CUT FLOWER VARIETY TRIAL RESULTS, 2006[z]

H. C. Wien, Department of Horticulture
Cornell University, Ithaca, NY 14853

EXECUTIVE SUMMARY: The 2006 Cut Flower variety trials comprised eight species and 39 varieties. Six of the trials were conducted both in the high tunnel as well as outside. Highlights of the trials are given below:

1. **Amaranth** performed well in both tunnel and outside. Main stems on some of the varieties were more massive than practical, but make a spectacular display. In particular, 'Love-lies-Bleeding' and 'Emerald Tassels' were attractive flowers, while 'Early Splendor's' dark red foliage was also handsome.
2. Three standard cut flower **aster** varieties were compared with the new cultivar 'Hulk'. The latter has an unusual flower of green color and good stem length.
3. Of the five **celosia** varieties tested, 'Temple Belle New Scarlet' produced a profusion of medium to small cockscombs of good stem length. The plume type 'Startrek Lilac' also performed well.
4. The 'Sparkler' series of **cleome** have the advantage of uniform and fast germination, and the ability to produce stems all summer, but tendency for blossom shattering, short stems and spines make them of limited use as a cut flower.
5. 'Sweet Scarlet' is an attractive addition to the Sweet line of **dianthus**. A vibrant medium red, about a week earlier than the Amazon lines, but also a few centimeters shorter, 'Sweet Scarlet' will fit well into a mix of Dianthus lines.
6. Of the **ornamental grasses** grown this year, *Eragrostis* 'Ruby Silk' was the most productive, and made an excellent and attractive filler in the vase, but was prone to lodging and time-consuming to harvest. *Pennisetum* 'Feathertop' was also attractive, but the aggressive root system was nearly impossible to remove at the end of the season.
7. The **lisianthus** trial showed the negative effect of late transplanting in the tunnel, with a nearly 50% reduction in yield compared to outside timely planting. Of the double varieties, 'ABC White GX12444' stood out with attractive ruffled petals.
8. **Ornamental peppers and eggplant** are good items to extend the cut flower season into late fall. Among the peppers, 'On Top Red' has black immature fruit that ripen to a dull red. 'Pumpkin-on-a-stick' (*Solanum integrifolium*) is an eggplant relative, and its fruits resemble miniature pumpkins. Although the leaves and stems are spiny in the latter, the tall stems make attractive arrangements with a fall theme.

[z] The excellent work of Liza White, and her assistants Martha Gioumousis, Liz Stuprich and Veronica DeVivo on these trials is gratefully acknowledged.

INTRODUCTION: The 2006 cut flower variety trials were conducted at the East Ithaca Gardens, both in the field, and in the high tunnel. Some accessions came from the Association of Specialty Cut Flower Growers national variety trials, while others were obtained by direct request from seed companies.

MATERIALS AND METHODS: The field trials were conducted on an Arkport sandy loam soil, to which compost had been added in April 2006 to a depth of about 2 in.. During spring land preparation a 20-10-10 fertilizer was applied on the field at a rate of 50 lbs/A N and disked in. The high tunnel is situated in the adjacent field of the same soil type, and has had compost additions in 2004 and 2005, but not in 2006. It also received 50 lbs/A N from a 20-10-10 fertilizer prior to application of black plastic on the soil beds. Prior to planting of the fall crops in the tunnel, soil in the beds was tilled and 25 lbs/A N was raked in using calcium nitrate.

Beds were constructed in the field and in the tunnel on 5 ft. centers, ca. 5 in. high and 40 in. wide at the top. Two trickle irrigation lines were placed on the surface under the 5 ft wide black polyethylene mulch. The trickle lines were placed between plants 1 and 2, and between plants 3 and 4 across the bed, when a 9 x 9 in. spacing was used.

Plants for the variety trials were started from seed in seedling trays in Metromix 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 experiments.

Plots in the tunnel were irrigated weekly all season long. The outdoor plots required little irrigation all season, given the excessive rain that fell much of the summer (Fig. 1).

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 fungicide or insect control chemical was applied to any of the trials in 2006. Weeds in the walkways were controlled by shielded sprays of Roundup, applied before the weeds became large.

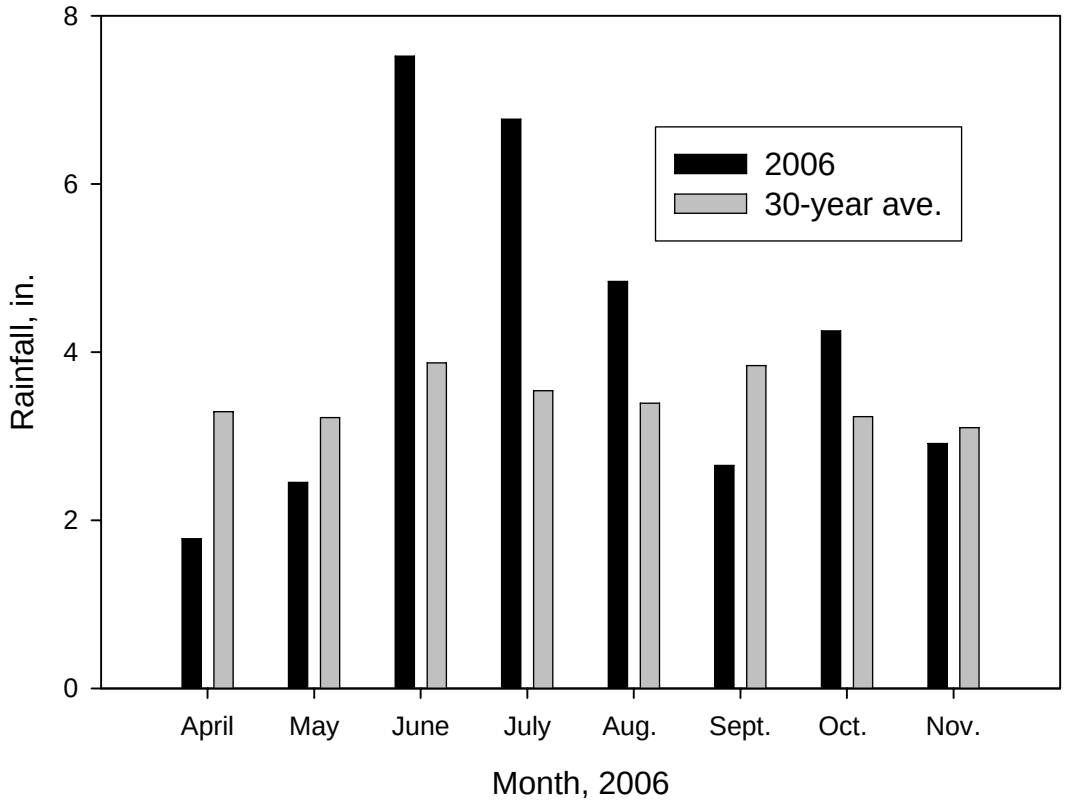

Fig. 1. Rainfall during the 2006 growing season, and the 30-year average rainfall, measured at the Cornell Game Farm Road station, about a mile from the flower farm. Source: Northeast Regional Climate Center, Ithaca.

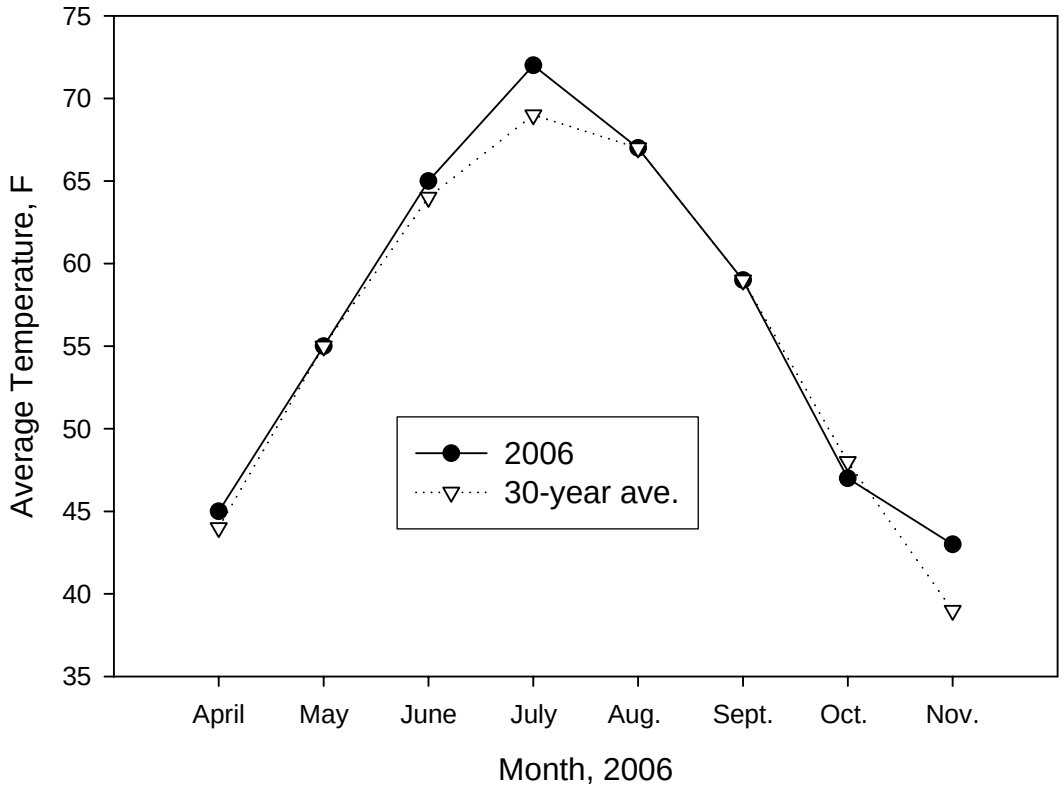

Fig. 2. Average temperature during the growing season of 2006, and for the last 30 years at the Game Farm Road station, Ithaca. Source: Northeast Regional Climate Center, Ithaca.

RESULTS AND DISCUSSION:

Climatic conditions for the trials: The 2006 growing season was one of the wettest on record, with nearly double the normal amount of rain during June through August (Fig. 1). Temperatures during the season adhered closely to the 30-year average all season (Fig. 2). Information on high tunnel temperatures are discussed in the report on cultural practice experiments.

The results of the individual experiments are given below, in alphabetical order.

AMARANTH: Two trials were conducted; the one for the tunnel was sown April 26, the one for the field on May 9 both transplanted to 9 x 9in. spacing. Plants grew well in both locations, with main stems almost too large for anything other than large bouquets (Tables). This might be avoided by an early pinching, leaving about six lower nodes.

Of the varieties tested, the feature of most interest for most of them was the inflorescence, which was long and pendent in the case of Emerald Tassels and Love Lies Bleeding, and erect in the Tower series and Opopeo (Fig. 3). Early Splendor is grown for its dark red foliage, but did not attain much height in these trials (Table 1). The leaves just below the flower on Tower Green tended to pucker and become necrotic at the edge, resulting in an unattractive distortion (Fig. 4). Once the inflorescence had fully extended, this distortion was less noticeable, and blended in to some extent with the shape of the flower head.

Performance tended to be similar in tunnel and outside in these experiments, except that the tunnel trial was harvested about 2 weeks earlier than the field trial (Table 1).

Table 1 . Stem length, no. of stems per plant and first harvest dates for six varieties of amaranth transplanted to the tunnel on May 25, and to the field June 2, 2006.

Name and	Stem length, cm[z]		Stems per plant		First harvest date	
(Source)	Tunnel	Outside	Tunnel	Outside	Tunnel	Outside
Tower Red (Gloeckner)	68	74	5.8	7.1	July 6	July 19
Tower Green	54	58	6.8	7.4	June 28	July 14
Early Splendor	34	48	5.4	3.8	July 12	July 21
Emerald Tassels (Johnny's)	74	100	6.6	4.1	July 6	July 17
Love Lies Bleeding	71	103	10.5	3.5	July 6	July 21
Opopeo	94	109	5.5	6.4	July 16	July 19

[z] Average of main stem and branches

With these varieties, main stems tended to be twice as long as the basal branches. The tallest plants had main stems of 1 to 1.5 meters, of limited usefulness in most bouquets, unless one is decorating a church or large room. For these varieties, early pinching may be necessary to produce more stems of a shorter length and thinner diameter.

Table 2 . Length of main stem and branches, as well as the length of the inflorescence in each case, of six amaranth varieties in the 2006 field trial. Early Splendor did not flower.

Name and (Source)	Stem length, cm[z]		Inflorescence length, cm	
	Main stem	Branches	Main stem	Branches
Tower Red (Gloeckner)	134	64	30	14
Tower Green	116	50	26	18
Early Splendor	78	38	--	--
Emerald Tassels (Johnny's)	160	80	32	24
Love Lies Bleeding	158	81	22	21
Opopeo	160	98	16	14

Fig. 3. Emerald Tassel (back) and Early Splendor amaranth in the 2006 tunnel trial.

Fig. 4. Tower Green amaranth leaf distortion on the youngest leaves below the head. This distortion occurred in both tunnel and the field.

ASTER (CALLISTEPHUS): Trials were conducted both in the tunnel and outside. Seeds were sown on May 2 for both trials and transplanted July 5 and _June 20_____, for tunnel and outside, respectively. Shortly after the plots had been transplanted, the plantings were covered with 'Covertan' spunbonded fabric to protect against leafhopper transmission of aster yellows virus. Plants remained under this cover until they were in the green bud stage. Specifically, the covers were removed on August 9_____ and July 28 for the tunnel and outside trials. None of the plants showed virus symptoms of leaf distortion and lack of flowering, although some plants were lost due to wilt in both plantings.

Table 3. Yield and yield components as well as first harvest dates of four aster varieties grown in both tunnel and in the field in 2006.

Name and (Source)	Stem length, cm[z]		Stems per plant		First harvest date	
	Tunnel	Outside	Tunnel	Outside	Tunnel	Outside
Hulk (Benary)	62	63	1.0	1.0	Sept. 5	Sept. 5
Princess Form. Mix (Johnny's)	70	58	1.5	2.4	Aug. 30	Aug. 25
Matsumoto Form. Mix	58	40	1.1	4.0	Aug. 21	Aug. 11
Compliment Form. Mix	59	42	1.1	3.8	Aug. 26	Aug. 11

Fig. 5. Aster (*Callistephus chinensis*) variety Hulk in the field trial. Very few branches formed on these plants that could be harvested separately.

In the tunnel, the plants produced only a strong central stem, with branches too short to be harvested separately (Table 3). In the field, the sideshoots were more pronounced, and contributed to yield, although as a result, average stem length was reduced. The Matsumoto and Compliment varieties flowered first, and produced the most branches. Complement was very nice producing flowers in a spray. The new variety Hulk produced an unusual flower, with much reduced petal length (Fig. 5). Relatively late flowering, it had good stem length and stem strength, but produced no basal branches. This variety was difficult to use in arrangements. It's flower head and stalk were large and not particularly attractive.

CELOSIA: This trial of 5 varieties was grown both in the high tunnel and in the field. The tunnel experiment was sown April 26 and transplanted May 25, while the field experiment was sown May 15 and transplanted June 9. Plants were spaced 9 x 9in., with 24 plants per plot in two replications in each location.

Plants performed similarly in the tunnel and outside, with only a week's delay in first harvest date when growing outside (Table 4). Yields and stem lengths were also quite similar in the two locations.

There were considerable differences among varieties in the trials. Bombay Firosa produced only one central stem and no side shoots. Unfortunately, the main inflorescence was an ugly pink to blush green, and consisted of unsightly welts and nubbins instead of large smooth combs. Several plants in each planting were judged too ugly to warrant harvesting (Fig. 6). The two Cramer's varieties produced medium sized combs of good stem length, with smaller side shoots that were also attractive. Temple Belle New Scarlet is an attractive, productive cockscomb type with dark red comb color. Comb width was comparable among these three varieties: about 4.5 cm. Startrek Lilac is

a plume type celosia that produced many stems of an attractive purple color (Fig. 7). Stem length was similar to Temple Belle New Scarlet.

Table 4. Stem length, yield and first harvest date for five celosia varieties grown in the tunnel and field in summer 2006.

Name and (Source)	Stem length, cm		Stems per plant		First harvest date	
	Tunnel	Outside	Tunnel	Outside	Tunnel	Outside
Bombay Firosa (Kieft)	53	57	1.0	1.1	July 19	July 26
Cramer's Burgundy (Gloeckner)	59	--	6.0	--	July 19	--
Cramer's Lemon Lime	64	66	5.0	5.6	July 19	July 26
Temple Belle New Scarlet	42	47	11.9	10.0	July 19	July 26
Startrek Lilac	43	50	15.2	14.7	July 19	July 26

Fig. 6. Bombay Firosa in the tunnel trial. Many plants had smaller and more misshapen heads than this one.

Fig. 7. The plume-type celosia Startrek Lilac in the tunnel trial.

CLEOME: This trial was conducted only in the field. Plants were sown in the greenhouse March 29, and transplanted May 24. Flowering started mid-June for the Sparkler series varieties, but continued through summer and into the fall. Although two of the Sparkler series produced a large number of stems, stem length was rather limited, and our staff complained about the presence of spines on the stems and leaves, making harvesting unpleasant. Value of the blooms as cut flowers was also limited, because petals tended to shatter after 5 days in the vase.

Table 5. Yield, stem length and first harvest date of four cleome varieties grown in the field at 12 x 12 in. spacing, with 21 plants per plot, in two replications.

Name and (Source)	Stem length, cm	Stems per plant	First harvest date
Rose Queen (Agway)	54	16	June 22
Sparkler Blush (Goldsmith)	38	16	June 20
Sparkler Lavender	36	24	June 14
Sparkler White	34	24	June 12

DIANTHUS: The trials compared the new ‘Sweet’ line ‘Sweet Scarlet’ with two standard dianthus cultivars. As the results in Table 6 indicate, Sweet Scarlet is about 10 days to 2 weeks earlier than the Amazon Neon lines, and nearly 10% shorter. The variety is an attractive bright red color that makes an interesting addition to a bouquet, and is worth growing.

Although the seeds for both trials were sown March 13, first harvest dates were slightly earlier in the tunnel, and there were fewer stems per plant. Plants tended to be slightly more productive in the field than in the tunnel, but stem lengths were comparable.

Table 6. Stem length, stems per plant and first harvest date for three dianthus varieties, transplanted to the tunnel and the field on May 10 and May 8, respectively.

Name and (Source)	Stem length, cm[z]		Stems per plant		First harvest date	
	Tunnel	Outside	Tunnel	Outside	Tunnel	Outside
Sweet Scarlet (Pan American)	43	40	13.2	16.2	June 23	June 23
Amazon Neon Purple (Harris)	47	49	10.2	11.6	July 5	July 10
Amazon Rose Magic (Harris)	44	47	10.9	11.0	July 5	July 7

ORNAMENTAL GRASSES: Seeds were sown for the two trials on March 7 and May 4 for high tunnel and field, respectively. They were transplanted May 10 and June 9. Spacing in both locations was at 12 x 12 inches, with 21 plants per variety in each of the two replications.

'Ruby Silk' flower heads were attractive in texture and color, and make a good filler in the vase (Fig. 8). Unfortunately, plants in the tunnel lodged even before the first harvest, so that harvesting became very difficult. In addition the thin stems of this species, and their close association with the leaves add to harvest difficulties. Lodging was also prevalent in the field planting. Cutting back the plants in the tunnel in late July allowed harvests to be resumed in late August, into the fall.

'Northern Sea Oats' is a perennial, and took until early September to produce a few flowers in the tunnel and outside (Table 7). Stem length was probably less than would be expected from a perennial after several years growth. Nevertheless, the flower heads are attractive in arrangements.

'Feathertop' made good growth of stems and started flowering in early July. It continued flowering all summer long, and the delicate flowers were excellent fillers in bouquets (Fig. 8). The plants unfortunately produced a massive root and stolon system by fall, which was very difficult to remove from the field.

Fig. 8. ‘Feathertop’ pennisetum (left) and ‘Ruby Silk’ ornamental grass in the tunnel variety trial, as photographed on July 6, 2006.

The two millet varieties produced flowering heads early, and then stopped producing any more. ‘Highlander’ has dark green to black seedheads, which might be attractive for some uses, but stem length and productivity are limiting. ‘Lime Light’ seed heads were taller and a more attractive bright green, but most plants only produced one flowering head. It was difficult to know when the millets should be harvested, and earlier harvests than were done here might have increased productivity.

Taken overall, all five grasses had significant drawbacks, and do not fulfill the role of an easily grown and harvested ornamental grass for mixed bouquets. They do have potential especially as dried grasses Displays held up really well through winter, retaining color and not shedding..

Table 7 . Variety trial of 5 ornamental grasses grown in the high tunnel and in the open field at East Ithaca. 'Ruby Silk' was not completely harvested, so stems per plant for this variety is probably less than one third of the possible yield.

Name and (Source)	Stem length, cm[z]		Stems per plant		First harvest date	
	Tunnel	Outside	Tunnel	Outside	Tunnel	Outside
Ruby Silk *Eragrostis tef* (Cramer)	98	97	8.2	8.1	July 6	Aug. 1
Northern Sea Oats *Chasmanthium latifolium* (Johnny's)	63	48	4.2	0.6	Sept. 5	Sept. 8
Feathertop *Pennisetum villosum*	80	67	33	34	July 6	Aug. 9
Highlander millet *Setaria italica*	70	54	3.5	5.9	June 9	July 10
Lime Light millet *Setaria italica*	84	88	1.2	0.9	June 28	Aug. 7

LISIANTHUS: Seeds were sown on Feb. 27 for both the tunnel and field trials. Because the tunnel was occupied by the early sunflower trial, the lisianthus could not be planted in the tunnel until June 27, by which time the plants were quite root-bound. In contrast, the field planting went in on June 2, and grew vigorously all summer.

The yield results from the trials reflect the health of the seedlings at transplanting (Table 8). With exception of the control variety Echo Champagne, stem yields were twice as high in the field as in the tunnel, and stem length was also superior in the field.

Of the varieties in the trial, ABC 2-3 Green had attractive double petals, adequate stem length, but the stems tended to lean. No netting was provided to support the stems, but it would have helped with this variety. ABC White GX12444 has attractive ruffled petals and a pure white flower color (Fig. 9). ABC 3-4 Rose has white petals with faint pink ruffled edges. The Laguna lines have single flowers and stronger, more erect stems than the doubles. Of these, Laguna Purple is relatively short, with attractive dark purple flowers, striped in the bud. Laguna 2-4 Blue Rim has a dark eye, but streaks of color running out from the center make the flower look muddy. (My assistant Liza White: I disagree, to me these did not look at all muddy and I thought that they were the most beautiful lisianthus we grew.) So take your choice. Laguna 2-4 Yellow is a yellowish green color and good stem length. Echo Champagne continues to produce early flowers of medium height. Its yellow blush color deepens to pink as the flower ages. The relatively short length of the main stem invites the possibility of pinching to get earlier production of the lower branches. This will be tested in 2007.

Table 8. Plant yield and stem length, as well as first harvest date for seven Lisianthus varieties grown in both an outside and a high tunnel trial in 2006.

Name and (Source)	Stem length, cm[z]		Stems per plant		First harvest date	
	Tunnel	Outside	Tunnel	Outside	Tunnel	Outside
ABC 2-3 Green (Pan American)	48	52	1.1	3.8	Aug. 15	July 27
ABC White GX12444	44	47	2.6	3.2	July 27	July 26
ABC 3-4 Rose	53	56	1.2	2.0	July 30	July 31
Laguna Purple EX02026	37	37	2.7	4.4	July 31	July 25
Laguna 2-4 Blue Rim	45	44	1.4	3.6	July 31	July 27
Laguna 2-4 Yellow	49	52	2.3	3.3	July 31	July 27
Echo Champagne (Johnny's)	39	41	3.8	2.5	July 24	July 18

Fig. 9. ABC White GX12444 (left) and ABC 2-3 Green in the field lisianthus variety trial in 2006. Picture taken on Aug. 14.

ORNAMENTAL PEPPERS: Seeds for the tunnel and outside trials were sown on May 4, and transplanted to the tunnel on July 3, and to the field June 28. Plants were transplanted into a 12 x 12 in. spacing in the field and tunnel, with 15 plants per plot.

In the relatively cool cloudy weather of 2006, plants made slow growth, and would have benefited from an earlier planting date, even in the tunnel. At the time of harvest, most plants had some immature fruits, whereas the earliest ones had attained the mature color.

'On Top Candles Red' has thin elongated erect fruits, borne in bunches at the tips of the main stem and branches. The main stem tends to be shorter than the basal branches, suggesting that pinching the main stem would be of advantage. Plants were productive, but slightly later than others in this trial (Table 9). 'On Top Round Bronze' and 'On Top Round Red' were similar to each other in plant stature and fruit shape and size, with round to slightly pointed fruits ca. 2-3 cm diameter when mature (Fig. 10, upper). Fruits are black and attractive when immature; the mature rusty red color of 'Bronze' and the shallow cracks in the fruit skin detract from their appearance.

'Nippon Taka' resembles 'On Top Candles Red' in many respects, except that it is slightly earlier and taller than the latter. 'Pumpkin-on-a-Stick' is actually a relative of eggplant, forming small ribbed fruits on the main stem and lower branches. Unfortunately, the variety we grew is quite spiny, on the stems, fruit pedicel and both leaf surfaces, making harvesting and weeding around it a challenge. The bright orange fruits, resembling miniature pumpkins, are quite attractive, and hold their color and shape well after the plant has been harvested (Fig.10, lower). As a whole, this category of fruiting ornamentals roused considerable interest among the general public, and deserves to be more widely grown and publicized. All of the peppers and eggplants also dried well and retained their color well. They did wrinkle some but this was not unattractive. They work well with the dried Sea Oats, Ruby Silk and Feather Top.

Table 9. Yield and yield components, and date of first harvest of four varieties of ornamental peppers and one ornamental eggplant, grown in the high tunnel and outside in summer, 2006.

Name and (Source)	Stem length, cm[z]		Stems per plant		First harvest date	
	Tunnel	Outside	Tunnel	Outside	Tunnel	Outside
On Top Candles Red (Gloeckner)	46	44	7.1	9.2	Oct. 19	Oct. 14
On Top Round Bronze	56	54	5.0	--	Oct. 13	Oct. 11
On Top Round Red	50	43	7.2	6.1	Oct. 13	Oct. 11
Nippon Taka (Johnny's)	50	49	7.0	7.5	Oct. 12	Oct. 11
Pumpkin-on-a-Stick *Solanum integrifolium*	87	84	2.0	3.6	Oct. 13	Oct. 11

Fig. 10. ‘On Top Round Red’ (upper picture, foreground), and ‘Nippon Taka’ in the tunnel variety trial of ornamental peppers. ‘Pumpkin-on-a-Stick’ (lower photo) close to harvest, showing fruits and spines on leaves.