

**HORTICULTURE RESEARCH INTERNATIONAL**

**EFFORD**

**Report to:**

Horticultural Development Council  
8 Lavant Street  
Petersfield  
Hampshire  
GU32 3EW

Tel.: 0703 63736  
Fax.: 0703 65394

**HRI Contract Manager:**

Miss M A Scott  
HRI Efford  
Lymington  
Hampshire  
SO41 0LZ

Tel.: 0590 673341  
Fax.: 0590 671553

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**CONTRACT REPORT**

**Fuchsia: Observation trial on  
the effect of DIF on a range  
of cultivars**

**HDC PC41b**

**PRINCIPAL WORKERS**

**HRI EFFORD**

Mrs E J Hemming BSc Hons (Hort), M.I.Hort (Author of Report)	Technical Officer
Mrs S Foster	Scientific Officer
Mr R Goode	Assistant Scientific Officer
Miss C Jenkins	Assistant Scientific Officer
Mr C A J Hemming	Nursery Staff
Mr S Langford	Nursery Staff
Miss A Peek	Nursery Staff
Mrs M Jenvey	Nursery Staff
Mr P Burnell	Nursery Staff

**AUTHENTICATION**

I declare that this work was done under my supervision according to the procedures described herein and that this report represents a true and accurate record of the results obtained.

Signature ..... *Margaret A. Scott* .....

Margaret A Scott  
Deputy Head of Station

Date ..... *30/7/92* .....

Report authorised by ..... *M R Shipway* .....

Signature

M R Shipway  
Head of Station

HRI Efford  
Lymington  
Hants  
SO41 0LZ

Date ..... *30/9/92* .....

## CONTENTS

	<b>Page</b>
Summary	1
Introduction	2
Objective	2
Materials and Method	3
Results	6
Discussion and Conclusions	9
Appendix I.	10
Result, tables and figures	
Appendix II.	21
Copy of Contract, Schedules etc.	

## SUMMARY

Funding was allocated by the Horticultural Development Council (HDC) to carry out an observation on the use of difference in temperature regimes (DIF) on eight cultivars of *Fuchsia*. Plants were grown alongside the main DIF bedding plants programme in Spring 1992.

The eight cultivars were 'Swingtime', 'Pink Ballet Girl', 'Marinka', 'La Campanella', - four 'trailing' types and 'Winston Churchill', 'Dollar Princess', 'Beacon' and 'Miniros' - four 'bush' types.

Treatments were as follows:

- A. Zero DIF regime.
- B. Negative DIF (-4°C for 2 hours at sunrise). (DROP).
- C. 4°C boost at end of night. (JUMP).
- D. Higher end night followed by negative DIF. (JUMP/DROP).

Differences recorded between regimes were small and results demonstrated a range of responses at the cultivar level making clear interpretation difficult.

JUMP and JUMP/DROP treatments generally advanced flowering and gave poorer shelf life. These regimes were only marginally effective in controlling height on three varieties, 'Dollar Princess', 'Miniros' and 'Marinka'. The other five varieties demonstrated a limited response to zero DIF and DROP treatments only. Possible reasons for these small and varied response to DIF treatment may be due to factors such as, timing, duration, and stage of growth applied.

## INTRODUCTION

DIF (difference in temperature) regimes are at present being examined to establish their potential for growth (height) control on a range of both bedding and pot plant species throughout Europe. Earlier investigations looked at temperature regimes where the whole of the daytime period was maintained below that of the night. Due to the practical problems of achieving this duration of temperature control for much of the year in the UK, it was decided to look at manipulating temperature around sunrise.

The Horticultural Development Council (HDC) decided to fund a 3 year joint programme based at HRI Littlehampton and HRI Efford looking at the potential use of DIF under UK conditions.

Initial trials at HRI Efford (part HDC funded) in 1990/91 indicated that a measure of height restriction was possible when bedding subjects were exposed to a negative DIF of  $-6^{\circ}\text{C}$  for 2 hours at sunrise. This short period temperature change is now commonly referred to as DROP. Variations of possible temperature manipulations around sunrise to control growth are currently being examined; these include raising the temperature towards the end of the night period and dropping back to the "normal" day temperature at sunrise (JUMP). Another variation is to give a modest temperature boost at the end of the night period followed by a drop to below "normal" day temperature at sunrise before returning to "normal" day temperature (JUMP/DROP).

An opportunity arose to screen for the response of *Fuchsia* within the 1992 Bedding DIF programme utilizing the same treatments as for the main trial. This report represents the results of that trial.

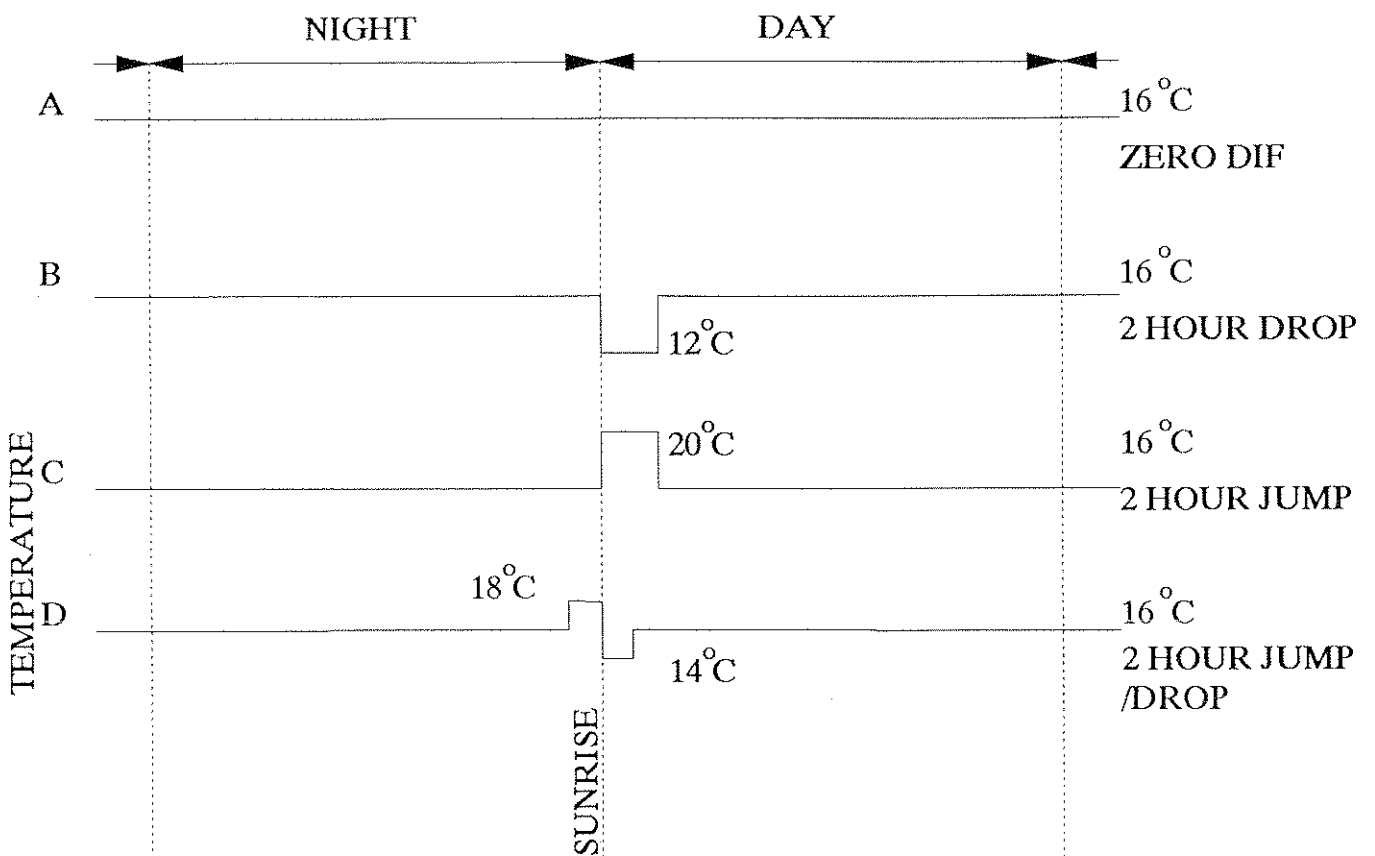
## OBJECTIVE

To screen a range of *Fuchsia* cultivars for their response to DIF temperature regimes.

**MATERIALS AND METHOD**

Plants for the trial were supplied by Hollyacre Plants Limited as rooted cuttings in Steva pots. Potting into 10 F pots in Fisons Levington M2 media took place on 10 January 1992. Once rooted out plants were transferred on 21 January to their respective treatment compartments in 'K' block, equipped with computerised environmental control.

**Treatments**



## **Cultivars**

'Swingtime'

'Pink Ballet Girl'

'Marinka'

'La Campanella'

'Winston Churchill'

'Dollar Princess'

'Beacon'

'Miniros'

## **Potting date**

Week 2 1992.

## **Design**

This unreplicated observation consisted of a single block of 20 plants of each cultivar in each treatment. The plots of each cultivar were placed in the same relative position along the bench in each treatment compartment. This was done to avoid differential response of plants to position on bench confusing possible treatment effects.

## **Cultural details**

Once potted, pots were drenched with propamocarb hydrochloride (Filex) and tolclofos-methyl (Basilex) as a tank mix (10 ml Filex and 2 g Basilex per m<sup>2</sup> in sufficient water to thoroughly penetrate the root zone) to protect against root rots. A preventative spray of iprodione (Rovral 0.5 g per litre) against *Botrytis* was applied on 26 January.

No plant growth regulants were applied in case possible treatment effects were masked.

Liquid feeding commenced 2 weeks after potting and was via overhead lance and rose. The feed given supplied 160 ppm N, 100 ppm P<sub>2</sub>O<sub>5</sub> and 150 ppm K<sub>2</sub>O at every watering.

## Assessments

During the course of the trial the following assessments were made:

1. Full cultural diary.
2. Plant height (cm).
3. 50% flowering date.
4. Growth and habit of plants.
5. Shelf life (dependent on space availability).



## RESULTS

### Effect of temperature regime on plant height

The effect of the four temperature regimes is shown in Figures 1 to 8, Tables 1 to 8, Appendix I, pages 10 to 17. Results were variable between cultivars and no real trends were apparent. Differences where they did occur were small and not necessarily consistent over time.

'**Swingtime**', some indication that treatment B, negative DIF (DROP) of  $-4^{\circ}\text{C}$  for 2 hours at sunrise gave the shortest plants (66.7 cm) whilst treatment C, the so called JUMP regime ( $4^{\circ}\text{C}$  boost in temperature at end of night prior to returning to ambient) gave the tallest plants (72.2 cm).

'**Pink Ballet Girl**', unlike 'Swingtime' treatment B resulted in the tallest growth. The other three treatments gave plants of similar height with only a 1.4 cm difference between them.

'**Marinka**', similar results to 'Pink Ballet Girl' with the negative DIF (DROP) treatment not producing the expected control of height and giving the tallest plants (72.2 cm). The most compact plants were from treatment D, (the JUMP/DROP regime), some 7 cm shorter.

'**La Campanella**', growth was similar regardless of treatment.

'**Winston Churchill**', all three DIF regimes produced some reduction in height compared with the control zero DIF regime (A).

'**Dollar Princess**', in contrast to all other cultivars treatment C, the JUMP regime produced the shortest material (46.2 cm), treatment A, zero DIF, the tallest (50.9 cm) with treatments B and D intermediate.

'**Beacon**', JUMP/DROP treatment produced slightly shorter plants during early growth (weeks 13-16) although the effect had evened out by week 18.

'**Miniros**', the JUMP and JUMP/DROP treatment (C and D) produced slightly shorter plants (57 cm) than the zero DIF treatment. The DROP regimes was similar to the zero DIF.

**Effect of temperature regime on flowering**

Counts were made as flowering for each cultivar commenced. Records included the number of days from potting to 50% of plants in each plot having buds in colour, as well as the number of days until 50% of plants in each plot had open flowers and would have been marketed. These results are shown in Table 9, Appendix I, page 18. These show an overall trend for a small advancement in flowering where JUMP and JUMP/DROP temperatures were employed (3-4 days). Marginally slower to flower were plants grown under negative DIF (DROP), treatment B.

It must be noted however, that daily temperatures were not adjusted to maintain absolutely identical mean 24 hour temperatures and that any advancement in flowering time may be due to slight differences between treatments especially in the JUMP and JUMP/DROP regimes where the 24 hour mean tended to be higher.

**Effect of temperature regime on growth and habit**

No visible differences were noted on growth characteristics such as branching, plant shape etc. between treatments. Overall growth was somewhat "lush" as no chemical growth regulants were used.

**Effect of temperature regime on shelf life**

A small sub sample of plants from three of the eight cultivars, 'La Campanella', 'Winston Churchill' and 'Miniros', were transferred at the marketable stage to controlled environment 'shelf life' facilities. Over a four week period a series of counts were made assessing numbers of flowers and buds remaining on the plants, as well as, numbers that had died or fallen off. Data is presented for each cultivar in Tables 10, 11 and 12, Appendix I, pages 19 and 20. Once again, results between cultivars and treatment response for each varied widely.

The following summary shows the fallen and dead buds recorded over the 4 week period as a % of the total number of flowers and buds produced.

**% of total flowers and buds fallen or dead after 4 weeks**

Cultivar	Treatment			
	A (Zero DIF)	B (DROP)	C (JUMP)	D (JUMP/DROP)
'La Campanella'	78	60	78	68
'Winston Churchill'	28	31	48	39
'Miniros'	66	78	96	84
Average %	57	56	74	64

The above indicates a tendency for plants grown under the JUMP and JUMP/DROP (treatments C and D) regimes to lose a greater proportion of flowers and buds during shelf life than the zero or negative DIF (DROP), treatments A and B).

## DISCUSSION AND CONCLUSIONS

The results and observations made on this trial give no clear indications of major differences between treatments resulting from the use of the four DIF temperature regimes. Response, where it occurred was small and varied with variety.

These preliminary results suggest that JUMP and JUMP/DROP treatments were less effective with regards to height control than regimes involving negative DIF (DROP) or zero DIF. Only the varieties 'Dollar Princess', 'Miniros' and 'Marinka' showed a slight shortening of plants under these regimes. It is also suggested from the limited data available that these regimes produced poorer performance in shelf life (ie. increased flower and bud abortion).

Apart from the differential response at the cultivar level other possible reasons for the lack of clear cut effect on a subject which it is claimed is responsive to DIF treatment may include:

- \* Degree and duration of drop: only a  $-4^{\circ}\text{C}$  decrease in temperature was employed which was maintained over a relatively short time period (2 hours). It may well be that *Fuchsia* require a more intense drop in temperature or a drop lasting for a greater duration to produce a distinct height reduction.
- \* Timing of DIF application: only the early morning period was investigated. Although in most trials to date this has been shown to be the point in time when sensitivity to DIF is at its greatest it may well be that *Fuchsia* sensitivity to DIF should be investigated at other time periods.
- \* Stage of application during growth cycle: as with other subjects responsiveness to DIF treatment may alter with stage of plant development. With bedding DIF has proved more effective during early stages of growth than on more mature plants, ie. the plug stage. DIF treatments in this trial did not start until 2 weeks after potting. A greater response may have occurred if plants had been exposed earlier to temperature treatment.
- \* *Fuchsia* being a vigorous species may require the combined use of a DIF regime in conjunction with a chemical plant growth regulant to effectively control growth.

APPENDIX I.

Figure 1  
Swingtime - Recorded Height (cm)

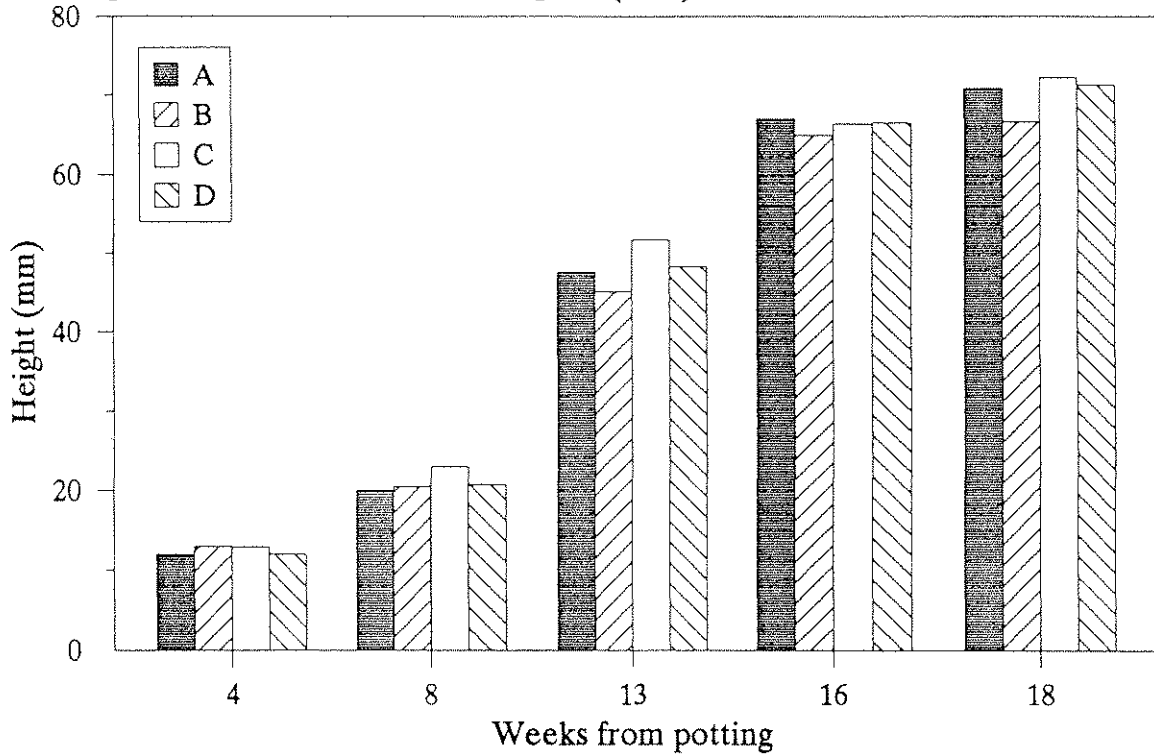


Table 1  
Swingtime - Recorded Height (cm)

Weeks from potting	4	8	13	16	18
Recording date	5 Feb	3 Mar	10 Apr	1 May	15 May
Treatment A	12.0	20.0	47.6	67.0	70.9
Treatment B	13.0	20.5	45.1	64.9	66.7
Treatment C	12.9	23.0	51.7	66.4	72.2
Treatment D	12.0	20.7	48.3	66.5	71.3

Figure 2  
Pink Ballet Girl - Recorded Height (cm)

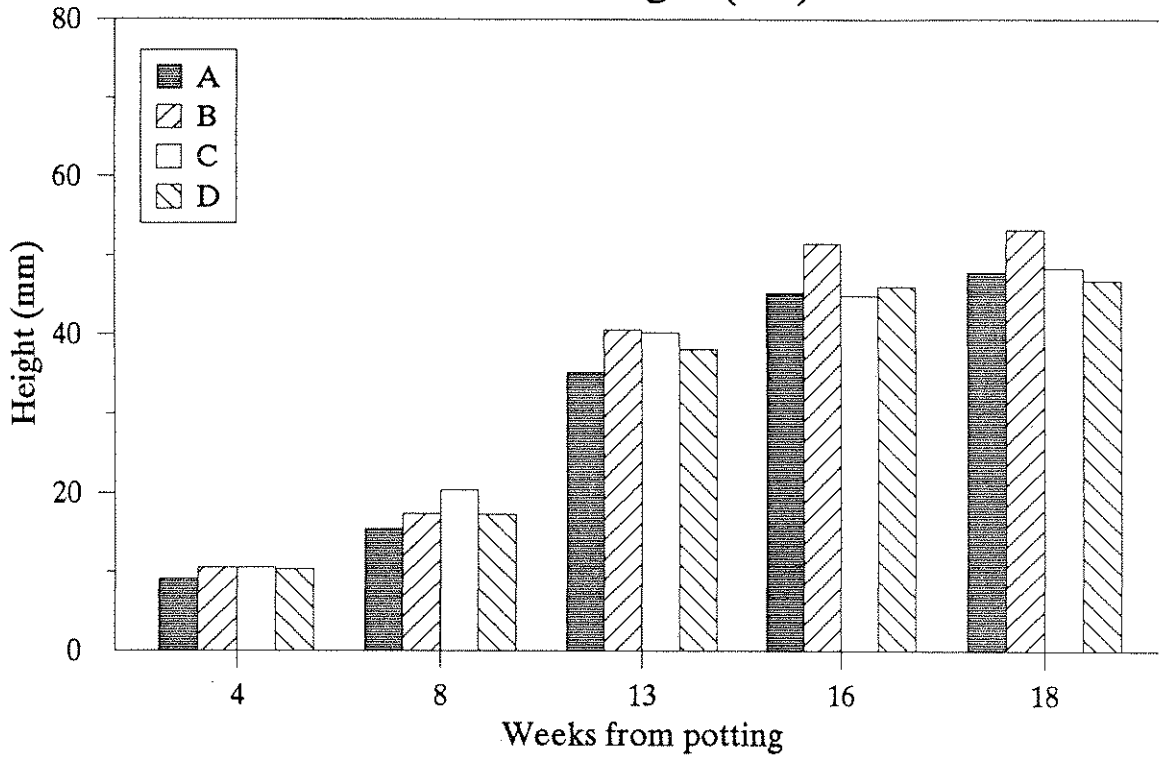


Table 2  
Pink Ballet Girl - Recorded Height (cm)

Weeks from potting	4	8	13	16	18
Recording date	5 Feb	3 Mar	10 Apr	1 May	15 May
Treatment A	9.1	15.5	35.2	45.3	47.9
Treatment B	10.6	17.4	40.6	51.5	53.2
Treatment C	10.6	20.4	40.2	44.9	48.4
Treatment D	10.3	17.3	38.1	46.1	46.9

Figure 3  
Marinka - Recorded Height (cm)

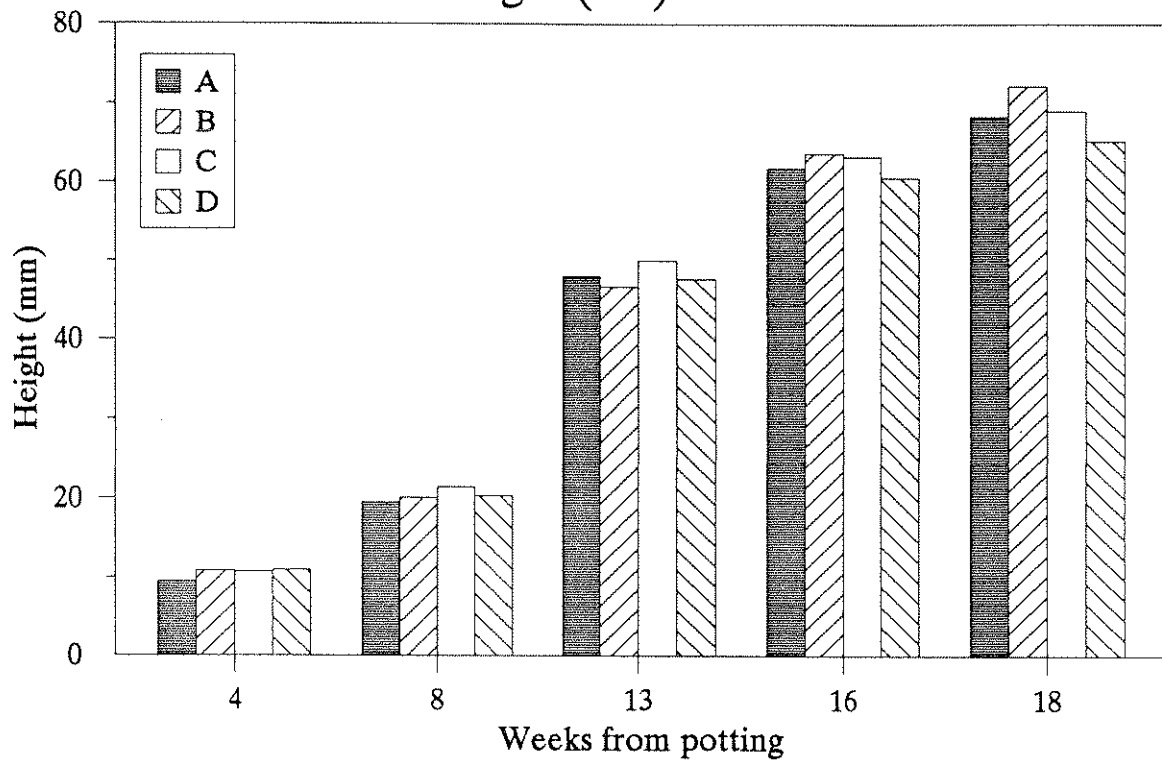


Table 3  
Marinka - Recorded Height (cm)

Weeks from potting	4	8	13	16	18
Recording date	5 Feb	3 Mar	10 Apr	1 May	15 May
Treatment A	9.5	19.5	48.0	61.8	68.4
Treatment B	10.9	20.1	46.6	63.6	72.2
Treatment C	10.7	21.4	49.9	63.2	69.1
Treatment D	11.0	20.3	47.6	60.6	65.3

Figure 4  
La Campanella - Recorded Height (cm)

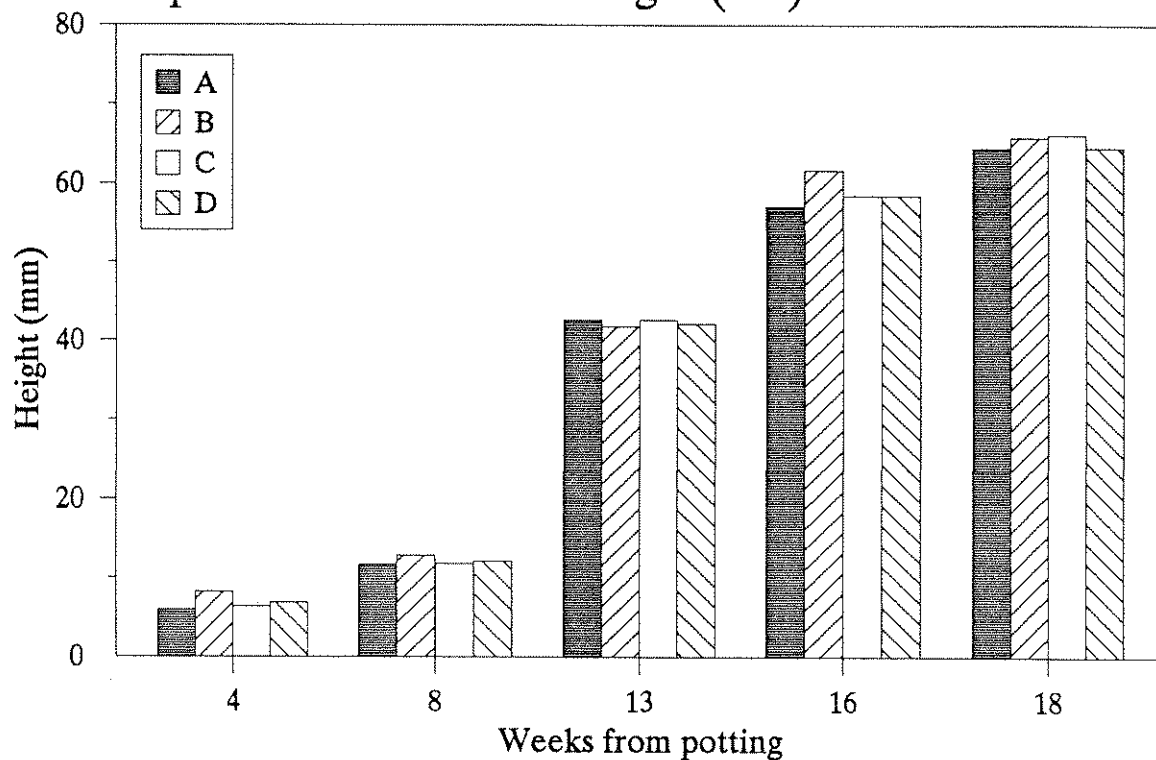


Table 4  
La Campanella - Recorded Height (cm)

Weeks from potting	4	8	13	16	18
Recording date	5 Feb	3 Mar	10 Apr	1 May	15 May
Treatment A	6.0	11.7	42.6	57.0	64.4
Treatment B	8.2	12.8	41.8	61.6	65.8
Treatment C	6.4	11.8	42.6	58.4	66.1
Treatment D	6.9	12.1	42.1	58.4	64.5



Figure 5  
Winston Churchill - Recorded Height (cm)

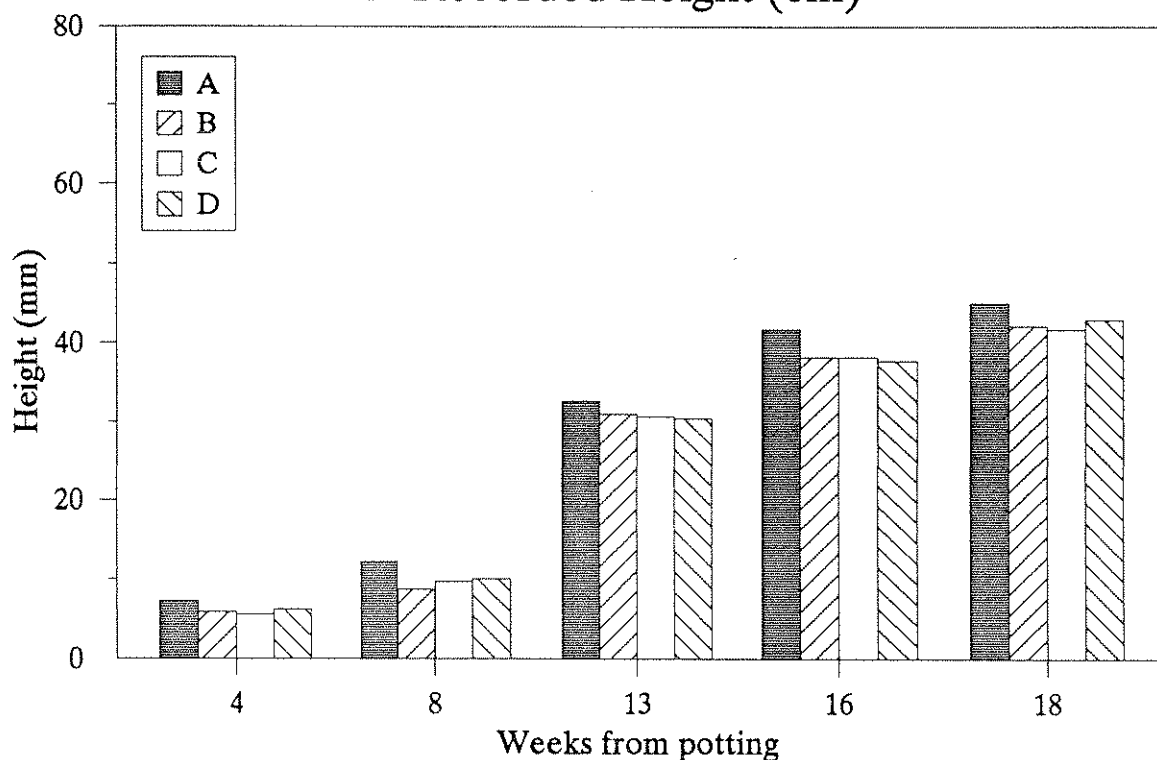


Table 5  
Winston Churchill - Recorded Height (cm)

Weeks from potting	4	8	13	16	18
Recording date	5 Feb	3 Mar	10 Apr	1 May	15 May
Treatment A	7.3	12.2	32.6	41.7	45.0
Treatment B	5.9	8.7	30.9	38.2	42.1
Treatment C	5.6	9.7	30.6	38.2	41.7
Treatment D	6.2	10.0	30.4	37.7	42.9

Figure 6  
Dollar Princess - Recorded Height (cm)

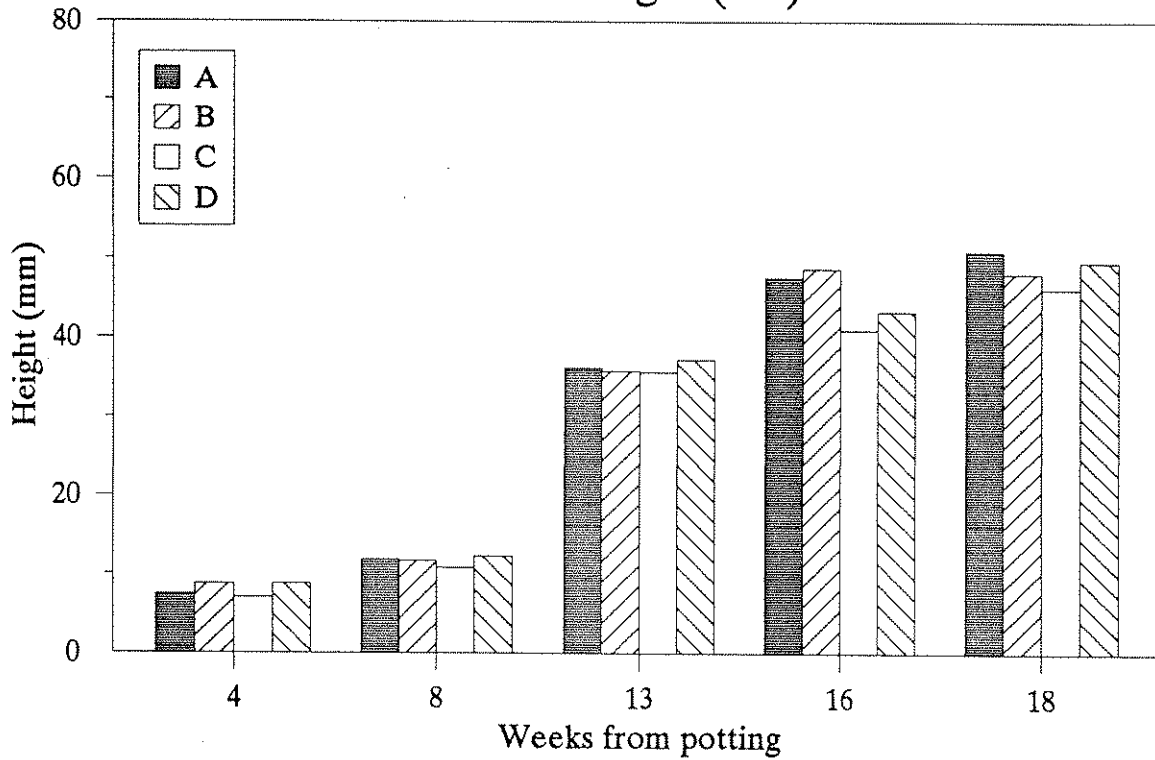


Table 6  
Dollar Princess - Recorded Height (cm)

Weeks from potting	4	8	13	16	18
Recording date	5 Feb	3 Mar	10 Apr	1 May	15 May
Treatment A	7.4	11.8	36.2	47.6	50.9
Treatment B	8.7	11.6	35.8	48.7	48.2
Treatment C	7.0	10.7	35.6	41.0	46.2
Treatment D	8.7	12.2	37.2	43.3	49.6

Figure 7  
Beacon - Recorded Height (cm)

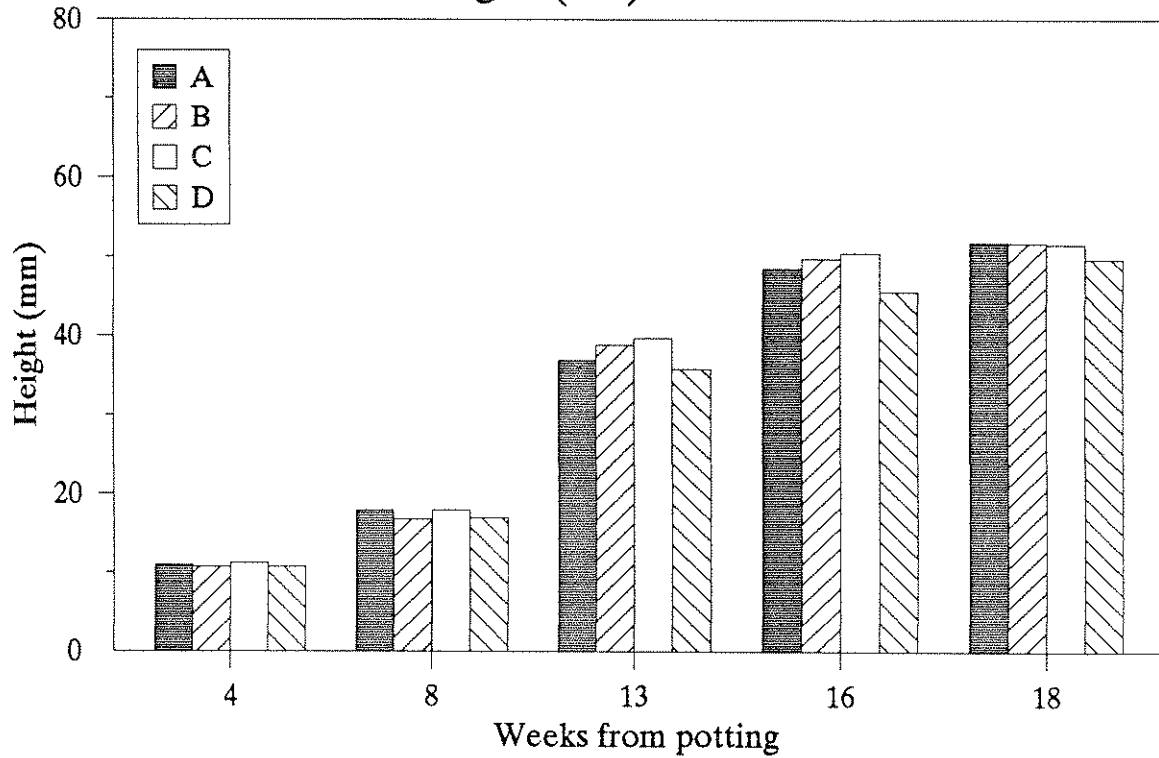


Table 7  
Beacon - Recorded Height (cm)

Weeks from potting	4	8	13	16	18
Recording date	5 Feb	3 Mar	10 Apr	1 May	15 May
Treatment A	11.0	17.9	36.9	48.6	51.9
Treatment B	10.7	16.8	38.8	49.8	51.8
Treatment C	11.2	17.9	39.7	50.5	51.6
Treatment D	10.7	16.9	35.8	45.7	49.8

Figure 8  
 Miniros - Recorded Height (cm)

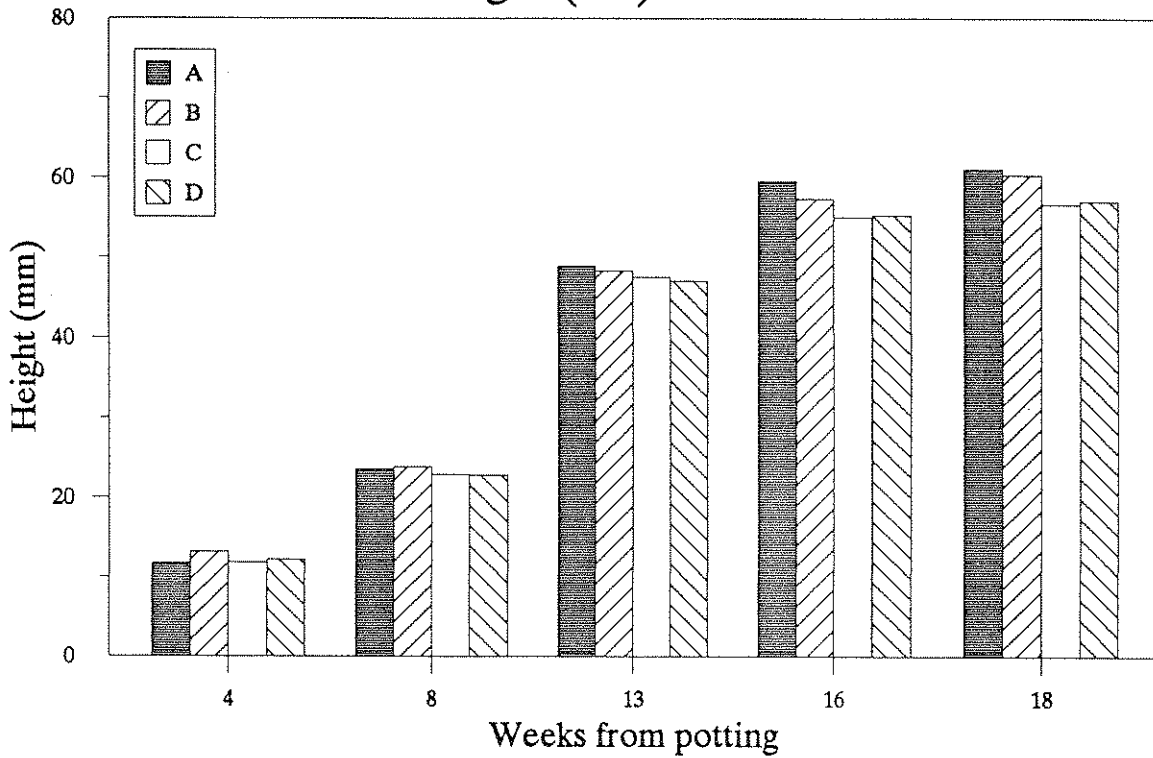


Table 8  
 Miniros - Recorded Height (cm)

Weeks from potting	4	8	13	16	18
Recording date	5 Feb	3 Mar	10 Apr	1 May	15 May
Treatment A	11.7	23.6	48.9	59.5	61.0
Treatment B	13.2	23.8	48.3	57.3	60.3
Treatment C	11.8	22.9	47.5	55.0	56.6
Treatment D	12.2	22.8	47.0	55.2	57.0

**Table 9. Number of days to 50% buds in colour and number of days to 50% flowering**

Cultivar		Treatments			
		A	B	C	D
'Swingtime'	50% bud	96	96	103	87
	50% flowering	125	>125	117	125
'Pink Ballet Girl'	50% bud	77	81	68	77
	50% flowering	110	>125	110	110
'Marinka'	50% bud	103	110	103	103
	50% flowering	>125	>125	125	>125
'La Campanella'	50% bud	103	96	103	103
	50% flowering	>125	>125	125	>125
'Winston Churchill'	50% bud	96	96	96	96
	50% flowering	>125	123	115	>126
'Dollar Princess'	50% bud	81	84	77	81
	50% flowering	110	115	110	108
'Beacon'	50% bud	96	96	96	96
	50% flowering	125	>125	123	125
'Miniros'	50% bud	73	77	73	73
	50% flowering	103	118	103	103
Average	50% bud	91	92	89	90
	50% flowering	115	119	116	115

**Table 10.**  
**Shelf life - number of flowers and buds plus number of flowers and buds dead or fallen over a four week period**

'La Campanella'		Treatment			
		A	B	C	D
Week 1	Flowers + buds	107	167	67	93
Week 2	Flowers + buds	22	49	34	46
	Dead or fallen flowers + buds	99	111	48	61
Week 3	Flowers + buds	4	6	2	6
	Dead or fallen flowers + buds	16	43	32	42
Week 4	Flowers + buds	16	41	2	11
	Dead or fallen flowers + buds	1	3	2	3
<b>Total</b>	Flowers + buds	149	263	105	156
	Dead or fallen flowers + buds	116	157	82	106

**Table 11.**  
**Shelf life - number of flowers and buds plus number of flowers and buds dead or fallen over a four week period.**

'Winston Churchill'		Treatment			
		A	B	C	D
Week 1	Flowers + buds	41	39	50	56
Week 2	Flowers + buds	39	33	30	42
	Dead or fallen flowers + buds	8	12	28	17
Week 3	Flowers + buds	12	19	13	20
	Dead or fallen flowers + buds	19	12	17	22
Week 4	Flowers + buds	11	11	9	9
	Dead or fallen flowers + buds	2	8	4	10
<b>Total</b>	Flowers + buds	103	102	102	127
	Dead or fallen flowers + buds	29	32	49	49

**Table 12.**  
**Shelf life - number of flowers and buds plus number of flowers and buds dead or fallen over a four week period.**

'Miniros'		Treatment			
		A	B	C	D
Week 1	Flowers + buds	135	136	152	141
Week 2	Flowers + buds	55	60	47	67
	Dead or fallen flowers + buds	110	104	165	147
Week 3	Flowers + buds	33	5	2	22
	Dead or fallen flowers + buds	23	57	27	46
Week 4	Flowers + buds	14	7	1	13
	Dead or fallen flowers + buds	23	1	2	10
<b>Total</b>	Flowers + buds	237	208	202	243
	Dead or fallen flowers + buds	156	162	194	203