WELSH COLLEGE

OF

HORTICULTURE

FINAL REPORT 1992

PROJECT 19D

# NATURAL SEASON CHRYSANTHEMUM PRODUCTION

## CONTENTS

PROJECT NO. 19D PART 1.

AIM:

**To evaluate the need for blackout treatment in the production of White American Beauty for the Christmas market.**

INTRODUCTION:

Trials in previous years at the Welsh College of Horticulture have demonstrated that the flowering date of American Beauty can be controlled by the use of blackout treatment. However, for crops planted to flower for Christmas, the advancement of the flowering date is small in relation to the length of blackout treatment used. Blackout treatment on a Natural Season Chrysanthemum nursery is a tedious time consuming treatment so this trial seeks to investigate the necessity for the treatment.

MATERIALS AND METHODS:

Cuttings of White American Beauty, select strain, were rooted in blocks and planted three weeks after sticking. The house was steam sterilised prior to planting and fertilised according to ADAS recommendations for a liquid fed crop.

The treatments applied were as follows:

| Treatment No. | Plant Week | Stop after 10 days | Blackout 7.00p.m.-8.00a.m. 7th - 21st September |
|---|---|---|---|
| 1 | 28 | Yes | No |
| 2 | 29 | Yes | No |
| 3 | 30 | Yes | No |
| 4 | 31 | Yes | No |
| 5 | 31 | Yes | Yes |

Each treatment was replicated within the same house and all plants were rubbed out to leave two shoots per plant.

Alar was applied to control stem and neck strength, each plot receiving two sprays pre-disbudding and two sprays post dis-budding.

RESULTS:

Twenty flowering stems from each plot were selected at random and evaluated with regard to flower bud and pedicel characteristics, diagrams 1 and 2, and total number of leaves. Then the remainder of each plot was harvested and graded according to marketability.

TABLE 1.

The effect of planting date and blackout treatment on the flower bud development and leaf count in White American Beauty, select strain.

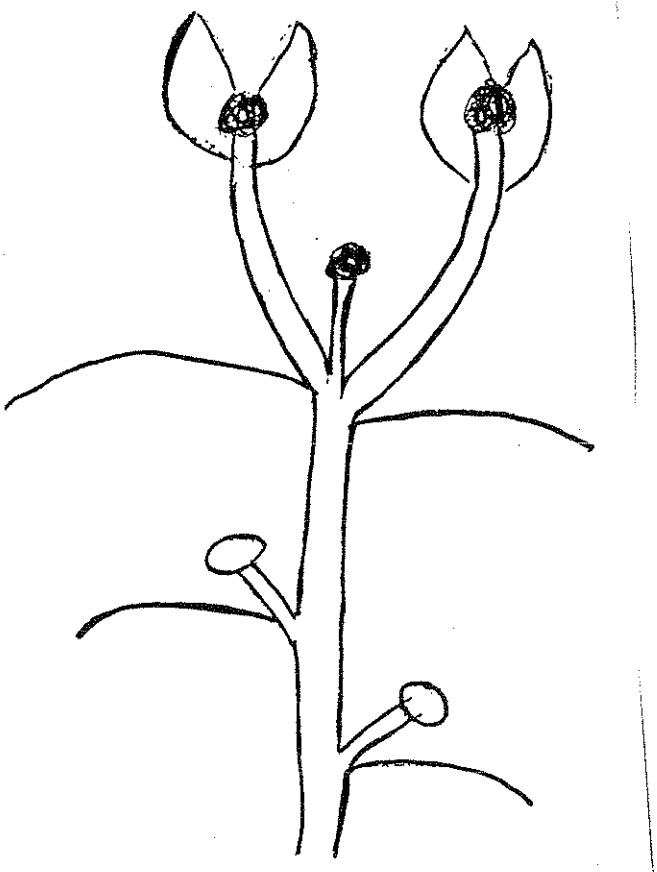
| | NO BLACKOUT | | | | BLACKOUT 7th - 21st September |
|---|---|---|---|---|---|
| | Plant weeks | | | | Plant week |
| | 28 | 29 | 30 | 31 | 31 |
| % Marketable 24's | 20 | 23 | 14 | 18 | 36 |
| Date 50% Flowering | 18th Dec. | 17th Dec. | 16th Dec. | 17th Dec. | 19th Dec. |
| Total No. leaves on stems with leaf No. buds | 31±2 | 32±2 | 29±2 | 26±1.5 | - |
| Total No. leaves on stems with short day buds | 30±3 | 32±1.5 | 28±2 | 26±1.5 | 25.5±0.5 |
| % Leaf Number buds | 85 | 45 | 52 | 3 | 0 |
| % Short Day buds | 15 | 55 | 48 | 97 | 100 |

DIAGRAM 1. Long day leaf no. (break) bud development.

**Pre-disbudding**

Note:

- Small terminal bud.
- Large lateral side shoots with bracts.
- Disbudding should be carried out as soon as possible.



**Post-disbudding**

Note:

- Terminal bud enlarges rapidly.
- Neck remains weak and thin above leaves.
- Large unsightly scars where side shoots were removed at disbudding.

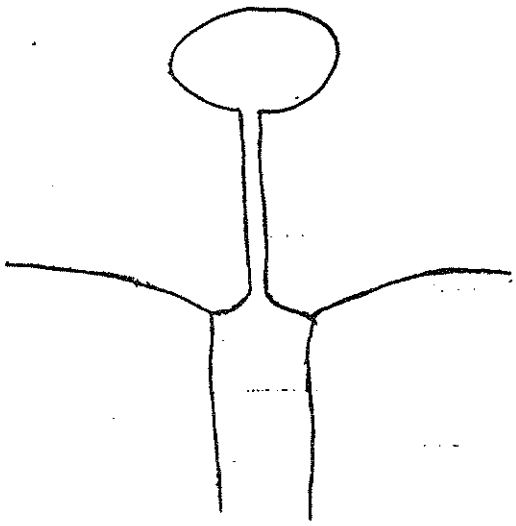


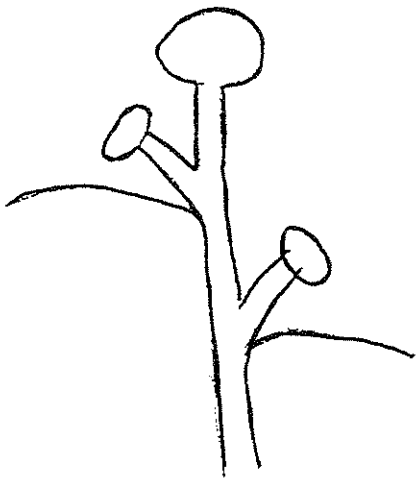
DIAGRAM 2. Bud development in short day conditions.

**Pre-disbudding**

Note:

. Larger terminal bud.

. Smaller lateral buds.



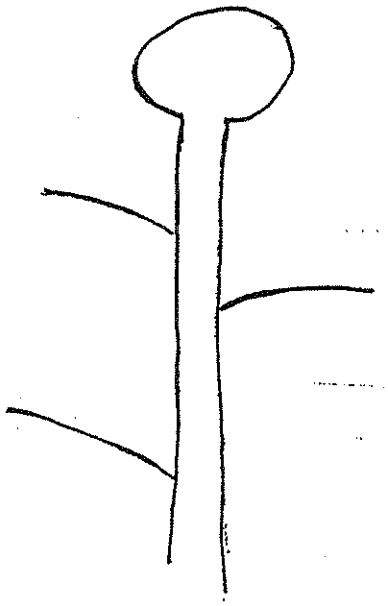
**Post-disbudding**

Note:

. Absence of large disbudding scars.

. Gradual tapering of stem thickness.

. Thickening of neck post disbudding.



The production of Long Day Leaf number buds (break buds) has an adverse effect on the percentage of the crop that can be marketed as good quality '24' grade. This results primarily from the quality of pedicel (neck) that this type of bud develops, Diagram 1., rather than from the effect on head sizes.

Blackout treatment reduces the incidence of long day leaf number buds, improves the uniformity of bud set and the percentage marketable '24' grade.

Planting date also affects the incidence of break bud production but has little effect on the percentage marketable '24' grade.

The number of leaves required for the initiation of flower buds in long days varies within the population but averaging at 31 + 2.

## CONCLUSION:

The production of American Beauty for the Christmas market is possible without the use of blackout treatment. However, this will be less reliable since the production of 'break buds' is likely to occur. Where plants are planted in week 31 production will be acceptable in some years, but in seasons where rapid growth occurs in August and early September 'break buds' will be produced. Planting later than week 31 could avoid this problem but in this case flower production, in seasons of slow growth, will occur on smaller plants resulting in small, hollow blooms on short stems.

Thus the recommendation for production in the North West, based on trials work at the Welsh College of Horticulture remains to plant rooted cuttings in week 31, stop the plants 10 days later, then blackout 7th - 21st September. This programme produces good quality blooms on stems of acceptable length within $\pm$ 7 days of the Christmas market where the crop is grown at 10 degrees C. post flower bud production. Minor adjustment can be made to this temperature ($\pm$ 2 degrees C.) in early November to accommodate seasonal variation, so ensuring that the crop meets the Christmas market.

PROJECT 19 D PART 2

Aim: **To investigate the potential for using negative DIF to control the neck length and strength in Natural Season Bloom Chrysanthemum Cultivars for Christmas flowering.**

## Introduction:

The production of 'good quality' chrysanthemum blooms of certain cultivars requires considerable use of Alar to control the stem and neck length and strength. This takes time to apply, needs careful timing of application and is never a popular task. There is also the additional problem that the use of Alar is already prohibited on edible crops which may eventually lead to the product becoming unavailable for either safety or economic reasons. With this in mind growers are aware of the need to find alternative methods of controlling stem and neck extension growth. Negative temperature differential has been shown to restrict extension growth in a number of species and this trial aims to elucidate its effect on Natural season bloom Chrysanthemums. A jump, drop programme was selected to minimise the cost of heating at night (most natural season crops are grown without thermal screening) and the treatment was withheld until 1st October to allow the completion of bud formation which requires a night temperature of 16 degrees C.

## Materials and Methods:

Unrooted cuttings of various natural season bloom cultivars were rooted in 5cm. biscuit blocks and planted three weeks after sticking. The cultivars and planting weeks used were as follows:

| | |
|---|---|
| White American Beauty (Select strain) | Plant week 31 |
| Yellow American Beauty | Plant week 31 |
| Crimson Shoesmith Salmon | Plant week 29 |
| Yellow Shoesmith Salmon | Plant week 29 |
| Fred Shoesmith | Plant week 30 |

The production house was steam sterilised prior and fertilised in accordance with ADAS recommendations for a liquid fed Chrysanthemum crop, prior to planting.

Rooted cuttings were planted at 7" x 7" spacing, stopped 10 days after planting and rubbed out to leave two shoots per plant.

**Treatments were applied as follows:**

**Temperature regime:**

Planting - 1st October 16° C Night 16° C Day 18° Vent

DIF Regime 1st October - Flower colour
Night to 2 hours before dawn 10° C
2 hours before dawn - dawn 17° C
dawn - 2 hours after dawn 8 - 10° C
Day ambient minimum 8° C
vent 12° C

Control - 1st October 10° C Night 10 - 12° C Day Vent 16° C
(with 5% continuous vent at all times).

Alar programmes used:

Shoesmith Salmon Cvs.

| | |
|---|---|
| Treatment 1 | No Alar |
| Treatment 2 | 2 sprays 1250 ppm. pre disbudding and post disbudding |

Fred Shoesmith

| | |
|---|---|
| Treatment 1 | No Alar |
| Treatment 2 | 1 spray pre disbudding 2500 ppm. |
| Treatment 3 | 2 sprays, pre disbudding and post disbudding, 2500 ppm. |

Yellow American Beauty

| | |
|---|---|
| Treatment 1 | No Alar |
| Treatment 2 | 1 spray pre disbudding 2500 ppm. |
| Treatment 3 | 3 sprays, 1 pre disbudding and 2 post disbudding 2500 ppm. |

White American Beauty

| | |
|---|---|
| Treatment 1 | No Alar |
| Treatment 2 | 2 sprays 1 pre disbudding and 1 post disbudding 2500 ppm. |
| Treatment 3 | 4 sprays alar, 2 re disbudding 1250 ppm and 2500 ppm and 2 post disbudding 2500 ppm. |

No day length control or carbon dioxide enrichment was given to any treatment.

Each treatment was replicated within the same house and the crop drown in accordance with standard practice for a crop of liquid fed Natural Season blooms for the Mid-late December market.

**Result**

At harvest 10 stems were selected at random from each plot and the following facets measured to assess the effect of the negative temperature differential ('Jump Drop') programme:-

- Neck length: - last to leaf to flower base
- Head diameter
- Head weight
- No leaves - from 60cm. trimmed stem
- Weight leaves from 60cm. trimmed stem

The remainder of the flowers harvested were graded, according to head size, into 24's, 30's and bunch.

**Table 1.** The effect of negative temperature differential and Alar application on the quality, grade out and harvesting date of a range of Chrysanthemum bloom cultivars.

| | | Neck length | Head weight | Leaf Number 60cm. stem | Leaf Weight 60cm. stem | Percentage '24' grade | Date 50% Flowering |
|---|---|---|---|---|---|---|---|
| Crimson Shoesmith Salmon | Control 2 sprays Alar | 6cm. | 16g. | 19 | 36g. | 33 | 20th Dec. |
| | -ive DIF No Alar | 11cm. | 17g. | 12 | 28g. | 39 | 22nd Dec. |
| | -ive DIF 2 Sprays Alar | 9cm. | 17g. | 16 | 38g. | 24 | 29th Dec. |
| Yellow Shoesmith Salmon | Control 2 Sprays Alar | 5cm. | 19g. | 17 | 35g. | 38 | 15th Dec. |
| | -ive DIF No Alar | 11cm. | 20g. | 15 | 21g. | 24 | 20th Dec. |
| | -ive DIF 2 sprays | 7cm. | 26g. | 18 | 34g. | 41 | 25th Dec. |
| Fred Shoesmith | Control 2 sprays Alar | 4cm. | 37g. | 20 | 24g. | 48 | 10th Dec. |
| | -ive DIF No Alar | 11cm. | 39g. | 16 | 16.5g. | 48 | 7th Dec. |
| | -ive DIF 1 spray Alar | 5.5cm. | 42g. | 18 | 20g. | 73 | 10th Dec. |
| | -ive DIF 2 sprays Alar | 6cm. | 42g. | 18 | 20g. | 54 | 10th Dec. |

| | | Neck length | Head weight | Leaf Number 60cm. stem | Leaf Weight 60cm. stem | Percentage '24' grade | Date 50% Flowering |
|---|---|---|---|---|---|---|---|
| White American Beauty | Control 4 sprays Alar | 5cm. | 24g. | 17 | 20g. | 26 | 16th Dec. |
| | -ive DIF No Alar | 19cm. | 26g. | 10 | 11.5g. | 44 | 15th Dec. |
| | -ive DIF 2 sprays Alar | 8cm. | 27g. | 15 | 18g. | 26 | 20th Dec. |
| | -ive DIF 4 sprays Alar | 6.5cm. | 24g. | 16 | 19g. | 26 | 21st Dec. |
| Early Yellow American Beauty | Control 3 sprays Alar | 7cm. | 27g. | 16 | 26g. | 22 | 16th Dec. |
| | -ive DIF No Alar | 13cm. | 24g. | 10 | 11g. | 65 | 12th Dec. |
| | -ive DIF 1 spray Alar | 6cm. | 25g. | 15 | 21g. | 41 | 16th Dec. |
| | -ive DIF 3 sprays Alar | 4cm. | 25g. | 16 | 22g. | 27 | 19th Dec. |

The results Table 1. show that there is a general pattern to the effects of temperature regime and alar spray programme:-

- Alar darkens foliage, shortens neck length and in the case of American Beauty affects flower size but not head weight.
- The negative temperature differential has had some effect on the neck length and strength and could in most cases reduce the number of Alar sprays needed but not replace the use of Alar.
- The date of flowering is delayed by the use of Alar and the negative DIF programme.
- Head weight and leaf size are not adversely affected by negative DIF.
- Leaf configuration (downward cupping) was not apparent in any of the cultivars in the negative DIF treatment plots.

## Conclusion

A negative temperature differential programme has the potential to reduce or replace the use of Alar for control of neck length and strength in bloom chrysanthemums. However further work is necessary to elucidate the exact temperature programme required and the appropriate time to start and finish the programme. Attention will also need to be given to the delay in flowering date observed in this trial. This delay resulted in a significant proportion of the Shoesmith Salmon crop missing the Christmas market. The delay occurred in all cultivars and was surprising since the two temperature regimes used have the same average 24 hour temperature. Terminating the negative differential at an earlier date may have alleviated this problem. Growers may also find that the mixture of cultivars which can be grown using the same temperature programme is restricted as bud initiation and development did not occur at the same time in the range of cultivars used in this trial. Stem strength was not a problem in any of the cultivars or treatments in this trial but with cultivars where this is a problem the effect of -ive DIF on bud initiation and development will also need to be evaluated if -ive DIF is to replace the use of early pre disbudding sprays of Alar.

## PROJECT NO. 19D PART 3

### Aim

**To compare the inputs and yields from a number of methods of producing Natural Season Chrysanthemums.**

### Introduction

Increasing financial pressure on growers of Natural Season Chrysanthemums has resulted in the need to increase yield, reduce imputs, investigate and develop niche markets. This trial investigates the inputs and potential returns from a number of methods of producing Natural Season bloom and spray.

### Materials and Methods

Cuttings, rooted in blocks, were planted in late July and grown as liquid fed crops.

The temperature regimes used were as follows:-

| | Night | Day | Vent | |
|---|---|---|---|---|
| Planting – Early October | 16 c | 16 c | 18 c | |
| then | | | | |
| Early October – Flowering | 10 c | 12 c | 15 c | November flowered crop. |
| Early October – Early November | 10 c | 10 c | 15 c) | December flowered crop |
| Early November – Flowering | 12 c | 12 c | 15 c) | |

Cultivars used and cultural treatments applied are shown in Tables 1 and 2.

Alar was applied as necessary to some cultivars to control the stem strength.

## Results

Flowers from each plot were assessed in relation to both quantity and quality. Sprays were graded according to stem strength and numbers of flowers and sleeved as follows:-

| | | |
|---|---|---|
| Large Sprays | > 6 open flowers | 4 per sleeve |
| Medium Sprays | 5-6 open flowers | 5 per sleeve |
| Small Sprays | 4 open flowers | 6 per sleeve |
| Make up | < 4 open flowers | 10 per sleeve |

Blooms were graded into 24's, 30's and bunch grade.

The results obtained raise several points of significance:-

The choice of cultivar has a significant effect on, the number of shoots produced at at pinching, Table 4, and on the quality of flower spray produced, see observations on performance of cultivars. Yield/m2 (numbers of sleeves) is generally lower in December than in November, Table 3, and this reduction is more apparent in some cultivars; Yellow Reagan and Delta are of doubtful suitability for December flowers. Spray quality is also reduced in the later flowering trial, flowers of Teide, Momento, Dark Amore are very small and leaf loss in Malibu is a serious problem.

Of particular note, however, is the number of sleeves /m2 produced by stopped but not rubbed out crops of Dark Amore, Damark, Stoika, Jaguar, Momento, and Malibu. These cultivars produced flowers of very acceptable quality in November and have potential for use in a natural season production programme. One current problem with the technique of stopping and not rubbing out is the variability of spray size produced; each plant giving rise to l or 2 very large sprays, 1 or 2 medium sized sprays and 1 or 2 bunch grade. The need to grade the sprays slows down harvest and there is some market resistance to very large sprays. Market research (see customer comments), indicates that there is a demand for mixed wraps of small spray and these cultivars with their free branching habit may be ideal for this purpose provided greater uniformity of grade can be achieved.

The results obtained, Table 3, also indicate that plant costs can be reduced by pinching and rubbing out to leave two shoots per plant. This produced no loss of yield or quality when compared with single stem production in the six cultivars trialed.

The results for bloom production, Table 3, show that the total yield is similar for all three cultivars trialed. Customers are still prepared to pay a small premium, 20%-30%, for American Beauty so this remains an attractive cultivar to grow despite problems with low percentage "24" grade and the requirement for Alar and blackout treatment. Crop observation of the American Beauty does indicate that stock selection or cutting selection may have a role to play in improving the flower grade out, since "low" grade flowers are usually found as two stems from the same plant. Pinching technique may also need to be examined as a variable which could be involved.

TABLE 1. CULTURAL TREATMENTS - NOVEMBER FLOWERED CROP

| Cultivars | Planting Date | Spacing | Plants/m2. | Stopping | Rubbing Out | Disbudding | Day length Control |
|---|---|---|---|---|---|---|---|
| American Beauty | Wk. 29 | 7" x 7" | 31 | Yes | Yes to 2's | Bloom | Blackout Wk. 34 - 37 (4 weeks) |
| White Whitby<br>Yellow Whitby | Wk. 28 | 7" x 7" | 31 | Yes | Yes to 2's | Bloom | None |
| Pink Gin<br>Robeam<br>Teide<br>Yellow Reagan<br>Delta<br>Mundial | Wk. 29 | 8" x 8" | 24 | Yes | No | Spray | Night break light to Wk. 37 |
| Pink Gin<br>Robeam<br>Teide<br>Yellow Reagan<br>Delta<br>Mundial | Wk. 30 | 7" x 7" | 31 | Yes | Yes to 2's | Spray | Night break light to Wk. 37 |
| Pink Gin<br>Robeam<br>Teide<br>Yellow Reagan<br>Delta<br>Mundial | Wk. 32 | 5" x 5" | 61 | No | No | Spray | Night break light to Wk. 37 |
| Dark Amore<br>Momento<br>Malibu<br>Jaguar<br>Stroika<br>Damark | Wk. 29 | 8" x 8" | 24 | Yes | No | Spray | Night break light to Wk. 37 |

TABLE 2. CULTURAL TREATMENTS - DECEMBER FLOWERED CROP

| Cultivars | Planting Date | Spacing | Plants/m2. | Stopping | Rubbing Out | Disbudding | Day length Control |
|---|---|---|---|---|---|---|---|
| American Beauty | Wk. 31 | 7" x 7" | 31 | Yes | Yes to 2's | Bloom | Blackout 7 - 21st September |
| Crimson and Yellow Shoesmith salmon | Wk. 29 | 7" x 7" | 31 | Yes | Yes to 2's | Bloom | None |
| Pink Gin Robeam Teide Yellow Reagan Delta Mundial | Wk. 33 | 8" x 8" | 24 | Yes | No | Spray | Night break lighting. Planting to end of Week 40. |
| Pink Gin Robeam Teide Yellow Reagan Delta Mundial | Wk. 33 | 7" x 7" | 31 | Yes | Yes to 2's | Spray | Night break lighting. Planting to end of Week 40. |
| Pink Gin Robeam Teide Yellow Reagan Delta Mundial | Wk. 35 | 5" x 5" | 61 | No | No | Spray | Night break lighting. Planting to end of Week 40. |
| Dark Amore Momento Malibu Jaguar Stroika Damark | Wk. 32 | 8" x 8" | 24 | Yes | No | Spray | Night break lighting. Planting to end of Week 40. |

TABLE 3: YIELD PER PLOT (4.4 m2)

| | | November flowering | | | | | December flowering | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Total Yield | % Sleeves 4's | 5's | 6's | 10's | Total Yield | % Sleeves 4's | 5's | 6's | 10's |
| **Sprays** | Yellow Reagan<br>Pink Gin<br>Robeam<br>Teide<br>Delta<br>Mundial | | | | | | | | | | |
| Stopped not rubbed | | 51 ± 5 | 26 | 47 | 16 | 10 | 38 ± 7 | 9 | 42 | 17 | 29 |
| Stopped rubbed | | 49 ± 5 | 35 | 49 | 5 | 11 | 34 ± 6 | 9 | 41 | 19 | 31 |
| Not stopped | | 50 ± 5 | 37 | 46 | 13 | 5 | 35 ± 8 | 9 | 37 | 19 | 26 |
| **Sprays** | Dark Amore<br>Damark<br>Momento<br>Malibu<br>Jaguar<br>Stroika | | | | | | | | | | |
| Stopped not rubbed | | 72 ± 10 | 40 | 36 | 12 | 12 | 45 ± 5 | 18 | 39 | 17 | 28 |
| **Blooms** | | | | | | | | | | | |
| American Beauty | | 250 | 40 | 40 | | | 240 | | 36 | 45 | |
| Shoesmith Salmon | | - | - | - | | | 230 | | 50 | 40 | |
| Whitby | | 260 | 63 | 30 | | | - | | - | - | |
| | | | % '24' | %'30' | | | | | %'24' | %'30' | |

**TABLE 4** The effect of cultivar and planting date on the number of flowering shoots /m2 (24 plants/m2).

| | Plant Week 29 November Flowering | Plant Week 32 December Flowering |
|---|---|---|
| Pink Gin | 59 | 54 |
| Robeam | 58 | 57 |
| Teide | 55 | 48 |
| Yellow Reagan | 65 | 60 |
| Delta | 58 | 58 |
| Mundial | 61 | 68 |
| Dark Amore | 116 | 84 |
| Momento | 81 | 58 |
| Malibu | 85 | 74 |
| Jaguar | 72 | 72 |
| Stroika | 89 | 55 |
| Damark | 73 | 60 |

**Observations on performance of the individual cultivars**

**Pink Gin**
- flowers satisfactorily in November and December.
- produces relatively few small sprays flowers.

**Yellow Reagan**
- flowers satisfactorily in November, but does not appears to be suitable for flowering at low temperatures in poor light conditions.
- The December crop flowered very late (mid January) and produced a large percentage of small thin sprays.

**Teide**
- flowers satisfactorily in November and December although the flowers in December are inclined to be small and green tinged.

**Robeam**
- flowers satisfactorily in November and December.
- sprays are inclined to be large and look untidy in a sleeve.

**Delta**
- flowers satisfactorily in November but is less good in December when flowers are slow to open and the sprays thin and weak stemmed.

**Mundial**
- flowers very well and uniformly in November and December.
- Stems are strong but are very hollow in December.
- Harvesting at the correct time is important as the flowers are inclined to shatter.
- Single stem production compounds, but stopped production does not when programmed to flower in December.

**Dark Amore**
- sprays are of better quality in November than December.
- Late flowering results in weaker stems and small flowers.
- very prolific.

**Momento**
- flowers satisfactorily in November and December.
- Compounding produces many large branched sprays in December.

**Malibu**
- better in November than December.
- leaf loss in December is a serious problem.

/.....

**Damark**

- flowers well in November and December.
- looks attractive in a mixed sleeve.

**Stroika**

- flowers satisfactorily in November and December.
- very attractive red single with yellow eye

**Jaguar**

- satisfactory in November, but flowers in response to leaf number in December giving masses of weak thin sprays with small hollow flowers.

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**American Beauty**

- flowers equally well in November and December, but produces a relatively low grade out (approximately 40% 24's in 1992).

**Whitby**

- flowers well in November. Stem strength good and needs much less Alar than American Beauty.

Percentage grade out "24's"

White 57%
Yellow 69%

**Shoesmith Salmon**

- flowers well in December but needs Alar treatment for neck strength.
- Loss of flower colour in mature flowers is a problem in Crimson, Pink and Bronze cultivars.

## Customer Comments

**Blooms:** In all cases the preferred size is "24" grade.

**American Beauty:** Demand limited in 1992 by recession.

**Whitby:** General preference for American Beauty.

**Shoesmith Salmon:** Demand as great at Christmas as for American Beauty.

**Sprays** Preferred presentations:–

- five good quality stems per sleeve.
- sold as single colours for florists to sell by the stem.
- five good quality but smaller stems per "small" sleeve in mixed colours for florists to sell as a "bunch".

There is little demand for very large sprays and for poor quality weak stemmed sprays.

Reducing stem length from 60cm automatically reduces the price per bunch.

Mixed flower bunches are also not in demand as florists and the wholesale market prefer to make their own or buy Dutch.

## CONCLUSION

The results obtained indicate that there are several "AYR" type cultivars which have potential for production under natural season conditions. However, careful selection of cultivar is necessary as flower quality, compounding and vegetative regrowth as a result of low temperature can cause problems. The 1992 season had lower than usual solar gain in October and this did necessitate a change of night temperature from 10 c to 12 c to restrict vegetative regrowth in the December flowered trial.

Some of the cultivars trialed as a pinched crop have the potential to produce increased numbers of sleeves/m2 due to their free branching habit. These could be particularly useful if a niche market for small, mixed sleeve can be developed and an improvement gained in the uniformity of spray size produced.

For growers of spray for marketing in single colours as 5's, plant costs can be reduced by stopping and rubbing out to leave two shoots per plant.

In terms of gross returns, /m2 production of good quality blooms remains competitive with the production of sprays from single stem and stopped, rubbed out crops. However, the higher yield from some spray cultivars grown as stopped and not rubbed out crops make this production system an attractive option provided the marketing of mixed sleeves of spray and the problems of uniformity of spray production can be addressed satisfactorily.

PROJECT NO. 19D PART 4

AIM:

**To demonstrate the benefit of using supplementary lighting, post-planting, on AYR spray chrysanthemum crops in the North West.**

INTRODUCTION:

The quality of chrysanthemum spray produced in AYR programmes in the north west is poor in the period from December to March. Stems are short, weak and inclined to be hollow. Thus, the finished product is lightweight and fragile and does not compete well with imported produce at this time of year.

Work carried out at H.R.I. Efford and in Holland has established that crop quality can be improved by the use of supplementary light after planting and this trial seeks to demonstrate this potential for improvement and to quantify the benefit achievable in the North West.

MATERIALS AND METHODS:

Unrooted cuttings of six cultivars, Dark Delta, Cerise Delta, Copper Delta, Bright Yellow Delta, Coral Delta and White Reagan, were obtained from Southern Glasshouse produce and rooted in 5 cm biscuit blocks. All the cuttings received supplementary (high pressure sodium SON/T) lighting, 4000 lux, 16 hr. days during propagation and were planted 14 days after sticking.

Prior to planting, the house was steam sterilised and fertilised according to ADAS recommendations for a liquid fed chrysanthemum crop. Cuttings were planted in week one at 5 inches x 5 inches, 120 cuttings per plot with each treatment plot being replicated, giving 240 plants per treatment.

Lighting treatments were applied as follows:

Treatment 1

- No supplementary lighting using sodium (SON/T) lighting given after planting.
- Long days post planting given (for 18 days) with tungsten filament cyclic night break lighting.
- No interruption given.

Treatment 2

- No supplementary lighting (SON/T) given after planting.
- Long days post planting, tungsten filament, cyclic night break lighting, 18 days.
- Interruption given with tungsten filament cyclic night break lighting for 6 days starting 14 days after the start of short days.

Treatment 3

- SON/T lighting, 4000 lux, 16 hour day given for 18 days post planting.
- SON/T lighting, 4000 lux, 10 hour day given for the duration of short day treatment.
- SON/T lighting, 4000 lux, 16 hour day given for the duration of the interruption 6 days starting 14 days after the start of short days.

Treatment 4

- SON/T lighting, 4000 lux, 16 hour day given for 18 days post planting.
- SON/T lighting, 4000 lux, 10 hour day given for the duration of short day treatment.
- Interruption given 6 days starting 14 days after the start of short days using tungsten filament, cyclic night break lighting.

Temperatures post planting were as follows until late February:-

Night 16° C  Day 17° C  Vent 20° C

At this stage lack of crop height appeared to be a problem so the temperature regime was changed to:

Night 18° C  Day 17° C  Vent 20° C

CO2 enrichment was not practised and NO growth regulator chemicals were applied to any of the treatment plots.

**RESULTS:**

At harvest a random sample of 10 stems was taken from each plot and assessed as follows:

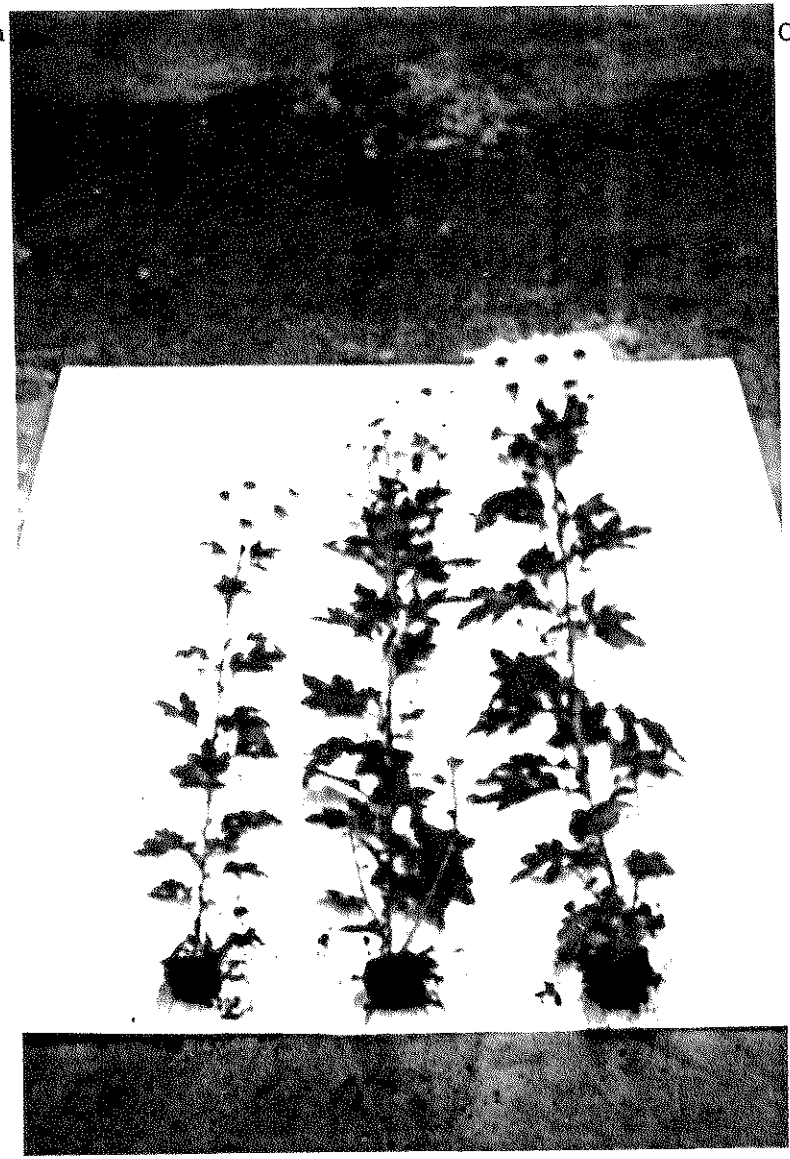
| | | |
|---|---|---|
| Total stem length | - | site of terminal bud to block length. |
| Stem weight | - | weight of spray, at harvest, trimmed to 65 cm length. |
| Number of leaves | - | number of leaves between propagation block and site of terminal bud. |
| Pedicel length | - | average length of top three pedicels. |
| Number of flower buds | - | number of buds which will open at flowering. |
| Flower size | - | average diameter of first three flowers to open. |

The remainder of the flowers from each plot were graded, as follows and the weight of five 'Class 1' wraps per plot noted.

| | | |
|---|---|---|
| Class 1 | - | 60 cm length.<br>5 flowers opening.<br>Reasonably strong stem. |
| Class 2 | - | 55 cm length.<br>3 - 4 flowers opening.<br>Reasonably strong stem. |
| Bunch | - | < 3 open flowers. |

PLATE 1 The effect of post-planting lighting on the quality of White Reagan and Copper Delta.

White Reagan



Copper Delta

| | | |
|---|---|---|
| LHS | Treatment 1 | No lighting |
| Centre | Treatment 2 | No lighting and tungsten interruption |
| RHS | Treatment 4 | SON/T lighting and tungsten interruption |

TABLE 1.

The effect of post planting lighting treatment of flower yield and quality

| | Wrap weight | Average stem length | Average weight Trimmed stems | Pedicel length | Flower number | Flower size | Number of leaves | Date of 50% flowering |
|---|---|---|---|---|---|---|---|---|
| Treatment 1<br>No supplementary lighting. | 217g | 60cm | 47g | 9.3cm | 6.6 | 7.3cm | 27 | 30th March |
| Treatment 2<br>No supplementary lighting.<br>Tungsten interruption. | 259g | 66cm | 56g | 12.0cm | 5.8 | 7.7cm | 27 | 11th April |
| Treatment 3<br>SON/T post-planting and for interruption. | 270g | 71cm | 58g | 11.0cm | 6.4 | 7.3cm | 30 | 4th April |
| Treatment 4<br>SON/T post planting.<br>Tungsten interruption. | 254g | 64cm | 52g | 10.9cm | 6.1 | 7.3cm | 29 | 4th April |

The use of supplementary (SON/T) light post planting improved the rate of growth after planting, giving a larger number of leaves at the time of flower initiation, Table 1 and advanced the flowering date by 7 days, Treatments 3 and 4 cf Treatment 2, Table 1. The lighting treatment also increased leaf size and the total plant size, Plate 1.

However, supplementary lighting treatment gave no advantage in the quality of the trimmed marketable product when compared with product which had received only interrupted lighting. The flowers produced from each plot were marketed to local retail outlets and the wholesale market where the heavier wraps produced by Treatments 2, 3 and 4 found a more ready demand but did not realise a higher price. None of the treatments affected the percentage grade out, there was no interaction between treatment and cultivar and all plants flowered within a period of $\pm$ 2 days of the date of 50% flowering for the treatment.

## CONCLUSION:

Although the quantity of supplementary light given in this trail is equal to or greater than that used in other trials, there was no notable benefit to crop quality. The shortening of the crop time by seven days will have some value but this is likely to be less than the capital cost of investment in lighting. The quality of crop produced using an interrupted light programme (Treatment 2) was equal to that produced on the same site in mid-December but was better than that produced in the early January - early March period. Supplementary lighting may have been of considerable benefit to crops programmed to flower during this period but on the basis of the results obtained in this trail is of limited value to later flowering crops.