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G77-361 Using Starter Fertilizers for Corn, Grain Sorghum, and Soybeans

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Using Starter Fertilizers for Corn, Grain Sorghum, and Soybeans

Starter fertilizer may increase early growth of corn and grain sorghum. Grain yield increases from starter nutrients are most likely on low phosphorus soils and some sandy soils.

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Proper use of a starter fertilizer is an important management tool for crop producers striving for top yields. While the use of a starter fertilizer can be important for crop production on many soils, it is more important for corn production on irrigated sandy soils than on fine textured soils.

What Is a Starter Fertilizer?

Starter fertilizer is defined as *"the placement of small quantities of nutrients in a concentrated zone in close proximity to the point of seed placement at the time of planting."* This placement can be directly below the seed, to the side of the seed, or to the side and below the seed.

The primary reason for using a starter fertilizer is to stimulate rapid early growth of seedlings.

Fertilizer also may be placed in a band near the row to correct a soil nutrient deficiency. The placement area is commonly termed "fertilizer band." Band application of fertilizer is an effective way to correct nutrient deficiencies and results in early growth response as well.

Positioning starter fertilizer in contact with the seed, commonly called "pop-up," is an option, but requires a great amount of care to prevent possible germination injury. Metering equipment must function perfectly to deliver uniform quantity down the row. The amount that can be applied safely is limited, and depends on the fertilizer used and soil properties. Starter fertilizer containing ammonium thiosulfate (12-0-0-26S) should not be placed with the seed.

Broadcast application of N-P-K fertilizer, although called "starter" by some producers, is not considered a starter. Applying fertilizer materials in a band on the soil surface also is not considered a starter even though some growth response to the nitrogen or sulfur in the fertilizer may occur. The reason broadcast and surface bands are not called "starter" is because the nutrient placement is positionally unavailable to early seedling development and growth. To be a "starter," nutrients must be strategically placed.

A starter fertilizer usually is composed of two or more nutrients. Under Nebraska conditions, a combination of nitrogen and phosphorus constitutes an effective starter material. Liquid 10-34-0 and dry 18-46-0 are popular starter fertilizer materials. Liquid 7-21-7 and dry 8-32-16 also commonly are used; however, potassium is not an essential starter nutrient on most Nebraska soils.

There are many other fertilizer grades that may be used as starters. The addition of zinc and/or sulfur may be desirable under some soil conditions. Zinc should be included when the zinc level in the soil is marginally adequate. Sulfur should be added for sandy soils low in organic matter.

Nitrogen alone may give an early growth response where soil nitrogen is low at the time of planting and phosphorus, zinc and sulfur are adequate. This is most likely to occur after excessive spring rains, particularly on low organic matter and/or sandy soils. Excessive spring rains will leach nitrogen and can result in cold soil conditions.

Benefits from Starter Fertilizer

The primary benefit of starter fertilizer is an increase in early growth and crop uniformity. Corn and grain sorghum commonly respond to starter fertilizers; soybeans seldom do.

Increased early growth in corn or grain sorghum can occur when starter fertilizer containing phosphorus is applied to soils that test as high as 45 ppm phosphorus (Bray P_1). Growth response often occurs on sandy soils when proper rates of nitrogen and sulfur are used, even if the soils have high phosphorus levels.

This growth response results in plants of more uniform size, which may aid in earlier cultivation. Enhanced early growth may permit earlier lay by and ditching for gravity irrigation.

Early growth response does not necessarily result in a grain yield increase. Grain yield increase from starter fertilizer containing phosphorus is most likely on soils low in phosphorus (15 ppm P or less). For low phosphorus soils, fertilizer containing phosphorus is suggested for corn and grain sorghum. The preferred application method is in a band for best fertilizer efficiency. Grain yield increase on sandy soil is commonly due to nitrogen and/or sulfur in the starter fertilizer.

For soybeans, fertilizer containing phosphorus is suggested when the soil test level is 10 ppm phosphorus or less. The fertilizer can be banded beside the row, but not closer than one inch to the seed. Early growth response is not likely.

Early growth response to starter fertilizer may result in slightly earlier flowering or maturity of the crop. A few days earlier flowering or maturity can result in improved yield in years of early frost in the fall. This effect of starter fertilizer is most often observed on grain sorghum in areas where nights are cooler. Also, earlier maturity may result in slightly drier grain at harvest (one or two percentage points lower moisture).

Rate and Placement

The amount of plant nutrients that can be safely applied in a starter fertilizer is limited. The rate at which a starter fertilizer can be applied depends upon the salt content or index of the fertilizer, the distance between the fertilizer and the seed, and the soil texture.

An indication of the salt index of a fertilizer can be determined by adding the rate of nitrogen (N), the rate of potassium (K_2O), and one half the rate of sulfur (S) applied.

For example, if nine gallons per acre of 7-21-7 fertilizer, which weighs 11.0 pounds per gallon, is used per acre, then 99 pounds per acre of material is applied. At 100 pounds per acre, a total of seven pounds nitrogen (.07 X 100) and seven pounds potassium (.07 X 100) would be applied per acre.

The estimated salt index would be 14 pounds per acre. The phosphorus content of the fertilizer is not considered when the salt index is calculated.

The limits for the salt index that can be applied are listed in *Table I*. These listed salt limits are designed to provide safe conditions for all years with very rare exceptions.

When soil moisture at planting is adequate and rainfall occurs after planting, problems associated with salt damage will be minimal or will not occur. Problems from salt damage, such as reduced germination and emergence, can be anticipated when soil moisture becomes limited because no rainfall occurs for two or three weeks after planting, and the fertilizer was placed too close to the seed. Drying of the soil after planting increases salt concentration (increased ionic activity), which interferes with new root growth.

In general, application of too high amounts of N, K_2O, and S too close to the seed will delay corn, grain sorghum, and soybean emergence and reduce stand.

Nutrient Ratios

Starter fertilizers commonly available have a 1:3 ratio of N:P_2O_5. This is a good ratio for fine textured soils not high in phosphorus.

Fertilizer that has a higher ratio of N:P_2O_5 (1:1 or 2:1) is less effective in stimulating early growth on soil low in phosphorus (<15 ppm P). For soils high in phosphorus (above 24 ppm Bray P) or sands, using a fertilizer material with a N:P_2O_5 ratio of 1:1 or 2:1 usually results in a better early growth response.

These higher N:P_2O_5 materials must be placed further from the seed *(Table I)*, since the additional nitrogen gives a higher salt index.

Table I. The amount of N, K_2O, and S that can be safely applied per acre for corn and grain sorghum in 30 inch rows as influenced by distance from the seed and soil texture.

Placement	Sandy Soils	Non-Sandy Soils
	salt index (lbs/acre)*	
with the seed (pop-up)	5	5
1/4 to 1/2 in. from the seed	10	10
1 in. from the seed	20	40
2 in. from the seed	20+	40+

*A relative estimate of salt index extrapolated to lbs/acres of fertilizer nutrients. The amount for soybeans is one-half of these values.

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