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PROJECT TITLE: Evaluation of plant growth regulators as a method of controlling the vegetative growth of bedding primrose and polyanthus varieties grown under protection.

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RELEVANCE TO GROWERS AND PRACTICAL APPLICATION

APPLICATION

The objective of the trial was to evaluate a range of growth regulator treatments on a number of primrose and polyanthus varieties grown under protection.

The majority of the treatments consisted of different rates of Bonzi (paclobutrazol), from 0.5ml/l up to 2.5ml/l, applied at different plant growth stages. Applications of Dazide (daminozide) and New 5C Cycocel (chlormequat with choline chloride) were also examined.

All the treatments suppressed plant growth, altered plant habit and restricted the elongation of the flower stems to some degree. Most treatments also reduced flower number and flower size as well.

Despite some potential adverse consequences from using plant growth regulators, the beneficial effects are such that they have good potential for use in the commercial production of primroses and polyanthus.

SUMMARY

Primroses and polyanthus are a major winter bedding crop. No statistics are available, but it is estimated that at least 10 million primrose plants, (excluding polyanthus) were produced in the UK in 1994.

To prevent damage from harsh weather and frosts, most primrose and polyanthus plants are grown under protection. This often leads to excessive amounts of vegetative growth being produced.

This experiment was therefore designed to evaluate the possible use of plant growth regulators as a commercially acceptable method for the control of vegetative growth of primroses and polyanthus.

The treatments examined included five different Bonzi (paclobutrazol) programmes, with rates varying from 0.5ml/l up to 2.5ml/l, one Dazide (daminozide) programme and one New 5C Cycocel (chlormequat with choline chloride) programme.

All of the treatments examined reduced the amount of vegetative growth produced and altered plant habit to some degree. Growth parameters were reduced by varying amounts with maximum effects as follows;

- leaf length 30%
- plant diameter 25%
- plant height 40%
- flower stem length 46% (see Tables 11 and 12).

The treatments which produced the most consistent results were Dazide applied at 7g/l three times following plant establishment and Bonzi applied as a drench at 1.25ml/l (20ml of the solution per plant) immediately after potting. (This treatment was only applied to the guard plants, which included the primrose varieties Bicolour Leda, Bicolour Triton, Bicolour Calypso and Dania blue).

The Dazide treatment also produced another effect, by delaying flowering by up to two weeks.

The New 5C Cycocel and the other various Bonzi treatments produced more variable results depending upon plant variety. However, encouraging results were obtained from using Bonzi (at either 0.5ml/l or 1.25ml/l) immediately after potting and then subsequently following plant establishment. The results obtained also indicate that higher rates of Bonzi (up to 2.5ml/l) can be applied later in the life of the crop to restrict growth if necessary.

As a result of using growth regulators, flower number and flower size of the primrose and polyanthus plant varieties examined were often depressed. In addition, the Dazide treatment (at the rate used in the trial of 7g/l) often suppressed vegetative growth and flower stem length too much. In the case of the primrose variety Alaska it reduced flower stem length to such an extent that the flowers were sometimes borne only just above the foliage. As a result of this lower rates of Dazide maybe more appropriate.

The New 5C Cycocel treatment examined in the trial also produced a marginal leaf chlorosis which was evident on the polyanthus variety Rainbow and primrose variety Bicolour Leda at marketing.

In conclusion, if the amount of vegetative growth produced by primroses and polyanthus cannot be controlled by environmental factors such as temperature, nutrition, watering etc., then the adoption of a growth regulator programme will help to prevent excessive vegetative plant growth. Very compact plants specifically aimed for use in display bowls and pots can also be produced by using higher rates of growth regulator.

EXPERIMENTAL SECTION

INTRODUCTION

Primroses and polyanthus are a major winter bedding crop, and can be found on most nurseries from the autumn right through to the spring. Most of the plants produced, especially over the winter period are grown under protection so that they do not become damaged by frosts or severe weather conditions. As a result of this method of production, it often becomes difficult to control the amount of vegetative growth produced by the plants. The warmer conditions under protection often result in plants producing excessive amounts of vegetative growth which both detracts from the overall appearance of the plant and encourages foliar diseases such as *Botrytis*.

This experiment was designed to evaluate the potential for the use of plant growth regulators as a commercially acceptable method to control the vegetative growth of primroses and polyanthus.

MATERIALS AND METHODS

All the young plants were bought in as 'plugs' from various commercial propagators, as shown below:

VARIETY		PLUG TRAY SIZE (CELL NUMBER)	SUPPLIER
Bicolour Leda)	260)
Bicolour Triton) primrose	260) Crystal Heart Plant
Bicolour Calypso) (guards)	260) Raisers Ltd
Dania Blue)	260)
Crescendo	polyanthus	264	Royal Sluis
Danova	primrose	135	Four Oaks
Rainbow	polyanthus	135	Four Oaks
Alaska	primrose	240	Colegrave Seeds Ltd

Potting took place on the following dates:

- 30 September 1994 All the guard primrose varieties were potted.
- 5 October 1994 The polyanthus variety Crescendo and two thirds of the requirement of the primrose variety Danova and the polyanthus variety Rainbow were potted. (The latter due to a shortfall in supply).
- 12 October 1994 The primrose variety Alaska and the remainder of the primrose variety Danova and the polyanthus variety Rainbow were potted.

To minimise the effect of two planting dates upon the final results, a number of plants from each of the two planting dates were included in each treatment.

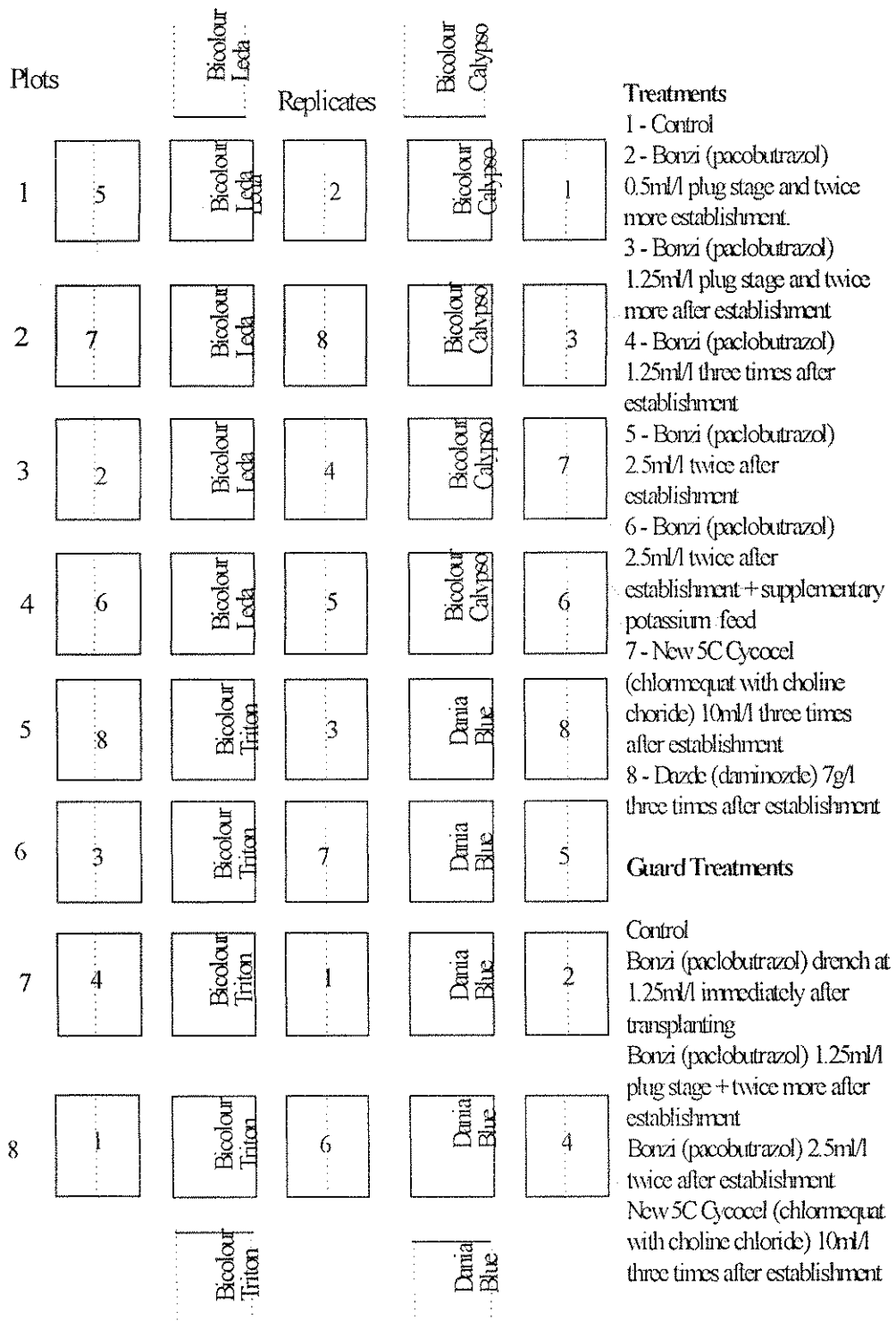
All the plants were potted into 9cm pots using a low nutrient Shamrock pot and bedding compost.

The plants were laid out according to the plan (see Figure 1) in trays with a capacity of 18 pots. A single plot consisted of two trays, each tray being divided into two so that nine plants of each of the four primrose/polyanthus varieties could be used.

The layout of the plant varieties in the trays remained the same in each plot. Seven treatments and a control were examined, each treatment being replicated three times, giving a total requirement of 864 plants (216 plants of each variety).

TRIAL LAYOUT

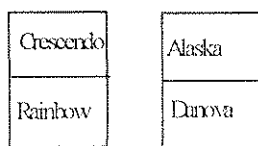
Figure 1



Plot Layout:

Plot 1

Two trays of 18 plants
9 pots of each variety



Five complete trays of each of the guard varieties were used in the trial, one tray per treatment.

The plants remained in the trays at the initial spacing for the entirety of the trial.

The plants were grown on the floor of a heated glass house, the thermostat being set for frost protection only. Venting occurred around 10 °C (Maximum/minimum temperatures for the period 17 October 1994 - 16 November 1994 are given in Appendix 1).

The plants were stood on capillary matting as an aid to even watering and watered overhead by hand as and when necessary. They were liquid fed approximately every 10 days with a 200:50:400 mg/l N.P.K liquid feed, mixed from 'straight fertilisers'.

The following treatments (all sprays) were applied to each of the primrose/polyanthus varieties (excluding the guard varieties):

1. Control, untreated.
2. Bonzi (paclobutrazol) at 0.5ml/l, applied at or just after potting and twice more following plant establishment.
3. Bonzi (paclobutrazol) at 1.25ml/l, applied at or just after potting and twice more following plant establishment.
4. Bonzi (paclobutrazol) at 1.25ml/l, applied three times following plant establishment.
5. Bonzi (paclobutrazol) at 2.5ml/l, applied twice following plant establishment.
6. Bonzi (paclobutrazol) at 2.5ml/l, applied twice following plant establishment. Plus a high potash supplementary liquid feed of 100:0:200 mg/l N.P.K, applied on 8 December 1994, 21 December 1994, 5 January 1995, 18 January 1995 and 6 February 1995.
7. New 5C Cycocel (chlormequat with choline chloride, 645g/l) at 10ml/l, applied three times following plant establishment.
8. Dazide (daminozide) at 7g/l, applied three times following plant establishment. Current recommendations are for a maximum of two of Dazide per crop).

For the purpose of this trial, plants were taken as established when roots were visible at the edge and bottom of the compost.

PLEASE NOTE. Some of the above rates of use of the growth regulators are not those recommended for bedding plants, such rates are used entirely at growers own risk.

The treatments were applied as and when necessary to each individual plant variety as allowance had to be made for the different potting times, the different sizes of plant material originally received from the propagators and the different speeds of growth of each variety. The exact time of each growth regulator application is given in Table 1, and the plant size at first spray is given in Appendices 2 and 3.

The following treatments were applied to the guard varieties:

1. Control, untreated.
2. Bonzi (paclobutrazol) at 1.25ml/l, applied as drench (to moist compost) at 20ml of the solution per pot, 5 days after potting.
3. Bonzi (paclobutrazol) at 1.25ml/l, applied approximately 1, 7 and 12 weeks after potting.
4. Bonzi (paclobutrazol) at 2.5ml/l, applied approximately 7 and 12 weeks after potting.
5. New 5C Cycocel (chlormequat with choline chloride 645g/l) at 10ml/l, applied approximately 7, 12 and 16 weeks after potting.

The exact date of each growth regulator application is given in Table 2. All the sprays were applied to the point of run-off through a small hand held sprayer.

No fungicides were applied to the plants so that the effects of the growth regulator treatments on the level of *Botrytis* could be monitored. A regular insecticide programme was used.

The time taken for the first flower to appear was noted in response to each treatment, and then when approximately 50% of the plants were in flower, assessments were made to establish the following:

- i) Average leaf length. (The longest fully developed leaf on each plant was measured).
- ii) Average plant diameter.
- iii) Average plant height. (The height attained by the foliage only was measured).
- iv) Average visible flower and flower bud number (and flower stem number for polyanthus varieties).
- v) Average flower stem length.
- vi) Average flower diameter.

TABLE 1

TREATMENT TIMINGS

*Variety: Crescendo**Potting Date: 5th October 1995*

<i>Treatment</i>	<i>Application Time</i>
Bonzi 0.5ml/l plug stage and twice more	5 Oct, 21 Dec, 18 Jan
Bonzi 1.25ml/l plug stage and twice more	5 Oct, 21 Dec, 18 Jan
Bonzi 1.25ml/l three times	21 Dec, 5 Jan, 18 Jan
Bonzi 2.5ml/l twice	21 Dec, 18 Jan
Bonzi 2.5ml/l twice + supplementary pottasium feed	21 Dec, 18 Jan
New 5C Cycocel 10ml/l three times	21 Dec, 5 Jan, 18 Jan
Dazide 7 g/l three times	21 Dec, 5 Jan, 18 Jan

*Variety: Rainbow**Potting Date: 5th and 12th October 1995*

<i>Treatment</i>	<i>Application Time</i>
Bonzi 0.5ml/l plug stage and twice more	5 and 26 Oct, 15 Nov, 21 Dec
Bonzi 1.25ml/l plug stage and twice more	5 and 26 Oct, 15 Nov, 21 Dec
Bonzi 1.25ml/l three times	15 Nov, 21 Dec, 18 Jan
Bonzi 2.5ml/l twice	15 Nov, 21 Dec
Bonzi 2.5ml/l twice + supplementary pottasium feed	15 Nov, 21 Dec
New 5C Cycocel 10ml/l three times	15 Nov, 21 Dec, 18 Jan
Dazide 7 g/l three times	15 Nov, 21 Dec, 18 Jan

*Variety: Danova**Potting Date: 5th and 12th October 1995*

<i>Treatment</i>	<i>Application Time</i>
Bonzi 0.5ml/l plug stage and twice more	5 and 26 Oct, 15 Nov, 21 Dec
Bonzi 1.25ml/l plug stage and twice more	5 and 26 Oct, 15 Nov, 21 Dec
Bonzi 1.25ml/l three times	15 Nov, 21 Dec, 18 Jan
Bonzi 2.5ml/l twice	15 Nov, 21 Dec
Bonzi 2.5ml/l twice + supplementary pottasium feed	15 Nov, 21 Dec
New 5C Cycocel 10ml/l three times	15 Nov, 21 Dec, 18 Jan
Dazide 7 g/l three times	15 Nov, 21 Dec, 18 Jan

*Variety: Alaska**Potting Date: 12th October 1995*

<i>Treatment</i>	<i>Application Time</i>
Bonzi 0.5ml/l plug stage and twice more	26 Oct, 21 Dec, 18 Jan
Bonzi 1.25ml/l plug stage and twice more	26 Oct, 21 Dec, 18 Jan
Bonzi 1.25ml/l three times	21 Dec, 5 Jan, 18 Jan,
Bonzi 2.5ml/l twice	21 Dec, 18 Jan
Bonzi 2.5ml/l twice + supplementary pottasium feed	21 Dec, 18 Jan
New 5C Cycocel 10ml/l three times	21 Dec, 5 Jan, 18 Jan
Dazide 7 g/l three times	21 Dec, 5 Jan, 18 Jan

TABLE 2

TREATMENT TIMINGS (GUARD VARIETIES)

*Variety: Bicolour Leda**Potting Date: 30th September 1995*

<i>Treatment</i>	<i>Application Time</i>
Bonzi drench 1.25ml/l after potting	5 Oct
Bonzi 1.25ml/l plug stage and twice more	5 Oct, 15 Nov, 21 Dec
Bonzi 2.5ml/l twice	15 Nov, 21 Dec
New 5C Cycocel 10ml/l three times	15 Nov, 21 Dec, 18 Jan

*Variety: Bicolour Triton**Potting Date: 30th September 1995*

<i>Treatment</i>	<i>Application Time</i>
Bonzi drench 1.25ml/l after potting	5 Oct
Bonzi 1.25ml/l plug stage and twice more	5 Oct, 15 Nov, 21 Dec
Bonzi 2.5ml/l twice	15 Nov, 21 Dec
New 5C Cycocel 10ml/l three times	15 Nov, 21 Dec, 18 Jan

*Variety: Bicolour Calypso**Potting Date: 30th September 1995*

<i>Treatment</i>	<i>Application Time</i>
Bonzi drench 1.25ml/l after potting	5 Oct
Bonzi 1.25ml/l plug stage and twice more	5 Oct, 15 Nov, 21 Dec
Bonzi 2.5ml/l twice	15 Nov, 21 Dec
New 5C Cycocel 10ml/l three times	15 Nov, 21 Dec, 18 Jan

*Variety: Bicolour Dania Blue**Potting Date: 30th September 1995*

<i>Treatment</i>	<i>Application Time</i>
Bonzi drench 1.25ml/l after potting	5 Oct
Bonzi 1.25ml/l plug stage and twice more	5 Oct, 15 Nov, 21 Dec
Bonzi 2.5ml/l twice	15 Nov, 21 Dec
New 5C Cycocel 10ml/l three times	15 Nov, 21 Dec, 18 Jan

vii) Average *Botrytis* score. (The amount of *Botrytis* on the leaves only was scored. 0 represented no *Botrytis* through to 5 which represented *Botrytis* present on all the lower foliage).

viii) Average Marketability score. (The score represented how suitable the plant was for marketing on the actual day of the assessment). Marketability varied according to:

- Amount of *Botrytis*
- Overall plant habit
- Amount of dead flower and leaf on the plant.
- Amount of flower and flower bud.

0 represented an unmarketable plant through to 5 which represented a well balanced plant with 3 or more open flowers which needed the minimum of preparatory cleaning before marketing.

To obtain the average, nine plants from each treatment were recorded. Once recorded, four plants (which were not so advanced) were selected from each treatment and potted into a shallow terracotta dish. Plants of the primrose variety Danova were potted, week beginning 13 February 1995, plants of the polyanthus varieties Crescendo and Rainbow were potted, week beginning 27 February 1995 and plants of the primrose variety Alaska were potted, week beginning 19 April 1995. The plants were then assessed 3-4 weeks after potting to find out if the growth regulator applications had any effect on the plants post marketing.

RESULTS

The results obtained are presented in Tables 3 - 13 and Figures 2 - 10.

1. *Effect on time to first flower and time taken for 50% of the plants to flower (Figure 2).*

The Dazide treatment appeared to consistently delay the time to first flower and the time to 50% flowering. Flowering could be delayed by up to 2 weeks (as in the case of the polyanthus variety Crescendo). The New 5C Cycocel treatment also increased the time taken to reach 50% flowering, but in most cases the delay was not as obvious as that produced by the Dazide treatment.

The various Bonzi treatments produced no consistent results, flowering appeared to be both delayed and advanced depending upon the treatment and plant variety.

2. *Effect on average leaf length (Figure 3).*

The two polyanthus varieties (Crescendo and Rainbow) used in the trial were more vigorous than the two primrose varieties (Danova and Alaska) as can be seen in Tables 3 - 6.

All the growth regulator treatments reduced leaf length to some degree. The Dazide treatment appeared to have the most consistent effect on leaf growth, checking leaf growth on the primrose variety Alaska by up to 22% (Table 11).

In terms of the guard varieties, the Bonzi drench treatment had the most consistent effect on leaf length.

The extent of leaf length reduction attained by the New 5C Cycocel treatment and remaining various Bonzi spray treatments was more variable.

3. *Effect on average plant diameter (Figure 4).*

As with leaf length, all the treatments gave rise to a reduction in plant diameter. The most consistent reduction was achieved by the Bonzi drench applied to the guard varieties only.

The Dazide treatment worked well again, but was not as consistent in its effects as the Bonzi drench treatment.

The results achieved by the various Bonzi spray treatments varied according to plant variety. However, this variation in effect between the Bonzi treatments was usually no more than a 2 - 3cm difference in average plant diameter.

TABLE 3

20-Jan-95

Assessment Date:

Variety : Danova

Treatment	Time of First Flower	Number of Plants in Flower	Average Leaf Length (cm)	Average Plant Diameter (cm)	Average Plant Height (cm)	Average Flower Bud Number	Average Flower Stem Length (cm)	Average Flower Diameter (cm)	Botrytis Score (0 -5)	Marketability Score (0-5)
Control	21-Dec-94	16	11.4	19	9.9	14	7.2	4.2	0.5	3.7
Bonzi 0.5ml/l at potting and twice more	21-Dec-94	13	9.2	17.6	7.4	14.5	5.7	4.5	0.2	4.2
Bonzi 1.25ml/l at potting and twice more	21-Dec-94	17	8	16.2	6.8	12.1	4.8	4.8	0.2	4.5
Bonzi 1.25ml/l three times after planting	14-Dec-94	15	8.3	16.4	7.7	15.2	5.8	4.5	0.1	4.4
Bonzi 2.5ml/l twice after planting	21-Dec-94	16	8.4	16.3	7.3	13.5	5	4.4	0.2	4.2
Bonzi 2.5ml/l twice after planting and high K feed	14-Dec-94	14	8.3	15.2	7.8	12.8	5.4	4.4	0.3	3.8
Cycoceel 10ml/l three times after planting	21-Dec-94	14	9	19	6	12.3	5.4	4.4	0.5	3.9
Dazide 7g/l three times after planting	21-Dec-94	10	8.3	16.4	6.9	11.5	4	3.6	0.1	3.9

TABLE 4

Variety: Crescendo

Assessment Date: 13-Feb-95

Treatment	Time of First Flower	Number of Plants in Flower	Average Leaf Length (cm)	Average Plant Diameter (cm)	Average Plant Height (cm)	Average Flower/Bud Number	Average Flower Stem Length (cm)	Average Flower Diameter (cm)	Botrytis Score (0-5)	Marketability Score (0-5)
Control	05-Jan-95	22	14.4	26.3	10.9	9.0 (2.0 stems)	14.9	4.8	0.1	3.7
Bonzi 0.5ml/l at potting and twice more	20-Jan-95	21	11.4	20.2	8.5	7.2 (1.9 stems)	9.7	4.7	0.2	3.9
Bonzi 1.25ml/l at potting and twice more	05-Jan-95	20	12.2	22.1	9.9	8.2 (1.5 stems)	12.7	4.6	0.2	3.9
Bonzi 1.25ml/l three times after planting	05-Jan-95	14	11.5	21	8.7	7.9 (1.7 stems)	8.9	4.2	0.3	3.5
Bonzi 2.5ml/l twice after planting	27-Jan-95	19	11.3	21.8	8.7	6.9 (1.9 stems)	7.9	4.3	0.3	3
Bonzi 2.5ml/l twice after Planting and High K Feed	05-Jan-95	16	12.8	23.4	11	9.8 (2 stems)	10.2	4.3	0.1	3.3
Cycocel 10ml/l three times after planting	20-Jan-95	17	13.7	23	10.8	8.2 (1.9 stems)	8.4	4.3	0.4	3.3
Dazide 7g/l three times after planting	27-Jan-95	11	12.2	23.1	8.9	6.8 (1.3 stems)	10.8	3.7	0.1	2.7

TABLE 5

Assessment Date: 13-Feb-95

Variety : Rainbow

Treatment	Time of First Flower	Number of Plants in Flower	Average Leaf Length (cm)	Average Plant Diameter (cm)	Average Plant Height (cm)	Average Flower/Bud Number	Average Flower Stem Length (cm)	Average Flower Diameter (cm)	Botrytis Score (0-5)	Marketability Score (0-5)
Control	20-Jan-95	26	14.1	26.7	13.2	10.7 (2.1 stems)	14.2	4.4	0.3	3.3
Bonzi 0.5ml/l at potting and twice more	27-Jan-95	21	11.7	25	9.2	9.3 (2.4 stems)	11.8	4.8	0.5	4.4
Bonzi 1.25ml/l at potting and twice more	20-Jan-95	25	13.2	23.8	10.3	9.8 (2.8 stems)	11.2	4.7	0.2	3.9
Bonzi 1.25ml/l three times after planting	27-Jan-95	24	12.5	23.8	11.2	9.7 (2.0 stems)	11	4.5	0.1	3.2
Bonzi 2.5ml/l twice after planting	05-Jan-95	17	11.8	23.5	10.8	8.8 (2.1 stems)	12	4.2	0.4	3.5
Bonzi 2.5ml/l twice after planting and high K feed	05-Jan-95	19	14	25.5	12.3	10.0 (2.0 stems)	12.3	4.3	0	3.7
Cycocel 10ml/l three times after planting	27-Jan-95	15	10.8	21.4	9.8	9.8 (2.2 stems)	7.7	3.9	0.5	3.2
Dazide 7g/l three times after planting	27-Jan-95	10	11.7	21.1	9.5	10.5 (2.1 stems)	8	3.2	0.3	2.8

TABLE 6

Variety : Alaska Assessment Date: 24-Mar-95

Treatment	Time of First Flower	Number of Plants in Flower	Average Leaf Length (cm)	Average Plant Diameter (cm)	Average Plant Height (cm)	Average Flower/Flower Bud Number	Average Flower Stem Length (cm)	Average Flower Diameter (cm)	Botrytis Score (0-5)	Marketability Score (0-5)
Control	04-Mar-95	21(0 Blind)	11.8	20.3	10.9	14	6	5	0.4	4.2
Bonzi 0.5ml/l at potting and twice more	28-Feb-95	19 (5 Blind)	9.5	15.5	8.8	13.7	5.3	4.4	0	4.2
Bonzi 1.25ml/l at potting and twice more	28-Feb-95	20 (3 Blind)	10.3	16.3	9.3	13.5	5	4.6	0.1	4.1
Bonzi 1.25ml/l three times after planting	12-Mar-95	16 (2 Blind)	10.5	17.1	10	15.3	6	4.5	0.4	3.8
Bonzi 2.5ml/l twice after planting	04-Mar-95	21 (1 Blind)	10.4	16.8	9.8	13	5.3	4.4	0.2	4.2
Bonzi 2.5ml/l twice after planting and high K feed	12-Mar-95	12 (6 Blind)	10.7	16.7	10.3	12.3	4.4	4.5	0.4	3.9
Cycoceel 10ml/l three times after planting	24-Feb-95	12 (3 Blind)	10	17.1	8.8	15.2	4.9	4.8	0.4	3.4
Dazide 7g/l three times after planting	12-Mar-95	12 (4 Blind)	9.2	15.2	9.2	14.2	4.9	4.3	0.7	4

Variety: Triton

Assessment Date: 20-Jan-95

TABLE 7

Treatment	Time of First Flower	Number of Plants in Flower	Average Leaf Length (cm)	Average Plant Diameter (cm)	Average Plant Height (cm)	Average Flower/Flower Bud Number	Average Flower Length (cm)	Average Flower Diameter (cm)	Botrytis Score (0-5)	Marketability Score (0-5)
Control	05-Jan-95	10	10.7	20	8.7	10	5	3.7	0	3.5
Bonzi 1.25ml/l drench after planting	05-Jan-95	10	8.2	17.2	8	10.7	4.7	4.4	0	4.5
Bonzi 1.25ml/l at potting and twice more	28-Dec-95	16	10.2	21	9.7	11	6	3.9	0	4
Bonzi 2.5ml/l twice after planting	28-Dec-95	12	9.7	19	8	11.7	5.2	4.2	0	4.7
Cycoceol 10ml/l three times after planting	05-Jan-95	8	11	20.7	9.2	11.5	5.2	4.4	0	4

Variety: Leda

Assessment Date: 13-Feb-95

TABLE 8

Treatment	Time of First Flower	Number of Plants in Flower	Average Leaf Length (cm)	Average Plant Diameter (cm)	Average Plant Height (cm)	Average Flower/Bud Number	Average Flower Length (cm)	Average Flower Diameter (cm)	Botrytis Score (0-5)	Marketability Score (0-5)
Control	27-Jan-95	16	16.7	28.5	13.7	14.2	9.2	4.4	0.2	3.2
Bonzi 1.25ml/l drench after planting	20-Jan-95	18	11	22	8.5	14.5	7.5	4.9	0	3.7
Bonzi 1.25ml/l at potting and twice more	13-Jan-95	18	13.7	27	12.2	16	7.7	5	0	3
Bonzi 2.5ml/l twice after planting	20-Jan-95	18	12.7	25.2	11.5	13.7	8	4.7	0.2	3.7
Cycocel 10ml/l three times after planting	13-Jan-95	18	13	24	10.2	13	8.2	4.7	0.2	3.5

Variety : Calypso

Assessment Date: 22-Feb-95

TABLE 9

Treatment	Time of First Flower	Number of Plants in Flower	Average Leaf Length (cm)	Average Plant Diameter (cm)	Average Plant Height (cm)	Average Flower/Bud Number	Average Flower Stem Length (cm)	Average Flower Diameter (cm)	Botrytis Score (0 -5)	Marketability Score (0-5)
Control	13-Jan-95	18	12.5	23.2	9.2	20.5	7.2	5.1	0.7	3.5
Bonzi 1.25ml/l drench after planting	13-Jan-95	18	9.5	19.7	8	18.7	5.7	5.2	0.5	4
Bonzi 1.25ml/l at potting and twice more	05-Jan-95	18	10.7	22.2	8.2	18.2	6.7	5.5	0.5	4.5
Bonzi 2.5ml/l twice after planting	20-Jan-95	18	11.5	22.7	8.7	16	6.5	5.2	0.7	4
Cycocel 10ml/l three times after planting	20-Jan-95	18	10.5	19.7	9.5	15.2	6.2	5.2	1	3.5

Variety : Dania

Assessment Date: 22-Feb-95

TABLE 10

Treatment	Time of First Flower	Number of Plants in Flower	Average Leaf Length (cm)	Average Plant Diameter (cm)	Average Plant Height (cm)	Average Flower/Bud Number	Average Flower Length (cm)	Average Flower Diameter (cm)	Botrytis Score (0 -5)	Marketability Score (0-5)
Control	05-Jan-95	18	12.2	24.7	11.5	29.7	9.5	4.6	0.5	3.2
Bonzi 1.25ml/l drench after planting	13-Jan-95	18	10.7	20	8.2	30.5	7.5	4.6	0.7	3.7
Bonzi 1.25ml/l at potting and twice more	05-Jan-95	18	11.2	21.5	9.2	24.7	7.2	4.6	0.2	4
Bonzi 2.5ml/l twice after planting	05-Jan-95	18	11.5	20	8	25.7	7.2	5	0.2	4
Cycocel 10ml/l three times after planting	05-Jan-95	18	11	23.2	9	22.2	7	4.5	0.7	4

MAXIMUM EFFECT OF THE VARIOUS GROWTH REGULATOR TREATMENTS

TABLE 11

(a) Trial varieties

Physical Parameter	Percentage		effect		compared		with		untreated		plants	
	Danova	Treatment	Crescendo	Treatment	Treatment	Treatment	Rainbow	Treatment	Alaska	Treatment	Treatment	Treatment
Average leaf length reduction	30%	3	21%	5	23%	7	22%	8	25%	8	8	8
Average plant diameter reduction	20%	6	23%	2	21%	8	19%	2	9%	4	4	4
Average plant height reduction	40%	7	22%	2	30%	2	46%	7	27%	6	6	6
Average flower bud number increase (where recorded)	8%	4	9%	6	-	-	8%	2	-	-	-	-
Average flower stem reduction	44%	8	43%	7								
Average flower diameter increase (where recorded)	14%	3	-	-								

Key

Treatment 2 - Bonzi 0.5 ml/l at potting and twice more. 3 - Bonzi 1.25ml/l at potting and twice more. 4 - Bonzi 1.25ml/l three times following establishment. 5 - Bonzi 2.5 ml/l twice following establishment. 6 - Bonzi 2.5ml/l twice following establishment. 7 - New 5C Cycocel 10 ml/l three times following establishment. 8 - Dazide 7g/l three times following establishment.

TABLE 12

MAXIMUM EFFECT OF THE VARIOUS GROWTH REGULATOR TREATMENTS

(b) Guard varieties

Physical Parameter	Percentage		effect		compared		with		untreated		plants	
	Damia	Treatment	Calypso	Treatment	Leda	Treatment	Triton	Treatment	Triton	Treatment	Triton	Treatment
Average leaf length reduction	22%	4	24%	2	34%	2	23%	2	23%	2	2	2
Average plant diameter reduction	19%	2/4	15%	2/5	23%	2/5	14%	2	14%	2	2	2
Average plant height reduction	30%	4	13%	2	38%	2	8%	2	8%	2	2/4	2/4
Average flower bud number increase (where recorded)	3%	2	-	-	13%	-	17%	3	17%	3	4	4
Average flower stem reduction	26%	5	21%	2	18%	2	6%	2	6%	2	2	2
Average flower diameter increase (where recorded)	8%	4	7%	3	14%	3	19%	3	19%	3	2/5	2/5

Key

Treatment 2 - Bonzi 1.25ml/l drench after potting. 3 - Bonzi 1.25ml/l at potting and twice more. 4 - Bonzi 2.5ml/l twice following establishment. 5 - New 5C Cycocel 10ml/l following establishment.

TABLE 13

ASSESSMENT OF THE PLANTS AFTER TRANSPLANTING INTO TERRACOTTA DISPLAY BOWLS.

Variety: Danova.	Planting Date: 13 February 1995. Assessment Date: 10 March 1995
<i>TREATMENT</i>	<i>COMMENTS</i>
Control	Large plants with plenty of foliage
Dazide 7g/l three times	Plants visibly more compact. Flowers were borne on shorter stems. The best treatment in visual terms.
New 5C Cycocel 10ml 3 times.	Flower stem length was variable according to flower colour.
Bonzi treatments	Of the Bonzi treatments, the Bonzi applied at 2.5ml/l twice with supplementary potassium feeds produced the best balanced plants. The lower rates of Bonzi did not appear to reduce the flower stem length by the same degree (although they were shorter than the control).
Variety: Rainbow.	Planting Date: 27th February 1995. Assessment Date: 10 March 1995.
<i>TREATMENT</i>	<i>COMMENTS</i>
Control	Flower stem length too long, detracted from overall visual appeal. Leaf length quite long.
Dazide 7 g/l three times	Visibly reduced flower stem length, produced plants more compact in nature.
New 5C Cycocel 10ml/l three times	As above, compact plants produced.
Bonzi treatments	All the treatments produced good results, only the low rate Bonzi (0.5ml/l applied at plug stage and twice more) struggled to suppress flower stem length.
Variety: Crescendo.	Planting Date: 27th February 1995. Assessment Date: 10 March 1995
<i>TREATMENT</i>	<i>COMMENTS</i>
Control	As with the above variety, flower stem length detracted from overall appearance. Flower number lower than Rainbow.
Dazide 7 g/l three times	A reduction in overall diameter noted. As flowering was generally sparse there was limited amount of 'colour' produced.
New 5C Cycocel 10ml/l three times	As above, compact plants produced.
Bonzi treatments	Flower number was fairly low with most treatments. Most of the treatments suppressed plant growth. The treatment 2.5ml/l applied twice with the supplementary potassium feed produced the best 'flower display'.

Variety: Alaska.

Planting Date: 10th April 1995.

Assessment Date: 3 May 1995

TREATMENT

COMMENTS

Control
Dazide 7 g/l three
times
New 5C Cycocel
10ml/l three times
Bonzi treatments

Visibly the largest plants with the longest leaves.
) These two treatments produced the most compact plants.
) Perhaps flower stem length was too short in the case of this
) variety.
)
As with the above two treatments, most of the Bonzi treatments
prevented the plants from actually 'filling' the bowl. The lower rates
of Bonzi had less of an effect on plant diameter.

FIGURE 2

Number of Plants in Flower

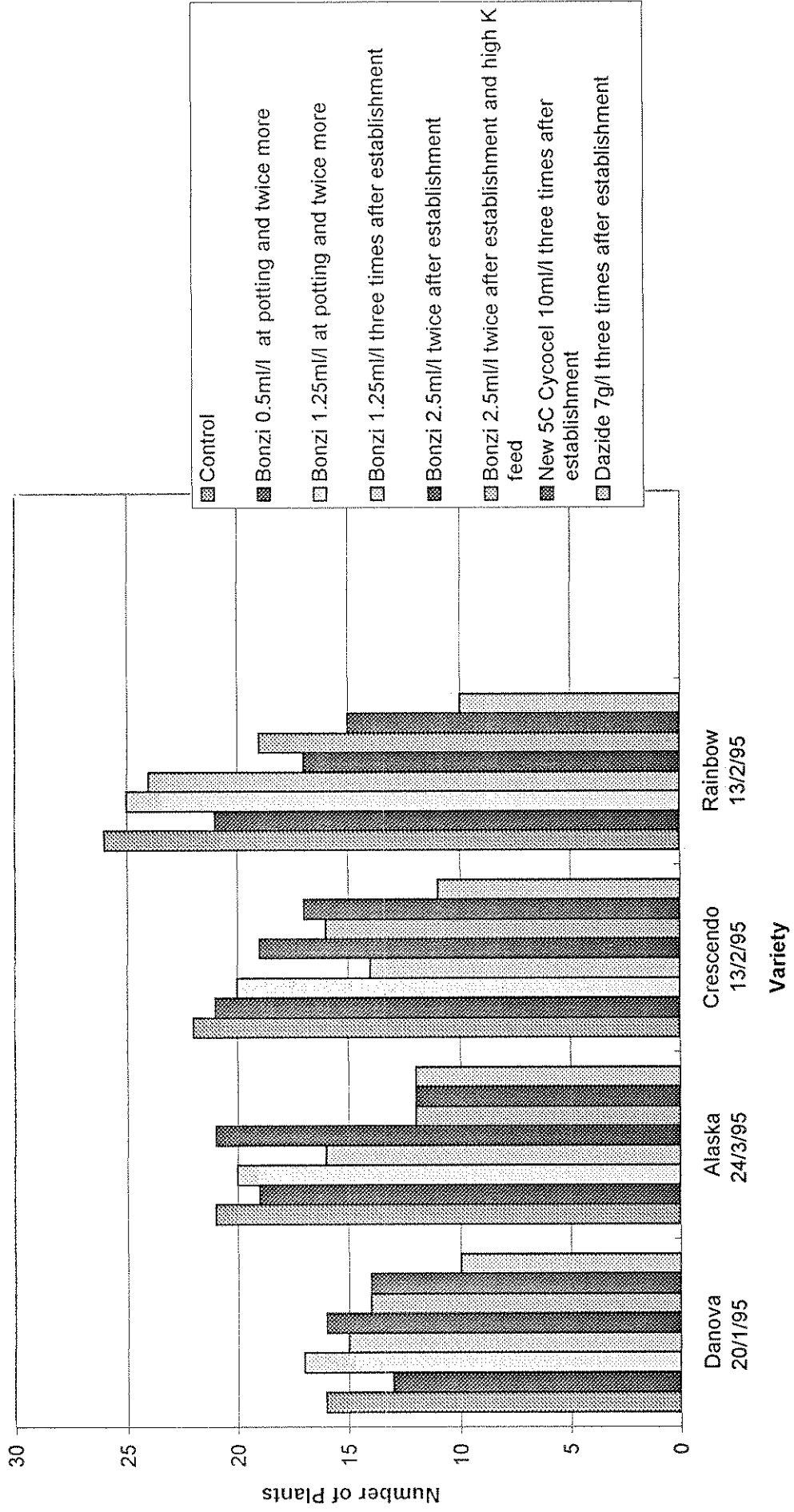


FIGURE 3

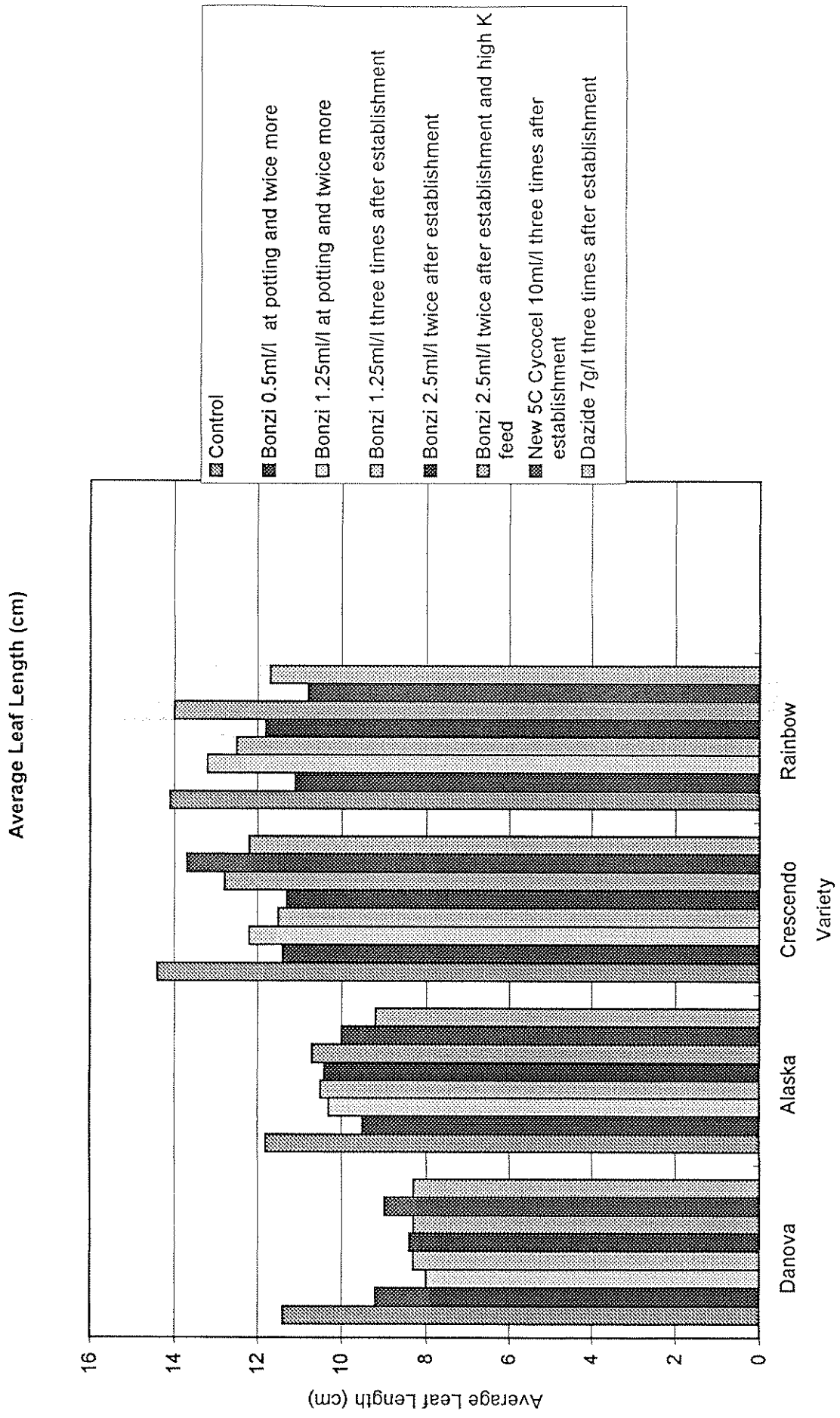
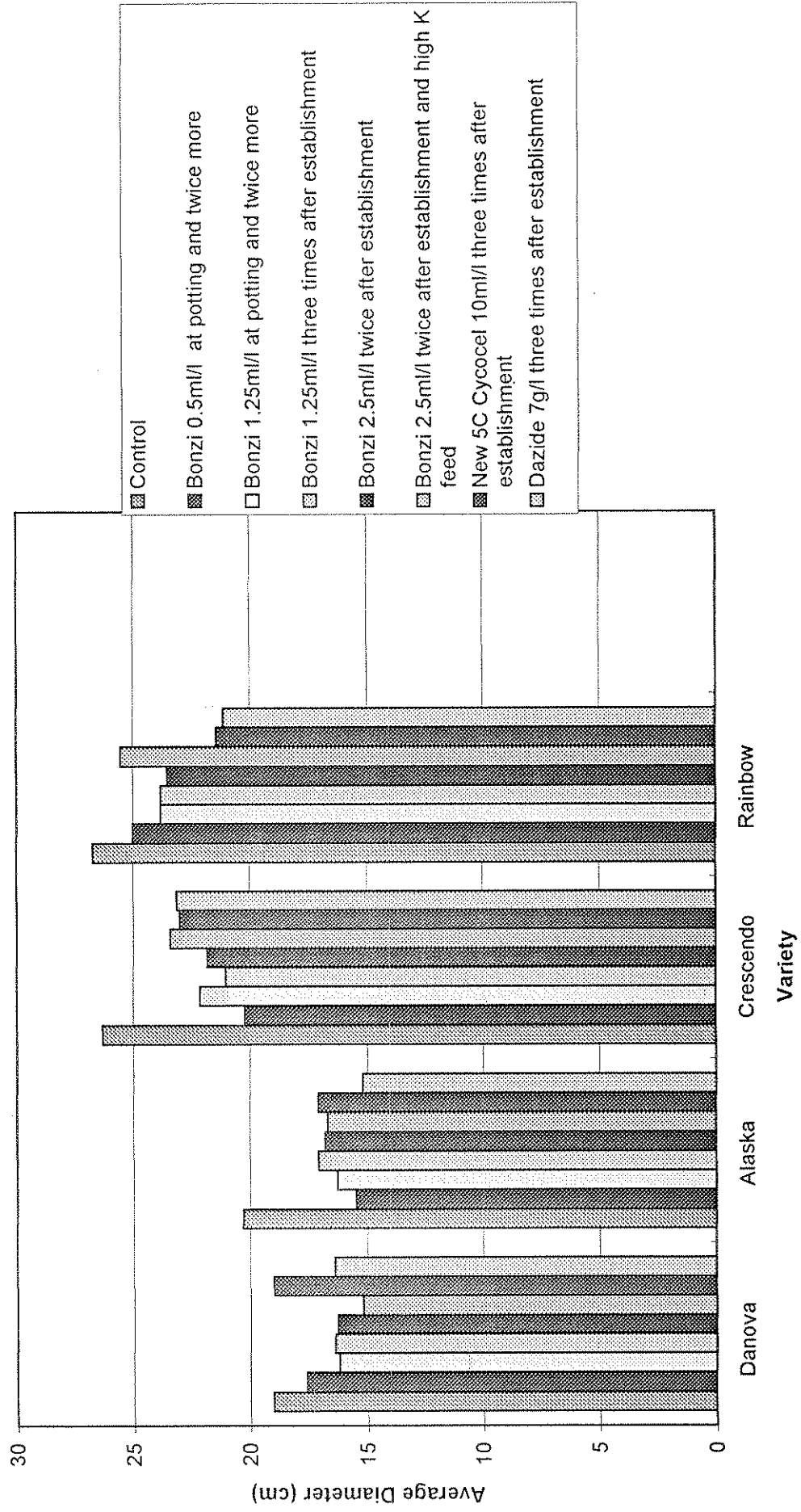


FIGURE 4

Average Plant Diameter (cm)



4. *Effect on average plant height (Figure 5).*

All the treatments reduced overall plant height. This resulted from a combination of reduced leaf length and altered plant habit (i.e. keeping the plant squat).

The following treatments gave the most consistent reduction in plant height; Bonzi at 0.5ml/l applied at potting and twice more following plant establishment, Dazide and New 5C Cycocel, the latter reducing plant height by 40% in the primrose variety Danova (Table 11).

The Bonzi drench treatment also worked well on the guard plants.

5. *Effect on average flower and flower bud number (Figure 6).*

In most cases the average flower bud number was reduced by the growth regulator treatments (by as much as 20% in certain cases). In a few cases flower bud number was increased by some of the treatments, for example the Bonzi drench applied to the primrose guard varieties Bicolour Triton, Bicolour Leda and Dania blue (see Tables 7-10).

6. *Effect on average flower stem length (Figure 7).*

The reduction in flower stem length achieved by all the treatments was the most visually striking aspect noted in the trial. Average flower stem length was reduced by as much as 46% (Table 11).

The New 5C Cycocel and Dazide treatments worked well, although in some cases the flower stem length was reduced too much so that the flower was only just borne above the foliage.

The effect of the Bonzi treatments on average flower stem length was variable.

7. *Effect on average flower diameter (Figure 8).*

Results obtained on flower diameter were conflicting. In the case of the primrose variety Alaska and the polyanthus varieties Crescendo and Rainbow, most of the treatments reduced average flower diameter. Yet in the case of the primrose variety Danova and the four guard primrose varieties, flower diameter was actually increased by most of the treatments.

The Dazide treatment appeared to consistently reduce flower diameter.

8. *Effect on Botrytis (Figure 9).*

The overall level of *Botrytis* in the crop was very low, even though the plants were not spaced. As a result it was difficult to assess the effect of the growth regulators on the degree of *Botrytis* on the plants.

FIGURE 6

Average Flower/Flower Bud Number

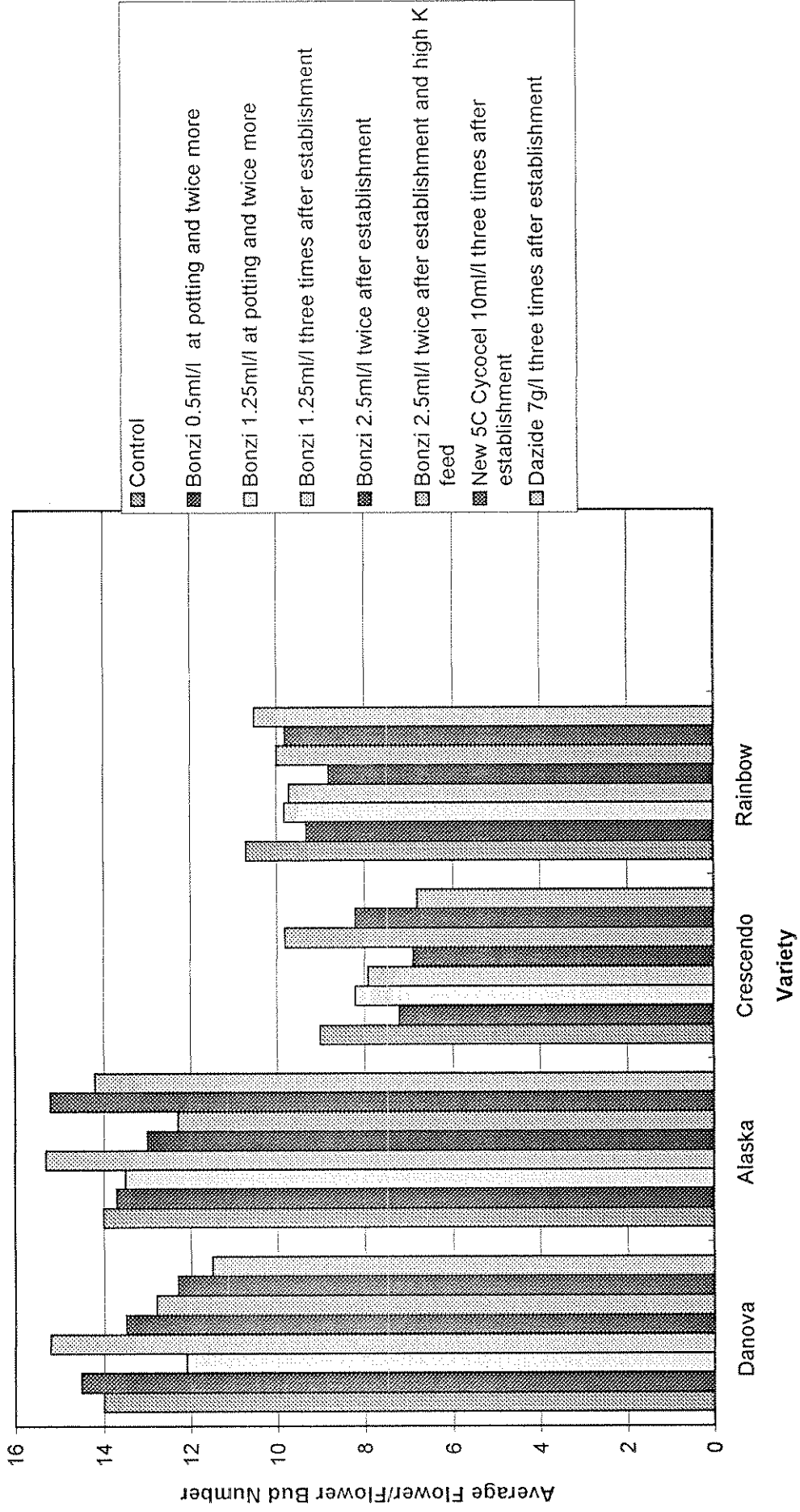


FIGURE 7

Average Flower Stem Length (cm)

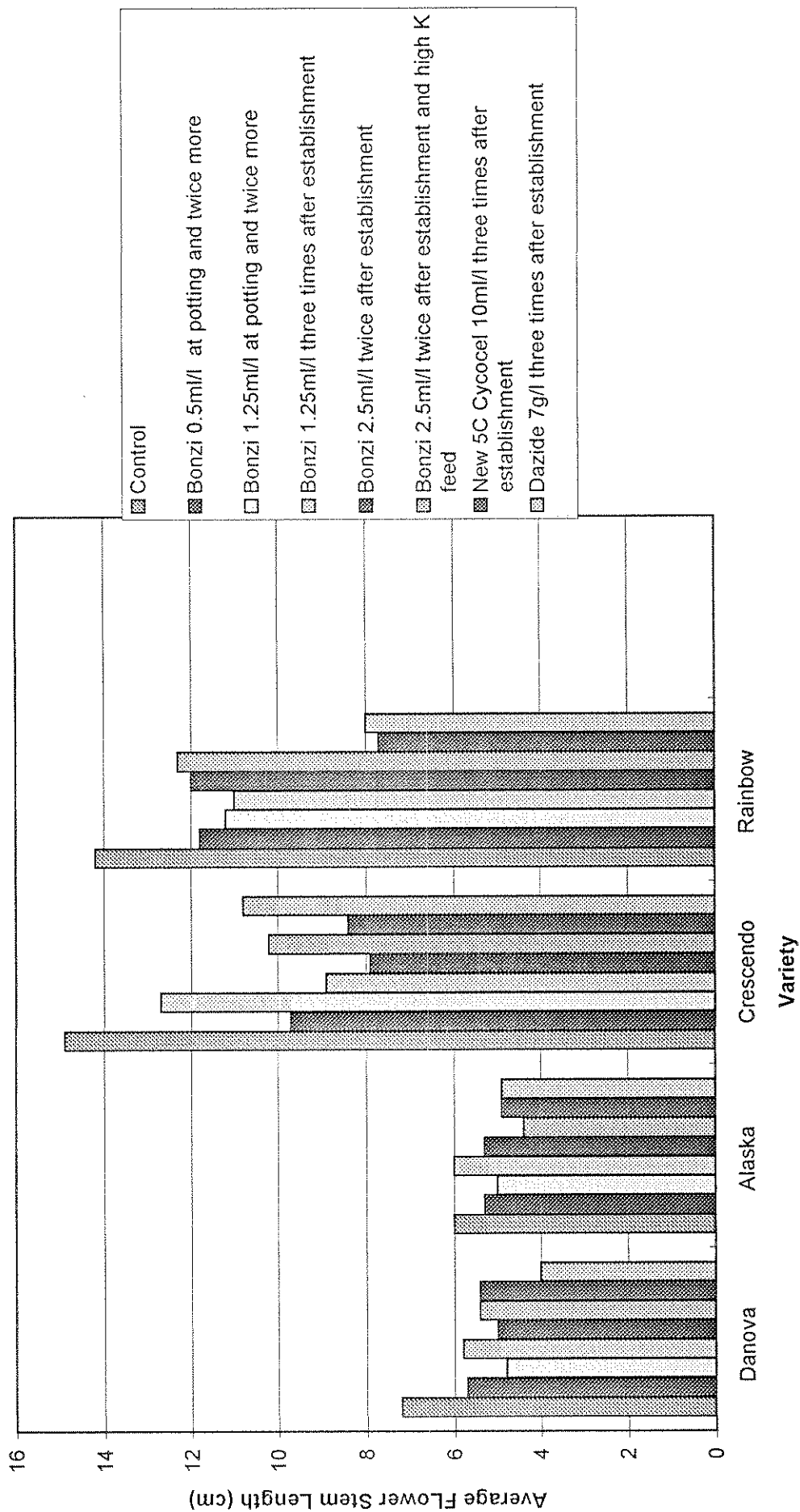


FIGURE 8

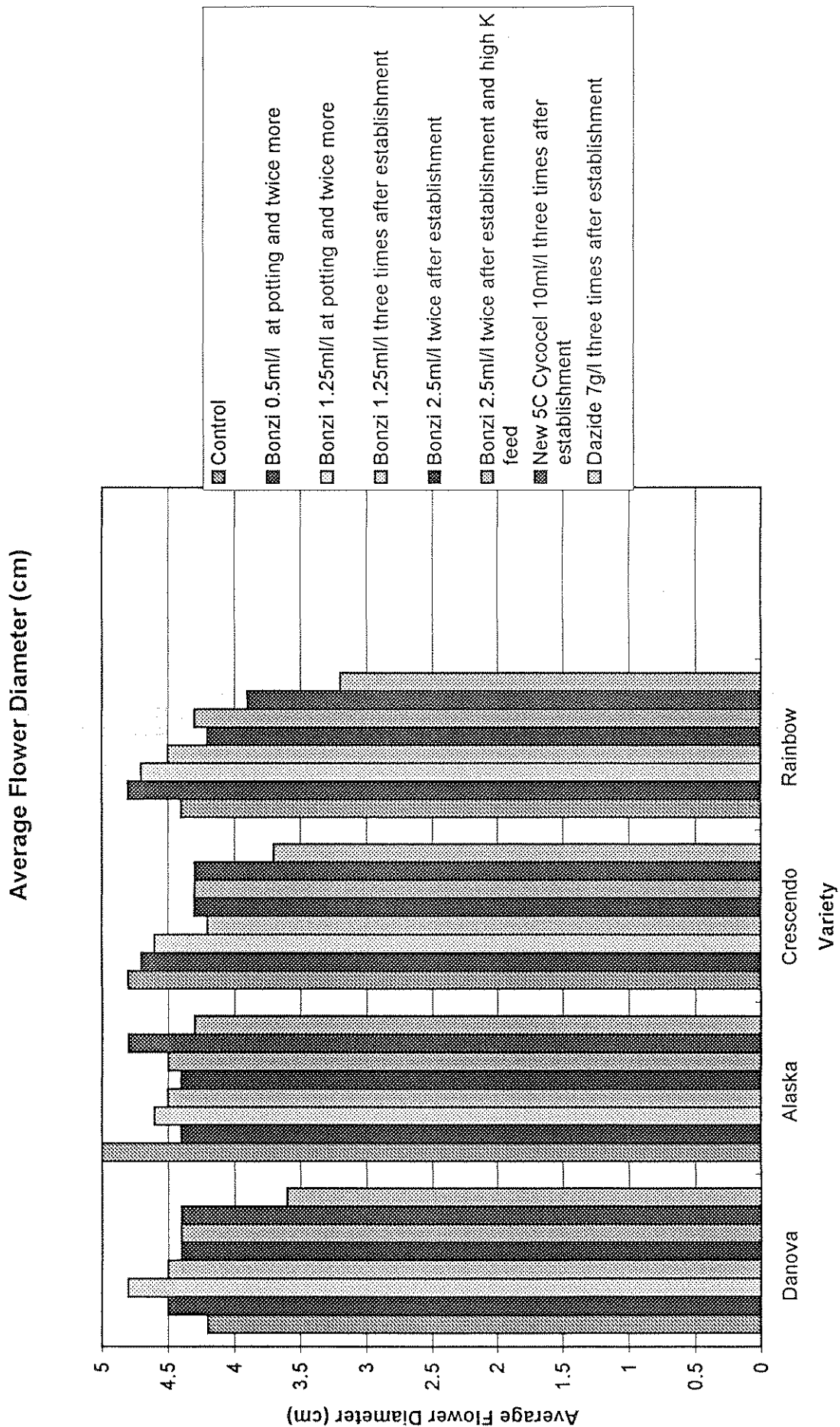
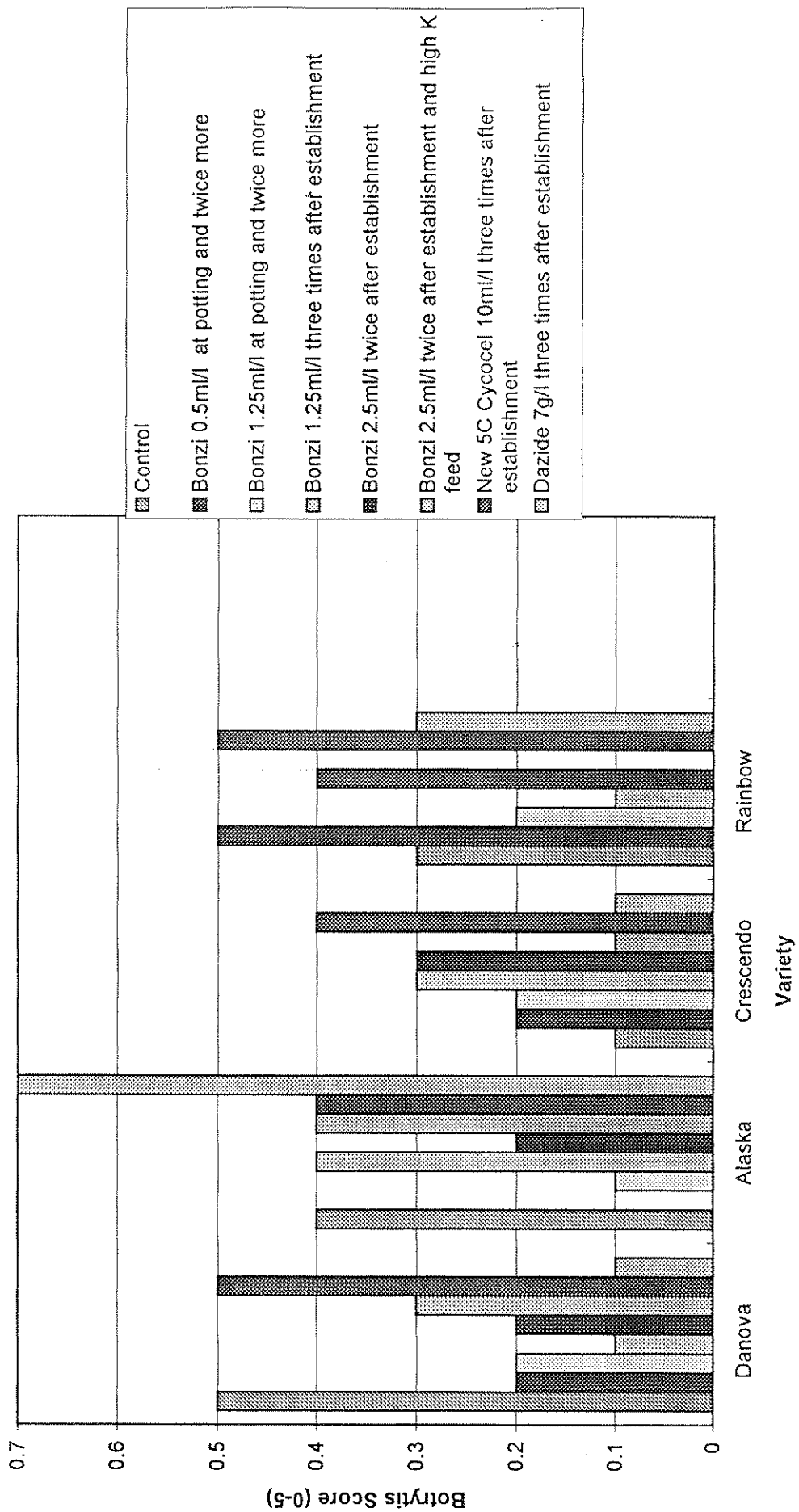


FIGURE 9

Botrytis Score (0-5)



9. *Effect on Marketability (Figure 10).*

Most of the treatments led to an improvement in the overall marketability of the plants. The plants were more compact with deeper green foliage and a better balance was achieved between the amount of foliage and flower.

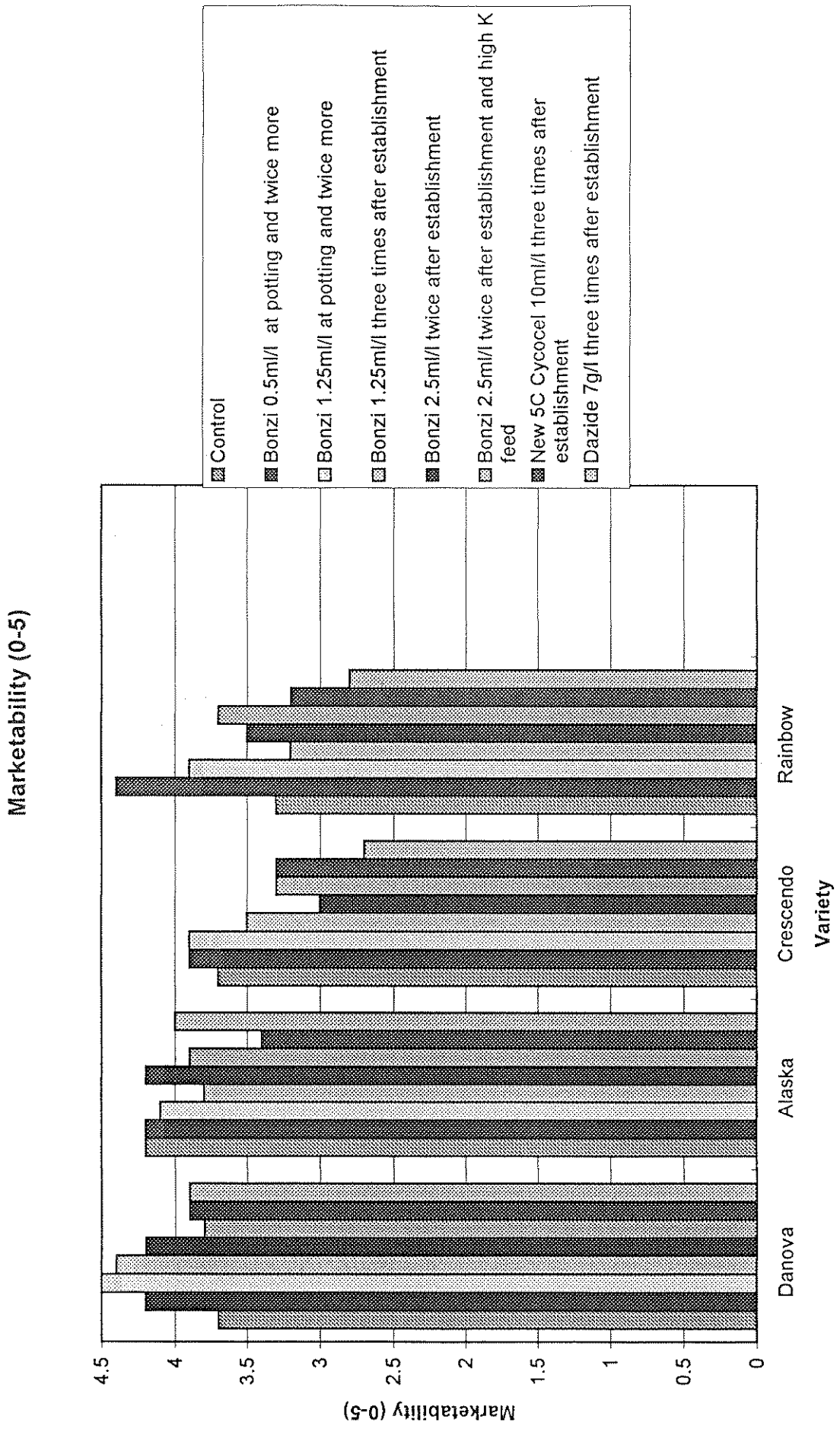
The Bonzi treatments of 0.5ml/l and 1.25ml/l at potting and twice more following plant establishment produced well balanced plants, as did the Bonzi drench applied to the guard plants.

The Dazide treatment was effective at checking growth, but at the rate used in the trial sometimes produced plants which could be too compact with small flowers (for example the primrose variety Alaska).

The New 5C Cycocel treatment produced a marginal leaf chlorosis when applied to the polyanthus variety Rainbow and the primrose variety Bicolour Leda.

Comments about the long term effects of the treatments after a number of the plants had been potted into terracotta bowls are presented in Table 13.

FIGURE 10



CONCLUSIONS

Primrose and polyanthus leaf length, plant diameter, plant height and flower stem length were all reduced by the application of the growth regulators. The Dazide growth regulator programme also delayed the time to flowering by as much as 2 weeks (in the case of the polyanthus variety Crescendo). This could be a benefit to growers aiming to produce late flowering crops.

However, as a consequence of using growth regulators, flower number and flower size were also reduced. (Usually the reduction in flower size being greater than the relative reduction in plant size). This was especially the case with the Dazide treatment.

The treatments which produced the most consistent plant growth suppression were Dazide, applied at 7g/l, three times following plant establishment and Bonzi applied as a drench at 1.25ml/l (20ml of this solution applied per plant) immediately after potting. The other treatments, New 5C Cycocel and the various Bonzi spray treatments, produced more variable results, often dependent upon plant variety.

Although the Dazide treatment produced consistent results, care must be taken when using it at the rate and frequency used in the trial. In a number of cases the treatment resulted in:

- Plants being too compact (e.g. the primrose variety Alaska).
- Plants with small flowers which were borne just above the foliage (noted in both primrose and polyanthus varieties).

Such compact plants could have specific uses for transplanting into display bowls and pots.

The Dazide treatment was the most expensive of all the treatments examined, forty times more costly than the low rate Bonzi treatments (Appendix 4).

The Bonzi drench proved a useful treatment in that a single application, after transplanting, was sufficient to keep plant growth in check up to the point of marketing. However, this 'single application' approach could prove too inflexible in commercial production situations and compared with the other Bonzi treatments the drench is a relatively expensive treatment (Appendix 4).

The New 5C Cycocel treatment appeared to be slightly less effective at growth limitation than the Dazide treatment. Quite often it also gave rise to a marginal leaf chlorosis which was noted on the primrose variety Bicolour Leda and the polyanthus variety Rainbow.

The 0.5ml/l and 1.25ml/l Bonzi treatments applied at potting and twice following plant establishment, highlighted the possibility of using low levels of growth regulators early in the life of the crop to achieve a more compact final plant. Applications at the plug stage will mean that such treatments will be cheaper and easier to apply.

Higher rates of Bonzi (up to 2.5ml/l) proved effective when applied later in the life of the crop. Even at these rates, the Bonzi treatments did not adversely reduce the growth of the plant, which suggests that still higher rates of Bonzi could still be used to check very vigorous plant varieties.

Additional applications of high potash liquid feeds appeared to make little difference to flower bud initiation.

From the results of a one year trial it is difficult to produce a complete set of recommendations for the use of growth regulators on primrose and polyanthus crops. However, the following tentative recommendations can be made:

i) Choice of growth regulator.

Dazide and Bonzi both produced good results in the trial. New 5C Cycocel applied as a spray may produce too much leaf chlorosis in certain plant varieties.

ii) Method of Application.

In the case of Bonzi, the growth regulator can be applied either as a spray to the point of run-off or as a one-off drench after potting. The drench may prove too inflexible though, especially if growing conditions deteriorate following the application. Only foliar sprays of Dazide and New 5C Cycocel were examined in the trial.

iii) Rate of Use

In the case of both Dazide and New 5C Cycocel, the rate will be no more than that used in the trial (7g/l for Dazide and 10ml/l for New 5c Cycocel), probably slightly less.

As mentioned previously Bonzi could possibly be applied as a spray at rates higher than 2.5ml/l to check vigorous growth. However, in a spray programme the rate is likely to be between 1.25ml/l and 2.5ml/l. Insufficient information exists to determine whether the rate of Bonzi used in the drench treatment is the most appropriate.

iv) Timing.

As highlighted in the trial it is difficult to produce a timetable of growth regulator applications. The prevailing weather conditions and their effect on growth will to a large extent determine the exact timing of the growth regulator sprays. However the trial highlighted a number of key points:

- a) Spray applications of Bonzi at the plug stage appeared to give a good initial check to vigorous plants.
- b) In a growth regulator spray programme, earlier applications appear to have more of an effect on plant growth and habit than later applications.
- c) Applications of growth regulators (following plant establishment) should be made in response to plant growth, rather than a pre-determined time table.

ACKNOWLEDGEMENTS

I would like to thank all the nursery staff for their help in the day to day running of the trial, the plant propagation companies who supplied the plant material and Mr Stuart Coutts for his help and inspiration with the trial.

APPENDIX 1

MAXIMUM AND MINIMUM TEMPERATURES IN THE GLASSHOUSE
BETWEEN 17/10/94 AND 16/11/94

Date	Max °C	Min °C
17/10/94	32	10
18/10/94	20	0
19/10/94	28	4
21/10/94	29	10
24/10/94	30	4
25/10/94	30	7
28/10/94	25	9
31/10/94	20	5
1/11/94	19	1
2/11/94	29	2
4/11/94	27	9
7/11/94	26	3
8/11/94	21	5
9/11/94	15	10
11/11/94	23	1
14/11/94	16	1
15/11/94	19	9
16/11/94	21	5
Av	23.1	5.3

APPENDIX 2

PLANT SIZE AT FIRST SPRAY FOLLOWING ESTABLISHMENT

Date:15 November 1994

Variety	Treatment	Average Leaf Number	Average Plant Diameter (cm)
Rainbow	Bonzi 0.5 ml/l at potting + twice more*	13	14
	Bonzi 1.25ml/l at potting + twice more*	14	13
	Bonzi 1.25ml/l three times	14	13
	Bonzi 2.5ml/l twice	12	14
	Bonzi 2.5 ml/l twice + supplementary potassium feed	14	13
	New 5C Cycocel 10ml/l three times	11	13
	Dazide 7g/l three times	14	12

Variety	Treatment	Average Leaf Number	Average Plant Diameter (cm)
Danova	Bonzi 0.5 ml/l at potting + twice more*	14	16
	Bonzi 1.25ml/l at potting + twice more*	14	15
	Bonzi 1.25ml/l three times	15	14
	Bonzi 2.5ml/l twice	13	15
	Bonzi 2.5 ml/l twice + supplementary potassium feed	14	13
	New 5C Cycocel 10ml/l three times	13	15
	Dazide 7g/l three times	13	13

Date: 21 December 1994

Variety	Treatment	Average Leaf Number	Average Plant Diameter (cm)
Crescendo	Bonzi 0.5 ml/l at potting + twice more*	13	15
	Bonzi 1.25ml/l at potting + twice more*	14	17
	Bonzi 1.25ml/l three times	11	15
	Bonzi 2.5ml/l twice	13	16
	Bonzi 2.5 ml/l twice + supplementary potassium feed	14	15
	New 5C Cycocel 10ml/l three times	12	15
	Dazide 7g/l three times	11	14

Variety	Treatment	Average Leaf Number	Average Plant Diameter (cm)
Alaska	Bonzi 0.5 ml/l at potting + twice more*	10	8
	Bonzi 1.25ml/l at potting + twice more*	10	9
	Bonzi 1.25ml/l three times	9	9
	Bonzi 2.5ml/l twice	12	9
	Bonzi 2.5 ml/l twice + supplementary potassium feed	10	8
	New 5C Cycocel 10ml/l three times	10	8
	Dazide 7g/l three times	10	9

* The above sprays would have been the second applied to these plants.

APPENDIX 3

PLANT SIZE AT FIRST SPRAY FOLLOWING ESTABLISHMENT (GUARD VARIETIES)

Variety	Treatment	Average Leaf Number	Average Plant Diameter (cm)
Bicolour Leda	Bonzi 1.25ml/l at potting + twice more*	12	15
	Bonzi 2.5ml/l twice	12	14
	New 5C Cycocel 10ml/l three times	13	15

Variety	Treatment	Average Leaf Number	Average Plant Diameter (cm)
Triton Bicolour	Bonzi 1.25ml/l at potting + twice more*	11	13
	Bonzi 2.5ml/l twice	13	13
	New 5C Cycocel 10ml/l three times	10	13

Variety	Treatment	Average Leaf Number	Average Plant Diameter (cm)
Bicolour Calypso	Bonzi 1.25ml/l at potting + twice more*	11	12
	Bonzi 2.5ml/l twice	11	10
	New 5C Cycocel 10ml/l three times	11	12

Variety	Treatment	Average Leaf Number	Average Plant Diameter (cm)
Dania Blue	Bonzi 1.25ml/l at potting + twice more*	13	14
	Bonzi 2.5ml/l twice	13	12
	New 5C Cycocel 10ml/l three times	12	15

* The above sprays would have been the second applied to these plants

APPENDIX 4

APPROXIMATE CHEMICAL COST OF EACH TREATMENT

Treatment	Cost p/100 plants*
Bonzi 0.5 ml/l at potting + twice more following establishment	2.2■
Bonzi 1.25ml/l at potting + twice more following establishment	5.4■
Bonzi 1.25ml/l three times following establishment	5.4
Bonzi 2.5ml/l twice following establishment	7.1
Bonzi 2.5 ml/l twice following establishment + supplementary potassium feed	7.1▲
New 5C Cycocel 10ml/l three times following plant establishment	11.1
Dazide 7g/l three times following plant establishment	86.4
Bonzi 1.25ml/l drench immediately after potting (20 ml of the solution per plant).	9.0

• All spray treatments are based on the assumption that 4ml of solution are applied per plant (except drench treatment).

■ Treatment of plants whilst in plug trays is easier than after potting.

▲ Not including extra cost of fertiliser.

FIGURE 11

THE VARIETIES DANOVA, RAINBOW AND CRESCENDO THREE WEEKS AFTER POTTING (FIRST BATCH OF PLANTS).



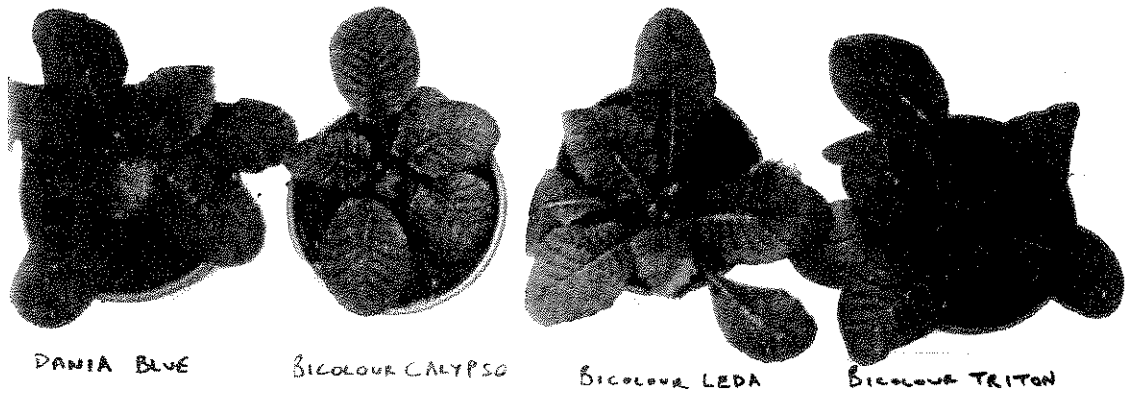
FIGURE 12

THE VARIETIES DANOVA, RAINBOW AND ALASKA TWO WEEKS AFTER POTTING (SECOND BATCH OF PLANTS).



FIGURE 13

THE GUARD VARIETIES DANIA BLUE, BICOLOUR CALYPSO, BICOLOUR LEDA, AND BICOLOUR TRITON APPROXIMATELY 1 MONTH AFTER POTTING.



DANIA BLUE

BICOLOUR CALYPSO

BICOLOUR LEDA

BICOLOUR TRITON

27 OCT 1994

**EFFECT OF THE VARIOUS GROWTH REGULATOR TREATMENTS ON THE
PRIMROSE AND POLYANTHUS VARIETIES USED IN THE TRIAL.**

KEY TO TREATMENTS SHOWN IN FIGURES -

CODE	TREATMENT
CONT	Control
BONZI 0.5 PX2	Bonzi at 0.5ml/l, applied at or just after potting and twice more following plant establishment.
BONZI 1.25 PX2	Bonzi at 1.25ml/l, applied at or just after potting and twice more following plant establishment.
BONZI 1.25X3	Bonzi at 1.25ml/l, applied three times following plant establishment.
BONZI 2.5X2	Bonzi at 2.5ml/l, applied twice following plant establishment.
BONZI 2.5X2K	Bonzi at 2.5ml/l, applied twice following plant establishment, plus a high potash liquid feed programme.
CYCOCEL 10X3	Cycocel at 10ml/l, applied three times following plant establishment.
DAZIDE 7X3D	Dazide at 7g/l, applied three times following plant establishment.
BONZI DRENCH	Bonzi at 1.25ml/l, applied as a drench at 20ml of the solution per pot 5 days after potting.

FIGURE 14

EFFECT OF THE VARIOUS GROWTH REGULATORS ON THE PRIMROSE VARIETY DANOVA

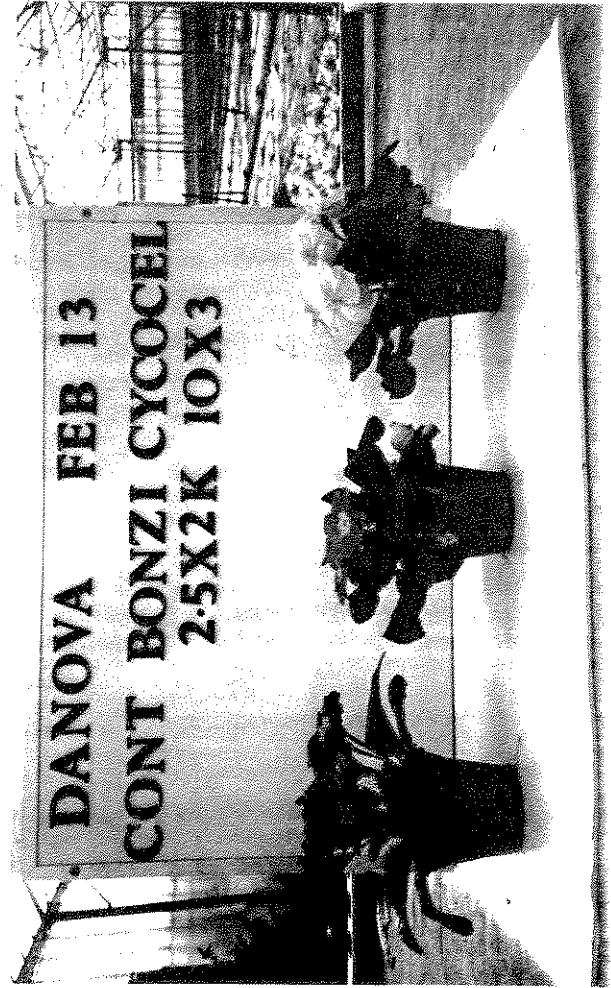
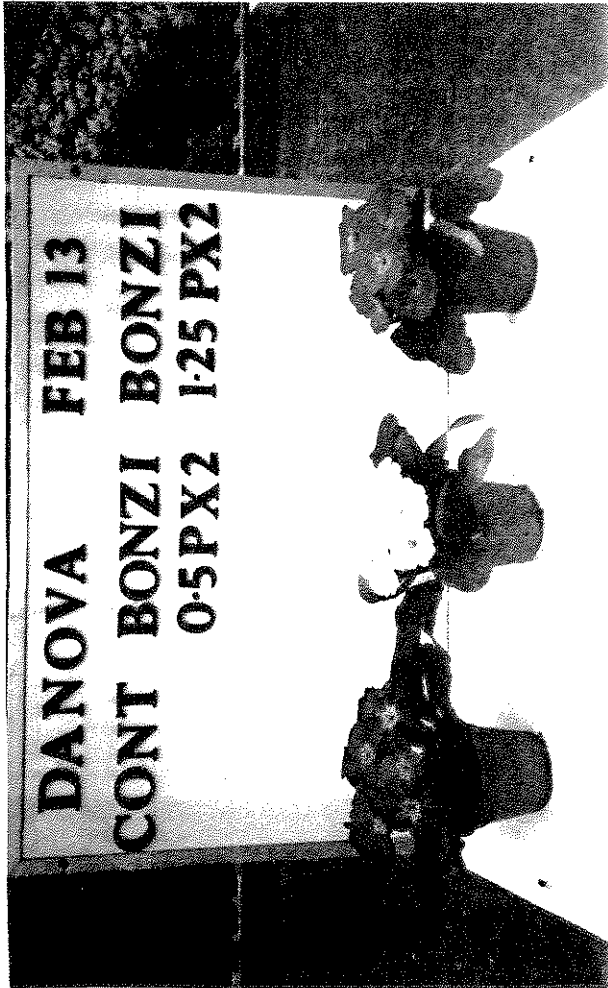


FIGURE 15

EFFECT OF THE VARIOUS GROWTH REGULATORS ON THE PRIMROSE VARIETY ALASKA

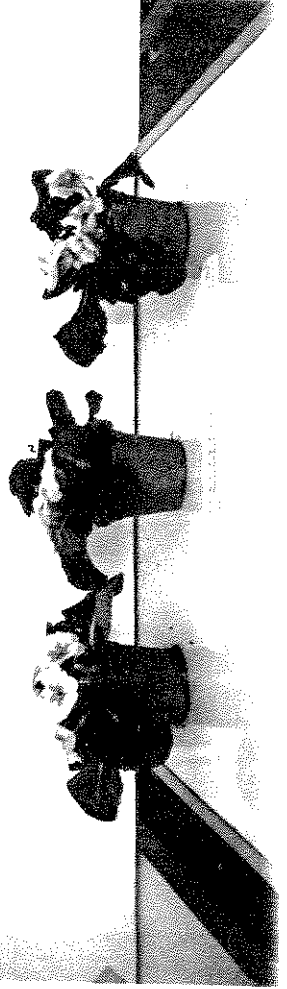
ALASKA MAR 29
CONT BONZI BONZI
0.5P X2 1.25PX2



ALASKA MAR 29
CONT BONZI BONZI
1.25X3 2.5X2



ALASKA MAR 29
CONT BONZI CYCOCEL
2.5X2K 10X3



ALASKA MAR 29
CONT DAZIDE
7 X3

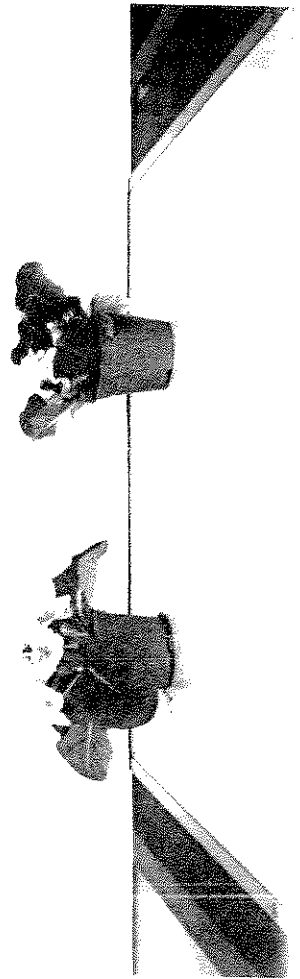


FIGURE 16

EFFECT OF THE VARIOUS GROWTH REGULATORS ON THE POLYANTHUS VARIETY CRESCENDO

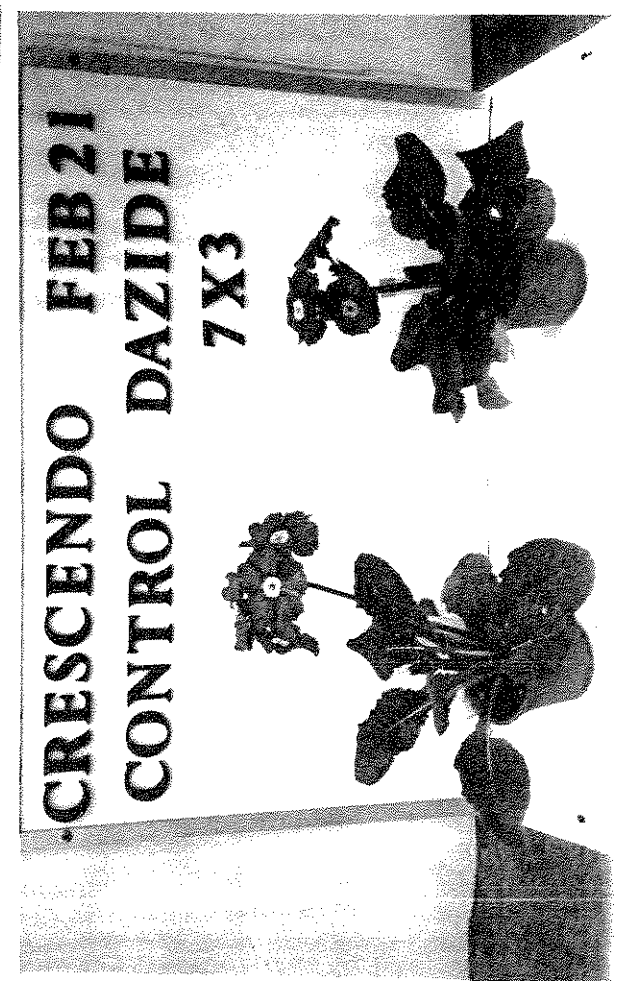


FIGURE 17

EFFECT OF THE VARIOUS GROWTH REGULATORS OF THE POLYANTHUS VARIETY RAINBOW

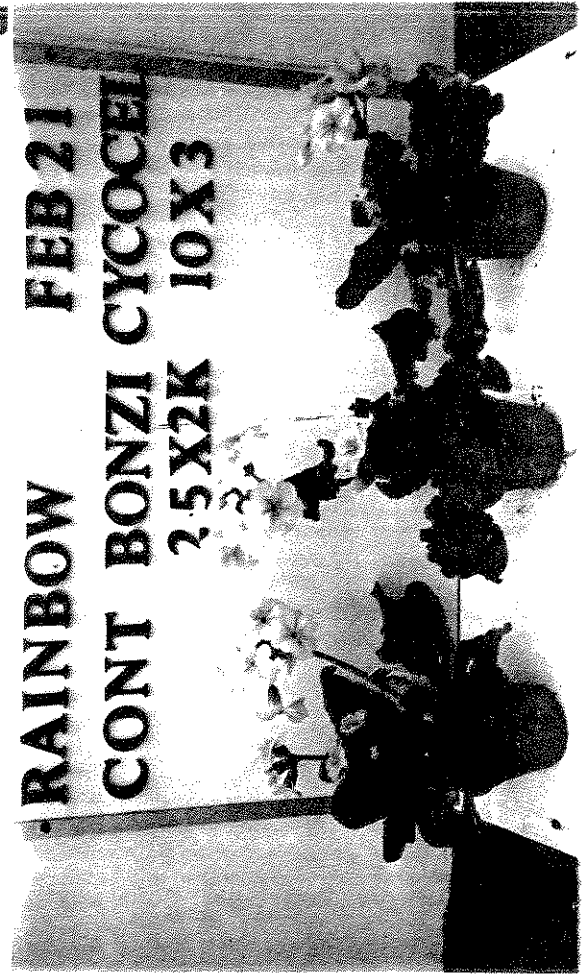
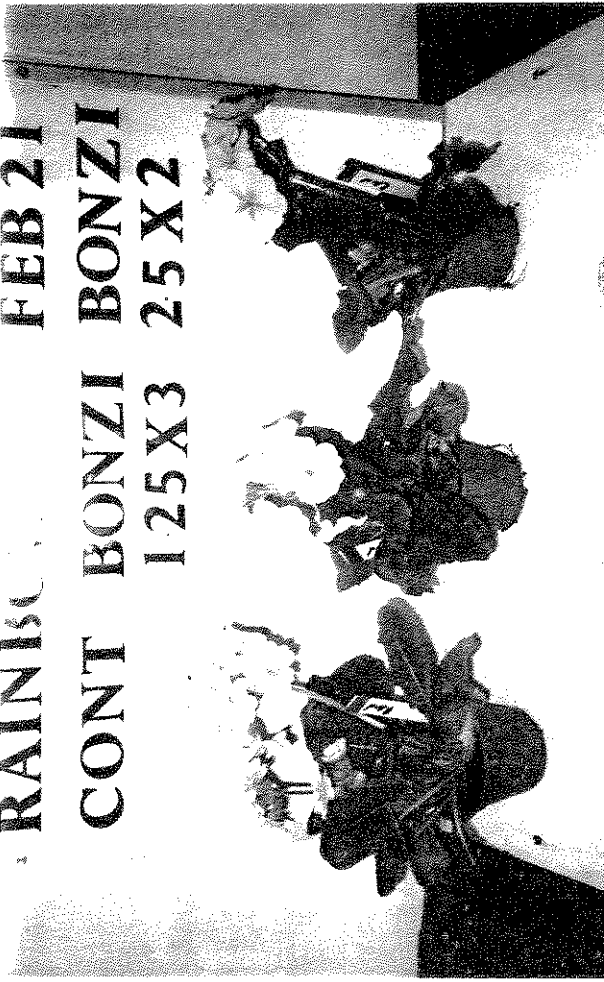
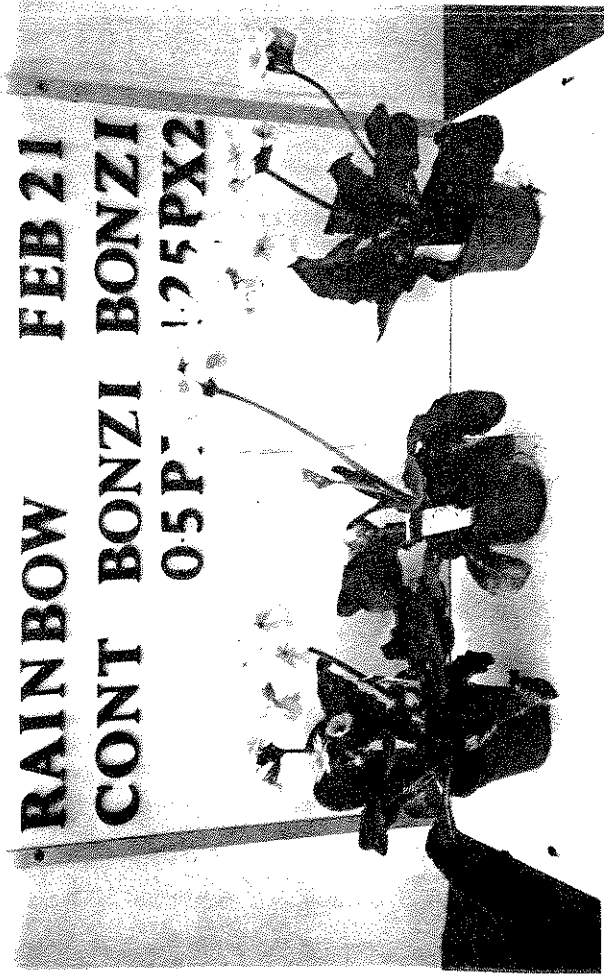


FIGURE 18
 EFFECT OF THE VARIOUS GROWTH REGULATORS ON THE PRIMROSE VARIETIES BICOLOUR LEDA AND BICOLOUR CALYPSO

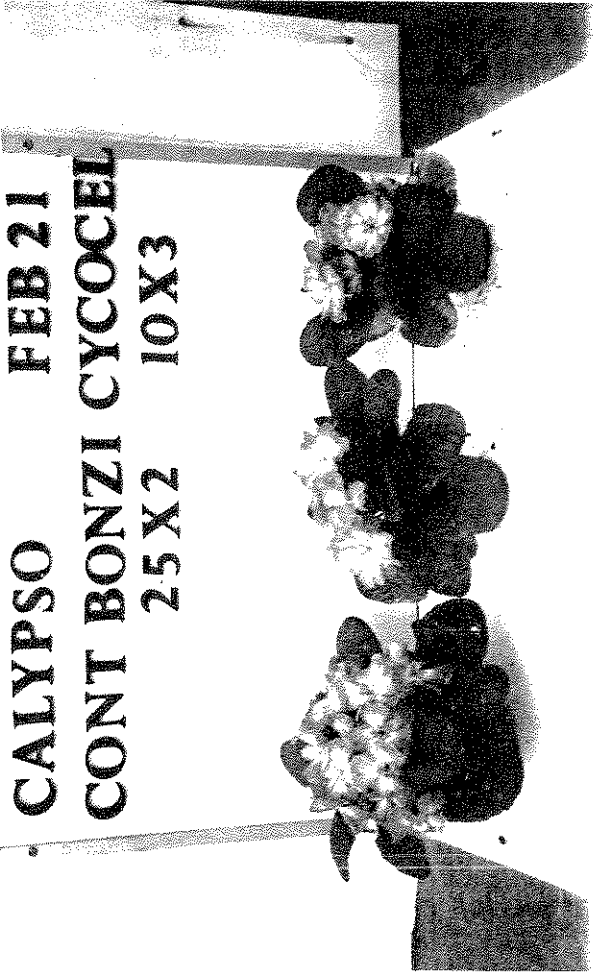
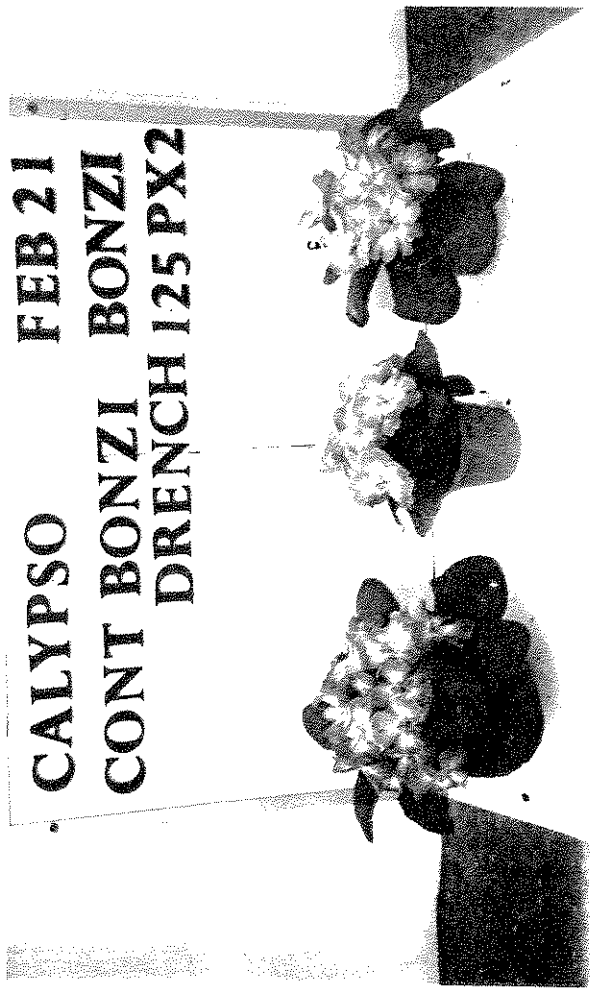
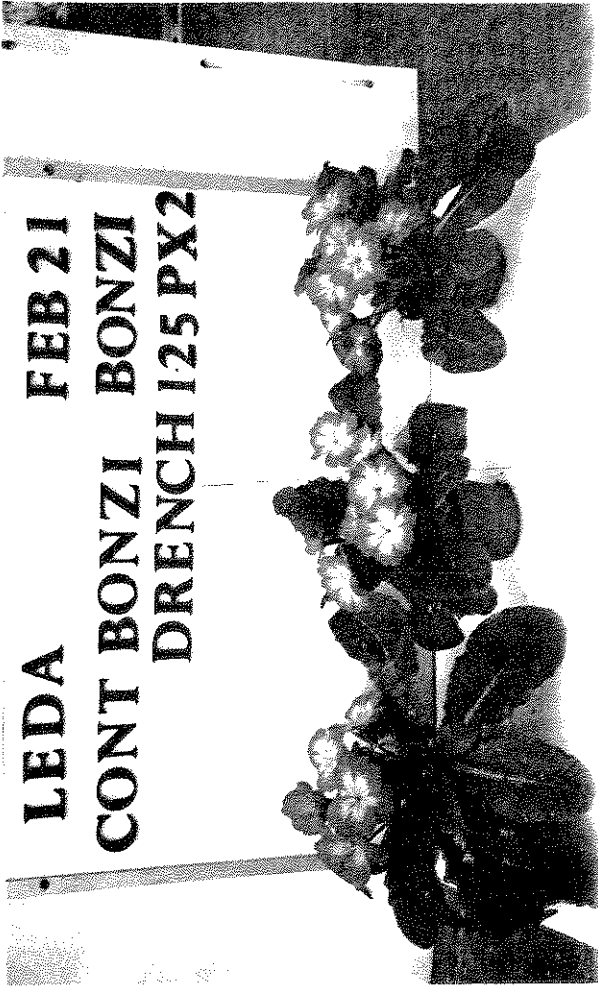
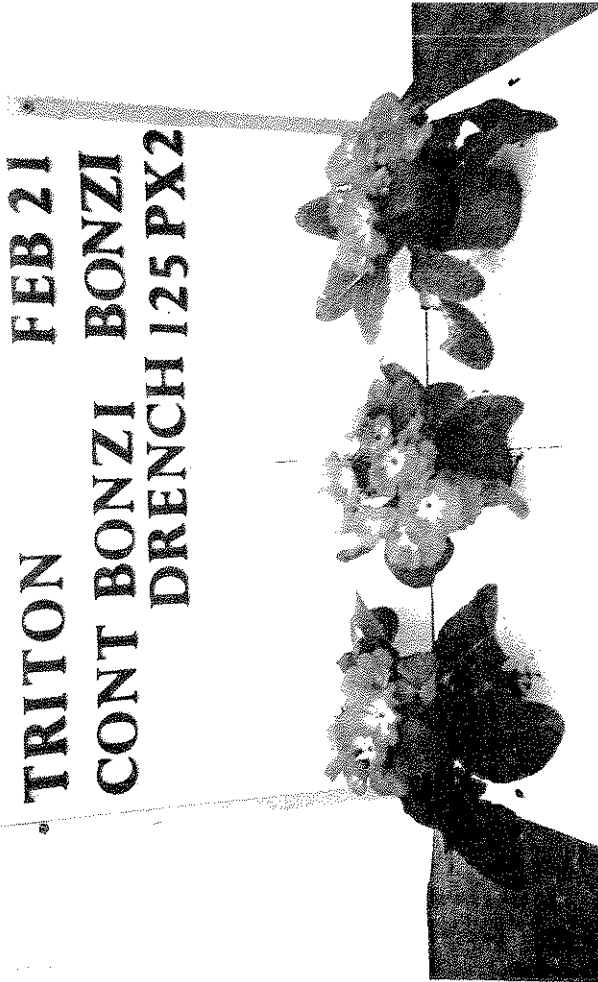
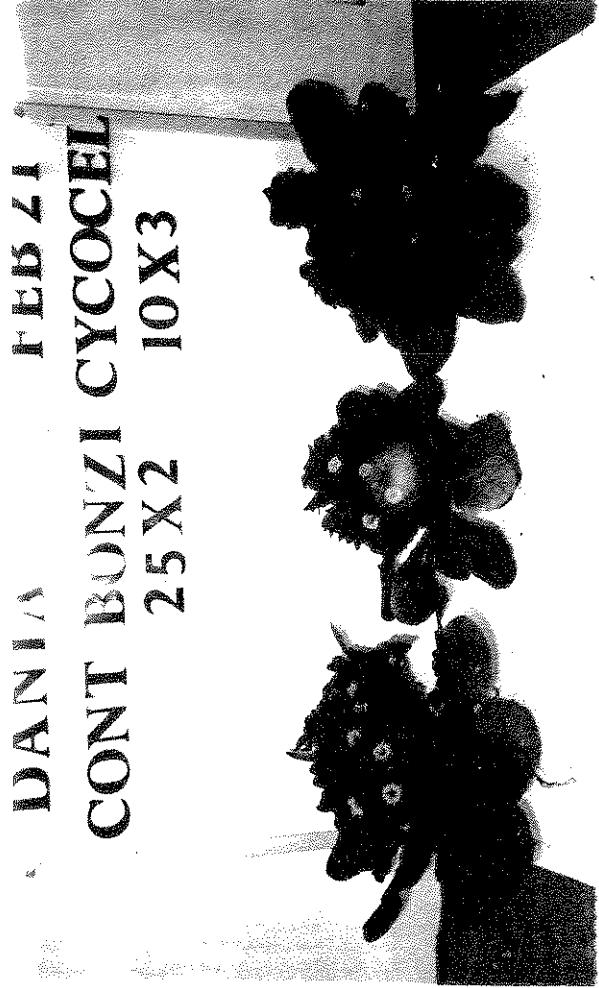
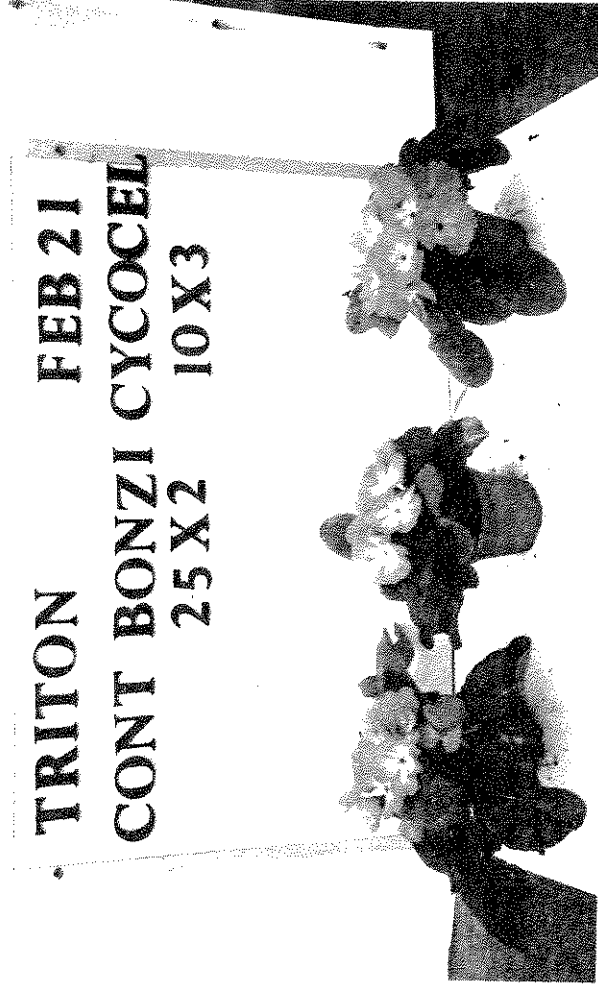


FIGURE 19
EFFECT OF THE VARIOUS GROWTH REGULATORS ON THE PRIMROSE VARIETIES BICOLOUR TRITON AND DANIA BLUE



Contract between ADAS (hereinafter called the "Contractor") and the Horticultural Development Council (hereinafter called the "Council") for a research/development project.

1. TITLE OF PROJECT

Contract No: PC106
Date: 13.2.95

EVALUATION OF PLANT GROWTH REGULATORS AS A METHOD OF CONTROLLING LEAF SIZE ON BEDDING PRIMROSE AND POLYANTHUS VARIETIES GROWN UNDER PROTECTION.

2. BACKGROUND AND COMMERCIAL OBJECTIVES

Primroses and polyanthus are a major winter bedding crop, and can be found on most nurseries from the autumn right through to the spring. Most of the plants produced, especially over the winter period are grown under protection so that they do not become damaged by frosts or severe weather conditions. However, as a result of this action it often becomes difficult to control the amount of vegetative growth produced by the plants. The warmer conditions under protection often result in plants producing excessive amounts of vegetative growth which both detracts from the overall appearance of the plant and encourages foliar diseases such as Botrytis.

This experiment was therefore designed to evaluate the possible use of plant growth regulators as a commercially acceptable method for the control of vegetative growth on primroses and polyanthus.

3. POTENTIAL BENEFITS TO THE INDUSTRY

No statistics are available but it is estimated that at least 10 million primrose plants (excluding polyanthus) were produced in the UK last year. With an estimated value of £3million this makes primroses an important crop for the bedding plant industry as a whole.

If the foliage growth of these plants can be controlled via the use of plant growth regulators then this will lead to:

- (i) the production of high quality plants, which are well balanced in terms of the amount of leaf and flower produced.
- (ii) a reduced incidence of Botrytis, as good control of plant and leaf size will lead to environmental conditions less suited to disease development.

This will create a number of direct benefits for the grower:

- a) fewer plants will be lost to Botrytis
- b) less time will have to be spent removing diseased leaves prior to marketing
- c) fewer fungicide sprays will have to be applied. A comprehensive fungicide programme will require the application of a protectant fungicide every 7-10

The following treatments are proposed;

- (i) Control, no growth regulator treatment
- (ii) Bonzi (paclobutrazol) applied at 0.5 ml/l at the plug stage and at 12 and 20 weeks following transplanting.
- (iii) Bonzi (paclobutrazol) applied at 1.25 ml/l at the plug stage and at 12 and 20 weeks following transplanting.
- (iv) Bonzi (paclobutrazol) applied at 1.25 ml/l at 12, 16 and 20 weeks following transplanting.
- (v) Bonzi (paclobutrazol) applied at 2.5 ml/l at 16 and 20 weeks following transplanting.
- (vi) Bonzi (paclobutrazol) applied at 2.5 ml/l at 16 and 20 weeks following transplanting. A high potash supplementary liquid feed will also be made to this treatment.
- (vii) New 5c Cycocel (chlormequat with choline chloride) applied at 10ml/l at 12, 16 and 20 weeks following transplanting.
- (viii) Dazide (daminozide) applied at 7g/l at 12, 16 and 20 weeks following transplanting.

All treatments will be applied to the point of run-off.

To fit in with commercial production requirements 9 plants of each variety per plot will be used, 36 plants per plot. Each treatment will be replicated 3 times, this will give a total requirement of 864 plants.

As outlined in the technical target of the work, the following physical parameters will be recorded: average leaf size, plant diameter, plant height, average flower number, flower stem length, flower size and time to first flower. The relative amounts of Botrytis in each treatment will also be recorded. A marketability score will also be given to the plants.

The plant establishment part of the trial will be held on a local college, and will consist of planting out a number of the primroses and polyanthus from each treatment, either into tubs or directly into the ground. Assessments of how well the plants establish and grow will be made via measuring the final plant diameter and counting the total number of flowers produced per plant.

7. COMMENCEMENT DATE, DURATION AND REPORTING

Start date 01.09.94; duration 1 year.

The trial will begin in September 1994 with the treatment of the plug raised primrose and polyanthus varieties. The plants will be planted out during February/March 1995 with the final plant measurements being made in April/May 1995.

The report will be produced by August 1995.

It is likely that the project will be extended for a second year providing that encouraging results are obtained in 1994/95.

8. STAFF RESPONSIBILITIES

Project leader; W Brough, Horticultural Consultant, ADAS Maidstone, 43 Sittingbourne Road, Maidstone, Kent ME14 5TY

Key collaborative staff; C Need, Bedding Plant Consultant, ADAS Chichester, Marlett House, St John's Street, Chichester, W. Sussex PO19 1UY

Other staff; H Kitchener, ADAS Pot Plant Consultant, ADAS Huntingdon, Chequers Court, Huntingdon, Cambs PE18 6LT

C Stevens, Senior Horticultural Consultant, ADAS Lewes, Medwyn House, Mountfield Road, Lewes, E Sussex BN7 2XP

9. LOCATION

The crop will be grown at Europa Nurseries, Ashes Lane, Hadlow, Tonbridge, Kent. During March 1995 the crop will then be transferred to Hadlow College, Court Lane Nurseries, Hadlow, Tonbridge, Kent for the 'plant establishment' part of the trial.

TERMS AND CONDITIONS

The Council's standard terms and conditions of contract shall apply.

Signed for the Contractor(s)

Signature.....M.C. Healk.....

Position.AOAS.....ACCOUNT..MANAGER

Date.....27/2/95.....

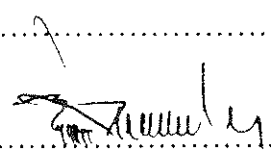
Signed for the Contractor(s)

Signature.....

Position.....

Date.....

Signed for the Council

Signature..........

Position.....CHIEF EXECUTIVE.....

Date.....16.2.95.....

FIGURE 5

