Results on Different Seeding Rates of Sugar Beets as Affecting Yield and Hand Labor Requirements

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THE USE OF SEGMENTED or otherwise processed beet seed has been almost universally adopted by the beet sugar industry of North America. That labor was saved by its adoption appeared obvious. The amount of labor saved or the relative yield resulting from plantings of segmented seed as compared with whole seed was not so certain. In the first place, factors affecting the results of such comparisons are numerous. The seeding rates used, methods of thinning, type labor employed, soil and weather conditions are all important factors influencing the final results. To make the direct comparison, however, is not as important as determining the point at which one reduces the hand labor requirements to a minimum without a sacrifice in yield or net return.

This paper deals with two studies---one made on the Experiment Station at Longmont, Colorado, and the other on farmers' fields at Billings, Montana, during the year 1947.

Materials and Methods

The seed used in the experiment conducted at Longmont consisted of a 1:1 mixture by weight of two commercial G.W. varieties. The number of seedballs per pound before segmenting was 35,600 with an average germination of 79 percent. After segmenting, there were 48,000 seedballs per pound with a total germination of 78.5 percent, of which 58.6 percent were singles. The field selected was of medium fertility and the planting was made April 30, under adverse germinating conditions. A John Deere No. 66 beet drill was used for planting the segmented seed and a hand planter for planting the whole seed. Flat bed planting with 20-inch rows was used. Six rows 300 feet long constituted a plot. Laborers were employed by the hour and were not professional beet workers. Two center rows the length of the plot were harvested for yield September 30. One-half this quantity of beets was used for sugar analysis.

The experimental design used at Longmont was that of a complete randomized block with five treatments and five replications. The five treatments were respectively:

a. 1 pound segmented seed per acre, no thinning.

b. 2 pounds segmented seed per acre, long-handled hoe thinned at 4- to 6-leaf stage.

[1]Agronomist, The Great Western Sugar Company Experiment Station, Longmont, Colorado, and Agronomist, The Great Western Sugar Company, Billings, Montana, respectively.

c. 4 pounds segmented seed per acre, long-handled hoe thinned at 4- to 6-leaf stage.

d. 4 pounds segmented seed per acre, hand-blocked and thinned at 10- to 12-leaf stage.

e. 20 pounds whole seed per acre, hand-blocked and thinned at 10- to 12-leaf stage.

In addition to the test just described, observations were made of low seeding rate trials conducted on selected farms near Billings, Montana. The summarized data as presented later in tabular form are self-explanatory. Restrictions concerning the trials were made only in the attempt to select fields relatively free of weeds and of reasonably good fertility.

Experimental Results

The data secured on the test conducted at Longmont are given in tables 1 and 2.

Table 1.—Pre-thinning and after-thinning stand counts for different seeding rates and thinning methods.

Treatment	Rate of seeding	Method of thinning	Plants per 100' of Row	
			Before thinning	After thinning
a.	1 pound per acre	None	50	50
b.	2 pounds per acre	Long-handled hoe	100	72
c.	4 pounds per acre	Long-handled hoe	183	92
d.	4 pounds per acre	Hand-blocked and thinned**	183	79
e.	20 pounds per acre*	Hand-blocked and thinned**	990	95

*Whole seed, others segmented seed.
**Delayed thinning, others thinned early.

Table 2.—Yield results and man hours used for thinning and hoeing.

Treatment	Roots per acre (tons)	Sugar content (percent)	Sugar per acre (pounds)	Hand labor hours per acre		
				Thinning	Hoeing	Total
a.	8.25	10.56	1742		13.0	13.0
b	10.47	11.00	2303	7.6	9.3	16.9
c.	11.24	12.46	2801	8.2	11.3	19.5
d.	10.76	12.38	2664	36.7	5.1	41.8
e.	10.48	12.72	2666	50.7	5.7	56.4
LSD 5 percent point	1.27	.54	317			
LSD 1 percent point	1.73	.74	438			

The pre-thinning counts represent from 18 to 20 percent emergence of the total potential germination in the case of the segmented seed and 25 percent of the total potential for the whole seed.

The harvest results and hand labor requirements for the various treatments are given in table 2.

The relatively low yields as presented in table 2 may be attributed, in part, to late seeding, one severe hail June 27, and an early harvest. Even though the yields in tons per acre are not significantly different at the 5 percent point between treatments c and e, the trend in yield suggests that competition resulting from heavy rates of seeding and late thinning

adversely affected the yield. The labor required was increased by an abundant growth of weeds. This was apparent whether the thinning was done early or late.

The information on low seeding rates as obtained by cooperation with different growers in Montana is given in table 3.

Table 3.--Results of semi-commercial trials with low seeding rates. Billings, Montana, 1947.

Grower	Acres planted (number)	Seed per acre (pounds)	Hills per 100 feet (number)	Spring labor cost per acre	Yield per acre (tons)	Yield on whole contract (tons)
Al DeMeyer	4.4	1	65	$12.50	19.47	19.93
Alec and Herman Popp	12.0	1	45	Own family	15.09	14.28
Henry Rush	3.4	2	65	$22.00	17.68	14.10
Loren Hill	.9	1	94	Own family	No harvest data	

In the results of table 3 it is significant to note that good crops were produced with as low a seeding rate as 1 pound of seed per acre on the farms observed. It is the opinion of the writers that many growers in the Yellowstone Valley have the requirements which tend to favor such a minimum rate. Their main advantage is in having irrigation water available for irrigating the beets up if soil moisture is low. The results of the test at Longmont (tables 1 and 2) show a favorable yield for pre-thinning stands of as low as 200 plants per 100 feet of row. Under conditions of uniform planting and uniform emergence as obtained at Longmont, this stand was ample. Light stands of beets can be worked easily by hand labor, using long-handled hoes with a marked saving in time, effort, and cost. With a number of growers the low seeding rates have been more acceptable than the method employing heavier rates of seeding and cross-blocking. Those afraid of having a crop failure because of low seeding might look toward making a double planting in the same field and cultivating out rows not desired at the time of the first cultivation. It appears to the writers that this might require special equipment that would plant both rates in one operation with special attention given to row and wheel spacings to avoid planting in wheel marks. The experience with a double planting this year indicated the numerous tractor wheel marks made by two separate planting operations disturbed the seedbed. The seriousness of this did not appear great but it is mentioned as it might become an important factor depending on the condition of the soil.

Summary and Conclusions

1. A seeding rate of 1 pound per acre employed in a test at Longmont, Colorado, under adverse germinating conditions lowered the yield in tonnage by one-fourth and sugar produced per acre even more.

2. A seeding rate of 2 pounds per acre gave an emergence of 100 beets per 100 feet of row. This rate of seeding compared favorably in tonnage to heavier rates of seeding but produced less sugar per acre compared to stands obtained as a result of heavier rates of seeding.

3. Yields obtained from a 4-pound seeding of segmented seed was equivalent to yields obtained from a seeding of 20 pounds per acre of whole seed and resulted in a large saving in labor.

4. The seeding rate should be governed by the anticipated percentage emergence. A seeding rate that produced 180 beets per 100 feet of row was ample in a test at Longmont where a precision planter and hoe thinning was used. Seeding rates as low as 1 pound per acre have shown considerable promise in the Billings, Montana, area.