ULTRA GRO

Ag is Life

Phosphorus

Phosphorus (P) is the major element most often overlooked in crop fertilization programs. Even though soil contains large amounts of P in its minerals, it is nearly all locked up in forms not readily available to the plants. If soil conditions are right, beneficial soil micro-organisms will slowly break mineral phosphorus and make it available to the plants. Many of today's soils are in such poor shape that plants can't get enough phosphorus.

This lack of adequate P shows up in low yields, poor quality and delayed maturity. Phosphorus is needed for all cell activities to transfer energy within the cell. It is especially needed in growing roots and stem tips. In young plants as much as 75% of the plants supply of P may be absorbed by the time it has reached 25% of its ultimate dry weight.

Photosynthesis (the incorporation of carbon into plant material) is driven by two forms of high energy phosphorus compounds. One of these, adenosine tri phosphate (ATP) has 3 phosphates in its structure. Two of these are high energy forms, and the interchange of ATP and ADP serves to drive most of the plants biochemical reactions. As one major example, to go from glucose (the product of photosynthesis) to citric acid requires the production of 38 molecules of ATP.

Phosphorus is not a constituent of proteins, but no protein can be made without it. The "high energy phosphate bond" moving between ADP and ATP is the universal fuel for all reactions within the plants cells. Photosynthesis would be a dead end if it was not followed by the phosphorylation of the sugar produced. This then makes the carbon available for the formation of other sugars, cellulose, organic acids, and proteins. Without the phosphate bonding in the adenine molecules no life (including microbial life) is possible without it.

Phosphorus, like nitrogen, must be present in a simple inorganic form before it can be taken up by the plant. In the case of P, the utilizable material is some form of orthophosphate ion. In the pH range most soils, H_2PO_2 and HPO_2 are the most common forms of orthophosphate. These orthophosphates are most available to plants at pH values near neutral (7). In acid soils, orthophosphate ions are bound by aluminum and iron. In alkaline soils, orthophosphates react with calcium to form an insoluble compound called hydroxyapatite. In general, due to these reactions little P leaches from the soil. However, this also makes it vital to control soil pH and to have a healthy population of soil microbes to insure phosphorus availability. Certain fungi and the florescent pseudomonads are the major group which make P available to plants. To obtain the optimum yield of most crops a much larger amount of P has to be applied than is removed in the first years crop. This is due to the fact that some phosphorus is "fixed" in the soil and is not immediately available. Foliar applications of P are very helpful in overcoming this as well as supplying phosphorus at critical times in the crop. A prime example is a foliar application of Ultra Gro 2-17-17 to grapes to supply P for energy and potassium to move sugar into the berries just before harvest.

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