

# Primer on Nutrients and pH

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If you want your plants to excel, you will want to pay close attention to the nutrient solution. By monitoring nutrients, not only can you feed your plants the appropriate level of nutrition, but you can also maximize the nutrients available for uptake. Monitoring a solution ensures plants will not be underfed or burnt with too-high levels.

## pH

The pH value of a nutrient solution is a measure of the acidity or alkalinity of a solution. Neutral solution is numerically equal to 7. The solution gets more acidic as the numbers decrease and more alkaline as the numbers increase. The pH scale ranges from 0 pH (very acidic) to 14 pH (highly alkaline). Pure water has a pH of 7.

Different nutrients are absorbed at different pH levels. Most plants need a pH level between 5.8 and 6.5 for optimum nutrient uptake. If the pH is too low, nutrients are bound up and the roots are unable to absorb them. If the pH is too high, plants may succumb to toxic salt buildup, limiting the ability of the roots to intake water and food.

Your pH will fluctuate and should be monitored regularly. It can be tested with inexpensive pH Paper Test strips or with a pH Shaker Tester, or you may choose to use a pH meter. pH meters come in various degrees of sophistication and price. Such as the Hanna GroPro pH Tester, a cheap and effective entry level handheld digital meter for pH. Some are handheld and need to be turned on each time they are used. They cost less but need more frequent calibration to keep them reading accurately. We like the **Bluelab pH pen**, a durable, easy to use and accurate handheld meter. Other pH meters are continuous reading models which are always on and should be mounted next to the reservoir such as **Bluelab Guardian Monitor**, although this is a “combo” meter.

You can tweak the pH of your solution to allow more nitrogen in the growth phases and then readjust during the bloom phase for more phosphorous uptake. Most importantly, adjust the pH based on what plants you're growing.

## Adjusting the pH Level

The pH level of your nutrient solution will need to be adjusted if it is too low (too acidic) or too high (too alkaline.) You will want to keep pH Up and pH Down handy in your grow area. Use very little at a time and stir the solution thoroughly. If you use too much of one then you will have to correct it with the other. Doing this to get to the correct pH is undesirable. The less you end up using, the better. Be careful when handling these solutions as they can burn the skin. We sell three types of pH up and down solution. **Spectrum Formulas** and **Advanced Nutrients** - strongest stuff - made for larger reservoirs. **Grow More** pH solutions - cheaper - made for small to mid-size applications. **Earth Juice Natural** pH Adjusters - All Natural in a powder solution.

## Measuring the Nutrient Levels

By monitoring nutrients, not only can you feed your plants the appropriate level of nutrition, but you can also maximize the nutrients available for uptake. Equally important, you can be certain that your plants aren't undernourished. Both EC & TDS meters give an easy-to-read reference point of the conductivity of nutrient in solution.

TDS stands for Total Dissolved Solids and is measured in ppm or Parts Per Million. One ppm is one part by weight of the mineral in one million parts of solution. In hydroponics TDS is estimated using a conversion from the measure of electrical conductivity (EC). TDS is currently the standard of measurement that most US growers use. This will probably begin to change in the future as manufacturers begin changing their products to EC.

Like pH, TDS (and EC) meters come in two different forms. Handhelds, like the pH meters above, are easy to use, generally cheaper in price, and are great for checking

multiple reservoirs with. We like the **Hanna Primo TDS** as an affordable entry level ppm meter. The **Bluelab PPM Pen** handheld meter is very nice. It is durable and easy to use, and is very accurate. Lastly, we like the “bullet-proof” Truncheon - It comes with a 5 year warranty, is easy to use, rarely ever breaks, and never needs to be calibrated. There are also continuous meters for reading TDS/EC only. However, most people interested in these want a “combo” meter.

## Nutrient and pH “Combo” Meters

Most serious gardeners will eventually grow into using a “combo” meter which will measure both pH and TDS. The nicer units will also measure Temperature, and lend a higher degree of accuracy by compensating for the effect temperature has on the readings. Along with temperature & compensation, some of the nicer meters will allow a change in the Conversion Factor ( what the meter uses to convert readings from Electrical Conductivity to the TDS (ppm) value ). There are handhelds and there are continuous Combo Meters available. The two handheld “combo” meters we suggest are the **Bluelab Combo Meter**, and the new **Hanna GroPro pH/EC/TDS/Temperature Meter**.

The **Bluelab Combo Meter** with remote probe is nice because it is both temperature compensated and allows for the changing of the Conversion Factor. It also is very accurate and very durable. The **Hanna GroPro pH/EC/TDS/Temperature Meter** is also temperature compensated but measures TDS on only one conversion factor (700ppm). Both allow its user to place its remote probe in the solution that is being measured the whole time that the solution is being set. In this way, one can add nutrients and adjust the pH occasionally swirling the probe without having to constantly turn the meter on and off to get new readings (like the other handhelds on the market). We offer 2 continuous “combo” meters, the **Bluelab Guardian Monitor** and the **Bluelab Guardian Monitor Connect**. Both continuously display its values and makes for easy reference and mixing of your reservoir. They also have temperature compensation for further accuracy. The **Bluelab Guardian Monitor Connect** has an added feature of data

logging all of the parameters to your computer. You can also access the data via the cloud from a remote mobile device or computer. So you are able to check in on your pH and TDS levels while you are elsewhere. A separate **Bluelab Connect Stick** is required to receive wireless data. Both have a 2 year warranty on its body and a 6 month warranty on the probes. We have not had many meters returned for warranty repairs, but we are considered a “Bluelab Certified” store. All products that we test and deem broken while still under warranty, can be replaced immediately, as long as we have it currently in stock.

## Nutrient and pH Controllers

Nutrient and pH controllers allow the grower to not only monitor but provide precise control achieved through the use of set points and duration dosage times. You program in the set points you wish for and the controller will dose the reservoir with a set amount of nutrient or pH adjuster to bring the reservoir readings to the right level. There are two delivery systems that are available for these controllers. One is gravity fed with the use of solenoid valves. The second method is with a peristaltic pump delivery system which eliminates the restriction on placement. (In gravity fed systems, the nutrients must be placed directly above the reservoir.) Both of these methods work well and once you have become acquainted with the parts involved, you will find them very easy to use. There are two nutrient and pH controller companies that we supply, varying in price and quality. The **Autogrow Mini Doser** can be used with either a solenoid valve or a peristaltic pump. They have a pH version and an EC version so you can control your pH or nutrients. The **Bluelab pH Controller** uses a peristaltic pump and comes with everything needed for set up right out of the box( except the actual pH solution).. The more professional grower will be more interested in the **Autogrow IntelliDose**. This unit can dose both pH and TDS/EC, it reads temperature levels (and is temperature compensated.). The **IntelliDose** can also be hooked up to a computer for remote management and data-logging.

## What nutrient level should my nutrient be at?

For seedlings, your nutrient level should be between 400ppm (800ms) and 600ppm (1,200ms). For vegetative growth, the level should be between 800ppm (1,600ms) and 1,100ppm (2,200ms). For bloom, the level should be between 1,000 ppm (2,000ms) and 1,400ppm (2,800ms). These -of course are very general levels.

## **How do I convert my readings from TDS to EC and vice versa?**

To get the approximate TDS value, simply multiply the EC reading (in microSiemens/cm) by the conversion factor for a given TDS meter or pen. The TDS Conversion factor is either 500 or 700. Conversion Factor (either 500 or 700) x E.C. reading will give you the new TDS value. Example: Say the E.C. was 1.0 and the conversion factor is 500 (for a given meter) you would then have a TDS value of  $1.0 \times 500 = 500$  ppms.