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THE AGRONOMY CORNER

The Big Three of Crop Nutrients

In this first installment of "The Agronomy Corner" we will take up the discussion on one of the big three of crop production – Nitrogen. The other two, phosphorus and potassium, will be discussed in later issues.

Nitrogen is a main nutrient in crop production because without it, all plants would wither and die. It serves several vital functions in plants. Nitrogen is a major part of the chemical chlorophyll which allows the plant to use sunlight to produce sugars through the process we call photosynthesis. These sugar compounds are used by the plant for food and growth.

Nitrogen is also a part of proteins in a plant. These proteins serve as building blocks for cell structure as well as being enzymes that direct the biochemical reactions on which the life of a plant is based. Another purpose of nitrogen is to be part of the basic genetic material of DNA and RNA which determines what a plant becomes. Finally, nitrogen also is a major component of the energy transfer compounds which do the major job of converting the plant food into energy used by the plant cells for growth and development.

Since we now know why nitrogen is so important for crop growth and development, where do crops obtain the nitrogen they need for healthy growth and development?

Nitrogen for plant use comes either from minerals in the soil or from the air. The nitrogen in the minerals in the soil is released as the minerals decompose. Although slow, this process can add significant amounts of nitrogen to the plants provided a large pool of available ions has been created naturally or through fertilization. The air is the major source of non reactive nitrogen in the soil. This nitrogen is converted into reactive forms by various microbes, fungi and earthworms. The growth of these microorganisms, and therefore the amount of nitrogen available to a plant, depends on the temperature of the soil. They grow very little or not at all if the temperature is 50 degrees F or less.

As the non reactive nitrogen is converted, it is carried to the plant in water soluble forms and is absorbed by the plant roots. Other microbes which need air to live also convert various forms of nitrogen into both plant usable forms and non plant usable forms.

If you want to delve deeper into how these processes occur, please see a good discussion on The Nitrogen Cycle.

From this discussion we can draw these conclusions: Nitrogen is essential for plant life. Most of the nitrogen used by crops comes from fertilization or from the air that is in the soil. The non reactive forms of nitrogen in the air must be converted into plant useable forms. This conversion process requires warmth (above 50 degrees F), air in the soil, water to carry it to the roots and of course lots of roots for large uptake of the nitrogen.

Certain types of plants, called legumes, have the ability to convert nitrogen directly from the air into plant reactive forms. These plants have a specific type of microbe that live on the roots and convert nitrogen into plant useable forms. If the plant has lots of root mass as well as the right microbes, it can produce much more usable nitrogen than the plant needs. This is the reason that the addition of fertilizer nitrogen to these type of plants does not generally increase the yield. However, with ever increasing yields, especially in the early growth stages when the plant is not capable of producing enough plant available nitrogen, the need for extra nitrogen becomes larger and additional nitrogen can be very helpful. Examples of these types of major crops are soybeans, field peas, edible beans and alfalfa to name a few.

Tale aways for efficient nitrogen usage:

Enough nitrogen to support healthy plant growth and development is essential.

The plant roots need access to air so anything that will reduce the availability of air, reduces nitrogen availability. Think compaction.

The plant needs lots of root mass so anything that either restricts root growth or reduces the number of roots affects nitrogen uptake and thus plant development. Think compaction and mechanical root damage or insects

All of the nitrogen in the world can be in your field but if the plant does not have water to carry it to the roots for uptake, it will do the plant no good.

It is the same for temperature. If it is not above 50 degrees F. the conversion into plant usable forms will not happen.

Soil microbes, fungi and earthworms are essential in the conversion process to make nitrogen available to the plant.

Legumes can use nitrogen from the air directly through their microbes that live on their roots.

Links to the sources for this discussion:

http://www.cropnutrition.com/efu-nitrogen

http://eldoradochemical.com/fertiliz1.htm