So Many Details, So Little Time: Take-Home Message You Can Get About Plant Fertigation

Irrigation & Nutrient Management Workshop

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In the Next 20-25 Minutes......

Get you repaid by providing the most essential, dry “biomass” about getting the most from fertigation.
Fertigation or Chemigation

Fertilizer + Irrigation = Fertigation

Fertigation + Chemical Controls = Chemigation

People use them without a universal rule. But I want to clarify here.
Fertigation is NOT an easy process.
Regardless of crops, production practices, scales, and locations of your operation, you want to fertilize:

Correctly
Uniformly
Responsibly
Please remember over-fert and under-fert are all bad: waste of money and time.

Recommendations from companies: you provide information, they give you the amount.

- Common for large scale production and maybe experienced growers
- Convenient
- Calculate by yourself? -----Soil test report, experience, or extension agent help
Know your injector or pump

Venturi injector: Courtesy given by Dr. Timothy Coolong, UGA

- Common in vegetable production, use pressure difference to draw nutrient solution into main irrigation line
- Clogging emitter can happen
- Type of fertilizer and mesh size
Positive Displacement Injector/Pump

Greenhouse positive displacement injector: Courtesy given by Dr. Timothy Coolong, UGA
Injector ratio (Venturi and Positive Displacement Pump) varies dramatically.

e.g., An injector ratio of 1:100 indicates 1 part of stock fertilizer solution with 99 parts of water flowing to the plants through irrigation line).

Ratio can range from 1:10 to 1:4000.
Amount of fertilizer to add to make 1 gallon solution?

**Desired concentration in parts per million x Dilution factor (1:1)**

\[ \% \text{ element in fertilizer} \times \text{Conversion constant} \]

*Conversion constant:*
- Ounce per gallon stock: 75
- Pound per gallon stock: 1200
- Gram per liter: 10

**Advantage:**
- Used with any injector ratio
- Used with any target fertility
- Used with common imperial units

Source: Thomas Boyle, Univ. of Florida
Example:
You have an injector with a 1:500 ratio and a fertilizer of 20-20-20. You want to apply 300-ppm N within three weeks, with evenly applied per week as a constant feed to your almond trees. How many ounces of fertilizer should you add to make 150 gallons of stock solutions per week?

Solution:
1) Desired fertility per week = 300 ppm ÷ 3 = 100 ppm N
2) Use the formula to calculate ounces of fertilizer used to make a 1 gallon solution:
   \[(100 \times 500) ÷ (20 \times 75) = 33.3 \text{ ounces per gallon}\]
3) Calculate ounces of fertilizer used to make 150 gallons stock solution:
   \[33.3 \times 150 = \text{roughly 5000 ounces} = 312 \text{ pounds}\]

Conclusion:
The grower needs to add 312 pounds of 20-20-20 to make 150 gallons nutrient solution to fertilize his almond field at 100-ppm N per week. IS THIS THE END?

1. Fertilizer solubility (chart available) and water temperature
2. Ease of application: 312 lb ÷ 25 lb/bag = 12.48 bags
Can we not open the 13\textsuperscript{th} bag and just use the entire 12 bags to have 300 lbs of 20-20-20 to make the same fertility level: yes we can! Let’s make 145 gallons of stock solution.
Regardless of crops, production practices, scales, and locations of your operation, you want to fertilize:

Correctly
Uniformly
Responsibly
• Completely pressurized before injecting (Irrigate enough time)

• Be uniform from the first tree to the last in each row---give fertilizer time to travel, e.g., fertilizers need 45 min to 1 h to reach the furthest emitter or trees.

• Always check your filter to flush out dirt and any others may clog emitters

• Do not turn off irrigation once fertigation is done---needs time to clean the residual fertilizers in pipes

Permission given by the grower
Regardless of crops, production practices, scales, and locations of your operation, you want to fertilize:

Correctly

Uniformly

Responsibly
BACK-FLOW CHECK!

Required by law

Some regions require dual preventers

Source: Bob Schulthesis, Univ. of Missouri Extension
Permission given by the grower

Backflow check with vacuum relief
Shift to the reliance on biologicals to partially replace chemical fertilizers, such as biofertilizers/biostimulants.

- Soil-derived
- Nitrogen fixation
- Phosphorous solubilization
- Enrich soil microbial community
- Use through drip/micro-sprinkler irrigation

**Bacteria:** Pseudomonas, Bacillus, Streptomyces, Azotobacter

**Fungi:** Glomus, Rhizopogon, Trichoderma
Conclusion

Goal: Equip yourself basic knowledge of fertigating precisely, uniformly, and environmentally-friendly.

Control fertigation by yourself.
GOOD LUCK!

THANK YOU

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