

# FAQ – controlling, adjusting and knowing pH in Hydroponic Gardening

Even though there has been great effort by many people to show hydroponic growing as something that can be done by anyone with little knowledge, it has come to my attention that many novice and commercial gardeners fail because of their inability to properly interpret the chemical phenomena around them. One of the variables that is primordial in hydroponic culture and that is grossly oversimplified in most literature about hydroponic gardening is the treatment of pH. For this reason, I decided to create this pH FAQ post in order to answer (in a basic but scientific way) the questions most people have (or should have anyway) about the science of hydroponics.

## **What is pH anyway ?**

This is the most basic and important question. In layman terms, pH is a measure that tells you if a solution is acid or basic, with values of pH over 7 being basic, and values below 7 being acid. Going a little bit deeper into detail, pH is just the result of applying the operator “p” over H (which symbolizes the concentration of  $H_3O(+)$  ions within a solution). The operator “p” is just getting the negative decimal logarithm of a number. Since  $H_3O(+)$  concentrations appear usually in really small magnitudes, like 0,00000001 M, using the logarithm let's us express this in more humanly understandable numbers, like 9.

## **Why is 7 the neutral pH ?**

Seven is the neutral pH value because the concentration of  $H_3O(+)$  ions in solution is determined by the self dissociation constant of water which is  $1 \times 10^{-14}$  and equals the product of  $H_3O(+)$  and  $OH(-)$  concentrations. If  $H_3O(+)$  concentrations are equal to  $OH(-)$  concentrations you have that  $H_3O(+)$

concentration should equal  $1 \times 10^{-7}$  which after applying "p" turns into 7.

### **Why is pH so important in hydroponics ?**

This variable is very important in hydroponic gardening because it determines the form in which nutrients are present inside the solution. In pH values which are too acid or too basic, nutrients assume forms which are different from the ones which plants can assimilate. Therefore, an adequate pH value needs to be maintained in order to ensure that all nutrients are present as the right species.

### **How do I measure pH correctly ?**

First of all, pH meters need to be calibrated prior to each measurement. In order to calibrate any pH instrument, at least two different buffer solutions must be used, one with pH 7.0 and the other with any other known pH value. The measurement should be taken with enough time for the reading on the instrument to stabilize.

### **How can I correct pH changes ?**

Bases or acids can be added to hydroponic solutions in order to increase or decrease the pH value of a solution. Bases and acids should be added as solutions and the amount added must be recorded in order to know how nutrients are changed. For example, if a potassium hydroxide solution is added to increase the pH of a solution, the amount of solution added needs to be recorded in order to know how much potassium was added to the solution (since this is a nutrient). Common acids to lower nutrient solution pH values are nitric acid, phosphoric acid and citric acid. I would recommend the use of citric acid to reduce pH and potassium carbonate to increase pH.

### **What is the ideal pH value ?**

It depends on the specific plant you are cultivating. Most crops grow very well with pH values between 5.5 and 6.0, although there are some plants which require more basic or slightly more acid pH values.

### **How can I stop pH from changing ?**

Please refer to the article I wrote about controlling the pH of your nutrient solution with buffers in order to effectively prevent pH variations inside your hydroponic nutrient solution.

