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Production and Postharvest Evaluations of

Fresh-Cut Peonies



Kansas State University Agricultural Experiment Station and Cooperative Extension Service

1997 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 quality 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 date 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. Flowers from the initial beds of ‘Shawnee Chief’ and flowers from the ‘Snow Mountain’ beds were used for prestorage treatment studies.

This year’s report includes the following topic:

- Harvest dates;
- Yield data and assessment;
- Initial vase life evaluation of cultivars;
- Vase life evaluations of cultivars after cold storage for 2, 4, 6, 8, and 10 weeks with and without floral preservative pretreatment;
- Vase life evaluations of ‘Snow Mountain’ after cold storage for 2, 4, and 6 weeks with pretreatments of water and floral preservative;
- Vase life evaluations of ‘Shawnee Chief’ after cold storage for 4, 8, and 12 weeks with pretreatments of water, floral preservative, 10% sucrose, silver thiosulfate(STS), STS-10% sucrose, 20% sucrose, and 20% sucrose-citric acid.

Table 1. Peony cultivars included in planting at the Horticulture Research Center -- Manhattan, KS, 1997.

<i>Cultivar</i>	<i>Description</i>
RED	
<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
<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>Rosebel</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
WHITE	
<i>ABC Nicholls</i>	Double, white
<i>Ann Cousins</i>	Double, white
<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, blush white, mid-late season
<i>Duluth</i>	Double, white
<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

Table 1. Peony cultivars included in planting at the Horticulture Research Center -- Manhattan, KS, 1997. (cont'd)

<i>Cultivar</i>	<i>Description</i>
WHITE	
<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
<i>Spellbinder</i>	Single, pure white, mid-season
<i>69A</i>	Bomb, ivory white, early season
PINK	
<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 a 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 a salmon pink center, late season
<i>Souvenir de Louis Bigot</i>	Double, rose pink/shell pink, mid-season

Table 1. Peony cultivars included in planting at the Horticulture Research Center -- Manhattan, KS, 1997. (cont'd)

<i>Cultivar</i>	<i>Description</i>
PINK	
<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
CORAL	
<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
<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 an orange center, mid-season
BICOLOR	
<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
LAVENDER	
<i>Easy Lavender</i>	Japanese, lavender

Yield Data

Some of the cultivars have been in the ground for 5 years now. An initial assessment was made of those cultivars. Because climatic conditions can affect yields, data from 2 more years when freezes do not reduce yields will be needed to provide a full assessment of the yield potential of the cultivars. Table 2 provides an overview of the cultivars' yield performance. The harvest period for 1997 was comparable with those for the past 3 years. Minimal freeze damage occurred. Table 3 provides a list of cultivars planted in 1992 that in their fifth year (1997) produced more than five flowers per plant.

Table 2. Fresh-cut peony flower harvest period and yield at the Kansas State University Horticultural Research Center -- Manhattan, KS, 1997.

<i>Color</i>	<i>Cultivar</i>	<i>Year Planted</i>	<i>Harvest Period</i>	<i>Yield per Plant*</i>
RED	Apache	1995	16 May-19 May	2
	Cherry Bomb	1993	24 May-30 May	0.4
	Comanche	1995	20 May-22 May	0.8
	David Harum	1992	23 May-4 June	11.6
	Felix Crousse	1992	21 May-4 June	7
	Felix Supreme	1992	30 June-3 June	8.4
	Grover Cleveland	1993	30 May-3 June	0.8
	Harry Richardson	1993	30 May-4 June	5.4

Table 2. Fresh-cut peony flower harvest period and yield at the Kansas State University Horticultural Research Center -- Manhattan, KS, 1997. (cont'd)

<i>Color</i>	<i>Cultivar</i>	<i>Year Planted</i>	<i>Harvest Period</i>	<i>Yield per Plant*</i>
RED	Henry Bocktoce	1994	--	---
	Judy Becker	1992	--	---
	Kansas	1992	21 May-23 May	0.6
	Karl Rosenfield	1992	19 May-3 June	6.6
	Lora Dexheimer	1992	20 May-27 May	1.4
	Lord Cavin	1994	--	---
	Louis van Houtte	1993	20 May-30 May	7.6
	Montezuma	1994	18 May-3 June	0.2
	Mon. Martin Cahuzac	1992	--	---
	Peter Brand	1994	19 May-19 May	0.2
	Philippe Rivoire	1992	23 May-6 June	13.4
	Raspberry Ice	1994	--	---
	Red Charm	1993	14 May-16 May	1.2
	Richard Carvel	1992	19 May-3 June	5.2
	Shawnee Chief	1992	20 May-4 June	8.6
PINK	Armistice	1993	25 May-3 June	0.6
	Baroness Schroeder	1992	2 June-4 June	1.8
	Better Times	1993	18 May-1 June	5.8
	Coral Fay	1994	4 May-16 May	2.4
	Coral n' Gold	1994	16 May-18 May	1.2
	Doris Cooper			
	/Lady Kate	1992	30 May-3 June	3.4
	Edulis Superba	1992	25 May-30 May	3.4
	Grace Batson	1992	24 May-1 June	3.2
	Hermoine	1993	26 May-3 June	3
	James Pillow	1992	26 May-1 June	2.2
	Jayhawker	1993	18 May-3 June	2.8
	Lovely Rose	1995	18 May-19 May	1.2
	Mister Ed	1992	18 May-30 May	7.2
	Monsieur Jules Elie	1992	18 May-30 May	8.8
	Mrs. F.D. Roosevelt	1992	19 May-30 May	7
	Orange Lace	1994	14 May-20 May	2.6
	Ozark Beauty	1993	19 May-3 June	12
	Reine Hortense	1992	21 May-3 June	7.4
	Romance	1995	25 May-3 June	3.8
	Sarah Bernhardt	1992	30 May-4 June	4.6
	Souvenir de			
	Louis Bigot	1992	--	---
Solange	1995	--	---	
Therese	1992	19 May-3 June	10.6	
Walter Faxon	1992	24 May-3 June	9	
Westerner	1993	23 May-3 June	0.8	

Table 2. Fresh-cut peony flower harvest period and yield at the Kansas State University Horticultural Research Center -- Manhattan, KS, 1997. (cont'd)

<i>Color</i>	<i>Cultivar</i>	<i>Year Planted</i>	<i>Harvest Period</i>	<i>Yield per Plant*</i>
PINK	Wrinkles and Crinkles	1993	25 May-1 June	3
	69A	1992	18 May-4 June	8
WHITE	DH 1460	1995	19 May-27 May	2.4
	Bridal Icing	1994	21 May-30 May	5
	Bridal Shower 1994	1994	19 May-4 June	5.2
	Candy Heart	1994	25 May-4 June	2.4
	Capitol Dome	1993	--	---
	Dr. F.G. Brethour	1992	25 May-3 June	2.4
	Duchess de Nemours	1994	18 May-4 June	5.2
	Elsa Sass	1993	31 May-4 June	3.2
	Festiva Supreme	1992	19 May-26 May	10.2
	Festiva Maxima	1992	18 May-3 June	12.2
	Henry Sass	1992	20 May-4 June	5.6
	Leading Lady	1993	27 May-1 June	1.4
	Lois Kelsey	1992	18 May-3 June	5
	Lullaby	1994	31 May-3 June	0.8
	Mme. de Vernville	1994	--	---
	Snow Mountain	1995	19 May-24 May	3.8
	Spellbinder	1995	18 May-23 May	0.8

* No yield data are listed for cultivars less than 3 years old.

Table 3. 1997 Initial assessment of peony cultivars with the best yields after five years.

<i>Color</i>	<i>Cultivar</i>	<i>Yield (stems per plant)</i>
RED	David Harum	11.6
	Felix Crousse	7.0
	Felix Supreme	8.4
	Karl Rosenfield	6.6
	Philippe Rivoire	13.4
	Richard Carvel	5.2
	Shawnee Chief	8.6
PINK	Mister Ed	7.2
	Monsieur Jules Elie	8.8
	Mrs. F.D. Roosevelt	7.0
	Reine Hortense	7.4
	Therese	10.6
	Walter Faxon	9.0
WHITE	Festiva Maxima	12.2
	Festiva Supreme	10.2
	Henry Sass	5.6
	Lois Kelsey	5.0
	69A	8.0

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.

Harvested flowers were prepared for evaluation 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 l glass jars. Three replications of five flowers each were used. Total vase life was determined from the time flowers were removed from storage to when the flowers became wilted beyond acceptable condition or the petals had abscised. Open vase life was determined as the time when the flowers were fully open to when they had wilted or the petals had abscised. Flower diameter was measured when the flowers were fully open.

Initial Postharvest Evaluations

Initial evaluations were conducted immediately after harvest on most of the cultivars. This information provided a baseline for all other postharvest evaluations. The flowers were prepared as described above.

Pink Cultivars

'Sarah Bernhardt', 'Reine Hortense', and 'James Pillow' had the longest total vase life. Because they took longer to open, their open vase life was no different from that of 'Jayhawker', 'Grace Batson', and 'Mrs. F. D. Roosevelt' (Table 4). These six cultivars provide a wide range of shades of pink, from the very light pink of 'Jayhawker' to 'Grace Batson's' dark rose pink.

Red Cultivars

'David Harum' and 'Felix Crousse' had the longest vase life both total and open (Table 4). Their color is a standard peony red and does not fade.

White Cultivars

DH1460, 'Henry Sass', and 'Dr. F. G. Brethour' had the longest total and open vase lives (Table 4). 'Candy Heart' also had a long total vase life but took 3 ½ days to open.

Table 4. 1997 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>
PINK			
Sarah Bernhardt	9.5	6.9	4.7
Reine Hortense	8.9	7.2	5.2
James Pillow	8.7	7.3	5.0
Walter Faxon	8.6	6.3	4.2
Jayhawker	8.4	6.9	5.2
Grace Batson	8.1	7.0	4.6

Table 4. 1997 Fresh-cut peony flower vase life and diameter immediately after harvest.
(cont'd)

<i>Cultivar</i>	<i>Total Vase Life(days)</i>	<i>Open Vase Life(days)</i>	<i>Diameter(inches)</i>
PINK			
Mrs. F.D. Roosevelt	8.0	6.8	5.2
Wrinkles and Crinkles	8.0	2.8	4.2
Doris Cooper/ Lady Kate	7.9	5.9	5.4
Ozark Beauty	7.8	6.1	4.8
Raspberry Sundae	7.6	6.3	5.6
Therese	7.5	5.8	4.8
Better Times	7.1	5.4	5.1
Monsieur Jules Elie	6.9	5.9	5.3
Mister Ed	6.2	5.8	5.8
Hermoine	6.1	4.5	5.3
Edulis Superba	5.9	5.1	4.9
Coral Fay	4.2	3.9	0.3
LSD 5.0% level*	±0.80	±0.94	±0.48
RED			
David Harum	9.8	8.5	4.7
Felix Crousse	9.5	8.1	4.7
Louis van Houtte	8.8	6.3	4.2
Harry Richardson	8.6	4.3	3.6
Karl Rosenfield	8.2	6.6	4.2
Philippe Rivoire	8.1	7.2	4.6
Richard Carvel	7.9	6.3	4.3
Felix Supreme	7.6	6.5	5.0
Shawnee Chief	6.8	6.1	5.0
Apache	5.2	3.8	3.6
LSD 5.0% level*	±0.87	±0.84	±0.94
WHITE			
DH1460	9.4	8.5	5.2
Dr. F.G. Brethour	9.0	7.2	5.4
Candy Heart	8.7	5.2	4.8
Henry Sass	8.5	7.4	5.1
Snow Mountain	7.5	6.1	5.0
69A	7.3	6.1	4.7
Lois Kelsey	7.2	6.1	5.3
Elsa Sass	7.1	4.3	4.2
Duchess de Nemour	7.1	5.3	5.2
Bridal Icing	6.8	5.6	4.5
Festiva Maxima	6.5	5.6	5.3
Festiva Supreme	5.7	4.3	5.8
LSD 5.0% level*	±0.88	±1.03	±0.55

* Column values for each color that differ by more than the LSD (least significant difference) 5.0% values are significant at the 5.0% level of *P* or less.

Vase Life Evaluations of Cultivars after Cold Storage at 2-3 C for 2, 4, and 6 Weeks, with and without Floral Preservative Pretreatment

The question has been raised as to what is the best way to handle harvested peony buds, if they are to be held in cold storage for short periods, because peonies must be harvested as often as two to three times a day to cut them at the right stage, they have to be stored until they are marketed, which may be a few days to a week. A study was conducted to see if pretreating the flowers by putting them in a floral preservative solution for a short time prior to storage, commonly called pulsing, would improve their vase life .

Harvested peony buds were bunched by fives and then were placed in polyethylene self-sealing 2-gallon bags and into cold storage at 2-3 C immediately or were placed in a standard floral preservative solution at room temperature for 2 hours before storage. Postharvest evaluations of vase life and flower diameter were conducted immediately after harvest (0 week) and after 2, 4, and 6 weeks of cold storage.

‘Shawnee Chief’, ‘Edulis Superba’, ‘Festiva Maxima’, and ‘Snow Mountain’ were evaluated at 0 weeks. ‘Edulis Superba’, ‘Festiva Maxima’, ‘Sarah Bernhardt’, and ‘Snow Mountain’ were evaluated at 2 weeks. ‘Shawnee Chief’, ‘Edulis Superba’, ‘Festiva Maxima’, ‘Sarah Bernhardt’, and ‘Snow Mountain’ were evaluated at 4 weeks. ‘Festiva Maxima’, ‘Sarah Bernhardt’, and ‘Snow Mountain’ were evaluated at 6 weeks.

At 0 weeks, open vase life was enhanced for ‘Edulis Superba’ and ‘Snow Mountain’ with the floral preservative pulse treatment (Table 5). This effect did not persist when the flowers were held for 2 weeks; the floral preservative pulse did not increase the vase life of any of the cultivars (Table 6). At 4 weeks, the floral preservative pulse increased the vase lives of ‘Edulis Superba’ by 0.9 days, of ‘Sarah Bernhardt’ by 0.8 days, and of ‘Snow Mountain’ by 0.5 days (Table 7). At 6 weeks, no difference occurred between the treatments (Table 8).

Table 5. 1997 Fresh-cut peony flower vase life and diameter immediately after harvest (0 week) with and without a 2-hour pretreatment of floral preservative.*

<i>Cultivar/ Treatment</i>	<i>Total Vase Life (Days)</i>	<i>Open Vase Life (Days)</i>	<i>Diameter (Inches)</i>
<i>Shawnee Chief(red)</i>			
No Pretreatment	6.8 b	6.0	5.0 a
Floral Preservative	8.1 a	5.9	4.2 b
<i>Edulis Superba (pink)</i>			
No Pretreatment	5.9 b	5.1 b	4.9
Floral Preservative	7.5 a	6.5 a	4.9
<i>Festiva Maxima (white)</i>			
No Pretreatment	6.5	5.6	5.3 a
Floral Preservative	6.7	5.7	4.5 b
<i>Snow Mountain(white)</i>			
No Pretreatment	7.5 b	6.1 b	4.9
Floral Preservative	8.3 a	7.3 a	4.5

*Value for each cultivar followed by different letters are different at the 5.0% level of *P*.

Table 6. 1997 Fresh-cut peony flower vase life and diameter after 2 weeks of cold storage (2-3 C) with and without a 2-hour pretreatment of floral preservative. *

<i>Cultivar/ Treatment</i>	<i>Total Vase Life (Days)</i>	<i>Open Vase Life (Days)</i>	<i>Diameter (Inches)</i>
<i>Edulis Superba(pink)</i>			
No Pretreatment	5.7 a	4.7	4.9
Floral Preservative	5.1 b	4.3	4.7
<i>Sarah Bernhardt(pink)</i>			
No Pretreatment	5.6	4.1	4.4
Floral Preservative	5.5	4.5	4.2
<i>Festiva Maxima(white)</i>			
No Pretreatment	4.8	4.3	4.9
Floral Preservative	4.8	4.2	4.4
<i>Snow Mountain(white)</i>			
No Pretreatment	6.4 a	5.5	5.3
Floral Preservative	5.9 b	5.2	5.0

*Values for each cultivar followed by different letters are different at the 5.0% level of *P*.

Table 7. 1997 Fresh-cut peony flower vase life and diameter after 4 weeks of cold storage (2-3 C) with and without a 2-hour pretreatment of floral preservative. *

<i>Cultivar/ Treatment</i>	<i>Total Vase Life (Days)</i>	<i>Open Vase Life (Days)</i>	<i>Diameter (Inches)</i>
<i>Shawnee Chief(red)</i>			
No Pretreatment	4.0	3.9	5.3
Floral Preservative	4.0	4.0	5.3
<i>Edulis Superba(pink)</i>			
No Pretreatment	4.2 b	3.6 b	4.9
Floral Preservative	4.9 a	4.5 a	4.7
<i>Sarah Bernhardt(pink)</i>			
No Pretreatment	5.4 a	4.1 b	3.9
Floral Preservative	4.9 b	4.9 a	4.0
<i>Festiva Maxima(white)</i>			
No Pretreatment	4.2	3.4	5.1 a
Floral Preservative	4.1	3.6	4.0 b
<i>Snow Mountain(white)</i>			
No Pretreatment	5.3 a	4.4 b	5.0 b
Floral Preservative	4.9 b	4.9 a	5.8 a

*Values within each cultivar followed by different letters are different at the 5.0% level of *P*.

Table 8. 1997 Fresh-cut peony flower vase life and diameter after 6 weeks of cold storage (2-3 C) with and without a 2-hour pretreatment of floral preservative. *

<i>Cultivar/ Treatment</i>	<i>Total Vase Life (Days)</i>	<i>Open Vase Life (Days)</i>	<i>Diameter (Inches)</i>
<i>Festiva Maxima(white)</i>			
No Pretreatment	3.5	3.5	3.4
Floral Preservative	3.5	3.5	3.4
<i>Snow Mountain(white)</i>			
No Pretreatment	4.1	4.1	4.4
Floral Preservative	4.4	3.8	3.8
<i>Sarah Bernhardt(pink)</i>			
No Pretreatment	4.9 a	3.6	3.7
Floral Preservative	4.0 b	3.5	4.0

*Values within each cultivar followed by different letters are different at the 5.0% level of *P*.

Vase Life Evaluations of Cultivars after Cold Storage for 0-10 Weeks

Harvested peony buds were bunched by fives and then were placed in polyethylene self-sealing 2-gallon bags and into cold storage at 2-3 C immediately. Postharvest evaluations of vase life and flower diameter were conducted immediately after harvest (0 weeks) and after 2, 4, 6, 8, and 10 weeks of cold storage.

Because of the varying number of flowers for each cultivar, not all cultivars were included in each storage period. Table 9 summarizes the results. Over time, the open vase lives of all the cultivars decreased. No difference occurred after 2 weeks for 'Edulis Superba', 'Therese', 'Festiva Maxima', and 'Festiva Supreme'. After 2 weeks, 'Snow Mountain' and 'Lois Kelsey' fared better than the other whites, 'Raspberry Sundae' and 'Therese' fared better than the other pinks, and 'David Harum' and 'Phillipe Rivoire' fared better than the other reds. At 4 weeks, 'Snow Mountain', 'Raspberry Sundae', and 'David Harum' continued to outperform the other cultivars. At 6 weeks, 'Snow Mountain' outperformed 'Festiva Maxima'.

Table 9. 1997 Fresh-cut peony flower vase life and diameter before and after 2, 4, 6, 8, 10 weeks of cold storage at 2-3 C.*

<i>Cultivar/ Weeks of storage</i>	<i>Total Vase Life (Days)</i>	<i>Open Vase Life (Days)</i>	<i>Diameter (Inches)</i>
<i>David Harum (red)</i>			
0	9.8 a	8.5 a	4.7 a
2	6.9 b	6.2 b	4.9 a
4	5.1 c	4.6 c	3.8 b
<i>Louis Van Houtte (red)</i>			
0	8.7 a	6.6 a	4.0
2	6.0 b	5.1 b	4.4
<i>Phillipe Rivoire (red)</i>			
0	8.1 a	7.2 a	4.6
2	6.1 b	6.1 b	4.8
4	5.7 b	5.5 c	4.6

Table 9. 1997 Fresh-cut peony flower vase life and diameter before and after 2, 4, 6, 8, 10 weeks of cold storage at 2-3 C.*(cont'd)

<i>Cultivar/ Weeks of storage</i>	<i>Total Vase life (Days)</i>	<i>Open Vase life (Days)</i>	<i>Diameter (Inches)</i>
<i>Shawnee Chief(red)</i>			
0	6.8 a	6.1 a	5.0 a
4	4.0 b	3.9 b	5.3 a
8	4.1 b	4.1 b	4.3 b
12	4.4 b	3.9 b	3.3 c
<i>Edulis Superba (pink)</i>			
0	5.9 a	5.1 a	4.9 a
2	5.7 a	4.7 a	4.9 a
4	4.1 b	3.5 b	4.8 a
6	4.0 b	3.7 b	4.0 b
<i>Mons. Jules Elie(pink)</i>			
0	6.9 a	5.9 a	5.3
2	6.0 b	4.9 b	5.2
<i>Raspberry Sundae(pink)</i>			
0	7.6 a	6.3 a	5.6 a
2	6.1 b	5.1 b	5.0 c
4	4.5 c	4.4 c	5.3 b
<i>Reine Hortense(pink)</i>			
0	8.8 a	7.0 a	5.1 a
2	5.9 b	4.5 b	4.2 b
<i>Sarah Bernhardt (pink)</i>			
0	9.4 a	6.9 a	4.5 a
2	5.6 b	4.1 b	4.4 a
4	5.4 bc	4.0 b	3.9 ab
6	4.9 c	4.3 d	3.6 bc
8	4.3 d	3.5 bc	3.6 bc
10	4.2 d	2.9 c	3.4 c
<i>Therese(pink)</i>			
0	7.6 a	5.9	4.8
2	5.5 b	5.1	4.5
<i>Festiva Maxima (white)</i>			
0	6.5 a	4.3 b	5.3 a
2	4.8 b	4.3 b	4.9 a
4	4.1 c	3.4 c	5.1 a
6	3.5 d	3.5 c	3.4 b
8	3.5 d	3.1 c	3.4 b
<i>Festiva Supreme(white)</i>			
0	5.7 a	4.3	5.4
2	5.8 a	4.1	4.8
4	4.0 b	3.6	5.5

Table 9. 1997 Fresh-cut peony flower vase life and diameter before and after 2, 4, 6, 8, 10 weeks of cold storage at 2-3 C.*(cont'd)

<i>Cultivar/ Weeks of storage</i>	<i>Total Vase life (Days)</i>	<i>Open Vase life (Days)</i>	<i>Diameter (Inches)</i>
<i>Snow Mountain(white)</i>			
0	7.5 a	6.1 a	4.9 a
2	6.4 b	5.5 a	5.3 a
4	5.3 c	4.4 b	5.0 a
6	4.1 d	4.1 b	4.3 b

*Values within each cultivar followed by different letters are different at the 5.0% level of *P*.

Vase Life Evaluations of ‘Snow Mountain’ after Cold Storage for 0, 2, 4 and 6 Weeks with Pretreatments of Water and Floral Preservative.

Numerous flowers of ‘Snow Mountain’ were available, so an extended storage and prestorage treatment study was conducted similar to one conducted on ‘Shawnee Chief’ in 1996. The purpose was to determine whether prestorage treatments would improve the vase life of the flower after long-term storage. Harvested peony flowers either were placed in polyethylene self-sealing 2-gallon bags and into cold storage at 2-3 C immediately or were placed in distilled water or a standard floral preservative solution at room temperature for 2 hours before storage in self-sealing 2-gallon bags, like the control. Postharvest evaluations of vase life and flower diameter were conducted immediately after harvest (0 week) and after 2, 4, and 6 weeks of cold storage.

Flowers pretreated with water before storage had better vase life at week 0 than the control or those pretreated with preservative (Table 10). This beneficial effect was not seen again until week 6, when only total vase life was better for the water pretreated flowers. Results for flower diameter were not consistent for any of the pretreatments.

Table 10. Vase life and diameter of ‘Snow Mountain’ fresh-cut peony flowers before and after cold storage at 2-3 C for 2, 4, and 6 weeks with and without pretreatment.*

<i>Cold storage/ Pretreatment</i>	<i>Total Vase Life (Days)</i>	<i>Open Vase Life (Days)</i>	<i>Diameter (Inches)</i>
Week 0			
Control	7.5 c	6.1 c	4.9 cd
Water	9.1 a	8.1 a	5.5 ab
Floral Preservative	8.3 b	7.3 b	4.5 de
Week 2			
Control	6.3 d	5.5 cd	5.3 abc
Water	5.8 de	5.4 de	5.1 bc
Floral Preservative	5.9 de	5.2 def	5.0 bc
Week 4			
Control	5.3 ef	4.4 ghi	5.0 bc
Water	4.7 fg	4.7 fgh	5.8 a
Floral Preservative	4.9 f	4.9 efg	5.8 a
Week 6			
Control	4.1 gh	4.1 hi	4.3 e
Water	4.8 f	4.4 ghi	3.5 f
Floral Preservative	3.8 h	3.8 I	4.4 e

*Values within each column followed by different letters are different at the 5.0% level of *P*.

Vase Life Evaluations of ‘Shawnee Chief’ before and after Cold Storage for 4, 8, and 12 Weeks with Pretreatments of Water, Floral Preservative, 10%Sucrose, Silver Thiosulfate (STS), STS+10% Sucrose, 20% Sucrose, and 20%Sucrose-Citric Acid

The extended storage and prestorage treatment studies started in 1996 were continued this year. Storage terms were narrowed to 4, 8, and 12 weeks with a 0-week control. Prestorage treatments were expanded and included a control of no pretreatment; a 2-hour pulse of either water, floral preservative, 10% sucrose, STS+10% sucrose, 20% sucrose, or 20% sucrose+citric acid; and a 30-minute pulse of STS, all room temperature.

Harvested peony flowers either were placed in polyethylene self-sealing 2-gallon bags and into cold storage at 2-3 C immediately for the control or were pulsed with the prescribed prestorage treatment listed above. After the pretreatment, the flowers were placed in self-sealing 2-gallon bags and into cold storage at 2-3 C. Postharvest evaluations of vase life and flower diameter were conducted immediately after harvest (0 week) and after 4, 8, and 12 weeks of cold storage.

All prestorage treatments with additives improved vase life compared to treatment with just water or no treatment (Table 11). Silver thiosulfate alone and in combination with sucrose and the sucrose solutions were better than the floral preservative. Floral preservatives usually have only 1-2% sucrose in them, so apparently the elevated levels of sucrose helped sustain the flowers better. This cultivar drops its petals when it dies, indicating that it might be ethylene sensitive. Therefore, the STS probably slowed the effect of ethylene.

Table 11. Vase life and diameter of ‘Shawnee Chief’ fresh-cut peony flowers before and after cold storage at 2-3 C for 4, 8 and 12 weeks with and without pretreatments. *

<i>Cold Storage/ Pretreatment</i>	<i>Total Vase life (Days)</i>	<i>Open Vase life (Days)</i>	<i>Diameter (Inches)</i>
Week 0			
Control	6.8 e	6.07 ab	5.0 ab
Water	6.9 de	5.80 bcde	4.7 bcd
Floral Preservative	8.1 b	5.87 abcd	4.2 ef
10% Sucrose	8.1 b	5.67 bcde	4.2 ef
STS	7.6 c	6.00 abc	3.9 fghij
STS-10% Sucrose	9.3 a	6.33 a	4.0 fgh
20% Sucrose	7.3 cd	5.93 abc	4.0 fgh
20% Sucrose-Citric Acid	5.9 fg	5.18 fgh	4.1 efgh
Week 4			
Control	4.0 l	3.9 o	5.3 a
Water	4.0 l	4.0 no	5.2 a
Floral Preservative	4.0 l	4.0 no	5.3 a
10% Sucrose	4.1 kl	4.07 mn	4.8 bc
STS	5.9 fg	5.87 abcd	4.7 bcd
STS-10% Sucrose	6.0 f	6.0 abc	4.7 bcd
20% Sucrose	5.9 fg	5.87 abcd	3.9 fghij
20% Sucrose-Citric Acid	4.6 j	4.5 ijk	3.8 ghijk
Week 8			
Control	4.1 kl	4.13 lmn	4.3 ef
Water	4.1 kl	4.07 mn	4.5 cde
Floral Preservative	4.1 kl	4.07 mn	4.1 efgh
10% Sucrose	4.0 l	4.0 no	4.3 ef
STS	4.1 kl	4.13 lmn	4.4 de
STS-10% Sucrose	4.7 ij	4.57 ijkl	4.1 efgh
20% Sucrose	4.4 jkl	4.36 klmn	3.8 ghijk
20% Sucrose-Citric Acid	4.5 jk	4.47 jklmn	4.3 ef
Week 12			
Control	4.4 jkl	3.9 o	3.3 l
Water	4.7 ij	4.67 ijk	3.4 l
Floral Preservative	4.8 ij	4.8 hij	3.5 kl
10% Sucrose	5.0 hi	5.0 gh	3.8 ghijk
STS	5.4 gh	5.4 defg	3.7 ijkl
STS-10% Sucrose	5.3 gh	5.3 efg	3.6 jkl
20% Sucrose	5.0 hi	5.0 gh	3.5 kl
20% Sucrose-Citric Acid	5.5 g	5.5 cdef	3.4 l

*Values within each column followed by different letters are different at the 5.0% level of *P*.

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