

SUGAR BEET

VARIETY, PLANT POPULATION and REGULARITY NAS 161 ML 72

SUMMARY: Plant populations over the range of 20,000 to 37,000 per acre had no effect on root or sugar yield. The very irregular distribution slightly reduced root and sugar yield. There was no interactions between variety and plant population or regularity of plant distribution.

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 Polybeet

2. Regularity

1. Regular - hand singled
2. 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 22 yds.

SOIL TYPE:

Beccles (sandy clay loam)

PREVIOUS CROPPING:

1971 Winter barley
1970 Spring barley
1969 Sugar beet

MANURING:

5 cwt per acre Kainit (18% K₂O) in autumn before ploughing
6 cwt per acre of a 22-11-11 compound fertilizer

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 20-11-11 compound fertilizer was applied on 20 March. The experiment was drilled on 27 March 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 singled 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 12 June and the experiment harvested on 29 November.

RESULTS:

FINAL PLANT POPULATION (plant stations '000 per acre)

Seed spacing (in.)	Regularity of stand			Variety			Mean
	Reg.	Irreg.	V. Irreg.	B.M.	A.	S.K.P.	
6.0	36.3	(± 1.00) 34.2	39.2	(± 1.00) 38.7	35.6	35.3	(± 0.58) 36.6
7.5	29.1	29.6	26.6	29.8	26.9	28.6	28.4
9.0	24.1	24.0	21.7	25.3	22.4	22.1	23.3
11.25	20.7	20.3	19.3	21.0	20.5	18.7	20.1
<u>Variety</u>		(± 0.87)					(± 0.50)
Bush Mono	28.9	29.4	27.9				28.7
Amono	26.7	26.1	26.4				26.4
S.K. Polybeet	27.1	25.6	25.8				26.2
Mean	27.5	(± 0.50) 27.0	26.7	(± 0.50) 28.7	26.4	26.2	

SE per plot (35 df) = ± 2.46 plant stations or 9.1% G.M.

SUGAR YIELD (cwt per acre)

Seed spacing (in.)	Regularity of stand			Variety			Mean
	Reg.	Irreg.	V. Irreg.	B.M.	A.	S.K.P.	
		(± 2.28)			(± 2.28)		(±1.32)
6.0	79.2	79.9	78.5	80.6	77.0	79.9	79.2
7.5	80.8	82.1	77.5	81.7	76.5	82.2	80.1
9.0	80.3	81.8	77.0	78.8	80.5	79.7	79.7
11.25	79.7	78.4	73.1	77.5	76.8	76.9	77.1
<u>Variety</u>		(± 1.98)					(±1.14)
Bush Mono	80.0	82.3	76.6				79.7
Amono	80.4	78.1	74.6				77.7
S.K.Polybeet	79.5	81.2	78.3				79.7
		(± 1.14)			(±1.14)		
Mean	80.0	80.5	76.5	79.7	77.7	79.7	

SE per plot (35 df) = ± 5.60 cwt per acre or 7.1% G.M.

- The level of field emergence based on the irregular distribution (drilled to a stand) showed Bush Mono to give the highest emergence at approximately 75% followed by Amono and Sharpe's Klein Polybeet at 68% and 65% respectively.
 - Because of these differences in field emergence between the three varieties there were small differences in the final plant populations achieved as shown in the table.
- The mean root yield from the three varieties were 22.31, 21.51 and 21.74 ton per acre from Bush Mono, Amono and Sharpe's Klein Polybeet respectively. The yield from the regular spacing (hand singled) and irregular spacing (drilled to a stand) were similar at 22.07 and 22.25 ton per acre respectively. The very irregular spacing gave a slightly lower yield at 21.24 ton per acre.
 - The yield of small size roots (<2.25 in.) was increased by the higher plant populations (derived from closer spacings) and to a lesser extent by increased irregularity of distribution.

3. There were varietal differences in sugar content. That Sharpe's Klein Polybeet was the highest at 18.3% followed by Amono at 18.1% and Bush Mono the lowest at 17.9%.

4. There were no differences of statistical significance in sugar yield between the three varieties or from the four plant spacings which gave a range of populations from approximately 20,000 to 37,000 plants per acre. However the very irregular plant distribution caused a yield loss of nearly 4 cwt sugar per acre compared with the regular and irregular distribution. As in 1970 and 1971 no interactions were detected between variety and plant population or regularity of distribution.

R.W.C.
June, 1973.

TOTAL ROOT YIELD (ton per acre)

Seed spacing (in.)	Regularity of stand			Variety			Mean
	Reg.	Irreg.	V.Irreg.	B.M.	A.	S.K.P.	
	(± 0.609)			(± 0.609)			(± 0.352)
6.0	21.84	21.94	21.80	22.55	21.28	21.75	21.86
7.5	22.30	22.69	21.28	22.90	20.96	22.41	22.09
9.0	22.12	22.54	21.38	21.97	22.49	21.58	22.01
11.25	22.03	21.82	20.49	21.81	21.31	21.22	21.45
Variety	(± 0.529)						(± 0.305)
Bush Mono	22.43	23.04	21.45				22.31
Amoro	22.19	21.61	20.73				21.51
S.K. Polybeet	21.60	22.09	21.54				21.74
Mean	(± 0.305)			(± 0.305)			
	22.07	22.25	21.24	22.31	21.51	21.74	

SE per plot (35df) = ± 1.493 ton per acre or 6.8% G.M.

SUGAR CONTENT (%)

Seed spacing (in.)	Regularity of stand			Variety			Mean
	Reg.	Irreg.	V.Irreg.	B.M.	A.	S.K.P.	
	(± 0.11)			(± 0.11)			(± 0.06)
6.0	18.1	18.2	18.0	17.9	18.1	18.4	18.1
7.5	18.1	18.1	18.2	17.8	18.3	18.3	18.1
9.0	18.2	18.2	18.0	17.9	17.9	18.5	18.1
11.25	18.1	18.0	17.8	17.8	18.0	18.1	18.0
Variety	(± 0.09)						(± 0.05)
Bush Mono	17.8	17.9	17.9				17.9
Amoro	18.1	18.1	18.0				18.1
S.K. Polybeet	18.4	18.4	18.2				18.3
Mean	(± 0.05)			(± 0.05)			
	18.1	18.1	18.0	17.9	18.1	18.3	

SE per plot (35df) = $\pm 0.26\%$ sugar or 1.4% 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.	
	(± 0.219)			(± 0.219)			(± 0.127)
6.0	1.79	2.32	2.42	2.45	2.37	1.72	2.18
7.5	0.91	1.28	1.57	1.28	1.17	1.31	1.25
9.0	0.62	1.19	0.86	0.99	0.91	0.78	0.89
11.25	0.35	0.60	0.55	0.40	0.62	0.49	0.50
Variety	(± 0.190)						(± 0.110)
Bush Mono	1.08	1.59	1.17				1.28
Amono	1.09	1.38	1.33				1.27
S.K. Polybeet	0.58	1.09	1.56				1.08
Mean	(± 0.110)			(± 0.110)			
	0.92	1.35	1.35	1.28	1.27	1.08	

SE per plot (35df) = ± 0.537 ton per acre or 44.5% G.M.

YIELD OF SMALL ROOTS AS % TOTAL YIELD

Seed spacing (in.)	Regularity of stand			Variety			Mean
	Reg.	Irreg.	V.Irreg.	B.M.	A.	S.K.P.	
	(± 0.96)			(± 0.96)			(± 0.55)
6.0	8.1	10.6	11.2	10.9	11.2	7.8	10.0
7.5	4.2	5.7	7.3	5.7	5.6	5.9	5.7
9.0	2.8	5.3	4.0	4.4	4.0	3.6	4.0
11.25	1.6	2.8	2.7	1.8	2.9	2.3	2.4
Variety	(± 0.84)						(± 0.48)
Bush Mono	4.9	6.9	5.3				5.7
Amono	4.9	6.4	6.4				5.9
S.K. Polybeet	2.7	4.9	7.2				4.9
Mean	(± 0.48)			(± 0.48)			
	4.2	6.1	6.3	5.7	5.9	4.9	

SE per plot (35df) = ± 2.35 % small roots or 42.7% G.M.