Comparison of Hand and Machine Thinning of Sugar Beets[1]

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In 1952 three experiments were conducted in Malheur County, Oregon, to compare the effects of hand thinning and machine thinning on yields of sugar beets. The use of mechanical thinners *in* this important beet growing area is increasing each year. Several demonstrations of machine thinning have been conducted by the Amalgamated Sugar Company, which operates in the area, but no replicated experiments had been previously carried out in Oregon to compare hand and machine thinning.

The data obtained in the three experiments are presented in Table **1.**

Furuyama Farm

On the Furuyama farm beets were planted during the last week of March in an excellent, smooth seedbed. Beets emerged evenly and were of uniform size. There were approximately 55 beet-containing inches per 100 inches of row. At thinning time a small amount of grass and very few weeds were present. Hand and machine thinning treatments were replicated 21 times *in* randomized blocks. Plots were 6 rows wide and 60 feet long.

Table 1.—.Summary of Data from Sugar Beet Thinning Method Experiments[1]

Thinning method	Beets/100 Ft. of row, Average	Average Spacing, Ins.	Beet Yield, T./A.	Percent Sugar	Lbs. Sugar/A.
		Furuyama Farm			
		Means for 21 Replications			
Hand	105	11.4	28.9	17.6	10,100
Machine	99	12.1	27.8	17.3	9,570
L.S.D.	N.S.[2]	N.S.	N.S.	N.S.	N.S.
		Bowers Farm			
		Means for 16 Replications			
Hand	93	12.9	22.5	16.9	7,590
Machine	67	17.9	18.1	16.8	6.060
L.S.D.	Sig.[3]	Sig.	Sig.	Sig.	Sig.
		Malheur Experiment Station			
		Means for 10 Replications			
Hand	91	13.2	20.2		
Flex-heads	154	7.8	21.6		
Flex-heads and knives	125	9.6	19.8		
L.S.D.		1.6	N.S.		

[1] Statistical Analyses by Dr. Jerome C. R. Li, Assoc. Prof, of Math., Oregon State College.
[2] N.S. = Differences not significant.
[3] Sig. — Differences significant at P = 0.05.

[1] Approved for publication as Technical Paoev No. 850 by Director for the Oregon Agricultural Experiment Station and the Chief of the Soil and Water Conservation Research Branch, Agricultural Research Service, U.S.D.A. Contribution of the Department of Soils of OAES and of the Western Section of Soil and Water Management of SWCRB.

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Hand thinning was done May 10 under supervision of one of the authors. After thinning there was an average stand of 105 beets per 100 feet of row; the average distance between beets was 11.4 inches.

Machine thinning was performed by the farmer, following his own schedule of operations. A 6-row rear-mounted Silver thinner was employed. Each unit was equipped with a gauge wheel to regulate depth of operation. Machine operations started May 10. The thinning machine was equipped with 16-tine flex-heads (spring tines from side-delivery hay rake) and the machine thinned beets were gone over four times, as a preliminary to the thinning. These operations removed a few beets and nearly all grass. Following this the thinning heads were equipped with 8-blade knives ($1^{1/4}$ inches wide) and the plots were gone over twice. This was followed by two times over with the machine with heads equipped with 16-blade knives (5/8-inch wide). An average stand of 99 beets per 100 feet of row was obtained; the average spacing was 12.1 inches between beets. A week after thinning the beets were hoed one time with a long-handle hoe. No other hoeing was done. To control weeds and grass, all plots were later gone over with the thinning machine equipped with flex-heads.

As shown in Table 1, on the Furuyama farm there were no significant differences in the effects of hand and machine thinning on numbers of beets, percentage of sugar, or yield of beets or sugar per acre. The machine-thinned beets yielded 27.8 tons per acre.

Bowers Farm

Seedbed preparation and planting on the Bowers farm were performed by the farmer. Thinning was carried out under supervision of the authors. The seedbed was somewhat cloddy and dry. Emergence of beets was uneven; when the first beets to emerge were of a size suitable for thinning others were much too small. A considerable amount of grass was present. There were approximately 20 beet-containing inches per 100 inches of row.

Beets were planted March 26. Plots were 6 rows wide and 40 feet long. Thinning treatments were replicated 16 times in randomized blocks. Mechanical thinning operations began May 8, when the machine-thinned beets were gone over twice with 16-tine flex-heads on a 4-row trailing Silver thinner. This removed most of the grass and several of the small beets.

May 14 the plots were given a once-over treatment with 8-blade knives. This operation was followed May 17 by a treatment with 12-tine flex-heads, and May 22 by a treatment with 16-tine flex-heads. Many of the small beets were removed. The machine-thinned beets averaged 17.9 inches apart or 67 beets per 100 feet of row.

Hand-thinned beets were thinned May 8 to a stand averaging 12.9 inches apart, or 93 beets per 100 feet of row.

All plots were hoed with a long-handle hoe May 23. The machine-thinned plots required about one-fourth less hoeing than the hand-thinned plots. No other hoeing was done. All plots were gone over one time with flex-heads during the summer, to remove small grass and weeds.

The hand-thinned plots produced an average yield of 22.5 tons per acre. The machine-thinned plots gave a significantly lower yield of **18.1** tons. Sugar percentages were similar for both treatments. Total yield of sugar paralleled yields of beets.

Malheur Experiment Station

Two methods of mechanical thinning were compared with hand thinning on the Malheur Experiment Station. On one case (A) , thinning was performed with flex-heads only, in the other (B) , by 8-blade knives after preliminary treatment with flex-heads.

Beets were planted April 1. After emergence there were approximately 28 beet-containing inches per 100 inches of row. Thinning treatments were replicated 10 times in randomized blocks. Plots were 4 rows wide and 90 feet long.

Light weedings were given all plots April 28 and 30 by going over them with flex-heads on a 4-row trailing Silver thinner.

The beets of one-third the plots were hand thinned May 23. The thinned beets averaged 13.2 inches apart, or 91 beets per 100 feet of row.

On one-third the plot thinning was accomplished with flex-heads only. The plots were gone over twice with 12-tine and once with 16-tine flex-heads between May 14 and 21. After thinning there were 154 beets per 100 feet of row; the average distance between beets was 7.8 inches.

Thinning of the beets of one-third of the plots was accomplished with a combination of flex-heads and knives. Between May 14 and 21 the plots were gone over twice with 16-tine flex-heads, once with 8-blade knives (H/j inch blades) , and once with 12-tine flex-heads. The stand of beets averaged 125 beets per 100 feet of row; 9.6 inches was the average distance between beets.

Plots of both mechanical thinning treatments were gone over with 16-tine flex-heads June 4. All beets were given one hoeing with long-handle hoes June 6.

There were no significant differences between yields of beets from plots of the three thinning treatments. The highest yield recorded was from the plots thinned with flex-heads only.

Summary and Conclusions

Hand and machine thinning (Silver thinner) of sugar beets were compared in three experiments. Where the beets were planted in a good seedbed and emerged evenly, yields of machine-thinned and hand-thinned beets were not significantly different. Where the seedbed was cloddy and dry, and emerged uneven, hand-thinned beets yielded significantly more than machine-thinned beets. Thinning method had no effect upon sugar content of the beets.