How To Calculate The Amount Of Phosphoric Acid Needed To Neutralize Water Of A Known Alkalinity

by

Bob Munter and John Erwin

A very common problem in the upper midwest is pH management. Often crops are grown in what would be considered alkaline media. As a result, crop growth is often depressed due to, among other things,nutrient deficiencies.

One way to manage pH is to simply neutralize you water prior to watering a crop. High pH water is neutralized by adding an acid to the water. To determine the amount of acid which must be added to neutralize water a water sample must be taken prior to adding fertilizer and sent to the soil testing lab to determine the 'alkalinity' of your water. Once the alkalinity of your water has been determined, the following computations can be done to determine the amount of acid you must add per gallon of water to result in a pH of 7.0. The most common acid used to neutralize water is phosphoric acid.

I. Basic Information:

Strength of phosphoric acid: Stock solution is 44.4 normal.
75% solution is 33.3 normal

Alkalinity is reported as milligrams of calcium carbonate ($CaCO_3$) per liter of water

Molecular weight of $CaCO_3$ is 100
Equivalent weight of $CaCO_3$ is 50

General formulas for equivalents, volumes, and normalities:

milliliters (ml) x normality (N) = ml x N
since ml x N = milliequivalents

ml x N = millieqivalents

mg/equivalent weight = milliequivalents

II. Example problem:

Given, 1 liter of water that has an alkalinity of 270 mg $CaCO_3$/liter

What volume of a 75% phosphoric acid solution (33.3 N) is required to neutralize the 270 mg $CaCO_3$ in 1 liter of water?

III. Solution:

270 mg $CaCO_3$ (alkalinity) / 50 (equivalent weight) = 5.4 milliequivalents $CaCO_3$/ liter.

ml x 33.3 (normality) = 5.4 (milliequivalents $CaCO_3$/liter)

ml = 5.4 (milliequivalents $CaCO_3$/liter) / 33.3 (normality) = 0.1622 ml phosphoric acid (H_3PO_4).

Therefore, 0.1622 ml of 75% phosphoric acid is needed to neutralize 1 liter of water with an alkalinity of 270 mg $CaCO_3$/liter. To determine the amount of acid required per gallon, multiply the amount of acid required per liter by 3.785. In our example, 0.61 ml of phosphoric acid would be required per gallon of water.

Remember!

1) Understanding the effects of temperature on Easter lily growth is very important to successfully force an Easter lily crop. The rate of leaf unfolding on an Easter lily is dependent on the average daily temperature which plants are grown under. In contrast, the morphology, or appearance, of the Easter lily is dependent on the relationship between the day and night temperature, or DIF. Easter is early this year. With an early Easter plants will probably need to be grown somewhat warm (>68°F) to insure flowering on time. To have 50% of your crop in flower 3 days before Palm Sunday you will need to be at visible bud around the 17th of February this year. **Leaf count!** Exact information on how temperature affects Easter lily growth can be found in the October issue of the M.F.G.A. bulletin.

2) Apply fungicides to your lily crop regularly, i.e. monthly. Do not wait for root rot to occur; it always does!

3) Try to minimize A-Rest use. A-Rest tends to encourage lower leaf drop late in the season.

4) Give your lilies adequate space. This is especially important late in the season, i.e. after visible bud. Crowding lilies late in the season will result in lower leaf drop.

5) Take the time to have full soil tests done on your bedding plant media. Initiate a preventative fungicide for your bedding plant crop. Do not wait for a problem to occur.

6) Crowding plants reduces branching. Do not crowd geraniums early in development.

7) Hydrangea flower color is dependent on a number of factors. Usually dormant plants are shipped to us 'pretreated' for a specific flower color. However, the way we treat plants once they have arrived can greatly affect whether plants actually are blue or pink at flower. A summary of what factors affect hydrangea flower color is shown below.

Factor	Flower Color	
	Blue	Pink
Phosphorus (P)	None	High
Potassium (K)	High	Low
Ammonium to Nitrate ratio (NH_4^+/NO_3^-)	Low	High
Aluminum sulfate ($Al(SO_4)_3$	Yes	No
pH	Low (5.5)	High (6.5-7.0)

8) Watch ammonium levels on zonal and ivy geraniums. This is the time of year we tend to have ammonium problems on each of these crops (especially on stock plants).

9) Graphically track lily and chrysanthemum crops this spring. Do not let stem elongation get away from you!

Editor's Notes

Easter Lilies seem late! - Most Easter lily crops in the Twin Cities are somewhat late. Emergence has been slow, and non uniform. Leaf count! Early counts suggest around 80-85 leaves per plant. You will probably have to grow your crop warm. Also, because of the variability, sorting will be necessary into different environments to even up the crop.

Control Thrips - Control thrips now before tomato spotted wilt virus is evident! Isolate new shipments of plants to insure they do not have thrips or tomato spotted wilt virus. If plants are suspected of having TSWV, have them tested. Last year TSWV was found on tomatoes, new guinea impatiens, gloxinia, and cineraria.