Sugarbeets Planted to Stand in 56 and 76-Centimeter Rows *

K. James Fornstrom and Grant Jackson

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INTRODUCTION

Sugarbeets have traditionally been grown in 56-cm rows in Wyoming. Farmers have been interested in growing sugarbeets in wider rows because field equipment can be used for more than one crop with minimal adjustment. Row spacings of 76-cm are commonly used for corn and dry edible beans.

Results of 31 research studies compiled by Cattanach and Schroeder (4) indicated sugar yields averaged 660 kg/ha greater for narrow rows (46 to 56 cm) than for wider rows (58 to 76 cm). Other research has also indicated higher yields for sugarbeets grown in 56-cm rows than for those grown in 76-cm rows (4, 8). No advantage seems to be gained when sugarbeets are grown in rows narrower than 56 cm (3).

Uniform population, row-spacing studies have been conducted by overplanting then thinning sugarbeet plants to desired populations. Sugarbeets can be planted to stand successfully in 56-cm rows in Wyoming (5). Minimum hand labor was required when complementary herbicides were used (1, 2).

The objective of this study was to compare 76-cm row spacings with 56-cm row spacings for sugarbeets using plant to stand, minimum labor practices. The study included two row spacings, two sugarbeet varieties and three seed populations.

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PROCEDURE

Treatments included: 56-cm and 76-cm row spacings; Mono Hy D2 and Holly Hybrid 30 seed varieties; and seed populations of 166,000, 110,000 and 84,500 seeds/ha. Four replications of each treatment were arranged in a split-plot, split-block design as follows: the blocks were split to include 56-cm and 76-cm rows; the plots were split with the two varieties; and within each variety, the seed population sub-plots were randomized.

The study was conducted at three locations in 1981 and in 1982. The locations were the Powell and Torrington Research and Extension Centers of the University of Wyoming and the Dennis Smith farm near Powell, Wyoming.

The plot areas were first bedded and than band treated with ethofumesate (Nortron) herbicide (1.9 kg/ha) and aldicarb (Temik 15g) insecticide (at the Powell and Smith locations, 10 gm ai/100 m of row) which were incorporated with a spring-tine incorporator. Seed was planted in mid-April with modified International 185 planter units. A jack-shaft was added to the planter units to allow the same three seed populations for both row spacings. Seed populations were chosen so that 50 percent emergence gave high, medium and low plant populations. Postemergence herbicides were applied about six weeks after planting. Desmedipham (Betanex, 0.56 kg/ha) plus ethofumesate (1.7 kg/ha) was applied in 1981. Desmedipham plus phemedipham (Betamix, 0.56 kg/ha) plus ethofumesate (1.7 kg/ha) was applied in 1982 to the Powell and Torrington sugarbeets. No postemergence herbicide was applied to the Smith sugarbeets in 1981 and desmedipham plus phemedipham (0.84 kg/ha) plus dalapon (Dowpon, 4.5 kg/ha) was applied to the sugarbeet on Smith's in 1982.

Initial stand counts were made 10 to 14 days after postemergence herbicide application. Root samples were collected in the last week of September at Powell and the first week of October at Torrington. A 6.1 m row was harvested for each replication. Roots smaller than approximately 4-cm crown diameter were judged non-machine-harves-

table and not included in the harvest sample.

RESULTS AND DISCUSSION

Initial plant populations for the two row spacings, two varieties and three seeding rates for the six study sites (3 locations, 2 years each) are presented in Table 1. At the Powell location in 1981, the seeding was not done correctly and the 76-cm beds were not uniform. This resulted in poor emergence of the beets in the 76-cm rows. Initial populations were also generally less at the other locations for the 76-cm rows than for the 56-cm rows. Higher initial populations were obtained for the Mono Hy D2 variety than for the Holly Hybrid 30 variety. Sugarbeets had to be replanted at Torrington in 1982. Only one variety, Holly Hybrid 30, was used. Significant differences between initial populations according to seeding rate were noted at all sites.

Harvest populations for all six sites are presented in Table 2. Harvest populations follow the same trends as the initial populations. Sugarbeets were inadvertently thinned at the Smith site in 1981 and the harvest populations were much less than initial populations. Harvest populations were less than initial populations due to plant loss during the growing season as well as small beets which were non-machine-harvestable. Harvest populations averaged 77 percent of the initial populations. Harvest populations averaged 69, 79 and 88 percent of the initial populations for the A, B and C seeding rates, respectively. Plant loss was greatest for the highest seeding rate (A population).

Root yields for all sites are presented in Table 3. Yields were higher for beets grown in the 56-cm rows than for those grown in the 76-cm rows, for the Holly Hybrid 30 variety than for the Mono Hy D2 variety and for the seeding rates which had harvest populations of 50,000-60,000 plants/ha.

Yields at a population of 61,800 plants/ha was used to put the root yields at all sites on a unit yield basis. Yield ratio was defined as the yield at a given popula-

Table 1. Initial populations of two varieties of sugarbeets planted to stand in 56-cm and 76-cm rows with three seed populations.

Treatment	Initial Population (100 plants/ha)					
	Study Site					
	Powell		Smith		Torrington	
	1981	1982	1981	1982	1981	1982
Row Spacing						
56 cm	62.3a*	77.3b	77.6	71.9	85.5	81.5
76 cm	27.9b	80.8a	64.2	60.8	81.3	81.3
Variety						
Mono Hy D2	51.4a	89.2a	84.3	75.9a	89.7a	**
Holly Hybrid 30	35.6b	68.9b	57.6	56.8b	77.1b	81.5
Seeding Rate						
A (166,000 seeds/ha)	60.0a	107.2a	102.8a	92.2a	117.9a	107.5a
B (110,000 seeds/ha)	39.8b	73.1b	60.5b	60.5b	77.6b	78.3b
C (84,500 seeds/ha)	31.1b	56.8c	49.7c	46.2c	55.1c	58.8c
Site Mean	43.7	79.1	70.9	66.2	83.5	81.5

*Means for a site followed by different letters are significantly different at the 0.05 level. Means with no superscript letters are not significantly different.

**Data for 1982 Torrington plots represent only Holly Hybrid 30 variety; no plots were planted with Mono Hy D2 variety.

Table 2. Harvest population of two varieties of sugarbeets planted to stand in 56-cm and 76-cm rows with three seed populations.

Treatment	Harvest Population (1000 plants/ha)					
	Study Site					
	Powell		Smith		Torrington	
	1981	1982	1981	1982	1981	1982
Row Spacing						
56 cm	53.4a*	65.0	44.2	57.6	68.4	60.0
76 cm	22.5b	65.7	33.1	48.4	64.0	61.0
Variety						
Mono Hy D2	49.4a	71.4a	44.0	58.1a	71.9a	**
Holly Hybrid 30	26.4b	59.3b	33.4	47.7b	60.5b	60.5
Seeding Rate						
A (166,000 seeds/ha)	53.1a	78.1a	46.0	65.0a	83.3a	72.2a
B (110,000 seeds/ha)	34.1b	63.5b	36.3	51.9b	63.3b	57.3b
C (84,500 seeds/ha)	26.7b	54.4b	33.6	42.0c	52.1c	52.1b
Site mean	38.1	65.2	38.5	52.9	66.2	60.5

*Means for a site followed by different letters are significantly different at the 0.05 level. Means with no superscript letters are not significantly different.

**Data for 1982 Torrington plots represent only Holly Hybrid 30 variety; no plots were planted with Mono Hy D2 variety.

Table 3. Root yield of two varieties of sugarbeets planted to stand in 56-cm and 76-cm rows with three seed populations.

Treatment	Root Yield (t/ha)					
	Study Site					
	Powell		Smith		Torrington	
	1981	1982	1981	1982	1981	1982
Row Spacing						
56 cm	46.0a*	47.7	56.9	40.4	45.7	50.2
76 cm	32.5b	46.2	59.2	35.9	41.9	48.0
Variety						
Mono Hy D2	43.7a	46.2b	58.1	36.8	40.8b	**
Holly Hybrid 30	34.7b	48.4a	58.1	39.5	46.6a	49.1
Seeding Rate						
A (166,000 seeds/ha)	43.7a	42.6b	62.1a	36.1	40.8	46.6
B (110,000 seeds/ha)	37.4b	47.5a	56.0b	39.9	43.9	50.0
C (84,500 seeds/ha)	36.5b	50.9a	56.0b	38.1	46.4	50.7
Site mean	39.2	47.1	58.1	38.1	43.7	49.1

*Means for a site followed by different letters are significantly different at the 0.05 level. Means with no superscript letters are not significantly different.

**Data for 1982 Torrington plots represent only Holly Hybrid 30 variety; no plots were planted with Mono Hy D2 variety.

tion divided by the yield at 61,800 plants/ha (obtained from the cubic regression curve for the respective location). Yield ratio as a function of plant population for all locations is plotted in Figure 1. The coefficient of

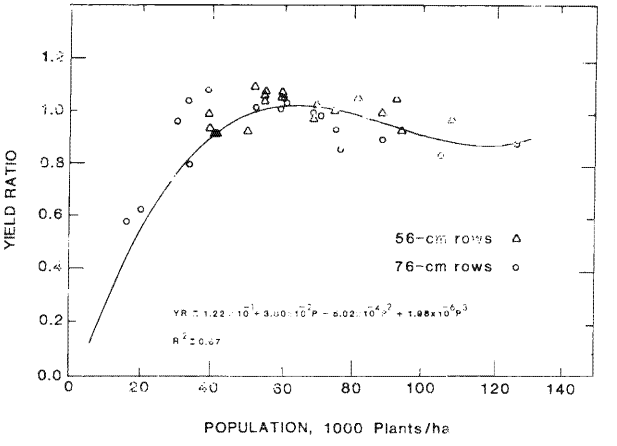

Figure 1. Yield ratio as a function of harvest population, all sites, 1981-82

determination of 0.67 indicates that population was highly significant in determining yield. The maximum yield ratio occurs at a population of 57,500 plants/ha. The curve also shows that under-population is much more damaging to yield than over-population.

Sucrose contents of sugarbeets from all sites are presented in Table 4. The sucrose contents are all about equal at each site except at Powell, in both 1981 and 1982. Low populations for the 56-cm rows and Holly Hybrid 30 variety may explain the differences for the 1981 plots but the reasons for the differences in the 1982 plots are not known.

Three of the six experiments, at Powell in 1982, Smith's in 1982 and Torrington in 1981, were conducted entirely as the experiment was intended. The three complete studies were combined and the average initial and harvest populations, yields and sucrose content for the two row spacings, two varieties and three seeding rates are presented in Table 5. Mono Hy D2 variety had superior

Table 4. Sucrose content of two varieties of sugarbeets planted to stand in 56-cm and 76-cm rows with three seed populations.

Treatment	Sucrose Content (%)					
	Study Site					
	Powell		Smith		Torrington	
	1981	1982	1981	1982	1981	1982
Row Spacing						
56 cm	16.5a*	16.5a	16.4	16.6	17.4	14.3
76 cm	15.8b	16.2b	15.4	16.6	17.4	14.1
Variety						
Mono Hy D2	16.5a	16.5a	16.0	16.7	17.6	**
Holly Hybrid 30	15.8b	16.2b	15.7	16.5	17.3	14.2
Seeding Rate						
A (166,000 seeds/ha)	16.2	16.4	15.7	16.8	17.4	14.4
B (110,000 seeds/ha)	16.2	16.3	16.0	16.5	17.8	14.0
C (84,500 seeds/ha)	16.1	16.3	15.9	16.5	17.1	14.2
Site mean	16.2	16.4	15.9	16.6	17.4	14.2

*Means for a site followed by different letters are significantly different at the 0.05 level. Means with no superscript letters are not significantly different.

**Data for 1982 Torrington plots represent only Holly Hybrid 30 variety; no plots were planted with Mono Hy D2 variety.

Table 5. Average populations and yields of two varieties of sugarbeets planted to stand in 56-cm and 76-cm rows with three seed populations, Powell-1982, Smith-1982 and Torrington-1981 sites.

Treatment	Population (1000 plants/ha)		Yield	
	Initial	Harvest	t/ha	% Sucrose
Row Spacing				
56 cm	78.3	63.8a*	44.6a	16.8
76 cm	74.4	59.3b	41.2b	16.7
Variety				
Mono Hy D2	85.0a	67.2a	41.0b	16.9
Holly Hybrid 30	67.7b	55.8b	44.8a	16.7
Seeding Rate				
A (166,000 seeds/ha)	105.8a	75.6a	39.9b	16.9
B (110,000 seeds/ha)	70.4b	59.6b	43.9a	16.9
C (84,500 seeds/ha)	52.6c	49.7c	45.1a	16.6
Mean	76.4	61.5	43.0	16.8

*Means followed by different letters are significantly different at the 0.05 level. Means with no superscript letters are not significantly different.

emergence but less yield than the Holly Hybrid 30 variety. With the high average emergence rate (63 percent), yields increased with lower seeding rates (B and C populations). For the three plots, sugarbeets in 56-cm rows yielded an average of 3.4 t/ha more than sugarbeets planted in the 76-cm rows.

This study and others indicated a reduced yield for sugarbeets planted in 76-cm rows as compared to 56-cm rows. However, there are some cost incentives for growing beets with 76-cm row spacing. Pesticide costs per unit area are reduced when banded on 76-cm rows. Pesticides applied in this study were ethofumesate (3.6 kg/ha) and desmedipham plus phemedipham (0.56 kg/ha) herbicides and aldicarb (10 gm/100m of row) insecticide. Current costs of these pesticides, when applied on an 19-cm band, would be $43/ha less for the beets planted in 76-cm rows than for those planted in 56-cm rows. This equates to about one t/ha of sugarbeet yield at present prices. If a nematode rate of aldicarb (29 gm/100m of row) were applied an additional savings of about $30/ha would occur. Equipment

savings may also be realized in that fewer row units are required for a given width of coverage. Equipment could be used on more crops and larger tractor tire sizes, could be used. A complete cost analysis would require many other inputs, including farm size and crop mix. There are cost advantages for both row spacings; higher yields are obtained when sugarbeets are grown in 56-cm rows and lower pesticide and equipment costs are incurred when beets are grown in 76-cm rows.

SUMMARY

Sugarbeets grown in 56-cm rows yielded 3.4 t/ha more than sugarbeets grown in 76-cm rows when plant to stand, minimum labor practices were used. Higher yields were obtained from seeding rates of 84,500 and 110,000 seeds/ha than from a seeding rate of 166,000 seeds/ha. The Mono Hy D2 variety emerged better but yielded less than the Holly Hybrid 30 variety. Lower yields of sugarbeets grown in 76-cm rows may be partially offset by lower pesticide and equipment costs.

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DISCLAIMER

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