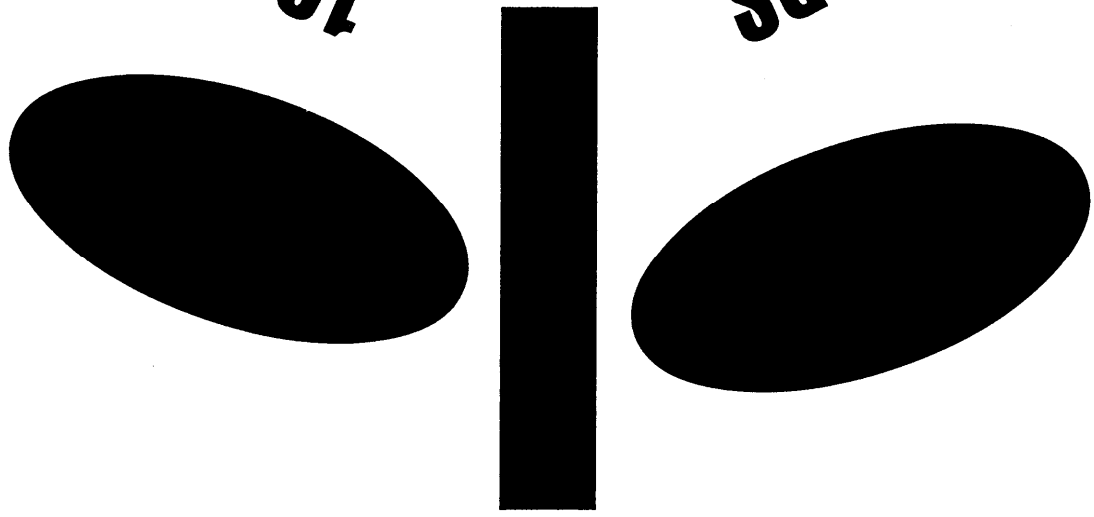


1995 PRODUCTION AND POSTHARVEST EVALUATION OF FRESH-CUT SUNFLOWERS



REPORT OF PROGRESS 751

Agricultural Experiment Station, Kansas State University, Manhattan, Marc A. Johnson, Director

1995 PRODUCTION AND POSTHARVEST EVALUATION OF FRESH-CUT SUNFLOWERS

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In the summer of 1995, a study was conducted to evaluate the field performance and postharvest life and of a wide variety of sunflower cultivars suitable for fresh-cut flower production. Seeds were purchased from seven seed companies (Table 1). Thirty-three different cultivars were evaluated (Table 2). Ten cultivars were evaluated more than once, because more than one seed company offered them. This provided a comparison of seed sources.

Table 1. Seed company sources for sunflower cultivars in 1995 evaluation trial, Manhattan, KS.

<i>Company</i>	<i>Cultivars</i>
<i>Burpee</i>	Happy Face, Sunset, Sunrise, Tangina
<i>Johnny's</i>	Autumn Beauty, Italian White, Sunbeam, Sunbright, Valentine
<i>Nichols</i>	Provance Mixture
<i>Pinetree</i>	Bellezzia D'Autono, Floristan, Musicbox, Sole D' Ore, Sonja, Taiyo, Vanilla Ice
<i>Shephard's</i>	Big Smile, Evening Sun, Golden Pheasant, Inca Jewels, Italian White, Moonwalker, Musicbox, Prado Red, Silverleaf, Sunbeam, Sunrich Lemon, Sunrich Orange
<i>Stokes</i>	Color Fashion Mix, Hallo, Teddy Bear, Zebulon
<i>Territorial</i>	Color Fashion, Daisetsuzan, Evening Sun, Floristan, Musicbox, Prado Red, Sunbright, Sunseed, Sunrich Lemon, Teddy Bear, Valentine

Table 2. Descriptions of fresh-cut sunflower cultivars included in 1995 evaluation trial, Manhattan, KS.*

<i>Cultivar</i>	<i>Description</i>
<i>Autumn Beauty</i>	Mixture of yellow, bronze, and purple shades with hi-colors; plants 1.52 meters tall; many long-stemmed flowers.
<i>Bellezzia D' Autono</i>	Light cream to deep mahogany ray florets; plants 1.83 meters tall; head diameter 12 centimeters.
<i>Big Smile</i>	Golden yellow ray florets and dark brown discs; plants 0.30 meters tall; head diameter 12 centimeters.
<i>Color Fashion</i>	Gold, rich yellow and deep bronze colored ray florets with yellow and orange tips; plants 1.52 to 1.83 meters tall; head diameter 5 centimeters.
<i>Color Fashion Mix</i>	Blend of yellow, bronze, red, and purple ray florets; single flowers; plants 2 meters tall; head diameter 10 centimeters.
<i>Daisetsuzan</i>	Silver-gray foilage; bright yellow ray florets and black discs; plants 2.13 to 2.74 meters tall; head diameter 12 centimeters; blooms for over 30 days.

Table 2. Descriptions of fresh-cut sunflower cultivars included in 1995 evaluation trial, Manhattan, KS (cont'd).*

<i>Cultivar</i>	<i>Description</i>
<i>Evening Sun</i>	Rich mahogany-red, rusty bronze, deep gold, burgundy, and other hi-color combinations of ray florets and dark discs; plants 1.83 to 2.44 meters tall.
<i>Floristan</i>	Reddish-brown ray florets with yellow tips and dark discs; foliage with deep purple veins; plants 0.91 meters tall.
<i>Golden Pheasant</i>	Golden-orange ray florets; double flowers with dense florets; plants 1.22 to 1.83 meters tall.
<i>Hallo</i>	Dark brown discs; single flowers; bushy plants, 1.70 meters tall; head diameter 20 centimeters; a prolific bloomer.
<i>Happy Face</i>	Golden yellow ray florets and greenish-yellow discs; plants 0.61 to 1.22 meters tall; head diameter 12 centimeters.
<i>Inca Jewels</i>	Bright yellow, banded gold, orange, burgundy, and hi-color bronze ray florets; plants 1.52 to 2.13 meters tall; heat and drought tolerant.
<i>Italian White</i>	Long, creamy lemon-custard ray florets and deep chocolate discs; plants 1.52 to 2.44 meters tall; head diameter 10 to 12 centimeters.
<i>Moonwalker</i>	Soft creamy, pale yellow ray florets; multiple blossoms; plants 2.44 to 3.05 meters tall.
<i>Music Box</i>	Yellow and true deep gold to over gold ray florets and deep chocolate discs; plants 0.61 to 0.91 meters tall; head diameter 10 to 12 centimeters; dwarf bush form.
<i>Prado Red</i>	All red ray florets; plants 1.70 to 1.83 meters tall; head diameter 30 to 38 centimeters; 15-20 flowers per plant; more sensitive to cold temperatures.
<i>Provance Mixture</i>	Multibranched with vibrantly hued flowers; plants 1.83 meters tall.
<i>Silverleaf</i>	Long yellow ray florets and chocolate discs; foliage silver green; plants 1.22 to 1.83 meters tall; disease resistant and tolerant of hot and cold conditions.
<i>Sole D'Oro</i>	Double blooms with golden yellow ray florets; plants 0.91 to 1.22 meters tall; head diameter 12 centimeters.
<i>Sonja</i>	Medium-sized blooms with golden orange ray florets; plant 1.01 to 1.14 meters tall.
<i>Sunbeam</i>	Deep, rich, golden-yellow ray florets and discs of yellow-green surrounding a thin ring of burgundy and a green center plants 1.52 to 2.13 meters tall; early bloomer.
<i>Sunbright</i>	Bright yellow ray florets and dark brown discs; plants 1.52 to 1.83 tall; head diameter 30 to 38 centimeters; tolerant to cold temperatures; produces no pollen.
<i>Sunrich Orange</i>	Deep golden ray florets and black discs; plants 1.22 to 1.83 meters tall; single-stem variety with very sturdy stalks; produces no pollen.
<i>Sunrich Lemon</i>	Bright lemon-yellow ray florets and black discs; single flowers; plants 1.22 to 1.83 meters tall; strong and sturdy stems; produces no pollen.

Table 2. Descriptions of fresh-cut sunflower cultivars included in 1995 evaluation trial, Manhattan, KS(cont'd).*

<i>Cultivar</i>	<i>Description</i>
<i>Sunrise</i>	Lemon yellow flowers; plants 1.52 meters tall; head diameter 15 centimeters.
<i>Sunseed</i>	Plants 1.22 to 1.52 meters tall; head diameter 30 to 38 centimeters; excellent seed production, also can be used for producing oil.
<i>Sunset</i>	Mahogany, gold-tipped ray florets; plants 0.91 meters tall; head diameter 15 centimeters.
<i>Taiyo</i>	Bright yellow ray florets; plants 1.22 meters tall; head diameter 15 to 20 centimeters; cold tolerant.
<i>Tangina</i>	Golden-orange ray florets and dark discs; plants 0.98 meters tall; head diameter of 5 centimeters.
<i>Teddy Bear</i>	Double yellow flowers; plants 0.75 to 0.91 meters tall.
<i>Valentine</i>	Lemon yellow ray florets and dark brown discs; plants 1.52 meters tall.
<i>Vanilla Ice</i>	Pale lemony yellow ray florets and brown discs; single flowers; plants 1.52 meters tall.
<i>Zebulon</i>	Golden yellow flowers; plants 0.72 meters tall; head diameter 25 centimeters; wind tolerant.

*Descriptions written from information supplied by seed companies.

Field Production

The planting was established at the KSU Horticulture Research Center -- Manhattan. Plots were 1 m by 2.7 m with three rows spaced 30 cm apart. Seeds were planted 15 cm apart in rows on 30 and 31 May 1995 and then replanted as necessary during the week of 12 June. Harvest began on 8 Aug. and ended on 18 Sept. 1995. Number of stems per plant harvested and number of surviving plants per plot were recorded. Yields are expressed as harvested stems per plot and plant (Table 3). The spring of 1995 was wet and cool, so the seeds were planted 4 weeks later than planned. Rains after the initial planting made replanting necessary. Head clipper weevils severely damaged the stems of the primary bloom on many plants of several of the cultivars and reduced yields.

Table 3. Yield and percent stand results for fresh-cut sunflower in 1995 cultivar evaluation trial, Manhattan, KS.

<i>Cultivar</i>	<i>Seed Source</i>	<i>Stand (%)</i>	<i>Total Yield (stems/plot)</i>	<i>Stems/Plant (no.)</i>
Autumn Beauty	Johnny's	87	52	1.1
Bellezia D'Atonia	Pinetree	75	41	1.4
Big Smile	Shephard's	66	38	1.1
Color Fashion	Territorial	81	97	2.2
Color Fashion	Stokes	66	83	2.3
Daisetsuzan	Territorial	40	11	0.5
Evening Sun	Territorial	57	81	2.6
Evening Sun	Shephard's	90	74	1.5
Floristan	Pinetree	53	42	1.4
Floristan	Territorial	87	51	1.2
Giant Sungold	Johnny's	83	41	0.9

Table 3. Yield and percent stand results for fresh-cut sunflower in 1995 cultivar evaluation trial, Manhattan, KS (cont'd).

<i>Cultivar</i>	<i>Seed Source</i>	<i>Stand (%)</i>	<i>Total Yield (stems/plot)</i>	<i>Stems/Plant (no.)</i>
Golden Pheasant	Shephard's	75	39	1.0
Hallo	Stokes	70	47	1.2
Happy Faces	Burpee	81	34	0.8
Holiday	Johnny's	37	34	1.7
Inca Jewels	Shephard's	46	63	2.5
Italian White	Johnny's	44	144	6.0
Italian White	Shephard's	38	164	7.8
Lemon Queen	Johnny's	62	57	1.6
Moonwalker	Shephard's	79	46	1.1
Music Box	Pinetree	68	39	1.1
Music Box	Shephard's	74	67	1.6
Music Box	Territorial	77	41	1.0
Prado Red	Shephard's	72	94	2.4
Prado Red	Territorial	70	75	1.9
Provance Mixture	Nichols	83	86	1.9
Silverleaf	Shephard's	22	2	0.2
Sole D'Oro	Pinetree	79	21	0.5
Sonja	Pinetree	72	28	2.0
Sunbeam	Shephard's	74	26	0.7
Sunbeam	Johnny's	46	31	0.7
Sunbright	Johnny's	83	41	0.9
Sunbright	Territorial	79	45	1.0
Sunrich Lemon	Territorial	55	37	1.2
Sunrich Orange	Shephard's	83	41	0.9
Sunrich Lemon	Shephard's	38	19	0.9
Sunrise	Burpee	90	70	1.4
Sunseed	Territorial	92	49	1.0
Sunset	Burpee	74	39	1.0
Taiyo	Pinetree	94	54	1.1
Tangina	Burpee	75	46	1.1
Teddy Bear	Stokes	74	44	1.1
Teddy Bear	Territorial	61	27	0.8
Valentine	Territorial	70	115	3.0
Valentine	Johnny's	55	89	2.9
Vanilla Ice	Pinetree	42	70	3.0
Zebulon	Stokes	46	7	0.3

Postharvest Treatments

Flowers were harvested when at least half of the outer row of disc florets in the head were open. Stems were cut at least 45 cm when possible. Flowers were bunched by cultivar/plot and placed in buckets filled with clean well tap water. Flowers then were either transported immediately to the laboratory where they were graded and placed in postharvest treatments or placed in cold storage (4° C) for no more than 24 hours until they could be transported to the laboratory for postharvest treatments.

Postharvest treatments were either municipal tap water or a holding solution with flower preservative (Prolong, Robert Koch Industries, Inc., Bennett, CO). Flowers were graded for marketability and bunched in fives; then stems were trimmed to 15 cm under warm tap water. Prepared flowers then were placed in 0.8-liter glass jars containing approximately 0.6 liter of water or holding solution for the prescribed postharvest treatment. Some

cultivars in the trial were not evaluated for both treatments or either treatment because not enough flowers were produced. The commercial floral preservative was mixed at a rate of 24 gm per liter of water. Municipal tap water was used in all postharvest handling procedures because most commercial growers do not have access to distilled or deionized water. Flowers were held at room temperature (20±5° C) and ambient indoor fluorescent light conditions (15. 1 micromol/sec/m²) and evaluated daily. Holding solution or water was added as needed. Evaluation criteria included petal wilting, petal curling, petal drop, and whole flower wilting. If any of these were present, the flower was deemed dead. Flower postharvest life for the two treatments is shown in Tables 4, 5, and 6.

Table 4. Postharvest life of sunflower cultivars held in tap water, 1995 evaluation trial, Manhattan, KS.

<i>Cultivar</i>	<i>Seed Source</i>	<i>Vase Life(days) *</i>	
Sunbright	Johnny's	13.3	a
Sunrich Lemon	Shephard's	12.6	ab
Sunrich Lemon	Territorial	11.3	bc
Happy Faces	Burpee	11.1	bcd
Taiyo	Pinetree	11.0	bcd
Golden Pheasant	Shephard's	10.9	bcd
Sunbeam	Johnny's	10.7	cde
Sunbeam	Shephard's	10.0	cdef
Giant Sungold	Johnny's	9.5	defg
Sunrich Orange	Shephard's	9.4	defg
Teddy Bear	Territorial	9.4	defg
Teddy Bear	Stokes	9.1	efg
Bellezia D' Atono	Pinetree	8.6	fgh
Hallo	Stokes	8.6	fgh
Valentine	Johnny's	8.4	fghi
Sunset	Burpee	8.3	fghi
Sole D'Oro	Pinetree	8.3	fghi
Inca Jewels	Shephard's	8.3	fghi
Vanilla Ice	Pinetree	8.2	ghij
Lemon Queen	Johnny's	8.1	ghij
Music Box	Pinetree	7.9	ghij
Color Fashion	Territorial	7.9	ghij
Sunrise	Burpee	7.7	ghij
Color Fashion	Stokes	7.3	hij
Italian White	Johnny's	7.2	hijk
Sonja	Pinetree	7.0	hijk
Evening Sun	Territorial	7.0	hijk
Tangina	Burpee	6.9	hijk
Valentine	Territorial	6.9	hijk
Music Box	Territorial	6.9	hijk
Italian White	Shephard's	6.9	hijk
Big Smile	Shephard's	6.8	ijk
Provance Mixture	Nichols	6.8	ijk
Prado Red	Shephard's	6.8	ijk
Floristan	Territorial	6.7	ijk
Music Box	Shephard's	6.7	ijk
Prado Red	Territorial	6.7	ijk
Floristan	Territorial	6.7	ijk
Sunseed	Territorial	6.5	jk
Moonwalker	Shepard's	5.5	k

*Values followed by different letters are significant at the 5.0% level of probability. Means of three replications of five flowers each.

Table 5. Postharvest life of sunflower cultivars held in commercial floral preservative, 1995 evaluation trial, Manhattan, KS.

<i>Cultivar</i>	<i>Seed Source</i>	<i>Vase Life(days)*</i>
Sunbright	Johnny's	14.7 a
Sunbright	Territorial	14.1 ab
Sunrich Lemon	Territorial	14.1 ab
Floristan	Pinetree	12.6 abc
Floristan	Territorial	12.3 abc
Taiyo	Pinetree	11.9 bcd
Vanilla Ice	Pinetree	11.9 bcd
Sunrich Orange	Shephard's	11.9 bcd
Happy Faces	Burpee	10.9 cde
Valentine	Territorial	10.7 cdef
Sunrise	Burpee	10.5 cdefg
Holiday	Johnny's	10.3 cdefgh
Autumn Beauty	Johnny's	10.1 cdefghi
Valentine	Johnny's	10.0 cdefghij
Big Smile	Shephard's	9.8 cdefghij
Bellezia D' Atono	Pinetree	9.7 defghij
Evening Sun	Territorial	9.5 defghij
Evening Sun	Shephard's	9.1 efghijk
Inca Jewels	Shephard's	8.9 efghijk
Color Fashion	Stokes	8.9 efghijk
Music Box	Territorial	8.7 efghijk
Giant Sungold	Johnny's	8.5 efghijkl
Provance Mixture	Nichols	8.3 fghijkl
Hallo	Stokes	8.3 fghijkl
Italian White	Johnny's	8.1 ghijkl
Tangina	Burpee	7.9 hijklm
Lemon Queen	Johnny's	7.9 hijklm
Italian White	Shephard's	7.7 ijklmn
Music Box	Shephard's	7.5 jklmn
Prado Red	Territorial	6.7 klmn
Sunseed	Territorial	6.1 lmn
Moonwalker	Shephard's	5.4 mn
Prado Red	Shephard's	5.3 n

*Values followed by different letters are significant at the 5.0% level of probability. Means of three replications of five flowers each.

Table 6. Comparison of postharvest life of sunflower cultivars when held in either tap water (H₂O) or commercial floral preservative (FP) treatment, 1995 evaluation trial, Manhattan, KS.

<i>Cultivar</i>	<i>Treatment</i>	<i>Seed Source</i>	<i>Vase Life(days) *</i>	
Bellezia D' Atono	FP	Pinetree	9.7	N.S.
Bellezia D' Atono	H ₂ O	Pinetree	8.6	
Big Smile	FP	Shephard's	9.8	**
Big Smile	H ₂ O	Shephard's	6.8	
Color Fashion	FP	Stokes	8.9	N.S.
Color Fashion	H ₂ O	Stokes	7.3	
Evening Sun	FP	Territorial	9.5	**
Evening Sun	H ₂ O	Territorial	7.0	
Floristan	FP	Territorial	12.3	**
Floristan	H ₂ O	Territorial	6.7	
Floristan	FP	Pinetree	12.6	**
Floristan	H ₂ O	Pinetree	6.7	
Giant Sungold	H ₂ O	Johnny's	9.5	N.S.
Giant Sungold	FP	Johnny's	8.5	
Hallo	H ₂ O	Stokes	8.6	N.S.
Hallo	FP	Stokes	8.3	
Happy Faces	H ₂ O	Burpee	11.1	N.S.
Happy Faces	FP	Burpee	10.9	
Inca Jewels	FP	Shephard's	8.9	N.S.
Inca Jewels	H ₂ O	Shephard's	8.3	
Italian White	FP	Johnny's	8.1	N.S.
Italian White	H ₂ O	Johnny's	7.2	
Italian White	FP	Shephard's	7.7	N.S.
Italian White	H ₂ O	Shephard's	6.9	
Lemon Queen	H ₂ O	Johnny's	8.1	N.S.
Lemon Queen	FP	Johnny's	7.9	
Moonwalker	H ₂ O	Shephard's	5.5	N.S.
Moonwalker	FP	Shephard's	5.4	
Music Box	FP	Shephard's	7.5	N.S.
Music Box	H ₂ O	Shephard's	6.9	
Music Box	FP	Territorial	8.7	N.S.
Music Box	H ₂ O	Territorial	6.9	
Prado Red	H ₂ O	Shephard's	6.8	N.S.
Prado Red	FP	Shephard's	5.3	

Table 6. Comparison of postharvest life of sunflower cultivars when held in either tap water (H₂O) or commercial floral preservative (FP) treatment, 1995 evaluation trial, Manhattan, KS (cont'd).

<i>Cultivar</i>	<i>Treatment</i>	<i>Seed Source</i>	<i>Vase Life(days) *</i>	
Prado Red	FP	Territorial	6.7	N.S.
Prado Red	H ₂ O	Territorial	6.7	
Provance Mixture	FP	Nichols	8.3	**
Provance Mixture	H ₂ O	Nichols	6.8	
Sunbright	FP	Johnny's	14.7	N.S.
Sunbright	H ₂ O	Johnny's	13.3	
Sunrich Lemon	FP	Territorial	14.1	**
Sunrich Lemon	H ₂ O	Territorial	11.3	
Sunrich Orange	FP	Shephard's	11.9	**
Sunrich Orange	H ₂ O	Shephard's	9.4	
Sunrise	FP	Burpee	10.5	**
Sunrise	H ₂ O	Burpee	7.7	
Sunseed	H ₂ O	Territorial	6.5	N.S.
Sunseed	FP	Territorial	6.1	
Taiyo	FP	Pinetree	11.9	N.S.
Taiyo	H ₂ O	Pinetree	11.0	
Tangina	FP	Burpee	7.9	N.S.
Tangina	H ₂ O	Burpee	6.9	
Valentine	FP	Johnny's	10.0	N.S.
Valentine	H ₂ O	Johnny's	8.4	
Valentine	FP	Territorial	10.7	**
Valentine	H ₂ O	Territorial	6.9	
Vanilla Ice	FP	Pinetree	11.9	**
Vanilla Ice	H ₂ O	Pinetree	8.2	

*Pairs of values followed by N.S. are not significantly different, and pairs of values followed by ** are significant at least at the 5% level of probability. Means of three replications of five flowers each.

A postharvest life of at least 10 days is desirable in the wholesale fresh-cut flower market. Of the 26 different cultivars evaluated with floral preservative, 22 had a postharvest life at least that long. Of the 31 different cultivars evaluated with water, 15 had a postharvest life at least that long. The availability of many cultivars with an acceptable postharvest life gives growers a wide choice of plant material. The list of acceptable cultivars includes light yellow-, dark yellow-, orange-, and mahogany-colored flowers; tall and short plants; and pollenless cultivars.

Seed source made no difference in postharvest life for any of the cultivars that had more than one source. 'Sunrich Lemon', 'Floristan' (both seed sources), 'Vanilla Ice', 'Sunrich Orange', 'Valentine', 'Sunrise', 'Big Smile', and 'Evening Sun' were the only cultivars that had longer postharvest life with the floral preservative than with water.

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