BALLTECH ON DEMAND™

Ball Seed®

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TECH TRAINING:
INTERPRETING IRRIGATION WATER QUALITY REPORTS

Irrigation water quality plays a critical role in influencing plant nutrition, substrate chemistry and overall plant growth. Conducting annual water tests is a simple and cost-effective practice that helps ensure that irrigation water quality meets the necessary standards for producing healthy crops. This document provides guidance on how to properly collect water samples, interpret water quality reports and take corrective actions when water quality falls outside of recommended parameters.

Tip 1: Know How to Take Samples

- Take samples annually from each water source.
  - For example, pond, well or municipal water sources.
- Sample both raw and treated water.
  - Verify current water treatment efficacy.
- Run water for 2 to 3 minutes before collecting samples.
  - Flush stagnant water from the lines.
- Collect samples in clean plastic bottles with tight fitting lids.
- Label and send samples (with appropriate forms) *within 24 hours* to a lab for testing.

Plastic bottles for water sampling should be clean with a tight-fitting lid.

Tip 2: Recognize the Important Factors on a Report

- Alkalinity, electrical conductivity (EC) and specific nutrient levels are paramount.
  - Alkalinity represents buffering capacity and should be between 60 and 80 ppm $CaCO_3$ for propagation or 80 to 140 ppm $CaCO_3$ for finished production.
  - Sodium (Na) and boron (B) toxicities can be common issues.
    - Na should be < 40 ppm and B should be < 0.5 ppm.
  - EC should be < 0.75 mS/cm for propagation and < 1.5 mS/cm for finished production.

EMW-400 : Water Irrigation Suitability		
Components		**Results mg/L**
MAJOR CATIONS		
Potassium	K	3.70
Calcium	Ca	49.57
Magnesium	Mg	23.22
Sodium	Na	4.74
MAJOR ANIONS		
Phosphate	PO4	0.63
Sulfate	SO4	9.94
Chloride	Cl	11.00
Bicarbonates	HCO3	226.35
Carbonates	CO3	0.00
Ammonium Nitrogen	NH4-N	ND
Nitrate Nitrogen	NO3-N	3.20
pH	pH	7.43
Soluble Salts	EC	0.42
Total Alkalinity	CaCO3	185.54
Iron	Fe	0.01
Manganese	Mn	0.01
Boron	B	0.04
Copper	Cu	0.02
Zinc	Zn	0.08
Molybdenum	Mo	0.01

Example of a water quality report showing different components and their associated values.

Tip 3: Take Corrective Actions if Necessary

- If values fall outside recommended ranges, know the proper corrective actions to take.
  - **For high alkalinity**, add or increase acidification, or use an acidic fertilizer like 20-10-20.
  - **For low alkalinity**, decrease acidification or use a basic Cal-Mag fertilizer like 13-2-13.
  - If Na or EC is high, consider reverse osmosis (RO) or other water treatment.

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Water Sampling Procedures: Following proper water sampling procedures is essential for getting an accurate report from which decisions can be made and corrective actions may be taken. Samples should be taken at least annually from each water source being used. When collecting samples, allow the water to run for at least 2 to 3 minutes prior to sample collection to clear stagnant water from the lines. Water should be collected directly into a clean, tight-lidded plastic bottle and submitted to the lab *within 24 hours* with the appropriate forms required by the lab. Always remember to label each sample with a sample identifier, the water source, the date and your name or business name.

When to Sample: The time of year samples are collected can significantly affect water analysis values. For example, water samples taken from wells and irrigation ponds in late summer will often have higher salt levels, especially during dry years. This is because salts become more concentrated as the water supply diminishes and is not being replenished as frequently. In contrast, water samples taken at the end of winter or in the spring will have lower salt levels because salt concentrations are diluted by higher water volumes. These factors should be considered when interpreting water quality reports.

Alkalinity: Water alkalinity is one of the most important aspects of water quality due to its effect on substrate pH and subsequent nutrient availability. High alkalinity irrigation water will raise the substrate pH over time and make it more difficult to maintain optimal substrate pH. In contrast, excessively low alkalinity can cause substrate pH to drop over time, requiring the use of high nitrate Cal-Mag fertilizers to manage pH. High alkalinity is more common in most regions, and there are tools available such as AlkCalc from e-GRO that can help calculate the amount of acid injection needed to control alkalinity.

Nutrient Toxicities: Several elements including Na and B can accumulate in high concentrations in the water supply, causing nutrient toxicities in the plant. While Na tolerance varies among species, toxicity symptoms can be expected when irrigation water contains more than 40 to 50 ppm Na. High Na concentrations may require water treatment such as RO. Increasing nutrients that compete with Na for uptake such as calcium (Ca) or magnesium (Mg) can help alleviate the toxic effects of Na when concentrations are marginally high. Boron is an essential nutrient but the margin between deficiency and toxicity can be quite thin. Optimal B levels in the irrigation water are 0.5 ppm. Most nutrient toxicities will lead to similar symptoms of root burn, lower leaf necrosis, stunting and death.

Corrective Actions: When water quality reports indicate that values are outside of the recommended ranges, it is time to take corrective actions. When alkalinity is high, start injecting acids like sulfuric acid or increase your acid injection rate to bring alkalinity within optimal ranges for production. If alkalinity is too low, consider buffering the water with a Cal-Mag fertilizer to increase the Ca and Mg levels. When specific nutrients are in toxic ranges or EC is too high, it may require treatment with RO systems. While not a component of most irrigation water quality tests, there are also tests for biological organisms in the water. These tests can help determine if certain pathogens are present in the water and whether sanitizing agents such as bleach or hydrogen peroxide-based products should be used.

For more information, check out these additional resources:

University of Massachusetts Amherst. Water Quality for Crop Production.
GrowerTalks. A Taste of Water Quality.
GrowerTalks. Thoughts on Water Quality.