CONTRACT REPORT FV 123

EARLY SUMMER AND AUTUMN CAULIFLOWER: EVALUATION OF THE EFFECT OF BOOSTER FEEDS IN COMPARISON WITH STARTER SOLUTIONS ON PERFORMANCE AND CONTINUITY OF PRODUCTION.

Report to:	The Horticultural Development Council 18 Lavant Street Petersfield Hants GU32 3EW
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Period of investigation:	1 Feb 1992 to 28 Feb 1993
Date of report issue:	May 1993
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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

R W P Hiron

Date 27-5-93

Report authorised by .....
Signature

M B WOOD
(Contract Manager on behalf of Dr M R Shipway, Head of Horticultural Development Division, Horticulture Research International)

27/5/93
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Date

COMMERCIAL IN CONFIDENCE

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EARLY SUMMER AND AUTUMN CAULIFLOWER: EVALUATION OF THE EFFECT OF BOOSTER FEEDS IN COMPARISON WITH STARTER SOLUTIONS ON PERFORMANCE AND CONTINUITY OF PRODUCTION

SUMMARY

Commercially funded trials have shown benefits of applying a high phosphate starter solution to cauliflower plants in terms of time to harvest, reducing spread of harvest and improved quality. This has been achieved by placing 50 ml of a 2% solution of 10:52:17 NPK highly soluble fertiliser in the planting hole just prior to the transplant. However, this is an expensive fertiliser and commercially carrying the solution (1700 l/ha) could prove cumbersome. Therefore this trial attempted to determine the minimal inputs in terms of fertiliser and water to achieve the maximum effect. It also looked at booster feeds applied at dispatch from the propagation area to see if these could have the same effect as a starter solution.

Booster feeds applied the equivalent of 0, 0.016, 0.032, 0.05, 0.15 and 0.5 g P/plant and starter solutions 0, 0.064, 0.16, 0.32, 0.8 and 2% solutions using 10:52:17 fertiliser these solutions contained the same amount of P as the equivalent booster feed. The starter solutions were applied in 20 or 50 ml. The trial was done twice, once on an early summer cauliflower crop and once on an autumn crop.

Apart from the fact that the highest booster feed killed the plants and the next to highest damaged the crop then there were no other sensible consistent or significant differences between any of the treatments in either trial. Therefore it would be inappropriate to draw firm conclusions from this trial without further work. However, growth rate data post planting suggests that 50 ml of a 2% starter solution is most effective.

OBJECT

To determine the most appropriate method of applying a high phosphate starter solution but without loss of efficacy to the cauliflower crop.

INTRODUCTION

On transplanting, a brassica crop exploits a very small volume of the soil and is in something of a Catch 22 situation, since to exploit the soil's fertility the root system needs to grow, but for the roots to grow the plant needs nutrients. However, crops do establish, as the modern transplanted crop from plastic trays are able to carry some nutrient to the field, and fields are fertilised to the extent that there is usually some nutrients available to even the smallest root system. But it is considered probable that at times, and under certain conditions, nutrient availability is sub optimal and can adversely affect the rate of crop establishment. One means of alleviating such stress has been shown to be by the use of a starter solution.

Applying a starter solution is defined as putting a small volume, typically 50 ml, of a nutrient solution, supplying something like 4:17:6 kg/ha N:P:K, around the root ball at planting. A range of trials at HRI Kirton funded commercially by Kemira Ltd, HDC and MAFF from 1990-92 on cauliflowers, have usually shown two to seven days advance in 50% cutting date, and on one occasion, a massive 18 day advancement, when starter solution was compared with either water or nothing at planting. In general, there is little affect on total yield except in the unusual circumstances where untreated plants fail to establish altogether. It is considered that a starter solution will be most useful in helping cropping programmes, especially with crops such as cauliflower, which is notoriously difficult to schedule at the best of times.

The drawback with using a starter solution is that even when only putting on this small amount of solution per plant it necessitates carrying 1700 l solution for every hectare planted (374 gal/ac). Therefore, the trial, which was done twice, once with early summer cauliflower and once with autumn cauliflower, investigated whether the amount or concentration of solution given to each plant could be reduced, or even eliminated by applying the starter solution as a booster feed in the glasshouse just prior to planting.

MATERIALS AND METHODS

1. Site

HRI Kirton is located in the village of Kirton situated five miles south of the town of Boston on the A16 in the county of Lincolnshire. The facilities used included a propagation unit and a modern block of Venlo glass.

The early summer cauliflower trial was planted on the field designated Lane 1 and the autumn cauliflower trial on the field designated New Land 2.

2. Trial design and treatments

Each trial was designed as a three replicate randomised block design for the complete factorial of three methods of applying the high level of phosphate fertiliser by six concentrations of phosphate.

The treatments were

1. Booster feeds applied in 1 litre water per tray in the glasshouse before planting

   i 0.5 g P/plant in tray in 1 l water
   ii 0.15 g P/plant in tray in 1 l water
   iii 0.08 g P/plant in tray in 1 l water
   iv 0.032 g P/plant in tray in 1 l water
   v 0.016 g P/plant in tray in 1 l water
   vi Control 1 litre mains water per tray

2. Starter solutions applied in 50 ml water per plant to furrow during planting (1700 l/ha)

i 2% solution in furrow at planting
ii 0.8% solution in furrow at planting
iii 0.32% solution in furrow at planting
iv 0.13% solution in furrow at planting
v 0.064% solution in furrow at planting
vi Control 50 ml water in furrow

3. Starter solutions applied in 20 ml water per plant to furrow during planting (600 l/ha)

i 2% solution in furrow at planting
ii 0.8% solution in furrow at planting
iii 0.32% solution in furrow at planting
iv 0.13% solution in furrow at planting
v 0.064% solution in furrow at planting
vi Control 20 ml water in furrow

NB The highest rate applied as a single booster feed (1i) killed and the second highest (1ii) damaged the plants in the early summer cauliflower trial and so in the second trial these two treatments were replaced by treatments applying the same amount of phosphate during the transplant production. This was achieved by feeding trays of plants with 10:52:17 NPK at 100 mg/l instead of 35:0:0 NPK, with the trays being fed for either the last five weeks (1i) and the last three weeks (1ii) of the transplant production phase.

RECORDS

i Fresh weights and leaf area assessments after planting.

ii Photographs of any marked differences emerging.

iii Crop maturity.

iv Yield and quality assessments.

TRIAL DIARIES

1. Early summer cauliflower crop

Field/soil type:	Lane 1/Course silty marine alluvial
Soil analysis:	pH 8.00 Index : N - 0, P - 3, K - 2, Mg - 4
Previous cropping:	1990 - Grass/barley then grass 1991 - Grass
Cultivations:	20.01.92 - ploughed Worked with Lely before planting
Fertiliser: Base:	09.03.93 - 150 kg/ha N applied as 15:8:24
Top:	23.04.92 - 100 kg/ha N applied as Kaynitro
Propagation:	14.10.91 - Jubro sown. Later pricked out into 104 trays
Planting:	12.03.92 - Trial planted by hand
Herbicides:	16.03.92 - Propachlor as 9 l/ha Ramrod and chlorthal-dimethyl as 6 kg/ha Dacthal
Insecticides:	22.05.92 - Chlorfenvinphos applied as Birlane granules
Fungicides:	None applied

Irrigation: None applied

Notes: Three planted fresh weight samples taken from each plot on 09.04.92, 23.04.92 and 07.05.92
02.06.92 - First harvest date
15.06.92 - Final harvest date

2. Autumn cauliflower crop.

Field/soil type: New Land 2/Course silty marine alluvial

Soil analysis: pH 7.20 Index : N - 0, P - 4, K - 2, Mg - 3

Previous cropping: 1990 - Grass
1991 - Grass

Cultivations: 18/19.10.91 - Subsoiled
05.12.91 - lime applied; 4 tonnes/acre on low pH, 2 tonnes/acre on rest
11.01.92 - Ploughed E-W
Worked with Lely before planting

Fertiliser: Base: ICI No 7 as 150 kg/ha N
Top: Nitram as 100 kg/ha N

Propagation: 07.05.92 - 30 trays Plana sown

Planting: 25.06.92 - Trial planted by hand

Herbicides: 30.06.92 - Chlorthal-dimethyl as 6 kg/ha Dacthal and propachlor as Portman Propachlor at 9 l/ha applied

Insecticides:	Pre-planting - Chlorpyrifos as 10-12 ml/sq. m Dursban drench on 24.06.92 14/15.08.92 - Cypermethrin as 250 ml/ha Ambush C applied 19.09.92 - Pirimicarb as 420 g/ha Aphox and Ambush C applied
Fungicides:	None applied
Irrigation:	None applied
Notes:	Three planted fresh weight samples taken from each plot on 23.07.92, 07.08.92 and 20.08.92 11.09.92 - First harvest date 28.09.92 - Final harvest date

RESULTS AND DISCUSSIONS

1. Growth rate in field

For both trials, fresh weight samples were taken four, six and eight weeks after planting. The results are summarised in Tables 1 and 2. In the first trial, applying the two highest rates of booster feeds to the trays in the propagation area killed the plants. In the second trial, in an attempt to overcome this problem, these two treatments were replaced with high phosphate feeds applied during the whole or part of the propagation phase, the idea here being to gradually build up the phosphate levels in the transplant root ball. Bearing in mind that the treatment differences were small in both trials, the results suggest that applying 50 ml of a 2% starter solution was the only effective treatment. Applying booster feeds to the trays appeared to have no effect at all, and the effect of the starter solution appeared to be reduced by a reduction in either the volume or concentration of starter solution.

Table 1 Fresh weight of samples four, six and eight weeks after planting the early summer trial (selected treatments).

Treatment	Fresh weight (g) time after planting (weeks) 4	6	8
Main treatments averaged:			
Applied in glasshouse	31	106	345
Applied in 50 ml solution in field	45	128	428
Applied in 20 ml solution in field	40	115	347
Individual field treatments:			
2% solution 10:52:17 (50 ml)	52	160	485
0.8% solution 10:52:17 (50 ml)	48	124	464
0.32% solution 10:52:17 (50 ml)	43	113	414
0.13% solution 10:52:17 (50 ml)	40	126	431
0.064% solution 10:52:17 (50 ml)	42	116	378
Water only (50 ml)	43	118	397

Table 2 Fresh weight of samples four, six and eight weeks after planting autumn trial

Treatment	Fresh weight (g) time after planting (weeks) 4	6	8
Main treatments averaged:			
Applied in glasshouse	81	713	2636
Applied in 50 ml solution in field	142	1020	3373
Applied in 20 ml solution in field	93	703	2889
Individual field treatments:			
2% solution 10:52:17 (50 ml)	172	1144	3720
0.8% solution 10:52:17 (50 ml)	150	1048	2979
0.32% solution 10:52:17 (50 ml)	142	1053	3220
0.13% solution 10:52:17 (50 ml)	128	1073	3049
0.064% solution 10:52:17 (50 ml)	125	1001	3628
Water only (50 ml)	122	1004	3643

2. Yield and maturity data

The yield and maturity data are summarised in Tables 3 and 4, for the early summer and autumn crops respectively. The results show there to be no consistent logical differences between treatments in either trial, except that in the first trial, as previously stated, the two

highest concentration booster feed treatments had detrimental effects, the 0.5 g/plant treatment killing plants, and the 0.15 g/plant treatment lowering yield and quality.

The only other important observation is that 50 ml of 2 or 0.8% solution appears to have reduced the spread of cut of the autumn crop compared to the water only control, although the differences were not quite significant at 5%.

Table 3. Yield and maturity data for early summer cauliflower trail

Treatment	50% harvest date	Length of cut (days)	Total mkble yield Class 1 & 2 (crates/ha)
Booster feeds applied to tray:			
0.5 g P/plant	DEAD	DEAD	DEAD
0.15 g P/plant	4 June	7.7	2095
0.08 g P/plant	4 June	7.1	2324
0.032 g P/plant	4 June	8.0	2409
0.016 g P/plant	5 June	7.2	2541
Water only (Control)	5 June	5.9	2326
50 ml Starter solution in furrow			
2% solution	3 June	4.6	2692
0.8% solution	4 June	5.6	2571
0.32% solution	6 June	5.3	2574
0.16% solution	5 June	4.4	2596
0.064% solution	6 June	5.7	2574
Water only (Control)	6 June	6.0	2640
20 ml Starter solution in furrow			
2% solution	4 June	6.9	2563
0.8% solution	4 June	5.4	2455
0.32% solution	4 June	7.8	2359
0.16% solution	6 June	7.2	2409
0.064% solution	4 June	5.8	2574
Water only (Control)	4 June	5.7	2480
*SED (32 df) = ±	0.7	1.41	181.9
LSD (5%)	1.3	2.86	369.3

Table 4. Yield and maturity data for autumn cauliflower trail

Treatment	50% harvest date	Length of cut days	Total mkble yield Class 1 & 2 (crates/ha)
Booster feeds applied to tray:			
High phosphate feed 5 weeks inprop	18 Sept	8.8	2640
High phosphate feed 3 weeks inprop	18 Sept	9.2	2442
0.08 g P/plant	16 Sept	9.8	2409
0.032 g P/plant	16 Sept	6.6	2310
0.016 g P/plant	17 Sept	7.5	2541
Water only (Control)	17 Sept	9.1	2343
50 ml Starter solution in furrow			
2% solution	14 Sept	6.8	2574
0.8% solution	13 Sept	5.7	2673
0.32% solution	15 Sept	10.2	2607
0.16% solution	15 Sept	8.9	2475
0.064% solution	15 Sept	9.2	2673
Water only (Control)	14 Sept	8.2	2805
20 ml Starter solution in furrow			
2% solution	15 Sept	7.0	2673
0.8% solution	14 Sept	8.1	2574
0.32% solution	16 Sept	10.4	2706
0.16% solution	16 Sept	9.4	2706
0.064% solution	17 Sept	7.8	2838
Water only (Control)	17 Sept	7.9	2376
SED (34 df) = ±	1.2	1.66	210.9
LSD (5%)	2.4	3.37	428.1

CONCLUSIONS

Unfortunately differences between treatments in both trials were so slight that it is not possible to draw sensible conclusions.

RECOMMENDATIONS FOR FURTHER WORK

This is thought to be an important area of work as if starter solutions are going to be used commercially it is important to know what minimum inputs are required to achieve the maximum effect therefore it is recommended that this continues in a modified form concentrating on starter solutions.

ACKNOWLEDGEMENTS

The author acknowledges the excellent technical assistance of Miss S A Minns of the Station's staff.

STORAGE OF DATA

The raw data will be stored at HRI Kirton, Government Buildings, Willington Road, Kirton, Boston, Lincs PE20 1EJ for a period of 10 years. The HDC will be consulted prior to disposal.

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