

FROM: WELSH COLLEGE OF HORTICULTURE

FINAL REPORT: NATURAL SEASON CHRYSANTHEMUM PRODUCTION TRIAL 1990

TRIAL AIMS

1. To establish a programme for the production of American Beauty blooms, during the early November to early January period using a range of planting and blacking out dates.
2. To improve the flower quality of American Beauty blooms by using either an interrupted lighting schedule or single stem production.
3. To improve the flower quality of Ivy Garland blooms by using various plant spacings, rubbing treatment and interrupted lighting.
4. To compare the market performance of Ivy Garland and American Beauty in the November period.
5. To investigate the use of Bonzi and Cycocel as alternatives to Alar for the control of stem strength in American Beauty.
7. To screen a range of early and late flowering spray cultivars for the Christmas market using lighting and blackout to control the flowering date.

CROP CULTURE

Propagation:

Unrooted cuttings supplied by Frank Row and Southern Glasshouse Produce were rooted on site using boxes, 100 ml module trays and 5 cm blocks. All cuttings were rooted in blocking compost and planted three weeks after sticking.

Planting to flowering:

Soil preparation: Steam sterilisation was carried out and base dressing applied in accordance with ADAS recommendations for liquid fed crops.

Planting: Rooted cuttings were planted three weeks after sticking; box raised and module raised plants had the root ball complete buried whilst blocks were half buried. Plants were spaced as follows:

| | |
|-----------|------------------------------------|
| 7" x 7" | American Beauty (stopped crop) |
| 5" x 5" | American Beauty (single stem crop) |
| 10" x 10" | Ivy Garland, Treatment 1 |
| 8" x 8" | Ivy Garland, Treatment 2 |
| 9" x 9" | Spray cultivars |

All plots were 14' x 40" and each treatment replicated twice. The path width was 15".

Stopping: Carried out ten days after planting except for single stem production.

Rubbing out: When shoots were big enough to handle leaving two shoots on American Beauty cultivars and three shoots on Ivy Garland and all spray cultivars.

Liquid feeding: Stopping - End of September 200ppm N : 200ppm K
End of September - Flower colour 150ppm N : 200ppm K

Temperature control: Planting - end of September 16°c min. Vent 20°c
End of September - flowering 10°c min. Vent 17°c

Night break lighting: Tungsten filament, 100 lux, 11.00 p.m. - 1.00 a.m.

Blackout: Dense black plastic, 7.00 p.m. - 8.00 a.m.

Pest and Disease Control: Standard programme using Dichlorvos and Decis for WFT and Bravo, Rovral and Thiram for Botrytis.

Growth Regulator Treatment: American Beauty Cultivars Standard Treatment;
Standard treatment:
Alar: 0.125% ai buds visible
0.25% ai pre-disbudding
0.25% ai post-disbudding
0.25% ai ten days later.

Experimental:
Cycocel: i) 1000 ppm buds visible
" " pre-disbudding
" " post-disbudding
Cycocel: ii) 2000 ppm buds visible
" " pre-disbudding
" " post-disbudding
Bonzi: iii) 12 ppm buds visible
" " pre-disbudding
" " post-disbudding
Bonzi: iv) 25 ppm buds visible
" " pre-disbudding
" " post-disbudding

Spray Cultivars:
Alar 0.25% ai:
One spray pre-disbudding all cultivars
One spray post-disbudding all except Cream Elegance.

Ivy Garland:

Alar 0.25% ai pre-disbudding.

Alar 0.25% ai post-disbudding

RESULTS

1. Flowering date and flower quality in American Beauty cultivars.

The flowering date of American Beauty "White C" can be precisely controlled using blackout treatment. Treatment to produce blooms for the Christmas market has now been carried out for three seasons and the following production schedule has proved to be reliable:

Plant Week 31

Stop Week 33

Blackout weeks 36-38 (2 weeks)

Earlier flowering can be achieved using earlier blackout treatment, Table 1. All plants for early flowering on stopped plants should be planted four to five weeks before the start of the blackout treatment to allow the development of at least two inches of shoot growth prior to the start of short days.

Short day treatment at an earlier stage than this produces short stemmed blooms and restricts the use of Alar so increasing the proportion of blooms with weak necks.

TABLE 1

The effect of blackout treatment on the flowering date of American Beauty White "C":

| Plant Week | Blackout Treatment | Date of 50% Flowering |
|------------|--------------------|-----------------------|
| 27 | Weeks 31 - 38 | 8th November |
| 30 | Weeks 34 - 38 | 6th December |
| 30½ | Weeks 35 - 38 | 7th December |
| 31 | Weeks 36 - 38 | 14th December |

The flower quality of AB blooms was not adversely affected by blackout date provided sufficient time between planting and the start of short days was programmed. In 1988, blackout treatment Week 33-38 from a Week 31 planting produced a significant number of daisy eyed flowers. No daisy eyed flowering was seen in any of the treatments applied in 1990.

The use of interrupted lighting, starting 8 days after the start of short day treatment for a 10 day period had no significant effect on the number of blooms harvested or the proportion of blooms grade 24, Table 2. However the use of interrupted lighting did delay flowering by approximately 10 days.

TABLE 2 The effect of interrupted lighting

| Planting Date | Lighting Treatment | Date of 50% Flowering | % Blooms Grade 24 |
|---------------|---|-----------------------|-------------------|
| Week 27 | None | 8th November | 68 |
| Week 27 | Long days for 10 days starting 8 days after the start of short days | 16th November | 65 |
| Week 30 | None | 6th December | 31 |
| Week 30 | Long days for 10 days starting 8 days after the start of short days | 19th December | 30 |
| Week 30½ | None | 7th December | 24 |
| Week 31 | None | 14th December | 30 |

The use of Cycocel and Bonzi for the control of neck strength proved to be less satisfactory than the results obtained using Alar, Table 3.

The growth regulators had no effect on flower size and quality but some leaf marking occurred when Cycocel was applied at 2000ppm. Bonzi gave greater control of neck length than Cycocel but spraying to run off at full crop cover caused some soil contamination. Tomato seedlings raised in surface (top 1 inch) and sub-surface (1 inch - 4 inches) soil samples showed severe and persistent stunting.

All crop residue was removed prior to soil sampling and ground preparation for subsequent crops. We have also noted that the cut flower Lily crop planted on the Bonzi treated area shows no stunted growth.

TABLE 3 The effect of Growth Regulator treatment on neck length of American Beauty "C"

| Treatment | Neck Length |
|------------------------------------|-------------|
| Alar (standard programme 4 sprays) | 6 - 8 cm |
| Cycocel (3 sprays at 1000ppm) | 20 - 25 cm |
| Cycocel (3 sprays at 2000ppm) | 15 - 20 cm |
| Bonzi (3 sprays at 12ppm) | 14 - 16 cm |
| Bonzi (3 sprays at 25ppm) | 10 - 15 cm |
| No Treatment (1988 results) | 20 - 30 cm |

Single stem production using both white and yellow strains of American Beauty produced disappointing results from a Week 33 planting date, Table 4. Flower bud production in the single stem plants was less even than with the stopped plants planted in Week 31. The flower buds produced were also much smaller and surrounded by very large shoots supporting lateral buds. After disbudding the flower buds increased in size but the neck strength remained weak despite the use of Alar to control the neck length.

TABLE 4 The effect of single stem production on flower quality

| | White AB | | Yellow AB | |
|------------------------------|-------------|---------|-------------|---------|
| | Single Stem | Stopped | Single Stem | Stopped |
| % 24's | 7 | 19 | 9 | 12 |
| % 30's | 44 | 51 | 41 | 43 |
| Total Blooms (maximum 72) | 212 | 240 | 238 | 246 |
| % Weak Necks | 80 | 0 | 40 | 0 |
| Average neck length | 7-9cm | 6-8cm | 5-8cm | 5-8cm |

Wholesale market prices for American Beauty were higher than for other blooms cultivars during the November and Christmas period but the fact that supplies of AB's during November were limited may have contributed to this premium.

2. FLOWER QUALITY IN IVY GARLAND

Flower production and quality in Ivy Garland was less good than for White American Beauty "C", flowering on approximately the same date, Table 5. Flower quality was not improved by the use of interrupted lighting (10 days starting on the 21st September) and the length of shoot at rubbing 2" CF 4" also had no effect.

TABLE 5 Flower production in Ivy Garland compared with American Beauty

| | Blooms/m ² | % 24's | % 30's |
|--|-----------------------|--------|--------|
| Ivy Garland 3 shoots/plant 10" x 10" | 35 | 19 | 34 |
| Ivy Garland 3 shoots/plant 8" x 8" | 42 | 10 | 21 |
| American Beauty (White) 2 shoots/plant 7" x 7" | 54 | 32 | 42 |

3. THE EFFECT OF LIGHTING AND BLACKOUT ON A RANGE OF SPRAY CULTIVARS

Spray cultivars planted during week 30 were subjected to three lighting programmes:

| | | |
|-------------------------|---|------------------------------|
| Blackout | - | 30th August - 21st September |
| Natural Season lighting | - | No lighting or blackout |
| Lighting | - | 21st September - 1st October |

The blackout treatment successfully advanced the flowering date of late flowering cultivars, Table 6, and markedly improved the evenness of bud initiation (Medallion) and the shape of the inflorescence (Kingpin). The lighting treatment applied had little effect on the flowering date and noticeably reduced the number of lower buds which developed into flowers, Table 7, suggesting that the lighting treatment was applied at too late a stage of development.

TABLE 6 The effect of lighting and blackout treatments on the flowering date of a range of spray cultivars

| | Date of 50% flowering | | |
|----------------|--|-----------------------|---------------|
| | Treatment | | |
| | With nightbreak lighting 21st September/ 1st October | No day length control | Blackout |
| Neurosemary | 29th November | 24th November | |
| Teide | 18th November | 14th November | |
| Robeam | 19th November | 13th November | |
| Medallion | - | 27th December | 13th December |
| Kingpin | - | 16th December | 3rd December |
| Cream Elegance | - | 27th December | 16th December |

TABLE 7 The effect of lighting and blackout treatments on the spray quality of a range of spray cultivars

| Cultivar | Day length Treatment | Spray Production | | | |
|-------------------|---|------------------|----------|-----------------|-------------------------|
| | | Grade I | Grade II | Total No. Stems | Average No. Flower/Stem |
| Neurosemary | Natural Season | 105 | 100 | 230 | 5 |
| | Light 21st September/ 1st October | 113 | 68 | 223 | 6 |
| Teide | Natural Season | 182 | 54 | 256 | 10 |
| | Light 21st September/ 1st October | 195 | 19 | 248 | 8 |
| Robeam | Natural Season | 172 | 70 | 259 | 14 |
| | Light 21st September/ 1st October | 176 | 50 | 260 | 9 |
| Kingpin | Natural Season | 80 | 100 | 225 | 10 |
| | Blackout 30th August/ 21st September | 133 | 67 | 240 | 7 |
| Medallion | Natural Season | 81 | 75 | 211 | 6.5 |
| | Blackout 30th August/ 21st September | 129 | 70 | 200 | 6 |
| Cream Elegance | Natural Season | 81 | 130 | 233 | 8 |
| | Blackout 30th August/ 21st September | 117 | 105 | 243 | 10 |

4. The effect of the plant raising system on subsequent plant performance

The use of block and module raised plants produced no clear yield gain over the bare root plant material, Table 8. This has probably resulted from the use of blocking compost as the rooting medium throughout. The compost adhered to the roots at planting so minimising the degree of root disturbance incurred. It should also be noted that the bare root plants were plants straight from the rooting box. Planting rate and subsequent crop management are however effected by the type of plant material used. Block raised material is quicker to plant and the frequency of irrigation required immediately post planting is less with both block and module raised material than with bare root plants. Block raised plants also establish faster so plants are ready for stopping 5 -7 days after planting compared with the 10 day period required for bare root material to reach that stage of development.

TABLE 8

Spray Cultivars

| | % Grade I | | Total Production | |
|----------------|-----------|-----------|------------------|------------|
| | BLOCKS | BARE ROOT | BLOCKS | BARE ROOT |
| Neurosemary | 46 | 51 | 230 | 246 |
| Teide | 86 | 72 | 247 | 250 |
| Robeam | 66 | 70 | 270 | 249 |
| Medallion | 62 | 52 | 217 | 186 |
| Kingpin | 48 | 62 | 235 | 246 |
| Cream Elegance | 44 | 52 | 236 | 250 |
| <u>Average</u> | <u>58</u> | <u>60</u> | <u>239</u> | <u>239</u> |

American Beauty "C"

| Plant Week | % 24 | | | Total Production | | |
|----------------|-----------|-----------|-----------|------------------|------------|------------|
| | BLOCKS | MODULE | BARE ROOT | BLOCKS | MODULES | BARE ROOT |
| 27 | 65 | 66 | 69 | 250 | 227 | 213 |
| 30 | 30 | 32 | 27 | 236 | 236 | 231 |
| 31 | 19 | 19 | 18 | 235 | 260 | 225 |
| 33 | 6 | 3 | 9 | 208 | 224 | 205 |
| <u>Average</u> | <u>30</u> | <u>30</u> | <u>31</u> | <u>232</u> | <u>237</u> | <u>218</u> |

CONCLUSION

This trial, together with those carried out in 1988 and 1989, has shown conclusively that American Beauty blooms can be produced successfully in the North West and that the flowering date can be controlled precisely using blackout treatment. Further work, however, is needed to evaluate methods of improving flower size as a significant number of plants still produce "30" grade blooms. Single stem production may be a technique which has the potential to improve the flower grade out provided a planting date which will give good flower bud initiation can be established. Interrupted lighting is also a technique worthy of further investigation.

Alar remains the best method of controlling pedicel length and strength as Cycocel produces phytotoxic symptoms at the concentration required for greatest effect and Bonzi treatment leaves residues of unknown persistence and cumulative effect in the soil.

The use of block of module raised material improves the ease of establishment and may be a technique which can be used to shorten the production cycle by planting later and/or by stopping sooner after planting.

The use of blackout treatment on a range of spray cultivars demonstrated that a number of late flowering cultivars have potential for Christmas flowering and also that the inflorescence shape can be improved by using a positive onset of short day treatment.

Installation of nightbreak type lighting into a natural season programme requires little investment in material and labour so delaying the flowering of "early" flowering cultivars and the use of interrupted lighting are likely to be easily implemented. However the trials to date has shown that greater benefits/effects can be accrued by the use of blackout treatment. This form of treatment is relatively simple and cheap to install when each bed is covered manually but involves more expenditure on labour to implement the treatment. Blackout treatment of American Beauty cultivars is likely to be a viable proposition due to the premium price (150% approximately) raised by this cultivar on the wholesale market but the economics of advancing the flowering date of spray cultivars and improving spray inflorescence shape still by the use of blackout treatment needs careful consideration.