Agricultural Development and Advisory Service

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CONTRACT REPORT

No. C/87/0360

Pot Chrysanthemums, use of Modules for propagation

Undertaken for HDC

PRINCIPAL WORKERS

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AUTHENICATION

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.

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Summary

Unrooted cuttings of pot chrysanthemums cv Purple Princess Anne were stuck into module trays (cells 30 mm square) at densities of 900, 450 and 225 plants/m². A batch of control cuttings were direct stuck into 140 mm dwarf pots, 5 per pot, giving an initial density of 250 plants/m². Half of the plants were grown in modules for two weeks (long days) and half for four weeks (two weeks long and two weeks short days). When removed from the modules the plants were graded, placing five plants of similar appearance into an individual 140 mm dwarf pot.

At marketing stage the pots were recorded for uniformity of height and stage of flower development within a pot. No significant differences were found between the treatments. It is suggested that the uniformity at marketing stage was not improved by the use of modules because the plant density at the module stage was too high.

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Introduction

Chrysanthemums are the single most important pot plant crop in the UK. Grown mainly in 14 cm dwarf pots, five unrooted cuttings of Princess Anne varieties being direct stuck around the edge, it is a crop almost unique to the UK.

The main problem area is the maintenance of winter quality, in particular, the uniformity of height and flowering in a pot. One approach to improving uniformity is to carefully grade the cuttings prior to sticking (HDC Report 640). However, cuttings which appear similar in terms of size and weight can perform differently (for example, due to premature budding). Within two weeks after pinching it is possible to identify strongly growing or prematurely budded plants; often the differences can be seen within two weeks of sticking.

Objective: To root chrysanthemums individually into small modules and to combine cuttings in the final pot only when differences in vigour can be identified.

Treatments

1	Module growing	i)	density 900 plants/m²
		ii)	" 450 "
		iii)	" 225 "
		iv)	direct stuck control 250 plants/m² pot thick weeks 1 & 2 125 " pots at 250 x 200 mm spacing weeks 3 & 4

2	Duration of module growing:	2 weeks 4 "
3	Sticking week:	44, 52, 8

Materials and Methods

Design

The intention was to have plots consisting of eight recorded pots and two replicates of each treatment at each sticking date. In practice, there were sufficient uniform plants from the module trays to provide only:

one replicate (eight pots) from sticking in week 44
one replicate (eight pots) " " " " 52
two replicates (sixteen pots)" " " " 8

Cultural details

Sticking: unrooted chrysanthemum cuttings, variety Purple Princess Anne, were received from a commercial propagator (Frampton) ready treated with rooting hormone (0.2% IBA). These were stuck according to the experimental treatments, the compost being a commercial peat based medium (Fisons Pot and Bedding). No chlorphonium chloride (Phosphon) was added to any compost in the trial. The module used throughout was one with 30 mm square cells containing 25 cm^3 of compost.

The different planting densities were achieved by either sticking one cutting per cell (900/m^2), one in every alternate cell (450/m^2) or one in every alternate cell in a row and omitting every alternative row completely (250/m^2). Plants stuck directly into 140 mm dwarf pots were grown pot thick for the first two weeks then for three weeks at 200 x 250 mm. All cuttings were covered with clear polythene sheeting for one week until rooting commenced. After sticking, the plants were sprayed with chlorothalonil (Bravo 2.2 ml/litre) to protect against Botrytis.

Photoperiod control: plants were grown in long days (using standard chrysanthemum tungsten night break lighting) for two weeks then transferred to short days until flowering.

Potting: after two weeks of long days, half of the plants were removed from the modules (guard rows being discarded) and graded for uniformity of appearance. Groups of five similar cuttings were placed into pots. The remaining cuttings were grown on in modules for two weeks before being graded and potted. After potting the pots were spaced to 200 x 250 mm.

Nutrition: plants were liquid fed as follows:

Feeding: standard liquid feed consisted of 300 - 400 mg/litre N & K_2O, 60 - 100 P. This was applied as follows:

Plants growing in modules were given half strength feed for one week, commencing one week after sticking. Full strength feed was given thereafter. Those in pots were given no feed for two weeks then full strength feed thereafter.

Spacing: after three weeks of short days pots were set out at 300 x 300 mm.

Growth regulant: pot 'mums are normally grown in the UK with chlorphonium chloride (Phosphon) incorporated into the compost. As plants were being grown in modules and pots of different volumes it was considered preferable to omit the growth regulant. Growth control was therefore achieved solely by the use of daminozide (Alar) applied as follows:

3 days after sticking	625 mg/litre (0.75 g Alar/litre)
10 " " "	2500 mg/litre (3.0 g " ")
7-10 " " "	2500 - 5000 mg/litre (3.0 - 6.0 g Alar/litre)

(repeated 5 - 8 times to give the required height control)

See Appendix 1 for details.

Pests and disease - see Appendix 1.

Recording: all plants in a trial were recorded on one day. The height of each plant in a pot was recorded individually along with the stage of development (score 1 - 8 [most open])of the most advanced flower on each plant. The number of flowers and coloured buds was also recorded.

The standard deviation of the heights and stages of flower development was calculated for each pot. These standard deviations were used as a measure of variability (a large standard deviation indicating a high level of variability).

Results

Analysis of variance was conducted on the records taken and no significant differences were found between any of the treatments. Sensitivity of the trial was greatly reduced by not being able to grade out sufficient wholly uniform material to pot two replicates on each occasion.

The effect of growing in modules on uniformity of flowering, plant height and flower number are shown in Tables 1 and 2 respectively. Very high coefficients of variation (up to 50%) were found so comparisons between treatments could be misleading.

In the absence of Phosphon in the compost, plants grew vigorously despite frequent and heavy applications of Alar.

Table 1 Effect of growing in modules at three densities and two durations on uniformity of flowering (standard deviation scored 1 - 8) within a pot

	Sticking week					
	44		52		8	
density plants/m²	A	B	A	B	A	B
900	0.60	0.19	0.62	0.67	0.80	0.54
450	0.62	1.08	0.91	0.80	0.72	0.58
225	1.14	0.38	0.75	0.71	0.63	0.60
control plots	1.03 1.23		0.56 0.59		0.77 0.92	

A = transplanted after 2 weeks long days
B = transplanted after 2 weeks long days and 2 weeks short days

Table 2 Effect of growing in modules at three densities and two durations on uniformity of height (standard deviation mm) within a pot

	Sticking week					
	44		52		8	
density plants/m²	A	B	A	B	A	B
900	15.0	16.1	30.5	23.5	13.6	17.1
450	20.4	13.0	20.9	16.4	9.4	15.7
225	14.9	19.1	18.6	17.2	12.3	12.7
control plots	22.9 32.6		19.8 16.5		17.9 15.0	

Table 3 Effects of growing in modules at three densities and two durations on number of flowers and buds in colour at marketing

	Sticking week					
	44 *		52		8	
density plants/m²	A	B	A	B	A	B
900	4.38	1.88	13.9	13.00	14.38	15.63
450	2.38	6.63	14.5	13.25	14.25	14.75
225	5.63	1.63	16.0	13.75	13.50	13.63
Control plots	6.25 6.50		13.25 12.25		13.50 14.88	

* in retrospect recorded too early - hence low numbers. Some plants very uneven with one or two advanced flowers.

Discussion and Conclusions

The high cutting densities chosen for the module treatments resulted in the production of non-uniform plants. In ECT 541 it was clearly shown that high plant densities, especially during the first two weeks of short days, can greatly increase variability. The highest density used in ECT 541 was equivalent to the lowest density used in the module trial. For a valid comparison of direct sticking and module growing, similar or lower densities must be used.

Whilst lower plant densities would be desirable, module size cannot be greatly increased. Five 30 mm plugs were easily inserted into the standard 140 mm dwarf pot; a larger size would probably be more difficult and time consuming to pot.

Further work on this topic should be given a low priority as the use of modules would introduce an additional operation into the commercial production costs. A low input 'observation' trial may, however, be considered to investigate the use of very low density growing in modules.

Spray Programme

Product Trade Name	Active Ingredient
Alar	daminozide
Bravo	chlorothalonil
Diazinon	diazinon
Hostaquick	heptenophos
Lindex	lindane
Mycotal	verticillium lecanii
Nimrod	bupirimate
Pirimor	pirimicarb
Stimufol	foliar feed
Tomahawk	flucythrinate
Torque	fenbutatin oxide

Module Trial - Week 44

Date	Spray	
30.10.86	Bravo	2.2 ml/litre
1.11.86	Alar	3 g/litre
5.11.86	Bravo	2.2 ml/litre
14.11.86	Alar	3 g/litre
19.11.86	Diazinon	1 ml/litre
27.11.86	Diazinon	1 ml/litre
1.12.86	Lindex	1.25 ml/litre
3.12.86	Diazinon	1 ml/litre
5.12.86	Hostaquick	0.75 ml/litre
8.12.86	Tomahawk	0.3 ml/litre
13.12.86	Alar	3 g/litre
17.12.86	Diazinon	1 ml/litre
18.12.86	Alar	3 g/litre
26.12.86	Alar	3 g/litre
30.12.86	Alar	3 g/litre
5. 1.87	Alar	3 g/litre
6. 1.87	Diazinon	1 ml/litre
14. 1.87	Alar	3 g/litre
19. 1.87	Alar	3 g/litre
27. 1.87	Diazinon	1 ml/litre
30. 1.87	Lindex	1.25 ml/litre
9. 2.87	Lindex	1.25 ml/litre

Module Trial - Week 52

Date	Spray	
23.12.86	Bravo	2.2 ml/litre
26.12.86	Alar	0.75 g/litre
30.12.86	Bravo	2.2 ml/litre
7. 1.87	Alar	3 g/litre
27. 1.87	Diazinon	1 ml/litre
30. 1.87	Lindex	1.25 ml/litre
9. 2.87	Lindex	1.25 ml/litre
12. 2.87	Alar	3 g/litre
14. 2.87	Diazinon	1 ml/litre
18. 2.87	Vertalec	0.5 g/litre
25. 2.87	Vertalec	0.5 g/litre
27. 2.87	Diazinon	1 ml/litre
2. 3.87	Alar	3 g/litre
4. 3.87	Vertalec	0.5 g/litre
4. 3.87	Pirimor	0.5 g/litre
9. 3.87	Alar	3 g/litre
11. 3.87	Pirimor	0.5 g/litre
11. 3.87	Vertalec	0.5 g/litre
13. 3.87	Diazinon	1 ml/litre
16. 3.87	Torque	0.5 g/litre
18. 3.87	Vertalec	0.5 g/litre
25. 3.87	Bravo	2.2 ml/litre
25. 3.87	Vertalec	0.5 g/litre
27. 3.87	Diazinon	1 ml/litre
1. 4.87	Vertalec	0.5 g/litre

Module Trial - Week 8

Date	Spray	
18.12.87	Bravo	2.2 ml/litre
21. 2.87	Alar	0.75 g/litre
27. 2.87	Bravo	2.2 ml/litre
28. 2.87	Alar	3 g/litre
4. 3.87	Vertalec	0.5 g/litre
4. 3.87	Pirimor	0.5 g/litre
11. 3.87	Vertalec	0.5 g/litre
11. 3.87	Pirimor	0.5 g/litre
13. 3.87	Diazinon	1 ml/litre
18. 3.87	Vertalec	0.5 g/litre
25. 3.87	Vertalec	0.5 g/litre
26. 3.87	Alar	3 g/litre
27. 3.87	Diazinon	1 ml/litre
30. 3.87	Alar	3 g/litre
6. 4.87	Alar	4.5 g/litre
10. 4.87	Diazinon	1 ml/litre
14. 4.87	Alar	6 g/litre
15. 4.87	Pirimor	0.5 g/litre
21. 4.87	Hostaquick	0.75 ml/litre
21. 4.87	Stimufol	0.5 g/litre
22. 4.87	Alar	6 g/litre
24. 4.87	Diazinon	1 ml/litre
5. 5.87	Torque	5 g/litre
18. 5.87	Diazinon	1 ml/litre