Monitoring and Adjusting Soluble Salts and pH[1]

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Once the decision is made regarding the desired method for measuring soluble salts and pH, you will need to develop a system to record data. The collected data must be recorded in a readily usable format to be useful in an operational situation.

Method of Measurement

The methods of measurement will likely depend on factors such as how quickly the information is required; what number of plants is to be sampled; if individual salt readings are required; and what your budget is. The Virginia Tech Extraction Method, or pour-through method, offers several advantages including immediate readings of soluble salts and pH; low cost per sample once the equipment is purchased; corrections made to media, and immediately verified results . For measurement of individual nutrients, samples need to be forwarded to the soils lab at the University of Georgia. We recommend a combination of the two methods, where day-to-day measurements that require quick action be made with the pour-through method and the more detailed analysis that occurs occasionally be accomplished with the saturation paste method.

The procedures and equipment outlined in this paper is the pour-through method. With the saturation paste method you would not need the salt/pH meter and the readings for soluble salts would differ due to the difference in methodology.

Equipment Acquisition

If you choose to monitor soluble salts and pH with the VTEM pour-through method, consider purchasing a combination soluble salts/pH meter. Meters such as the Agri-meter AG6-pH are available from nursery supply companies (CASSCO, Ben Meadows, etc.). The combination salt and pH meter allows you to use a small amount of leachate for both measurements. Keep a supply of the standardized salt solutions and pH buffer solutions. These are necessary to check your meter and ensure that it is functioning correctly.

Sampling Technique

The sampling techniques used to measure soluble salts and pH can have a significant impact on the results. Whatever procedures you use, be sure to document and be consistent between crops and sample dates. This allows for comparison of data between crops and different sample dates. For simplicity, assume that the nursery has one water source (well water), one irrigation regime (over-head sprinklers), and one growing media (pine bark and sand). Select two or three of the major crops (in terms of units of production), and four or five containers of each variety for tracking. These containers should be labeled so the same containers are measured throughout the life of the crop. Monitoring the same container will reduce variation and require fewer samples. Different size containers of each cultivar should be treated as a separate crop, e.g. #1, #3, and #7 containers of *llex cornuta* should be treated as three separate crops.

Recording and Utilization of Data

The usefulness of the data will be influenced by the format used to record the information. Data collected on the backs of envelopes, paper towels, or scratch paper is subjected to disposal prior to use. The data should document the production history of each crop. It also needs to be displayed in a manner that allows for decision making after a brief glance over the data. The best format is usually a graphic display. A sample chart for recording data is shown in Figure 1. The data collection sheet records soluble salts and pH for each plant cultivar/ variety. Each production/potting date (spring, fall) represents a new crop.

[1]Fact Sheet H-93-016. Ornamental Horticulture Facts. The Cooperative Extension Service. The University of Georgia, Athens, GA 30602 U.S.A.

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The soluble salts chart has the optimum range for both salt sensitive plants (such as azaleas or liners) and general nursery plants (holly, daylily, etc.) crops using the VTEM pour-through method. You may wish to have only the optimum range for the crop being tracked. The optimum range would be different for the saturated paste method. The frequency of sampling is indicated along the “x” or horizontal axis of the chart. The sampling frequency will vary with the crop production time and expected fluctuations from cultural practices. However, for most situations the frequency of measurement should range from weekly to monthly.

For each crop determine the number of containers to be sampled. We recommend at least five plants from each block. The plants can be selected randomly from each of five locations forming an “x” pattern. As mentioned earlier, each plant should be labeled so the same plants can be tracked through the production cycle. The soluble salts readings for the three plants should be recorded on the chart as individual data points. Recording individual data points rather than the average of the three readings (which would be one data point for each sampling period) allows you to see the variation between containers. Recording data graphically allows you to see trends that are developing. For instance, soluble salts readings for three measurement periods may be within the optimum range, but they may gradually move above the optimum range. The graphic display allows you to take action to lower the salt level before it gets above the optimum range and results in plant chlorosis and loss of plant growth. A key consideration is that the data is displayed in a graphic format and placed in a highly visible area of the nursery so decision making is quick and easy.

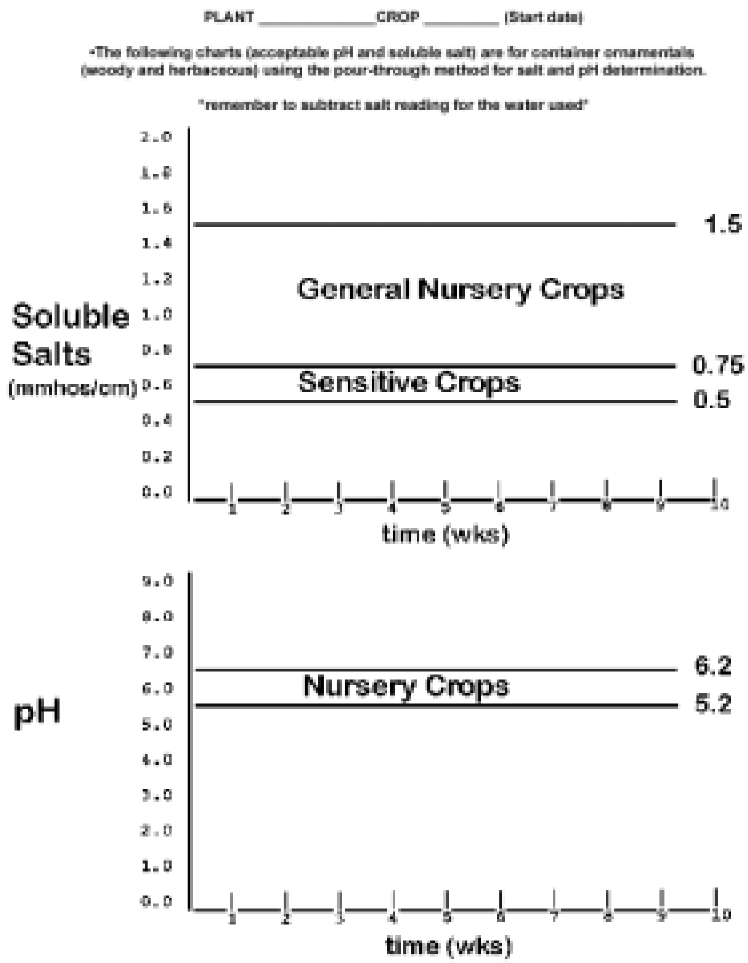
The pH chart contains the optimum pH range for nursery crops grown in pine bark and sand media. The optimum pH can vary with media type and the specific crop. The leachate sample obtained with the pour-through method can be used for both soluble salts and pH. As with soluble salts, it is important to look at the changes in media pH during the crop cycle and take corrective steps before the pH reaches above or below optimum levels and causes loss of crop quality and growth rate.

A flow chart showing the actions required to modify media soluble salt levels and pH is shown in Figure 2. If soluble salts are high, plants should be leached with a quantity of water equal to two container capacities (the amount of water a container with potting medium will hold after being saturated and allowed to drain is referred to a “container-capacity.” If soluble salt levels are low, it is time to reapply fertilizer based on the particular needs of the crop being grown. Time of year will often dictate when and how much fertilizer should be used.

When the pH of a growing medium is too high, acid injection is the quickest method to decrease the pH. Phosphoric, sulfuric or hydrochloric acids can be used to decrease the pH of a growing medium. Iron sulphate is effective as a topdress treatment (1 tsp/#1 container) or as a liquid drench (1 tsp/gal of water). Use of ammonium-nitrogen fertilizers will also help decrease the pH of a growing medium. When pH is low, dolomitic limestone is often incorporated into the growing medium (5-8 lbs/cu. yd). Dolomitic limestone supplies calcium as well as magnesium. If magnesium is not needed, calcium carbonate can be used. Hydrated lime (1-3 lbs/cu. yd) can be used as a topdress treatment to correct the acidity of a growing medium after the plants are potted. Hydrated lime should be used with caution as it is very caustic.

Growers of nursery and greenhouse crops should make every attempt to monitor regularly the pH and soluble salts levels in their growing media. This knowledge will allow you to make immediate decisions regarding fertility and leaching requirements and to reduce the frequency of nutritional problems.

FIGURE 1



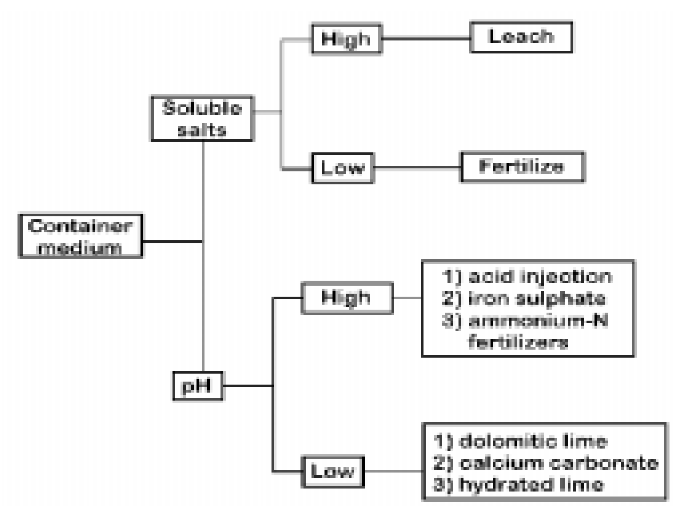


Figure 2. Corrective measures for adjusting soluble salt and pH problems.