

Effect of Gibberellic Acid on Germination, Sucrose, and Yield of Sugar Beets

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Gibberellic acid has been tested on sugar beets primarily as a tool to shorten the reproductive cycle by reducing the necessary photo-thermal induction period. In other crops, reports of increased yields have been made yet there is no information available on the effect of gibberellic acid on the yield and sucrose content of the sugar beet crop.

This paper reports the effect of spraying gibberellic acid on sugar beet seed and subsequent effects on germination as well as spraying gibberellic acid on the growing plants and the effect of this treatment on the yield and sucrose content of the sugar beet crop.

Materials and Methods

The source of gibberellic acid used in this test was the potassium salt of gibberellic acid. Immediately prior to planting, three groups of seed of variety MW 161 were sprayed with 9 cc. of gibberellic acid solution, one group 1000 p.p.m., a second 100 p.p.m., and a third 10 p.p.m. This seed, as well as the untreated seed for the check plot, was planted at a one-inch spacing in order that differences in germination might be checked. All plots in which spray applications to plants were to be made were planted at the regular fifteen pound per acre planting rate. Due to limited amounts of gibberellic acid available, plot size was limited to two rows by fifteen feet, with five replications of each treatment. Only one row of each plot was treated and harvested. The second served as a guard row to prevent drift to adjacent plots. Spray treatments were applied with a Hudson hand sprayer. Ten cc. of the proper spray solution was measured into the sprayer and applied to each plant individually. Spray applications were made at concentrations of 10, 100, and 500 p.p.m. Rate of application was about 60 gallons per acre. Dates of application were July 1, August 1, and September 1. Also, two combination treatments of (1) August 1, September 1, and (2) July 1, August 1, September 1 were made. The plots were harvested in the usual manner and all beets in each plot were harvested for yield and sucrose analysis.

¹ Plant Breeder, Holly Sugar Corporation, Sheridan, Wyoming.

Experimental Results

Seed Spray Results

Stand counts and vigor ratings made at time of emergence showed no differences between the check and the three seed spray treatments of 10, 100 and 1000 p.p.m. gibberellic acid.

Plant Spray Results

The yield data for the plant spray treatments described above are presented in Table 1.

Table 1.—Yield Data for Plant Spray Treatments Using Gibberellic Acid at Sheridan, Wyoming, in 1957.

Application ¹		Yield		Percent Sucrose ²
Date	Conc. p.p.m.	S/A	T/A	
Check		5013	16.512	15.13
7/1	10	4903	15.959	15.36
	100	4908	16.157	15.15
8/1	10	4880	16.117	15.14
	100	4950	16.315	15.17
9/1	10	4658	15.444	15.08
	100	4982	17.820	13.98
	500	4920	18.414	13.36
8/1, 9/1	10	4968	16.751	14.83
	100	4645	16.196	14.34
7/1, 8/1, 9/1	10	4514	15.088	14.96
	100	4781	16.751	14.27
LSD (5%)		NS	NS	.76

¹ Rate of application was about 60 gal. per acre.

² Underlined values differ significantly from the check.

Because of the small plot size and few replications, experimental error was high. Significant differences were obtained for percent sucrose only.

Applications of gibberellic acid applied July 1 and August 1 had no significant effect on sucrose or yield of sugar beets at harvest time. Applications of gibberellic acid applied September 1 reduced percent sucrose significantly in concentrations of 100 and 500 p.p.m. Although the tonnage figures do not differ significantly, there are indications that the reduction in percent suc-

rose was accompanied by an increase in tonnage as shown by the figure of 18.414 tons per acre for the 500 p.p.m. application made on September 1.

Sugar per acre for all treatments did not differ significantly from the check.

Summary

1. Spray applications of gibberellic acid were made on sugar beet seed and sugar beet plants. Applications were made to seed in three concentrations prior to planting. Applications were made to plants in three concentrations at three dates and two combinations of dates.

2. Spray application of gibberellic acid did not affect percent or vigor of germination of sugar beet seed.

3. Spray application of gibberellic acid in concentrations of 100 and 500 p.p.m. on growing plants reduced sucrose and tended to show an increase in tons per acre without changing yield of sugar per acre.
