Starter Fertilizers for Corn – Are they Necessary?
Michigan State University
Cooperative Extension Service
Michigan Energy Conservation Program for Agriculture and Forestry
M.L.Vitosh and B.P. Darling, Crop and Soil Sciences Department
November 1990
4 pages

MECP

Michigan Energy Conservation Program for Agriculture and Forestry

Extension Bulletin E-2289 November 1990

STARTER FERTILIZERS FOR CORN - ARE THEY NECESSARY?

M. L. Vitosh and B. P. Darling
Crop and Soil Sciences Department
Michigan State University

The term, "starter fertilizer," usually refers to the placement of fertilizer near the seed at planting time. This method of application is commonly referred to as band placement. Starter fertilizers are usually composed of two or more primary nutrients and possibly several micronutrients. Combinations of nitrogen and phosphorus normally constitute a good starter fertilizer. Liquid 10-34-0 or dry 18-46-0 are the two most popular nutrient starters. Potassium is often included in the starter, but its importance is usually secondary. Potassium applications are needed only on low or very low testing soils.

The primary objective of a starter fertilizer is

MECP is a cooperative effort of the
Michigan Department of Agriculture - Michigan Soil Conservation Districts - USDA Soil Conservation Service
Michigan State University's Agricultural Experiment Station and Cooperative Extension Service

to stimulate rapid plant growth early in the season. Most of the early growth response can be attributed to the phosphorus in the starter. Banded nitrogen can also improve early plant growth.

Nitrogen responses are most noticeable on sandy soils after excessive spring rains, or under no-till conditions where mineralization of organic nitrogen is slowed by cool soil temperatures.

Phosphorus responses are most common on low testing soils, but the response can also be seen on medium or high phosphorus testing sites. The response is particularly noticeable in cold, wet springs, but the stimulation of early plant growth does not always result in a grain yield increase. This has been well documented throughout the corn belt, where early growth differences did not effect a yield increase. There are many factors other than early plant growth that are responsible for final crop yield.

Reasons for Using Starter Fertilizers

If starter fertilizers do not increase crop yields, why use them? There must be some reason other than economics why growers use starter fertilizers. Many farmers have been using starter fertilizers for years and have never considered planting without them. After all, band placement of fertilizer is the most efficient method of application. When micronutrients are needed, there is no better way to apply them than in a band near the seed at planting time. Band placement of phosphorus and micronutrients minimizes the fixation of these nutrients in soils. The addition of some nitrogen in the band also improves the uptake of other nutrients. Starter fertilizers in many instances are used to ensure against any unforeseen or unknown factors.

In addition, there are several indirect advan-

Table 1

Phosphorus starter fertilizer demonstrations conducted from 1987 to 1989 on corn in 6 Michigan counties.

County	Year	---- Soil Test ---- pH	Bray P1	Exch K	--Yield bu/A[1]-- W/O P_2O_5	W/ P_2O_5
Cass	1989	6.3	423	216	168	175
Eaton	1988	6.5	112	176	66	64
Ionia	1989	6.7	132	202	164	161
Kent	1987	6.6	76	200	150	149
	1988	6.6	59	202	108[a]	105[b]
	1989	6.6	108	880	167	174
Montcalm	1988	6.0	154	204	112	113
Ottawa	1989	6.5	822	343	152	156
Averages:		6.5	236	303	136	137
		Average Grain Moisture:			26.1%	25.4%

1 Any two means followed by different letters are significantly different statistically (p=.05).

tages to starter fertilizers and the rapid growth that they promote. (1) They can aid in weed control, especially when the crop is to be cultivated. Rapid plant growth allows the farmer to cultivate early in the growing season when weeds are small and easier to control. Rapid plant growth also shades the soil which helps reduce weed competition. (2) Starter fertilizer can alter the time of tasseling and pollination by a few days. This can be an advantage or a disadvantage depending on the weather at the time of pollination. Usually early pollination is an advantage because moisture is generally more plentiful early in the season. (3) Rapid plant growth can result in drier grain at harvest, but the decrease is usually small and inconsistent. Grain moisture at harvest is also influenced by many factors other than starter fertilizer.

When are Starter Fertilizers No Longer Necessary?

How high is high? At what point do farmers no longer get an economical return from the starter fertilizer and when should they stop using them? What are the environmental costs of continuing to use phosphorus fertilizers on high testing soils?

These are questions many farmers are now asking. More than 50 percent of Michigan's corn and soybean farmers have soils with high or very high phosphorus tests. The median for all samples coming to the MSU soil testing laboratory is more than 100 lbs of Bray P1 per acre. MSU does not recommend additional phosphorus for corn and soybean production on these fields. These recommendations are based on soil test calibration data collected

Table 2

Complete starter fertilizer demonstrations conducted from 1988 to 1989 on corn in 7 Michigan counties.

		---- Soil Test ----			--Yield bu/A[1] --	
County	Year	pH	Bray P1	Exch K	W/O P_2O_5	W/ P_2O_5
Branch	1989	6.2	275	219	131	133
Calhoun	1989	6.6	263	400	137	139
	1989	6.2	300	286	155	153
Ingham	1988	7.0	92	208	83	79
Kalamazoo	1988	6.4	76	368	97[a]	92[b]
	1988	6.6	110	248	124	125
	1989	6.4	109	194	158[b]	171[a]
Kent	1989	6.6	108	880	165	174
Mason	1989	6.3	240	244	89	95
Shiawassee	1988	6.5	228	308	83[a]	76[b]
Averages:		6.5	180	336	122	124
Average Grain Moisture:					26.4%	25.7%

1) Any two means followed by different letters are significantly different statistically (p=.05).

from numerous experiments and years of experience.

Tables 1 and 2 contain data from 18 on-farm fertilizer demonstrations conducted from 1987 to 1989. Only one site, Kalamazoo 1989, responded positively to starter fertilizers. The Kent County sites in 1987 and 1988 were the only demonstrations where MSU recommended a P fertilizer. Phosphorus fertilizer is not recommended when we are confident that yields will not be increased, but this does not mean that adding phosphorus as a starter fertilizer will not improve early plant growth. We believe these recommendations to be sound agronomically, economically and environmentally.

Environmental Impacts

The environmental issue of nonpoint source phosphorus loading in Michigan lakes and streams and the poor economic climate of today's farm industry has made the continued use of phosphorus fertilizer on high testing soils a questionable practice. Phosphorus is the most limiting nutrient for aquatic weed growth; an excessive amount of phosphorus in water can cause severe degradation of a lake. The elimination of phosphorus fertilizer is not the total answer to reducing phosphorus contamination of lakes and streams. Because most of the phosphorus in water is tied to soil sediment, We must also control soil erosion to have a significant impact on reducing nonpoint source phosphorus pollution. A smaller fraction of the phosphorus in our lakes and streams is soluble phosphorus. This phosphorus is lost from fields through tile drainage and water runoff during periods of high rainfall or rapid snow melt.

Summary

The key to sound agronomic, economic and environmental fertilizer management is soil testing, proper fertilizer placement, and wise use of fertilizer. When the soil test calls for phosphorus and/or micronutrients, starter fertilizers should be used because banding is the most efficient method of applying these nutrients. When phosphorus soil tests are very high and micronutrients are not needed, there is good justification for eliminating starter fertilizers on corn. When micronutrients are needed but no phosphorus is necessary, the choice of a good starter fertilizer to act as a carrier for the micronutrients becomes limited.

Michigan farmers will reduce both sediment and soluble phosphorus contamination in our surface waters by eliminating or reducing phosphorus fertilizer applications on high phosphorus testing fields. The changes brought about by this phosphorus reduction strategy will be slow, but practices to improve water quality are important for the future. Farmers will need to increase their adoption of better soil and water conservation practices to have the greatest impact on reducing nonpoint source phosphorus in our lakes and streams.

"This bulletin was prepared with the support of the U.S. Department of Energy, Grant No. DE-FG0276CS60204. However, any opinions, findings, conclusions or recommendations expressed herein are those of the author(s) and do not necessarily reflect the views of DOE"

0-19048

New-11:90-3M-TCM-UP. Price 20 cents, single copy free to Michigan residents.
File 32.41 (corn)