Commercial Fertilizers Speed Growth Of Corn and Advance Its Maturity

By Armand Bauer[1], E. B. Norum[2], J. C. Zubriski[3] and Earl Skogley[4]

During the 1954 and 1955 seasons, 12 trials were conducted on a variety of soils in southeastern North Dakota, testing response of Nodak Hybrid 301 corn to commercial fertilizers. Nodak Hybrid 301 has a relative maturity of 83 days. The corn was checked in hills.

Nitrogen, phosphorus, and potassium fertilizer treatments were applied in the hill by planter attachment and by broadcasting before plowing or seedbed preparation. One treatment included side dressing with nitrogen.

Hill treatments consisted of two rates of phosphorus (20 and 40 pounds of P_2O_5 per acre) as the only treatments, as well as in combination with nitrogen at two rates (10 and 20 pounds of N per acre), with potash (10 pounds K_2O per acre) and in combination with nitrogen (10 pounds per acre) and potash (10 and 20 pounds of K_2O per acre).

A combination of hill and broadcast applications was used for several treatments. The hill treatment (10 pounds N + 40 pounds of P_2O_5) was uniform. The broadcast treatment varied, with 40 pounds of P_2O_5 being applied alone, in combination with 40 pounds of N, in combination with 40 pounds of K_2O, and with both 40 pounds of N and 40 pounds of K_2O. The last named combination was also tested without any hill treatment. In some tests, 40 and 50 pounds of N was sidedressed on corn adequately supplied with phosphorus and potash.

The most consistent reactions to fertilizer were faster early growth, earlier tasseling and silking, and advanced maturity of both vegetative and grain parts. Even though response to treatment was expressed in various ways, there were several cases where there was no accompanying increase in yield. Corn is more sensitive to soil moisture conditions at tasseling through silking stage than at any other stage of growth. Drought during this stage of growth is a highly important factor determining yield. Drought at silking time is thought to be responsible for failure to obtain yield increases in several instances where substantial response was expressed in other growth characteristics. In other cases no yield increase resulted because of inadequate fertility in the later stages of growth.

The maximum increase in yield from fertilizer applied as a hill treatment was about 10 bushels per acre. Increases of this magnitude were observed in trials where moisture was fairly good throughout the growing season. Phosphorus alone was responsible for the yield increase. Neither nitrogen nor potassium applied in

[1]Assistant Soil Scientist.
[2]Soils Scientist.
[3]Assistant Soil Scientist.
[4]Graduate Assistant.

the hill increased yield. The more rapid early growth occasioned by inclusion of 10 pounds of nitrogen per acre in addition to phosphorus may be worth while, however, if it facilitates cultivation.

In both seasons, corn on all plots became fully mature before frost. Hill fertilized plots matured about a week earlier than those not hill fertilized. Yields were as high on plots receiving only the broadcast treatment as on those receiving the combination hill and broadcast treatment, but the hill treated plots matured earlier, which might be a very significant factor in years of early frost. In instances where soil moisture was fairly good throughout the growing season, combination hill and broadcast treatment increased yield by as much as 24 bushels per acre. No significant increase in yield was found to result from either sidedressing corn with nitrogen or from the use of potash fertilizer.

In some cases stand reduction has resulted from hill application of 20 pounds of N or 10 pounds N + 20 pounds K_2O. These treatments did not reduce the stand where soil moisture was near field capacity at or within a short time after planting. When fertilizer is applied as bands along drilled corn, more nitrogen fertilizer may be added per acre before any reduction in stand will occur. Rates of 40 pounds of nitrogen per acre have not reduced stands at Fargo when banded along the drill row.[5]

In many studies of the response of corn to commercial fertilizer it has been found that the outcome varied considerably with varying stands and moisture conditions. In both 1954 and 1955, the yield from four-stalk hills was compared to the yield from three-stalk hills, the increase from the higher population ranging from two to 20 bushels per acre. Three-stalk hills outyielded four-stalk hills only when moisture conditions were adverse, with the maximum difference in yield being five bushels per acre. Ear size characteristically decreases as plant population is increased. It is likely that some of the smaller ears, occurring most frequently with four-stalk hills, will not be saved in picking. This, however, is of little or no consequence where livestock is allowed to range in the cornfield after picking.

It may be expected that the results obtained in these trials, especially the results from different stands, will apply somewhat differently where corn of relative maturity other than that of Nodak Hybrid 301 is used.

Further research is necessary to establish securely what these effects will be, but it appears likely that with relatively short season corn, the optimum stand will be somewhat thicker than for longer season corn. It would seem that North Dakota farmers who produce corn for grain will realize their greatest profits by growing a hybrid recommended for the area, planted at a rate to give a stand of 12,500 to 14,000 plants per acre, with phosphate or nitrogen-phosphate fertilizer applied either in the hill alone or as a combination hill and broadcast treatment, depending on the general fertility level of the soil.

[5]Personal communication from Dr. Ralph A. Young, Associate Soil Scientist.