e-GRO Alert
Volume 4, Number 38 November 2015

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Christmas Cactus: Phylloclade Yellowing and Necrosis

Christmas cacti are sensitive to low substrate pH conditions, which can lead to phylloclade chlorotic blotches and necrosis. Learn how to diagnose the situation and take corrective actions.

A group of Christmas cacti (*Schlumbergia* spp.) were observed in a greenhouse with mature phylloclade having chlorotic blotches (Fig. 1) and necrosis (Fig. 2). Based on the symptoms, my initial thought focused on the possibility of an iron (Fe) deficiency (Fig. 3), but the symptoms were not occurring on the upper foliage.

I have only conducted flower enhancement studies with Christmas cacti, so I do not have much experience with nutritional disorders. Iron deficiency can be a problem if the substrate pH is too high (>6.5). It is also reported that Christmas cacti have a high demand for magnesium. The symptoms were similar enough that a magnesium deficiency could be a possibility. On the opposite end of the pH spectrum, iron and manganese toxicities are reported if the substrate pH is too low.

Figure. 1. Mature phylloclade having chlorotic blotches. (Photo by B. Whipker, Copyright)

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Figure. 2. Mature phylloclade having chlorotic blotches and necrotic spotting. (Photo by B. Whipker)

Plants were tested using the PourThru technique and the substrate pHs of the tested plants ranged from 4.4 to 4.7. This clearly implicated a low substrate pH problem.

This range is lower than the 5.5 to 6.5 recommended by Dole and Wilkins for Christmas cactus. Concern over low substrate pH induced iron and manganese toxicities, resulted in Dr. Harvey Lang to revised the optimal substrate upward to a narrower 6.0 to 6.5 range. Dr. Lang conducted a number of experiments while at Texas A&M investigating low pH problems of Christmas cactus.

Figure. 3. Young phylloclade having chlorois (interveinal chlorosis) due to an elevated substrate pH above 6.5. (Photo by B. Whipker)

For most floriculture crops, low pH problems begin to occur at levels lower than 5.4, with the majority of symptoms being evident at pH 4.8 or lower. Therefore I am in agreement with increasing the lower recommended range. Rarely are symptoms of low substrate pH induced iron and manganese toxicity occurring at pH 5.8. I have observed elevated substrate pH induced iron (Fe) deficiencies when the pH is above 6.5, so in my opinion the upper target limit for the substrate pH should be <6.3. Therefore, when conducting in-house pH testing of Christmas cactus, the recommended pH range can be slightly wider and be between 5.8 and 6.3. When the substrate pH enters the range of 0.2 pH units lower or higher of the optimum is when corrective procedures should be implemented.

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To confirm the diagnosis a tissue sample was taken from the affected plants and analyzed for nutrient levels at the Agronomic Division Lab of the North Carolina Dept. of Agriculture (Table 1). The sample was collected from the foliage that exhibited leaf chlorosis and necrosis. Analysis of the sample detected an iron (Fe) concentration of 538 ppm. This was almost 5X times higher when compared to the general recommended range for iron (based on the values reported by Dole and Wilkins, while only ~2X higher than the values reported by Creswell and Weir). Manganese concentration was 359 ppm, which is almost 3X higher than the range recommended by Dole and Wilkins (although only ~50 ppm higher than the range recommended by Creswell and Weir).

The substrate pH should be monitored during production of Christmas cacti to avoid low or high pH levels. Corrective procedures for low pH include the application of hydrated lime, flowable lime, or potassium bicarbonate. Application details are provided in e-GRO Alert 4.02.

Table 1. Leaf tissue nutrient analysis results for Christmas cacti (*Schlumbergia* spp.).

Element	Most Recently Matured Leaves From Flowering Plants[1]	Most Recently Matured Leaves From Flowering Plants[2]	Tissue Sample With Lower Leaves With Chlorotic and Necrotic Symptoms
Nitrogen (%)	2.7-3.7	2.8-4.5	2.68
Phosphorus (%)	0.5-0.9	0.6-1.0	0.48
Potassium (%)	6.2-7.0	4.9-6.0	3.93
Calcium (%)	0.7-0.9	0.8-1.5	0.70
Magnesium (%)	1.6-2.2	0.4-1.0	1.93
Sulfur (%)	Not reported	0.25-0.5	0.46
Sodium (%)	Not reported	0.10	Not reported
Iron (ppm)	105-110	75-300	538
Manganese (ppm)	35-130	60-300	359
Zinc (ppm)	50-65	25-100	70.7
Copper (ppm)	10-15	10-30	14.9
Boron (ppm)	65-70	20-50	29.7

Sources:

[1] Dole and Wilkins, 2005. Floriculture Principles and Species.

[2] Creswell and Weir, 1997. Plant Nutrient Disorders 5: Ornamental Plants and Shrubs.

Figure. 4. Overview of a plant with low pH induced iron and manganese toxicity. (Photo by B. Whipker)

Figure. 5. Sympotoms did not readily develop on all cultivars (plant on right). (Photo by B. Whipker)