

Soil Test Interpretation and Recommendations

The information within this article was developed to serve as a quick reference for interpretation of floriculture soil tests by the University of Minnesota. In addition to supplying the recommended ranges for the various factors quantified in the soil test, some recommendations for common problems are also supplied. Specific recommendations for your situation can be obtained by calling me, John Erwin, at (612)-624-9703. Making sure you have both a recent water test as well as the soil test are recommended. It is very possible that you may receive the 'voice mail' system when you call. This means that either I am out of my office or am on another line. Always leave a message! I will return your call as soon as possible.

| Test Parameter or Nutrient | Recommended | Acceptable | Toxic |
|-------------------------------|-------------|------------|-------|
| pH | 6.2-6.8 | 5.8-7.2 | >7.6 |
| Soluble Salts (SS) | 80-140 | 50-150 | >150 |
| Nitrates (NO ₃) | 150-250 | 100-350 | >400 |
| Ammonium (NH ₄) | 0-10 | 0-15 | >15 |
| Phosphorus (P) | 10-15 | 5-20 | >80 |
| Potassium (K) | 50-100 | 30-120 | - |
| Calcium (Ca) | 50-200 | 25-300 | - |
| Magnesium (Mg) | 30-50 | 20-60 | - |
| Sodium (Na) | 10-40 | 5-60 | - |
| Iron (Fe) | 0.20-0.50 | 0.10-0.70 | - |
| Manganese (Mn) | 0.50-1.50 | 0.30-1.75 | - |
| Zinc (Zn) | 0.10-0.50 | 0.05-0.75 | - |
| Boron (B) | 0.05-0.25 | 0.02-0.50 | >1.00 |

Typical Problems

High pH - High pH is by far the most common problem in greenhouse media in the upper midwest. The best solution is to amend the water and/or fertilizer solution before it is applied to the pot! If pH is high, a one time quick method to drop the pH is recommended. The easiest way to do this is by adding acid to your water and drenching the media. The exact amount of acid which is needed to drop your media pH is difficult to determine; it varies with water source, and media and fertilizer composition. However, a 'rule of thumb' which has worked is to add 2.0-3.5 ounces of 75-85% phosphoric acid to 100 gallons of water (final solution) as a 1 time drench. In general, this will drop the media pH 0.5-1.0. Do not add more than this! Test media before attempting to adjust further.

High Soluble Salts - The easiest way to solve a high soluble salts problem is to 'leach' the media. Leaching is simply watering with clear water for an extended period of time. Remember that your pH will probably increase since water pH in the upper midwest is generally high.

High Ammonium - High ammonium levels can result in ammonium toxicity. High ammonium often results from using fertilizer which contains ammonium during a period of the year when both light levels and temperatures are generally lower. Ammonium toxicity is prevalent from October 15 to March 15. Ammonium tends to build up more easily in media which contain soils. Ammonium toxicity is aggravated by high pH, low potassium, and cool temperatures. If ammonium levels are high 1) stop using fertilizers which contain ammonium, 2) leach the media, 3) lower pH, and 4) increase the potassium content of the media.

Low phosphorus - Phosphorus levels can be increased rapidly by applying a 'starter' fertilizer high in phosphorus as a 1 time application. Generally if phosphoric acid is being injected into the water to modify pH, the phosphorus requirements for plant growth are met.

Low Potassium - Potassium deficiency is characterized by a yellow 'speckling' on the leaves. Increase the amount of potassium nitrate which is in your fertilizer mix. A potassium deficiency is aggravated by nitrate levels more than 3 x's that of the potassium level. Always try to maintain a potassium level 1/3 of that of the nitrate level.

High Calcium - High calcium usually suggests high water alkalinity. High calcium is usually not detrimental, however, it can aggravate a magnesium deficiency. Therefore, make sure that magnesium levels are as close to 1/3 that of the total calcium levels in a crop.

Low Magnesium - Magnesium leaches readily from a medium. Therefore, it is often necessary to add magnesium through continuous feeding or with regular single drenches. Drench a minimum of 1 time each month with magnesium sulfate (Epsom salts, $MgSO_4$) at a rate of 8 ounces/100 gallons. Alternatively, apply 2 ounces $MgSO_4$ /100 gallons water in a continuous liquid feed program. Do not mix magnesium sulfate and calcium nitrate together; they will react in the stock tank.

Low Iron, Manganese, and Zinc - Add a micronutrient source to your regular feed program or drench with a micronutrient source. A good time to do this is in combination with the monthly magnesium sulfate drench.

High Boron - High boron often results from a high boron content in your water source. Have the water source tested. It may be necessary to eliminate any micronutrient applications and/or use reverse osmosis to 'clean' your water. Leach with water.