

SUGAR BEET

VARIETY, PLANT POPULATION and REGULARITY 1971 NAS 161 ML

SUMMARY:

Plant population over the range of 20,000 - 30,000 plant stations per acre had no effect on root or sugar yield. Increasing degrees of irregularity reduced root and sugar yield. There was no interaction between variety and plant population or degree of regularity.

OBJECT: To examine the effect on yield of four populations obtained from different seed spacings using three varieties. Also to assess the effect of three regularities of spacing and any interactions between variety, plant population and regularity.

TREATMENTS:

All combinations of:-

1. Variety

1. Bush Mono
2. Amono
3. Sharpe's Klein Polyheet

2. Regularity

1. Regular - hand singled
2. Irregular - drilled to a stand
3. Very Irregular - drilled to a stand with $\frac{2}{3}$ live to $\frac{1}{3}$ dead seed (Poor seed)

3. Plant Population derived from:-

	Good seed	Poor seed
1.	6.0 in. spacing	4.0 in. spacing
2.	7.5 in. "	5.0 in. "
3.	9.0 in. "	6.0 in. "
4.	11.25 in. "	7.5 in. "

LAYOUT: 2 randomised blocks Factorial
Treatment area 5 rows x 20 in. x 30 yds.
Harvest area 1 row x 20 in. x 20 yds.

SOIL TYPE:

Ashley (sandy loam)

PREVIOUS CROPPING:

1970 Winter Oats
1969 Spring Barley
1968 Winter Wheat

MANURING:

5 cwt per acre Kainit (18% K₂O) in autumn before ploughing
6 cwt per acre of a 20.14.14 compound fertiliser.

SEED:

9-12/64 in pelleted.

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METHOD:

5 cwt per acre of Kainit (18% K₂O) was ploughed in during the previous autumn and 6 cwt per acre of a 20.14.14 compound fertiliser was applied on 31 March. The experiment was drilled on 6 April and overall sprayed with pyrazone at 2.2 lb a.i. per acre for weed control.

Two genetic monogerm varieties, Bush Mono and Amono and a multigerm polyploid, Sharpe's Klein Polybeet were drilled to a stand at 6, 7.5, 9 and 11.25 inch spacing to give an irregular stand. A regular stand was achieved by drilling at 1.5 inch spacing and hand singling to the population levels produced by the above spacings. The very irregular stand was obtained by planting a mixture of $\frac{2}{3}$ live to $\frac{1}{3}$ dead seed at spacings of 4, 5, 6 and 7.5 inches respectively to give the same number of viable seeds per acre.

Final plant populations were determined on 5 July and the experiment harvested on 7 December.

RESULTS:

FINAL PLANT POPULATION (plant stations '000 per acre) 5 July

Seed spacing (in.)	Regularity of Stand			Variety			Mean
	Reg.	Irreg.	V. Irreg.	B.M.	A.	S.K.P.	
	(± 0.71)			(± 0.71)			(± 0.41)
6.0	36.9	36.1	33.5	36.9	36.4	33.3	35.5
7.5	31.8	29.8	28.1	32.6	27.3	29.8	29.9
9.0	26.3	24.7	24.7	27.3	24.9	23.6	25.3
11.25	20.3	17.9	21.1	21.5	19.2	18.5	19.7
Variety	(± 0.61)						(± 0.35)
Bush Mono	30.9	29.2	28.6				29.6
Amono	27.9	26.5	26.5				27.0
S.K. Polybeet	27.7	25.7	25.5				26.3
Mean	28.8	27.1	26.9	29.6	26.9	26.3	

1. The level of field emergence based on the irregular distribution (drilled to a stand) showed Bush Mono to give the highest emergence at 76% followed by Amono and Sharpe's Klein Polybeet at 69% and 67% respectively.
2. Due to these differences in field emergence between the three varieties there were small differences in final plant populations achieved as shown in the table.

SUGAR YIELD (cwt per acre)

Seed spacing (in.)	Regularity of Stand			Variety			Mean
	Reg.	Irreg.	V. Irreg.	B.M.	A.	SKP	
	(± 2.16)			(± 2.16)			(±1.25)
6.0	77.4	76.9	75.4	76.2	76.5	77.1	76.6
7.5	81.2	76.7	75.2	78.6	75.6	78.9	77.7
9.0	81.2	76.3	72.1	76.3	73.7	79.5	76.5
11.25	76.5	75.9	76.2	76.6	71.8	80.3	76.2
Variety	(± 1.87)						(±1.08)
Bush Mono	80.9	75.7	74.1				76.9
Amono	75.5	73.3	74.4				74.4
S.K.Polybeet	80.8	80.3	75.7				78.9
Mean	(± 1.08)			(±1.08)			
	79.1	76.4	74.7	76.2	74.4	78.9	

S.E. per plot (34 d.f.) = ± 5.28 cwt per acre or 6.89% G.M.

1. The mean root yield from the three varieties were 23.94, 22.79 and 23.49 ton per acre from Bush Mono, Amono and Sharpe's Klein Polybeet respectively.

The yield from regular spacing produced by hand singling was 24.09 ton per acre which was significantly greater than that obtained from the irregular and very irregular distributions at 23.27 and 22.85 ton per acre respectively. The resultant plant populations obtained from 6 in. and 11.25 in. spacings did not affect root yield.

2. The yield of small size roots was increased by the higher plant populations (derived from closer spacings) and to a lesser extent by increased irregularity of distribution.
3. There were statistically significant differences in sugar content between the three varieties. Sharpe's Klein Polybeet was the highest at 16.8% followed by Amono at 16.3% and Bush Mono the lowest at 16.1%. Plant population also influenced sugar content. The highest sugar content being 16.6% from 7.5 in. spacing followed by 16.4% from 6 in. spacing and 16.3% from both 9 and 11.25 in. spacings.
4. The highest sugar yield was given by Sharpe's Klein Polybeet at 78.9 cwt per acre followed by Bush Mono at 76.9 and Amono at 74.4 cwt per acre. The regular plant distribution gave the highest yield at 79.1 cwt sugar per acre, the irregular distribution caused a yield loss of 2.7 cwt per acre and the very irregular distribution a further loss of 1.7 cwt per acre.

Over the plant population range of 20,000 - 35,000 per acre there were no differences of statistical significance in either root or sugar yield. As in 1970 there were also no interactions between variety and plant population or regularity of spacing.

TOTAL ROOT YIELD (ton per acre)

Seed Spacing (in.)	Regularity of Stand			Variety			Mean
	Reg.	Irreg.	V. Irreg.	B.M.	A.	S.K.P.	
	(± 0.578)			(± 0.578)			(± 0.334)
6.0	23.50	23.38	23.08	23.77	23.18	23.00	23.32
7.5	24.45	23.15	22.67	24.20	22.91	23.16	23.42
9.0	24.74	23.47	22.30	23.96	22.85	23.71	23.51
11.25	23.66	23.09	23.36	23.82	22.20	24.09	23.37
Variety	(± 0.501)						(± 0.289)
Bush Mono	25.20	23.46	23.16				23.94
Amono	23.09	22.37	22.90				22.79
S.K. Polybeet	23.97	23.99	22.50				23.49
Mean	(± 0.289)			(± 0.289)			
	24.09	23.27	22.85	23.94	22.79	23.49	

S.E. per plot (34 df) = ± 1.418 ton per acre or 6.05% G.M.

APPENDIX II
SUGAR CONTENT (%)

Seed Spacing (in.)	Regularity of Stand			Variety			Mean
	Reg.	Irreg.	V. Irreg.	B.M.	A.	S.K.P.	
	(± 0.13)			(± 0.13)			(± 0.08)
6.0	16.5	16.4	16.3	16.0	16.5	16.8	16.4
7.5	16.6	16.6	16.6	16.2	16.5	17.0	16.6
9.0	16.4	16.2	16.2	15.9	16.1	16.8	16.3
11.25	16.2	16.4	16.3	16.1	16.2	16.7	16.3
Variety	(± 0.11)						(± 0.07)
Bush Mono	16.1	16.1	16.0				16.1
Amono	16.3	16.4	16.2				16.3
S.K. Polybeet	16.8	16.7	16.8				16.8
Mean	(± 0.07)			(± 0.07)			
	16.4	16.4	16.3	16.1	16.3	16.8	

S.E. per plot (34 df) = $\pm 0.316\%$ sugar or 1.93% G.M.

YIELD OF SMALL ROOTS (ton per acre)

Seed Spacing (in)	Regularity of Stand			Variety			Mean
	Reg.	Irreg.	V. Irreg.	B.M.	A. S.K.P.		
	(± 0.149)			(± 0.149)			(± 0.086)
6.0	1.10	1.82	1.43	1.34	1.61	1.40	1.45
7.5	0.88	1.35	0.83	1.27	0.77	1.03	1.02
9.0	0.47	0.70	0.87	0.69	0.70	0.65	0.68
11.25	0.38	0.35	0.49	0.32	0.50	0.41	0.41
Variety	(± 0.129)						(± 0.074)
Bush Morjo	0.63	1.13	0.95				0.90
Amono	0.76	1.03	0.91				0.90
S.K. Polybeet	0.74	1.01	0.86				0.87
Mean		(± 0.074)		(± 0.074)			
	0.71	1.06	0.91	0.90	0.90	0.87	

S.E. per plot (34 df) = ± 0.364 ton per acre or 40.9% G.M.