



LITCHFIELD ANALYTICAL SERVICES

P.O. Box 457

535 Marshall Street

Litchfield, MI 49252

Phone: (517)-542-2915

Fax: (517)-542-2014

email: litchlab@qcnnet.net

web page: www.litchlab.com

Feeds Forages Mycotoxins Soils Plant Tissues Manure Fertilizers Lime Water

Plant Nutrients & Their Functions

Nitrogen (N)

Plant Uptake of N: NO_3^-
 NH_4^+

Functions of Nitrogen

- Directly involved with chlorophyll production.
- Key building block for proteins and enzymes.
- Promotes cell division.
- Causes darker green plants and rapid growth.
- Boosts plant protein levels.

Nitrogen Deficiency Symptoms

- Young, spindles, stunted plants.
- Reduced growth.
- Yellowing of plants starting with older leaves.

Phosphorus (P)

Plant Uptake of P: H_2PO_4^-
 HPO_4^{2-}

Functions of Phosphorus

- Promotes rapid root development from seeds planted early in cold, moist soils.
- Insures vigorous seedling growth early.
- Promotes seed formation and reproduction.
- Improves water use efficiency.
- Improves uniformity of crop maturity and quality.

Phosphorus Deficiency Symptoms

- Stunted or reduced growth.
- Purpling of leaves especially with young plants
- Delayed maturity.

Potassium (K)

Plant Uptake of K: K^+

Functions of Potassium

- Controls plant respiration.
- Improves stalk quality and reduces plant lodging.
- Builds disease resistance.
- Helps open and close leaf pores (stomates) more efficiently to control water loss during drought.
- Promotes rapid and efficient conversion of nitrogen into protein.
- Helps regulate many enzyme reactions and other plant functions.

Potassium Deficiency Symptoms

- Firing of tips and margins of lower leaves.
- White spots and yellowing of edges of lower leaves.
- Leaf tips are scorched.
- Plant lodging.

Calcium (Ca)

Plant Uptake of Ca: Ca^{++}

Functions of Calcium

- Cell wall formation for strong cells.
- Translocation of sugars.
- Root hair formation (feeder roots).
- Neutralized poisons produced in the plant.
- Encourages fruit and seed production.
- Improves general plant vigor and stiffness of straw.

Calcium Deficiency Symptoms

- Dark green vein in mid-rib of leaf, with yellowish green areas between.
- Leaves have wrinkled appearance and may defoliate.
- Dying back of border of plants.
- Poorly developed root hair.
- Blossom end rot of tomatoes.
- Young leaves and terminal bud become hooked in appearance and die back at the tips and along the margin.

Magnesium (Mg)

Plant Uptake of Mg: Mg^{++}

Functions of Magnesium

- Essential for chlorophyll formation.
- Seed formation.
- Helps regulate the uptake of other plant nutrients.
- Acts as a carrier of phosphorus in the plant.
- Promotes formation of oils and fats.

Magnesium Deficiency Symptoms

- General loss of green color starting at the bottom older leaves and later moves up the plant.
- Veins of leaf remain green with loss of color between the veins.
- Leaves curve upward along the margins.
- Plants have weak stalks with long branch roots.

Sulfur (S)

Plant Uptake of S: SO_4^{--}

Functions of Sulfur

- Necessary for protein formation.
- Helps maintain dark green color.
- Promotes nodule formation on legumes.
- Stimulates seed production.
- Encourages more vigorous plant growth.

Sulfur Deficiency Symptoms

- Deficiency occurs in new growth only.
- Stems turn yellow, while leaves turn a very bright yellow, with even lighter veins.

Boron (B)

Plant Uptake of B: H_3BO_3^-

Functions of Boron

- Aids in nodule and seed formation in legumes.
- Aids in calcium uptake and sugar transfer.
- Aids in terminal bud formation.

Boron Deficiency Symptoms

- More generally deficient in high pH soils.
- Dry rot of sugar beets.
- Yellow top of alfalfa.
- Lack of seed formation on one side of ear of corn.

Chloride (Cl)

Plant Uptake of Cl: Cl^-

Functions of Chloride

- Aids in photosynthesis.
- Controls water use efficiency in plants.
- Aids in crop maturity.
- Helps with disease control.
- Aids in sugar translocation.

Chloride Deficiency Symptoms

- Deficiency symptoms on row crops are not common.
- Chloride deficient small grains show a higher incidence of moisture stress, greater incidence of root, stem, and leaf diseases, and reduced yields.

Copper (Cu)

Plant Uptake of Cu: Cu^{++}

Functions of Copper

- Essential for intercellular metabolism and it acts as an oxidizer in the plant processes.

Copper Deficiency Symptoms

- Die back in extreme cases.
- Little or no fruit.
- S shaped tips with coarse leaves.
- Deficiency shows on new growth first.
- Generally associated with high organic soils (muck) especially those with a high pH.

Iron (Fe)

Plant Uptake of Fe: Fe^{++}

Functions of Iron

- Needed for chlorophyll synthesis, plant metabolism, and oxidation.
- Functions as a catalyst in chlorophyll formation.

Iron Deficiency Symptoms

- Deficiencies occur on alkaline or high pH soils due to insolubility of the iron and on acid soils due to the extreme solubility and resultant leaching of iron.
- Tall, slender plants with few leaves.
- Pale green, then yellow, then white between the veins. (Generally new leaves with light green band along the leaf margins.)
- Die back in the case of advanced deficiency.
- Short, much branched root system.

Manganese (Mn)

Plant Uptake of Mn: Mn^{++}

Functions of Manganese

- Aids in oxidation and respiration processes of the plant.
- Accelerates seed germination and plant maturity with resultant crop yield and quality.
- Increases the availability of calcium, magnesium, and phosphorus.
- Aids in the synthesis of chlorophyll.
- Functions in photosynthesis.

Manganese Deficiency Symptoms

- Occurs on new growth first.
- Fading between veins changing to medium yellow with dark mid-rib.
- Does not affect size of leaf nor texture, only color.
- More deficient on soils with a high pH, either due to natural calcareous content or due to over-liming.

Molybdenum (Mo)

Plant Uptake of Mo: MoO_4^{--}

Functions of Molybdenum

- Aids in protein synthesis.
- Essential for legume nitrogen fixation.
- Helps enzyme systems.
- Aids in nitrogen metabolism.

Molybdenum Deficiency Symptoms

- Similar to nitrogen deficiency symptoms because plants cannot utilize nitrate nitrogen without adequate supplies of molybdenum.

Zinc (Zn)

Plant Uptake of Zn: Zn^{++}

Functions of Zinc

- Controls use of other elements in plants.
- Needed for growth hormone, seed and grain production.
- Influences protein synthesis rate of maturing of seed, and stalks, height or length of plants.

Zinc Deficiency Symptoms

- More deficient with high soil pH.
- White area between the veins (chlorosis).
- Small sharp pointed leaves.
- Undersized leaf is a definite characteristic of zinc deficiency.
- In corn, white buds form.