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FERTILIZER PHOSPHORUS FORMS

Phosphorus is one of the 17 nutrients essential for plant growth. Its functions in the plant cannot be performed by other nutrients. In the absence of an adequate supply, optimum growth and reproduction is restricted. Soils deficient in phosphorus require nutrient amendment from either fertilizer or livestock manure.

Phosphorus is taken up by plants as the inorganic ion orthophosphate. It enters the plant through root hairs, root tips, and the outermost layer of root cells. Once inside the plant, the phosphorus is incorporated into organic compounds. Phosphorus plays a key role in photosynthesis and the transfer of genetic information from plant to seed.

Phosphate fertilizers are formulated using phosphate rock as the mineral source. The phosphate rock is mined from marine phosphorite deposits. Using a process known as acidulation (treatment with a strong acid), the highly insoluble rock phosphate is made water soluble and plant available. The resulting phosphoric acid is then reacted with ammonia to produce the commonly available fertilizers like monoammonium phosphate (MAP), diammonium phosphate (DAP), and ammonium polyphosphate (APP). The reason for commercial phosphorus fertilizer sources being combinations of phosphorus and ammonium nitrogen is that research has shown increased phosphorus uptake by crops when combined with ammonium.

Some fertilizer sources differ in the proportion of orthophosphate they contain. While all the phosphorus in monoammonium and diammonium phosphate is orthophosphate, ammonium polyphosphate contains 30 to 40% orthophosphate with the remainder found as polyphosphate (term used for two or more orthophosphate ions combined together by removing water).

Polyphosphates were developed to offer their unique ability to sequester other metal ions. This allows the uniform blending of higher concentrations of micronutrients in fertilizer solution blends. Once applied to the soil, the polyphosphate reacts with water and rising temperatures to quickly convert to orthophosphate for plant uptake. Research across North America evaluating crop responses to phosphorus has shown that orthophosphate and polyphosphates are equally effective.

Selection of a phosphorus source (fluid or dry) depends more on farmer preference, the seeding system being used, and the combination of nutrients being applied. Dry monoammonium phosphate and fluid ammonium polyphosphate are the most common in areas where fertilizer is seed placed, minimizing the potential for seedling toxicity from the ammonium nitrogen. Where phosphorus is broadcast, diammonium phosphate is generally the most common source. Either of these dry fertilizer forms, or fluid ammonium polyphosphate, can be used in fertilizer blends with other nutrients.

Assuring an adequate supply of phosphorus is key to balanced crop nutrition. This means using soil testing to determine soil phosphorus levels and selecting the fertilizer source to meet crop requirements.

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