# CUT FLOWER VARIETY TRIALS, ITHACA, NY, 2005

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**INTRODUCTION**: The 2005 Cut Flower Variety Trials were conducted at East Ithaca Gardens, both outdoors, and for some species, also in a high tunnel. Some of the varieties tested were supplied as part of the national cut flower variety tests conducted through the Association of Specialty Cut Flower Growers, and others were donated by a number of seed companies.

**MATERIALS AND METHODS**: The site for the cut flower research at East Ithaca has an Arkport sandy loam soil. It received two additions of compost, to a depth of 4 in., in fall 2003 and 2004. The compost was obtained from Cornell Farm Service, and was derived from food scraps and other organic matter. It was incorporated with a disk harrow shortly after application, and the land was then plowed in spring. Compost application in the high tunnel was made by hand, and incorporation by rototiller. In spring, a complete fertilizer was applied to the field in early May, at the rate of 100-21-42 (lbs/A N-P-K), using a 20-10-10 fertilizer. In the tunnel, 50 lbs/A N was applied on all beds before covering with plastic mulch, using calcium nitrate.

In the tunnel, beds were formed on 5ft. centers, were about 40 in. wide at the top, and 5 in. high, with a 15 in. walkway between beds. Two 'T-Tape' drip lines were placed on the surface of the soil on all beds, and the beds were covered with 5 ft. wide green (IRT) polyethylene mulch of 0.001 in. thickness. This material is somewhat transparent to infrared radiation, but prevents transmission of visible light, and thus discourages weed growth underneath. Beds outdoors had similar size and conformation.

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 in the field 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 a similar frequency of water application in July through August, but not earlier or late in the season (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 were applied to any of the trials in 2005. Weeds in the walkways were controlled by shielded sprays of Roundup, applied before the weeds became large.

**RESULTS AND DISCUSSION**:

Climatic conditions for the trials: After a relatively cool May, temperatures during most of the summer were higher than normal (Fig. 1). Fall conditions continued mild, with plants continuing to grow and yield into October, and not exposed to damaging frost until early November.

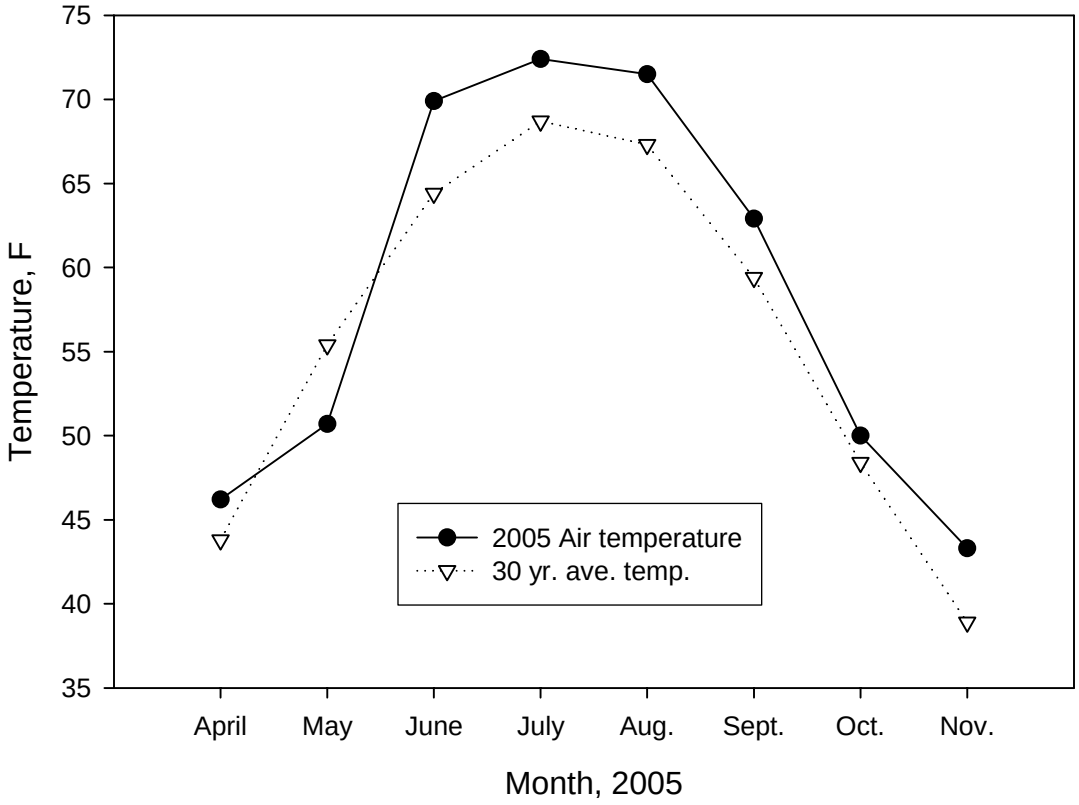


Fig. 1. Air temperatures at a nearby weather station, for the 2005 growing season, compared to the 30-year mean temperature at the same site. Source: Northeast Regional Climate Center.

Rainfall incidence was normal or above in April and June, but conditions were abnormally dry in May, and July through August (Fig. 2). Irrigation was essential for good plant growth during those months.

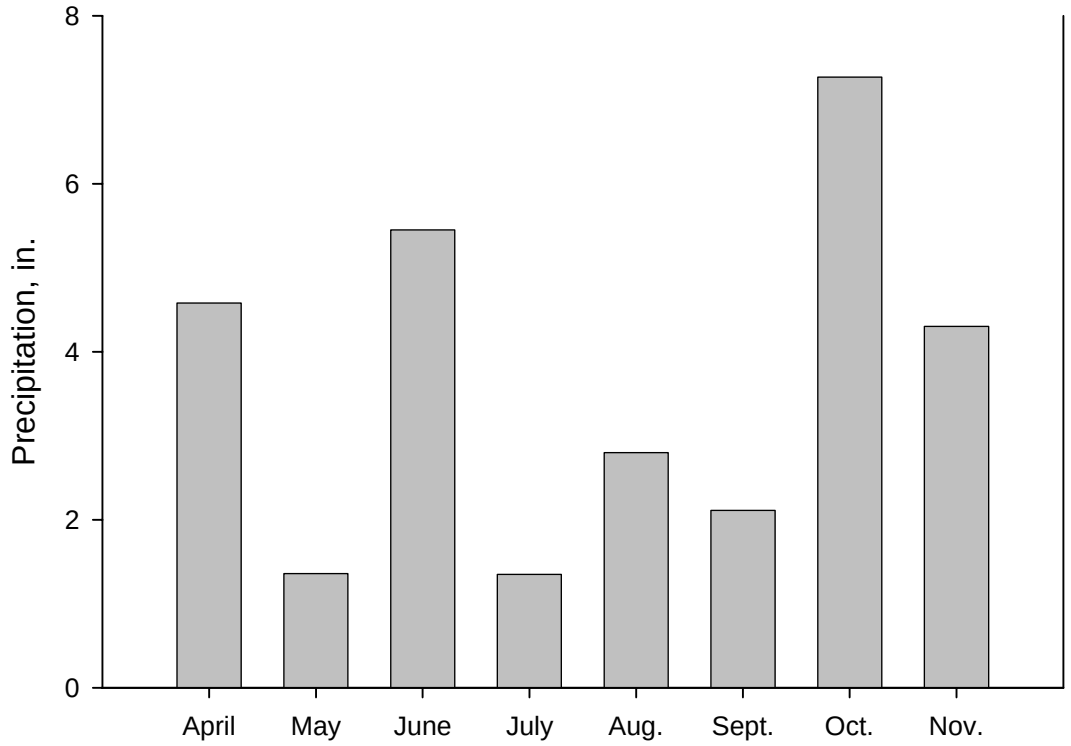


Fig. 2. Rainfall totals for the 2005 growing season at Ithaca, as measured at the Northeast Climate Center weather station.

Temperatures were also monitored in the high tunnel, compared to outside, and the temperature trends were similar to the previous year, with average tunnel air temperatures exceeding those outside by 3 to 5 F (data not shown).

The results for the individual species trials follow below. Those trials that were conducted in both tunnel and outdoors will be given first, followed by those that were carried out only in one location.

**DELPHINIUM**: Tunnel and outdoors trials were sown on Feb. 17 and March 2, respectively, and both were transplanted on May 19. The plants were spaced 12 x 12 in. on the beds, in 3 rows. There were a maximum of 18 plants per subplot, with 2 replications in the tunnel and outside. The most noteworthy aspect of the trial was the drastic decline in plant numbers during the summer (Table 1). By Aug. 11, only 67% of the plants remained alive in the tunnel trial, and only 48% of the plants in the outdoor trial. By Sept. 8, plant stand had declined further, to 36% in the tunnel, and 23% outdoors. The new hybrid varieties by PanAmerican, Takii and Sakata were especially badly affected, while Bellamosum, Belladonna and Oriental Blue showed more satisfactory survival. This decline in plant stand showed first as a yellowing of the developing leaves, and a browning and death of the root system. Plant death was more

pronounced outside, but also occurred in the tunnel, so that harvests of flowers were essentially completed by mid-August for the new hybrid varieties.

Table 1. Plant stand of 11 **Delphinium** varieties, planted in a high tunnel and outdoors. Average of two replications in both locations.

| | Plant stand, %. | |
|---|---|---|
| Name and (Source) | Aug. 11 | Sept. 8 |
| Aurora Blue (Takii) | 41 | 22 |
| Aurora Deep Purple | 61 | 32 |
| Guardian Blue (PanAm.) | 66 | 40 |
| Guardian White | 32 | 3 |
| Candle White Shades (Sakata) | 53 | 14 |
| Candle Lavender Shades | 34 | 10 |
| Candle Blue Shades | 57 | 28 |
| Candle Violet Shades | 30 | 17 |
| Belladonna Clivenden Beauty (Gloeckner) | 71 | 39 |
| Bellamosum | 90 | 45 |
| Oriental Blue | 96 | 74 |

As a result of the poor stand and plant health, stem numbers for many varieties did not exceed 1 in the outdoors trial (Table 2). Generally, plants grew taller in the tunnel, and produced more stems per plant. Many varieties were also significantly earlier in the protected environment of the tunnel.

The Aurora and Candle series appeared to have greater stem length than the Guardian series, and in the case of Aurora, to maintain that stem length when grown outside. The incidence of root disease outside may well have adversely influenced stem length of the plants in the outdoor trial.

All three of the modern hybrid series have single spike racemes, with closely packed individual florets. The Belladonna, Bellamosum and Oriental Blue varieties have a more branched, round inflorescence, useful as fillers in the vase. Limited preliminary postharvest trials indicated that the florets of the latter three varieties began to shatter by 4 days after harvest, while the modern hybrids lasted at least a week before petal fall began.

In summary, the modern hybrid varieties tested in this trial must be treated as annuals in our climatic conditions. In this trial, the high incidence of root disease (crown rot, *Sclerotium rolfsii var. delphinii*?) seriously affected productivity. The bellamosum types appear to have better longevity.

Table 2. Stem length, number of stems per plant, and first harvest dates for 11 **delphinium** varieties, grown in two replications, both outside and in a high tunnel.

| Name and (Source) | Stem length, cm | | Stems per plant | | First harvest date | |
|---|---|---|---|---|---|---|
| | Tunnel | Outside | Tunnel | Outside | Tunnel | Outside |
| Aurora Blue (Takii) | 76 | 72 | 1.7 | 1.0 | July 3 | July 8 |
| Aurora Deep Purple | 74 | 73 | 2.6 | 0.9 | July 1 | July 14 |
| Guardian Blue (PanAm.) | 64 | 51 | 3.0 | 1.3 | June 30 | July 1 |
| Guardian White | 66 | 56 | 2.6 | 1.1 | June 22 | July 8 |
| Candle White Shades (Sakata) | 85 | 82 | 2.0 | 0.9 | July 5 | July 18 |
| Candle Lavender Shades | 68 | 55 | 3.6 | 1.0 | June 20 | July 12 |
| Candle Blue Shades | 76 | 48 | 3.6 | 1.8 | June 28 | July 4 |
| Candle Violet Shades | 72 | 52 | 2.0 | 1.2 | July 3 | July 2 |
| Belladonna Clivenden Beauty (Gloeckner) | 66 | 46 | 4.0 | 2.8 | June 26 | July 4 |
| Bellamosum | 72 | 62 | 4.6 | 1.8 | July 5 | July 2 |
| Oriental Blue | 64 | 65 | 4.2 | 1.8 | July 8 | July 22 |

**LISIANTHUS, DOUBLE-FLOWERED**: Seeds for both the tunnel and outdoors trials were sown on Feb. 4, and transplanted on May 18. Plants were spaced 9 x 9 in., with 4 rows per bed and 20 plants per subplot.

Table 3. Stem length, stems per plant and first harvest dates for seven **double lisianthus** varieties grown in a high tunnel and outdoors in 2005. Figures are averages of two replications of 20 plants each, in each location.

| Name and (Source) | Stem length, cm | | Stems per plant | | First harvest date | |
|---|---|---|---|---|---|---|
| | Tunnel | Outside | Tunnel | Outside | Tunnel | Outside |
| ABC 2-3 Blue (PanAm) | 51 | 49 | 8.0 | 6.1 | July 16 | July 25 |
| ABC 2-3 Blue Rim | 45 | 43 | 6.4 | 4.2 | July 13 | July 22 |
| ABC 2-4 Yellow | 45 | 45 | 7.5 | 4.3 | July 15 | July 19 |
| ABC 3-4 Rose | 50 | 47 | 8.0 | 4.8 | July 16 | July 22 |
| Cinderella Ivory (Johnny's) | 42 | 39 | 9.0 | 6.8 | July 13 | July 19 |
| Cinderella Pink | 50 | 45 | 9.1 | 6.9 | July 12 | July 22 |
| Echo Champagne | 47 | 42 | 8.7 | 8.0 | July 11 | July 19 |

The 2005 growing season was an excellent one for growth and production of lisianthus. Plants produced nearly twice as many stems in both tunnel and outdoors trials as in the 2004 season, and the flower quality outdoors was much improved in 2005 because of the dry conditions. Production in the tunnel gave a consistent improvement of 7% in stem length compared to outside, while 37% more stems were produced by tunnel-grown plants. Plants grown in the tunnel reached first harvest date about 7 days sooner than those growing outside, even though they were both transplanted at the same time.

The ABC varieties were productive and attractive, and are worth growing again. Of particular interest were the blue and rose varieties, with their long stems and productivity, especially in the tunnel. ABC Blue had a full, large double rose bloom that flattened out as it matured. ABC Rose retained the rose bud shape longer, and had attractive ruffled petals. ABC Blue Rim aroused considerable interest among the public, and had stiff, upright stems, but its productivity was not as good as the other lines. Cinderella Ivory tended to produce a profusion of short branches set high up on the main stem, so that individual stem length was decreased. Echo Champagne combined exquisite color with good productivity, and is definitely worth growing again. Cinderella Pink was also relatively long-stemmed and productive. Postharvest life of all the lines was nearly 2 weeks, as would be expected of this species.

**TRACHELIUM**: Seeds for the tunnel and outdoors variety trials were sown on Feb. 17 and 23, respectively, and the plants were transplanted on May 9 and May 17. Plant spacing was 9 x 9 in. in 4 rows, with 20 plants per plot. There were two replications in each trial.

Trachelium responded more to the tunnel environment than any other species that we have tested so far (Table 4). On average, stem length was increased by 19% in the tunnel, while there was an increase of 44% in stems per plant. Tunnel culture also advanced first harvest date by 8 days.

Table 4. Stem length, stem number per plant and first harvest date of seven **Trachelium** varieties grown in a high tunnel or outside in 2005.

| Name and (Source) | Stem length, cm | | Stems per plant | | First harvest date | |
|---|---|---|---|---|---|---|
| | Tunnel | Outside | Tunnel | Outside | Tunnel | Outside |
| Devotion Blue Improved (Johnny's) | 38 | 34 | 21.8 | 14.6 | July 1 | July 15 |
| Devotion Purple Improved | 38 | 34 | 18.1 | 14.7 | July 10 | July 23 |
| Summer Dafne (Harris) | 44 | 36 | 17.0 | 14.2 | July 20 | July 26 |
| Summer Helios | 46 | 38 | 14.0 | 12.4 | July 20 | July 25 |
| Lake Louise Blue (PanAm) | 49 | 42 | 14.7 | 8.1 | July 20 | July 25 |
| Lake Louise White | 42 | 34 | 15.3 | 9.0 | July 20 | July 26 |
| Lake Louise Purple | 44 | 38 | 17.4 | 9.2 | July 13 | July 23 |

The two Devotion lines were significantly earlier than the rest of the varieties, but stem length was also significantly smaller. Among the main season varieties, the Summer series lines had adequate stem length and average productivity. The Lake Louise series varieties produced long stems, but in the field, plants tended to be less productive than in the tunnel.

Appearance of the flowers among the three series did not vary significantly. Both Summer Helios and Lake Louise White are a whitish-green color rather than pure white. Summer Dafne is a soft pink, while the color of the other varieties is as stated in the names.

Informal postharvest studies indicated that Trachelium can easily last 2 weeks in a vase, and we did not notice differences in this property among the varieties tested here. With its productivity, long vase life and attractive appearance as a filler flower in bouquets, Trachelium deserves to be more widely grown by cut flower producers of the Northeast.

**GODETIA**: Seeds for this trial were sown on Feb. 23, and seedlings transplanted to the tunnel on April 20. There was no corresponding trial for outdoor production. Standard spacings and plot sizes were used.

Table 5. Stem length, stems per plant and first harvest date of six **Godetia** varieties grown in a spring trial in the high tunnel.

| Name and (Source) | Stem length, cm | Stems/plant | First harvest date |
|---|---|---|---|
| Clarkia Mixed (Stokes) | 72 | 8.8 | May 13 |
| Tall Double Mix | 70 | 12.1 | June 24 |
| Apple Blossom (Thompson and Morgan) | 62 | 7.2 | May 13 |
| Flamingo White (Takii) | 54 | 12.9 | June 17 |
| Flamingo Rose Eye | 54 | 12.8 | June 17 |
| Flamingo Salmon | 60 | 12.0 | June 26 |

Two types of Godetia were featured in this variety trial: an indeterminate type, often termed 'Clarkia' by the trade, which produces a long central stem of about 100cm, and long basal branches, and a determinate type in which there is no central leader, but a number of stems are produced of roughly equal length. In this trial, the first 3 varieties are indeterminate, and the last 3 (Flamingo series) are determinate.

The flowers of the Clarkia Mixed and Apple Blossom are lacy, with narrow, frilly petals, while the other varieties have petals that are fuller and more rounded, forming a more solid calyx. Apple Blossom's petals are numerous and form a soft pink pom-pom. The other varieties have single flowers. All are unscented, and last one or two weeks in the vase.

All the varieties were quite productive, and stem length was adequate for use as cut flowers. The main stem of Clarkia Mixed and Apple Blossom could be harvested about a month earlier than the other varieties, but total stem production of these varieties might have benefited from a pinch of the main stem at about node 10, to allow the branches to develop earlier and to facilitate harvesting. Overall, Godetia (Clarkia) is a useful and productive plant for cut flower production in tunnels, when planted early in the spring.

A second planting was sown on May 2, and transplanted June 15. These plants grew well, but flowered early, so that stem length averaged 30 cm for the indeterminate and 20 cm for the determinate types. This could be indicative of a long-day reaction with regard to flowering, and will need to be checked out in controlled photoperiod experiments. Preliminary work at 80/70 F in a greenhouse indicated that Godetia is inhibited from flowering at such warm temperatures, and continues to grow vegetatively until the plants are transferred to cooler conditions.

**LISIANTHUS, SINGLE-FLOWERED**: This was an exploratory trial of 10 varieties, all supplied by PanAmerican Seed, and was planted only in the tunnel, in one replication of 20 plants per variety. Seeds were sown Feb. 4, and the plants were transplanted at standard spacing on May 18.

Table 6. Stem length, stem number per plant and first harvest date of 10 **single-flowered lisianthus** varieties grown in an unreplicated trial in the high tunnel. Data is averaged from 20 plants per plot.

| Name | Stem length, cm | Stems/plant | First harvest date |
|---|---|---|---|
| Laguna 2-3 Ivory | 47 | 9.4 | July 8 |
| Laguna 2-3 Rose Deep | 46 | 9.3 | July 13 |
| Laguna 2-3 Rose Rim | 42 | 11.2 | July 11 |
| Laguna 2-3 Bright Cream Blush | 36 | 6.1 | July 18 |
| Laguna 2-4 Green | 50 | 10.8 | July 13 |
| Laguna 3-4 Blue Blush | 50 | 7.4 | July 21 |
| Laguna 3-4 Blue Rim | 42 | 6.2 | July 15 |
| Laguna 3-4 Peach | 43 | 7.4 | July 18 |
| Laguna 4 Blue Deep | 47 | 9.0 | July 21 |
| Laguna 4 Rose Deep | 36 | 9.0 | July 18 |

The single lisianthus varieties tested in this trial were productive, and about 3 days earlier than the double varieties grown in the same tunnel. Of particular interest are the first three lines, and the Green variety, with their high productivity of relatively long stems, and relative earliness. The Blue Deep variety also stood out with its dark blue flowers, and spiral-striped buds, although it was the latest variety in the trial. Informal comparisons of vase life showed all to last about two weeks in tap water.

**SNAPDRAGON**: Since there was insufficient room in the high tunnel for this trial, it was only conducted outside. Seeds were sown in the greenhouse on March 21, and seedlings were transplanted on May 17. There were two replications of 20 plants for each variety, spaced 9 x 9 in. in four rows. The trial was supported by one layer of plastic netting to reduce lodging.

Table 7. Number of stems per plant, average stem length and first harvest dates for eight **snapdragon** varieties grown in an outdoor trial at East Ithaca Gardens in 2005.

| Variety name | Flowering group | Source | Stems/plant | Stem length, cm | First harvest date |
|---|---|---|---|---|---|
| Animation Deep Orange | 2 | Benary | 8.1 | 40 | June 8 |
| Animation Pink Impr. | 2 | Benary | 9.4 | 45 | June 8 |
| Animation Rose | 2 | Benary | 8.8 | 42 | June 11 |
| Animation Yellow Impr. | 2 | Benary | 8.4 | 50 | June 11 |
| Animation Velvet Red | 2 | Benary | 11.0 | 45 | June 12 |
| Overture Orange | 2 | Goldsmith | 8.0 | 46 | June 11 |
| Potomac Red Impr. | 4 | PanAmerican | 2.3 | 67 | July 2 |
| Charming White Impr. | 3-4 | Gloeckner | 3.2 | 52 | June 30 |

The prolonged warm temperature conditions of July and August were not favorable for production of snapdragons (Fig. 3). Harvests began in early to mid-June for the early (flowering group 2) varieties, followed by those classified as Group 4. No stems were produced by any variety from early August to the third week of September, when the Group 2 varieties again could be harvested. The Group 4 materials had a small late harvest, but were not as productive, and thus had an overall poor performance. The fast recovery from heat-induced cessation of flowering may make Group 2 varieties attractive for late season production in the field or in high tunnels. Data from the Flowering Group time-of-planting trials, described in the cultural practice trials results, confirm this supposition.

In addition to the information found in Table 7, Animation Yellow Improved had to be marked down for having the florets spaced wide apart on the spike. Overture Orange had a similar characteristic. Both dark red varieties, Animation Velvet Red and Potomac Red Improved, produced short flower stems on the main flowering stem just below the oldest florets, rendering many stems unmarketable. The other varieties had attractive colors, although stem lengths were often somewhat short for the cut flower trade. Comparisons with additional varieties can be made with the outdoor Snapdragon Plant Flowering Study that was transplanted on the same day, and was located in adjacent plots on the same beds (found in a subsequent report).

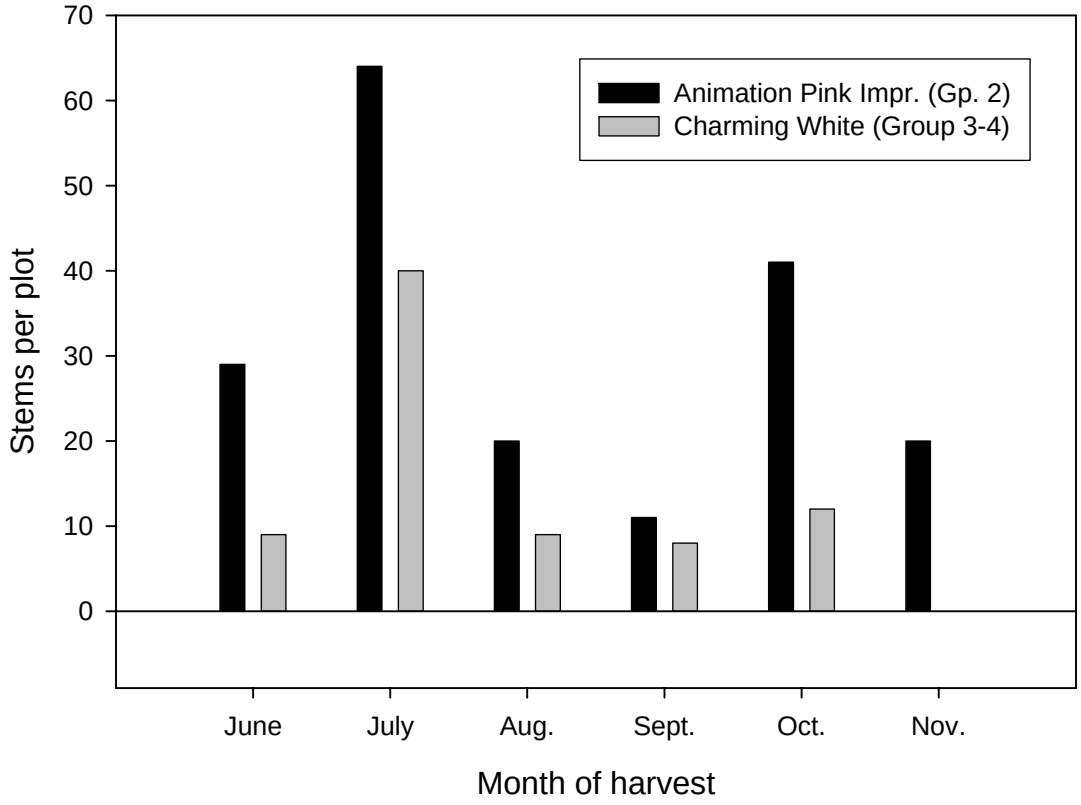


Fig. 3. Monthly harvest data for two snapdragon varieties in the trial, one a Flowering Group 2, the other a Flowering Group 3-4 variety.

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