

The Effect of Bolting and Seed Stalk Removal On Yield and Sucrose Content of Sugarbeets

RONALD C. JOHNSON AND DON C. KIDMAN¹

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The occurrence of seed stalks in commercial sugarbeet fields is generally considered undesirable by both the grower and company personnel. A small percentage of bolters will make a sugarbeet field look extremely ragged. Growers frequently instruct their labor to remove the seed stalks at the same time they are weeding the beets. Only limited information has been published concerning the effect of bolters or the removal of these seed stalks on yield and sucrose content of sugarbeets.

The weather in February and the first part of March of 1967 was favorable for the planting of sugarbeets in much of the area in which the Utah-Idaho Sugar Company grows beets. However, in the later part of March, April and part of May it was adverse to planting or growing sugarbeets. This adverse weather caused excessive bolting in many of the early planted fields, which afforded an opportunity to evaluate the effect of bolting on the yield and sucrose content of sugarbeets.

Experimental Procedure

To fully evaluate the effect of bolting three separate tests or three parts of the same test were conducted. The first was to compare beets that had bolted with beets that had not bolted. The second was to compare beets from the same field but with different planting dates where the earlier planting dates had bolting beets and the later date did not. The third was to remove the seed stalks from alternate six-row strips and compare the strips that had the bolters removed with strips where the bolters were not removed. All tests were conducted with Utah-Idaho monogerm hybrid #2.

Paired Sample Comparisons

Samples were gathered intermittently from five fields by selecting two non-bolting beets with a bolting beet in between, or two bolting beets with a non-bolting beet in between. All samples were taken from areas that had full stands, which meant that the beets adjacent to the sampled beets and the beets in adjacent rows were not more than 15 inches apart with a minimum of 30 paired samples from each field. Four of the selected fields were in the Garland, Utah area and one was in the Toppenish, Washington area.

¹ Agricultural Research Manager and Research Agronomist respectively, Utah-Idaho Sugar Company, Salt Lake City, Utah.

All of the bolting beets would be classed as early bolters as there was well developed seed on all of the seed stalks. (Early bolting beets generally produce seed whereas late bolting beets produce a leafy stalk but no seed).

Four of the five fields yielded sizeable differences in tonnage in favor of the non-bolting beets. In the fifth field (Okada Bros.) the bolting beets gave the highest yield. In the four fields in which the non-bolting beets gave the highest yield, the bolting beets seemed a little tougher with a more coarse, woody fiber than did the non-bolting beets. This was not true in the Okada field where the bolting beets gave the highest yield. In this field there was no discernable difference in the fiber whether the beets had bolted or not. As the results of this field were so different from that obtained in the other fields, additional samples were taken which confirmed that the bolting beets were slightly heavier than the non-bolting beets.

The differences in sucrose were not nearly as pronounced as were the differences in yield. The non-bolting beets had the highest sucrose in three of the fields and the bolting beets in the other two. The average of the five tests, as recorded in Table 1, shows that the non-bolting beets yielded 3.10 tons more per acre, had 0.4% higher sucrose and produced 1,124 more pounds of sugar per acre than did the bolting beets. This confirms the work done in 1952 by Nelson and Deming (1)².

Table 1.—Comparison of bolting and non-bolting beets from paired samples.

Grower	Tons/acre		Sucrose %		Lbs of sugar/acre		Planting date
	Bolters	Non-bolters	Bolters	Non-bolters	Bolters	Non-bolters	
D. Bingham	15.36	20.19	14.1	14.9	4,332	6,017	March 25
Okada Bros.	26.13	24.39	13.4	13.3	7,003	6,488	March 27
L. Anderson	22.81	27.64	13.7	15.0	6,256	8,292	March 7
A. Jeppson	14.10	21.23	15.6	15.1	4,399	6,411	March 10
Company Farm*	18.53	19.01	13.5	14.2	5,003	5,399	February 5
Average	19.39	22.49	14.1	14.5	5,397	6,521	

* Washington

Difference Caused by Planting Dates

A field of sugarbeets was planted on a company farm in Washington on February 5. Part of the same field was held for weed control experiments and was not planted until March 10. By the first week in July the early-planted part of the field averaged approximately 80% bolters. The part of the field that was planted on March 10 had only an occasional bolter.

Sixteen samples were taken from each of the planting dates

² Numbers in parentheses refer to literature cited.

for yield and sucrose determination. Each sample was 15 feet long and contained not less than 12 beets. Yield does not seem to vary much with stands of beets from 75 to 125 beets per 100 feet of row (2).

The results in Table 2 show a large increase in yield from the later planting (March 10) as compared to the early planting (February 5). There was also a small increase in sucrose percentage in favor of the later planted beets that had only a few bolters. The net result was an increase of 1,290 pounds of sugar per acre or a 30% increase over the early planted part of the field.

Table 2.—Comparison of yield and sucrose of a February 5 planting that had 80% bolting and a March 10 planting that had only an occasional bolter.

Tons/acre		Sucrose %		Lbs of sugar/acre	
Bolters	Non-bolters	Bolters	Non-bolters	Bolters	Non-bolters
15.98	20.49	13.53	13.70	4,324	5,614

Removal of Seed Stalks

In the same field that was planted on February 5 and had 80% bolters, the seed stalks were removed from three six-row strips to determine the effect on yield and sucrose. The bolters were cut off on July 12 and good cultural practices continued until the beets were harvested on October 4. Eight 15-foot samples were taken from each strip or a total of twenty-four 15-foot samples were taken from areas having the seed stalks removed and adjacent areas where the seed stalks were not removed.

Table 3 shows a 1.1 ton increase from removing the seed stalks but there was no effect on the sucrose percentage. This resulted in an increase of 292 pounds of sugar per acre or a 7% increase from removing the seed stalks.

Table 3.—Comparison of bolting beets with beets that had seed stalks removed. Eighty percent of beets had bolted.

Tons/acre		Sucrose %		Lbs of sugar/acre	
Bolters	Cut off bolters	Bolters	Cut off bolters	Bolters	Cut off bolters
16.33	17.42	12.3	12.3	3,993	4,285

The test indicated that the tonnage increase would compensate for the expense and effort of removing the seed stalk and there were additional benefits in harvesting and processing these beets.

Discussion

These tests would indicate that non-bolting beets produced more than do adjacent bolting beets. This confirms the work done by Nelson and Deming (1). All of the beets in these tests were from fields that were planted early and bolted early. All of the bolters developed seed and would therefore be classed as early bolters though the bolter beets in one of the fields had most of the characteristics of medium or late bolters.

The second part of the test indicated that the part of the field planted March 10 that had only an occasional bolter produced more than the part of the field planted February 5 that had 80% of the beets bolt. Though much data have emphasized the advantage of early planting, it should be clarified that both dates of February 5 and March 10 would be considered early planting dates for this area. The February 5 date is earlier than the company has ever recommended for the area and this test indicates that a compromise early date of the last of February or first part of March is probably advantageous.

The third part of the test indicates there are some advantages to be gained from removing the seed stalk. The yield was affected more than was the sucrose and the 7% increase in pounds of sugar per acre should more than compensate for the effort and expense to remove the seed stalk. It should also be recognized that some additional benefits are generally gained in harvesting and processing the beet crop.

Summary

The comparisons made in these tests would indicate:

1. Non-bolting beets produce more than adjacent bolting beets.
2. Beets planted early enough that 80% of the beets bolted produced less than beets planted later that had no bolters. Both plantings were actually "early".
3. There are benefits to be gained from the removal of the seed stalks.

Literature Cited

- (1) NELSON, R. T. and G. W. DEMING. 1952. Effect of bolters on yield and sucrose content of sugar beets. *Proc. Am. Soc. Sugar Beet Technol.* 7: 441-444.
 - (2) TOLMAN, BION. 1946. Population and distribution studies with sugar beets. *Proc. Am. Soc. Sugar Beet Technol.* 4: 177-184.
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