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Nutritional Monitoring Series: Element Edition

Calcium (Ca)

Function: Calcium (Ca) is a major constituent of cell walls. Calcium is a non-mobile element and uptake occurs at the root tips.

Deficiency: Deficiency symptoms are expressed as death (necrosis) of growing points of terminal buds and roots (Figs. 1-4). Young leaves may be yellow (chlorotic) and have upward puckering of leaf



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Figure 1. An environmentally induced calcium deficiency results in leaf puckering and death (necrosis) of the leaves surrounding the flower bud. Photo by: Brian Whipker.

Calcium

Elemental Parameters

Immobile Element:
Deficiency symptoms appear on young growth

Function:
Cell walls

Target Fertilizer Range:
50 to 100 ppm Ca
Supplied from fertilizer or irrigation water

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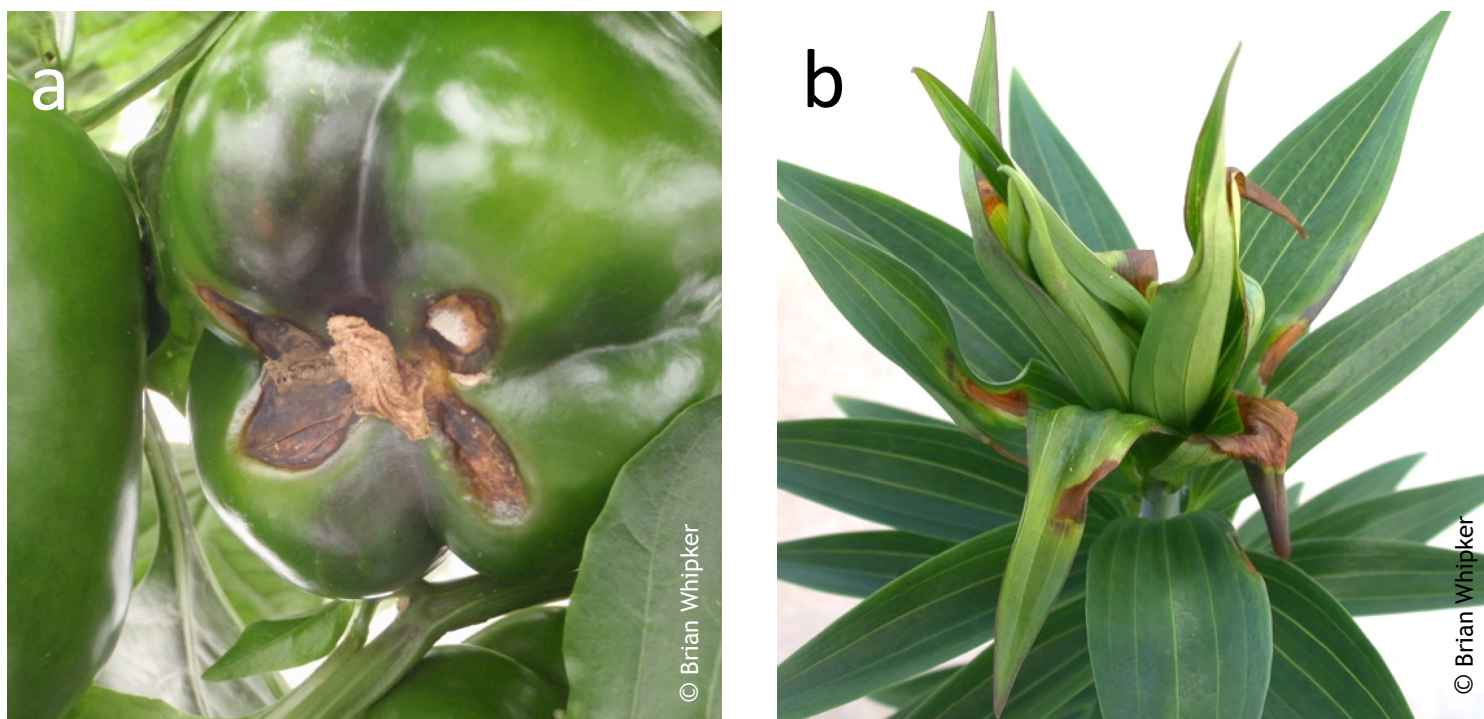


Figure 2. A calcium deficiency can result in (a) blossom end rot of greenhouse peppers or (b) leaf scorch of lilies. Photos by: Brian Whipker.

margins. Low levels of Ca have been linked to weak stems and the resulting stem breakage. The most common concern with poinsettias is leaf scorch and bract edge burn. It is important to correct Ca deficiency when symptoms first appear because leaf scorch or bract edge burn can not be reversed. Calcium is a non-mobile element within the plant, therefore deficiency symptoms will first appear on the upper, younger leaves.

Excess: Can reduce uptake of potassium (K), magnesium (Mg), or boron (B).

Misdiagnosis With:

- Pesticide phytotoxicity. If suspected, then review cultural records.
- Boron deficiency. Conduct leaf tissue analysis to determine levels.

Confirm your actual Ca levels by conducting a routine root substrate (medium) test and/or a plant tissue analysis.

Monitoring and Management Strategy for Calcium

Fertilization Rate: Provide or target 50 to 100 ppm constant liquid fertilization rate. For poinsettias follow the bract edge burn prevention guidelines listed below when bracts begin to color.

Ratio: Calcium fertilization rates >200 ppm can have an antagonistic effect on K or Mg uptake by the plant. Supplying the plants with a K : Ca : Mg ratio (ppm) of 4 : 2 : 1 will limit any antagonisms.

Tissue Concentration: Normal range of 0.5 to 1.75%. Levels below 0.5% are considered deficient in many species.

Options:

Preplant: Application of dolomitic limestone.

Irrigation Water: Calcium in irrigation water (test water to determine available levels) Supplement with additional Ca in your fertilization program.

Continual Fertilization:

1. Use a fertilizer that provides Ca. Examples include calcium nitrate $[\text{Ca}(\text{NO}_3)_2]$, 13-2-13 Cal-Mag, 15-5-15 Cal-Mag, and others. Calculate the desired ppm of Ca provided and make supplemental Ca applications if required.

2. Common fertilizers like 20-10-20 and 20-20-20 do not provide Ca [or magnesium (Mg)]. If using 20-10-20 or 20-20-20, alternate every third fertilization with calcium nitrate $[\text{Ca}(\text{NO}_3)_2]$ at 200 ppm of Ca. Also, apply supplemental Mg (refer to the Mg elemental factsheet).

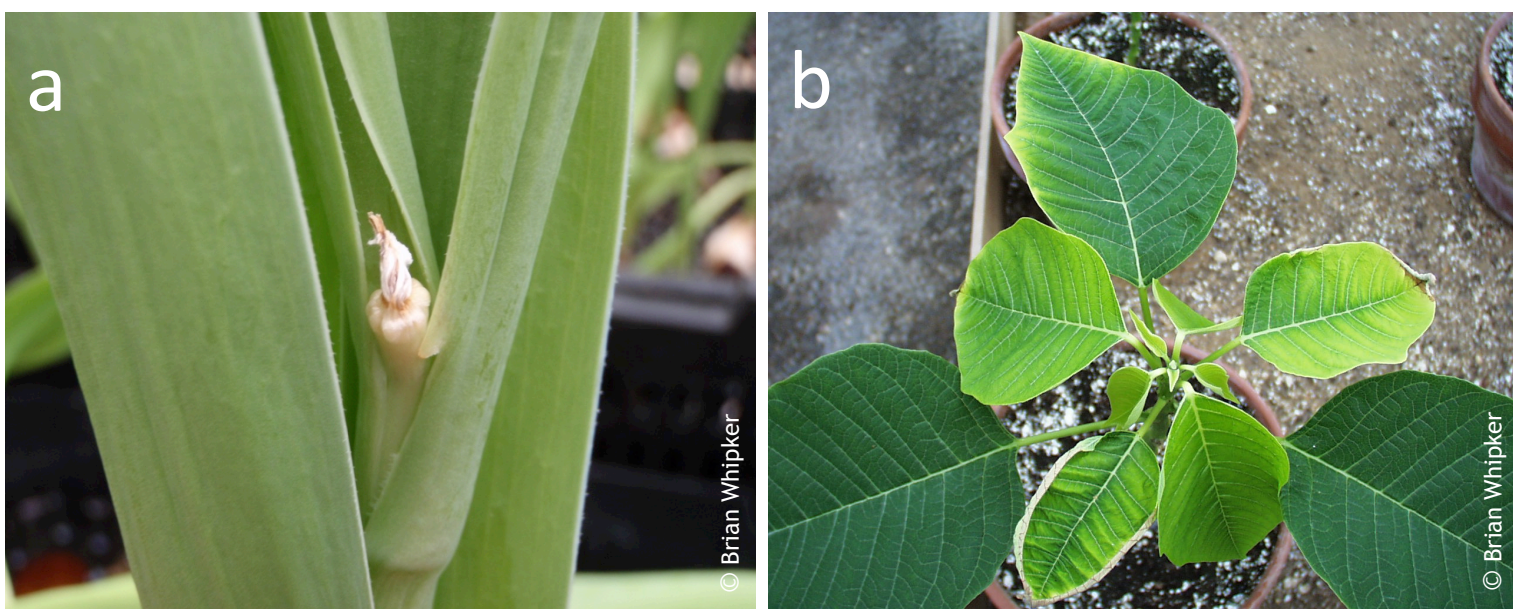


Figure 3. Flower die back in tulip (a) or (b) leaf edge burn in poinsettias can also occur if calcium levels are too low. Photos by: Brian Whipker.

Corrective Fertilization:

1. Supplemental applications of calcium nitrate $[\text{Ca}(\text{NO}_3)_2]$ at 200 ppm of Ca. Visible improvements with the use of the corrective Ca fertilization should be evident on the new growth within 2 to 3 weeks. Do not over apply. It is important to correct Ca deficiency when symptoms first appear because leaf scorch, bract edge burn, or leaf necrosis can not be reversed.

Additional: Remember that Ca uptake into the plant and transportation within the plant is through the water flow, so promoting good root growth so water uptake can occur and good shoot growth that aids in transpiration will assist in Ca uptake. Excessive humidity will also negatively affect Ca uptake. Increased proportions of blue LED lighting can cause Ca deficiency.

Poinsettia Bract Edge Burn Prevention:

Start weekly applications of calcium at 400 ppm from when bracts begin to color and bracts are still expanding until pollen shed. Spray enough to just wet the bracts. Apply early morning or late afternoon. Avoid applying when temperatures are above 80°F (27°C). Consider using reagent grade chemicals to assure purity and avoid possible leaf burn, especially on the bracts. A spreader sticker such as Capsil aids with calcium uptake (0.63 ml per liter, or 2.4 ml per gallon), but should not be used more than once a week.

Option A. Calcium chloride ($\text{CaCl}_2 \cdot 2 \text{H}_2\text{O}$): Mix 1.47 grams per liter, or 5.6 grams per gallon, or 0.196 oz per gallon.

Option B. Calcium nitrate ($\text{Ca}(\text{NO}_3)_2 \cdot 4 \text{H}_2\text{O}$): Mix 2.36 grams per liter, or 9.0 grams per gallon, or 0.31 oz per gallon.



Figure 4. Leaf tip burn on lettuce (a and b) due to a deficiency of calcium. Photos by: W. Garrett Owen.

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