Nutrient Guide

NITROGEN (N):

Nitrogen has many roles in plants and is a major component of chlorophyll. Nitrogen is essential in the formation of amino acids and proteins and is critical in the formation of natural biostimulants without which plants cannot grow and function.

In most instances the nitrogen content of plants is among the highest of any nutrient. The percent of dry weight of plant tissue is usually greater than 5%. Nitrogen is very mobile in both plants and soil and research has shown that other essential nutrients such as phosphorous, potassium, calcium and magnesium are taken up from the soil in proportion to the uptake of nitrogen. Plants can and will take up nitrogen in the form of nitrate (NO3N), ammonium (NH4N), and Urea (CO(NH2)2). Although plants take up nitrogen in many forms, they actually utilize nitrogen in the ammonia (NH2) form. Nitrogen taken up in forms other than ammonium (NH2) must be reduced within the plant by the enzyme N-Reductase which is produced primarily in the lower one third of new root growth.

PHOSPHOROUS (P):

Phosphorous is the plant energy nutrient. Energy is primarily in the form of adenine triphosphate (ATP), which gives energy in the Krebs cycle. Phosphorous is a structural component of DNA and RNA in the metabolism of lipids. Deficiencies of phosphorous result in slow, inefficient growth and plant development. Phosphorous is one of the most reactive of all soil nutrients and will tie up readily with other nutrients and its availability is also responsive with soil (pH). Because the availability of phosphorous in the soil and its critical roles with plants, many producers successfully rely on strategic applications made to the plant foliage to insure its availability at critical development periods.

POTASSIUM (K):

Potassium is an essential nutrient for plant growth. Because large amounts are absorbed from the root zone in the production of most agronomic crops, it is classified as a macronutrient. Potassium is associated with movement of water, nutrients, and carbohydrates in plant tissue. If K is deficient or not supplied in adequate amounts, growth is stunted and yields are reduced. This makes it one of the most critical of all nutrients and very important to profitable crop production. Potassium is the stabilizer of cell chemistry in that it controls stomata opening during the transpiration processes. Potassium facilitates photosynthesis, protein building and enzyme formation, but is not a component of either. Potassium exists within the plant only as the K+ ion. Potassium improves resistance to diseases and insects and moves easily in soil with gravitational water and its availability is compromised by compacted soils.

CALCIUM (Ca):

Calcium ¨the prince of all nutrients¨ is essential in cell division, critical to cell wall formation and DNA only replicates in a cloud of extracellular calcium.

When plants receive mechanical damage or come under attack from insects and/or pathogens, the plant responds by producing a compound called calcium pectate that helps to seal off the attack site. Most soils have enough to an excess of stored calcium, but the soluble calcium available to plants can be very low even on soils storing massive quantities of calcium. Calcium like phosphorous, is very reactive in the soil and in the case of phosphorous and calcium, an excess of either effectively negates the uptake of both.

Foliar application of calcium is an extremely effective tool in crop production.

MAGNESIUM (Mg):

Magnesium occupies the space of the anchor molecule in the development of chlorophyll. The magnesium must react with several enzymes and borrow an electron from iron in order to fulfill this role in chlorophyll development. Magnesium is essential to plant energy in the enzymatic function, dealing with the generation and use of ATP in the Krebs cycle. It is also essential in protein synthesis and RNA function.

Magnesium availability from the soil is most often compromised by an unbalanced ratio with calcium.

Foliar applications of magnesium can be extremely effective.

SULFUR (S):

Plants require sulfur in the utilization of nitrogen. Sulfur deficiencies result in slow inefficient growth. Plants utilize sulfur in the sulfate (SO4) form and this form is easily ¨tied up¨, by excessive calcium in the soil. Sulfur is essential in the production of Amino Acids, Proteins, Enzymes and Antioxidants.

BORON (B):

Although needed only in very small amounts, Boron is a critical nutrient. It has roles in, Cell wall synthesis, Sugar transport, Lignifications and Carbohydrate metabolism.

Boron is deficient in most sandy soils.

Foliar applications of boron can be extremely effective.

COBALT (Co):

Not considered essential by some, foliar applications of cobalt at low rates on some crops can aid yield.

COPPER (Cu):

Most crops need a very limited amount of copper but its availability from the soil is usually very limited.

Copper is critical to Enzyme formation that drives chlorophyll production, Antioxidant activity, Lignifications, and Carbohydrate metabolism.

Foliar applications of copper can be extremely effective.

IRON (Fe):

Iron is critical in many essential plant processes as a donor in chlorophyll formation and other enzymatic functions. Iron is extremely reactive in the soil making its availability problematic.

Foliar applications of iron can be extremely effective.

MANGANESE (Mn):

Manganese plays important roles in crop production. One of its most critical roles is in the conversion of nitrate into usable ammonia for plant use. The role of manganese inside the plant is mostly limited to enzymatic functions like photosynthesis, oxygen release, cell division, cell extension, and the development of essential phytohormones. Iron is deficient in most soils.

Frequent foliar applications are very effective.

MOLYBDENUM (Mo):

Molybdenum is needed in minuscule amounts and the best way to sum up the importance of molybdenum is that it is not mobile in either the soil or in the plant tissue. However, it plays a critical role in the enzymatic process of converting nitrate into usable ammonium. Without this, there is no protein synthesis.

Emphatically, the best way to apply molybdenum is via foliar means.

No Mo = No Go

NICKEL (Ni):

Nickel is needed only in very small quantities. It is needed in the conversion of enzymes, (URZASE), which breaks down the urea molecule in plants. Supplementation of nickel is rarely needed.

ZINC (Zn):

The role of zinc in plants is almost exclusively in enzymatic function. The role of zinc is, DNA replication, CO2 splitting, Cell division, Protein synthesis, Carbohydrate metabolism, and Membrane integrity.

Zinc deficiencies cause the plant to be overly sensitive to temperature fluctuations.

Foliar applications are very effective and the best way to manage zinc deficiencies.

IMPORTANT NOTE

Although technically not nutrients, never forget the importance of carbon (C), hydrogen (H), oxygen (O) and silicon (Si).