UNIVERSITY of NEW HAMPSHIRE
Cooperative Extension

Understanding the Chemistry of Plant Nutrition:

Water Quality, Alkalinity and pH Management

Today's Lecture

- pH
- Alkalinity
- Injector Calibration
- Substrate Monitoring

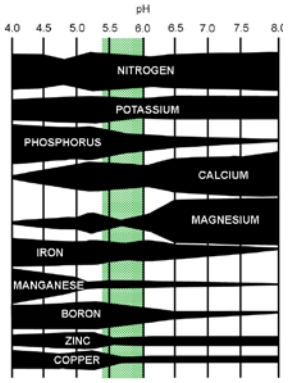
What is pH?

pH is the measure of H+ ions in a solution

- pH 0-7 = acidic
- pH 7-14 = basic (alkaline)

pH effects nutrient availability in the soil solution

Why we care…



What is Alkalinity

Alkalinity – the buffering capacity of water to resist change in pH

- Carbonate
  - CO_3^{-2}
- Bicarbonate
  - HCO_3^-

Alkalinity

Units of measure

- Millieqivilants/Liter
- PPM

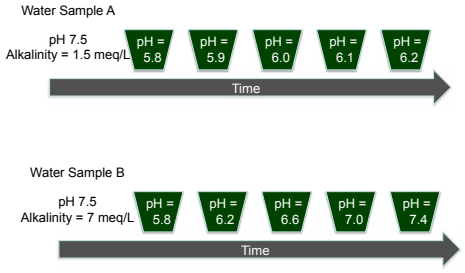
Convert from meq/L to PPM

- Carbonate
  - 1 meq/L = 50 ppm
- Bicarbonate
  - 1 meq/L = 61 ppm

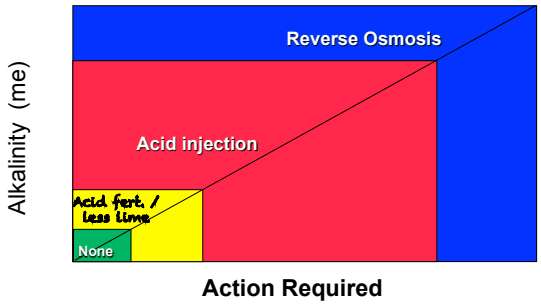
Alkalinity vs pH

Water Sample A	Water Sample B
pH 7.5 Alkalinity = 1.5 meq/L	pH 7.5 Alkalinity = 7 meq/L
Acceptable	Problematic

Alkalinity vs pH



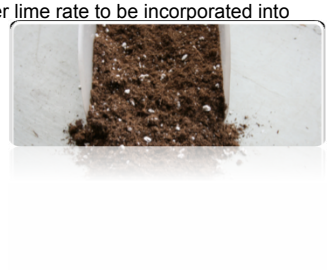
Alkalinity



Alkalinity

Correcting with lime

- request lower lime rate to be incorporated into substrate



Alkalinity

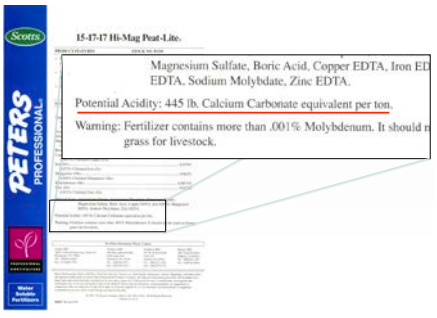
Correct with fertilizer selection

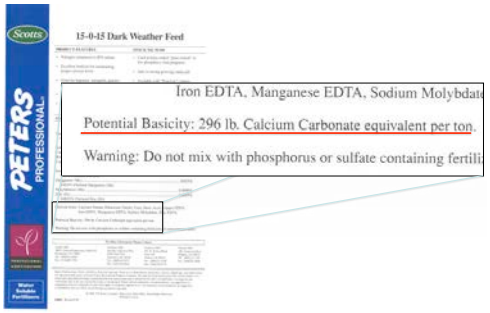
- Potential basicity:

  Lbs or calcium carbonate that give an equal pH rise to that caused by 1 ton of fertilizer

- Potential acidity:

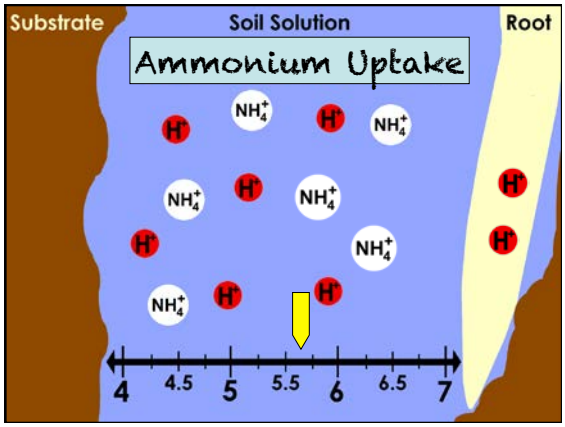
  Lbs of calcium carbonate required to neutralized the acidity cause by using 1 ton of fertilizer

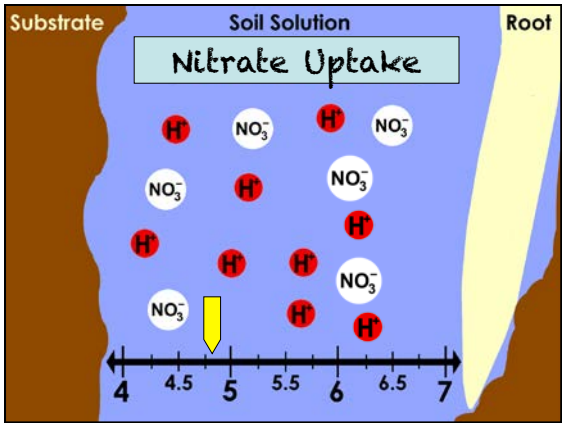




Fertilizer	Acidity	Basicity
21-7-7	1539	-
20-10-20	407	-
20-5-30	100	-
20-0-20	0	0
15-5-15	-	69
17-0-17	-	161
15-2-20	-	195
13-2-13	-	319
15-0-15	-	344

Fertilizer	Acidity	Basicity
ammonium sulfate	2200	-
urea	1680	-
diammonium phosphate	1400	-
ammonium nitrate	1220	-
monoammonium phosphate	1120	-
superphosphate	0	0
potassium chloride	0	0
potassium sulfate	0	0
calcium nitrate	-	400
potassium nitrate	-	520
sodium nitrate	-	580





Alkalinity vs pH

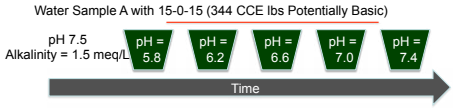
Water Sample A with 20-10-20 (407 CCE lbs Potentially Acidic)

pH 7.5
Alkalinity = 1.5 meq/L

pH = 5.8 | pH = 5.4 | pH = 5.0 | pH = 4.6 | pH = 4.2

Time

Alkalinity vs pH



Why Calibrate?

Nutrient toxicities

- Over application

Nutrient deficiencies

- Under application

$$$$$$$$$$$$

- Cost of fertilizer
- Cost of lost sales

How To Calibrate

Two methods

- Flow Method
- EC Method

PourThru

Irrigate the crop one hour prior to PourThru

PourThru

Place a plastic saucer under container

PourThru

Pour enough water over top of substrate to displace ~ 50mL of solution

Distilled Water Volumes

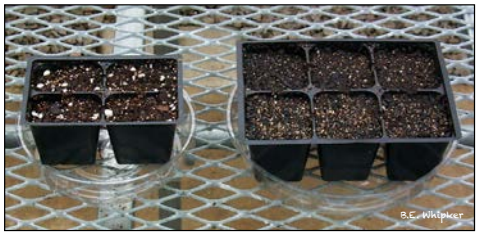
Pot Size (inches & cm)	ml	oz
Cell Pack	30	1.0
4” (10 cm)	30	1.0
5” to 6” (12 to 15 cm)	75	2.5
6.5”+ (16 cm+)	100	3.4

PourThru

Collect & analyze the leachate

6 or 8-inch saucers

PourThru



PourThru

Measure

PourThru

- Don’t over react
- Look for trends
- Don’t ignore it
- Consistency is the KEY

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