

SUGAR BEET
SPRING MECHANISATION NAS 504 ML 73

SUMMARY

Hand singling and drilling to a stand produce very similar yields approximately 6 cwt more sugar per acre than blind mechanical gapping. Losses from mechanical harvesting were similar whether lifted at the early dry lifting date or at the late date under wet soil conditions.

OBJECTS: 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 harvesting
2. Late harvesting

Sub:- method of harvesting

1. Hand
2. Machine

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

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

and seed type:

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

LAYOUT:

3 randomised blocks with split, split plots
Treatment area
Harvest area

SOIL TYPE: Ashley (sandy loam)

PREVIOUS CROPPING:

Field. Ravens Grove
1972 Spring wheat
1971 Potatoes
1970 Winter beans

MANURING:

5 cwt per acre Kainit (18% K₂O) in autumn before ploughing.
6 cwt per acre of a 23-10-11 compound fertiliser.

SUGAR BEET

SPRING MECHANISATION

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METHOD

5cwt per acre of Kainit were ploughed in during the previous autumn and 30cwt per acre of lime applied on 13 March. 6cwt per acre of a 23 - 10 - 11 compound fertiliser were applied on 21 March followed by seedbed preparation on 22 March. This consisted of one pass of a springtine cultivator, roll, Lilla Harine followed by a further pass of the roll and finally a Dutch harrow. This resulted in a fine but dry seedbed. The experiment was drilled on 23 March and overall sprayed with pyrazone at 2.2lb a.i. per acre.

Mechanical gapping and hand singling were carried out on 6 June when the beet had reached 4 - 6 true leaves. The mechanical gapper was set to give a reduction of 45% for both seed types.

The early lift was taken on 15 October under moist friable soil conditions and the late lift was completed on 5 December after recent rain resulting in wet plastic soil conditions.

RESULTS

Final Plant Population (Plant Stations '000 per acre)

Method of Spring Mechanisation	Seed type		Date of lifting		Mean
	S.K.	Poly Bush Mcno	Early	Late	
	(± 1.18)		($\pm 1.18V$)	(-1.05 H.I.)	(± 0.84)
3in. Hand singled	27.7	27.0	27.8	26.9	27.4
3in. Mech gapped	30.8	27.4	29.9	28.4	29.1
7in. Drilled to a stand	23.4	22.5	23.3	22.6	23.0
Date of lifting	(± 0.80 VI) (± 0.96 H)				
Early	27.6	26.3			
Late	27.0	25.0			
Mean	(-0.68)		(-0.42)		
	27.3	25.7	27.0	26.0	

SE per plot (2df) = ± 0.73 plant stations per acre or 2.8% G.M.
 SE per subplot (4df) = ± 1.36 plant stations per acre or 5.1% G.M.
 SE per sub, sub plot = ± 4.09 plant stations per acre or 15.5% G.M.

1. Final plant populations of the hand and machine harvested plots which are not given in the table were very similar at each treatment comparison.
2. Both varieties when drilled to a stand at 7.0in. spacing gave a rather low level of plant populations corresponding to approximately 50% seedling emergence.

3. After mechanical gapping the plant population of both varieties was near to the target of 30,000 plants per acre, that of Sharpe's Klein Polybeet being 30,800 and Bush Mono 27,400 plants per acre. In both cases the mechanical gapper had been set to give a 4.5% 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 8.7 and 8.5% respectively, hand singling giving 21%. The corresponding figures for Bush Mono were 4-7, 2-8 and 1.2% respectively.

TOTAL YIELD ROOTS (ton per acre)

Method of Spring Mechanisation	Seed Type		Date of Lifting		Mean
	S.K. Poly	Bush Mono	Early	Late	
	(± 0.463)		($\pm 0.463V$) ($\pm 0.564H.I.$)		(± 0.328)
3in. Hand singled	18.99	20.18	19.67	19.50	19.58
3in. Mech.gapped	18.03	17.80	18.19	17.64	17.91
7in. Drilled to a stand	20.32	19.70	19.80	20.22	20.01
Date of Lifting	($\pm 0.496VI$) ($\pm 0.378H$)				
Early	19.12	19.31			
Late	19.10	19.14			
Mean	(± 0.268)		(± 0.418)		
	19.11	19.22	19.22	19.12	

SE per plot (2df) = ± 0.723 ton per acre or 3.8% G.M.

SE per sub plot (4df) = ± 0.748 ton per acre or 3.9% G.M.

SE per sub,sub plot (40df) = ± 1.605 ton per acre or 8.4% G.M.

1. There was no difference in root yield between the early and late dates of harvesting. In agreement with the 1972 results and unlike the 1971 results there was no interaction between date of lifting and variety and at neither date of lifting was there any difference in yield between the two varieties.

2. Drilling to a stand and hand singling gave similar average yields at 20.01 and 19.58 ton per acre respectively. Mechanical gapping resulted in a mean yield loss of 2.10 ton per acre compared with drilling to a stand.

3. Contrary to the 1971 results there was no interaction between method of spring mechanisation and varietal type.

4. Losses from machine harvesting were very similar from early harvesting under dry conditions and from the late harvesting carried out under wet soil conditions. These losses amounted to 1.84 and 1.35 ton per acre respectively.

5. The yield of small roots (< 2.25in. dia.) obtained by hand lifting were the lowest from hand singling and drilling to a stand at 0.66 and 0.63 ton per acre respectively. After mechanical gapping the yield of small size roots was much higher at 1.17 ton per acre. These yields of small roots represented 3.3, 3.0 and 6.2% of the total root yield respectively. Compared with hand lifting, machine harvesting recovered 81% of the small size roots after mechanical gapping whereas from hand singling and drilling to a stand recovery was virtually complete.

6. The mean top tare was higher at 6.4% after machine harvesting compound with 2.9% after hand lifting. When harvested by machine top tare was highest from the drilled to a stand treatment at 8.2% compound with 5.4% and 5.7% from hand singling and mechanical gapping. Measured over all the other factors Bush Maro, when machine harvested, gave a higher top tare at 7.2% than Sharpe's Klein Polybeet at 5.7%. This effect was also observed in the 1972 experiment.

SUGAR YIELD (cwt per acre)

Method of Spring Mechanisation	Seed Type		Date of lifting		Mean
	S.K. Poly	Bush Maro	Early	Late	
	(± 1.58)		($\pm 1.58V$)	($\pm 1.82HI$)	(± 1.12)
3in. Hand singled	64.4	66.3	64.4	66.4	65.4
3in. Mech. gapped	61.6	57.7	59.7	59.5	59.6
7in. Drilled to a stand	67.8	63.5	63.8	67.6	65.7
Date of lifting	($\pm 1.57VI$)($\pm 1.29H$)				
Early	63.5	61.8			
Late	65.8	63.2			
Mean	(± 0.91)		(± 1.28)		
	64.6	62.5	62.6	64.5	

SE per plot (2df) = ± 2.21 cwt per acre or 3.5% G.M.
 SE per sub plot (4df) = ± 1.97 cwt per acre or 3.1% G.M.
 SE per sub, sub plot (40df) = ± 5.48 cwt per acre or 8.6% G.M.

1. At both harvest dates Sharpe's Klein Polybeet gave the highest sugar content exceeding that of Bush Maro at the early date by 0.60% and at the late date by 0.72%. The method of spring mechanisation influenced sugar content of both varieties. Hand singling and mechanical gapping gave the higher mean sugar content at 16.7% whilst drilling to a stand reduced sugar content to 16.4%.

2. Hand singling and drilling to a stand produced very similar yields approximately 6cwt per acre higher than mechanical gapping.

3. Delaying harvesting from 15 October to 5 December increased sugar yield by only 2.3 and 1.4cwt per acre from Sharpe's Klein Polybeet and Bush Maro respectively.

4. Losses from mechanical harvesting were similar whether lifted early under moist friable soil conditions or late when the soil was much wetter.

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Sugar Content (%)

Method of Spring mechanisation	Seed Type		Date of Lifting		Mean
	S.K.Poly	Bush Mono	Early	Late	
	(± 0.079)		($\pm 0.079V$)($\pm 0.076HI$)		(± 0.056)
3in. Hand singled	16.98	16.44	16.38	17.05	16.71
3in. Mech. gapped	17.10	16.21	16.42	16.89	16.66
7in. Drilled to a stand	16.68	16.13	16.11	16.70	16.40
Date of Lifting	($\pm 0.061VI$)($\pm 0.065H$)				(± 0.040)
Early	16.60	16.00			16.30
Late	17.24	16.52			16.88
Mean	(± 0.046)		(± 0.040)		
	16.92	16.26	16.30	16.88	

SE per plot (2df) = $\pm 0.069\%$ sugar or 0.4% G.M.
 SE per sub plot(4df) = $\pm 0.184\%$ sugar or 1.1% G.M.
 SE per sub,sub plot (40df) = $\pm 0.275\%$ sugar or 1.7% 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	
	(± 0.098)		($\pm 0.098V$)	($\pm 0.102HI$)	(± 0.069)
3in. Hand singled	0.59	0.64	0.59	0.64	0.61
3in. Mech. gapped	1.18	0.95	1.12	1.00	1.06
7in. Drilled to a stand	0.73	0.56	0.65	0.63	0.64
Date of lifting	($\pm 0.085VI$)($0.080H$)				(± 0.063)
Early	0.88	0.70			0.79
Late	0.78	0.73			0.76
Mean	(± 0.057)		(± 0.063)		
	0.83	0.72	0.79	0.76	

SE per plot (2df) = ± 0.109 ton per acre or 14.1% G.M.
 SE per sub plot(4df) = ± 0.153 ton per acre or 19.8% G.M.
 SE per sub,sub plot(40df) = ± 0.340 ton per acre or 43.9% G.M.

SMALL ROOTS AS % TOTAL YIELD

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Method of Spring Mechanisation	Seed Type		Date of Lifting		Mean
	S.K.Poly	Bush Mono	Early	Late	
	(± 0.50)		($\pm 0.50V$)	($\pm 0.57HI$)	(± 0.35)
3in. Hand singled	3.1	3.2	3.0	3.3	3.1
3in. Mech.gapped	6.5	5.4	6.2	5.6	5.9
7in. Drilled to a stand	3.6	2.8	3.3	3.1	3.2
Date of lifting	($\pm 0.49VI$) ($\pm 0.40H$)				(± 0.40)
Early	4.6	3.7			4.2
Late	4.1	3.9			4.0
Mean	(± 0.29)		(± 0.40)		
	4.4	3.8	4.2	4.0	

SE per plot (2df) = $\pm 0.69\%$ or 16.8% G.M.SE per sub plot(4df) = $\pm 0.76\%$ or 18.6% G.M.SE per sub,sub plot (40df) = $\pm 1.72\%$ or 42.1% G.M.TOP TARE (%)

Method of Spring Mechanisation	Seed Type		Date of Lifting		Mean
	S.K.Poly	Bush Mono	Early	Late	
	(± 0.35)		($\pm 0.35V$)	($\pm 0.41HI$)	(± 0.25)
3in. Hand singled	3.7	4.8	3.8	4.7	4.2
3in. Mech.gapped	3.5	4.7	3.9	4.3	4.1
7in. Drilled to a stand	5.7	5.6	5.0	6.2	5.6
Date of lifting	($\pm 0.36VI$) ($\pm 0.29H$)				(± 0.29)
Early	4.0	4.5			4.3
Late	4.6	5.5			5.0
Mean	(± 0.20)		(± 0.29)		
	4.3	5.0	4.3	5.0	

SE per plot (2df) = $\pm 0.51\%$ or 10.9% of G.M.SE per sub plot(4df) = $\pm 1.25\%$ or 26.9% of G.M.SE per sub,sub plot(40df) = $\pm 1.22\%$ or 26.3% of G.M.