

UNDERSTANDING ORTHOPHOSPHATE AND POLYPHOSPHATE LIQUID FERTILIZERS

Management of phosphorus is critical to crop establishment and achieving the maximum economic yield per acre. It also plays a critical role in several other important plant functions. The soil contains large amounts of phosphorus with a limited amount being made available to the growing plant each year.

Application of phosphorus as a starter fertilizer offers many advantages, and there are several starter fertilizer products to select from. The most common liquid fertilizers contain orthophosphate alone or blended with polyphosphate in a variety of combinations.

Orthophosphate and Polyphosphate Liquid Fertilizers:

While both forms can be true solution liquid fertilizers, they definitely have different characteristics and chemical structures.

Orthophosphate – Each molecule contains a single atom of phosphorus. In simple terms, this looks like the individual links in a chain not being connected. In this form a plant can readily absorb the phosphorus.

Polyphosphate – Poly means “many” and refers to multiple linkages of phosphorus in each molecule. In simple terms, this would look like a chain with the links connected. Here the polyphosphate form must go through a chemical reaction converting it into the orthophosphate form to be readily available for the plant to absorb the phosphorus.

CONVERSION OF POLYPHOSPHATE TO ORTHOPHOSPHATE*

Soil pH	Days After Application	% Remaining In Polyphosphate Form
4	100	50
7.2	30	50

*Source: Sutton and Larson, Soil Science 97



There are a variety of factors that can affect the conversion of the polyphosphate to the orthophosphate form. These include soil temperature (cooler temperatures can lengthen the conversion time), soil pH (as indicated above), clay content of the soil, application method, along with several other factors.

Methods of Application:

Phosphorus can be applied to the soil in a variety of ways. It can be sprayed on the soil surface and then incorporated. This is a time efficient method of application. The disadvantage to this type of application is that only 20-30% is actually taken up during the initial growing season and the balance (70–80%) is added to the phosphorus reserves in the soil. This results in more phosphorus coming into contact with the soil and can lead to more fixation of the phosphorus making it unavailable to a growing crop.

If a grower is looking to achieve the best return for his/her phosphorus investment, banding offers many advantages with placement on-the-seed yielding the greatest potential return. Banding concentrates the fertilizer in a narrow band either along side of the row or right on-the-seed. The outer surface of the band can tie up with the clay particles in the soil, but the center is still all available for uptake by the plant. In practical terms, this is like placing a steel rod in the soil. The outer surface will form a thin layer of rust, and the inside is still a bright, clean metal.

Recent data has shown that the closer to the seed that fertilizer is placed, the greater potential returns.

STARTER FERTILIZER PLACEMENT PERFORMANCE*		
Field Site Number	2" To the Side, 2" Below the Seed Yield in Bu/A	¾" To the Side, ½" Below the Seed
1	156	160
2	176	190
3	150	16.5
4	182	186
Overall Average	166	174

*Source: Farm Journal April 2000

Managing your phosphorus by applying it as a starter fertilizer also has several additional benefits including reducing the phosphorus-to-soil exposure, which decreases the potential for fixation. Placement in the root zone can establish a strong healthy root system in the seedling stage. You may also be able to reduce your total phosphorus application because more of the phosphorus will be available and absorbed by the plant in the root zone.

Starter Fertilizer Can Be Placed On-The-Seed?

Some starter fertilizers can be placed on-the-seed. The key is that it must be a low-salt starter fertilizer. Salt index is a measure of the starter fertilizer safety for application on-the-seed or close to the seed. The lower the salt index, the less likely a fertilizer material may cause injury to the seed or growing seedling.

Product Selection:

Since there are a variety of different starter fertilizer products on the market with either 100% orthophosphate or a combination of orthophosphate and polyphosphate combinations, how do I make my selection?

Remember what the goal of a starter fertilizer is—it is responsible for getting the crop off to a fast start. A 100% orthophosphate fertilizer or a combination liquid fertilizer with 80% orthophosphate and 20% polyphosphate will provide an optimum level of phosphorus to the emerging seedling for optimum growth. Phosphorus is essential in early season root growth and development. With starter fertilizers that are higher in polyphosphate and lower in orthophosphate, it is unpredictable how long it may take for the polyphosphate to convert to orthophosphate so it can be utilized by the growing seedling.

With corn, the 21 days after emergence is critical because the young corn plant will establish the ear and determine the number of kernel rows, which can have a significant impact on yield.

Summary:

There are definite differences between the orthophosphate and combination orthophosphate and polyphosphate liquid fertilizers. While both will supply phosphorus to the corn plant, the orthophosphate form can be readily absorbed by the growing plant.

Phosphorus is essential for early season root growth and development. Liquid fertilizer formulations that are higher in polyphosphate and lower in orthophosphate are unpredictable because there are a number of factors that can effect conversion of the polyphosphate to orthophosphate.

When placing your starter on-the-seed, a low-salt liquid fertilizer is recommended to reduce potential injury to the seed or growing seedling.

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