UNIVERSITY of IDAHO

COLLEGE OF AGRICULTURE

Fertilizers for Sweet Corn

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IDAHO Agricultural Experiment Station

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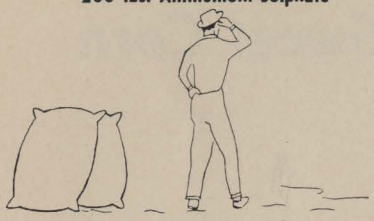
NITROGEN and increased Sweet Corn yields

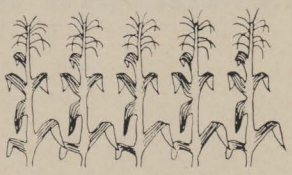
No Nitrogen

6.3 tons per acre

200 lbs. Ammonium Sulphate

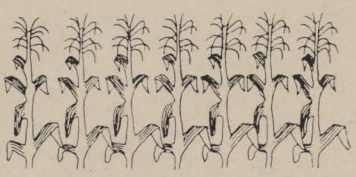


6.3 tons per acre

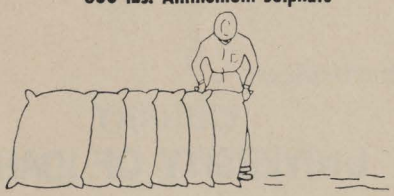


400 lbs. Ammonium Sulphate

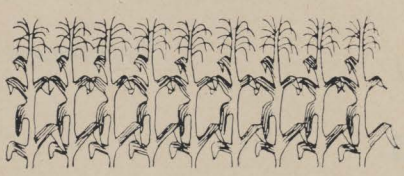
7.9 tons per acre



600 lbs. Ammonium Sulphate



8.7 tons per acre



Sweet Corn Fertilizers

THERE is no magic in an application of fertilizer—*unless the absence of one of its constituents in the soil actually limits growth.*

Yet there is a strong tendency on the part of growers to use fertilizer more or less as a crop insurance, with the idea that an application will do no harm, and that it might even do some good. Sometimes complete fertilizers— those containing nitrogen, phosphorus and potassium — are used when only one or two elements are needed.

Such a program is likely to be wasteful. You may get no response at all You may get a response from a single element.

In general, as will be shown in the following pages, sweet corn in the Boise Valley, at least, does not respond to fertilizers on land previously in alfalfa, or on some of the more fertile, heavy soils. Obviously, you will get your maximum crop from these soils without the use of fertilizer.

Except in very special cases, where cropping history indicates a need for phosphorus or potash, applications are a waste of money and time. So our recommendation for phosphorus and potash for sweet corn is: *you probably don't need either.* This is borne out by the experiments reported here.

The chances are good that you will get response from nitrogen on light, sandy soils, or on other soils which have been heavily cropped and have no legume history. Such a response is shown diagrammatically on the opposite page. Forty pounds of nitrogen (or 200 pounds of ammonium sulphate) per acre won't do much good. From 300 to 600 pounds per acre will give good results, but more than that is probably wasteful. The 300 to 600 pounds may cost you $15 to $25 but you will more than get your money back from the increased tonnage of ears. Whether you feed your fodder or plow it under, you'll gain in increased tonnage. *It doesn't matter much how you put it on—broadcast, bands, or anhydrous—you will get about the same response per unit of nitrogen.*

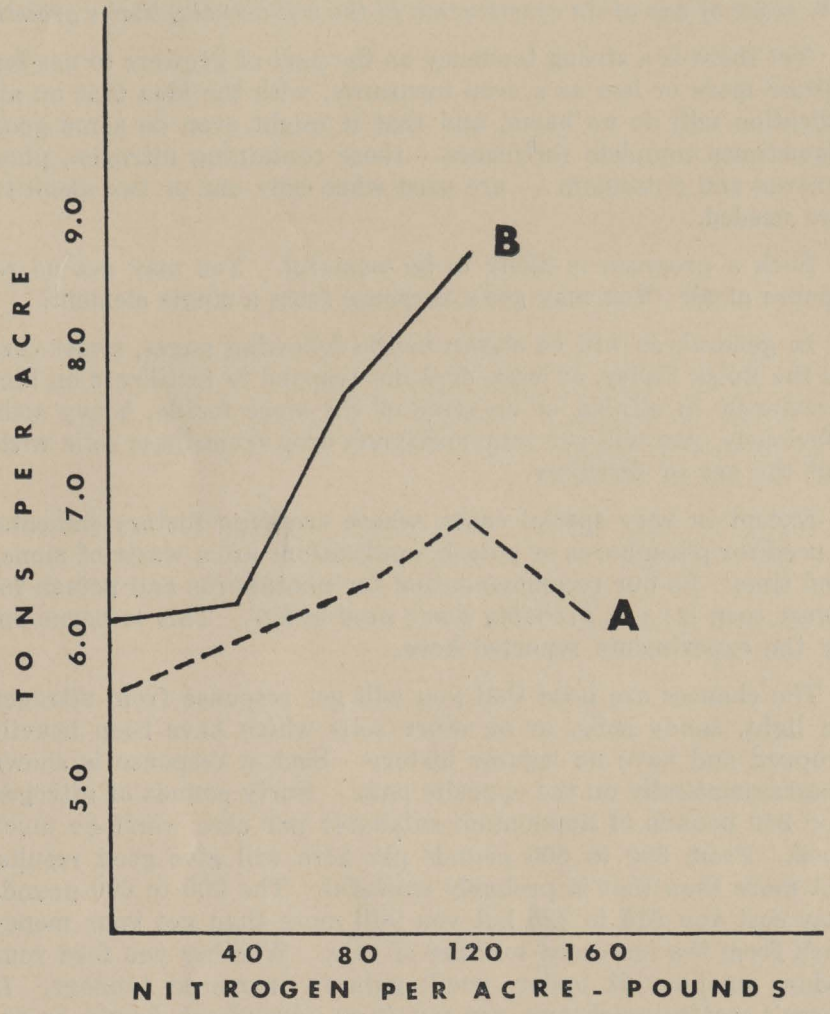


Figure 1.—Yields of unhusked corn on: A—Abbott farm 1951, and B—Pitman farm 1953.

Fertilizers For Sweet Corn

E. T. BULLARD and GEORGE W. WOODBURY*

EXPERIMENTS were started in 1950 by the University of Idaho Agricultural Experiment Station to determine the amounts of fertilizer necessary for the production of high yields of corn on various types of soil. These trials were conducted in the vicinity of Parma on fields of sweet corn actually grown for processing.

Fertilizer experiments were conducted on Golden Cross Bantam on five separate farms during the years 1950 through 1953. The history and soil types of these farms are listed in table 1. In 1950, nine different treatments of fertilizers were applied as indicated in table 2. The fertilizer was broadcast and disked before planting. Ammonium nitrate was used as the source of nitrogen and single-superphosphate as the source of phosphate. Each plot consisted of 4 rows planted 3 feet apart. Each treatment was replicated five times.

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*Associate Horticulturist (formerly) and Horticulturist, respectively, Idaho Agricultural Experiment Station. Gratitude is expressed to C. A. Simpkins, formerly Assistant Agronomist, Idaho Agricultural Experiment Station, for his help in planning the experiments and doing part of the field work during the early stages of these studies.

Table 1.—Location and soil types of farms used for fertilizer experiments

Cooperator	Location	Year	Soil type	pH	Available phosphate pounds per-acre CO_2 method	Percent total nitrogen in soil	Previous crop
A. N. Stanfield	Wilder	1950	Silty clay loam	7.8	19	.40	mixed grain
Marvin Abbott	Roswell	1951	Greenleaf silt loam	8.0 - 8.6	19-27	.12	sugar beets
Glenn Allender	Roswell	1952	Greenleaf silt loam	7.6 - 7.7	22-37	.09-.11	alfalfa
Lewis Farm	Parma	1953	Greenleaf silt loam	6.6 - 7.3	10	.25	alfalfa
C. V. Pitman	Apple Valley	1953	Reece sand	7.1 - 8.2	66	.12	sweet corn

The plot arrangements in 1951, 1952, and 1953 were similar to the ones described for 1950. The fertilizer was broadcast and banded in 1951. The broadcasting was done just prior to planting and this fertilizer was disked into the soil. The band treatment was applied at seeding time 3 inches below and 4 inches to the side of the corn seed. Ammonium nitrate was used as the source of nitrogen and treble-superphosphate as the source of phosphorus. The two middle rows of each plot were harvested for yield records. Data were recorded on unhusked ear weight. Yields of cut corn were obtained by using the cutting percentage which is the percentage of actual cut corn coming from ears as they are harvested and brought from the field.

The fertilizer applications are listed in this publication as pounds per acre of actual nitrogen, phosphoric acid or potash. Four pounds of actual nitrogen per acre would be equivalent to about 1⅓ 100-pound bags of ammonium nitrate or two 100-pound bags of ammonium sulphate since ammonium nitrate contains 33 percent nitrogen and ammonium sulphate approximately 20 percent nitrogen. Since treble-superphosphate contains approximately 4 percent actual available phosphate, two 100-pound bags would yield 80 pounds of actual phosphate per acre. Forty pounds of actual potash per acre would be equivalent to 67 pounds of muriate of potash since muriate of potash contains approximately 60 percent of actual available potash.

In 1952, fertilizer was not banded, due to the fact that the alfalfa roots interfered with the banding application. The harvest methods were similar to those described for 1951. Ammonium sulphate was used as the source of nitrogen and treble-superphosphate as the phosphate source.

One subplot treatment on the Lewis farm in 1953 consisted of broadcasting the fertilizer before planting and disking, while the other subplot received anhydrous ammonia at a depth of 8 inches. Ammonium sulphate was used as the source of nitrogen and single-superphosphate as the source of phosphate for the broadcast fertilizer.

All of the fertilizer was banded at planting time on one of the subplots of the Pitman farm in 1953; the other subplot received one-half of the nitrogen by banding at planting time and the other

half by sidedressing at the time of the last cultivation. Ammonium sulphate was used as the nitrogen source and single-superphosphate as the source of phosphate. Tissue samples were collected from each plot and analyzed by the Department of Agricultural Chemistry of the University of Idaho. The moisture percentages of the corn were determined on a Steinlite moisture tester to determine the effect of fertilizers on maturity.

Table 2.—Fertilizer trial conducted on A. N. Stanfield farm at Greenleaf, Idaho, 1950.

Fertilizer treatment[1]	Unhusked corn yield tons per acre
0—0 —0	5.5
40—0 —0	5.7
80—0 —0	7.0
0—80—0	4.7
40—80—0	4.6
80—80—0	5.7
0—80—40	5.5
40—80—40	6.4
80—80—40	6.2

[1] The first number designates the number of actual pounds of nitrogen per acre, the second number the actual pounds of available phosphoric acid per acre and the third number the actual pounds of available potash per acre.

Results

Table 2 indicates that none of the fertilizer treatments produced a significant[1] increase in yield in 1950. In 1951, following sugar beets, 80 pounds of nitrogen per acre produced a higher yield of unhusked ears per acre than the unfertilized plots. There was no significant further increase in yield when more than 80 pounds of actual nitrogen was applied. The use of phosphate did not increase the yield. No significant yield differences were obtained between the banding and broadcasting methods of application. The

[1]Differences as great as those shown in the table would occur more than once out of 20 times if no fertilizer had been used and are, therefore, not great enough to serve as a basis for recommendations, or, in other words, are not "significant" as the term is used in this paper. This is the general usage of "significant" in this paper.

fertilizer treatments did not produce any significant increase in whole-kernel cut corn.

The different fertilizer applications produced no significant response in yield in 1952. The fact that alfalfa was on the soil for 5 years before the corn was planted likely accounts for these results. The fourth cutting of alfalfa was plowed under in the fall before the corn was planted in the spring of 1952.

Results similar to those obtained in 1952 were obtained in 1953 on the Lewis farm which previously had been in alfalfa. The different fertilizer applications produced no significant increases in yield. The field had been in alfalfa the 3 years previous and the fourth cutting of alfalfa was plowed under in the fall before the corn was planted in the spring of 1953. There was no significant difference between the broadcast method and the anhydrous ammonia application. The different rates of nitrogen apparently

Table 3.—Fertilizer trial conducted on C. V. Pitman farm at Apple Valley, Idaho, in 1953.

Fertilizer treatment[1]	Unhusked ears - tons acre			Cut corn - tons acre		
	Not side-dressed	Side-dressed	Treat-ment av.	Not side-dressed	Side-dressed	Treat-ment av.
0 - 0	5.8	6.8	6.3	2.1	2.3	2.2
40 - 0	6.4	6.3	6.4	2.2	2.1	2.1
80 - 0	7.6	8.2	7.9	2.6	2.8	2.7
120 - 0	8.5	8.9	8.7	2.9	3.0	2.9
0 - 80	5.1	5.4	5.3	1.8	1.8	1.8
40 - 80	6.6	6.9	6.8	2.2	2.2	2.2
80 - 80	7.5	7.3	7.4	2.5	2.5	2.5
120 - 80	7.7	8.3	8.0	2.7	2.9	2.8
Application average[2]	6.9	7.3		2.4	2.5	
L.S.D. 5%*			1.6			.6
L.S.D. 1%			2.1			.8

[1] The first number designated the number of actual pounds of nitrogen (n) per acre and the second the actual pounds of available phosphate (psph) per acre.
[2] No significant difference between application methods.
*This "least significant difference" merely means that differences as great or greater than 1.6 tons are due to treatment 19 out of 20 times, and differences as great or greater than 2.1 tons are due to treatment 9 times out of 11. The same thing is true for the cut corn figures.

had no effect on the moisture content of the corn. Processors use moisture content as a measure of maturity and generally prefer corn of 68 to 72 percent for processing. Corn with a lower moisture percentage is considered overmature. Fertilizer treatments did not have any effect on ear size.

The 1953 results obtained on the Pitman farm are recorded in table 3 and figure 1. The application of 120 pounds of actual nitrogen produced an increase in yield of unhusked ears, husked ears and cut corn significantly higher than the plots that were not fertilized. The high response from nitrogen on this farm may be due to the fact that the soil is very sandy. Forty pounds per acre of nitrogen did not give an increase in yield over no application but 80 pounds per acre did produce a significantly higher yield. Table 4 shows that an application of 120 pounds of actual nitrogen

Table 4.—The value of nitrogen on the fertilizer trials on Pitman farm in Apple Valley, Idaho, in 1953.

Fertilizer treatment[1]	Cost of nitrogen[2]	Estimated cost of application	Unhusked corn tons per acre	Received per acre $25.50 per ton[3]	Price per acre less cost of nitrogen & application
0 - 0	$ 0.00	$0.00	6.3	$160.65	$160.65
40 - 0	6.00	1.00	6.4	163.20	156.20
80 - 0	12.00	1.00	7.9	201.45	188.45
120 - 0	18.00	1.00	8.7	221.85	202.85

[1] The first number designated the number of actual pounds of nitrogen per acre and the second the actual pounds of available phosphate per acre.

[2] Based on the average 1953 price of $.15 per pound of actual nitrogen.

[3] Based on the average 1953 price of cannery corn.

produced economical returns on this farm in 1953. The phosphorus applications did not increase the yield. No significant increase in yield was produced by applying one-half of the fertilizer in bands and the other half as a sidedress application. Larger ears were obtained from the plots that received 120 pounds of actual nitrogen than from the plots that received no nitrogen. The moisture per-

centage results showed that the fertilizer application did not significantly affect the maturity of the corn.

Table 5 shows the combined analysis of all the fertilizer trials conducted during these 4 years.

Table 5.—Fertilizer trials for 1950, 1951, 1952, and 1953.

Fertilizer treatment[1]	Yield unhusked ears—tons per acre					
	1950	1951	1952	1953	1953	Average of trials
0 - 0	5.5	5.7	5.8	6.4	6.3	5.9
40 - 0	5.7			6.5	6.4	6.2
80 - 0	7.0	6.5	6.2	6.9	7.9	6.9
120 - 0		6.8	6.5	7.4	8.7	7.4
160 - 0		6.4	6.2			6.3
0 - 80	4.7	5.6	6.2	6.5	5.3	5.7
40 - 80	4.6			6.5	6.8	6.0
80 - 80	5.7	6.6	6.0	7.3	7.4	6.6
120 - 80		6.5	6.4	7.3	8.0	7.1
160 - 80		6.5	6.3			6.4
L.S.D. 5%	N.S.	.7	N.S.	N.S.	1.6	1.0
L.S.D. 1%		.9			2.1	1.4

[1] The first number designated the number of actual pounds of nitrogen per acre and the second the actual pounds of available phosphate per acre.

Summary

1. Herein are reported fertilizer trials on Golden Cross Bantam sweet corn, grown in the Boise Valley, over a period of 4 years.

2. Ammonium sulphate, ammonium nitrate and anhydrous ammonia were the sources of nitrogen used, while single and treble-superphosphate furnished the phosphoric acid, and potash was provided in the muriate form.

3. Fertilizers were applied broadcast, sidedressed, and in the case of anhydrous ammonia, by applicator.

4. Soils ranged in texture from sand to silty clay loams and tests were made on sweet corn following mixed grain, sugar beets, alfalfa, and sweet corn.

5. When corn followed sugar beets, 80 pounds of actual nitrogen per acre gave an increase in yield on a silty clay loam, while 120 pounds of nitrogen increased yield on a sandy soil when corn followed corn.

6. There was no significant response in yield to applications of nitrogen where sweet corn followed alfalfa.

7. Where sweet corn followed mixed grain on heavy soil, there was some indication that nitrogen was beneficial, although differences were not statistically significant.

8. Method of application and source of nitrogen had no effect upon yield.

9. Phosphorus and potash, used separately or in combination with nitrogen, gave no yield response.

Other University of Idaho Publications on Vegetables

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Vegetable varieties for Idaho gardens. Extension Circular 102.

You can grow tomatoes. Extension Circular 116.

Your vegetable garden. Extension Circular 124.

Imperida: A new bunching carrot. Station Circular 116.

Fiesta, a new hybrid onion for use where Sweet Spanish strains are adapted. Bulletin 211.

Bonanza, a new hybrid onion for long storage. Bulletin 212.

Copies may be obtained from the University of Idaho College of Agriculture, Moscow; from the University Agricultural Extension Service, State House, Boise; or from county agricultural agents.