GROWER 101:

Nutrient Disorders in Greenhouse Crops Part II

Ammonium toxicity. (Photos courtesy of Paul Nelson)

Pinpoint greenhouse crop problems with this second of a two-part series identifying nutrient disorders.

By Paul V. Nelson

As promised in last month's issue, the second of *GPN*'s two-part series on nutrient disorder shows you symptoms associated with additional deficiencies and toxicities of nutrients in greenhouse crops. When assessing nutritional status, remember the four sets of information: irrigation water quality, root substrate tests, foliar analysis and visual symptomology. The deficiencies below will help you with visual symptomology.

Ammonium Toxicity. In older plants with floral buds, margins of leaves curl upward or downward depending on the plant species. Older leaves develop chlorosis. The form of chlorosis is variable and depends on the plant species. Necrosis follows chlorosis on older leaves. Fewer roots form, and in advanced toxicities, root tips become necrotic, often with an orange-brown color.

With seedlings and bedding plants, young leaves develop chlorosis, most often in an interveinal pattern, and margins curl up or down depending on species.

Potassium Deficiency. The margins of older leaves become chlorotic followed by immediate necrosis. Similar necrotic spots may form across the blades of older leaves but more so toward the margin. Soon, the older leaves become totally necrotic. Seedlings and young bedding plants, prior to the formation of chlorosis and necrosis on older foliage, are more compact and deeper green than normal.

Some foliage plants will develop oily spots on the undersides of older leaves that then become necrotic.

Calcium Deficiency. Symptoms are expressed at the top of the plant. Young leaves may develop variable patterns of chlorosis and distortion such as dwarfing, strap-like shape or crinkling. Edges of leaves may become necrotic; shoots stop growing; petals or flower stems may collapse; and roots are short, thickened and branched.

The older leaves of foliage plants may become thick and brittle. In *Philodendron scandens* subspecies *oxycardium* and in *Epipremnum aureum* calcium has symptoms of a mobile nutrient. Yellow spots occur in the basal half of older leaves. These spots enlarge into irregular, yellow areas containing numerous, scattered, oil-soaked spots.

Sulfur Deficiency. Foliage over the entire plant becomes uniformly chlorotic. Sometimes the symptoms tend to be more pronounced toward the top of the plant. While symptoms on the individual leaf look like those of nitrogen deficiency, it is easy to distinguish sulfur deficiency from nitrogen deficiency because nitrogen deficiency begins in the lowest leaves.

Manganese Deficiency. Young leaves develop interveinal chlorosis, sometimes followed by the formation of tan spots in the chlorotic areas between the veins.

Manganese toxicity. Toxicity very often begins with interveinal chlorosis of young leaves due to iron deficiency caused by high manganese antagonism of iron uptake. Manganese toxicity takes the form of burning ➧

From top to bottom: Potassium deficiency in begonia seedling; calcium deficiency in poinsettia; sulfur deficiency in impatiens.

Top to bottom: Manganese deficiency in zinnia; manganese toxicity; zinc deficiency in carnation shoots; copper deficiency in chrysanthemum.

of the tips and margins of older leaves or formation of reddish-brown spots on older leaves. The spots are initially about 1/16 inch (1-2 mm) in diameter and are scattered over the leaf. Spots become more numerous and eventually coalesce into patches.

Zinc Deficiency. Young leaves are small, and internodes are short, giving the stem a rosette appearance. These leaves are also chlorotic in varying patterns but tend toward interveinal. In kalanchoe, zinc deficiency can express itself as a fasciation (a flattened, highly branched stem).

Copper Deficiency. Young leaves develop interveinal chlorosis; however, the tips and lobes of these leaves may remain green. Next, the youngest, fully expanded leaves rapidly become necrotic. The sudden death of these leaves resembles desiccation. GPN

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