxx has: Calories 14; Protein 1 gram; Carbohydrates 3 grams; Fat 0 grams. Xxxxx contributes fiber, vitamin C, B vitamins including folic acid, and many other nutrients, antioxidants and healthful phytochemicals to the diet.

Guess Who? 4

Fun Facts: Fashionable high-society Chinese women used to use xxxxx skins to stain their teeth black. The most common type of xxxxx eaten in the U.S. is the large, dark-purple Italian xxxxx. Less common are the slender lavender and small white types of xxxxxs. Xxxxx is one of the least-frequently eaten vegetables in the U.S.

Selecting Fresh Xxxxx: Look for a firm xxxxx that is 6 to 8 inches long. Choose one with tender, smooth, glossy skin. Also look for one that, when it is gently pressed, yields to the pressure but the dent disappears. Look for an xxxxx with an oval, not round, dimple at the blossom end. Select one where the stem and cap are still greenish and fresh-looking. Avoid xxxxxs that have hard flesh, as well as ones where the dent remains in the flesh after it is gently pressed, because it is likely to be brown and spongy inside, taste bitter, and have large tough seeds. Avoid those with a round dimple on the blossom end, since they may have more seeds and be spongier. Avoid xxxxx that is dull, discolored, soft, shriveled or split. Avoid those with dark brown spots, which are a sign of decay.

Measuring Fresh Xxxxx:

- 1 medium xxxxx = about 1 1/4 pounds as purchased = about 1 pound ready-to-cook = about 4 cups diced, raw or cooked
- 1/2 cup cooked = about 1 3/4 ounces by weight = about 50 grams

Handling and Preserving: Refrigerate unwashed xxxxx in a perforated plastic bag in the vegetable drawer for up to 1 week. Handle gently to avoid bruises. It develops a bitter taste during storage in the refrigerator. **To freeze:** Rinse off dirt. Cut off ends. Peel if skin is tough. Dice, or slice into 1/3-inch thick rounds. Immediately place them in a mixture of 1 gallon boiling water with 1/2 cup lemon juice for 2 to 4 minutes. Remove and place in ice water for 2 to 4 minutes. Drain. Place in freezer bags, leaving 3 inches of air. Squeeze out the air, seal, date and freeze.

Preparation and Serving: Rinse off dirt. Cut off the ends. Peel if the skin is tough. Young tender xxxxx may be cooked with the peel left on. Cook xxxxx by baking, grilling, steaming or frying it. Use as directed in recipes, but do not overcook. Xxxxx has a mild flavor that is enhanced by culinary herbs and other vegetables.

Nutrition Facts One serving = 1/2 cup steamed xxxxx. It provides: Calories 13; Protein 1 gram; Carbohydrates 3 grams; Fat 0 grams.

Guess Who? 21



Fun Facts: Xxxxxs can be green or white, red, blue, blue-black or purple. Some have seeds while others are seedless. Xxxxxs are among the top six most-frequently eaten fruits in the U.S. On average, each person eats about 8 pounds of fresh xxxxxs and 2 pounds of dried xxxxxs, or raisins, per year, in addition to jelly, jam, juice and wine.

Selecting Fresh Xxxxxs: Look for firm, plump, smooth, sweet xxxxxs with a uniform bright color, tender skins, and pleasant aroma. Look for market xxxxxs that have been protected in covered containers. Avoid xxxxxs with blotches of color or that are wet, mushy, wrinkled, shriveled, scarred, leaky or moldy.

Measuring Fresh Xxxxxs

1 pound = about 15 ounces ready to eat = about 2 1/2 cups of xxxxxs

1/2 cup = about 15 to 20 xxxxxs = about 3 ounces by weight = about 80 grams

Handling and Preserving: Handle xxxxxs gently so they do not bruise. Refrigerate (preferably at 32° F.) unwashed xxxxxs as soon as possible in a perforated plastic bag. Xxxxxs absorb odors, so store them away from strong-smelling foods. Xxxxxs do not ripen further after harvest. For best quality, use during the first few days. **To freeze:** Select fresh xxxxxs. Rinse off dirt. Remove stems. Leave seedless xxxxxs whole, but cut others in half and remove seeds. Pack into freezer bags or containers, leaving 1/2 inch of air. If desired, cover with a cold syrup made with 1 cup water and 2/3 cup sugar. Squeeze out air, seal, date and freeze.

Preparation and Serving: Just before use, rinse xxxxxs under cool running water. Remove those with bruises and decay. Enjoy them plain! Or serve with other foods, such as cheese, yogurt and cereal. Use as directed in a recipe, such as for a cold salad, dessert or main dish.

Nutrition Facts: One serving = 12 fresh xxxxxs or 1/4 cup raisins. 12 xxxxxs provide: Calories 43; Protein 1/2 gram; Carbohydrates 11 grams; Fat 0 grams. 1/4 cup raisins provide: Calories 124; Protein 1 gram; Carbohydrates 33 grams; Fat 0 grams. Xxxxxs and raisins contribute fiber, B vitamins and essential minerals to the diet. Xxxxxs contain many healthful antioxidants, phytochemicals and pigments. Eating xxxxxs or xxxxx products can help protect against heart disease and cancer.

Guess Who? 10



Fun Facts: Some types of xxxxxs are purple, but turn green when cooked. Yellow or wax xxxxxs are closely related to xxxxxs. Xxxxxs are the immature pod and xxxxxs of dried legumes. Xxxxxs used to be called "string xxxxxs" because of the stringy fiber that grew along the seam of the bean pod. Newer xxxxxx varieties do not have this stringy fiber. Xxxxxs are one of the top 20 vegetables eaten in the U.S.

Selecting Fresh Xxxxxs: Look for xxxxxs with a pod that is firm, crisp, straight and long, and that snaps easily. The tip should be flexible. Avoid xxxxxs with large seeds within the pod. If you can see the bulge of a developing xxxx through the green pod, the pod will probably need to be discarded since it will be too tough to eat, but the seeds can be removed and cooked. Avoid xxxxxs that are thick, tough, stringy, fibrous or wilted, or with pods that look rusty or damaged.

Measuring Fresh Xxxxxs:

1 pound raw = about 14 ounces ready to eat = 3 cups raw = about 2 1/2 cups cooked
1/2 cup cooked = about 2 1/4 ounces by weight = 63 grams

Handling and Preserving: Refrigerate unwashed dry xxxxxs in a plastic bag in the vegetable drawer for up to 3 days. **To freeze,** select fresh xxxxxs. Rinse. Remove stem ends. If desired, snap into 1-inch pieces. Place in boiling water for 2 or 3 minutes, depending on size. Drain immediately and place in ice water for 2 or 3 minutes. Drain again. Pack into freezer bags, leaving 3 inches of air space. Squeeze out the air, seal, date and freeze.

Preparation and Serving: Wash xxxxxs under cool running water and drain. Remove the stem ends. Enjoy cooked xxxxxs as a hot side dish or chilled in a salad, or use as directed in recipes. To cook: steam, microwave, boil or stir-fry them until fork-tender. Boiled fresh xxxxxs cook in about 15-30 minutes. For best results, do not overcook.

Nutrition Facts One serving = 1/2 cup xxxxxs. Each 1/2 cup of cooked xxxxxs has: Calories 22; Protein 1 gram; Carbohydrates 5 grams; Fat 0 grams. Xxxxxs contribute vitamin C, carotenoids (which the body converts to vitamin A), fiber, B vitamins including folic acid, essential minerals and other nutrients, antioxidants and phytochemicals to the diet.

Guess Who? 17



Fun Facts: XXXXX is 95% water. Iceberg xxxxx is the second most-frequently vegetable eaten in the U.S., while leaf xxxxx is among the top 13 vegetables eaten. Americans eat almost five times more xxxxx now than they ate in the early 1900s.

Selecting Fresh XXXXX: Look for crisphead-type xxxxxs, such as iceberg, and cos, or romaine, xxxxx that have crisp leaves. Romaine xxxxx forms a long medium-dense head. Leaf (or loose-leaf) xxxxx should have crisp leaves loosely arranged on the stalk. Look for butterhead xxxxx, such as Boston or Bibb, that has a small loose head with tender, soft leaves (the inner leaves have an oily or buttery feel). Avoid xxxxx that is dry or wilted, or that has soft decay spots or looks rusty or discolored.

Measuring Fresh XXXXX:

1 head = about 2 pounds = about 20 to 24 ounces ready to eat = about 10 or 12 cups
1 cup shredded or chopped = about 2 ounces by weight = 55 grams

Handling and Preserving: Refrigerate unwashed dry xxxxx for up to 2 weeks in a perforated plastic bag in the coolest part of the refrigerator, which is the top shelf against the rear wall, or in the vegetable drawer. Avoid storing xxxxx near apples, pears or bananas since they release a natural ripening gas, ethylene, which causes xxxxx to develop brown spots and decay quickly. Leaf and head xxxxx do not freeze well.

Preparation and Serving: Wash xxxxx leaves under cool running water and drain. Pat dry with a clean towel or dry with a salad spinner. Restore limp leaves by soaking them in ice water for a few minutes. Tear leaves into pieces. For best nutrition and appearance, do not cut or slice xxxxx in advance. Use all types of xxxxx as a salad, on sandwiches, as a garnish, or as directed in recipes. Iceberg, leaf and romaine xxxxx provide flavor and crunch. Butterhead xxxxx has a delicate sweet flavor. Peel the uncommon stem-type or asparagus xxxxx and use raw, like celery, or cooked.

Nutrition Facts One serving = 1 cup raw xxxxx. 1 cup chopped xxxxx has: Calories 7-10; Protein 1 gram; Carbohydrates 1 to 2 grams; Fat 0 grams. Nutritional value varies, with darker-colored leaves contributing more nutrients. Iceberg xxxxx has very low levels of all nutrients. Romaine, leaf and butterhead xxxxx contribute vitamins C and K, carotenoids (which the body converts to vitamin A), the B vitamin folic acid, essential minerals such as chromium, and other nutrients, antioxidants and phytochemicals.

Guess Who? 15



Fun Facts: Xxxxxs can be yellow, red or white, but the most common type is yellow. Green xxxxxs, also called scallions and spring or summer xxxxxs, are called ‘green’ because they are immature. If they are left in the ground to grow for a longer time, they mature into bulb or storage xxxxxs. Garlic, asparagus, leeks, chives, shallots and xxxxxs are in the same family of plants. Xxxxxs are the fourth most-frequently eaten vegetable in the U.S. On average, each American ate 18 pounds in 2002, up from the 12 pounds eaten in 1982. Residents of Libya eat the most xxxxxs, almost 4 times as many as people in the U.S.

Selecting Fresh Xxxxxs: Green xxxxxs have a sweeter, milder taste than mature xxxxxs. Look for green xxxxxs or scallions with several inches of white, crisp flesh at the root end and fresh tender green tops. Avoid those that are wilted, discolored, or decayed. If selecting mature bulb xxxxxs, look for ones that are firm, dry and small at the top and with layers of papery outer skins. Avoid those that are split or wet, are sprouting, or that have decay, soft spots, or green areas which indicates sunburn.

Measuring Fresh Xxxxxs:

- 1 pound green xxxxxs = about 2 1/2 cups ready to eat, sliced, with tops = about 1 cup ready to eat, sliced, without tops.
- 1 pound mature xxxxxs = about 3 large or 4 or 5 medium xxxxxs = about 2 1/2 cups ready to eat, raw = about 2 cups cooked xxxxx
- 1/2 cup steamed xxxxxs = about 3 3/4 ounces by weight = 105 grams

Handling and Preserving: Refrigerate unwashed green xxxxxs for up to 4 weeks in a perforated plastic bag in the vegetable drawer. Store mature xxxxxs for up to 4 months on a counter in a cool, dry, well-ventilated place, but not in a plastic container. **To freeze xxxxxs**, peel, rinse and chop spring or bulb xxxxxs. Pack into freezer bags, leaving 3 inches of air space. Or place xxxxx pieces in a single layer on a tray, freeze, and then pack into freezer bags. Squeeze out the air, seal, date and freeze. Use in cooked products.

Preparation and Serving: Peel off the dry and colored outer layers. Rinse under cool running water and drain. The sulfur-containing compound in xxxxxs can bring tears to your eyes. To limit your tears, chill the xxxxx before cutting it, and cut into the root end of the xxxxx last. Use xxxxxs raw, or boil, steam, microwave, grill, stir-fry or bake them.

Nutrition Facts One serving = 1/2 cup. 1/2 cup steamed xxxxxs has: Calories 40; Protein 1 gram; Carbohydrates 9 grams; Fat 0 grams. Xxxxxs contain the antioxidant quercetin, and organosulfur compounds, which help protect against chronic diseases.

Guess Who? 6



Fun Facts: Do you know any identical twins who are “as alike as two xxxxxs in a pod”? Xxxx xxxxxs, also called garden or English xxxxxs, are eaten after the outer pod is removed. Removing the pod is called “shelling” the xxxxxs. To do this, pinch off the ends, pull the string down on the inside of the pod and squeeze upward quickly to pop the xxxxxs out. Xxxx xxxs have either smooth or wrinkled seeds. Wrinkled seed xxxxxs are sweeter and are usually eaten when tender and immature, or “green”. Smooth-seeded xxxxxs have more starch and are often allowed to ripen, then are eaten in split-pea soup, etc., when mature. Edible-pod xxxxxs include snow, sugar snap and Chinese xxxxxs.

Selecting Fresh Xxxs: Look for firm, crisp xxxx pods with a bright green color and a soft, velvety feel. Avoid those with limp, wrinkled, fibrous, discolored or decayed pods. Xxxx xxxs are best when they have fully-expanded pods filled with large round xxxxs. Choose edible-pod snow and sugar snap xxxxs that have flat tender pods 1 1/2 to 3 inches long, with undeveloped seeds inside. Small pods are sweeter and more tender. If an edible-pod xxx is too fibrous, remove the pod and use just the xxx seeds inside.

Measuring Fresh Xxxxx Xxxxxs:

1 pound xxxx xxxxxs = about 6 ounces shelled = about 1 cup, raw or cooked

1/2 cup cooked green or edible-pod xxxxxs = about 3 ounces by weight = 80 grams

Handling and Preserving: Refrigerate unshelled, unwashed xxxs in a perforated plastic bag. For best quality, since their sugar quickly turns to starch, eat xxxx xxxs as soon as possible and within 5 days. Edible pod xxxxxs will keep up to two weeks. **To freeze:** Select fresh tender xxxs. Rinse dirt off. Remove the ends and strings from all xxxxxs, and the pods from xxx xxxs. Place 1 cup xxxs in boiling water for 2 minutes. Remove immediately and place in ice water for 2 minutes. Drain. Pack into freezer bags, leaving 3 inches of air space. Squeeze out the air, seal, date and freeze.

Preparation and Serving: Rinse dirt from xxxxxs. Shell xxxxx xxxxxs. For edible- pod xxxxxs, remove the ends and strings from both sides of the pod. Edible-pod xxxxxs may be eaten raw. For best quality, do not overcook xxxxxs.

Nutrition Facts for one serving, or 1/2 cup cooked xxx xxxs: Calories 67; Protein 4 grams; Carbohydrates 13 grams; Fat 0 grams. In contrast, 1/2 cup cooked edible-pod xxxs provides 34 calories and 6 grams carbohydrates. Xxxxxs contribute vitamin C and K, B vitamins, fiber and essential minerals to the diet.

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Guess Who? 9



Fun Facts: Xxxxxs are one of the top 20 most-frequently eaten vegetables in the U.S. Xxxxxs are a member of the cabbage, or cruciferous, family of vegetables. You can make xxxxxs into edible shapes by cutting them not quite all the way through and placing them in ice water so they fan out. Some xxxxxs are thin and long, others are short and round. There are spring and winter xxxxxs. **Spring xxxxxs** can be red, pink, purple, white, or red and white, and some have a hot taste while others are mild. **Winter xxxxxs** are large and can be black, white or green. Black xxxxxs have a strong, pungent flavor. Daikon or Chinese xxxxxs are milder and bigger than black xxxxxs; they can grow to be 18 inches and 6 pounds.

Selecting Fresh Xxxxxs: Look for spring xxxxxs that are 1/2 to 1 inch wide and are firm, smooth and shiny. Avoid large spring xxxxxs that yield to pressure; they are fibrous, spongy, tough or woody and their flavor is hot. If the xxxxx top is attached, look for fresh green leaves. Avoid xxxxxs that are limp or dull in appearance, or that have wilted, yellow or decayed tops.

Measuring Fresh Spring Xxxxxs:

- 1 pound raw without tops = about 15 ounces ready to eat = about 90 small xxxxxs or 50 medium xxxxxs = about 3 1/2 cups of raw slices
- 1/2 cup raw slices = about 2 ounces by weight = 58 grams

Handling and Preserving: Cut off the leafy xxxxx top and refrigerate it unwashed in a separate plastic bag; cook within 1 or 2 days. Brush off any dirt clods from the xxxxx and refrigerate unwashed, dry xxxxxs in a plastic bag in the vegetable drawer for 1 to 4 weeks. (Winter xxxxxs keep longer than spring xxxxxs do.) Xxxxxs do not freeze well, but may be pickled. Use pickling salt as directed by the recipe, since table salt may make the brine cloudy and the pickles be off-color.

Preparation and Serving: Cut off the root. Scrub off all dirt under cool running water. Peel daikon xxxxxs but not spring xxxxxs. Enjoy xxxxxs raw or cooked; whole, sliced, diced or shredded; plain or in a recipe.

Nutrition Facts One serving = 1/2 cup xxxxxs. In each 1/2 cup of raw sliced spring xxxxxs there are: Calories 12; Protein 0 grams; Carbohydrates 2 grams; Fat 0 grams. Xxxxxs are an excellent source of vitamin C and contribute other nutrients, antioxidants and phytochemicals to the diet.

Guess Who? 11



Fun Facts: A recipe with the word “florentine” means it contains xxxxx. The expression honors the French queen, Catherine de Medici, who loved xxxxx and was from Florence, Italy. New Zealand xxxxx is a leafy green vegetable, but it is not really xxxxx. It can, however, be used in similar ways. Xxxxx is extremely high in healthful antioxidants. Eating xxxxx helps protect health against many diseases, including heart disease, cancer and age-related macular degeneration. Xxxxx is closely related to beets and Swiss chard. On average, Americans eat about 2 1/2 pounds of xxxxx per year.

Selecting Fresh Xxxxx: Look for fresh, crisp dark green leaves and tender stems. Smooth leaf varieties are easier to clean. Avoid xxxxx with wilted, yellow, discolored, damaged or slimy leaves, or with long or tough stems.

Measuring Fresh Xxxxx:

1 pound raw = about 14 ounces ready to eat = about 13 cups chopped, raw
= about 2 cups cooked

1/2 cup cooked = about 3 1/2 ounces by weight = 95 grams

Handling and Preserving: Refrigerate in a perforated plastic bag in the vegetable drawer. Xxxxx may stay fresh up to 14 days, but when possible use during the first few days. **To freeze**, select tender fresh leaves. Rinse off dirt. Remove stems if tough. Place a handful of xxxxx in boiling water for 1 1/2 minutes. Drain immediately and place in ice water for 1 1/2 minutes. Drain again. Pack into freezer bags, leaving 3 inches of air space. Squeeze out the air, seal, date and freeze.

Preparation and Serving: Rinse dirt from xxxxx leaves and dry with clean paper towels or in a salad spinner. Serve raw or cooked xxxxx plain, or use as directed in recipes. Xxxxx may be used in cold and hot salads, casseroles including egg dishes, soups, dips, etc. To cook xxxxx: steam, microwave, boil or stir-fry until tender. For the best taste, color, texture and nutrition, do not overcook.

Nutrition Facts 1 serving = 1 cup raw or 1/2 cup cooked xxxxx. Each 1/2 cup steamed xxxxx has: Calories 21; Protein 3 grams; Carbohydrates 3 grams; Fat 0 grams. For 1 cup raw xxxxx: Calories 7; Protein 1 gram; Carbohydrates 1 gram; Fat 0 grams. Xxxxx contributes fiber, carotenoids (which the body converts to vitamin A), vitamins C and K, B vitamins including folic acid, iron, and many other nutrients to the diet.

Guess Who? 19

Fun Facts: All xxxxxs start out green, but some are left on the plant longer before being harvested, so that other colors -- and a sweeter, more mellow flavor -- develop. Unlike sweet xxxxxs, spicy xxxxxs provide a burning sensation because they contain capsaicinoids, which act on pain receptors in the mouth – not on our taste buds! These compounds are stored in the light-colored veins, on the walls, and around the seeds of hot xxxxxs. Hot, spicy varieties include pimiento, tabasco, cayenne, chili and paprika xxxxxs, and they should be handled with caution.

Selecting Fresh Xxxxxs: Choose crisp, firm xxxxxs that are 3 to 4 inches long, glossy and bright in color. Sweet xxxxxs can be green, red, orange, yellow, brown, white, light yellow, lilac or purple. Avoid xxxxxs with shriveled or wrinkled skin; with thin or flimsy walls; or with soft, watery, or sunken spots.

Measuring Fresh Xxxxxs

1 pound = 2 to 3 medium whole = 3 1/2 cups raw sliced = 2 3/4 cups cooked sliced
1/2 cup raw, sliced = about 2 1/2 ounces by weight = about 75 grams

Handling and Preserving: Store unwashed xxxxs in a plastic bag to hold in moisture. They usually store well for up to ten days. Xxxxxs keep best between 40-50° F, so put them in the vegetable bin rather than the main part of the refrigerator. Colder storage temperatures may result in discoloration and disagreeable flavors. Xxxxxs freeze well. Wash, core, and cut them up, as desired, then spread in a single layer on a tray and freeze. Soon after they are frozen, loosen pieces and store in a sealed freezer bag. Upon thawing, the xxxxs will still be crisp and can be used raw, or in cooked dishes.

Preparation and Serving: Rinse xxxxxs under cold running water to remove dirt. Cut off bruises and decay. Remove the stem, center membrane parts, and seeds. Delicious raw as a relish or in salads. Or enjoy xxxxxs grilled, roasted, baked, steamed, microwaved, boiled, pan-fried or stir-fried. Use as directed in a recipe.

Nutrition Facts for one serving, or 1/2 cup chopped raw xxxxs: Calories 20; Protein 1 gram; Carbohydrates 5 grams; Fat 0 grams. All xxxxxxxxxs are very high in vitamin C. Red xxxxxxxxxs are also very high in vitamin A.

Guess Who? 1



Fun Facts: Xxxxxs, one of the top five favorite vegetables, used to be called love apples. In 1893, the U.S. Supreme Court ruled that xxxxs are a vegetable. Ripe xxxxs can be red, yellow or orange, and can be full-, cherry- or grape size.

Selecting Fresh Xxxxxs: Look for xxxxs with bright, shiny skins and firm flesh. Xxxxxs are best when ripened on the vine at temperatures below 90°F. Avoid those with blemishes, cracks or soft spots, or that are lacking in color. Roma & plum xxxxs are fleshy, with less juice and fewer seeds than other kinds of xxxxs.

Measuring Fresh Ripe Xxxxxs:

1 pound = 2 or 3 medium full-sized = 2 1/4 cups raw diced

1/2 cup raw chopped = about 3 ounces by weight = about 90 grams

Handling, Ripening and Preserving: Handle gently. Store unwashed ripe xxxxs on a counter between 60-80°F., away from direct sunlight, for up to 3 days. Refrigerate xxxxs, uncovered, only if you want to keep them from ripening further. When temperatures are above 90°F, pick xxxxs while still pink. **To ripen xxxxs,** place xxxxs, stem end up, in a paper bag with several holes in it, fold the top over, store at 60-80°F., and check them daily. **To freeze xxxxs for use in cooked dishes:** Wash xxxxs and drop a few into 1 gallon boiling water for only 30 seconds, or longer if using firm xxxxs. Remove immediately and cool in a bowl of ice water. Skin will pull away easily if they were in the boiling water long enough. Core and cut into pieces. Cook on a stovetop or in a microwave oven until tender. Pour into a shallow container and place in ice water until xxxxs are cool. Pack cooked xxxxs into freezer containers and leave 1 inch of air space before sealing.

Preparation and Serving: Rinse xxxxs under cold running water to remove dirt. Cut out the core and any damaged areas. Cut lengthwise from stem to blossom end to retain more juice in each slice. Enjoy xxxxs fresh (served at room temperature) or grilled, stewed, baked, steamed, microwaved, boiled, pan-fried or stir-fried. Xxxxxs cook in less than 15 minutes. Use as directed in a recipe.

Nutrition Facts for one serving, or 1/2 cup raw chopped red or green xxxxs, not peeled: Calories about 20; Protein 1 gram; Carbohydrates 4 grams; Fat 0 grams. Xxxxxs are high in vitamin C and provide fiber and healthful pigments and antioxidants, such as the carotenoids beta-carotene and lycopene, to the diet.