

What Is Your Substrate Trying to Tell You

Part III

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This article is the third in a five-part series of articles on potting mixes and properties of potting mixes that are important for optimum plant growth. The goal of these articles is to provide you with some guidelines for chemical and physical characteristics of potting mixes. The words potting mix, container growth medium, and substrate are used interchangeably throughout these articles.

In the first and second articles, we reviewed chemical properties of soilless potting mixes, those being pH, electrical conductivity (EC), cation exchange capacity (CEC), and carbon to nitrogen (C:N) ratio. In this article, I will describe three methods used to measure pH and EC. You can have major impacts on plant growth by monitoring and controlling both of these characteristics in your potting mixes.

Methods Used to Measure pH AND EC

I have written about the four chemical properties that a grower should analyze when getting ready to use a potting medium. The question is, can you as a grower complete any of these analyses yourself? If so, which ones? Perhaps the simplest tests that growers could complete themselves are pH and EC determinations. Relatively good equipment needed for each test can cost between \$100 and \$1,000, with quality meters available for around \$200. Various nursery and greenhouse supply companies sell different types and qualities of meters. Just remember the old saying that usually holds true in situations when buying any type of product, “you get what you pay for”.

The next question to ask is how will the pH and EC of the potting mix solution be measured. A number of techniques can be used, but I will describe just three of them. The first is the Saturated Extraction Method (also called saturated paste extraction), which is an older but still highly used method. The Virginia Tech. Extraction Method (also called the Pour-through Method) has been around for 10 or more years and is the second technique that will be covered. The third method involves using the Soil Moisture Sampler, and this method is somewhat new to this country. I will briefly describe the advantages and liabilities of each of these methods.

Saturated Extraction Method (SEM)

With this method, the potting mix is taken from the bin, pile or several pots, and just enough distilled water is added to saturate the medium. The potting mix is usually stirred to ensure that the entire medium becomes saturated. Free water should be absent from the top of the medium at the saturation point. The pH electrode can be stuck directly in the saturated medium, but the solution will have to be extracted from the medium to get an EC reading. For most soilless

mixes, extracting the solution is as simple as putting the saturated medium in gauze or cheesecloth, squeezing the sample, and catching the extract in a collection container. Vacuum filtration is needed for extracting the solution from saturated field soil.

Advantages of this extraction method include (a) this method is widely used, (b) growers have experience relating analyses to actual plant growth, and (c) results from this method can be compared between substrates composed of drastically different components. As with everything in life, this extraction technique has its liabilities too. These include (a) the person completing the analysis should have or obtain some experience deciding on the saturation point to get consistent results, (b) the medium must be removed from the container and subsequently extracted, (c) handling and extraction take time, and (d) controlled-release fertilizer particles can be ruptured when mixing water with the potting medium, causing erroneously high EC readings.

Pour-Through Method

This extraction technique was developed at Virginia Tech. University about ten years ago. With this method, a container with medium in it is elevated above a collection vessel suitable for collecting leachate from drainage holes. Enough distilled water or good quality tap water is added to the surface of the medium to collect 50 milliliters (ml) (about 2 ounces) of leachate from the pot. The moisture level of the container medium should be at or near container capacity BEFORE starting this method.

Probably waiting about two hours after watering the mix would be a good time to add the water for the analysis. For one-gallon or three-gallon containers, about 150 ml (5 ounces) or 350 ml (11 ounces) of water will need to be added to get enough leachate for analysis. At least three samples or containers should be tested. The leachate obtained by this method can be directly used in a variety of chemical tests.

Advantages of the method include (a) extraction and analyses can be done in the field, (b) time required for extraction is short and handling medium is unnecessary, (c) controlled-release fertilizer is untouched so that prills remain intact, and (d) specialized equipment for extracting the solution is unnecessary. Liabilities associated with this technique include (a) results from the test must be related to plant growth, (b) the moisture level in the medium should be similar each time the method is completed to obtain consistent results, and (c) water may channel in the medium (in other words pour straight through the mix), causing erroneous results. These disadvantages can be overcome as the person completing the extraction gains experience.

Rhizon Soil Moisture Samplers

The samplers are manufactured in the Netherlands. Although I am unfamiliar with this extraction technique, I have talked with a researcher at Rutgers University who has completed tests with the moisture samplers and likes using them for measuring pH and EC of potting mixes. The Ben Meadows catalog is one source of the samplers.

A sampler is a hydrophilic, porous polymer tube that is inserted vertically into a potting mix. Substrate solution diffuses into the sampler tube and is removed with a syringe. Substrate solution taken from the potting mix should be removed from the sampler at a consistent time based on the water content of the medium (for example, just prior to the plants needing watering

or two hours after watering). The solution obtained by this method can be used directly in a variety of chemical tests.

Advantages of this system include (a) the results correlate well with the Pour-through method, (b) problems with water channeling in the medium are avoided, (c) time required for extraction is short and handling potting medium is unnecessary, and (d) controlled-release fertilizer is untouched so that prills remain intact. Liabilities associated with the samplers include (a) results from the test must be related to plant growth, and (b) the moisture level in the medium should be similar each time the samplers are used to obtain consistent results.

When to Use These Extraction Methods

The method of extraction to use is your choice. Use the method which you feel most comfortable using. Once you decide on a method, however, use it to test pH and EC of a potting medium BEFORE you plant into it. You can or should also test pH and ECs after the crop is growing in a substrate by using any of these extraction techniques. After the crop is planted, pH can be checked once a month, and EC can be tested once every two weeks. The interval between testing depends on your schedule, the potting mix, and the crop.

In the next article, I will present methods you can use to control pH and EC of potting mixes. I will also describe physical properties of potting mixes and one way you can measure them. The final article of the series will contain some examples of physical and chemical properties of potting mixes made with paper sludge. If you have questions about information contained in this article, contact your local county extension educator or contact me (by phone: 208.885.6635 or by e-mail: btripepi@uidaho.edu).