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Poinsettia Fertilization:
Sulfur Deficiency

Initial symptoms of sulfur deficiency appear as an overall pale-green to yellow discoloration of the middle part of the plant. The lower foliage will remain dark green.
Click to view YouTube summary: Poinsettia Sulfur

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An often forgotten essential element is sulfur. Many times, it is already provided by the irrigation water or via air pollution. Sulfur can also be provided as part of the fertilizer charge in the substrate or through supplemental fertilizations.

While sulfur deficiencies are infrequent, incidences have occurred over the last few years. To make you aware of the disorder, identification of sulfur deficiency and management strategies are discussed in this e-GRO Alert.

Figure 1. The initial symptoms of sulfur deficiency appear as an overall yellowing. Discoloration begins in the middle of the plant and moves upward.

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Sulfur is an often overlooked element when it comes to plant nutrition. The sulfur content is not listed on most fertilizer bags. Substrate and tissue recommended ranges for sulfur does not exist for most crops.

Often considered a "me too" element because historically adequate levels have been provided via air pollution. Sulfur deficiency is still rare, but I am surprised it does not appear more often in greenhouses, especially as the electrical generation industry has shifted to low sulfur containing coal. Predictions of increased sulfur deficiency problems is not new. In the 1964 book "Sand and Water Culture Methods Used in the study of Plant Nutrition", E.J. Hewitt predicted an increase incidence of S deficiency in the UK as diesel powered railroad engines replaced coal fired ones.

Symptoms

What do symptoms look like? Sulfur deficiency appears as an overall, uniform, chlorosis (or yellowing) of the middle to top foliage. Typically the lower leaves remain darker green. This offers the ability to differentiate the problem based on visual symptoms.

Sulfur and iron deficiency occur on the upper foliage, while N deficiencies occur first on the lower foliage. Confirmation of the diagnosis can be done with either a substrate or tissue test.

Iron deficiency induced by high substrate pH initially appears as an interveinal chlorosis of the upper leaves. Basically the veins remain green while the area between the veins turn yellow. With advanced conditions, plants can develop an overall yellowing over time. Confirmation of the diagnosis can be done with a substrate test for pH. Typically the pH would be >6.5 for iron deficiency to occur.

Nitrogen deficiency begins as an overall yellowing of the bottom foliage. As symptoms become more severe, it moves up the plant and lower leaves typically abscise (fall off). Confirmation of the diagnosis can be done with either a substrate or tissue test.

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Figure 2. As symptoms progress, yellowing moves upward. Typically the lower foliage will remain a normal green color.

Figure 3. Close up of pale green to yellow leaves.

Remember: yellowing bottom up, think N deficiency; yellowing top down, think S deficiency.

Management

How does a sulfur deficiency occur? Supplemental Ca and Mg applications are typically provided to poinsettias. Cal-Mag formulas are an excellent choice. To avoid the risk of precipitation with sulfates, Mg in Cal-Mag formulas are typically provided by $MgNO_3$, and not by $MgSO_4$. Therefore little if any additional S is supplied by the fertilizer.

In a few cases in North Carolina, the grower relied upon a Cal-Mag fertilizer to provide supplemental Mg. After 4 to 6 weeks of growth, the S available from the substrate ran out. With no additional S, a deficiency occurred.

How do you avoid S deficiency problems? Water test to determine if S levels are sufficient. If not, make monthly applications of $MgSO_4$ by mixing 1 pound per 100 gallons of water and applying it as a drench to pots with a 10 to 20% leaching fraction.

It is also a good idea to conduct periodic substrate tests to confirm sulfur levels. The target S levels in the substrate should be between 50 to 100 ppm based on the saturated media extraction method.

How do you correct a sulfur deficiency? Apply a drench with a higher rate of $MgSO_4$ by mixing 2 pounds per 100 gallons of water and drench the pots with a 10 to 20% leaching fraction.

As a side note, for the majority of the plants in these photographs, they greened up within 2 weeks after the corrective drench was applied.

Summary

The sulfur requirements of plants are often overlooked. If your irrigation water contains insufficient levels of S, consider making monthly supplemental applications of $MgSO_4$ to avoid problems.

Table 1. Corrective procedures for overcoming sulfur deficiency of poinsettias.	
Correction Steps – take these steps when problems occur	**Notes**
a. Determine via substrate, fertilizer solution and tissue analysis if there is a problem of insufficient S being supplied or a problem with waterlogging of the root system. b. Provide 1 or 2 corrective application(s) of water soluble magnesium sulfate (1 to 2 pounds per 100 gallons of water [119 to 238 grams per 100 liters of water]). Atmospheric SO2 from industrial activities may supply sufficient levels of S. c. After making the corrective application(s), retest the substrate to determine if the plant is now receiving sufficient S levels.	MISDIAGNOSED OR CONFUSED WITH: a. Nitrogen deficiency – although the overall chlorosis symptoms are similar, N deficiency occurs on the oldest leaves. (Conduct leaf tissue analysis to determine levels.)