

**Plant Nutrition for Greenhouse Crops**  
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**Identifying nutrient disorders of greenhouse crops**  
**Geoffrey Njue, UMass Extension**

**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 CO<sub>2</sub>), H (water), O (air, water),
- Macro: N,P,K, Ca,Mg,S
- Micro: Fe, Mn, Zn, 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 abscission

**Phosphorus deficiency (mobile)**

- Deep green foliage
- Severe stunting
- Chlorosis then necrosis
- Possible purpling
- Roots longer and fewer

### **Nitrogen Vs. Phosphorus**

#### **N**

- Uniform chlorosis then necrosis on of older leaves
- Stunting
- **Early flowering**
- Possible red color
- **Leaf abscission**

#### **P**

- Chlorosis then necrosis of older leaves
- Severe stunting
- Deep green foliage**
- Possible purpling
- Roots longer and fewer**

### **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)**

- Interveinal 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

<b>Fe</b>	<b>Mn</b>
• Chlorosis	Chlorosis
• Chlorosis clears to yellow or white	<b>Tan flecking</b>
• Necrosis	Necrosis

### **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