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RECOGNIZING PLANT NUTRIENT DEFICIENCIES

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INTRODUCTION

When a plant in the ground or in a pot begins to look pale and unhealthy, or starts to show signs of yellowing, reddening or browning leaves, it is probably experiencing some kind of problem. The exception to this is when a change is due to a normal part of the plant's cycle, e.g. iris foliage dieback; or leaf color changes in deciduous trees in autumn. Problems may be due to a number of factors — disease, drought, insects or environmental pollution. In order to treat the problem, it is important first to diagnose it.

Solving the problem may be fairly simple if it is diagnosed correctly. When a plant, shows symptoms, check first to see if a disease organism is present. When an insect causes a plant problem, the insects themselves (or their eggs or other signs) are often visible. If a fungus causes plant disease, there are generally signs such as the fuzzy threads (hyphae) that they produce or other clear indications that can be traced. Getting rid of these organisms or restoring good growing conditions may be the answer. Environmental changes may cause plant problems that are similar to nutrient deficiencies or plant disease. Determine whether the plant is getting enough or too much sun; whether it is receiving correct moisture; and whether the temperatures are acceptable for its growth. A shade-loving plant will get burned in full sun, and a plant designed for full sun will not thrive with limited light. Likewise, when a plant is suffering from a deficiency in one essential nutrient or another, there are usually consistent telltale indications unique for each nutrient, but these may appear much like symptoms of pests or environmental conditions.

Nutrient deficiencies are often related to other problems.

- Is the plant getting enough water? Too much? Check the soil moisture, and make sure that there is sufficient drainage. Improper watering, too much or too little, can prevent the plant from obtaining nutrients.
- Is the soil too acid or too alkaline? Nutrients are more or less available in acidic or alkaline soils.
  - This is measured as pH, on a scale of 1 (very acid, e.g. concentrated sulfuric acid) to 14 (very alkaline e.g. lye). Neutral pH is 7.
  - Many plants grow best in a pH range of 5.5 – 7.5
  - Soils in the desert tend to have quite a high pH, 8.5 or higher, which inhibits normal plant growth. Soils in areas that receive much rain are usually quite acidic.
  - Iron, manganese and zinc are three essential elements that become inaccessible above pH 7.8, hence deficiency of one of these minerals is common in the desert.
- Is the soil very cool?
  - Certain nutrients are inaccessible when soils are cool, but the definition of "too cool" varies with the plant. For instance, a cactus will have difficulty taking up nutrients from soils at a temperature that might be perfectly fine for a pine.

DEFINITIONS:

Rosetting: The stem of the plant does not extend normally, so that the youngest leaves grow as a tight bunch near the base of the plant on the ground..
Bronzing: Leaves develop a shiny purplish tinge overall.
Stunting: Growing points do not extend normally. The plant is abnormally small and compact.

PLANT NUTRIENT DEFICIENCY SYMPTOMS

The following photographs are indicative of nutrient deficiencies. One photograph cannot hope to be an entire diagnostic system. It is important to take all symptoms into consideration before concluding that a single nutrient is deficient. Soil and tissue analyses are by far the most accurate means to determine nutrient levels.

Tomatoes showing blossom end rot. Secondary fungi have begun to invade the rotted tissue. (Photo by M.A. Hansen, Virginia Tech).

In nitrogen deficiency, younger greenleaves remain green and older leaves turn yellow. (Photo University of Nevada Cooperative Extension)

Iron deficiency causes younger leaves to turn pale, with veins still green. Older leaves remain green. In some plants, iron deficiency causes leaves to become nearly white. (Photos by University of Nevada Cooperative Extension)

Nutrient	Part of plant affected by nutrient deficiency	Symptoms	External circumstances leading to the nutrient deficiency	*Notes*
Nitrogen	**Older foliage, going to whole plant…….. Petioles (rare)……..**	**Pale green or yellow Red**	**Excessively leached or waterlogged soils, Soils with low organic matter**	***Most desert soils have insufficient nitrogen for normal plant growth***
Phosphorus	Older Leaves…… Whole plant…….. Petioles…….	Purpling, bronzing Stunting Red	Cold wet soils (early spring), acid or very alkaline soils, compacted soils	*Plant may be extremely dark green.*
Potassium	Older Leaves…… Leaf Margins……	Yellow translucent spots Browning	Soils with excessive leaching, high pH soils	*May be a problem if in excess*
Calcium	Roots……... Whole plants……..… New shoots…….. Stem or petiole…….. Fruit…….. Young or old leaves ……	Thickened Stunted Withered or dead Collapse Blossom End Rot Tip Burn	**Improper watering (most common cause),** very acid soils, soils with excessive potassium, excessively dry or wet soils	*Plant remains green Other crop problem includes: brownheart of escarole carrot cavity spot, celery blackheart, High in Nevada soils*
Iron	**Young leaves…….**	**Tissue between veins becomes pale or white**	**High pH soils, soils with low organic matter, high phosphorus, excess zinc, manganese or copper**	***Common desert problem*** *toxic at pH under 5.5 Rare in Nevada*
Zinc	**Young leaves……... Petioles……**	**Pale or grayish, yellowing between veins; rosetted Weak**	**High pH, low organic matter, excess phosphorus in soil, lack of nitrogen**	***Common desert problem***
Manganese	**Young leaves…….**	**Yellow mottled areas**	**Soils with pH over 6.5, high iron soils, low nitrogen soils, dry weather compacted soils**	***Common desert problem*** *Similar to lack of iron toxic at pH under 5.5*
Magnesium	Interveinal space of older leaves; may begin around interior perimeter of leaf	Yellowing	Light acid soils, soils with excess potassium, calcium or phosphorus	*Plant green; leaves may look scorched*
Sulfur	Young leaves……. Leaf Veins…….. Whole plant……	Yellowing Paler than rest of leaf Stunted, pale	Sandy soils, soils with low organic matter	*Similar to virus infection symptoms or magnesium deficiency symptoms*
Boron	Growing points…… Young leaves……...	Die back Yellowing, distorted, form unnatural rosettes	Soil pH under 5.5 or over 6.8, sandy soils with low organic matter lack of nitrogen	*Plant dark green. May be toxic in excess.*
Copper	New shoots…….... Young leaves……. Whole Plant……..	Do not open Yellowing, become thin Pale green	High pH soils, lack of nitrogen compacted soils	
Molybdenum	Older leaves	Yellow, distorted, narrow	Soils with pH under 5.5	*Looks like lack of nitrogen*
Bold = Very common desert problem				

Table 1 describes nutrient deficiency symptoms by element. It is good also to remember that excess of one nutrient can cause a deficiency of another. Balance is important for a good fertilization program that is designed to supplement available soil nutrition. The soil may not have sufficient levels of a nutrient to meet plant demands, or environmental conditions prevent the nutrient from being accessible to the plant. Plants not receiving balanced nutrition are often more susceptible to attack by insects and disease-causing organisms and damage by extremes in environmental conditions.

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