

## SUGAR BEET

SPRING MECHANISATION 1972 NAS 504 ML 72

- SUMMARY:** Hand singling gave the highest sugar yield at 72.6 cwt per acre followed by mechanical gapping at 68.5 and drilling to a stand at 67.1 cwt per acre. Losses from mechanical harvesting increased from 4.0 cwt sugar per acre at the early dry lifting date to 8.1 cwt sugar per acre at the late date under wet soil conditions.
- 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 64' 6" x 5 rows x 20 in.  
Harvest area 60' x 1 row x 20 in.
- SOIL TYPE:** Ashley (sandy loam)
- PREVIOUS CROPPING:** 1971 Winter Barley  
1970 Spring Barley  
1969 Sugar Beet
- MANURING:** 5 cwt per acre Kainit (18% K<sub>2</sub>O) in autumn before ploughing.  
6 cwt per acre of a 20-11-11 compound fertilizer.

SUGAR BEET

SPRING MECHANISATION

NAS 504. ML 72

**METHOD** 5 cwt per acre of Kainit was ploughed in during the previous autumn and 6 cwt per acre of a 20-11-11 compound fertilizer was applied on 20 March. Seedbed preparation consisted of two passes of a springtine cultivator (25 March) at 6 in. depth followed by a Cambridge roll. On 27 March one pass of a Salo Harrow and roll was carried out. The experiment was drilled on 29 March after a further cultivation with a Salo Harrow. Weed control was by pyrazone overall sprayed at 2.2lb a.i. per acre. Mechanical and hand singling were carried out on 23 May. The mechanical gapper was set to give a reduction of 40% for both seed types.

The early lift was taken on November under very dry soil conditions and the late lift was completed on 12 December after recent rain resulting in wet plastic soil conditions.

**RESULTS FINAL PLANT POPULATION (Plant stations '000 per acre) 14 June**

Method of Spring Mechanisation	Seed Type		Date of Lifting		Mean
	S.K.Poly	Bush Mono	Early	Late	
	( $\pm 1.14$ )		( $\pm 1.14V$ )( $\pm 1.00HI$ )		( $\pm 0.8$ )
3 in. Hand singled	28.8	30.2	29.7	29.3	29.5
3 in. Mech. gapped	33.8	38.3	35.2	36.8	36.0
7 in. Drilled to a stand	27.0	28.4	27.4	27.9	27.7
Date of Lifting	( $\pm 0.76VI$ )( $\pm 1.17H$ )				( $\pm 0.39$ )
Early	29.6	32.0			30.8
Late	30.1	32.6			31.4
Mean	( $\pm 0.66$ )		( $\pm 0.39$ )		
	29.9	32.3	30.8	31.4	

S.E. per plot (2df) =  $\pm 0.67$  plant stations per acre or 2.2% G.M.  
 S.E. per sub plot (4df) =  $\pm 2.04$  plant stations per acre or 6.6% G.M.  
 S.E. per sub,sub plot (40df) =  $\pm 3.95$  plant stations per acre or 12.7% G.M.

- Final plant populations of the hand and machine harvested plots which are not given in the table were very similar at 31,600 and 30,600 (S.E. -830) per acre respectively.
- Both varieties when drilled to a stand at 7.0 in. spacing gave a satisfactory plant population corresponding to approximately 60% seedling emergence.
- After mechanical gapping the plant population of Bush Mono was high at 38,300 but that of Sharpe's Klein Polybeet nearer the target (30,000) at 33,800 plants per acre. In both cases the mechanical gapper had been set to give a 40% reduction calculated from emergence counts.

4. The highest percentage of doubles was given by Sharpe's Klein Polybeet mechanically gapped or drilled to a stand at 10.1 and 10.0% respectively, hand singling giving 2.8%. The corresponding figures for Bush Mono were 2.4, 3.5 and 1.7% respectively.

TOTAL YIELD ROOTS (ton per acre)

Method of Spring Mechanisation	Seed	Type	Date of Lifting		Mean
	S.K.Poly	Bush Mono	Early	Late	
	( $\pm 0.445$ )		( $\pm 0.445V$ ) ( $\pm 0.396HI$ )		( $\pm 0.315$ )
3 in. Hand singled	19.35	20.46	18.63	21.18	19.90
3 in. Mech. gapped	19.34	18.47	17.30	20.52	18.91
7 in. Drilled to a stand	18.64	18.60	17.54	19.70	18.62
Date of Lifting	( $\pm 0.301VI$ ) ( $\pm 0.363H$ )				( $\pm 0.157$ )
Early	17.89	17.76			17.82
Late	20.33	20.60			20.46
Mean	( $\pm 0.257$ )		( $\pm 0.157$ )		
	19.11	19.18	17.82	20.46	

S.E. per plot (2df) =  $\pm 0.274$  ton per acre or 1.4% G.M.  
 S.E. per sub plot (4df) =  $\pm 1.224$  ton per acre or 6.4% G.M.  
 S.E. per sub,sub plot (40df) =  $\pm 1.542$  ton per acre or 8.1% G.M.

1. On average the yield at the late date of lifting was increased by 2.64 ton per acre. Unlike the 1971 results there was no interaction between date of lifting and variety. At neither date of lifting was there any difference in yield between the two varieties.
2. Hand singling gave the highest root yield at 19.90 ton per acre. Compared with hand singling, mechanical gapping and drilling to a stand resulted in a similar yield loss of 0.99 and 1.28 ton per acre respectively.
3. Contrary to the 1971 results there was no interaction between method of spring mechanisation and varietal type.
4. At the early harvest carried out under dry soil conditions machine harvesting resulted in a yield loss of 1.30 ton per acre. This increased to 2.35 ton per acre under the wet soil conditions at the late date of lifting.
5. The yield of small roots was the lowest from hand singling at 0.62 ton per acre followed by drilling to a stand at 1.06 and mechanical gapping the highest at 1.78 ton per acre representing 3.1, 5.8 and 9.4% of the total yield respectively. More small roots were recovered by hand harvesting, 1.36 compared with 0.94 ton per acre by machine harvesting. Compared with hand lifting, machine harvesting

recovered only 64% of the small size roots after mechanical gapping which was rather less than for drilling to a stand and hand singling at 72% and 76% respectively.

- Top tare was higher at 7.7% after machine harvesting compared with 3.7% after hand lifting. When meaned over other factors Bush Mono when machine harvested gave a higher top tare than Sharpe's Klein Polybeet at 8.7 and 6.8% respectively.

SUGAR YIELD (cwt per acre)

Method of Spring Mechanisation	Seed Type		Date of Lifting		Mean
	S.K.Poly	Bush Mono	Early	Late	
	( $\pm 1.71$ )		( $\pm 1.71V$ )( $\pm 1.45HI$ )		( $\pm 1.21$ )
3 in. Hand singled	71.8	73.4	68.0	77.2	72.6
3 in. Mech. gapped	71.0	66.0	62.5	74.5	68.5
7 in. Drilled to a stand	68.0	66.1	63.0	71.1	67.1
Date of Lifting	( $\pm 1.07VI$ )( $\pm 1.4OH$ )				( $\pm 0.41$ )
Early	65.6	63.4			64.5
Late	74.9	73.7			74.3
Mean	( $\pm 0.99$ )		( $\pm 0.41$ )		
	70.3	68.5	64.5	74.3	

S.E. per plot (2df) =  $\pm 0.71$  cwt per acre or 1.0% G.M.  
 S.E. per sub plot (4df) =  $\pm 4.44$  cwt per acre or 6.4% G.M.  
 S.E. per sub, sub plot (40df) =  $\pm 5.92$  cwt per acre or 8.5% G.M.

- Sharpe's Klein Polybeet had a higher sugar content than Bush Mono at 18.4% and 17.9% respectively. The sugar content of both varieties were 0.1% lower when hand lifted compared with machine harvesting.
- Hand singling gave the highest sugar yield at 72.6 cwt per acre followed by mechanical gapping at 68.5 and drilling to a stand at 67.1 cwt per acre respectively. Sharpe's Klein Polybeet outyielded Bush Mono when mechanically gapped but when hand singled or drilled to a stand the two varieties gave similar yields.
- Delaying harvesting from 2 November to 12 December increased sugar yield by 9.27 and 10.29 from Sharpe's Klein Polybeet and Bush Mono respectively.
- Losses from mechanical harvesting increased from 4.0 cwt sugar per acre at the dry lifting date to 8.1 cwt sugar per acre at the late date under wet soil conditions.

## SUGAR CONTENT (%)

Method of Spring Mechanisation	Seed Type		Date of Lifting		Mean
	S.K.Poly	Bush Mono	Early	Late	
	( $\pm 0.09$ )		( $\pm 0.09V$ ) ( $\pm 0.08HI$ )		( $\pm 0.06$ )
3 in. Hand singled	18.5	17.9	18.2	18.2	18.2
3 in. Mech. gapped	18.4	17.9	18.1	18.2	18.1
7 in. Drilled to a stand	18.2	17.8	18.0	18.0	18.0
Date of Lifting	( $\pm 0.07VI$ ) ( $\pm 0.08H$ )				( $\pm 0.04$ )
Early	18.3	17.8			18.1
Late	18.4	17.9			18.1
Mean	( $\pm 0.06$ )		( $\pm 0.04$ )		
	18.4	17.9	18.1	18.1	

S.E. per plot (2df) =  $\pm 0.07\%$  sugar or 0.4% G.M.  
 S.E. per sub plot (4df) =  $\pm 0.11\%$  sugar or 0.6% G.M.  
 S.E. per sub,sub plot (40df) =  $\pm 0.32\%$  sugar or 1.8% G.M.

## 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	
	( $\pm 0.156$ )		( $\pm 0.156V$ ) ( $\pm 0.169HI$ )		( $\pm 0.111$ )
3 in. Hand singled	0.62	0.62	0.60	0.64	0.62
3 in. Mech. gapped	1.63	1.92	1.86	1.70	1.78
7 in. Drilled to a stand	1.07	1.05	1.24	0.88	1.06
Date of Lifting	( $\pm 0.143VI$ ) ( $\pm 0.128H$ )				( $\pm 0.111$ )
Early	1.12	1.34			1.23
Late	1.09	1.06			1.07
Mean	( $\pm 0.090$ )		( $\pm 0.111$ )		
	1.10	1.20	1.23	1.07	

S.E. per plot (2df) =  $\pm 0.192$  ton per acre or 16.7% G.M.  
 S.E. per sub plot (4df) =  $\pm 0.324$  ton per acre or 28.2% G.M.  
 S.E. per sub,sub plot (40df) =  $\pm 0.542$  ton per acre or 47.0% G.M.

SMALL ROOTS AS % TOTAL YIELD

Method of Spring Mechanisation	Seed Type		Date of Lifting		Mean
	S.K.Poly	Bush Mono	Early	Late	
	( $\pm 0.78$ )		( $\pm 0.78V$ )( $\pm 0.80HI$ )		( $\pm 0.54$ )
3 in. Hand singled	3.2	3.0	3.2	3.0	3.1
3 in. Mech. gapped	8.4	10.3	10.5	8.2	9.4
7 in. Drilled to a stand	5.8	5.8	7.2	4.4	5.8
Date of Lifting	( $\pm 0.66VI$ )( $\pm 0.63H$ )				( $\pm 0.49$ )
Early	6.3	7.7			7.0
Late	5.3	5.1			5.2
Mean	( $\pm 0.45$ )		( $\pm 0.49$ )		
	5.8	6.4	7.0	5.2	

S.E. per plot (2df) =  $\pm 0.84\%$  or 13.9% G.M.  
 S.E. per sub plot (4df) =  $\pm 1.51\%$  or 24.9% G.M.  
 S.E. per sub,sub plot (40df) =  $\pm 2.68\%$  or 44.2% G.M.

TOP TARE (%)

Method of Spring Mechanisation	Seed Type		Date of Lifting		Mean
	S.K.Poly	Bush Mono	Early	Late	
	( $\pm 0.54$ )		( $\pm 0.54V$ )( $\pm 0.54HI$ )		( $\pm 0.38$ )
3 in. Hand singled	4.7	5.9	5.4	5.2	5.3
3 in. Mech. gapped	5.6	6.8	6.5	5.9	6.2
7 in. Drilled to a stand	5.5	6.0	5.2	6.3	5.7
Date of Lifting	( $\pm 0.45VI$ )( $\pm 0.45H$ )				( $\pm 0.32$ )
Early	5.3	6.1			5.7
Late	5.3	6.3			5.8
Mean	( $\pm 0.31$ )		( $\pm 0.32$ )		
	5.3	6.2	5.7	5.8	

S.E. per plot (2df) =  $\pm 0.55\%$  or 9.6% G.M.  
 S.E. per sub plot (4df) =  $\pm 0.92\%$  or 15.9% G.M.  
 S.E. per sub,sub plot (40df) =  $\pm 1.89\%$  or 32.9% G.M.