

Testing the Soil Conductivity

Total dissolved solids (TDS) instruments which determine the dissolved solids in water are basically water conductivity measuring instruments. The quantity of dissolved solids in parts per million (ppm) or mg/L by weight is directly proportional to conductivity in millimhos (mMhos or milli Siemens) per unit volume. However the electrical conductivity (EC) varies not only to the concentration of salts present, but also to the chemical composition of the nutrient solution. Some fertilizer salts conduct electric current better than others. For instance, ammonium sulphate conducts twice as much electricity as calcium nitrate and more than three times that of magnesium sulphate, whereas urea, does not conduct electricity at all.

Electrical conductivity measures total solutes, it does not differentiate among the various elements. For this reason, while a close theoretical relationship exists between TDS and EC, standard solutions of nutrient formulation should be measured to determine their correlation in a given solution. A list of conductivities for 0.2% solutions (2 grams of fertilizer in 1 liter of distilled water) of various fertilizers are given in Table A.

Fertilizer Compound	EC (mMhos or mS)	Fertilizer Compound	EC (mMhos or mS)
$\text{Ca}(\text{NO}_3)_2$	2.0	$\text{MnSO}_4 \cdot 7\text{H}_2\text{O}$	1.2
KNO_3	2.5	$\text{MnSO}_4 \cdot 4\text{H}_2\text{O}$	1.55
NH_4NO_3	2.9	NaH_2PO_4	0.9
$(\text{NH}_4)_2\text{SO}_4$	3.4	KH_2PO_4	1.3
K_2SO_4	2.4	HNO_3	4.8
H_3PO_4	1.8		

Table A - Conductivity (EC) of 0.2% sodium in distilled water - Hydroponics Food Production, Howard M. Resh, Ph.D.

Actual conductivity measurements for fertilizers may vary somewhat from these in Table A due to the solubility and purity of the particular fertilizer source, Monitoring the changes in the nutrient solution over time will indicate what adjustments should be made to keep the solution in balance for the crop being grown. This principle can become more useful by determining for each crop the relationships among total dissolved solids, electrical conductivity, concentration of each essential element and stage of plant growth under similar light conditions.

Too high conductivity levels indicate that the nutrients is in excess, and plant growth can be restricted or prevented, while low values indicates nutrient deficiency.

A simple method to test conductivity is given below:

The procedure outlines requires the use of clean equipment. The soil to be tested should be dried in air.

1. Crush the sample.
2. Weigh a quantity of soil. e.g. 10g into a suitable container.
3. Add distilled water or deionised water in the ratio of 5ml water to each gram of soil. Thus if you have 10g soil add 50mL water.
4. Shake the container to thoroughly mix the soil and water.
5. Allow the soil to settle.
6. Use a tester or meter to take the reading.

Various books are available on soil with information on soil salinity. Further assistance may be available

at Government departments. The conductivity of the soil can be corrected by adding fertilizer.

Note:

- The result will be influenced by contamination. It is suggested that the utensils used must be washed with a mild detergent and rinsed thoroughly in deionised water.
- A ceramic mortar and pestle is recommended to be used to break down the soil. Particles less than 2mm will suffice.
- After initial shaking allow the suspension to stand, with intermittent shaking for an hour.

