Analyzing EC

EC (Electrical conductivity) the reciprocal of electrical resistivity, and measures a material's ability to conduct an electric current. The SI (International System of Units) of conductivity is S/m at 25 °C., unless otherwise qualified. 1 EC = 1 mS/cm

Temperature influence:

The conductivity of a solution is highly temperature dependent, therefore it is important to either use a temperature compensated instrument (ATC), or calibrate the instrument at the same temperature as the solution being measured. As the temperature of a solution increases, the mobility of the ions in the solution also increases and consequently this will lead to an increase in its conductivity. Therefore it is mandatory to always associate conductivity measurements with a reference temperature of 25° C. (standard temperature), unless otherwise qualified.

Comparing results of EC methods:

There are different methods of analyzing the EC-value of potting soil. Each with its advantages and disadvantages. The more controlled and reliable, the more useful as a comparative tool, but of course the more simple and fast methods are the most easy to use in the field. To be able to make use of EC-values in regulating soil and plant life, it is very important to know that all analyzing methods have their own results, which are not interchangeable. The amount of water used to extract plant-available nutrients and other details of the analyzing methods can give large differences in results. Always use the interpretative data that match the analyzing method you used, otherwise you could make an incorrect interpretation of the results. Therefore each EC-value should always state the analyzing method to make it a useful value for the reader.

Soluble salt levels determined by a few of the different analyzing methods:

1:2 Method	SME	PourThru	Indication for plant
0-0.03	0-0.8	0-1.0	Very low
0.3-0.8	0.8-2.0	1.0-2.6	Low
0.8-1.3	2.0-3.5	2.6-4.6	Normal
1.3-1.8	3.5-5.0	4.6-6.5	High
1.8-2.3	5.0-6.0	6.6-7.8	Very high
>2.3	>6.0	>7.8	Extreme

Optimizing soil analysis:

Collect samples which best represent the nutrient status of the crop or the problem to be diagnosed. First identify the crop unit(s) to be sampled (bench, greenhouse, etc). In a mixed greenhouse, crops of different species must be sampled separately for the tests to have any value. For diagnosing a problem, it is best to have a sample from both normal and abnormal plants for comparison.

To sample, from each crop unit at least 5 pots or flats should be chosen at random. Those 5 are mixed into one sample analysis per crop unit, this way representing the crop as a whole.

For the volume testing methods (1:1.5 or 1:2) and SME method, the actual soil sample is taken by either a core or composite sample from all depths in the pot or from the root zone only. Never sample from just the surface as nutrient and soluble salt levels will always be much higher here than in the root zone and composite samples. As a result CE-levels would be higher and fertility would be overestimated.

Sample about 1-2 hours after fertilizing or at least on the same day. If slow-release fertilizer pellets are present, try to pick them out. If the pellets are left in and they break during testing this may result in an overestimation of fertility.

Be consistent in all sampling procedures each time you sample. A lot of variability can be introduced to tests due to inconsistent sampling. The value of analyzing will diminish with such variability, especially if you are trying to track fertility.

1:1.5 volume method for potting soil:

The potting soil is brought at a prescribed water content by adding demineralised water up to the level where the solution just can be pinched through the fingers. A defined volume of this potting soil is extracted by filling it into a cylinder up to a defined level under a defined compression. The extracted potting soil is thoroughly mixed with exactly 1.5 times the volume of the cylindrical level of the potting soil. The EC-level of the mixture is measured with calibrated EC measurement equipment.

Advantages of the method:

- very accurate and reliable
- high consistency in repeated measurements provide good comparative results

Disadvantage of the method:

- necessity of accurate handling and specialized instruments
- more time consuming and difficult in the field

In professional horticulture this method is popular because of its accuracy, reliability and consistency. Depending on region, application or horticulturist, several varieties of this method are being used (for example 1:2 method, 1:5 method), of course all with their own non-interchangeable results but with the same consistency.

1:2 volume method for potting soil:

In this test an air-dried sample of soil and water are mixed together in the volume ratio of 1 part soil to 2 parts water (using a measuring cup). The liquid extract is then separated from the solids using laboratory grade filter paper or a common coffee filter. The extract is then ready for analysis. This is a very

easy test to master and quite suitable for on-site greenhouse testing of pH and soluble salt using the so-called pH and EC "pens" available from greenhouse suppliers. The 1:2 method is a very good choice for occasional pH and soluble salts testing by growers on-site.

PourThru method (also called drain method):

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 is added to the surface of the medium to collect 50 milliliters (ml) of leachate from the container medium. The moisture level of the container medium should be at or near container capacity before starting this method. At least 5 samples or containers should be tested.

Advantages of the PourThru method:

- extraction and analyses can be done on-site
- plants do not have to be sacrificed or disturbed for testing
- time required for extraction is short and no preparation of medium
- specialized equipment for extracting the solution is unnecessary

Disadvantage of the PourThru method is mainly a poor liability, as:

- the moisture level in the medium should be exactly similar each time
- water may channel in the medium causing erroneous results
- variety in ml. of water poured through

The PourThru Method is best used for continuous monitoring and graphical tracking of pH and soluble salts. An irrigation and leachate protocol must be established and carefully followed to make this method work best. This method is not a good choice for casual checks (use volume method for this) as the "numbers" are often quite variable, inconclusive, and probably unreliable.

Squeeze method:

With this method, irrigate the substrate with diluted water until it is thoroughly wet. Sample substrate from at least 5 plug trays and mix the sample to ensure uniformity. Place the collected sample in a paper towel

(cheesecloth) and squeeze the solution from the substrate into a cup. Measure the EC directly in the extracted solution.

Advantages of the method:

- more representative as no subjective addition of the correct amount of water is involved
- extraction and analyses can be done in the field
- simple and fast
- specialized equipment for extracting the solution is unnecessary

Disadvantage of the method is mainly a poor liability, as:

- variety in water wetness of medium, gives other results
- variety in squeezing gives other results

Saturated Media Extract (SME):

In this test a saturated paste is made using a representative sample of the media and deionized water. After 90 minutes, the liquid portion (the extract) is separated (filtered under suction) from the solid portion for pH, soluble salt, and nutrient analysis. Special skills and laboratory equipment are required to perform this test. SME is probably not suitable for a grower to use, unless the greenhouse operation is large enough to support a lab, to have a technically trained person to carry out the tests, and with a commitment to frequent testing and tracking of the results