WHY FRUIT TREES FAIL TO BEAR

Fruit Gardens

BY
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Normal, healthy fruit trees will begin to set fruit soon after they are old enough to flower. However, the ability to develop flowers and produce fruits depends on environmental conditions, fruiting habits, and cultural practices. Any of these conditions can adversely affect flowering and fruit production. Control over as many of these conditions as possible is necessary for the tree to produce fruits.

Tree Age

Fruit trees from a nursery generally are 1 to 2 years old when you buy them. They usually are in a juvenile stage of growth and will begin producing fruit at maturity. The period from planting to fruit bearing will vary depending on the type of fruit, the rootstock onto which it is grafted, and growing conditions. Fruit trees grafted on dwarf rootstock can bear fruit 1 to 2 years earlier than a standard size tree. The age when fruit trees are expected to bear fruit depends on the type of fruit: apple and apricot, 2 to 5 years; sour cherry and citrus, 3 to 5 ; peach, 2 to 4; pear, 4 to 6; sweet cherry, 4 to 7; plum, 3 to 6; fig, 2 to 3; and quince, 5 to 6.

Limbs

Permanent or scaffold limbs should be trained so they grow at wide angles. This exposes potential fruiting areas to sunlight and causes hormonal changes within the tree, which promotes fruit bud development. For the first two to three years, trees should make vegetative growth for future fruit bearing, rather than supporting a fruit crop. By the third growing season, some trees may have blossoms and fruit development.

Spreading limbs for sunlight exposure enhances fruit bud development on apple and pear trees. This should be done during the first and second growing seasons. The main limbs (scaffolds) of the trees can be bent so they form an angle of about 60 degrees with the trunk. Limbs that grow at steeper angles will produce more vegetation than fruit buds. When limbs are limber, they can be bent away from the center of the tree.

Limb spreaders, weights or stakes are used to spread limbs and branches. Spreaders can be made of 1 x 2-inch wood, or plaster lath of different lengths (Figure 1a). To keep the spreaders in position, cut a notch in each end or drive a nail into each end and cut the head off at an angle, leaving a sharp point to stick into the tree branch. Place the spreader so it forces the limb away from the tree center. Do this with care so you do not split the limb from the tree trunk.

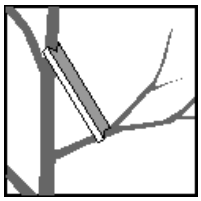

Figure 1a

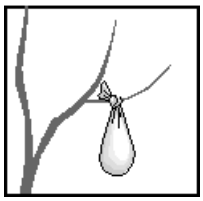

Figure 1b

Figure 1c

Weights can be made by putting sand in nylon hose and tying the hose to the outer side of the limb (Figure 1b). Stakes also can be used to help develop an open tree structure (Figure 1c). When using stakes, the tie down material should be soft, such as a nylon hose, to prevent cutting into the bark. Tighten the material to the stake until the limb forms an angle of about 60 degrees to the tree trunk.

Be careful not to spread the limbs near a 90-degree angle or more, or vertical shoot growth may develop on the upper side of

the limbs. Spreading can be done throughout the growing season.

Tree Vigor

Excessive tree vigor leads to a reduction in flower bud formation. This can be caused by overfertilization, especially with nitrogen, or over-pruning. If more than 12 to 24 inches of new shoot growth occurs on bearing trees during the growing season, nitrogen fertilization should be stopped. Nonbearing trees should have 18 to 30 inches of growth. Nitrogen should be increased by 25 percent next spring if growth falls below 18 inches. More than 30 inches of growth indicates overfertilization or over-pruning.

Too much growth without overfertilization is a sign of over-pruning. Excessive pruning, especially heading cuts that remove portions of the branch, will stimulate upright growth that reduces flower bud formation and delays fruit bearing. However, thinning out, which is the removal of the entire branch back to its origin point, will develop a strong framework with a central leader and encourage horizontal branches where flower buds develop.

Yearly Pruning

Insufficient pruning results in an increasing number of limbs, branches and shoots in the canopy of the tree. This growth causes heavy shading, and fruit buds fail to develop. Over a few years, fruit buds will develop only at the top and sides of the tree where there is sunlight. Pruning a large portion of the limbs and branches inside the canopy to increase sunlight penetration will promote fruit bud development in the inner area of the tree. Two to three years of selective pruning will be necessary to induce fruit production in the inner part of the tree.

Non-Chilling Temperatures

The hardiest fruit trees in Kansas require certain hours of temperatures below 45 degrees for proper breaking of bud dormancy. When winters are too mild, spring growth is delayed, irregular, or slow, which reduces fruit set.

Winter Cold Injury

Extremely cold winter temperatures may kill flower buds, although bud survival can depend on variety and fruit type. Hardy apple, pear, plum and sour cherry varieties are seldom injured by winter weather. Sweet cherry varieties are relatively sensitive to cold until they harden. Mid-winter temperatures around –10 ^{o}F can kill the flower buds of peach trees. A mid-winter warm period followed by a cold one can damage the flower buds of most fruits.

Temperatures at which fruit buds are injured depends primarily on their stage of development. Table 1 shows critical temperatures for blossom buds at the first stage of bud development.

Spring Frost Damage

As flower buds begin to swell and open, they become susceptible to damage from temperatures below 24 degrees and might be killed. Injured flowers may appear normal, but the pistil (the center part of the flower) is damaged, and trees will not bear fruit.

When a heavy frost is expected, covering home-garden trees will sometimes prevent bud or blossom injury, if temperatures do not fall too low and the cold period is short. Hanging incandescent or Christmas tree lights on trees during frost periods can offer protection to the fruit buds when used under such a tree cover.

Table 1 - Critical temperatures at which fruit buds are injured (in degrees Fahrenheit).

Type of Fruit	10 % Bud Kill	90 % Bud Kill	Bud Stage
Apples[a]	15°	2°	Silvertip
Cherries[b]	17°	5°	First swelling
Peaches[c]	18°	1°	Swollen bud (first swelling)
Pears[d]	15°	0°	Swollen bud (scales separating)
Prunes[e]	14°	0°	Swollen bud (first swelling)

[a]For Red Delicious. Golden Delicious and Winesap, 1 degree lower; Rome Beauty, 2 degrees lower at this stage.

[b]For Bing, Lambert and Rainier, 1 to 2 degrees lower.

[c]For Elberta.

[d]For Bartlett. Anjou is similiar and may bloom earlier and be more tender than Barlett at the same date.

[e]For Italian and Early Italian prunes.

Commercial growers can heat their orchards to protect against frost. Overhead sprinklers provide effective protection when temperatures dip below 32 degrees. As ice forms on the flower buds, it releases heat that protects flower buds until temperatures rise above freezing.

Pollination Requirements

All fruit buds require pollination for fruit development. Without sufficient pollination they may blossom abundantly, but will not bear fruit. Most species of fruit trees have "perfect" flowers. Perfect flowers have anthers, which contain pollen, and pistils, which develop into fruit, in the same flower on the same tree. If trees bear fruit as the result of pollination from their own anthers, they are self-fruitful. Fruits such as quinces, sour cherries, most apricots, most peaches and European plums like Stanley, Green Gage and Italian prune are self-fruitful. Self-unfruitful trees with perfect flowers that cannot produce fruit from their own pollen require pollen from another cultivar. This type includes apple, pear, sweet cherry, and Japanese and American plum trees. At least two varieties must be planted nearby. Some nut trees, such as pistachios, have pollen-producing male trees and fruit-producing female trees. Pecan trees have separate male and female flowers on the same tree.

To ensure successful pollination of self-unfruitful trees, the following planting practices need to be followed:

Apple. Most cultivars produce high yield and quality fruit when they are cross-pollinated. Golden Delicious, Jonathan and Red Delicious are some of the cultivars that produce viable pollen. Poor pollen producers are Stayman, Winesap, Jonagold, Crispin, Gravenstein, Summer Rambo, and Spigold. They need to be planted with at least two other varieties to ensure adequate pollination.

Pear. Many cultivars of pears are partially or completely self-unfruitful. For adequate pollination, plant at least two cultivars together. Moonglow, Maxine, and Duchess are effective pollinating varieties. Bartlett and Seckel pears will not pollinate each other, and Magness and Waite cannot be used as pollinators because of their sterile pollens.

Plum. Most American and Japanese plum cultivars are self-unfruitful; therefore, plant two or more cultivars side by side. Japanese plums will not pollinate European plums.

Sweet Cherry. Pollinating cultivars are needed for most sweet cherries. Bing, Lambert, and Napoleon cultivars do not pollinate each other, so plant a pollinator nearby. Black Tartarian, Republican, Van, or Windsor cherry cultivars, or a sour cherry cultivar, such as Montmorency, is appropriate. Stella and Compact Stella do not need a pollinating variety. As a rule of thumb, dark-colored varieties will pollinate dark varieties, and light varieties will pollinate light varieties. Most sour cherries do not need a pollinator. They are hardier and bloom later than the sweet cherries.

Apricot. Most varieties are self-fruitful. However, a pollinator will increase yield and improve fruit size. Goldrich, Perfection, and Riland must be pollinated to set fruit.

Peach. Most peach varieties are self-fruitful. However, J.H. Hale, Stark Honeydew Male, Stark Male, and Berta Giant cultivars need another variety to ensure pollination.

Biennial Bearing

Occasionally, certain fruit trees, especially apples, bear fruit heavily one year and sparsely the next. Pruning and fruit thinning will correct biennial bearing. A heavy pruning during the dormant season following a light fruit crop reduces the fruit crop that otherwise would be heavy the coming season. Also, small fruits can be removed by hand 30 days after bloom during the heavy fruiting year.

Train and prune your fruit trees every year to promote annual bearing, and limbs will be well-distributed around the tree.

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