

SUGAR BEET

SUGAR BEET SEED PRIMING

NAS 511 ML 77

Following the useful yield increases brought about by priming seed with H_2O_2 in 1976, the trial was continued in 1977 using the same varieties but with the inclusion of Sharpe's Klein Monobeet. An additional treatment of advancing the seed with water was also included. To investigate the priming effect in commercial practice a regularity factor was incorporated into the trial. The regular plant stand was drilled at 9.5 cm spacing and then hand singled whilst the irregular spacing was 'drilled to a stand' at 19 cm spacing.

Method

Commercial grade sugar beet seed that had been prepared normally up to the point of pelleting was 'primed' by soaking in 0.2% (w/v) hydrogen peroxide for 10 hours in the laboratory and dried back to its original moisture content. A further sample was soaked in water for a similar period and then dried. This latter treatment was a steeping as opposed to a washing process. The seed was then pelleted for sowing with a precision drill.

Treatments

Variety	Bush Mono G Amono Nomo Sharpe's Klein Monobeet
---------	---

Seed priming	Commercial seed Commercial seed soaked in water Commercial seed primed with H_2O_2
--------------	--

Regularity	Regular. Hand singled from 9.5 cm Irregular. Drilled to a stand at 19.0 cm
------------	---

The 9.5 cm spacing was hand singled to allow sugar yields to be compared at a constant plant density whereas the 19.0 cm spacing was included for commercial comparison where degree of establishment, speed of emergence and seedling vigour all have their effect on sugar yield.

The trial was drilled on 7 April into a fine moist seedbed. Counts made on 25, 26, 27, 29 April and 1 and 4 May were used to determine the pattern of seedling emergence. Seedlings from $2m^2$ were harvested on 2 June, washed and dried for determination of seedling dry weight. The hand singling treatment was done on 2 June to give a regular distribution of 75,000 plants/ha. The trial was hand harvested on 5 December.

RESULTS

The mean seedling numbers from the two seed spacings are given in the following table.

Seedling emergence plants/ha(thousands)

Variety	Comm.	Comm.	Comm.	Comm.	Comm.	Comm.	Comm.	Comm.	Comm.
	(control)	+	+	(control)	+	+	(control)	+	+
		H ₂ O	H ₂ O ₂		H ₂ O	H ₂ O ₂		H ₂ O	H ₂ O ₂
	<u>25 April</u>			<u>26 April</u>			<u>27 April</u>		
	(± 1.66)			(± 3.30)			(± 3.84)		
Bush Mono G	3.9	5.4	14.3	22.0	30.5	41.0	33.6	43.7	52.1
Anono	2.2	3.9	9.0	18.2	13.7	28.5	27.6	21.0	30.5
Nono	2.1	2.3	21.5	16.7	20.2	43.7	25.7	29.6	54.7
Sharpe's	0.9	1.6	3.2	8.7	12.6	17.2	15.5	23.5	24.5
Mean	2.3	3.3	12.0	16.4	19.3	32.6	25.6	29.4	40.5
	(± 0.83)			(± 1.65)			(± 1.92)		
	<u>29 April</u>			<u>1 May</u>			<u>4 May</u>		
	(± 4.23)			(± 3.37)			(± 3.12)		
Bush Mono G	54.7	61.5	75.8	107.7	108.3	106.8	114.8	116.0	116.0
Anono	47.6	33.6	52.0	88.2	73.7	94.4	100.2	90.4	97.5
Nono	41.8	53.7	62.7	101.8	102.2	112.7	114.2	112.5	114.7
Sharpe's	41.8	48.5	42.4	91.4	98.6	95.0	106.1	110.6	107.2
Mean	46.5	49.3	58.2	97.3	95.7	102.2	108.8	107.4	108.9
	(± 2.12)			(± 1.09)			(± 1.56)		

The first seedling count was made 18 days after sowing and showed a much higher seedling number with the hydrogen peroxide primed seed. Nono showed the biggest increase but Bush Mono G primed also had a higher emergence count than unprimed. These effects had largely disappeared by the time counts were made in May.

Number of days after sowing to 50% of final plant population

Variety	Commercial	Commercial	Commercial	Mean
	(control)	+	+	
		H ₂ O	H ₂ O ₂	
Bush Mono G	21.6	20.7	20.2	20.8
Anono	22.2	23.4	21.9	22.5
Nono	22.2	21.7	20.2	21.4
Sharpe's Klein Monobeet	22.4	22.0	22.2	22.2
		(± 0.28)		(± 0.16)
Mean	22.1	21.9	21.1	
		(± 0.14)		
Standard error as % G.M.		3.1%		

Both Bush Mono G and Nono had a significant reduction in number of days to 50% emergence when the seed had been primed with hydrogen peroxide. Arono behaved unexpectedly in that seed washed in water took longer to emerge than both primed and commercial seed. Washing in water which is supposed to remove inhibitors did not appear to work in this case.

Dry weight per seedling (g) on 2 June (56 days after sowing)

Variety	Commercial	Commercial + H ₂ O	Commercial + H ₂ O ₂	MEAN
Bush Mono G	0.33	0.33	0.32	0.33
Arono	0.28	0.27	0.32	0.29
Nono	0.28	0.30	0.38	0.32
Sharpe's Klein Monobeet	0.26	0.31	0.25	0.28
		(±0.022)		(±0.013)
Mean	0.29	0.30	0.32	
		(±0.011)		
Standard error as % G.M.		17.6%		

Bush Mono G and Nono gave the highest seedling weights on 2 June whilst Arono and Sharpe's Klein Monobeet gave the lowest. The commercial seed + H₂O gave a marginally higher seedling weight than commercial seed and the H₂O₂ primed seed gave the highest seedling weight. The only variety to respond significantly to H₂O₂ priming was Nono. The figure of 0.38 grams was significantly higher than the commercial seed of Nono and the commercial seed + H₂O. Nono treated with H₂O₂ also gave a higher seedling weight than the other varieties treated with H₂O₂ but this just failed to reach statistical significance.

Final plant population at harvest was not affected by any of the priming treatments but there were varietal differences in final numbers. Nono was significantly higher than both Arono and Sharpe's Klein Monobeet whilst Arono was significantly lower than the other three varieties.

Sugar yield tonnes/ha on 5 December 1977

Variety	Commercial (control)	Commercial + H ₂ O	Commercial + H ₂ O ₂	Mean
Bush Mono G	9.08	8.71	8.87	8.89
Amono	9.12	8.71	9.11	8.98
Nomo	9.15	9.22	10.27	9.55
Sharpe's Klein Monobeet	9.01	8.99	9.05	9.02
		(±0.217)		(±0.125)
Mean	9.09	8.91	9.33	
		(±0.109)		
Standard error as % G.M.		5.8%		

When the trial was harvested in early December Amono gave the highest sugar content (17.54%) and Nomo the lowest (17.12%), the difference being significant. However Nomo yielded significantly higher than the other varieties. Prining with hydrogen peroxide gave the highest yield. This reached statistical significance when compared with the washing in water treatment but failed to reach statistical significance when compared with commercial seed. Varieties behaved differently to prining and only Nomo showed any degree of yield increase to hydrogen peroxide. Washing in water produced yields lower than the commercial treatment with both Bush Mono and Amono. However these prining/variety interaction yields whilst giving interesting results did not reach statistical significance.

The relative response in sugar yield appears to be related to the increase in dry weight of the seedlings in early June and also to the rate of seedling establishment as expressed by time to reach 50% of final plant emergence. Results from Bush Mono G which tends to be an early emerging variety were however somewhat inconsistent and did not follow the general result.