



*Report of Progress 820*

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*Production and Postharvest Evaluations of*

***Fresh-Cut  
Peonies***



*Kansas State University Agricultural Experiment Station and Cooperative Extension Service*

## 1998 PRODUCTION AND POSTHARVEST EVALUATIONS OF FRESH-CUT PEONIES

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In the fall of 1992, a cultivar trial of peony plants (*Paeonia lactiflora* Pallas) was established at the Kansas State University Horticulture Research Center, Manhattan, KS, to determine which cultivars would produce good fresh-cut flowers. Since then, new cultivars have been added, so the planting now includes 99 different cultivars (Table 1). The cultivar trial plots include five plants set 0.91 m apart within the beds. Beds are 0.91 m-wide with 1.22 m-wide grass aisles between them. In addition to the yield and harvest data, flowers from these trials were used for postharvest evaluations studies.

In 1993, a commercial-size trial was established of the cultivar 'Shawnee Chief', a red double. The initial planting included three beds 0.91 m wide with 1.22 m-wide grass aisles between them. Plants were set in double rows in the beds with 0.61 m between the double rows and 0.91 m between plants in the rows. Beds were 32 m long with a total of 70 plants per bed. In the fall of 1995, seven more beds were established in the same manner. Four of these beds contain 'Shawnee Chief', and three of them contain 'Snow Mountain', a white bomb-type.

This year's report includes the following topics:

- harvest dates;
- yield data and an assessment of cultivars 5 years and older;
- assessment of cultivars for incidence of peony measles;
- initial vase life evaluation of cultivars;
- vase life evaluations of selected cultivars after short term, cold storage treatments in water or floral preservative and dry;
- evaluation of methyl jasmonate cold-storage treatment.

**Table 1. Peony cultivars included in planting at the Horticulture Research Center --  
Manhattan, KS, 1998.**

<i>Cultivar</i>	<i>Description</i>
<b>RED</b>	
<i>Apache</i>	Single, dark red, early mid-season
<i>Carol Mae Nelson</i>	Double, very dark crimson-maroon, late mid-season
<i>Cherry Bomb</i>	Bomb, deep red, early mid-season
<i>Comanche</i>	Japanese, dark rose wine, early mid-season
<i>David Harum</i>	Double, light crimson, mid-season
<i>Douglas Brand</i>	Double, watermelon red, late season
<i>Elmer's Red</i>	Double, red
<i>Felix Crousse</i>	Double, brilliant ruby red, mid-season
<i>Felix Supreme</i>	Double, rich ruby red, mid-season
<i>Grover Cleveland</i>	Double, deep crimson, late season
<i>Harry Richardson</i>	Double, rich carmine red, very late season

**Table 1. Peony cultivars included in planting at the Horticulture Research Center -- Manhattan, KS, 1998. (cont'd)**

<i>Cultivar</i>	<i>Description</i>
<i>Henry Bocktoce</i>	Double, true red, early mid-season
<i>Judy Becker</i>	Double, rich dark red, late mid-season
<i>Kansas</i>	Double, bright red, early season
<i>Karl Rosenfield</i>	Double, brilliant crimson, mid-season
<i>Longfellow</i>	Double, bright crimson, mid-season
<i>Lora Dexheimer</i>	Double, bright crimson, mid-season
<i>Louis van Houtte</i>	Double, dark red, late mid-season
<i>Monsieur Martin Cahuzac</i>	Double, very dark red, early mid-season
<i>Montezuma</i>	Single, crimson, early season
<i>Mt. St. Helens</i>	Double, molten red, mid-season
<i>Peter Brand</i>	Double, very dark red, early mid-season
<i>Philippe Rivoire</i>	Bomb, very dark crimson, mid-season
<i>Raspberry Ice</i>	Bomb, raspberry red/silver, early season
<i>Red Charm</i>	Bomb, double, dark red, early mid-season
<i>Red Magic</i>	Double, vivid cranberry red
<i>Richard Carvel</i>	Double, bright crimson, early season
<i>Rosabel</i>	Double, American Beauty rose red, mid-season
<i>Rubra Plena</i>	Double, red, early season
<i>Shawnee Chief</i>	Double, dark red, mid-season
<b>WHITE</b>	
<i>ABC Nicholls</i>	Double, white
<i>Ann Cousins</i>	Double, white late mid-season
<i>Bridal Icing</i>	Bomb, pure white, mid-season
<i>Bridal Shower</i>	Bomb, pure white, mid-season
<i>Capital Dome</i>	Bomb, pure white, mid-season
<i>Cloud Cap</i>	Double, pure white, mid-season
<i>Cream Puff</i>	Japanese, single, pale pink, mid late season
<i>Duluth</i>	Double, white late season
<i>DH1460</i>	Double, pure white, mid-season
<i>Dr. F.G. Brethour</i>	Double, creamy center, late season
<i>Duchess de Nemours</i>	Double, light yellow center, early season
<i>Elsa Sass</i>	Double, pinkish cast, late season
<i>Festiva Supreme</i>	Double, crimson flecks, mid-season
<i>Festiva Maxima</i>	Double, crimson flecks, early season
<i>Henry Sass</i>	Double, pure white, late mid-season
<i>Krinkled White</i>	Single, translucent white, late season
<i>Leading Lady</i>	Double, pure white, late season
<i>Le Cygne</i>	Single, tinged ivory to white, early season
<i>Lullaby</i>	Double, blush to white, late season
<i>Mary E. Nicholls</i>	Full Double, pure white of warm tone, late season
<i>Madame de Vernville</i>	Bomb, blush center, early season
<i>Nebraska</i>	Double, large pure white, late season
<i>Shirley Temple</i>	Double, pink blush turning to white, mid-season
<i>Snow Mountain</i>	Bomb, pure white, late season

**Table 1. Peony cultivars included in planting at the Horticulture Research Center -- Manhattan, KS, 1998. (cont'd)**

<i>Cultivar</i>	<i>Description</i>
<b>WHITE</b>	
<i>Spellbinder</i>	Single, pure white, mid-season
<i>69A</i>	Bomb, ivory white, early season
<b>PINK</b>	
<i>Armistice</i>	Double, rose pink, late mid-season
<i>Baroness Schroeder</i>	Double, very light pink/blush, late mid-season
<i>Better Times</i>	Double, deep rose pink, late mid-season
<i>Doris Cooper</i>	Double, light pink, late season
<i>Duchess de Orleans</i>	Double, deep salmon-pink, mid-season
<i>Edulis Superba</i>	Double, old rose pink, early season
<i>Grace Batson</i>	Double, medium pink, late mid-season
<i>Hansina Brand</i>	Double, light pink, late season
<i>Heidi</i>	Japanese, pink with coral tips, mid-season
<i>Hermoine</i>	Double, light pink, late mid-season
<i>James Pillow</i>	Double, light pink, late season
<i>Jayhawker</i>	Bomb, soft pink, early season
<i>Lady Kate</i>	Double, sparkling pink, very late season
<i>Mister Ed</i>	Bomb, soft pink, early season
<i>Monsieur Jules Elie</i>	Bomb, medium pink, early mid-season
<i>Mrs. Franklin D. Roosevelt</i>	Double, soft rose pink, mid-season
<i>Ozark Beauty</i>	Double, radiant pink, late season
<i>Paula Fay</i>	Semi-double, vivid pink, early mid-season
<i>Princess Margaret</i>	Double, deep rose pink, late season
<i>Raspberry Sundae</i>	Double, light creamy pink, mid-season
<i>Reine Hortense</i>	Double, light pink, crimson flecks, mid-season
<i>Romance</i>	Japanese, dark pink with yellow center, mid-season
<i>Rosea Plena</i>	Double, pink
<i>Rose Pearl</i>	Double, medium pink, mid late season
<i>Sarah Bernhardt</i>	Double, apple blossom pink, late season
<i>Solange</i>	Double, buff with salmon pink center, late season
<i>Souvenir de Louis Bigot</i>	Double, rose pink/shell pink, mid-season
<i>Therese</i>	Double, old rose pink, mid-season
<i>Walter Faxon</i>	Double, shell pink, mid-season
<i>Westerner</i>	Japanese, soft pink, mid-season
<i>Wilford Johnson</i>	Double, rose pink, late season
<i>Wrinkles and Crinkles</i>	Double, deep rose pink, late mid-season
<b>CORALS</b>	
<i>Coral Charm</i>	Semi-double, glowing coral, early season
<i>Coral Fay</i>	Single, hot rose coral, early season
<i>Coral'n'Gold</i>	Single, orange coral, early season
<i>Coral Sunset</i>	Semi-double, intense coral with rose, early season
<i>Lovely Rose</i>	Single, coral pink, very early season
<i>Mrs. Livingston Farand</i>	Double, coral pink, late season
<i>Orange Lace</i>	Japanese, pink with orange center, mid-season

**Table 1. Peony cultivars included in planting at the Horticulture Research Center -- Manhattan, KS, 1998. (cont'd)**

<i>Cultivar</i>	<i>Description</i>
<b>BICOLOR</b>	
<i>Candy Heart</i>	Double, white with red stripes, mid late season
<i>Lois Kelsey</i>	Semi-double, white with red stripes, mid-season
<i>Lord Cavin</i>	Double, creamy pink with red stripes, mid-season
<b>LAVENDER</b>	
<i>Easy Lavender</i>	Japanese, lavender

### Yield Data and Assessment

Several cultivars have been planted for 5 years or more. A yield assessment was made of these cultivars this year as was done last year. Two hard freezes occurred on April 18 and 20 that severely damaged most of the early white cultivars. Most had 100% crop loss. A freeze-protection irrigation system that had been damaged the previous fall had not been repaired. Cool wet weather in the spring also created favorable conditions for botrytis, and staff was not available to apply much-needed fungicide treatments at critical times. Yields for many promising cultivars were severely limited. This year's yields will not be included in the 3-year yield assessment.

Table 2 provides an overview of the cultivars' harvest period and yield performance. The 1998 harvest period was extremely short. The bulk of the harvest occurred was from 15 May to 23 May. Table 3 provides a list of cultivars planted in 1992 and 1993 that produced more than 5 flowers per plant.

**Table 2. Fresh-cut peony flower harvest period and yield at the Kansas State University Horticultural Research Center -- Manhattan, KS, 1998.\***

<i>Color</i>	<i>Cultivars</i>	<i>Year Planted</i>	<i>Harvest Period</i>	<i>Yield per Plant</i>
<b>RED</b>	Apache	1995	13 May-20 May	2.0
	Cherry Bomb	1993	20 May	0.6
	Comanche	1995	16 May-20 May	1.0
	David Harum	1992	18 May-21 May	6.4
	Felix Crousse	1992	19 May-21 May	2.2
	Felix Supreme	1992	17 May-21 May	13.4
	Grover Cleveland	1993	19 May-21 May	5.0
	Harry Richardson	1993	20 May-26 May	1.2
	Henry Bocktoce	1994	15 May-18 May	2.2
	Kansas	1992	18 May	0.4
	Karl Rosenfield	1992	16 May-21 May	7.8
	Lora Dexheimer	1992	17 May-21 May	3.0
	Louis van Houtte	1993	15 May-24 May	8.8
	Peter Brand	1994	14 May-15 May	3.6
	Philippe Rivoire	1992	19 May-21 May	7.6
	Raspberry Ice	1994	13 May-15 May	1.0
	Red Charm	1993	12 May-20 May	3.4
	Richard Carvel	1992	15 May-21 May	13.4
	Shawnee Chief	1992	20 May-21 May	1.7

**Table 2. Fresh-cut peony flower harvest period and yield at the Kansas State University Horticultural Research Center -- Manhattan, KS, 1998.\* (cont'd)**

<i>Color</i>	<i>Cultivars</i>	<i>Year Planted</i>	<i>Harvest Period</i>	<i>Yield per Plant</i>	
<b>PINK</b>	Armistice	1993	18 May-19 May	1.2	
	Baroness Schroeder	1992	19 May-21 May	0.2	
	Better Times	1993	15 May-21 May	4.4	
	Coral Fay	1994	6 May-7 May	4.4	
	Coral'n'Gold	1994	11 May-20 May	3.4	
	Doris Cooper				
	/Lady Kate	1992	18 May-21 May	2.8	
	Edulis Superba	1992	12 May-19 May	5.1	
	Grace Batson	1992	18 May-22 May	1.8	
	Hermoine	1993	19 May-22 May	5.0	
	James Pillow	1992	18 May-21 May	2.8	
	Jayhawker	1993	15 May-21 May	4.0	
	Lovely Rose	1995	14 May-20 May	---	
	Mister Ed	1992	13 May-21 May	1.6	
	Monsieur Jules Elie	1992	13 May-21 May	1.8	
	Mrs. F.D. Roosevelt	1992	13 May-19 May	5.6	
	Orange Lace	1994	7 May-14 May	7.2	
	Ozark Beauty	1993	15 May-21 May	4.0	
	Reine Hortense	1992	15 May-21 May	5.0	
	Romance	1995	16 May-17 May	2.8	
	Sarah Bernhardt	1992	22 May-22 May	20.2	
	Solange	1995	20 May	---	
	Therese	1992	15 May-21 May	16.6	
	Walter Faxon	1992	15 May-21 May	9.4	
	Westerner	1993	16 May-20 May	0.8	
	Wrinkles and				
	Crinkles	1993	17 May-21 May	3.4	
	<b>WHITE</b>	69A	1992	16 May-22 May	3.4
		DH 1460	1995	16 May-20 May	---
		Bridal Icing	1994	16 May-22 May	4.6
		Bridal Shower	1994	15 May-17 May	3.2
		Candy Heart	1994	18 May-19 May	6.0
		Dr. F.G. Brethour	1992	17 May-24 May	1.0
Duchess de Nemours		1994	16 May-21 May	2.8	
Elsa Sass		1993	26 May	0.6	
Festiva Supreme		1992	13 May-20 May	1.4	
Festiva Maxima		1992	17 May-20 May	1.0	
Henry Sass		1992	7 May-20 May	5.8	
Leading Lady		1993	20 May	0.2	
Lois Kelsey		1992	15 May-20 May	6.6	
Lullaby		1994	22 May-26 May	2.8	
Snow Mountain		1995	14 May-20 May	4.0	
Spellbinder	1995	14 May-20 May	3.4		

\* Several with total crop loss are not listed. No yield data are listed for ones less than 3 years old.

**Table 3. 1998 Peony cultivars with the best yields after 5 years or more.**

<i>Color</i>	<i>Cultivar</i>	<i>Yield (stems per plant)</i>
<b>RED</b>	David Harum	6.4
	Felix Supreme	13.4
	Grover Cleveland	5.0
	Karl Rosenfield	7.8
	Louis Van Houtte	8.8
	Philippe Rivoire	7.6
	Richard Carvel	13.4
<b>PINK</b>	Edulis Superba	5.1
	Hermoine	5.0
	Mrs. F. D. Roosevelt	5.6
	Reine Hortense	5.0
	Sarah Bernhardt	20.2
	Therese	16.6
	Walter Faxon	9.4
<b>WHITE</b>	Henry Sass	5.8
	Lois Kelsey	6.6

**Assessment of Cultivars for Incidence of Peony Measles, Caused by *Cladosporium* spp.**

On July 8, 1998, Judith O'Mara, Plant Disease Diagnostician, and Joy Pierzynski, Extension Associate-Plant Pathology, assessed the incidence of peony measles caused by *Cladosporium* spp., in the different peony plantings: the original cultivar trial, the commercial block, and the new cultivar trial. Each plant in the five-plant cultivar group was assessed and given a rating of 1-5 based on the level of disease incidence. These ratings were 1=0-20%, 2=21-40%, 3=41-60%, 4=61-80%, 5=81-100%. The means ratings of the five plants appear in Table 4.

Disease was more prevalent in the original cultivar trial. These plants have been in the ground for at least 3 years, and no disease spray program has been used on them. The commercial block and the new cultivar trial had lower disease incidence scores. Besides having younger plants, the new cultivar trial is protected by a tree barrier between it and the old planting.

**Table 4. Peony measles evaluation of peony cultivars included in planting at the Horticulture Research Center -- Manhattan, KS, 1998. Disease rating scale 1=0-20%, 2=21-40%, 3=41-60%, 4=61-80%, 5=81-100%.**

<i>Cultivar</i>	<i>Disease Rating</i>	<i>Cultivar</i>	<i>Disease Rating</i>
<b>RED</b>		<b><u>New Cultivar Trial</u></b>	
<b><u>Original Cultivar Trial</u></b>		Apache	1.8
David Harum	4.2	Carol Mae Nelson	2.4
Felix Crousse	4.4	Comanche	2.2
Felix Supreme	2.8	Douglas Brand	0.7
Grover Cleveland	2.0	Elmer 's Red	1.0
Harry Richardson	1.0	Longfellow	1.0
Henry Bocktoce	3.2		

**Table 4. Peony measles evaluation of peony cultivars included in planting at the Horticulture Research Center -- Manhattan, KS, 1998. Disease rating scale 1=0-20%, 2=21-40%, 3=41-60%, 4=61-80%, 5=81-100%. (cont'd)**

<i>Cultivar</i>	<i>Disease Rating</i>	<i>Cultivar</i>	<i>Disease Rating</i>
<b>RED</b>			
<b><u>Original Cultivar Trial</u></b>		<b><u>New Cultivar Trial</u></b>	
Judy Becker	4.0	Montezuma	3.0
Kansas	1.4	Mt. St. Helens	0.7
Karl Rosenfield	2.8	Peter Brand	2.7
Lora Dexheimer	2.5	Red Magic	1.0
Louis van Houtte	1.2	Rosabel	1.0
Monsieur Martin Cahuzac	1.0	Rubra Plena	1.0
Philippe Rivoire	1.0		
Raspberry Ice	1.2		
Red Charm	2.6		
Richard Carvel	2.6		
Shawnee Chief	1.0		
<b>WHITE</b>			
<b><u>Original Cultivar Trial</u></b>		<b><u>New Cultivar Trial</u></b>	
Bridal Icing	1.0	ABC Nicholls	1.0
Bridal Shower	1.0	Ann Cousins	1.0
Capital Dome	1.0	Cream Puff	1.0
Cloud Cap	2.6	Duluth	1.0
Dr. F.G. Brethour	1.2	DH1460	1.2
Duchess de Nemours	1.2	Krinkled White	1.0
Elsa Sass	1.0	Le Cygne	1.0
Festiva Supreme	2.8	Mary E. Nicholls	1.0
Festiva Maxima	3.0	Nebraska	1.0
Henry Sass	1.2	Shirley Temple	1.0
Leading Lady	1.0	Snow Mountain	1.2
Lullaby	1.0	Spellbinder	1.2
Madame de Vernville	2.6		
69A	2.0		
<b>PINK</b>			
<b><u>Original Cultivar Trial</u></b>		<b><u>New Cultivar Trial</u></b>	
Armistice	5.0	Duchess de Orleans	1.0
Baroness Schroeder	1.2	Hansina Brand	0.8
Better Times	2.8	Heidi	1.0
Doris Cooper/Lady Kate	1.0	Paula Fay	1.0
Edulis Superba	1.4	Princess Margaret	1.0
Grace Batson	1.0	Romance	1.4
Hermoine	1.0	Rosea Plena	1.0
James Pillow	1.0	Rose Pearl	1.0
Jayhawker	2.0	Solange	1.0
Mister Ed	2.2	Westerner	1.6
Monsieur Jules Elie	1.4	Wilford Johnson	1.4



**Table 4. Peony measles evaluation of peony cultivars included in planting at the Horticulture Research Center -- Manhattan, KS, 1998. Disease rating scale 1=0-20%, 2=21-40%, 3=41-60%, 4=61-80%, 5=81-100%. (cont'd)**

<i>Cultivar</i>	<i>Disease Rating</i>	<i>Cultivar</i>	<i>Disease Rating</i>
<b>PINK</b>			
<b><u>Original Cultivar Trial</u></b>			
Mrs. Franklin D. Roosevelt	2.0	Souvenir de Louis Bigot	4.0
Ozark Beauty	2.2	Therese	2.4
Raspberry Sundae	1.0	Walter Faxon	1.4
Reine Hortense	1.2	Wrinkles and Crinkles	1.4
Sarah Bernhardt	1.2		
<b>CORAL</b>			
<b><u>Original Cultivar Trial</u></b>			
Mrs. Livingston Farand	1.2		
<b><u>New Cultivar Trial</u></b>			
Coral Charm	1.0	Coral Sunset	1.0
Coral Fay	1.0	Lovely Rose	2.7
Coral'n'Gold	1.5	Orange Lace	1.0
<b>LAVENDER</b>			
<b><u>New Cultivar Trial</u></b>			
		Easy Lavender	1.0
<b>BICOLOR</b>			
<b><u>Original Cultivar Trial</u></b>			
Candy Heart	1.0		
Lois Kelsey	2.8		
Lord Cavin	1.4		

### Postharvest Evaluations of Fresh-Cut Flowers

Postharvest handling and evaluation of the flowers for all studies were similar. Pretreatments and storage times may have differed and are explained in the individual studies. Flowers were harvested in the colored bud stage when they were soft like a marshmallow. This is the minimal level of maturity for flowers to open. It varies slightly with each cultivar and color of the flowers. Red flowers must be more open and softer than whites and pinks. When harvested at this stage, the flowers store longer and are less damaged when handled.

Flowers were prepared by cutting 2.5 cm from the stems under water and by removing the leaves from the bottom two-thirds of the stems. The flowers were placed in 600 ml distilled water in 0.9 liter glass jars. Total vase life was determined from the time flowers were placed in jars to when the flowers became wilted beyond acceptable condition or the petals had abscised. Open vase life was determined as from the time when the flowers were fully open to when they had wilted or the petals had abscised. Diameters were measured when the flowers were fully open.

## Initial Postharvest Evaluations

Initial evaluations provide a baseline for all other postharvest evaluations (Table 5). Several cultivars already have 3 years of initial postharvest evaluations, so were not included in this year's initial evaluations. Significant crop loss also was a major contributor to the small number of cultivars included. The flowers were prepared for evaluation as described above.

### *Pink Cultivars*

Although 'Romance' had a great total vase life, it took 5.6 days to open, making it one of the cultivars with the shortest open vase life. 'Doris Cooper/Lady Kate', 'Jayhawker', and 'James Pillows' were the best overall both good total and open vase lives.

### *Red Cultivars*

All red cultivars had good total vase life, but 'Lora Dexheimer' took 3 days to open. The others took less than a day and half to open, giving them a fair open vase life. 'Red Charm' had enough flowers this year for evaluation. It is one of a few herbaceous peonies that is close to a true red.

### *White Cultivars*

'Snow Mountain' performed the best of the white cultivars. Most of the others took more than 1 ½ days to open. 'Snow Mountain' took 2 ½ days.

**Table 5. 1998 Fresh-cut peony flower vase life and diameter immediately after harvest. \***

<i>Cultivar</i>	<i>Total Vase Life (days)</i>	<i>Open Vase Life (days)</i>	<i>Diameter (inches)</i>
<b>PINK</b>			
Romance	10.4 a	4.8 fe	3.9 bc
Doris Cooper/ Lady Kate	8.4 b	6.9 a	5.0 a
Jayhawker	7.7 b	6.5 abc	4.5 ab
James Pillow	7.6 b	6.6 ab	3.8 bc
Orange Lace	6.6 c	5.0 de	5.2 a
Wrinkles and Crinkles	6.6 c	3.7 f	3.3 c
Edulis Superba	6.5 c	5.9 bc	5.1 a
Coral'n'Gold	5.3 d	5.0 de	3.3 c
Therese	5.0 d	2.1 g	1.5 d
Coral Fay	4.4 d	3.3 fg	3.3 c
<b>RED</b>			
Lora Dexheimer	7.3 a	4.3 c	3.4 c
Peter Brand	7.1 ab	6.0 a	4.9 b
Shawnee Chief	6.4 ab	5.1 b	4.0 c
Red Charm	6.3 b	5.7 ab	5.9 a
<b>WHITE</b>			
Snow Mountain	9.2 a	6.7 a	4.0 b
69A	6.9 b	5.4 b	4.1 b
Spellbinder	6.9 b	5.3 b	4.7 ab
Duchess de Nemours	6.6 b	5.6 ab	4.5 ab
Bridal Shower	6.6 b	5.3 b	5.1 a
Lullaby	6.4 b	3.1 c	2.1 c

\*Values within columns followed by different letters are significant at the 5.0% level of *P*.

## Evaluation of Short-Term Storage Conditions

There has been discussion as to what is the best way to store peony buds for short periods of a week or so. Some growers store their flowers dry, others in water, and others in floral preservative. The objective of this study was to survey several cultivars to determine how they perform when stored dry or in water or floral preservative. Harvested flowers were bunched by fives and placed in either a polyethylene self-sealing 2-gallon bag or a 2.5 liter plastic container half full of either water or floral preservative. They all were held for 1 week at 2 C. After the week of cold storage, flowers were prepared for evaluation as described above. Total and open vase lives, flower diameters, and days until open were recorded.

Comparisons of dry, water, and floral preservative treatments were conducted for seven cultivars: 'Edulis Superba', 'Ozark Beauty', 'Philippe Rivoire', 'Richard Carvel', 'Sarah Bernhardt', 'Snow Mountain', and 'Walter Faxon'. A comparison of dry and water was conducted for nine cultivars: 'Better Times', 'David Harum', 'Henry Sass', 'Lois Kelsey', 'Louis van Houtte', 'Mrs. F. D. Roosevelt', 'Reine Hortense', 'Raspberry Sundae', and 'Therese'.

Total and open vase lives, diameter, and days until open for 'Better Times', 'Lois Kelsey', 'Therese', 'Richard Carvel', and 'Ozark Beauty' were not affected by the holding method (Tables 6 and 7). Holding method did not affect the vase life of 'Henry Sass', 'Louis van Houtte', 'Mrs. F. D. Roosevelt', 'Reine Hortense', 'Walter Faxon', and 'Edulis Superba' (Tables 6 and 7).

'Walter Faxon', 'Sarah Bernhardt', 'Shawnee Chief', and 'Mrs. F.D. Roosevelt' flowers held in floral preservative took longer to open. 'David Harum' flowers held in water took longer to open. 'Snow Mountain' flowers held in both floral preservative and water took longer to open (Tables 6 and 7).

Flowers of 'Reine Hortense', 'Mrs. F.D. Roosevelt', and 'Henry Sass' held dry were bigger than flowers held in water, whereas 'David Harum' flowers held in water were bigger than those held dry. 'Sarah Bernhardt' flowers held dry were bigger than both flowers held in water and in floral preservative, and flowers held in floral preservative were bigger than flowers held in water. Only 'Walter Faxon' flowers held in floral preservative were bigger than flowers held in water. Flowers of 'Philippe Rivoire' held in water and in floral preservative were both bigger than flowers held dry (Tables 6 and 7).

Flowers of 'Mrs. F.D. Roosevelt' and 'Raspberry Sundae' held dry lasted longer in the open stage than both flowers held in water and in floral preservative. Flowers of 'Snow Mountain' and 'David Harum' held dry lasted longer in the open stage than flowers held in water. For 'Philippe Rivoire', both flowers held dry and in water lasted longer in the open stage than flowers held in floral preservative. Flowers held dry lasted longer than both flowers held in floral preservative and in water, and flowers held in floral preservative lasted longer in the open stage than flowers held in water for 'Edulis Superba'. 'Louis van Houtte' flowers held in water lasted longer in the open stage than flowers held dry. 'Sarah Bernhardt' flowers held in water lasted longer in the open stage than flowers held in floral preservative (Tables 6 and 7).

For total vase life, 'Snow Mountain' flowers held in floral preservative lasted longer than flowers held in water, whereas 'Raspberry Sundae' flowers held dry lasted longer than both

**Table 6. 1998 Diameter, vase life, and days until open for fresh-cut peony flowers held for 1 week at 2-3 C dry or in water. \***

<i>Cultivar/ Treatment</i>	<i>Diameter (inches)</i>	<i>Total Vase Life (days)</i>	<i>Open Vase Life (days)</i>	<i>Days until Open</i>
Better Times				
Dry	4.5	7.1	6.1	1.0
Water	5.0	6.2	5.2	1.0
David Harum				
Dry	4.3*	7.1*	6.1**	1.0*
Water	4.8	6.5	5.2	1.2
Henry Sass				
Dry	5.7*	7.9	6.9	1.0
Water	5.1	7.7	6.4	1.3
Lois Kelsey				
Dry	4.8	7.0	6.0	1.0
Water	4.8	6.9	5.9	1.0
Louis van Houtte				
Dry	4.4	6.1	4.7***	1.4
Water	3.4	6.7	5.5	1.2
Mrs. F.D. Roosevelt				
Dry	5.1*	7.2	6.2	1.0
Water	4.5	6.8	5.8	1.0
Reine Hortense				
Dry	4.3**	7.4	6.6	1.0
Water	2.6	7.0	6.1	1.7
Therese				
Dry	4.3	6.7	5.7	1.0
Water	4.2	6.7	5.7	1.0

\*Values for each cultivar followed by \*, \*\*, and \*\*\* are significantly different at the 5.0%, 1.0%, and 0.1% level of *P*, respectively.

flowers held in water and in floral preservative. Flowers of ‘Philippe Rivoire’ held both dry and in water had longer total vase life than flowers held in floral preservative. For ‘Edulis Superba’, flowers held dry had a longer total vase life than both flowers held in water and in floral preservative. The flowers held in floral preservative lasted longer than flowers held in water (Tables 6 and 7).

Examining the effects of the different holding methods on vase life, flower size and opening time shows some contradictory results. For ‘Philippe Rivoire’, water appears to be the best holding method. Although flowers in floral preservative were bigger, they did not last as long as flowers held dry and in water. Flowers held dry were not as big as flowers held in water. For ‘Mrs. F.D. Roosevelt’, holding flowers dry is best, because they were bigger and last longer open. For ‘Snow Mountain’, a holding solution of floral preservative lengthened the time for flowers to open, so their open vase life was less. For ‘David Harum’, flowers held in water took longer to open and were bigger than flowers held dry, but dry flowers lasted longer open than flowers held in water. Although ‘Sarah Bernhardt’ flowers held in water lasted longer open than flowers held in floral preservative, they were smaller than both flowers held dry and in floral preservative.

In light of these results, no general recommendation as to the best holding method for all cultivars can be made. Even within the cultivars evaluated, floral preservative may have increased vase life but lengthened the opening time and resulted in smaller flowers. When this evaluation was started, an assumption was made that floral preservatives probably would push the flowers into opening early and lasting a shorter time, because they would be “feeding” the flowers. We found this to not be true with many of the cultivars. If anything, flowers held in floral preservative took longer to open and lasted longer. Visual observations revealed that flowers held in water and in floral preservative looked better. Their petals were more turgid and brighter in color.

**Table 7. 1998 Diameter, vase life, and days until open for fresh-cut peony flowers held for 1 week at 2-3 C dry or in water or floral preservative\*.**

<i>Cultivar/ Treatment</i>	<i>Diameter (inches)</i>	<i>Total Vase Life (days)</i>	<i>Open Vase Life (days)</i>	<i>Days until Open</i>
Edulis Superba				
Dry	4.8	6.6a	5.6a	1.0
Water	4.9	6.2b	5.1b	1.0
Floral preservative	4.8	6.3ab	5.3ab	1.0
Ozark Beauty				
Dry	3.2	6.4	5.7a	1.0b
Water	4.4	5.8	4.7b	1.0b
Floral preservative	3.5	6.3	4.3b	2.0a
Philippe Rivoire				
Dry	3.6b	7.2a	6.1a	1.0b
Water	4.3a	7.0a	6.0a	1.0b
Floral preservative	4.0ab	6.0b	4.8b	1.2a
Richard Carvel				
Dry	3.7	7.0	5.7	1.3
Water	3.8	6.7	5.5	1.2
Floral preservative	3.8	6.7	5.7	1.0
Raspberry Sundae				
Dry	4.8	7.0a	6.0a	1.0
Water	5.2	6.1b	5.1b	1.0
Floral preservative	4.6	6.2b	5.2b	1.0
Sarah Bernhardt				
Dry	5.1a	6.3	4.9a	1.3b
Water	4.4c	6.5	5.5a	1.0b
Floral preservative	4.8b	6.1	3.9b	2.2a
Snow Mountain				
Dry	4.6	7.9ab	6.9	1.0b
Water	4.7	6.9b	5.6	1.6a
Floral preservative	4.0	8.2a	6.3	2.0a
Walter Faxon				
Dry	3.8ab	7.0	6.0	1.0b
Water	3.5b	7.2	5.9	1.2b
Floral preservative	4.9a	6.9	5.1	1.8a

\* Values within columns for each cultivar followed by different letters are significant at the 5.0% level of *P* or greater.

## Evaluation of Methyl Jasmonate Storage Treatment

Methyl jasmonate is a chemical recently found to have properties that help horticultural crops maintain postharvest life. Among these properties is the development of plant defenses against storage disease organisms. Peony flowers stored for long periods often are subject to grey mold infection caused by *Botrytis cinerea* sp. This renders the flowers unmarketable. The objective of this evaluation was to determine whether a methyl jasmonate treatment during storage would improve vase life and flower appearance and lower disease incidence.

This evaluation was divided into two parts. The first part evaluated three cultivars, 'Edulis Superba', 'Sarah Bernhardt', and 'Snow Mountain' after 6 weeks of cold storage at 2 C with only a methyl jasmonate treatment and a control of no methyl jasmonate. The second part evaluated 'Shawnee Chief' after 6, 8, and 10 weeks of cold storage at 2 C with a methyl jasmonate treatment and a control of no methyl jasmonate and a prestorage treatment of silver thiosulfate (STS) in floral preservative for 2 hours before storage. Previous work indicated that an STS prestorage treatment and floral preservative extended the vase life of peony flowers held in cold storage for long periods.

Leaves were stripped from the bottom two-thirds of the stem, and flowers were bunched in fives and placed into 2-gallon self-sealing polyethylene bags. 'Shawnee Chief' flowers receiving the STS-floral preservative treatment had their stems cut under water and then were placed in a standard floral preservative solution with a silver concentration of 0.463 mM for 2 hours. After this pretreatment, the flowers also were placed in the storage bags. For those flowers receiving the methyl jasmonate treatment, a 5 cm-diameter absorbent pad with 0.5 ml methyl jasmonate applied to it was placed in each bag. Treatments were replicated three times.

When the prescribed storage time was over, stems were cut under water by 2.5 cm and flowers were placed in 0.9 liter glass jars filled with approximately 600 ml distilled water. Vase life and diameter were evaluated as previously discussed. A disease incidence assessment was made of the sepals, guard petals, and petals. If no disease was present, a rating of 0 was given; if any disease was present a rating of 1 was given; and if the disease infection was great, then a rating of 2 was given. The percent openness of the flowers also was assessed.

Methyl jasmonate was most beneficial for 'Edulis Superba' (Table 8). Treated flowers lasted longer but were significantly smaller in diameter. The same was found for 'Sarah Bernhardt'; treated flowers were significantly smaller by more than 2 inches in diameter. 'Sarah Bernhardt' flowers treated with methyl jasmonate opened faster than the untreated flowers. Methyl jasmonate significantly reduced the vase lives, both total and open, for both 'Sarah Bernhardt' and 'Snow Mountain'.

These results indicate that after 6 weeks of cold storage, the effect of the methyl jasmonate is cultivar specific. It seems beneficial for one, 'Edulis Superba', but not for the others.

**Table 8. Vase life, diameter, and days until open for ‘Edulis Superba’, ‘Sarah Bernhardt’, and ‘Snow Mountain’ fresh-cut peony flowers stored for 6 weeks at 2 C with and without a methyl jasmonate treatment during storage. \***

<i>Cultivar/ Treatment</i>	<i>Total VaseLife (days)</i>	<i>Open Vase Life (days)</i>	<i>Diameter (inches)</i>	<i>Days until Open</i>
Edulis Superba				
Methyl jasmonate	6.0***	4.0***	4.2***	2.0
No methyl jasmonate	5.3	3.3	5.2	2.0
Sarah Bernhardt				
Methyl jasmonate	5.1***	4.1	2.5***	1.0***
No methyl jasmonate	6.0	3.5	4.6	2.5
Snow Mountain				
Methyl jasmonate	6.4*	6.3	5.0	0.1
No methyl jasmonate	7.0	6.8	4.6	0.2

\*Values for each cultivar followed by \* and \*\*\* are significantly different at the 5.0% and 0.1% level of *P*, respectively.

For the ‘Shawnee Chief’ flowers at 6 weeks, the STS had a greater effect than the methyl jasmonate, although flowers receiving only methyl jasmonate were slower to open than the others. STS-treated flowers lasted longer and were bigger in diameter (Table 9). At 8 weeks, methyl jasmonate-treated flowers with and without STS lasted longer than those without methyl jasmonate. Although significantly larger than most of the other treatments, the methyl jasmonate-only flowers were only negligibly larger than those with STS-only (Table 9). No treatment differences occurred in days until open for either 8 or 10 weeks of storage. At 10 weeks, the methyl jasmonate-STS treated flowers lasted longer and were bigger.

At 6 weeks, the sepals of the methyl jasmonate-STS treated flowers had the least disease incidence (Table 10). After that, no differences occurred, because all treatments had botrytis on the sepals. For guard petals, disease incidence was lowest at 6 weeks and no treatment differences occurred. At 8 and 10 weeks, disease incidence was high, and little difference occurred among the treatments. At 10 weeks, STS-treated flowers had a lower incidence than those without STS. For petals, disease incidence at 6 weeks was low, but treatment differences occurred. At 8 weeks, disease incidence continued to be low and not being treated with STS resulted in significantly lower incidence. At 10 weeks, disease levels had increased, and levels for flowers not treated with STS were significantly worse than levels for STS-treated flowers.

At 6 week, no difference occurred in the percent of openness of the flowers. At 8 and 10 weeks, flowers not receiving an STS treatment were less open when removed from storage. Methyl jasmonate did not have a clear effect on disease incidence or openness of flowers after long-term storage for ‘Shawnee Chief’ flowers, but after 8 and 10 weeks of cold, it extended the vase life compared to untreated flowers. The combination of methyl jasmonate and STS appears to be of benefit to the flowers.

**Table 9. Effect of methyl jasmonate (MJ) and a prestorage silver thiosulfate/floral preservative treatment (STS) on vase life and diameter of fresh-cut ‘Shawnee Chief’ peony flowers stored for 6, 8, and 10 weeks at 2-3 C.\***

<i>Weeks of Storage</i>	<i>Treatment</i>	<i>Total Vase Life (days)</i>	<i>Open VaseLife (days)</i>	<i>Diameter (inches)</i>	<i>Days until Open</i>
6	MJ STS	6.7bc	6.4b	3.8cd	0.3 b
6	MJ NO STS	5.1de	4.3f	3.4e	0.8 a
6	NO MJ STS	7.5a	7.3a	3.8cd	0.2 b
6	NO MJ NO STS	5.3e	5.0de	3.5de	0.3 b
8	MJ STS	5.5d	4.5ef	3.9bc	1.0 a
8	MJ NO STS	4.8ef	3.9fg	4.3a	0.9 a
8	NO MJ STS	4.0g	3.0 h	4.2ab	1.0 a
8	NO MJ NO STS	4.1g	3.1h	3.9bc	1.0 a
10	MJ STS	6.9b	5.9bc	3.3e	1.0 a
10	MJ NO STS	4.5fg	3.5gh	2.8f	1.0 a
10	NO MJ STS	6.4c	5.4cd	2.2 g	1.0 a
10	NO MJ NO STS	4.1g	3.3h	2.7f	0.9 a

\* Values within columns followed by different letters are significant at the 5.0% level of *P* or greater.

**Table 10. Effect of methyl jasmonate (MJ) and a prestorage silver thiosulfate/floral preservative treatment (STS) on disease incidence on sepals, guard petals, and petals and percent openness of flowers of ‘Shawnee Chief’ peonies stored for 6, 8, and 10 weeks at 2 C.\***

<i>Weeks of Storage</i>	<i>Treatment</i>	<i>Disease Incidence</i>			<i>Openness of Flowers</i>
		<i>Sepals</i>	<i>Guard Petals</i>	<i>Petals</i>	
6	MJ STS	0.18 c	0.36 c	0.10 c	55.0 b
6	MJ NO STS	0.56 b	0.11 c	0.04 c	55.3 b
6	NO MJ STS	0.88 a	0.25 c	0.04 c	48.3 bc
6	NO MJ NO STS	0.44 b	0.11 c	0.04 c	47.0 bc
8	MJ STS	0.93 a	1.0 a	0.17 b	54.6 b
8	MJ NO STS	0.93 a	0.87 ab	0.09 c	28.1 d
8	NO MJ STS	1.0 a	1.0 a	0.24 bc	76.0 a
8	NO MJ NO STS	1.0 a	0.80 ab	0.04 c	37.6 cd
10	MJ STS	1.0 a	0.67 b	0.24 bc	44.6 bc
10	MJ NO STS	1.0 a	0.87 ab	0.37 ab	30.0 d
10	NO MJ STS	0.93 a	0.73 b	0.24 bc	54.6 b
10	NO MJ NO STS	1.0 a	1.00 a	0.57 a	32.0 d

\* Values within columns followed by different letters are significant at the 5.0% level of *P* or greater.



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