Forms of Nitrogen as Related to Sugar Beet Seed Production in Oregon[1]

R. A. PENDLETON[2]

Introduction

In recent years there have been local shortages of some forms of nitrogen fertilizers. Consequently, users have frequently been required to make some adjustments in their fertilizer programs to fit the market situa-tion. This has been of particular concern to growers of sugar beet seed, who normally use 300 to 400 pounds of nitrogen per acre for their crop.

It seemed desirable to test some of the more common commercial nitro-gen fertilizers as to their efficiency in production of sugar beet seed under specific conditions. Although results obtained on one type of soil are not necessarily applicable to all types, they may give good indications of results to be expected elsewhere.

Methods of Study

Field plots were established on Chehalis sandy loam soil to study the effects of several forms of nitrogen on yield and germination of beet seed. Sugar beets grown on this soil have a high nitrogen requirement and rela-tively low phosphorus and potash requirement. Sulfur and boron are known to be limiting (1, 2, 3)[3].

In 1950-51 field plots were arranged in a randomized block design with 7 fertilizer treatments and 6 replications. Fertilizers used were: 1. Ammonium sulfate; 2. ammonium sulfate and sodium nitrate; 3. ammonium sulfate and calcium nitrate; 4. ammonium sulfate and ammonium nitrate; 5. ammonium sulfate and urea; 6. ammonium sulfate and lime; and 7. ammonium phos-phate (16-20-0) .

A total of 300 pounds per acre of nitrogen was applied to all plots in three equal increments: the first in the fall, the second in early April, and the third in early May. Where two sources of nitrogen were used, an equal amount was supplied from each source. Lime was applied for treat-ment No. 6 at 10 tons per acre of high grade ground limestone at planting time.

The fertilizers were all side dressed at about 4 to 6 inches to one side of the row and 4 to 5 inches deep. Previous to planting in early August a uniform application was made of 25 pounds of borax and 125 pounds of gypsum per acre.

It had been previously demonstrated that gypsum as the only source of sulfur will not prevent sugar beets on this soil from showing sulfur deficiency symptoms when fertilized heavily with nitrogen[1]. Therefore, fertilizer mixtures were used in which at least half the material supplied sulfur in sulfate form. The gypsum treatment supplied adequate sulfur until the first application of fertilizer was made.

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[2] Agronomist, Field Crops Research Branch, Agricultural Research Service, U. S. Depart-ment of Agriculture.

[3] Numbers in parentheses refer to literature cited.

[4] Unpublished data, Soils Department, Oregon State College.

Experimental Results

Seed yields and germination percentage of the harvested seed were determined. These data are given in Table 1.

Table 1.—Sugar Beet Seed Yield and Germination Resulting from Fertilizer Treatments.

Treatment	Seed yield	Germination
	pounds per acre	percent
1. Ammonium sulfate	3,535	92.0
2. Ammonium sulfate and sodium nitrate	3,771	94.0
3. Ammonium sulfate and calcium nitrate	3,654	96.0
4. Ammonium sulfate and ammonium nitrate	3,700	97.7
5. Ammonium sulfate and urea	3,606	94.7
6. Ammonium sulfate and lime	3,674	95.3
7. Ammonium phosphate (16-20-0)	3,716	96.5
Difference for significance at 5 percent level	120	2.29

It is apparent that ammonium sulfate alone is not the best fertilizer for sugar beets on this soil. All other treatments except No. 5 produced significantly higher seed yields than ammonium sulfate alone. The mixture with sodium nitrate gave the highest yield but in this trial did not produce a significant improvement in germination.

In this crop there was plenty of time between the last fertilizer appli-cation and harvest for all forms of nitrogen to become available. Conse-quently, the urea or ammonium was not at any disadvantage in this respect. In commercial fields it is common practice to apply some additional nitrogen later in the season with the irrigation. This has not been tried in replicated plots but observations indicate that it is a desirable practice. In all small non-replicated tests, late nitrogen applications, particularly with nitrate-N, have produced seed with indications of improved viability.

Summary

Several sources of nitrogen were tested in field plots for their efficiency in sugar beet seed production. Both yield and germination percentage of the harvested seed were determined.

All treatments included a portion of the nitrogen from a source which supplied sulfur.

The poorest yield and lowest quality seed were produced in plots fertilized solely with ammonium sulfate.

The fertilization conducive to the highest yield of seed did not produce seed with the highest viability.

Literature Cited

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