

Cultural Practices Related to Yields and Germination of Sugar Beet Seed¹

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A major problem in the production of sugar beet seed has been maintaining high germination quality. Much of the early production in the Pacific Northwest had germination tests of 70 to 80 percent. This has been improved in later years so that most of the crop will test above 85 percent and a considerable portion above 90 percent. However, seed from this area that will test better than 95 percent is rare. Lygus bugs and other insects can damage beet seed but control measures as worked out by Hills et al. (1)³ eliminate most of this hazard. A partial answer has been looked for in the fertilizer and cultural program.

Methods of Study

A. Fertilizer Experiment.

Field plots were established in 1951-52 on Chehalis sandy loam soil to study the relation of several fertilizer treatments to germination. Plots were in randomized blocks of split-plot design with 5 replications of the fertilizer treatments each split into three parts for minor element leaf spray treatments.

Fertilizer treatments were as follows:

1. Check—no fertilizer.
2. Nitrogen only to supply 150 pounds per acre of the element, half as ammonium sulfate and half as sodium nitrate.
3. Nitrogen only at double the rates of treatment No. 2.
4. Nitrogen as in treatment No. 3 plus 100 pounds per acre of P_2O_5 at each spring application.
5. Nitrogen and phosphorus as in treatment No. 4 plus 50 pounds per acre of K_2O at each spring application.

The fertilizers were sidedressed in three equal increments, the first in the fall as soon as the beets were large enough to cultivate, the second in early April and the third in early May. The phosphate was supplied from treble superphosphate and the potash from potassium chloride.

When the plants were well leafed out in the spring, spray treatments were superimposed on the fertilizer, as follows: 1. none (check); 2. polybore at 10 pounds per acre; and 3. sodium molybdate at 2 pounds per acre.

B. Top Clipping Experiment.

A common practice among growers of table beet seed has been to clip the tips of the seed stalks when they are about 2 to 2^{1/4} feet high. This is alleged to induce branching and more uniform development and maturity

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³ Numbers in parentheses refer to literature cited.

of seed as well as increase yield. Transplanted table beets have been shown to develop relatively short thick fibrous root systems that do not anchor them well and such pruning may help to keep the beets from tipping out of the ground.



Figure 1.—Root development of transplanted red beets. Note fibrous roots with not much anchor.

There is some question as to whether or not the practice results in any improved seed yield or quality. A small field trial was made in 1950 to test the effect of tip pruning on yield of table beet seed. Four methods of pruning were used. Briefly, the results showed a reduced yield when the seed stalks were clipped back severely at about 12 to 15 inches high. Mild pruning of the tips when the plants were about $2^{1/2}$ feet tall had no effect on seed yield. Germination tests were not made on this seed.

Such top clipping has not been a practice with overwintered sugar beets for seed. Some growers have pastured weedy fields in early spring before seed stalks had made much development but the effects have not been measured.

Plots were set up within a randomized block design to test the effect of cutting back the tips of the seed stalks at two stages of growth on seed production. In one treatment, the stalks were tipped when about 8 inches high, and in the other case when they averaged about $2^{1/2}$ feet high. In each instance, from 2 to 4 inches of the tips were removed.

Experimental Results

A. Fertilizer Experiment.

Seed yield and germination percentage were determined. These are given in Table 1.

The very striking difference in yield between unfertilized and the 150-pound nitrogen rate was to be expected. Some highly significant additional yield was obtained from the double rate of nitrogen but there was no evidence of any benefit from phosphate. In a previous trial on similar soil, phosphate applied in the spring gave a consistent increased yield of about 400 pounds per acre (2). In this trial the potash treatment had a rather striking effect in making the seed stalks much stiffer so that they did not break over as did those with no potash.

Both boron as polybore and molybdenum spray treatments showed a trend toward higher seed yields but the differences were not significant in this trial.

Table 1.—Effects of Fertilizers and Leaf Spray Treatments on Sugar Beet Seed Production.

Fertilizer Treatment	Yields (pounds per acre)			
	Check	Leaf Spray Treatments		Mean
		Polybore	Mb.	
Check	1,299	1,508	1,605	1,471
N ₁	3,235	3,299	3,323	3,286
N ₂	3,582	3,969	3,880	3,810
N ₂ P	3,807	3,711	3,816	3,778
N ₂ PK	3,985	3,969	3,920	3,958
Means	3,182	3,291	3,309	

Difference for significance at 5 percent level Fert. treat. 500 pounds.
Leaf spray treat. 308 pounds.

Fertilizer Treatment	Germination (percent)			
	Check	Polybore	Mb.	Mean
Check	86.6	85.2	84.6	85.5
N ₁	90.4	89.0	87.4	89.1
N ₂	92.0	90.6	92.4	91.7
N ₂ P	93.4	93.4	93.6	93.5
N ₂ PK	93.4	93.2	93.6	93.4
Means	91.2	90.3	90.4	

Difference for significance 5 percent level Fert. treat. 7.68 percent.
Leaf spray treat. N.S.

Nitrogen and phosphorus together produced a highly significant effect on seed quality as measured by germination, and there was some indication of improvement from nitrogen alone but not significant in this trial. There was no improvement in germination of the harvested seed due to the leaf spray treatments.

B. Top Clipping Experiment.

Results of the clipping plots are given in Table 2. The data show clearly that clipping the tips of the sugar beet seed stalks at the later growth stage was injurious to both seed yield and germination. Clipping at an

earlier growth stage showed less positive evidence of a similar but less severe injury. Results of like nature were secured *in* a previous trial in 1944⁴ in which the leaves were mowed off in early spring before the seed stalks were much in evidence.

Table 2.—Effect of Clipping of Seed Stalk Tips on Seed Production.

Treatment	Seed Yield	Germination
	lbs. per acre	percent
None	3,871	93.6
Tipped at 8" height	3,549	86.4
Tipped at 24" height	3,469	82.8
5% level significance	372	4.37

Summary

Field trials were established to test the effect of nitrogen, phosphorus and potassium on seed yield and germination of harvested seed.

Relatively low germination was obtained of seed that was produced without fertilizer other than sulfur and boron.

One hundred and fifty pounds per acre of nitrogen more than doubled the seed yield. Twice this amount of nitrogen produced more than 500 pounds additional increased yield.

When phosphate was added with the heavy nitrogen rate, germination of the seed produced was increased by 8 percent over the check treatment. Strong indications of improved germination were shown by the nitrogen alone treatments.

Spring leaf spray treatments produced no significant effect on either seed yield or quality as measured by germination.

Clipping the seed stalk tips when they were about 2 feet high, such as is commonly done with table beets, was detrimental to both seed yield and germination of the harvested seed.

⁴ Unpublished data Soils Department, Oregon State College.

Literature Cited

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