Nutrient Deficiency Symptoms in Corn

- Agronomic and environmental factors can cause nutrient deficiencies.
- Restricted root growth from various causes can reduce nutrient uptake.
- Plants can outgrow deficiency symptoms when environmental conditions improve.

Potential Causes of Foliar Deficiency Symptoms

Nutrient deficiency symptoms can be a result of several agronomic and environmental factors. Actual soil nutrient deficiencies may exist or other situations may cause symptoms to be temporary or season-long. Situations that can cause foliar nutrient deficiency symptoms include:

- Decreased metabolism and photosynthesis from environmental conditions such as cool nighttime temperatures, cloudy weather, and saturated soils.
- Rapid plant growth triggered by warm temperatures that followed slow growth during cool weather.
- Cool, saturated soils can reduce microbial activity and release of nutrients from residue.
- Compacted soils can restrict root growth and nutrient uptake.
- Soils that are low in organic matter, are acidic, or have a high pH may be deficient in sulfur (S), magnesium (Mg), and zinc (Zn), respectively.
- Restricted root growth caused by insects, disease, fertilizer burn, or chemicals can result in reduced nutrient uptake.
- Symptoms can be non-nutrient related such as carryover injury from a fomesafen herbicide misapplication.

Identifying Typical Corn Nutrient Deficiencies

Please see Figure 1 for pictures of the following:

**Nitrogen (N):** A deficiency in N causes the oldest leaves to turn pale or yellowish-green and develop a "V" shaped discoloration starting at the tip of the leaf.

**Phosphorus (P):** Leaves of young plants deficient in P may appear purplish in coloration.

**Potassium (K):** Leaf margins become yellow and brown.

**Sulfur:** Because S is not easily translocated within the plant, the youngest leaves can become yellow.

**Zinc:** A Zn-deficient corn plant exhibits interveinal chlorosis on the upper leaves. The veins, midrib, and leaf margins remain green. As the deficiency intensifies, bands or stripes develop on either side of the midrib and the leaves may turn almost white. Stalk internodes can be shortened, which can result in stunted plants.

**Magnesium:** 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 show the striping first.

Contributing Environmental and Agronomic Factors

Saturated soils can create an anaerobic (without oxygen) condition that limits the ability of roots to effectively absorb nutrients. This condition can be enhanced when soil temperatures are cold. When these combined conditions exist, N and P deficiency symptoms are common.

Compaction caused by equipment can last for several seasons and result in the root mass being somewhat flattened and unable to reach non-
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mobile nutrients. An N application when soils are too wet can also cause the knife sidewalls to become smeared or compacted and result in the inability of roots to penetrate through the sidewalls to find available nutrients. Typically, roots growing under this situation fail to spread out and become vertically flat in appearance (Figure 2).

It is important to determine the cause of the foliar symptoms. Injury to the roots from insects, fertilizer, or chemicals can restrict root growth and their ability to absorb nutrients. Leaf purpling, which is symptomatic of P deficiency, is common when roots are restricted. Additionally, leaves can show symptoms that are similar to nutrient deficiencies but are caused by carryover from foliar applied herbicides, or could be a result of insecticide and herbicide interactions. A late application or dry soil conditions after an application of a fomesafen-based soybean herbicide the previous season can cause corn leaf streaking similar to a Zn deficiency except that the midveins are yellowish to white and the interveinal tissue is green (Figure 3). If appropriate label directions are followed for the herbicide the previous year, the likelihood of carryover is reduced. Be aware that dry environmental conditions can increase the likelihood of injury from carryover.

Nutrient Deficiency Determination

Soil testing and crop tissue testing can help determine nutrient deficiencies. Testing results can help determine if the deficiency is due to soil availability or plant uptake and metabolism. Tissue samples taken during the growing season can provide the nutrient levels within the plant at the time of sampling. Tissue analysis procedures vary by lab, but generally, the corn ear leaf at silking should be sampled for S, Mg, and Zn levels. An early-season tissue analysis can be done after the seedling stage, but prior to tasselling.

When plants with a suspected nutrient deficiency are sampled, it is recommended a sample of unaffected plants at a similar stage also be collected. Early-season testing results can be used to determine if a supplemental fertilizer should be applied. A tissue test, in combination with a soil test, may provide answers as to why plant nutrient 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.

Summary

Plants often outgrow deficiency symptoms when soils become warmer and drier, which encourages root growth, microbial activity, and the breakdown of organic material, which releases nutrients. Deeper root growth can also allow roots to reach water-soluble nutrients such as S and N that may have moved deeper into the soil profile with wet conditions.

Corn between the V3 to V5 growth stages transitions from depending on the seed for energy to acquiring energy from photosynthesis. The cosmetic appearance of plants during these stages is often variable and can be due to an environmental effect. A wait-and-see approach can be taken during the vegetative stages, and a tissue analysis may be conducted at the silking stage if symptoms persist into the season. Correcting the problem for the current season may not be feasible, but soil preparation for next season can include fertilizer applications based on soil test recommendations and compaction alleviation or prevention.

Sources


For additional agronomic information, please contact your local seed representative. Individual results may vary, and performance may vary from location to location and from year to year. This result may not be an indicator of results you may obtain as local growing, soil and weather conditions may vary. Growers should evaluate data from multiple locations and years whenever possible. ALWAYS READ AND FOLLOW PESTICIDE LABEL DIRECTIONS. Asgrow and the A Design® is a registered trademark of Monsanto Technology LLC. All other trademarks are the property of their respective owners. ©2016 Monsanto Company. 130411060201 051316LGM