

SUGAR BEET

SPRING MECHANISATION 1971

N.S. 504. ML.

**SUMMARY:** Hand singling gave the highest sugar yield at 65.5 cwt per acre followed by drilling to a stand at 60.4 and mechanical gapping at 55.0 cwt per acre. When hand singled Sharpe's Klein Polybeet outyielded Bush Mono but after mechanical gapping or drilling to a stand Bush Mono gave the higher yield.

**OBJECT**

To compare three methods of mechanisation of spring work for two seed types (polyploid and monogerm), their effects on plant population and yield. Also to compare early and late harvesting both by hand and machine.

**TREATMENTS**

Main:- date of lifting

1. Early harvest
2. Late harvest

Sub:- method of harvesting

1. Hand
2. Machine

Sub, Sub:- method of spring mechanisation and seed type.  
all combinations of

1. 3 in spacing hand singled
2. 3 in spacing machine gapped
3. 7 in spacing drilled to a stand  
and seed type

1. Polyploid (Sharpe's Klein Polybeet)
2. Monogerm (Bush Mono)

**LAYOUT**

3 randomised blocks with split, split plots.  
Treatment area 22 yds x 5 rows x 20 in  
Harvest area 18 yds x 1 row x 20 in

**SOIL TYPE**

Ashley (sandy loam)

**PREVIOUS  
CROPPING**

1970 Winter Oats  
1969 Spring Barley  
1968 Winter Wheat

**MANURING**

6 cwt per acre of a 20:14:14 compound fertiliser  
5 cwt per acre Kainit (18%K<sub>2</sub>O) in autumn before ploughing.

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**METHOD:** 5 cwt per acre of Kainit was ploughed in during the previous autumn and 6 cwt per acre of a 20.14.14 compound fertiliser was applied on 31 March. Seedbed preparation consisted of a single pass of a springtine cultivator (6 in. depth) and medium harrows on 31 March, followed by a cambridge roll on 1 April. The trial was drilled on 5 April after two passes of a Lilla Harrie. Weed control was by pyrazone overall sprayed at 2.2 lb a.i. per acre. Mechanical and hand singling were carried out on 1 June. The mechanical gapper was set to give a reduction of 55%.

The early lift was taken on the 26th October under dry friable soil conditions. The late lift was completed on 20 December after 0.25 in. of rain resulting in wet plastic soil conditions.

**RESULTS:** FINAL PLANT POPULATION (Plant Stations '000 per acre) 5 July.

Method of Spring Mechanisation	Seed Type		Date of Lifting		Mean
	S.K. Poly	Bush Mono	Early	Late	
	( $\pm 1.31$ )		( $\pm 1.31VI$ )( $\pm 1.23H$ )		( $\pm 0.65$ )
3 in. Hand singled	30.2	30.8	30.2	30.8	30.5
3 in. Mech.Gapped	27.6	32.7	30.7	29.6	30.1
7 in.Drilled-to- Stand	25.3	29.1	27.6	26.8	27.2
Date of Lifting	( $\pm 0.97 V$ )( $\pm 1.07HI$ )				( $\pm 0.43$ )
Early	28.5	30.5			29.5
Late	26.9	31.2			29.1
Mean	27.7	( $\pm 0.53$ ) 30.8	29.5	( $\pm 0.43$ ) 29.1	

SE per plot (2df) =  $\pm 748$  plant stations/acre or 2.55% G.M.

SE per sub plot (4df) =  $\pm 1,848$  plant stations/acre or 6.31% G.M.

SE per sub, sub plot (40 df) =  $\pm 3,200$  plant stations/acre or 10.91% G.M.

- Final plant populations of the hand and machine harvested plots which are not given in the table were very similar at 28,800 and 29,700 (se  $\pm 750$ ) per acre respectively.
- Bush Mono drilled to a stand at 7.0 in. spacing gave a satisfactory plant population of 29,100 whereas that of Sharpe's Klein Polybeet was significantly lower at 25,300 corresponding to approximately 65.0% and 56.5% seedling emergence respectively.

3. Similarly after mechanical gapping the plant population of Bush Mono was 32,700 and Sharpe's Klein Polybeet significantly lower at 27,600 respectively. The mechanical gapper however had been set to give a 55% reduction in both cases.
4. Sharpe's Klein Polybeet gave 9.9% doubles, significantly more than Bush Mono at 3.9%.
5. The highest percentage of doubles was given by Sharpe's Klein Polybeet mechanically gapped at 15.2% whereas drilling to a stand gave 11.8% and hand singling 3.3%. The corresponding figures for Bush Mono were 5.9%, 3.9% and 1.8% respectively.

TOTAL YIELD ROOTS (ton per acre)

Method of Spring Mechanisation	Seed Type		Date of Lifting		Mean
	S.K.	Poly. Bush Mono	Early	Late	
	( $\pm 0.516$ )		( $\pm 0.516VI$ )( $\pm 0.718H$ )		( $\pm 0.365$ )
3in. Hand Singled	19.47	19.35	18.13	20.69	19.41
3 in. Mech. Gapped	15.27	17.52	15.72	17.07	16.40
7 in. Drilled to Stand	17.22	18.49	16.57	19.14	17.85
Date of Lifting	( $\pm 0.653V$ )( $\pm 0.42HI$ )				( $\pm 0.581$ )
Early	16.75	16.86			16.81
Late	17.89	20.05			18.97
Mean	( $\pm 0.298$ )		( $\pm 0.581$ )		
	17.32	18.45	16.81	18.97	

S.E. per plot (2 df) =  $\pm 1.08$  ton/acre or 5.63% G.M.

S.E. per sub plot (4df) =  $\pm 3.08$  ton/acre or 17.21% G.M.

S.E. per sub, sub plot (40 df) =  $\pm 1.79$  ton/acre or 10.00% G.M.

1. On average the yield at the late date of lifting was increased by 2.16 ton per acre. There was however an interaction between date of lifting and variety. At the early date of lifting there was no difference in yield between the two varieties but by the late date Bush Mono increased in yield by 3.19 ton per acre, significantly more than that of Sharpe's Klein Polybeet at 1.14 ton per acre.
2. Hand singling gave the highest root yield at 19.41 ton per acre. Compared with hand singling drilling to a stand resulted in a yield loss of 1.56 ton per acre and mechanical gapping a larger yield loss of 3.01 ton per acre.
3. There was an interaction between method of spring mechanisation and varietal type. When hand singled the two varieties gave similar root yield. When mechanically gapped the yield loss from Sharpe's Klein Polybeet was significantly greater than that of Bush Mono, 4.20 and 1.83 ton per acre respectively. Similarly when drilled to a stand the yield loss compared with hand singling was 2.25 ton per acre from Sharpe's Klein Polybeet and 0.86 ton per acre from Bush Mono.

4. When meaned over all other factors the yield of roots from Bush Mono was 1.13 ton per acre greater than from Sharpe's Klein Polybeet.
5. The yield of small roots was the lowest from hand singling at 0.60 t/ac followed by drilling to a stand at 0.80 and mechanical gapping the highest at 1.02 t/ac representing 3.0, 4.5 and 6.1% of the total yield respectively. More small roots were recovered by hand harvesting, 0.99 compared with 0.62 t/ac by machine harvesting. Compared with hand lifting machine harvesting recovered only 50% of the small size roots after mechanical gapping which was significantly less than for drilling to a stand and hand singling at 76% and 69% respectively.
6. Top tare was higher at 0.97 t/ac after machine harvesting compared with 0.27 t/ac after hand lifting. When meaned over other factors Bush Mono gave a higher top tare than Sharpe's Klein Polybeet. Bush Mono when machine harvested had a top tare of 1.11 t/ac, significantly greater than that of Sharpe's Klein Polybeet at 0.80 t/ac.

SUGAR YIELD (cwt per acre)

Method of Spring Mechanisation	Seed Type		Date of Lifting		Mean
	S.K.Poly	Bush Mono	Early	Late	
	( $\pm 1.63$ )		( $\pm 1.63VI$ )( $\pm 2.74H$ )		( $\pm 1.16$ )
3 in. Hand Singled	67.5	63.6	61.9	69.1	65.5
3 in. Mech. Gapped	52.2	57.9	53.2	56.9	55.0
7 in. Drilled to Stand	58.8	61.4	56.1	64.1	60.1
Date of Lifting	( $\pm 2.57V$ )( $\pm 1.34HI$ )				( $\pm 2.39$ )
Early	57.7	56.4			57.1
Late	61.2	65.5			63.4
Mean	( $\pm 0.94$ )		( $\pm 2.39$ )		
	59.5	60.9	57.1	63.4	

SE per plot (2df) =  $\pm 4.14$  cwt/acre or 6.86% of G.M.

SE per sub plot (4df) =  $\pm 10.03$  cwt/acre or 17.17% of G.M.

SE per sub,sub plot (40 df) =  $\pm 5.66$  cwt/acre or 9.41% G.M.

1. Sharpe's Klein Polybeet had a higher sugar content than Bush Mono at 17.2% and 16.5% respectively. The sugar content of Bush Mono declined from 16.7% at the early harvest to 16.3% at the later date but Sharpe's Klein Polybeet showed little change at 17.2% and 17.1% respectively.
2. There was a differential varietal reaction to date of harvesting. Bush Mono increased by 9.1 cwt per acre at the late date of lifting but Sharpe's Klein Polybeet increased by only 3.5 cwt per acre, a mean response to delayed harvesting of 6.3 cwt per acre.

3. Hand singling gave the highest sugar yield at 65.5 cwt per acre followed by drilling to a stand at 60.1 and mechanical gapping at 55.0 cwt per acre. Sharpe's Klein Polybeet outyielded Bush Mono when hand singled but as with root yield Bush Mono gave the higher sugar yield when mechanically gapped or drilled to a stand.
  
4. The mean sugar yield from the hand lifted treatment was 63.2 cwt per acre which compared with 57.2 cwt per acre from machine harvesting. In terms of root yield this difference represents 1.7 ton per acre but in neither case were there differences of statistical significance.

R.W.C.

## SUGAR CONTENT (%)

Method of Spring Mechanisation	Seed Type		Date of Lifting		Mean
	S.K. Poly	Bush Mono	Early	Late	
	( $\pm 0.12$ )		( $\pm 0.08VI$ )( $\pm 0.15H$ )		( $\pm 0.06$ )
3 in. Hand singled	17.3	16.4	17.1	16.7	16.9
3 in. Mech. gapped	17.1	16.5	16.9	16.7	16.8
7 in. Drilled to Stand	17.1	16.6	16.9	16.7	16.8
Date of Lifting	( $\pm 0.14V$ )( $\pm 0.07 HI$ )				( $\pm 0.13$ )
Early	17.2	16.7			17.0
Late	17.1	16.3			16.7
Mean	( $\pm 0.05$ )		( $\pm 0.13$ )		
	17.2	16.5	17.0	16.7	

SE per plot (2 df) =  $\pm 0.23\%$  sugar or 1.37% GM

SE per sub plot (4 df) =  $\pm 0.15\%$  sugar or 0.89% GM

SE per sub, sub plot (40 df) =  $\pm 0.28\%$  sugar or 1.67% GM

## YIELD OF SMALL SIZE ROOTS (ton per acre)

Method of Spring Mechanisation	Seed Type		Date of Lifting		Mean
	S.K. Poly	Bush Mono	Early	Late	
	( $\pm 0.145$ )		( $\pm 0.103VI$ )( $\pm 0.161H$ )		( $\pm 0.073$ )
3 in. Hand singled	0.67	0.53	0.45	0.74	0.60
3 in. Mech. gapped	1.01	1.03	0.87	1.17	1.02
7 in. Drilled to Stand	0.86	0.73	0.69	0.91	0.80
Date of Lifting	( $\pm 0.149V$ )( $\pm 0.0842HI$ )				( $\pm 0.137$ )
Early	0.68	0.66			0.67
Late	1.01	0.87			0.94
Mean	( $\pm 0.059$ )		( $\pm 0.137$ )		
	0.85	0.76	0.67	0.94	

SE per plot (2 df) =  $\pm 0.238$  ton per acre or 29.40% GM

SE per sub plot (4 df) =  $\pm 0.177$  ton per acre or 20.85% GM

SE per sub, sub plot (40 df) =  $\pm 0.356$  ton per acre or 43.40% GM

SMALL ROOTS AS % TOTAL YIELD

Method of Spring Mechanisation	Seed Type		Date of Lifting		Mean
	S.K. Poly	Bush Mono	Early	Late	
	( $\pm 0.85$ )		( $\pm 0.60VI$ )( $\pm 0.87H$ )		( $\pm 0.43$ )
3 in. Hand Singled	3.5	2.6	2.5	3.6	3.0
3 in. Mech. Gapped	6.5	5.8	5.4	6.8	6.1
7 in. Drilled to Stand	5.1	3.9	4.1	4.9	4.5
Date of Lifting	( $\pm 0.80V$ ) ( $\pm 0.50H$ )				( $\pm 0.72$ )
Early	4.2	3.8			4.0
Late	5.9	4.4			5.1
Mean	( $\pm 0.35$ )		( $\pm 0.72$ )		
	5.0	4.1	4.0	5.1	

SE per plot (2 df) =  $\pm 1.24\%$  of total yield or 27.6% GM

SE per sub plot (4 df) =  $\pm 1.40\%$  of total yield or 31.1% GM

SE per sub, sub plot (40 df) =  $\pm 2.09\%$  of total yield or 44.6% GM

APPENDIX III

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TOP TARE (ton per acre)

Method of Spring Mechanisation	Seed Type		Date of Lifting		Mean
	S.K. Poly	Bush Mono	Early	Late	
	( $\pm 0.081$ )		( $\pm 0.057VI$ )( $\pm 0.097H$ )		( $\pm 0.041$ )
3 in. Hand singled	0.54	0.67	0.71	0.50	0.61
3 in. Mech. gapped	0.54	0.68	0.71	0.51	0.61
7 in. Drilled to stand	0.52	0.70	0.71	0.52	0.61
Date of Lifting	( $\pm 0.091V$ ) ( $\pm 0.047H$ )				( $\pm 0.085$ )
Early	0.65	0.77			0.71
Late	0.42	0.60			0.51
Mean	( $\pm 0.033$ )		( $\pm 0.085$ )		
	0.54	0.68	0.71	0.51	

SE per plot (2df) =  $\pm 0.147$  ton per acre or 24.10% GM

SE per sub plot (4 df) =  $\pm 0.218$  ton per acre or 35.75% GM

SE per sub, sub plot (40 df) =  $\pm 0.199$  ton per acre or 32.61% GM