

CONTRACT REPORT C383 FV131

**BRUSSELS SPROUTS: TO INVESTIGATE THE
POTENTIAL OF THE USE OF A HIGH
PHOSPHATE STARTER SOLUTION TO IMPROVE
YIELDS AND PREVENT LODGING OF CROPS
RAISED IN CELLULAR TRAYS**

UNDERTAKEN FOR THE HDC

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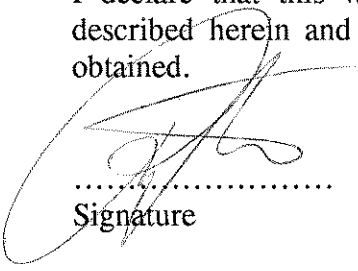
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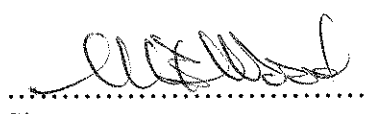
I declare that this work was done under my supervision according to the procedures described herein and that this report represents a true and accurate record of the results obtained.


.....
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Date 8-1-93

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BRUSSELS SPROUTS: TO INVESTIGATE THE POTENTIAL OF THE USE OF A HIGH PHOSPHATE STARTER SOLUTION TO IMPROVE YIELDS AND PREVENT LODGING OF CROPS PROPAGATED IN CELLULAR TRAYS

SUMMARY

The effects of a high phosphate starter solution on the Brussels sprout crop were investigated. Three varieties; Lunet, Troika and Lauris were field-grown from three establishment procedures; cell-raised transplants with starter solution, cell-raised transplants with water only starter solution equivalent and bare-root transplants. The treatments were compared for early growth, lodging and yield.

Variety had no effect upon early growth when measured as individual plant fresh weight, the starter solution had a slight beneficial effect but the bare-root transplants were considerably heavier than the cell-raised transplants.

Troika lodged less than Lauris which was considerably better than Lunet, starter solution had no effect upon leaning or lodging whilst bare-root raised plants were much better than the cell-raised transplants.

Lunet and Lauris outyielded Troika, starter solution had no effect upon yield but the bare-root-raised plants considerably outyielded the cell-raised transplanted crop.

OBJECT

To investigate whether the use of a starter solution applied to the planting hole of cell-raised Brussels sprouts transplants improved yield and or prevented lodging.

INTRODUCTION

Simply put, the idea behind the use of a starter solution, is to ensure that a small amount of the major nutrients, especially phosphate, is put in close proximity to the roots at

transplanting to ensure that a crop suffers no stress from shortage of fertiliser during the very early stages of growth. In conditions where this starter solution is alleviating stress then this should result in faster earlier growth and a yield or earliness advantage.

Over the period 1990-1992 in trials funded by Kemira Cropcare Ltd, the HDC and MAFF this advantage has been shown to hold true for cauliflower usually resulting in an earlier harvest and this earliness has ranged from 3-18 days, depending upon establishment condition.

The HDC was approached to fund work to extend the range of crops on which the effect of a starter solution at transplanting could be investigated and Brussels sprouts was considered a suitable candidate for the following reason. In the early 1980's cellular tray-raised transplants were introduced for, and taken up by, cauliflowers growers in the eastern counties, especially South Lincolnshire. Once the system was accepted and growers converted to their use then all brassicas grown by these growers were raised in the same system. This has led to a significant proportion of Brussels sprouts being raised in cellular trays despite the observations that such plants were more prone to lodging and sometimes gave a reduced yield when compared with drilled, or bare-root-transplant-established crops. Government funded work at HRI-Kirton during the eighties looked at a number of cultural and nutritional means of modifying plant growth to improve the yields and standability of 'cellular tray'-raised sprouts, none of which were particularly successful.

Work on transplanted cauliflower at HRI-Kirton over the last two seasons has investigated the effect of high phosphate starter solutions which have been found to be advantageous. These advantages can be explained by the earlier development of a larger root system which leads to more efficient nutrient and/or water extraction. If this is the case, then starter solution-treated Brussels sprouts might develop a root system capable of more efficient nutrient extraction which may compensate for any loss of yield inherent in the raising method and if the increased root growth included greater growth of structural roots then the resultant root system may provide better anchorage and stability and thus reduce lodging. This hypothesis was investigated in the trial described as follows:-

MATERIALS AND METHODS

Site

HRI Kirton is located in the village of Kirton situated five miles south of the town of Boston. The facilities used include a propagation unit, with adjacent block of modern Venlo glass. The trial was established by hand in the field designated 40 Acres 8. Commercial type sprout stripping and grading facilities were used.

TRIAL DESIGN AND TREATMENTS

This was a simple four replicate randomised block design with three varieties and three starter solution/transplant treatments. Therefore $3 \times 3 \times 4 = 36$ plots.

a) Varieties:

- i Lunet
- ii Troika
- iii Lauris

b) Starter solution/transplant treatment:

- i Tray-raised with starter solution (60 ml of 3% soln 10:52:17)
- ii Tray-raised no starter solution (60 ml water)
- iii Bare-root plants no starter solution.

RECORDS TAKEN

- a) Crop diary
- b) Fresh weight of sample of six plants on three dates
- c) Leaning and lodging
- d) Yield in size grades

TRIAL DIARY

Field/soil type: 40 Acres 8/medium - heavy silt loams

Soil analysis: pH 7.8 Indices : $P_2O_5=4$, $K_2O=2$, $Mg=3$

Previous cropping: 1990 - Alliums
1991 - Grass

Cultivations: 4.12.91 - ploughed
8.5.92 - worked with two passes of Lely Roterra before planting

Fertiliser: Base: 7.5.92 150 kg/ha N as Kaynitro 25:0:16
Top: 4.6.92 100 kg/ha N as Nitram 35:0:0

Propagation: 11.3.92 - Lunet, Lauris and Troika sown: five GPG 308 plastic trays and three dutch lights per variety

Planting: 8.5.92 - by hand, with or without starter solution (see treatments)

Herbicides: 15.5.92 - Propachlor as 9 l/ha Ramrod and chlorothal- dimethyl as 6 kg/ha Dachthal W-75

Insecticides: 22.6.92 - Demeton-S-Methyl as 560 ml/ha Metasystox and cypermethrin as 250 ml/ha Barclay Cypersect
16.7.92 - Metasystox and Cypersect, as on 22.6.92
14/15.8.92 - Cypermethrin as 250 ml/ha Ambush C
15.8.92 - Methiocarb as 5.4 kg/ha Draza applied to pathways
10.9.92 - Metasystox and Cypersect, as on 22.6.92
8/9.19.92 - Pirimicarb as 420 g/ha Aphox and cypermethrin as 250 ml/ha Ambush C

Fungicides: 18.8.92 - Chlorothalonil and metalaxyl as 2 l/ha Folio
575FW and triamenol as 500 ml/ha Bayfidan
17.9.92 - Folio and Bayfidan as above
14.10.92 - Chlorothalonil as Bravo applied

Irrigation: None

Harvest: 12.10.92 All Lauris plots
4.11.92 All Lunet and Troika plots

Note: Six-plant fresh weight samples per plot taken on 1.6.92, 16.6.92
and 1.7.92

RESULTS AND DISCUSSION

1. Growth differences on three dates during early development

Plots were sampled on 1 and 16 June and 1 July when six plants per plot were taken for fresh weight determinations. The results are presented in Tables 1, 2 & 3. There are no significant consistent differences between varieties but on all three dates the bare-root plants were considerably heavier than the two tray-raised treatments.

Although on all three dates the starter solution-treated plants were heavier than the no starter solution treatments this was only significant on the middle date.

Table 1 Fresh weight, in grammes, of individual plant means recorded on 1 June

Variety	Treatment			Mean
	Tray-raised plant plus starter	Tray-raised plant no starter	Bare-root plant	
Lunet	34.6	31.8	44.4	37.0
Troika	38.9	29.1	57.0	41.7
Lauris	33.6	29.4	65.1	42.7
Mean	35.7	30.1	55.5	
SED (24 df)		Variety = 3.46		
		Treatment = 3.46		
		Var x Treat = 5.99		

Table 2 Fresh weights, in grammes, of individual plant means recorded on 16 June

Variety	Treatment			Mean
	Tray-raised plant plus starter	Tray-raised plant no starter	Bare-root plant	
Lunet	323.1	254.4	310.5	296.0
Troika	276.6	250.2	416.4	314.4
Lauris	292.2	242.7	455.9	330.3
Mean	297.3	249.1	394.3	
SED (24 df)		Variety = 16.35		
		Treatment = 16.35		
		Var x Treat = 28.31		

Table 3 Fresh weight, in grammes, of individual plant means recorded on 1 July

Variety	Treatment			Mean
	Tray-raised plant plus starter	Tray-raised plant no starter	Bare-root plant	
Lunet	883	834	924	880
Troika	814	820	911	848
Lauris	846	777	948	857
Mean	848	810	928	
SED (24 df)		Variety = 36.1		
		Treatment = 36.1		
		Var x Treat = 62.4		

2. An examination of leaning and lodging of plants just prior to harvest

A Brussels sprout plant was deemed to be leaning if the angle of the stem was judged to be 45 degrees or more away from the vertical; number per plot are recorded. However, to get an overall impression of lodging a sample of ten plants per plot were measured for length of stalk and head height above ground and expressed as a ratio height above ground divided by stem length so that a ratio of 1.00 is perfectly upright and 0.0 would be flat on the ground. The data for leaning are given in Table 4 and for lodging in Table 5. The two means of measuring uprightness showed similar trends.

The variety Troika leaned/lodged very little compared to the other two varieties, and a higher proportion of Lunet leaned/lodged than did Lauris. There was no effect of starter compared with no starter but the bare-root-raised plants stayed more upright than the cell-raised transplanted crop.

Table 4 Number of sprout stalks assessed as leaners (leaning by more than 45°)

Variety	Treatment			Mean
	Tray-raised plant plus starter	Tray-raised plant no starter	Bare-root Plant	
Lunet	53.2	41.3	22.3	38.9
Troika	11.0	9.8	8.0	9.6
Lauris	28.3	45.8	14.1	29.4
Mean	30.8	32.3	14.8	
SED (24 df)		Variety = 6.74		
		Treatment = 6.74		
		Var x Treat = 11.67		

Table 5 An estimation of average lodging by the ratio of height of stalk head above ground over stalk length

Variety	Treatment			Mean
	Tray-raised plant plus starter	Tray-raised plant no starter	Bare-root Plant	
Lunet	0.59	0.62	0.71	0.64
Troika	0.86	0.82	0.86	0.85
Lauris	0.83	0.68	0.89	0.80
Mean	0.76	0.71	0.82	
SED (24 df)		Variety = 0.033		
		Treatment = 0.033		
		Var x Treat = 0.057		

3. Yield data

The yield data are presented in Table 6. Lunet and Lauris outyielded Troika as did the bare-root-raised plants when compared to the cell-raised-transplanted crop. The presence of a starter solution had no effect upon yield.

Table 6 Total marketable yield results

Variety	Treatment			Mean
	Tray-raised plant plus starter	Tray-raised plant no starter	Bare-root plant	
Lunet	17.9	20.3	21.2	19.8
Troika	11.7	10.6	15.2	12.5
Lauris	19.2	17.8	20.4	19.1
Mean	16.3	16.3	18.9	
SED (24 df)		Variety = 0.75		
		Treatment = 0.75		
		Var x Treat = 1.31		

CONCLUSIONS

1. The use of a high phosphate starter solution had very little effect in this trial, perhaps giving a slight increase in plant size, but having no effect upon standability or yield.
2. Bare-root-raised plants were heavier, lodged less and yielded higher than cell raised transplants.

RECOMMENDATIONS FOR FURTHER WORK

- 1 This trial should be repeated as responses to starter solution vary from season to season (NB In cauliflowers, crop have responded best during dry, stressful conditions).
2. Treatments should be modified to attempt to bridge the gap between cell-raised plants to bare-root plants which, as this experiment confirms, still at yield cell-raised ones.

ACKNOWLEDGEMENTS

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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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