CUT FLOWER CULTURAL PRACTICE STUDIES AND VARIETY TRIALS, 2013

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EXECUTIVE SUMMARY:

ANEMONE/RANUNCULUS TUNNEL TRIAL. Page 5. Surprisingly tough plants that can be planted in mid-December in the high tunnel, and begin harvest of stems a foot long in early April. Secondary protection using a low tunnel advances harvest a couple of weeks without altering yield of 4 – 6 stems per plant.

DELPHINIUM LONGEVITY TRIAL. Page 7. Choice of variety appears to be the most effective way to counteract the early dieback of delphinium varieties in our fields. In a 7-line trial, only 'Guardian Blue' and 'Pacific Giant King Arthur' had shown a significant decline in plant stand by the end of this first year.

LARKSPUR PLANTING DATE AND PINCHING TRIAL. Page 8. We compared sowing larkspur directly in the high tunnel in October with transplanting it in April, and found that both plantings gave similar yields, but the October seeded plants were 2 weeks earlier, and had 15% longer stems. Pinching did not affect yield, and can be accomplished more easily in the fall sowing by increasing the no. of seeds per spot.

SUNFLOWER NIGHT INTERRUPTION EXPERIMENT. Page 9. Most sunflower varieties that are sensitive to daylength flower earlier under short days, but do so on shorter stems and produce smaller flowers. To counteract that reaction one can either lengthen the day artificially using lights, or to use a shorter duration of artificial light during the middle of the night. In this experiment, we confirmed that 'Sunrich Orange' plants gave a long day reaction by both a 4-hour long day extension, and by a 2-hour night interruption in the middle of the night.

SUNFLOWER TOPPING METHODS TRIAL 1. Page 10. Topping sunflower plants in the vegetative stage to increase yield by forcing plants to branch has been effective, but the topping procedure is tedious. In this trial, using hedge clippers was not accurate enough, and left many plants with growing points intact but partly defoliated. At later stages, hand pruners worked well. The branching variety 'Starburst Panache' was more than twice as productive on topping than the single stem 'Procut Gold', and variation in time of topping had no significant effect.

SUNFLOWER TOPPING TRIAL 2. Page 11. The reaction of sunflower varieties to topping can vary greatly. In this trial, topping *per se* resulted in no yield increase of 'Procut Lemon', a moderate yield increase in 'Sunrich Orange' and 'Procut Gold', and a larger response in the branching 'Goldrush'. Delaying topping to the 10-leaf stage was detrimental to yield in all varieties except 'Goldrush'. The results indicate that growers using this practice should test it on a small scale first.

VARIETY TRIALS:

AMARANTHUS: Page 13. The current trial tested varieties that have upright flowering heads and foliage color from dark red to green. All except 'Early Splendor' produced main stems and usable branches, so could probably be topped in the vegetative stage to increase yield of medium-length stems.

CELOSIA: Page 15. Of the 8 varieties in this field trial, the plume types 'Sunday Orange', 'Sunday Red' and 'Pampas Plume' were most productive. Bright colors and adequate stem length makes celosia a favorite summer cut flower.

EUCOMIS: Page 18. With 2 small trials in the tunnel, and one in the field, we are finding that Eucomis can successfully be overwintered in the high tunnel, and that the second-year plants produce about 2 flower stalks per plant, as against less than one in the first year of growth. In the field, fewer than half the plants produced flowers in the April planting. Time of flowering was in mid-July in the old tunnel planting, late July for the younger tunnel planting, and early August in the field, suggesting a way of increasing the length of the market window for this crop of inherently short flowering time.

LISIANTHUS: Page 20. Of the 11 varieties in this trial, 9 were supplied by Takii. The relatively cool conditions kept yields low in both tunnel and field, and favored the early varieties. As a consequence, Cinderella Pink and Echo Champagne, our two standards, produced highest yields. Among the new lines, 'Arena 2 Light Pink' and 'Arena 2 Blue Flash' were most promising.

MARIGOLD: Page 23. The tall marigold varieties in this test again demonstrated that they can produce 15 to 20 stems of flowers per plant with adequate stem length. With vase life of 2 weeks or more, and attractive bright yellow to orange flower color, the crop has a promising future as a cut flower.

ORNAMENTAL PEPPERS: Page 25. The first trial compared the performance of 10 *Capsicum baccatum* lines with the *C. annuum* standard 'Cappa Conic'. PI441525 and PI441542 remained well hydrated for up to two weeks while 'Cappa Conic' wilted quickly, in spite of use of hydrator solution. 'Cappa Conic was more attractive as a dried stem, and leaf removal was easier from those stems, than the C. baccatum lines. In the second trial, C. annuum varieties from PanAmerican Seeds showed promise as dried stems without leaves, but did not remain well hydrated in the vase. C. frutescens lines were generally not attractive as fresh material or dried.

PUMPKIN-ON-A-STICK: Page 34. Of the 3 lines tested, two appeared identical, with dark red stems and petioles, and prominent spines on leaves and stems. The third line, from Ivy Garth, had smooth green stems and sturdier stems, and seemed more useful as an ornamental. All three were called pumpkin-on-a-stick, but the obvious differences among these lines point out the need for varietal names.

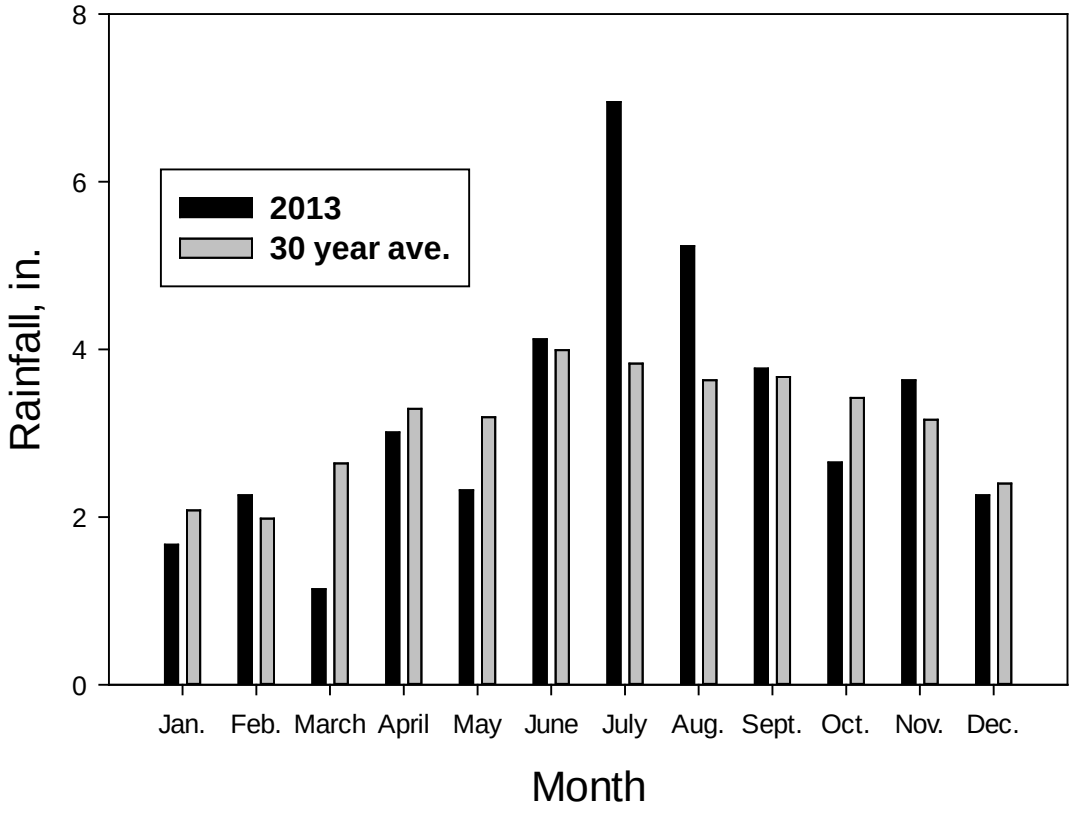
SNAPDRAGON: Page 35. Seven varieties of snapdragon were planted in the field in late spring, and in the high tunnel in summer for fall production. The field trial continued producing stems into the fall, so that yields of 30 stems per plant were achieved for the early varieties, compared to one third that in the tunnel. Varieties of particular promise included 'Chantilly Velvet' 'Trumpet Pink' and 'Potomac Lavender'.

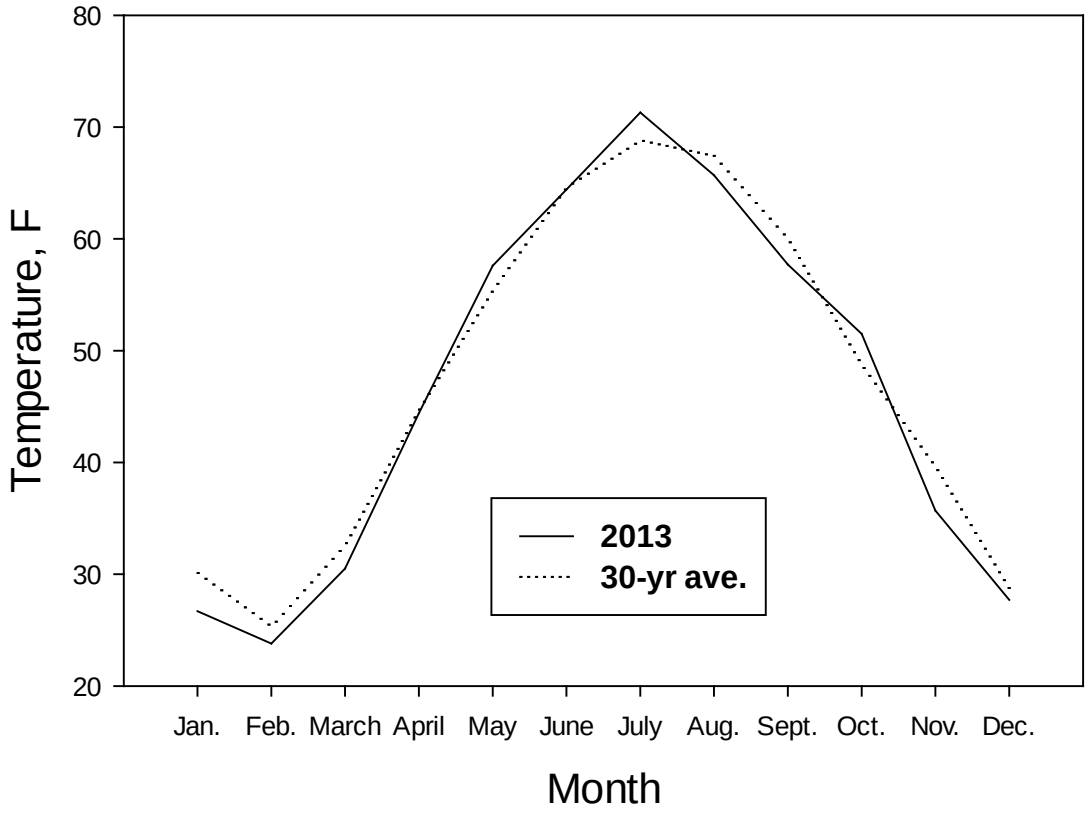
ZINNIA: Page 38. A summer planting in the high tunnel of 7 varieties was cut short by powdery mildew. 'State Fair Mix' was vigorous and productive, and seemed less affected by the disease.

ACKNOWLEDGEMENTS: I gratefully acknowledge the supply of seeds by the following companies for these trials: Geo, Fred C. Gloeckner, Harris, Johnny's Seeds, PanAmerican and Takii. I am also grateful to The Association of Specialty Cut Flower Growers for allowing me to participate in its variety testing program, and for its financial support of some of the work. I am thankful for the technical assistance of Liza White and Priscilla Thompson. Federal Formula Funds partly funded this research.

WEATHER CONDITIONS:

A relatively dry spring was followed this year by a very wet summer due to heavy storms. Temperatures adhered more closely to normal conditions, with winter temperatures slightly cooler than normal. The impact of those conditions on individual experiments will be mentioned in the specific sections.





GENERAL MATERIALS AND METHODS:

The 2013 cut flower trials were conducted at East Ithaca Gardens, in both the field and the high tunnel. The latter has ground dimensions of 30 ft. width and 96 ft. length, with roll-up sides and end wall vents. The sides open under the control of a thermostat-controlled, battery-powered motor with max. and min. temperature settings of 65 and 85 F. In the field, 2 in. of compost was applied in late fall 2012 and worked in. On May 11, 300 lbs. of a 20-10-10 was applied by machine to the field before beds were formed. Beds were made on 6 ft. centers, with dimensions of 5 in. height and 40 in. width, and covered with black polyethylene mulch, with two trickle irrigation lines under the mulch in each. Supplemental nitrogen in the form of calcium nitrate at the rate of 20 lbs. N per acre was added once in mid-season in the field, when plants showed slow growth and/or yellowing lower leaves.

There was no compost addition in the high tunnel this year, but Lisianthus and Marigold beds received 25 lb./A N using calcium nitrate on June 21. Three trickle irrigation lines were placed in each of the high tunnel beds.

Plants for the variety trials were started in greenhouses from seed in seedling trays in Redi-earth artificial soil mix, at recommended temperatures for the species. The time of sowing was adjusted to assume access to the tunnel in the third week of April, and outdoors a month later. Except where noted, spacing was a staggered grid of 4 rows, with 9 in. between plants and rows. There were usually 20 plants in each subplot, and 2 replications in both the tunnel and outdoor variety trials.

Plots in the tunnel were irrigated weekly during the dry period and twice weekly during the warmest periods. Stems were harvested at the recommended maturity stage for the species, and stem lengths were determined for each stem. Repeated harvests were made as needed, often at weekly or greater frequency. No insecticide or fungicide applications were made to plots in the field in 2013, except to control an infestation of sucking insects on the snapdragon variety trial. In the high tunnel, we controlled spider mites by releasing *Neoseiulus californicus* and *Mesoseiulus longipes* on three occasions. Aphids were not well controlled by ladybird beetles in the tunnel mum trial in late fall. The natural enemies were supplied by IPM Labs, Locke, NY. Three sprays of insecticidal soap on the mums for aphid control were also not effective. Weed control between the beds in the field was accomplished by three shielded sprays of glyphosate. For the rest of the season weed control was done by hand.

ANEMONE/RANUNCULUS TUNNEL TRIAL

The report of this experiment was published in the Summer 2013 issue of the Cut Flower Quarterly, and is reproduced here:

High tunnels for cut flower growing are often primarily season extenders, allowing three weeks of frost-free growing at both ends of the season. But that means no income until the early crops like stock, sweet peas and larkspur start flowering in the high tunnel in May and June. The realization that the high tunnel could also be used to overwinter crops for earlier spring harvests came to me more recently, encouraged by attending the ASCFG conference in Tacomah, WA.

I always supposed that anemone and ranunculus required the regulated cool temperatures of a winter greenhouse, and had avoided trying them in the high tunnel. But Ron Beck, bulb expert at Gloeckner suggested that they could be tried as an overwinter crop in the high tunnel in our Zone 5-6 location. Accordingly, we soaked the corms in early December, and planted them in our cold high tunnel in mid-December. Hedging our bets, we covered half the plots with polyester low row cover, and left the other half uncovered. You can imagine my surprise when the first open anemone flowers appeared under the low cover plots at the end of March, after what could be considered a normally-cold winter. I was amazed and delighted.

The low tunnel covers advanced the start of flowering by about a week, and stem length was increased one or two inches with the cover treatment. Harvest of anemone started on April 8, while ranunculus were 3 weeks later. Harvests continued until May 24.

	Stem length, in.		Stems per plant	
Anemone	No cover	Low cover	No cover	Low cover
Galilee Red	12.5	13.3	6.4	5.5
Meron Bordeaux	9.1	10.6	4.2	4.6
Ranunculus				
Labelle Champagne	13.4	15.3	3.6	3.6
Amadine Yellow Picotee	13.0	15.2	3.4	4.0

As can be seen from the summary table, the anemone was more productive than the ranunculus, but three of the four varieties tested had similar stem length.

So with a little work in December we were able to use a vacant space in the high tunnel to produce valuable and desirable flowers in April. That might not work in a mild winter, like the one in 2012, but it is worth a try, especially with the secondary protection of the low tunnel.

Fig. 1. 'Galilee Red' anemone, growing in the high tunnel. Wires supported the polyester row cover, removed in mid-April. Picture was taken on April 8.

Fig. 2. ‘Amadine Yellow Picotee’ ranunculus. Picture was taken on April 29.

DELPHINIUM LONGEVITY TRIAL

In previous trials, delphinium lines have been difficult to grow as perennials because their survival declined as early as late in the year of planting. The causal organism that might be causing this decline has not been identified, and treatment of the transplants with Rootshield has not been effective to stop the decline. We did find, however, that some varieties are much more robust than others, with ‘Centurion White’ showing outstanding longevity in comparison to ‘Guardian Blue’. The current trial is an attempt to enlarge the list of varieties that are true perennials while flowering in the first year.

Materials and Methods: Seeds for the trial were started in 98-cell trays in the greenhouse on March 11. They were initially refrigerated at 35 F for two weeks, then transplanted at 12 x 12 in. spacing in three replications in the field, 15 plants per plot. The first two reps were planted in an area that had contained a delphinium planting the previous three years, the third in the bed next to that. Plant stands were determined on 5 dates starting on July 12 and ending on Oct. 23, and averaged for statistical analysis.

Results and Discussion: All varieties in the trial flowered in the first year and produced several stems per plant (Table 1). The ‘Centurion’ lines had the longest stems, followed by ‘Pacific Giant Percival’, and these varieties also tended to be the latest in flowering. Stem yields were highest for the varieties with shorter stems.

Plant stand declined significantly for only 'Guardian Blue' and 'Pacific Giant King Arthur' in the trial, while the others maintained nearly complete stands. The trial will be kept in the field for several more years to determine the longevity of the lines.

Table 1. Plant stand averaged over 5 sampling dates, stem length and yield at harvest and relative earliness for seven delphinium varieties in the planting year in the field. Values in a column were significantly different if followed by a different letter, as determined by Duncan's Multiple Range Test at the 5% level.

Variety	Plant stand, %	Stem length, cm	Stems/plant	First flower date, DAS
Centurion White	99.4 a	64 ab	2.9 c	137 ab
Centurion Rose	97.2 a	68 a	3.4 bc	143 a
Aurora Blue	93.9 a	52 de	3.6 bc	127 c
Pacific Giant Percival	93.3 a	61 bc	3.6 bc	134 bc
Candle Blue	91.6 a	51 d	6.0 a	119 c
Guardian Blue	79.4 b	48 e	4.4 abc	122 c
Pacific Giant King Arthur	69.4 b	57 cd	4.9 ab	124 c

LARKSPUR PLANTING DATE AND PINCHING TRIAL

We have normally transplanted larkspur in the high tunnel from seed sown in February in the greenhouse. These plantings come into flower in mid-June. In 2012, a chance seedling overwintered in the tunnel, and produced a good crop of flowers 3 weeks earlier than the spring-transplanted crop. Fall sowing of larkspur is widely recommended among cut flower growers, but there is need to make a direct comparison with the method we have used. In this case, seeds were sown directly rather than transplanted.

Materials and Methods: Two varieties, 'Sublime Bicolor' and 'Cannes Mix' were either sown in the high tunnel on Oct. 24, 2012, or transplanted from a greenhouse sowing on April 8. The latter were sown on Feb. 13. Seedlings from both plantings were either pinched in spring, leaving 6 nodes, or left alone. Each plot consisted of 30 hills, 6 in. apart, and there were 2 replications. Experimental design was a split-split plot, with planting dates as main plots, pinching treatments as sub-plots and varieties as sub-sub-plots.

Results and Discussion: The fall-sown crop survived the winter in the high tunnel without secondary protection, and came into flower in early June (Table2). This crop had 13 percent longer stems, but cut stem yields were comparable. The spring-planted crop flowered about 2 weeks later (Fig. 3). 'Cannes Mix' had slightly higher yields of stems than 'Sublime Blue'. The effect of pinching was not significant on stem length, yield and earliness (data not shown).

Table 2. Effect of planting season and variety on stem length, yield and relative earliness of larkspur. The fall planting was sown directly in the high tunnel on Oct. 24; the spring crop was transplanted from the greenhouse on April 8.

Season	Variety	Stem length, cm	Stems/plant	First flower date
Fall	Sublime Blue	72	3.6	June 6
Fall	Cannes	70	6	June 6
Spring	Sublime Blue	59	3.6	June 17
Spring	Cannes	64	4	June 22

The results of this trial indicate that fall direct sowing of larkspur is a preferable method of establishing the crop, as long as high tunnel space is available. Instead of pinching the plants in the spring, putting 2 to 3 seeds per hole in the fall planting will accomplish the goal of having several stems.

Fig. 3. Larkspur trial, showing spring-planted plots in front, and fall-sown plants behind. Photo taken on June 10, 2013.

SUNFLOWER NIGHT INTERRUPTION EXPERIMENT

Trials over the years have shown that exposure to short or long days in the first three weeks after emergence predisposes some sunflower varieties to flower early, or late. This has been achieved by

exposing the varieties to either 12 or 16 hrs. daylength on a light-controlled greenhouse bench, and then planting them out in the field. Many daylength stimuli can also be given by using a night-interrupt treatment of low light intensities, given in the middle of a long dark period. It is not known if the daylength-sensitive sunflower is affected by use of a night break to interrupt the long night, so the current experiment investigated that question.

Materials and Methods: Seeds of the daylength-sensitive variety 'Sunrich Orange', and the day-neutral 'Procut Lemon' were sown in a greenhouse in 18-cell packs and subjected to one of three treatments: 1. Control under ambient light conditions of March/April; 2. Long day conditions imposed by lengthening the daylength to 16 hrs. with artificial lights; 3. Exposure to a night-interrupt treatment consisted of a 2-hour light treatment from 11 pm to 1 am. Treatments were imposed from emergence for three weeks, after which the plants were transplanted to 12 in. pots and grown on in a greenhouse until flowering. The experiment was conducted twice, with 6 plants per treatment, with light treatments starting March 19 and April 1.

Results and Discussion: The photoperiod sensitive variety 'Sunrich Orange' showed a typical short-day response, with delays in flowering, taller plants, increased leaf number and greater flower diameter as a result of the long day treatment (Table 3). The night interruption had virtually identical effects, indicating that this treatment could be substituted for the long day treatment given. Daylength treatment had little effect on the day-neutral 'Procut Lemon'. From an economic standpoint, the night interruption treatment required lights for two hours whereas the long day treatment had the same lights on twice as long, so night interruption will be cheaper.

Table 3. Effect of short or long days, or a two-hour night interrupt treatment on plant characteristics of two sunflower varieties. Average of two replications, with six plants per treatment.

Variety	Light treatment	Plant height, cm	Leaf no.	Flower diameter, cm	Days to flower
Sunrich Orange	Short day	108	18	5.6	53
	Long day	145	26	7.7	62
	Interrupt	141	26	8.4	61
Procut Lemon	Short day	121	18	6.5	57
	Long day	116	18	5.7	56
	Interrupt	115	20	6.2	56

SUNFLOWER TOPPING METHODS TRIAL 1

Previous research has shown that removal of a sunflower's vegetative apex when it has developed about 6 leaves forces the plant to branch and produce from 3 to 5 stems, each with its own flower. We have accomplished this by manually pinching out the apex, a rather tedious procedure. Topping has worked on both single stem and branch-producing cut flower varieties of sunflower. Finding a more convenient and faster means of accomplishing the topping is important, although the amount of mechanical damage done to the leaves by such methods could negatively affect productivity and the quality of flowers produced on topped plants.

Materials and Methods: The experiment compared four topping treatments: 1. A non-topped control; 2. Manual pinching at the 6 expanded leaf stage; 3. Topping using a hedge clippers at the 8-leaf stage; and 4. Topping using Felco pruners at the 10-leaf stage. Two varieties were used: the branching 'Starburst Panache' and the single-stemmed 'Procut Gold'.

The plants were started in the greenhouse in 72-cell trays, transplanted on June 5 after 3 weeks. Plots consisted of 20 plants spaced 9 x 9 in. apart in 4 rows. Experimental design was a split plot, with pruning treatments as main plots and varieties as subplots, with three replications.

Results and Discussion: As in previous topping trials, apex removal resulted in formation of branches that increased yield. Since the increased branching caused crowding of those stems in the same area, flower diameter and stem length and thickness (not shown) were reduced. The timing of topping did not appear to affect yield or flower appearance for either variety in this trial (Table 4). Using hedge clippers for the topping at the 8-leaf stage was not satisfactory, because it was difficult to take out the growing point with this tool. In the 10-leaf treatment we therefore used hand-held pruners which allowed closer control.

Table 4. Effect of time of apex removal (topping) on yield and flower size of two varieties of sunflower.

	Stems per plant		Flower diameter, cm	
Topping time	Starburst	Procut Gold	Starburst	Procut Gold
Not topped	1.1	1.0	7.7	8.5
6-leaf	5.0	2.7	5.2	5.2
8-leaf	4.7	2.6	5.3	5.5
10-leaf	4.3	2.9	5.4	5.2
Interaction signif.	**		**	

SUNFLOWER TOPPING TRIAL 2

Traditionally we have practiced apex removal to force branching in sunflower when about 6 leaves have unfolded at the stem apex, and the stem apex has started to elongate. Topping later, when the apical flower bud is visible on the stem appears to reduce branching on some varieties, notably 'Procut Lemon', but there has been little formal research into this question. The present trial was therefore conducted to find out the effect of time of topping on four sunflower varieties.

Materials and Methods: The experiment compared a control with topping at either the 6 or the 10-leaf stage using pruners. Treatments were applied to 'Procut Lemon', 'Procut Gold', 'Sunrich Orange' and 'Goldrush'. Each plot consisted of 20 plants and there were 3 replications. The trial design was a split plot, with topping treatments as main plots and varieties as subplots. The seeds were sown July 17 in the greenhouse, and transplanted Aug. 14.

Results and Discussion: The trial confirmed our previous findings that earlier topping has greater benefits on yield than waiting until the 10-leaf stage (Table 5). With the exception of the branching line

'Goldrush', the single stem varieties had higher yields when topped at the 6-leaf stage. The reaction to topping by 'Procut Lemon' confirmed earlier observations: this variety showed no increase in branching when topped at either time (Fig. 4). As in earlier trials in previous years, the lower leaves of 'Sunrich Orange' were severely affected by a leaf disease. Topping removed the younger, healthier leaves and confined productivity to the old leaves, reducing the plants' ability to develop the lower branches.

Table 5. The effect of removing the plant apex at either the 6 or the 10-leaf stage on branch production and flowering date of four sunflower varieties grown in the field.

Variety	Stems per plant			Days to flower		
	Control	Topped node 6	Topped node 10	Control	Topped node 6	Topped node 10
Procut Lemon	1	0.8	1.1	69	85	86
Procut Gold	1	4.1	2.7	65	71	76
Sunrich Orange	1	3.0	1.9	77	81	84
Goldrush	1	3.8	5.1	63	68	69
Interaction significance		***			**	

Topping delayed flowering by an average of 5 days except for 'Procut Lemon', in which the delay was more than two weeks. This is another indication of inhibited branching on this cultivar.

Overall, the results of this experiment suggest that topping is a practice that works well in branching varieties, but must be used with caution in single-stem varieties. For the latter, a small preliminary trial would be advisable before topping is practiced on a larger scale.

Fig. 4. 'Procut Lemon' sunflower topped at the 10-leaf stage, showing a lack of branching of the topped plants.

VARIETY TRIALS

AMARANTHUS

Materials and Methods: The trial was sown on May 17 in 98-cell trays in the greenhouse, and transplanted to the field on June 12 at a 9 x 9 in. spacing with 24 plants per plot.

Results and Discussion: The trial grew well and was productive. In addition to the main stem, most varieties also produced shorter side shoots that could be harvested later in the season. Observations of the individual varieties:

Elephant Head: Plants 88 cm tall produced a main stem and several branches (Table 6). Red compact heads and green leaves and stems.

Autumn's Touch: Tall (166 cm) plants with thick stems, and upright flowers green and turning to bronze with age.

Autumn's Pallet: Similar to 'Autumn's Touch' in appearance, height and productivity.

Velvet Curtains: Productive, relatively late variety of 116 cm height. Dark red leaves and flower head.

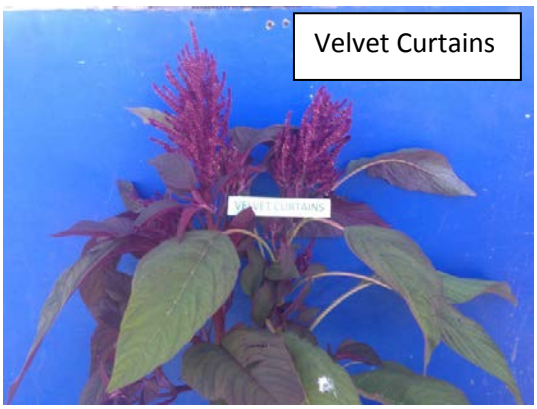
Early Splendor: Relatively short plant with pendulous flower head. Dark red leaves and flower, no branches.

Oeschberg: Short plant (95 cm) with erect dark red flower spike. Numerous branches, some consisting only of flowers without stems.

Red Cathedral Superior: Upright bright red spikes of flowers on plants of intermediate height (122 cm).

Table 6. Stem length, yield and flowering time of seven amaranth varieties grown in the field in 2013.

Variety and Source	Stem length, cm	Stems/plant	Days to first flower
Elephant Head (Genesis)	41	5.3	73
Autumn's Touch (Johnny's)	67	9.7	68
Autumn's Pallet (Geo)	60	10.2	68
Velvet Curtains	48	9.6	74
Early Splendor (Ivy Garth)	52	1	70
Oeschberg	41	6.8	58
Red Cathedral Superior	52	5.1	78


Velvet Curtains


EARLY SPLENDOR


RED CATHEDRAL


2 Autumn's Touch


ELEPHANT HEAD


Autumn's
Pallet

CELOSIA VARIETY TRIAL

Materials and Methods: The trial was sown on May 17, and transplanted to the field on June 14. Spacing was 9 x 9in., with 24 plants per plot. In addition to the normal stem length and stem count taken at each harvest, the width of the main stem combs on comb-producing varieties was measured for the first couple of harvests.

Results and Discussion: Several of the varieties tested in this trial looked promising, and in the case of the 'Sunday' lines, confirmed last year's favorable evaluations (Table 7). Descriptions of the individual varieties follow:

Red Flame: Medium large plant with dark red foliage and small, bright red comb. Promising.

Bombay Green: Earliest flowering line in the trial; medium large bright green comb; plant produces some branches

Table 7. Stem length, productivity, flowering time and width of the flower comb for eight celosia varieties planted in the field in 2013.

Variety and Source	Stem length, cm	Stems/plant	Days to first flower	Comb width, cm
Red Flame (Genesis)	44	10.4	68	5.6
Bombay Green (Kieft)	39	5.6	61	9.4
Bombay Orange	37	1.0	82	4.4
Sunday Orange (Geo)	46	14.4	68	-
Sunday Red	49	14.2	68	-
Pampas Plume	73	15.3	80	-
Chief Mix	52	9.4	73	5.7
Fireglow (Ivy Garth)	52	9.4	73	5.5

Bombay Orange: Plants produced orange, small disfigured combs and no branches. Not recommended for field production.

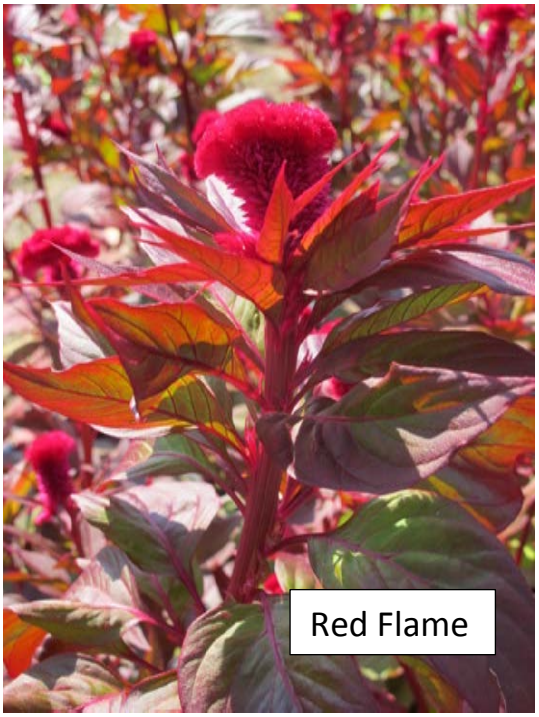
Sunday Orange: Bright orange plumes on a medium-sized plant. Very productive and useful.

Sunday Red: Similar in size and productivity to 'Sunday Orange'. Plants have dark red leaves and bright red plumes. Promising and useful.

Pampas Plume: Tall, productive plants ranging in foliage color from light green to red. Plumes narrow, pointed, with colors from green to dark red. Promising and useful.

Chief Mix: Medium height plant producing small combs. Foliage and comb color variations from green to dark red. Comb shape and size also varies.

Fireglow: Medium height plant with leaves green with red leaf edges. Combs small, bright red.



DIANTHUS VARIETY TRIAL

Materials and Methods: Seeds were sown in the greenhouse on March 30 in 72-cell trays, and transplanted to the field on May 7.

Results and Discussion: The varieties grew well under the field conditions, and produced a respectable yield of relatively short stems, beginning in late June, and ending in late September (Table 8). Height and earliness were not very different among the lines since they are related. 'Sweet Black Cherry' is the newest line, having attractive dark red, almost black flowers without eyes. 'Sweet Red with White Eye' was of a dark red color, with pink center and pink outer fringe. The 'Sweet Mix' contained both these, but also others that were solid white or solid pink. Overall, the 'Sweet' series is productive and attractive, if long stems are not needed.

Table 8. Stem length, yield and earliness of three 'Sweet' dianthus lines grown in the field in 2013.

Variety and Source	Stem length, cm	Stems/plant	Days to first flower
Sweet Black Cherry (Pan American)	31	18	92
Sweet Red with White Eye	31	24	86
Sweet Mix (Harris)	35	20	94

***EUCOMIS* VARIETY TRIALS**

Pineapple lily (*Eucomis spp*.) has become interesting as a cut flower crop because of its beautiful appearance and long vase life. The flower is native to South Africa, but has been selected and improved by plant breeders in New Zealand and the US.

Materials and Methods: The *Eucomis* trials in 2013 consisted of two plantings in the high tunnel and one in the field. The first tunnel trial was planted in April 2012, consisting of four varieties in two replications, the second was planted on April 10, 2013 at the east end of the same bed. The field trial was planted in mid-May from bulbs harvested from a small field planting of 2012. All trials were spaced 12 x 12 in. apart in 3 rows, the tunnel trials with 18 plants per plot, the field trial with 9. The 2012 tunnel trial was overwintered in place without low tunnel protection until March 13, when new shoots started to emerge, and it was necessary to protect them from frost. Low tunnel covers were also placed over the new tunnel planting, and were kept in place until the end of April and the middle of May for the old and new plantings, respectively.

Results and Discussion: The over-winter survival of the 2012 trial was perfect, without any plant loss. Green shoots were already visible by March 13, and the plants grew vigorously, with a dense canopy of leaves that eventually lodged. Flowering occurred in July, and was relatively concentrated in about 10 days for each variety (Table 9). The varieties had similar stem lengths, but yield varied more widely, with 'Reuben' only producing one flowering shoot, whereas 'Innocence' had 2.7. The same varieties planted in the field in 2013 were later to come to flower, and had less than one flower per plant (Table 9). Flower stem lengths were also considerably shorter.

Three new varieties planted in the tunnel in April 2013 also had short flowering stems and less than one flower stem per plant. Flowering time was intermediate between the overwintered tunnel trial and the field trial.

Table 9. Summary table of three small Eucomis trials, started in tunnel or the field, showing stem lengths, yield per plant and the first and last harvest dates for each. The tunnel trials had 2 replications, the field trial only one.

Trial	Variety	Stem length, cm	Stems/plant	Harvest duration
2012 Tunnel	Innocence	73	2.7	July 14-26
	Megaru	70	2.0	July 10-28
	Reuben	66	1.0	July 14-22
	Tugela Jade	66	2.2	July 10-20
2013 Tunnel	Tugela Gem	42	0.7	July 25 – Aug. 4
	Tugela Jewel	50	0.6	July 26 – Aug. 6
	Tugela Ruby	46	0.6	July 24 – Aug. 4
2013 Field	Innocence	50	0.6	Aug. 14 – Sept. 9
	Megaru	57	0.1	Aug. 21
	Reuben	51	0.3	Aug. 14-23
	Tugela Jade	56	0.6	Aug. 19 – Sept. 9

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The results of these trials indicate that *Eucomis* does not become productive until the second year. The rather narrow period of flowering of individual plantings can be extended by growing the crop both in the high tunnel and outside. Overwintering experiments are in progress to know if *Eucomis* can be left in the field.

LISIANTHUS VARIETY TRIALS

Lisianthus (*Eustoma grandiflora*) has gained in popularity as a cut flower in recent years, and is now commonly grown by cut flower producers, often using plugs as propagating materials to avoid the 100-day seedling growth duration.

Materials and Methods: Two trials were grown, one in the tunnel, and one in the field. Seeds for each were started on Jan. 29 and Feb. 13, respectively in 98 and 128-cell trays. The tunnel trial was planted in the high tunnel on May 8; the field planting was planted out in mid-May. Plots in the tunnel averaged 20 plants while the field planting had from 9 to 20 plants, depending on initial seed germination. Spacing was 9 x 9 in. in 4 rows throughout.

Results and Discussion: In the relatively cool season of 2013, plants grew slowly even in the tunnel, and only the main stem was harvest from field-grown plants, whereas the tunnel-grown plants had only a fraction of the branch stems harvested (Table 10). It was very frustrating to see so many stems not make it to the flowering stage at the end of the season. Earliness in flowering paid off in this season, and perhaps pinching the main stem to force earlier branching would also have been useful, but was not practiced. Characteristics of the individual varieties follow:

Arena 2 Light Pink: Vigorous tall plants in the tunnel with medium pink double flowers with dark centers. Basal branching relatively slow. Attractive and promising.

Arena 3 Baby Pink: Similar to first variety with lighter pink double flowers with dark centers.

Arena 2 Blue Flash: Vigorous tall plants in the tunnel with attractive white double flowers having blue speckles near the midribs. Worth another look.

Arena 3 Red: Latest variety in both trials. Dark pink double flowers with dark red petal edges.

Vulcan 2 Purple Picotee: Medium height plant with small to medium sized single flowers. Dark purple wide flower petal margins on a white background. Flower markings not attractive.

Magic Green: Medium height plants with large double flowers of an attractive greenish yellow color.

Vulcan 2 Deep Purple: Shortest stems in the trial. Single small to medium sized flowers, deep purple and attractively striped buds.

Falda 2 Salmon: Plants medium height with variable vigor. Flowers semi-double, dark pink with darker edges, ruffled, and dark centers.

Magic Champagne: Relatively short stems, early to medium maturity; flowers large, double, ruffled petal edges; flower color medium green with yellow centers, on some plants greenish-pink.

Cinderella Pink: Plants of medium height, most productive in both trials. Flowers double, large, showy, attractive, promising.

Echo Champagne: Productive, relatively short plants with showy double flowers; color pale yellow with yellow centers; pink ruffled petal edges. Attractive, standard variety in our trials.

Table 10. Stem length, yield and earliness of 11 lisianthus varieties grown in both high tunnel and field in 2013.

Variety (Source)	Stem length, cm		Stems/plant		First flower date, DAP	
	Tunnel	Field	Tunnel	Field	Tunnel	Field
Arena 2 Light Pink (Takii)	57	42	2.0	1.3	184	180
Arena 3 Baby Pink	53	46	3.2	1.6	185	180
Arena 2 Blue Flash	57	42	2.2	1.4	181	172
Arena 3 Red	58	48	2.1	2.9	199	188
Vulcan 2 Purple Picotee	49	48	2.7	1.2	182	182
Magic Green	49	47	2.4	1.2	181	180
Vulcan 2 Deep Purple	41	41	3.4	2.4	183	175
Falda 2 Salmon	46	39	2.1	1.3	181	172
Magic Champagne	45	40	3.0	1.8	180	166
Cinderella Pink (Johnny's)	48	41	4.6	3.4	180	170
Echo Champagne	47	39	3.4	2.2	180	166

MARIGOLD VARIETY TRIALS

There has been recent development of double marigold varieties with sufficient stem length for use as cut flowers. In our previous trials, they have been productive and had a vase life of two weeks or longer, so that provided incentive to test the new materials in both high tunnel and field.

Materials and Methods: Seven varieties, all obtained from the Ameriseed Company, were sown in 98-cell trays on May 13. On June 10, both trials were transplanted using identical spacing: 12 x 12 in. between plants in 3 rows on black plastic mulch. There were two replications of 15 plants per plot.

Results and Discussion: Both trials grew well but performed differently in the two environments. In the tunnel, plants produced 10% longer stems (Table 11), and began flowering about a week before the field-grown plants. Yields per plant were only 15 stems in the tunnel, compared to 19 in the field, due to a shortened harvest season, which ended on Sept. 20 in the tunnel compared to Oct. 18 in the field.

Although the height of the plants in these trials ranged from 3 to 5 feet, stem lengths of the harvested flowers did not vary that much. In general, all were quite productive, lasted more than 2 weeks in the vase after harvest, and were attractive in mixed bouquets. The performance of the individual varieties was as follows:

Babuda Gold: Bold yellow double flowers of 3-4 in. diameter, on medium tall plants.

Babuda Yellow: Similar to 'Babuda Gold', but flower color brighter yellow.

Narai Yellow: Dark green foliage on slightly taller plants than the 'Babuda' series. Flowers light yellow, averaging 3 in. diameter.

Narai Orange: Canopy height similar to 'Babuda Gold', deep orange flowers of 3-4 in. diameter. Earliest variety in trial.

Optiva Orange: Tallest plants, and latest in flowering in the trial. Dark orange flowers of 3-4 in. diameter.

Jedi Gold: Intermediate stem length, bright yellow flowers 3-3.5 in. diameter.

Jedi Orange: Tall plants and long stems; open flowers exserted well out of the canopy, flower diameter 3-4 in. Relatively late in flowering.

Table 11. Stem length, yield and first flower date for 7 marigold varieties grown as cut flowers in the high tunnel and the field in 2013.

	Stem length, cm		Stems/plant		First flower date, DAP	
Variety (Source)	Tunnel	Field	Tunnel	Field	Tunnel	Field
Babuda Gold (Ameriseed)	47	44	16	20	81	84
Babuda Yellow	51	47	15	18	82	87
Narai Yellow	46	44	14	17	74	89
Narai Orange	45	43	13	18	71	80
Optiva Orange	71	62	14	21	92	91
Jedi Gold	57	53	16	21	77	91
Jedi Orange	65	60	15	18	91	95
Average	55	50	15	19	81	88

ORNAMENTAL PEPPER VARIETY TRIALS

In 2013, Dr. Michael Mazourek and I offered ASCFG trialers the opportunity to test some Capsicum baccatum lines that had performed well as fall ornamentals in previous years here. The results of their trials were summarized in the winter 2014 issue of the 'Cut Flower Quarterly', as part of the trialing program of the ASCFG. For that issue, I also wrote a short article, which is reprinted below:

FRUITING PEPPER STEMS: WHAT ABOUT THE LEAVES?

Cut stems of ornamental peppers add color and texture to fall arrangements, reinforcing the themes of harvest and fruitfulness. Yet commercially-available varieties of ornamental peppers only look attractive after the leaves have been removed, because the leaves wilt promptly when the stems are put in water. We have tried to maintain leaf turgor by using commercial hydrator solutions, but without success.

A couple of years ago, a colleague at Cornell who is developing new pepper varieties showed me some spectacular pepper plant introductions that had potential as cut stems. They are a different species: *Capsicum baccatum*, rather than the ornamental varieties we normally grow, *Capsicum annuum*. They are big plants that require a long growing season to mature, and in the first year, dropped their leaves as the fruits matured, thus eliminating the need for defoliation (We are in cold hardiness zone 5B). Last year, the season was cooler, so we did not see the leaf drop, but when we placed the cut stems in water, leaves did not wilt, and the stems stayed attractive for three weeks.

This growing season we shared sample seeds of five lines with several ASCFG members through the National Cut Flower Trials, and the results of their tests can be found in the trial article of this issue. Again, vase life ranged from 7 to 14 days or more. Only a few trialers kept the leaves on in their vase test, but were happy with the result. So it seems we have some pepper lines that show promise as fall cuts.

What next? If some of you would like to try these lines next year, please let Judy or I know, and we can send you samples. In addition, several seed companies also participated in the trials, and I am hopeful that they will be further developing these materials for extended vase life.

Another strategy for dealing with the pesky leaves is to treat the stems like dried plants by hanging them up in a dry environment. We did that with these lines and found that all except PI 441525 retained an attractive appearance, but leaf removal continued to be a chore. Only PI 159252 had leaves that could be easily removed.

So should you leave the leaves? Try it on a sample, and let the results dictate your actions.

Acknowledgements: Many thanks to Dr. Michael Mazourek for producing the seeds for the trial, and to Liza White and Priscilla Thompson for gathering the data. I am also very grateful to the ASCFG Research Foundation for sponsoring this work.

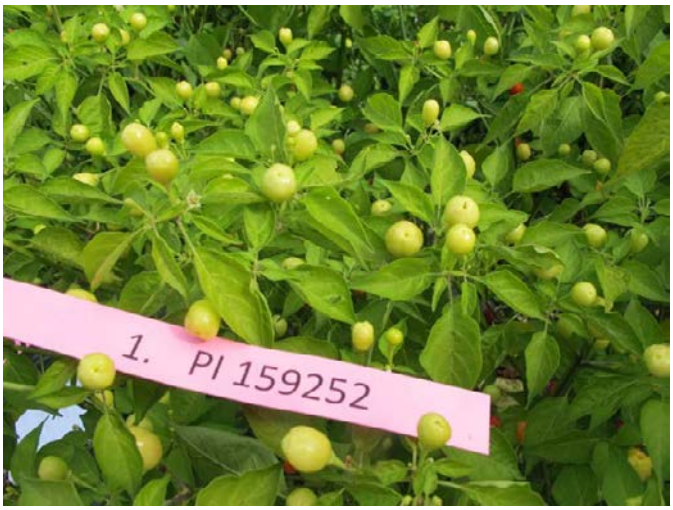


Fig. 5. One of the lines tested. Mature fruits are about 1 in. diameter.

Fig. 6. Priscilla Thompson, my assistant, next to one of the tested lines. By the end of the trial, plants were about 5 ft. tall, producing stems 30 to 40 in. long.

ASCFG PEPPER TRIAL, CORNELL RESULTS:

In addition to the lines distributed to the ASCFG network, we planted additional lines that were of interest from previous years' results. In addition to standard variety trial observations, we examined these lines for their postharvest attributes, especially their wilting characteristics when held in a vase.

Materials and Methods: Eleven pepper lines were sown in 72-cell trays in the greenhouse on April 22 and transplanted to the field on June 3. Plant spacing in the field was 18 x 18 in., with 2 rows per bed and 10 plants per plot. There were 3 replications, but plant numbers in the third replication were limited due to plant shortages for some lines.

Observations on plant height and plant and fruit attributes were taken several times starting in early September and concluding on Oct. 15. Two plants per plot were harvested in October and divided into marketable stems. For postharvest evaluations, 2 replications of 2 stems each were placed in a dimly-lit room in either tap water or hydrator solution, and observed for wilting characteristics and leaf and fruit drop at 4, 7 and 14 days. Other branches were cut and allowed to dry, and their attractiveness and ease of leaf removal rated after about one month.

Results and Discussion: Plants made very vigorous growth, reaching more than a meter in height by the time of harvest (Table 12). The relatively cool summer conditions resulted in relatively slow growth and late fruit setting and maturity. None of the plants in this trial reached full maturity, nor produced senescent leaves resulting in defoliated plants. With the exception of 'Cappa Conic', a *Capsicum annuum* commercial variety, all the PI's were *C. baccatum* plant introduction lines originally from the USDA Plant Introduction Station in Griffin, GA.

Table 12. Evaluation of pepper lines for use as ornamental stems at fruit maturity. Plants were grown in the field as part of the ASCFG pepper variety trial.

Pepper line	Plant height, cm	Stem length, cm	Stems/plant
PI 159252	122	96	17
PI 441525	157	103	20
PI 441542	122	110	17
PI 441552	157	103	15
PI 441575	122	88	22
PI 441530-2	157	93	12
PI 441530-1	170	111	16
PI 441589	122	99	14
PI 441572	104	86	18
Cappa Conic	86	61	14

Table 13. Postharvest evaluation of 10 pepper lines, rating the degree to which the leaves wilt when placed in water or hydration solution. A second set of stems were stored dry, and rated for ease of leaf removal and attractiveness of the stems and their attached fruits.

Pepper line	Hydration evaluation[z]						Dry plant evaluation	
	4 days		7 days		14 days			
Hydration sol'n.	No	Yes	No	Yes	No	Yes	Leaf removal ease[y]	Attractiveness[x]
PI 159252	5	5	1	1	1	1	4	3
PI 441525	5	5	5	5	5	5	3	1
PI 441542	5	5	3	5	1	5	3	3
PI 441552	5	5	3	1	1	1	1	3
PI 441575	5	3	3	3	1	1	4	3
PI 441530-2	--	--	3	3	1	1	3	3
PI 441530-1	3	5	1	3	1	1	1	5
PI 441589	5	5	5	5	3	3	1	3
PI 441572	3	5	1	3	1	1	1	5
Cappa Conic	1	1	1	1	1	1	5	5

[z]Hydration evaluation: 1= wilted; 5= fully turgid

[y]Leaf removal ease: 1= difficult; 5= easy, partly defoliated

[x]Attractiveness: 1= ugly; 5= attractive, with prominent, well-colored fruits

At the spacing used, plants of the PI lines got very large, and yielded more than 15 stems in most cases (Table 12). The hydration test showed less satisfactory results than last year, when the same lines had

leaves that were still turgid after 3 weeks (Table 13). This time, only PI 441525 retained turgidity for two weeks, while PI 441542 and PI 441589 were only slightly wilted. The use of hydration solution did not slow down the rate of wilting of most lines.

Lines worth further evaluation include:

PI 159252, with numerous round fruits that stayed attractive even after drying. The plants did not remain turgid, however, so might be best used dry.

PI 441525: Stayed turgid for two weeks, and had leaves that were easy to remove in the dry state. The fruits did not retain an attractive appearance after drying.

PI 441542: Stayed somewhat turgid with hydration solution, had leaves that were easy to remove and stayed moderately attractive in the dry state.

PI 441589: Stayed well hydrated for a week. In the dry state, leaves were hard to remove, but fruits retained attractive appearance. Fruits of this line were thin, green turning red, and leaves started to senesce on plants in the field by Oct. 15.

Cappa Conic: A commercial variety that produces relatively short plants, but has prominent blunt pointed fruits that start yellow and turn red. Leaves wilt quickly when stems are placed in water or hydrator, but are easy to remove when plants are dried.

ORNAMENTAL PEPPER TRIAL

Plantings of plant introduction lines of *C. frutescens* in 2012 showed potential as ornamentals for fall cut stems. Our 2012 planting of *C. baccatum* confirmed that peppers that bear showy fruits in fall, and lose their leaves readily, have ornamental value. In addition, Panamerican Seed is developing ornamental peppers (*C. annuum*) for cut stems that were also of interest.

Materials and Methods: Twenty four accessions were sown in 72-cell trays on April 26 and transplanted to the field on June 10. Plants were spaced at 18 x 18 in. in two rows, with 12 plants per plot in two replications. Evaluations of the lines were conducted as with the ASCFG trial described above.

Results and Discussion*:* Although most lines made good growth and reached acceptable plant heights and stem lengths as well as stem yields (Table 14), few were satisfactory in the vase (Table 15). As in the ASCFG trial, hydrator solution made little difference in vase life for most lines, only prolonging leaf turgidity in the first few days. Three lines that looked promising with regard to hydration as cut stems were:

PI 370009: Stems held up well in the vase, but the pendent yellow fruits were partly concealed in the foliage, so that stems were not judged attractive. Stems were also not showy when dried, and leaves were hard to remove.

Grif 9303: Stems stayed well hydrated, but the erect, thin green fruits were not showy in the fresh or dried state.

PI 360729: Stayed well hydrated, but leaves were hard to remove when dry, and dried stems were only moderately attractive.

PI 645558: Did not stay hydrated, but erect, small yellow fruits were attractive in the dried state.

PI 193470: Did not stay hydrated, but erect, green to red fruits at top of canopy were attractive, and leaves were easy to remove.

Table 14. Field evaluation of 24 pepper lines for plant height at harvest, length and yield of harvested stems.

Pepper line	Plant height, cm	Stem length, cm	Stems/plant
Grif 9228	84	75	7.4
Honduras 12097	107	94	9.2
PI 370009	107	92	7.5
PI 370007	56	60	9.6
PI 586675	184	76	8.8
PI 645559	107	94	9.1
PI 645558	122	84	9.2
PI 644826	107	89	9.9
Grif 9303	122	123	8.5
PI 238056	107	80	10.0
PI 197406	84	73	12.4
PI 193470	107	78	9.2
PI 260480	84	73	5.8
PI 360729	84	81	7.9
PI 583231	74	59	8.7
PI 439502	74	63	9.0
Cappa Conic White Red	74	55	10.8
Cappa Round Red	74	54	6.9
Cappa Round Tricolor	84	62	6.4
Cappa Topfruit White Red	74	41	14.4
Garda Chandelier	74	62	10.5
Garda Fireworks	56	34	15.2
Garda Hocus Pocus	15	Not harvested: too short	
Garda Tricolor	74	56	12.2

Table 15. Hydration status after 4, 7 and 14 days in either water or hydrator solution, and ease of leaf removal and attractiveness of 24 ornamental pepper lines grown in the field.

Pepper line	Hydration evaluation[z]						Dry plant evaluation	
	4 days		7 days		14 days			
Hydration sol'n.	No	Yes	No	Yes	No	Yes	Leaf removal ease[y]	Attractiveness[x]
Grif 9228	5	5	3	5	3	1	1	3
Honduras 12097	5	5	5	5	1	3	1	2
PI 370009	3	4	3	5	3	5	2	2
PI 370007	1	1	1	1	1	1	3	5
PI 586675	1	1	1	1	1	1	3	1
PI 645559	2	4	1	1	1	1	1	3
PI 645558	3	5	1	4	1	1	3	5
PI 644826	4	5	2	2	1	1	4	1
Grif 9303	5	5	5	5	3	5	1	1
PI 238056	1	3	1	3	1	3	1	1
PI 197406	4	5	1	5	1	1	3	1
PI 193470	3	3	1	2	1	1	5	4
PI 260480	1	2	1	1	1	1	1	3

PI 360729	5	5	5	5	5	5	1	3
PI 583231	1	3	1	1	1	1	1	5
PI 439502	5	5	1	2	1	1	5	2
Cappa Conic White Red	2	4	1	1	1	1	3	5
Cappa Round Red	3	4	2	3	1	1	4	4
Cappa Round Tricolor	2	2	1	2	1	1	3	2
Cappa Topfruit White Red	5	5	3	3	1	1	3	5
Garda Chandelier	4	5	1	1	1	1	5	5
Garda Fireworks	1	1	1	1	1	1	1	3
Garda Hocus Pocus	Not rated						Not rated	
Garda Tricolor	3	5	1	1	1	1	2	5

[z]Hydration evaluation: 1= wilted; 5= fully turgid

[y]Leaf removal ease: 1= difficult; 5= easy, partly defoliated

[x]Attractiveness: 1= ugly; 5= attractive, with prominent, well-colored fruits

The named lines supplied by Panamerican Seeds produced relatively smaller plants and shorter stems. The stems had generally a poor hydrated vase life, but had prominent and colorful fruits that looked attractive when plants were dried. Leaf removal was moderately easy for most of these lines. They could thus be useful as defoliated fresh cuts, or as dried stems.

Cappa Conic White Red: Already described and rated in the ASCFG trial above.

Cappa Round Red: Prominent round fruits, green turning red. Plants partly lodged due to fruit weight.

Cappa Topfruit White Red: Relatively short branches with fruits bunched at the top. Fruits pale green turning red, erect.

Garda Chandelier: Stems attractive and promising, with many fruits, yellow turning red. Easy leaf removal.

Garda Fireworks: Clusters of erect pointed fruits, purple immature, turning orange-red at maturity. Poor hydration properties, leaves hard to remove.

Garda Tricolor: Attractive stems of small fruits, pointed, erect and turning from purple to orange to red.


CAPPA ROUND RED


CAPPA TOPFRUIT
WHITE RED


GARDA CHANDELIER


GARDA FIREW


GARDA TRICOLOR

PUMPKIN-ON-A-STICK VARIETY TRIAL

Solanum integrifolium has become a popular fall decorative item similar to ornamental pepper, with fruits resembling miniature pumpkins. In this trial, two new introductions were tested against a standard line.

Materials and Methods: Seeds were sown on March 25 in 98-cell trays in Redi-earth. Seedlings were transplanted to the field on May 7, but had to be protected from low temperatures during the week of May 13 using low tunnels covered with the spunbonded material 'Covertan'. Protection was inadequate, and the plants froze back to the ground. There was enough green stem left that the plants produced basal sprouts and grew normally thereafter. Final harvest of plants with mature red fruits was made on Oct. 9. All three varieties were of similar maturity.

Results and Discussion: Pumpkin-on-a-Stick has become a common item in seed catalogs for cut flower growers. Unfortunately, only one common name is used, even though the plant characteristics of these lines may vary among companies. In the current trial, the items from Genesis and Gloeckner appear to be identical or closely similar, while the line from Ivy Garth differs (Table 16). The first two lines are characterized by dark red stems and bright red mature fruits, with prominent spines on the upper leaf surfaces and on the stems. The last item has thicker, green stems, lacks spines and the fruits are a lighter red color at maturity. The Ivy Garth line also has longer stems, and appears to be more productive. We encountered some lodging of the first two lines in the field as fruits matured while the green-stem line had stronger stems. The lodging tendency carried over into a lack of stem strength of harvested stems in the vase. For these reasons, the Ivy Garth line is the more desirable variety in this trial. There is a need to affix variety names to the lines being offered by seed companies, and to make sure that identical items carried by more than one company are designated only by one name.

Table 16. Stem length and yield of three lines of Pumpkin-on-a-Stick grown in the field and harvested Oct. 9.

Source	Stem length, cm	Stems/plant
Genesis	53	4.8
Gloeckner	54	4.6
Ivy Garth	63	6.5

Fig. 7. Two lines of Pumpkin-on-a-Stick, differing in stem color. In the picture on the left, stems and petioles are dark red, and leaves and petioles are spiny; in the picture on the right, stems and petioles are green and spineless.

SNAPDRAGON VARIETY TRIALS

Materials and Methods: Two trials were conducted, a spring planting for the field, and a summer-fall planting for the high tunnel. The first was sown March 25 in 98-cell trays and transplanted on May 16. The later trial was sown June 4 in 72-cell trays and transplanted to the tunnel on July 15. All plants were topped at the 6-leaf stage in the tunnel trial, since especially the early lines tend to produce very short, worthless stems in the heat of the summer.

Results and Discussion: Harvest of the field trial started in late June and continued for four months, thus allowing a sizeable yield to accumulate, especially of the early varieties (Table 17). Stem length was greater in the high tunnel. The later varieties tended to be less productive, and produce longer stems, especially in the tunnel. The lower yield of the tunnel trial was mostly due to the short harvest season: from late August to late October. Again the early varieties outperformed the later materials in that situation.

Observations on individual varieties:

Chantilly Velvet: Early productive plants with open-faced, dark red petals and prominent yellow stamens. Racemes short, especially in hot weather.

Purple Twist: Early productive plants with conventional flower form. Under cool conditions, flower petals have broad purple streaks on a pink background; in warm conditions, streaks give way to purple dots. Such an apparently weather-related color pattern is interesting, but perhaps difficult to market during a long growing season.

Trumpet Pink: Early productive plants with open-faced bright pink upright-facing florets. Florets spaced relatively widely apart on the raceme.

Madame Butterfly Mix: Medium-sized plants with open-faced double flowers. Among the latest in the trials, the mix included colors from white through pink to maroon. Moderate productivity.

Snappy Tongue: Intermediate stem length, average productivity on stems with standard florets. Flowers were an attractive mix of colors from yellow to pink, light purple with pale yellow tube.

Supreme Light Lavender: Intermediate stem length, moderate productivity and main season maturity. Florets of standard type, light pink petals with slightly darker lower lip. Attractive flower appearance.

Potomac Lavender: Tallest plants in trial with long racemes. Latest maturing variety in trial. Flower type standard, color dark lavender tube with medium lavender tongue. Promising.

Table 17. Stem length, yield and earliness of 7 cut flower snapdragon varieties grown in both field and high tunnel.

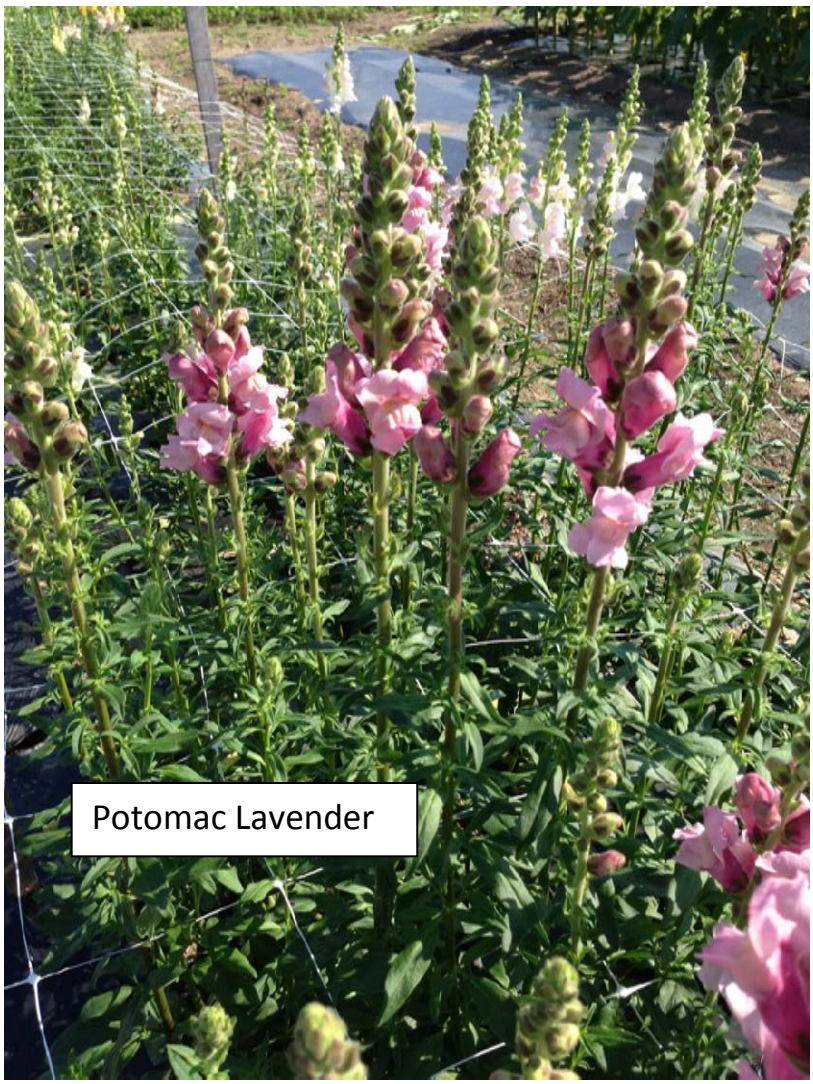
Variety (Source)	Stem length, cm		Stems/plant		First flower date, DAP	
	Field	Tunnel	Field	Tunnel	Field	Tunnel
Chantilly Velvet (Takii)	43	50	33	13	75	78
Purple Twist (PanAmerican)	41	50	32	10	64	83
Trumpet Pink	43	53	33	11	64	81
Madame Butterfly Mix (Geo)	48	63	23	6	93	93
Snappy Tongue	41	56	24	8	92	88
Supreme Light Lavender (Gloeckner)	41	53	19	7	79	85
Potomac Lavender (PanAmerican)	61	84	18	7	95	94
Average	45	58	26	9	80	86


Chantilly Velvet


Purple Twist


Trumpet Pink


Supreme Light Lavender



ZINNIA VARIETY TRIAL

Materials and Methods: The trial was only planted in the tunnel, following earlier larkspur and vegetable trials. Seeds were sown on June 11 in the greenhouse in 72-cell trays, and transplanted July 3 at 9 in. spacing, with 24 plants per plot.

Results and Discussion: The plants grew well in the summer conditions of the high tunnel, but began to show increasing signs of powdery mildew in late August that eventually defoliated the entire crop, in spite of three sprays of organic fungicides such as *Bacillus subtilis* (Cease). There were differences in varietal reaction to the mildew, as noted below. Flowering began at nearly the same time among all varieties (Table 18).

Benary Giant Golden Yellow: Plants to 1 meter tall, flowers 3 to 4 in. diameter, mostly double, color medium dull yellow. One of the first to show powdery mildew in the trial.

Benary Giant Orange: Plants to 120 cm tall, with long stems. Flowers 3 – 4 in. in diameter, orange to light red in color, mostly double. One of the earliest varieties to show powdery mildew.

Candy Mix: Plants to 120 cm tall, spindly, with flowers 2 – 3 in. diameter, single. Flower color ranged from white to pink to red, salmon and lavender. Most productive variety in the trial, but also showed early signs of powdery mildew.

Inca: Plants about 75 cm tall, with relatively short stems. Flowers 3 – 4 in. diameter, double with 'cactus' type flower petals that give the flower a tousled appearance. Color from orange to light red.

Pinka: Similar to 'Inca' except that flower color is bright pink. Lowest-yielding variety in the trial.

State Fair Mix: Plants up to 120 cm in height, with long stems. Vigorous growth with flowers up to 4 in. wide. Double flowers ranging in color from pink through red to lavender. Promising.

Uproar Rose: Vigorous plants to 100 cm height. Flowers uniform in color, 3 -4 in. diameter, double, of deep lavender color. Useful and promising.

Table 18. Stem length, yield per plant and days to first flower of seven long-stemmed zinnia varieties grown in mid-summer in the high tunnel.

Variety and Source	Stem length, cm	Stems/plant	Days to first flower
Benary Giant Golden Yellow (Geo)	63	7.2	54
Benary Giant Orange	68	6.8	56
Candy Mix	57	10.8	52
Inca	56	7.6	52
Pinca	54	4.8	56
State Fair Mix	69	6.8	57
Uproar Rose	60	7.1	52


CANDY MIX


INCA


Pinka


STATE FAIR MIX


Uproar Rose