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St. John's Wort: Lower Leaf Necrotic Spotting

Low substrate pH can lead to symptom development on the lower leaves of sensitive species. On St. John's Wort, these symptoms included a dark necrotic spotting, marginal bronzing, and tip necrosis in advanced cases.

Monitoring substrate pH is an important step in growing a healthy crop. This is especially true for plant species that are sensitive to low pH and develop symptoms in response to sub-optimal pH values (typically lower than 5.2). Common symptoms include necrotic spotting, chlorosis, and marginal necrosis of the lower leaves. These symptoms are a result of iron (Fe) and manganese (Mn) toxicity, as these elements become available in excess at low pH (Pilon, 2006).

A crop of St. John's Wort (*Hypericum perforatum*) was recently observed with the typical symptoms associated with low pH (Fig. 1). These symptoms were a black spotting and marginal bronzing of the lower leaves while the upper foliage remained green and healthy (Fig. 2). In more advanced cases, the tips of symptomatic leaves were necrotic (Fig. 3).

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Figure 1. Symptoms of necrotic spotting and marginal bronzing on the lower leaves could be seen on a number of plants throughout the crop.

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Figure 2. These symptoms only affected the oldest leaves. The younger growth appeared vigorous and healthy.

These symptoms indicated that the substrate pH was low, so a PourThru test was done to determine if this was the case. The pH was 6.5 and the electrical conductivity (EC) was 1.24. This pH was actually on the high end, contradicting the initial diagnoses of low substrate pH. Since the PourThru test did not confirm our suspicions, we collected tissue samples from several plants throughout the crop. Symptomatic leaves were collected to determine the foliar nutrient concentrations. The tissue concentrations of Fe and Mn were excessively high at 1090 and 2400 ppm respectively, confirming a toxicity of these two elements (Table 1). Although specific tissue nutrient recommendations are not available for St. John's Wort, these values are at least 2 - 3x higher than maximum range for most crops.

This particular grower had been struggling with low pH in several crops, and had applied corrective measures to raise the pH. It was likely that this crop had been suffering from low pH, but a recent lime application had increased the pH to 6.5. The new growth appeared vigorous and healthy, indicating that the crop was growing out of this issue. Tissue analysis confirmed that this problem was a low pH induced Fe and Mn toxicity.

Management

Monitor St. John's Wort to make sure that the substrate pH is within the recommended range for most perennials of

5.8 to 6.2. Limiting or reducing other sources of plant stress will also help to prevent these symptoms.

Corrective Procedures

Corrective procedures for low pH are listed below. Switching to a basic fertilizer when the substrate pH is nearing the lower limit will help stabilize the pH. If the pH is below the recommended range, then corrective procedures will need to be implemented. Flowable lime is one option. Typically, a rate of 2 quarts per 100 gallons of water will increase the substrate pH by roughly 0.5 pH units. The flowable lime may be applied using a fertilizer injector. Additional applications can be made if needed.

Potassium bicarbonate can also be applied. The rate of 2 pounds per 100 gallons of water will increase the substrate pH by roughly 0.8 pH units. This treatment will also provide excessive amounts of potassium and cause a spike in the substrate EC. The day following a potassium bicarbonate application, a leaching irrigation with clear water is required to restore the nutrient balance (the ratio of K:Ca:Mg) and lower the EC level. As always, remember to recheck your substrate pH to determine if reapplications are needed.

Flowable Lime

Use 1 to 2 quarts per 100 gallons of water.

Rinse foliage.

Avoid damage to your injector by using rates of 2 quarts per 100 gal of water, or less.

Can split applications.

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Figure 3. Tip necrosis could be seen on the oldest, most symptomatic leaves.

Hydrated Lime

Mix 1 pound in 3 to 5 gallons of WARM water.
Mix twice. Let settle. Decant liquid and apply
through injector at 1:15.

Caustic (rinse foliage ASAP and avoid skin
contact).

Potassium Bicarbonate (KHCO₃)

Use 2 pounds per 100 gallons of water.

Rinse foliage ASAP.

Provides 933 ppm K

Leach heavily the following day with a
complete fertilizer to reduce EC levels and
restore nutrient balance.

Rates greater than 2 pounds per 100 gallons
of water can cause phytotoxicity!

References

Epstein, E. and A. Bloom. 2005. Mineral Nutrition of
Plants: Principles and Perspectives. 2nd ed. Sinauer
Associates, Sunderland, MA. p. 400.

Pilon, P. 2006. Perennial solutions: a grower's guide to
perennial production. Ball Publishing, Batavia, IL. p. 546.

Table 1. St. John's Wort (*Hypericum perforatum*) tissue nutrient levels.

Element	Unit	Tested Values	Typical Ranges ¹
N	%	2.56	0.5 – 6.0
P	%	0.36	0.15 – 0.5
K	%	0.49	0.8 – 8.0
Ca	%	3.17	0.1 – 6.0
Mg	%	0.75	0.05 – 1.0
S	%	0.62	0.1 – 1.5
Fe	ppm	1090	20 – 600
Mn	ppm	2400	10 – 600
B	ppm	101	0.2 – 800
Cu	ppm	6.4	2 – 50
Zn	ppm	72.1	10 - 250

¹ Tissue nutrient concentrations were obtained from Epstein and Bloom (2005). No recommended nutrient ranges are reported for St. John's Wort.