Why nutrient problems occur

- Wrong media pH
- Improperly working fertilizer injector
- Excessive watering
- Low temperature
- Disease

Before You Start
Determine whether you are dealing with a nutrient deficiency or a disease/insect problem
Look for patterns or lack of patterns:

- Disease or insect problem: no pattern
- Nutritional disorder: consistent pattern
- Check the roots

Know your Plant Nutrients

- Non-fertilizer: C (air CO₂), H (water), O (air, water),
- Macro: N, P, K, Ca, Mg, S
- Micro: Fe, Mn, Zn, Cu, Cu, B
- Cl, Ni (occur in sufficient quantities to meet plant needs in media and fertilizer material: usually not included in fertilizer programs)
- Mobile: N, P, K, Mg
- Partially mobile: Ca, Fe, Mn, Zn, Cu, B

Where do you find the symptom?

- Mobile: Base of plant (N, P, K, Mg)
- Immobile: Top of plant (Ca, Fe, Mn, Zn, Cu, B)
- Partially mobile: Whole (mid) plant (S, Mo)

Nitrogen deficiency (mobile)

- Uniform chlorosis then necrosis on older leaves
- Stunting
- Early flowering
- Possible red color
- Leaf abscision

Phosphorus deficiency (mobile)
• Deep green foliage
• Severe stunting
• Chlorosis then necrosis
• Possible purpling
• Roots longer and fewer

Nitrogen Vs. Phosphorus

<table>
<thead>
<tr>
<th>N</th>
<th>P</th>
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<td>Uniform chlorosis then necrosis on old leaves</td>
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Potassium Deficiency (mobile)
• Chlorosis might occur briefly at the tip and margin of old leaves
• Rapid necrosis of margins or spotting across old leaf blades
• Seedlings are compact and deeper green prior to showing symptoms

Magnesium deficiency (mobile)
• Intereveal chlorosis on older leaves
• Necrosis of older leaves
• Possible red on older leaves

Sulfur deficiency (partially mobile)
• Uniform chlorosis on entire plant (may be more at bottom of plant)
• Necrosis
• Faded flower colors

Molybdenum deficiency (partially mobile)
• For ornamentals seen mainly on poinsettia (mid-plant)
• Clear chlorotic band around leaf margin
• Necrosis follows chlorosis inward
• On some vegetables (brassicas) young leaf distortion
Iron Deficiency (immobile)
- Intervenial or uniform chlorosis on younger leaves
- Chlorosis clears to yellow or white
- Necrosis

Manganese Deficiency (immobile)
- Chlorosis of younger leaves
- Tan flecking

Iron Vs. Manganese
Intervenial or uniform chlorosis on younger leaves

<table>
<thead>
<tr>
<th>Fe</th>
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Calcium deficiency (immobile)
- Leaf distortion, chlorosis, necrosis, edge burn (tip burn)
- Incomplete flower formation
- Roots short, densely branched and thick
- Intervenial necrotic spotting
- Incomplete flower formation
- Roots short, densely branched and thick

Boron deficiency (immobile)
- Distorted shoot tips, death of growing tip, chlorosis, necrosis
- Incomplete flower petal formation
- Short internodes-rosetting
- Thick leaves
- Flower abortion, branching
- Incomplete flower stem formation
- Corking of leaf and petiole tissue
- Fewer shorter, thick branched roots
Calcium Vs. Boron

Ca
- Leaf distortion, chlorosis, necrosis
- Incomplete flower formation
- Roots short, densely branched and thick

B
- Distortion, chlorosis, necrosis
- Incomplete flower formation
- Roots short, densely branched and thick
  - Short internodes (rosetting)
  - Thick leaves
  - Flower abortion, branching

Copper deficiency (immobile)
- Leaves roll and curl and develop a blue cast
- Variable chlorosis
- Rapid necrosis of young fully expanded leaves
- Smaller lighter colored flowers or none

Zinc deficiency (immobile)
- Leaves may roll
- Variable Chlorosis
- Rapid necrosis of young expanded leaves
- Small leaves and short internodes

Copper Vs. Zn
Young and recently mature leaves affected

Cu
- Leaves roll and curl and develop a blue cast
- Variable chlorosis
- Rapid necrosis of young fully expanded leaves
- Smaller lighter colored flowers or none

Zn
- Leaves may roll
- Variable chlorosis
- Rapid necrosis of young expanded leaves
- Small leaves and short internodes

Iron/Manganese toxicity
- Necrotic spots and marginal burn (geraniums)
- Necrotic specks and bronzed appearance (marigolds)
- Twisted appearance (new guinea impatiens)

Phosphorus toxicity in poinsettia
- Reduced plant growth
- Reduce bract size

Ammonium toxicity
- Chlorosis/necrosis of leaf margins and between veins
- Thick/leathery leaves
- Death of root tips

**Boron toxicity**
- Marginal chlorosis on lower leaves.
- Severe cases, the chlorotic areas turn brown and become necrotic and expand on most lower leaves

**Fluoride toxicity**
- Easter lilies and Dracaena species, and spider plants very sensitive
- Leaf tip and marginal necrosis
- Bract edge burn has been shown in poinsettia

**High soluble salts toxicity**
- Chlorosis of leaf tips and margins.
- Necrosis and browning leaf tips and margins
- Leaf edge burn