BALLTECH ON DEMAND™

Ball Seed®

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TECH TRAINING:
PLANT HEALTH DIAGNOSTICS PART II: NUTRIENT DISORDERS

Nutrient deficiencies and toxicities commonly occur during commercial production when there are issues with the substrate pH, electrical conductivity (EC) or fertilizer management. First, identify and describe the observed symptoms and compare them with published descriptions. Then, check the current fertilization strategy and confirm the diagnosis with in-house nutrient monitoring techniques.

Tip 1: Compare Symptoms with Published Descriptions

- Nutrient disorders tend to be more uniform across a crop than biotic diseases.
- Marginal and interveinal chlorosis, stunting, reddening and distortion are all common symptoms.
    - Use the *Ball TOD Nutrient Disorder Diagnostic Key*.
- Deficiencies often occur on either the upper or lower leaves.
    - Lower leaf symptoms: Mobile nutrients (N, P, K, Mg).
    - Upper leaf symptoms: Immobile nutrients (Ca, B, Fe, Mn).
- Toxicity symptoms often occur on the lower leaves.

Symptoms of interveinal chlorosis on petunia due to high pH induced iron (Fe) deficiency.

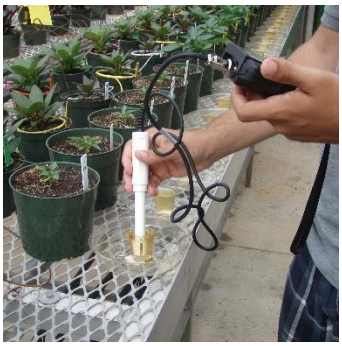
Tip 2: Check the Current Fertilization Strategy

- Does the fertilizer make sense for the species?
    - For example: Using an acidic fertilizer for low pH loving species like petunia or using a Cal-Mag analysis for crops prone to Mg deficiency.
- Is water quality being considered?
    - If alkalinity is high, acid injection should be considered.
    - Consider the impact of the fertilizer analysis being used.
- Ensure fertilizer injectors are calibrated and set to the intended injection ratio.
    - Test the hose-end EC to check the fertilizer concentration.

Double check injection ratio and stock tank mixing rates. Calibrate injectors and test diluted EC.

Tip 3: Confirm with In-House Nutrient Monitoring

- Use a pH / EC meter to determine substrate values.
    - *Conduct a PourThru or 1:2 Dilution*. See video.
- Compare values with published ranges.
    - Implement corrective procedures if pH or EC are outside the recommended ranges.
    - Keep supplemental fertilizers, acid, and liquid lime on hand to correct issues.
- When in doubt, send samples out for lab-based analysis.
    - Tissue, substrate and water tests are helpful tools.



The PourThru method is a quick and easy way to check substrate pH and EC.

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Nutrient Deficiencies. While plants may develop deficiencies to any of the essential macro- or micronutrients, nitrogen (N), phosphorus (P), magnesium (Mg) and iron (Fe) deficiencies tend to be more common. Boron (B) and calcium (Ca) deficiencies can also occur but tend to be environmentally driven (cold temperatures, high humidity and poor air movement) or can be more common for a particular species. Deficiencies of potassium (K), sulfur (S) and most micronutrients are relatively uncommon if a complete fertilizer is being used.

Nutrient Toxicities. In many cases, nutrient toxicities occur when the pH is out of balance. The best example of this is when Fe and manganese (Mn) hyperaccumulate in the lower leaves when substrate pH is low, and these micronutrients become excessively available for plant uptake. In other cases, toxicities are simply a result of overfertilization, which can easily be checked by measuring substrate electrical conductivity (EC).

pH Imbalances. Deficiencies and toxicities are often the result of a pH imbalance in the substrate. High pH typically leads to micronutrient deficiencies with Fe deficiency being most common. In contrast, low pH often leads to toxicities of Fe and Mn due to greater availability. While nutrient disorders are often the direct result of an imbalance of the substrate pH or EC, these imbalances can occur due to improper alkalinity management or using a suboptimal fertilizer analysis given a particular species and water quality. For instance, using a basic fertilizer like 13-2-13 with high water alkalinity can result in high substrate pH and lead to Fe deficiency.

In-House Nutrient Monitoring. Investing in a pH and EC meter is an inexpensive way to obtain tangible data and make informed decisions on fertility management. The PourThru and 1:2 Dilution methods are quick and easy to perform with published ranges to compare with. Check out Nick Flax's video detailing the process. Other online resources including Fert, Dirt, & Squirt and e-GRO offer fact sheets and tutorials to aid with in-house nutrient monitoring on a crop-specific basis. If in-house testing proves inconclusive, consider sending substrate, tissue or water samples to your preferred diagnostic laboratory and compare with published values.

Corrective Procedures. In many cases, nutrient disorders can be corrected by adjusting the pH or fertilizer rate. High pH can be corrected by injecting acid or switching to an acidic fertilizer like 20-10-20. Low pH can be corrected by reducing acid injection, switching to a basic fertilizer like 13-2-13 or drenching with liquid lime. Potassium bicarbonate can also increase pH but can cause salt damage due to high concentrations of potassium. Increasing or decreasing the fertilizer rate is a simple way to correct EC imbalances. Occasional clear water drenches can also flush excess salts.

In summary. If the diagnostic process points to a likely nutrient disorder, implement corrective procedures as required. Become familiar with common nutrient issues and use in-house nutrient monitoring to help inform fertility management decisions. Lastly, remember to use university and industry resources to assist in diagnostics and maintain plant health through optimal nutrition.

For more information, check out these additional resources:

Ball Tech on Demand. General Nutrient Disorders Diagnostic Key.
Fert, Dirt, & Squirt. Monitoring pH & EC of Greenhouse Crops.
University of New Hampshire. Scouting & Managing Greenhouse Nutrient Problems.