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A CHECK-UP USING NUTRIENT DEFICIENCY SYMPTOMS

When the uptake of any of the essential nutrients is inadequate, the plant metabolism becomes disrupted and distinctive symptoms often begin to appear. Since nutrients are involved in specific growth processes, deficiency symptoms provide clues to what nutrient might be lacking. However, most nutrient deficiencies begin to interfere with plant productivity long before the symptoms become visible.

Plant tissue testing is needed to verify that a visual symptom is caused by a specific nutrient deficiency. This differs from soil analysis, which verifies a sufficient reserve of nutrients in the soil, but does not account for conditions that may be interfering with nutrient uptake by roots (such as cold, dry, or compacted soils).

When the cause of deficiency symptoms is known, it still must be determined if a prompt nutrient application will correct the problem. There may be economic constraints or difficulties getting equipment into the field to alleviate the deficiency. Foliar sprays of soluble nutrients are often useful to treat deficiencies as they appear during the growing season. Some nutrients may be added to irrigation water and applied via fertigation to correct plant shortages. However, nutrient deficiencies result in permanent loss of growth and plants may fail to recover from severe deficiencies even after corrective measures.

In general, leaf nutrient deficiency symptoms fall into general categories:

- Chlorosis (yellowing) may appear between the leaf veins or impact the entire leaf
- Necrosis (leaf death) usually begins at the leaf tip or edges, or appears between the leaf veins
- Lack of new plant growth as a result of the growing points dying and failure of new leaves to develop
- Accumulation of plant pigments (especially purple-colored anthocyanin)
- Overall plant stunting with normal or abnormal coloring

A shortage of a nutrient does not immediately result in visible deficiency symptoms. Overall plant growth and metabolism is usually hindered for some time before visual symptoms are present. This so-called "hidden hunger" occurs with low levels of chronic nutrient deficiency, and is far more common than visible deficiency symptoms. By the time obvious visual symptoms first appear, the plant can no longer function properly.

Nutrient deficiency symptoms are most useful for diagnostic purposes (and correction) when they are identified as early as possible. Even when supplemental nutrients are applied to correct deficiencies, irreversible damage to yield or crop quality has likely already occurred.

Environmental stresses also cause abnormal symptoms to appear on plant leaves that may not be directly related to nutrient deficiency. Additionally plant disease, insect damage, herbicide impacts, or excessive salinity are examples of non-nutrient factors that cause leaf disorders and stunting.

Nutrient deficiency can cause secondary plant damage that is not readily visible. For example, potassium shortages have been shown to reduce plant resistance to various diseases and insects. Many turfgrass diseases are more common under nitrogen-deficient conditions. Maintaining an adequate supply of phosphorus reduces the severity of diseases such as root rot in wheat and barley, and minimizes various infections of corn and soybean.

IPNI is developing guides to help growers identify nutrient deficiencies symptoms of important horticultural and agronomic crops. The first e-book was written by Drs. Pitchay and Mikkelsen (on broccoli) and is available for free for download from iTunes® or for small fee from Amazon®. A collection of outstanding images of deficiency symptoms of important world crops is available for purchase at the IPNI store.

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Note: *Plant Nutrition TODAY* articles are available online at the IPNI website: www.ipni.net/pnt