FAQ – Electrical Conductivity (EC) in Hydroponics

Amongst one of the few properties that hydroponic growers use to control their nutrient solutions is electrical conductivity (EC). The main problem with the measurement of the EC, is that few growers really understand it's meaning and more often than not, grossly overestimate the amount of information it can give them. Therefore, I decided to create this FAQ in order to better explain electrical conductivity, it's limitations and it's uses.

So, what is electrical conductivity ?

Electrical conductivity measures the easiness in which an electrical charge can flow through a certain length of a certain material. It is usually measured in S/cm which just means that the material has a certain conductance in S (Siemens) per centimeter. A material with a higher electrical conductivity let's charge flow more swiftly (it offers less resistance to the movement of charge).

Why is this useful in hydroponics ?

It is useful in hydroponics because the conductivity of a solution is directly proportional to the amount of salts (in this case, the salts are our nutrients) dissolved inside it; so, if a solution has more salts dissolved, it has a higher conductivity. Therefore, measuring EC can give you an idea of how many nutrients are left in your solution.

What are the limitations of EC in hydroponics ?

The first limitation arises because of the chemical character of the property we are measuring. Since EC is proportional to the amount of dissolved salts in each solution, you could suppose that measuring EC would always allow you to calculate nutrient concentrations within your nutrient solution. This is wrong ! Salts increase conductivity but each different ion

present inside the solution has a different specific conductivity (they contribute differently to the overall EC) so you could in fact be deceived because you could just have a small amount of an ion that conducts a lot or too much of an ion with a small conductivity. Of paramount importance are the ions that determine pH which have conductivities hundreds of times larger than other ions.

What are some common mistakes when measuring EC ?

Given the above mentioned conditions, EC should always be measured at a constant pH. An EC measured at pH 5 and an EC measured at a pH of 7 will be completely different given that the ions which determine pH have a very large effect on the EC value. Another important fact is that the conductimeter should be calibrated using a solution of known conductivity. If it is not, comparison between measurements can be meaningless.

What is EC useful for ?

The electrical conductivity can tell you if your solution has lost nutrients or water due to evaporation, if measurements are done at the exact same pH value. The EC should be measured when the solution is prepared and three times each day after then. If your solution's EC becomes too high, you can add water to lower it to the original value. If EC becomes too low (70% of original value), you should not add nutrients. This means that your solution has been substantially changed in composition by the plant and it needs to be disposed off and a fresh one needs to be prepared.

Why can't I add nutrients to a solution with low EC ?

You cannot do this because you don't know which nutrients the plant took up. By adding nutrients to the solution you could be putting too much or too little of any given compound. Of course, you could always do some fancy atomic emission analysis to know the exact ionic composition of the solution but the safest (cheapest and easiest) thing would be to

adequately dispose of your nutrient solution and start a fresh batch.

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