

**The following elements are mobile elements and are more likely to exhibit visual deficiencies in the older leaves.**

## **NITROGEN DEFICIENCY**

Plants will exhibit lack of vigor as older leaves become yellow (chlorotic) from lack of chlorophyll. Chlorosis will eventually spread throughout the plant stems, petioles, and lower leaf surfaces may turn purple.

**Toxicity:** Leaves are often dark green and in the early stages abundant with foliage. If excess is severe, leaves will dry and begin to fall off. Root system will remain under developed or deteriorate after time. Fruit and flower set will be inhibited or deformed.

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## **PHOSPHORUS DEFICIENCY**

Plants are stunted and older leaves are often dark dull green in color. Stems, petioles may turn purple. Plant maturity is often delayed.

**Toxicity:** This condition is rare and usually buffered by pH limitations. Excess phosphorus can interfere with the availability of copper and zinc.

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## **POTASSIUM DEFICIENCY**

Older leaves are initially chlorotic but soon develop dark necrotic lesions (dead tissue), which is first apparent on the tips and margins of the leaves. Stem and branches may become weak and easily broken.

**Toxicity:** Usually not absorbed excessively by plants. Excess potassium can aggravate the uptake of magnesium, manganese, zinc and iron.

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## **MAGNESIUM DEFICIENCY**

The older leaves will be the first to develop interveinal chlorosis, starting at leaf margin or tip and progressing inward between the veins.

**Toxicity:** Magnesium toxicity is rare and not generally exhibited visibly.

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## **ZINC DEFICIENCY**

Chlorosis may accompany reduction of leaf size and a shortening between internodes. Leaf margins are often distorted or wrinkled.

**Toxicity:** Zinc in excess is extremely toxic and will cause rapid death. Excess zinc interferes with iron causing chlorosis from iron deficiency.

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## **SULFUR DEFICIENCY**

The initial symptoms are the yellowing of the entire leaf including veins usually starting with the younger leaves. Leaf tips may yellow and curl downward.

**Toxicity:** Leaf size will be reduced and overall growth will be stunted. Leaves yellowing or scorched at edges.

## The following elements are immobile elements and will show their first symptoms on younger leaves and progress to the whole plant.

### **CALCIUM DEFICIENCY**

Young leaves are affected first and become small and distorted or chlorotic with irregular margins, spotting or necrotic areas. Bud development is inhibited and roots may be under developed or die back. Fruit may be stunted or deformed.

**Toxicity:** Difficult to distinguish visually. May precipitate with sulfur in solution and cause clouding or residue in tank.

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### **IRON DEFICIENCY**

Pronounced interveinal chlorosis similar to that caused by magnesium deficiency but on the younger leaves.

**Toxicity:** Excess accumulation is rare but could cause bronzing or tiny brown spots on leaf surface.

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### **MANGANESE DEFICIENCY**

Interveinal chlorosis on younger or older leaves followed by necrotic lesions or leaf shedding. Restricted growth and failure to mature normally can also result.

**Toxicity:** Chlorosis, or blotchy leaf tissue due to insufficient chlorophyll synthesis. Growth rate will slow and vigor will decline.

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### **CHLORINE DEFICIENCY**

Wilted chlorotic leaves become bronze in color. Roots become stunted and thickened near tips.

**Toxicity:** Burning of leaf tip or margins. Bronzing, yellowing and leaf splitting. Reduced leaf size and lower growth rate.

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### **BORON DEFICIENCY**

Stem and root tip tissue often die. Root tips often become swollen and discolored. Internal tissues may rot and become host to fungal disease. Leaves show various symptoms which include; drying, thickening, distorting, wilting, and chlorotic or necrotic spotting.

**Toxicity:** Yellowing of leaf tip followed by necrosis of the leaves beginning at tips or margins and progressing inward. Some plants are especially sensitive to boron accumulation.

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### **COPPER DEFICIENCY**

Young leaves often become dark green and twisted. They may die back or just exhibit necrotic spots. Growth and yield will be deficient as well.

**Toxicity:** Reduced growth followed by symptoms of iron chlorosis, stunting, reduced branching, abnormal darkening and thickening of roots. This element is essential but extremely toxic in excess.

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### **MOLYBDENUM DEFICIENCY**

Often interveinal chlorosis which occurs first on older leaves, then progressing to the entire plant and developing severely twisted younger leaves which eventually die.

**Toxicity:** Excess may cause discoloration of leaves depending on plant species. This condition is rare but could occur from accumulation by continuous application. Used by the plant in very small quantities.