SUGAR BEET - SEED PRIMING NAS 511 ML 78

SUMMARY

There were marked differences between varieties in their response to priming and pelleting treatments.

Bush Mono G was generally unresponsive to treatment.

Nomo had an improved emergence rate after steeping in peroxide solution, while pelleting improved its emergence rate further at a later stage.

Amono seedling emergence and final plant establishment was better with pelleting and this also appeared to improve its sugar yield.

No significant yield differences can be attributed to any treatment due to considerable variations in yield data throughout the experiment.

OBJECT

To compare the priming and pelleting treatments of 4 varieties of sugar beet seed. Half the seed of each priming treatment was pelleted with Filcoat and the remainder with Filcoat + CaO_2.

TREATMENTS

Variety	Priming Treatment	Pellet	Regularity of spacing
Bush Mono G	Untreated	Filcoat	Regular - hand singled from 9.5 cm
Amono	H_2O_2	Filcoat+CaO_2	Irregular - Drilled to a stand at 19 cm
Nomo			
Sharpe's Klein			
Monobeet			

LAYOUT

2 randomised blocks

SOIL TYPE

Ashley series (sandy clay loam)

PREVIOUS CROPPING

Field: Myll Field
1977 Peas
1976 W.wheat
1975 S.barley + W.oats

Drilled

7 April 1978

Harvested

By hand 20 Nov. 1978

CONFIDENTIAL*

SUGAR BEET - SEED PRIMING, 1978

NAS 511 ML
3rd year

SUMMARY

There were marked differences between varieties in their response to seed priming using either a hydrogen peroxide (H_2O_2) steep or calcium peroxide in the seed pellet coat. Whereas Bush Mono G was generally unresponsive to treatment, Nono appeared to have a more rapid initial seedling emergence when treated with H_2O_2 and further improvement in emergence rate at a later stage from the pellet treatment. Amono tended to respond more to the pellet treatment than to the seed steeping treatment both in emergence rate and in plants finally established. This effect also appeared to influence the sugar yield of Amono but because of the variability within the experiment none of the yield differences were significant.

METHOD

In 1976 and 1977 field trials at Morley had indicated useful improvements in the rate of crop emergence and seedling vigour through seed treatment by hydrogen peroxide. This effect was especially pronounced with the variety Nono, which gave significant yield increases from the seed priming.

In 1978 representative samples of seed of four major sugar beet varieties were divided into two lots. Half were treated by steeping in 0.5% (w/v) hydrogen peroxide for 10 hours then dried back to their original moisture content while the remainder were left untreated. Each lot were further sub-divided into two parts, one part being pelleted in the standard Germain 'Filcoat' material and the other part was pelleted in an experimental formulation of 'Filcoat' including calcium peroxide at 50% on seed weight.

When the trial was drilled into a fine moist seedbed on 7 April all treatments were sown in duplicate plots at both 9.5 and 19.0 cm spacings by precision drill. The close spaced plots were intended for hand thinning to assess vigour effects by eliminating population differences which might occur from drilling to a stand, but emergence on these plots was unsatisfactory and it was not possible to achieve constant plant populations by this technique. The results which follow were obtained from the drilled-to-a-stand plots. There were two fully randomised replicates.

*NOT FOR PUBLICATION WITHOUT THE DIRECTOR'S CONSENT. This report deals primarily with only one year's work so any conclusions given are only provisional.

Frequent counts of seedlings were made between 29 April and 1 June to determine the pattern of emergence. The trial was hand harvested on 20 November.

TREATMENTS

All combinations of:

Variety: Bush Mono G
Anono
Nono
Sharpe's Klein Monobeet (data excluded because of poor emergence)

Seed Priming: Commercial seed
Commercial seed primed with H_2O_2

Type of Pellet: Standard 'Filcoat'
'Filcoat' with CaO_2

Layout

2 randomised blocks

RESULTS

1. Seedling Emergence

Summaries of typical seedling counts carried out during the brairding period are given in the following table.

Seedling establishment plants/ha (thousands)

Variety	Untreated Seed	H_2O_2 steep	CaO_2 pellet	H_2O_2 steep + CaO_2 pellet
29 April			($\pm$1.39)	
Bush Mono G	8.2	9.5	7.0	6.7
Anono	0.5	6.0	2.0	7.0
Nono	0.8	19.2	3.0	19.2
2 May			($\pm$7.26)	
Bush Mono G	36.2	35.7	40.5	24.5
Anono	23.0	26.7	27.2	28.0
Nono	18.5	35.2	24.5	51.5
5 May			($\pm$5.66)	
Bush Mono G	57.0	51.0	60.7	54.7
Anono	46.0	48.2	58.5	54.7
Nono	52.2	57.2	59.0	67.0

S.E. per plot (11 d.f.) 29 April $\pm$1.96 or 26.4% of G.M.
2 May $\pm$10.27 or 33.1% of G.M.
5 May $\pm$8.01 or 14.4% of G.M.

There was a marked difference between varieties in their response to the priming techniques used. Bush Mono G, which was relatively quick to emerge, proved to be generally unresponsive, but at the other extreme normal untreated Nono was slower to emerge and hydrogen peroxide steeping produced a significant improvement in the initial emergence rate.

By contrast, the calcium peroxide pellet had no observable effect on the early emergence pattern but appeared to improve the emergence rates at a later stage, this was most obvious with Anono, but the differences were not statistically significant.

There are a number of alternative methods of summarising the seedling emergence data. In the past some emphasis has been placed on calculations of the number of days to a given level of emergence, usually 50%, but there are difficulties with this technique when the final plant populations for the various treatments show large differences. One possible way of comparing the emergence patterns which does not suffer from this problem and which does not require knowledge of a laboratory standard (as in Relative Emergence Efficiency) is the calculation of Field Germinative Energy based on a weighted mean % emergence.

$$\text{Field Germinative Energy} = \frac{\text{Sum of (\% emergence x days from drilling) per count}}{\text{Sum of days from drilling per count}}$$

The more rapid the emergence, the nearer the figure will be to 100 (maximum).

Both methods for summarising the emergence patterns are given in the following table:-

Variety	Untreated seed	H_2O_2 Steep	CaO_2 pellet	H_2O_2 steep + CaO_2 pellet
Days to 50% Emergence			($\pm$4.80)	
Bush Mono G	27.6	28.0	26.7	27.8
Anono	41.3	42.5	27.3	28.1
Nono	28.1	27.5	29.1	25.5
S.E. per plot (11 d.f.)	$\pm$6.79 or 22.7% of G.M.			
Field Germinative Energy			($\pm$3.37)	
Bush Mono G	44.7	44.2	46.0	39.1
Anono	34.4	37.3	42.3	43.4
Nono	42.0	45.7	44.1	54.9
S.E. per plot (11 d.f.)	$\pm$4.76 or 11.0% of G.M.			

Because of considerable variability in the results the differences between means were not statistically significant but did support trends seen in individual counts.

2. Plant Vigour

The trial was given a score for plant vigour by two independent observer's on 17 July. The mean scores are given in the following table.

Crop Vigour - 17 July (1 = poor; 10 = good)

Variety	Untreated seed	H_2O_2 steep	CaO_2 pellet	H_2O_2 steep + CaO_2 pellet
			(±0.50)	
Bush Mono G	8.0	7.5	7.7	7.5
Amono	6.7	7.2	8.2	7.7
Nono	7.5	7.5	7.5	7.7
S.E. per plot (11 d.f.)	±0.71 or 9.4% of G.M.			

The differences were small and not significant.

Final Plant Population

Numbers of roots at harvest (th/ha)

Variety	Untreated seed	H_2O_2 steep	CaO_2 pellet	H_2O_2 steep + CaO_2 pellet
			(±4.7)	
Bush Mono G	60	58	59	57
Amono	45	49	63	62
Nono	68	59	68	68
S.E. per plot (11 d.f.)	±6.7 or 11.2% of G.M.			

There appeared to be a much higher plant population resulting from using calcium peroxide pelleted seed compared with the standard pellet in the case of Amono, but these differences were not statistically significant.

3. Sugar Yield

The trial was hand harvested on 20 November and the results are given below:

Yield of sugar (t/ha)

Variety	Untreated seed	H_2O_2 steep	CaO_2 pellet	H_2O_2 steep + CaO_2 pellet
			(±0.545)	
Bush Mono G	8.91	8.45	8.23	8.36
Amono	8.23	9.07	9.75	9.33
Nono	8.85	8.39	9.14	8.73
S.E. per plot (11 d.f.)	±0.770 or 8.8% of G.M.			

Amono appeared to respond to having calcium peroxide in the pellet coat by producing a higher yield. However, as with many of the assessments, the yield data showed considerable variability and there were no significant differences in sugar yield due to seed or pellet treatment.

G.M.P. & W.E.B.