

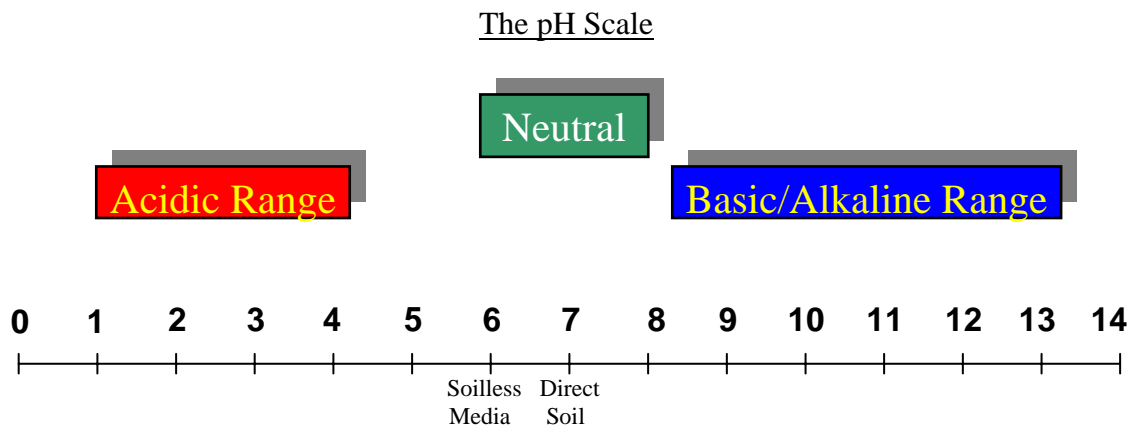
pH measurements in Irrigation Water

pH measurements is one of the most important disciplines a grower should perform. When I visit a grower who is experiencing a less-than-healthy crop and ask what the root medium pH is, the response is often, "I don't know."

pH meter technology has advanced significantly over the past 25 years. In the 1970's and early 1980's grower's options for pH monitoring involved manual calculations or a sizeable investment in instrumentation that existed at that time. Today costs have come down and manufacturers continue in making pH instruments more user friendly. The formula for pH determination was created by Walther Nernst. The equation reads as: $E_{obs} = E_c + \ln(10)RT / nF \log(aH^+)$. *The good news is pH meters do this calculation for you.*

Why do I need to measure pH? pH is the measure of the concentration of hydrogen ions (H+) in water or soil. A pH of 7 is considered neutral. pH below 7 is considered more acidic and pH above 7 is considered more basic or alkaline. Water pH is important for plant management because it affects the solubility of fertilizers and the efficacy of insecticides and fungicides. In many regions of the United States, the primary concern is pH that is too low. That's why liming, which raises pH, is common in these areas. However, in other regions, particularly the arid West, soils tend to have high pH. In this case, you must acidify the soil to lower the pH to a more desirable level.

Below is a pH scale that ranges from 0 – 14 pH. Most plants have an optimal pH between 5.8 and 6.4 pH in soil-less media. For direct soil applications, a typical pH range of 6.5 – 7.0 pH is more common.



The importance of Temperature in irrigation water – Temperature itself plays a very important role in plant health. Soil temperature appears to be more critical than air temperature when irrigating during mid-summer. Commonly, you will hear irrigators say that it is not good to irrigate when irrigation water gets warm, but it's okay when the water is cold. There are two reasons for this. Colder water holds more dissolved oxygen and colder water usually contains less dissolved salt.

From a pH perspective, I always recommend that you purchase a pH meter with automatic temperature compensation. If you look back at the Nernst Equation in the second paragraph, the (T) stands for

temperature. Changes in temperature will have an impact on your pH readings. A meter with automatic temperature compensation will account for these changes and still be able to produce an accurate pH result. The cost is minimal to include this feature.

Alkalinity – Alkalinity is another measurement growers should be aware of.. Alkalinity is the ability of a substance to resist a change in pH. Some people define alkalinity as the buffering capacity of a solution and effects how much acid is needed to control pH. Alkalinity is measured in mg/L of Calcium Carbonate (CaCO₃). The higher the alkalinity of your water, the more resistant it will be to controlling the pH. The lower the alkalinity, the higher the volatility in achieving the optimal pH value.

Alkalinity readings can be taken by a low cost test kit. Hanna Instruments code HI3811 would be a readily available option.

pH readings of water and soil

- A. Taking a pH reading of your irrigation water is simple.
- Calibrate your pH meter in a 7pH buffer and 4 pH buffer
 - Take a sample
 - Place the pH electrode in the sample and record.

B. pH readings of your soil

Soil pH can require a little more work. To take a pH reading of your soil:

1. Certainly, the PourThru Extraction Method developed at North Carolina State University is well documented (details at www.ces.ncsu.edu/depts/hort/floriculture/crop/crop_PTS.html) I'd encourage you to take a look at those guidelines if you aren't familiar with the technique.
2. You can also create a soil slurrie consistent with the use of the saturated media extract approach. Collect samples from the edge of the root medium from multiple points. Then create a liquefied soil sample so the pH sensor can function correctly. A good ratio to use would be two parts distilled water, one part soil - (100 mL of soil/200 mL of distilled water). You must use distilled water.
3. The third option is to purchase a direct soil pH meter. Hanna model HI99121 was designed to help growers minimize the need to create slurries. The HI99121 pH /Temp meter comes with a glass electrode with a spherical tip designed to penetrate soft soil samples. The electrode is glass so it must be treated with some care. Also – make sure you rinse the electrode after each use with DI water. The tip should be kept saturated with electrode storage solutuon or a 4 pH buffer when being stored.

pH Meters for all budgets.

Hanna Instruments has wide selection of portable and in-line pH meters that range in cost and functionality.

Some common options would be:

1. HI9813-5 – portable pH/EC/TDS and temp meter
2. HI98128 – portable pH/Temp tester
3. HI98129 – portable pH/EC/Temp tester
4. BL981411 – low cost in-line pH monitor. Electrode sold separately.

And Much, Much more !

Prior to working at Hanna, I owned my own Greenhouse for 22 years. I understand and identify with the challenges growers face. Please feel free to call me at 800-426-6287 x 52 or at dwiegers@hannainst.com if I can be of any assistance.

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