Symptoms of Corn Nutrient Deficiencies

Foliar nutrient deficiency symptoms of corn can be the result of actual deficiencies, environmental interactions, herbicide injury, insect feeding, compaction, and other factors. Soil and foliar tissue testing can help determine if a true nutrient deficiency exists. Spring-time deficiency symptoms often disappear when soils become warmer and drier.

What to Watch For

During routine scouting, yellow, brown, purplish, striped, or desiccated corn leaves may be found. These symptoms can be foliar signs of a nutrient deficiency. Common symptoms for the most important corn nutrients include:

Sulfur (S): Youngest leaves show a yellow striping, particularly at the leaf margin because S is not easily translocated within the plant (Figure 1A).

Magnesium (Mg): Plants initially become pale because of a shortage of chlorophyll. Severe deficiencies result in leaves developing full length striping with green veins and yellow tissue between the veins. Lower leaves develop striping first (Figure 1B).

Nitrogen (N): Oldest leaves turn pale or yellowish-green and develop an inverted “V” or spear shaped discoloration starting at the tip of the leaf and extending toward the leaf base (Figure 1C).

Phosphorus (P): Leaves on young plants may appear purplish (Figure 1D).

Zinc (Zn): Intervenial chlorosis on the upper leaves can occur with veins, midrib, and leaf edges remaining green. Bands or stripes develop on either side of the midrib and leaves may turn nearly white if the deficiency intensifies. Stunted plants may be apparent because of shortened internodes (Figure 1E).

Potassium (K): Leaf edges can become yellow and brown (Figure 1F).

Figure 1. Nutrient deficiency symptoms for: A) sulfur; B) magnesium; C) nitrogen; D) phosphorus; E) zinc; F) potassium. A, B, and E are courtesy of Jim Donnelly.
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Nutrient Deficiency Causes

Though actual nutrient deficiencies may exist, a reduction in nutrient uptake may also be caused by:

- Compaction (Figure 2, left)
- Injured roots from insects, diseases, fertilizer burn, or chemicals (Figure 2, right)
- Reduction in plant metabolism and photosynthesis from cool nights, cloudy weather, and saturated soils
- Warm temperatures after a cool period can cause plants to grow rapidly and may induce temporary deficiencies
- Slow nutrient release from residue
- Soil attributes can cause deficiencies - low soil organic matter (S), acidic soils (Mg), high pH soils (Zn).

Impact on Your Crop

The affect on potential yield from nutrient deficiencies is dependent on how quickly, if possible, the deficiencies are rectified by more favorable environmental conditions and/or the application of additional nutrients. Season long deficiencies can result in substantial yield loss. When roots are injured by insects or chemicals, and depending on the severity of damage and the time required for new root growth, the potential for yield loss increases. As an example, sulfur deficiencies lasting longer than 21 days after emergence can result in a yield loss of 1 to 2 bu/acre.²

Managing Nutrient Deficiencies

Soil and crop tissue testing can help determine if a deficiency exists and if it is due to soil nutrient availability, restricted plant uptake, or reduced metabolism. When plants with a suspected nutrient deficiency are sampled, a sample of unaffected plants should also be collected and analyzed to help determine if a nutrient deficiency is the cause. Tissue samples taken during the growing season can provide nutrient levels within the plant at the time of sampling and help determine if a supplemental fertilizer should be applied.³ Tissue analysis procedures vary by lab; however, in general, the corn ear leaf at silking should be sampled for S, Mg, and Zn levels.⁴ An early-season tissue analysis can be done after the seedling stage, but prior to tasseling.

A tissue test, in combination with a soil test, may provide answers as to why plant levels are high or low. Alone, soil test results can be the most useful for predicting nutrient needs for the following growing season, but may not give reliable results for S levels. Corn responds best when soil pH levels range between 5.6 to 7.5. A pH goal for continuous corn or a corn-soybean rotation should be about 6.0 on acid soils. If alfalfa or clover are in the rotation, the pH goal should be 6.5 to 7.0. Appropriate amounts of lime can increase soil pH and help increase the availability of plant nutrients.

Nutrient deficiencies are often outgrown when soils become warmer and drier because root growth, microbial activity, and the breakdown of organic material and the release of nutrients are enhanced. Unrestricted root growth can allow roots to reach water-soluble nutrients such as S and N that may have moved deeper into the soil profile. Between the V3 to V5 growth stages, while corn plants transition from seed dependency to acquiring energy from photosynthesis, plant appearance can be variable and can be from environmental conditions. During the vegetative stages a wait-and-see approach can generally be taken and tissue samples gathered just prior to silking if symptoms persist. Correcting the problem may not be feasible for the current crop; however, soil preparation for the next season can include fertilization applications based on soil test recommendations and compaction alleviation or prevention.

Sources:


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