

SUGAR BEET

SUGAR BEET SEED QUALITY

NAS 510 ML 76

The commercial grade of sugar beet seed as made available to growers contains fruits of density greater and less than 1 g/cc. Seeds (fruits) denser than 1 g/cc germinate better and produce larger seedlings. The proportion of seeds (fruits) of density >1 g/cc (sinkers) and <1 g/cc (floaters) is much affected by variety.

The seeds (fruits) >1 g/cc density show a greater weight of whole seed and of 'true seed'; with the exception of Bush Mono G this is also true of the fully imbibed 'true seed'. It has also been shown that the volume inside the pericarp is larger in the denser seeds. The dry or fully imbibed 'true seed' also tends to be larger in volume than less dense seeds. However, the density of the fully imbibed 'true seed' is similar in seeds of >1 g/cc and <1 g/cc density.

Physical properties of seeds

Variety	Density grade	% by weight	Weight mg/seed			Density of fully imbibed seed g/cc
			Whole seed air dry	True seed		
				Oven dry	Fully imbibed	
Amono	>1 g/cc	11	10.7	3.3	5.0	1.18
	<1 g/cc	89	9.0	2.9	4.7	1.19
Bush Mono G	>1 g/cc	66	11.7	3.1	4.6	1.20
	<1 g/cc	34	10.3	2.9	4.7	1.22
Nomo	>1 g/cc	14	9.0	2.6	4.0	1.15
	<1 g/cc	86	7.1	2.2	3.6	1.13
Vytomo	>1 g/cc	12	9.0	2.7	4.3	1.18
	<1 g/cc	88	7.6	2.3	3.3	1.19
Monotri	>1 g/cc	16	9.5	2.5	4.4	1.18
	<1 g/cc	84	6.9	1.8	3.0	1.16
S.K. Monobeet	>1 g/cc	4	11.0	2.9	4.5	1.18
	<1 g/cc	96	9.1	2.7	4.3	1.18

Source L.V. Vaidyanathan ADAS Soil Science, Cambridge.

METHOD

Commercial grade seed that had been prepared and processed in the normal way up to the point of pelleting was separated into density categories by flotation in water (less than 5 minutes) and dried back to their original moisture contents and then pelleted.

Treatments:

Variety

- Bush Mono G
- Amono
- Nomo

Density

Commercial seed  
>1 g/cc

Spacing

9.5 cm Hand singled  
19.0 cm Drilled to a stand

The 9.5 cm spacing was hand singled to allow sugar yields to be compared at a constant plant density. The 19.0 cm spacing was included as a commercial practice treatment where factors such as per cent establishment, speed of emergence and seedling vigour are integrated in their effect on sugar yield.

The experiment was re-drilled on 9 April as the original drilling on 26 March was severely damaged by mice. The pattern of seedling emergence was established from counts made on the 23, 26, 29 April, 4 May and 3 June. Seedlings from 2 m<sup>2</sup> were collected on 3 June, washed and dried, for determination of seedling dry weight. The hand singling treatment was also made on 3 June to give a regular distribution of 75,000 plants/ha. A systemic insecticide (Aphox) was applied on 2 and 25 June to control aphids.

RESULTS

The mean seedling numbers from the two spacings are shown in the table.

Seedling emergence plants/ha.(thousands)

Variety	23 April Comm. >1g/cc		26 April Comm. >1g/cc		4 May Comm. >1g/cc		3 June Comm. 1g/cc	
	(±3.2)		(±4.6)		(±4.0)		(±3.3)	
Bush Mono G	32	38	79	93	96	107	100	107
Amono	22	26	63	73	77	88	84	94
Nomo	14	42	73	77	93	90	105	98
Mean	(±1.9)		(±2.6)		(±2.3)		(±1.9)	
	23	35	72	81	90	95	96	100

The first seedling emergence count was made 14 days after sowing and clearly showed a higher seedling population from the seed of density >1 g/cc. This was particularly marked for the variety Nomo at this early count but not at subsequent counts. After 17 days, seedling emergence was still in favour of the denser seed but by the 25th day after sowing there was little difference between the two seed grades. The varieties Bush Mono G and Amono still showed some advantage in favour of seeds 1 g/cc but Nomo achieved higher seedling establishment from the commercial grade seed.

Intact plants were carefully collected to include as much of the root system as possible and dried to allow seedling dry weight to be determined.

Dry weight per seedling (g) 55 days after sowing

Variety	Commercial		>1 g/cc		Mean
	9.5 cm	19.0 cm	9.5 cm	19.0 cm	
Bush Mono G	1.51	1.62	1.51	1.70	1.59
Amono	1.46	1.38	1.47	1.72	1.51
Nomo	1.35	1.76	1.83	1.86	1.70
Mean	1.44	1.59	1.61	1.76	
Mean	1.51		1.68		

The largest seedlings were from the variety Nomo and the smallest from Amono with Bush Mono G intermediate in value. Seed of >1 g/cc density gave a mean seedling dry weight of 1.68 g compared with the commercial seed at 1.51 g. The drilled to a stand treatment (19 cm spacing) consistently gave larger seedlings than the close spaced seeds for hand singling (9.5 cm spacing). Inter-plant competition had therefore occurred to a greater extent at the closer spacing before hand singling was carried out. There was no interaction between variety and seed density on seedling dry weight.

Plant density at harvest thousands/ha

Variety	Commercial		>1 g/cc		Mean
	9.5 cm	19.0 cm	9.5 cm	19.0 cm	
Bush Mono G	72	76	71	82	75
Amono	66	69	69	76	70
Nomo	71	79	66	86	76
Mean	70	75	69	81	
Mean	72		75		

The target plant density of 75 thousand plants/ha hand singled was not achieved but the relatively narrow range of 66 to 72 thousand plants/ha was unlikely to have a large effect on sugar yield. The drilled to a stand treatment averaged 75 thousand plants/ha from commercial seed and 81 thousand/ha from seed of density >1 g/cc. This advantage was consistent for each variety.

(N.B. It was stated earlier that the seedling emergence counts showed Nomo seed >1 g/cc density to have a lower plant number than the commercial seed. This result refers to the mean of the two seed spacings. The wide spacing of Nomo gave a similar result to the other two varieties, that is seed >1 g/cc density giving a higher seedling establishment than the commercial seed.)

Root yield was slightly greater from the drilled to a stand treatment at 54.5 t/ha compared with 52.3 t/ha from hand singling (S.E. ±0.85 t/ha). This was in accord with the greater seedling dry weights 55 days after sowing. There were no significant differences in sugar percentage although the >1 g/cc seed averaged 14.5 and the commercial seed slightly higher at 14.7 per cent (S.E. ±0.07 per cent).

Variety	Commercial		>1 g/cc		Mean
	9.5 cm	19.0 cm	9.5 cm	19.0 cm	
Bush Mono G	7.53	7.73	7.68	8.09	7.76 (±0.180)
Anono	7.85	7.71	7.56	7.56	
Nomo	7.52	8.05	7.64	8.63	
Mean	7.63	7.83	7.63	8.09	(±0.208)
Mean	7.73		7.86		(±0.147)

Sugar yield differences were small as shown in the table. There were no differences in sugar yield from the three varieties or between the commercial seed and the seed of density >1 g/cc. However the drilled to a stand treatment did outyield the hand singling. This may follow from the greater seedling dry weight but also the higher plant population may have been a contributory factor in conditions of severe water deficit for much of the growing season.

If the yield results are examined as sugar yield per plant this also shows no difference between commercial and >1 g/cc seed. The values being 108 and 106 g/plant respectively (S.E. ±2.2 g/plant).

R.W. Clare,  
July, 1977