PLANT MICRO NUTRIENT FUNCTIONS:

Boron

A primary function of boron is related to cell wall formation, so boron-deficient plants may be stunted. Sugar transport in plants, flower retention and pollen formation and germination also are affected by boron. Seed and grain production are reduced with low boron supply. Boron-deficiency symptoms first appear at the growing points. This results in a stunted appearance (rosetting), barren ears due to poor pollination, hollow stems and fruit (hollow heart) and brittle, discoloured leaves and loss of fruiting bodies.

Boron deficiencies are found mainly in acid, sandy soils in regions of high rainfall, and those with low soil organic matter. Borate ions are mobile in soil and can be leached from the root zone. Boron deficiencies are more pronounced during drought periods when root activity is restricted.

Copper

Copper is necessary for carbohydrate and nitrogen metabolism and, inadequate copper results in stunting of plants. Copper also is required for lignin synthesis which is needed for cell wall strength and prevention of wilting. Deficiency symptoms of copper are dieback of stems and twigs, yellowing of leaves, stunted growth and pale green leaves that wither easily.

Copper deficiencies are mainly reported on sandy soils which are low in organic matter. Copper uptake decreases as soil pH increases. Increased phosphorus and iron availability in soils decreases copper uptake by plants.

Iron

Iron is involved in the production of chlorophyll, and iron chlorosis is easily recognized on iron-sensitive crops growing on calcareous soils. Iron also is a component of many enzymes associated with energy transfer, nitrogen reduction and fixation, and lignin formation. Iron is associated with sulphur in plants to form compounds that catalyze other reactions. Iron deficiencies are mainly manifested by yellow leaves due to low levels of chlorophyll. Leaf yellowing first appears on the younger upper leaves in interveinal tissues. Severe iron deficiencies cause leaves to turn completely yellow or almost white, and then brown as leaves die.

Iron deficiencies are found mainly on high pH soils, although some acid, sandy soils low in organic matter also may be iron-deficient. Cool, wet weather enhances iron deficiencies, especially on soils with marginal levels of available iron. Poorly aerated or compacted soils also reduce iron uptake by plants. Uptake of iron decreases with increased soil pH, and is adversely affected by high levels of available phosphorus, manganese and zinc in soils.

Manganese

Manganese is necessary in photosynthesis, nitrogen metabolism and to form other compounds required for plant metabolism. Interveinal chlorosis is a characteristic manganese-deficiency symptom. In very severe manganese cases, brown necrotic spots appear on leaves, resulting in premature leaf drop. Delayed maturity is another deficiency symptom in some species. White/gray spots on leaves of some cereal crops are a sign of manganese deficiency.

Manganese deficiencies mainly occur on organic soils, high-pH soils, sandy soils low in organic matter, and on over-limed soils. Soil manganese may be less available in dry, well-aerated soils, but can become more available under wet soil conditions when manganese is reduced to the plant-available form. Conversely, manganese toxicity can result in some acidic, high-manganese soils. Uptake of manganese decreases with increased soil pH and is adversely affected by high levels of available iron in soils.

Chloride

Because chloride is a mobile anion in plants, most of its functions relate to salt effects (stomata opening) and electrical charge balance in physiological functions in plants. Chloride also indirectly affects plant growth by stomata regulation of water loss. Wilting and restricted, highly branched root systems are the main chloride-deficiency symptoms, which are found mainly in cereal crops.

Most soils contain sufficient levels of chloride for adequate plant nutrition. However, reported chloride deficiencies have been reported on sandy soils in high rainfall areas or those derived from low-chloride parent materials. There are few areas of chloride-deficient so this micronutrient generally is not considered in fertilizer programs. In addition, chloride is applied to soils with KCl, the dominant potassium fertilizer. The role of chloride in decreasing the incidence of various diseases in small grains is perhaps more important than its nutritional role from a practical viewpoint.

Molybdenum

Molybdenum is involved in enzyme systems relating to nitrogen fixation by bacteria growing symbiotically with legumes. Nitrogen metabolism, protein synthesis and sulphur metabolism are also affected by molybdenum. Molybdenum has a significant effect on pollen formation, so fruit and grain formation are affected in molybdenum-deficient plants. Because molybdenum requirements are so low, most plant species do not exhibit molybdenum-deficiency symptoms. These deficiency symptoms in legumes are mainly exhibited as nitrogen-deficiency symptoms because of the primary role of molybdenum in nitrogen fixation. Unlike the other micronutrients, molybdenum-deficiency symptoms are not confined mainly to the youngest leaves because molybdenum is mobile in plants. The characteristic molybdenum deficiency symptom in some vegetable crops is irregular leaf blade formation known as whiptail, but interveinal mottling and marginal chlorosis of older leaves also have been observed.

Molybdenum deficiencies are found mainly on acid, sandy soils in humid regions. Molybdenum uptake by plants increases with increased soil pH, which is opposite that of the other micronutrients. Molybdenum deficiencies in legumes may be corrected by liming acid soils rather than by molybdenum applications. However, seed treatment with molybdenum sources may be more economical than liming in some areas.

Zinc

Zinc is an essential component of various enzyme systems for energy production, protein synthesis, and growth regulation. Zinc deficient plants also exhibit delayed maturity. Zinc is not mobile in plants so zinc-deficiency symptoms occur mainly in new growth. Poor mobility in plants suggests the need for a constant supply of available zinc for optimum growth. The most visible zinc deficiency symptoms are short internodes and a decrease in leaf size. Delayed maturity also is a symptom of zinc-deficient plants.

Zinc deficiencies are mainly found on sandy soils low in organic matter and on organic soils. Zinc deficiencies occur more often during cold, wet spring weather and are related to reduced root growth and activity as well as lower microbial activity decreases zinc release from soil organic matter. Zinc uptake by plants decreases with increased soil pH. Uptake of zinc also is adversely affected by high levels of available phosphorus and iron in soils.