

### TOMATO NUTRIENT MANAGEMENT 101

T. CASEY BARICKMAN, PH.D.









#### CHOOSE A GOOD DISEASE RESISTANT TOMATO VARIETY!

- Testing new varieties for field production in MS
  - Bejo, Harris Moran, Seminis, and Sakata
    - Primo Red, Mt. Gem, Red Deuce, Emmylou, Mt. Spring Plus,
- Greenhouse tomato varieties
  - De Ruiter, Seminis, and Syngenta
    - Bigdena, Climstar, Inspired

### FIELD AND HIGHT TUNNEL TOMATO NUTRIENT MANAGEMENT

#### SAMPLING TO KNOW MORE DETAILS

- Soil test before planting (fall test-spring plant) for nutrients and adding lime as recommended
- Sub-Sample surface down to at least 6" to 12" deep in each field at 7-10 locations in a W pattern.
- It takes time to adjust the soil pH to optimum.
  - Lime requirements
- Tomato plants like 6.0-7.0 pH
  - Optimum is 6.5 6.8



# OPTIMUM PH (6.5 – 6.8) ALLOW IDEAL NUTRIENT UPTAKE



#### The Influence of Soil pH on Nutrient Availability

| Needed Plant Nutrients Pounds Per Acre |          |                  |  |  |
|--|----------|------------------|--|--|
| Ν                                      | $P_2O_5$ | K <sub>2</sub> O |  |  |
| 120                                    | 50       | 200              |  |  |

- Verona, MS soil pH was 6.8
- No Lime was recommended.
- We usually custom blend our fertilizers because?



ALL

PURPOSE

TILIZER

13-13-13

FERTIL

#### **P & K CONVERSIONS**

•  $P_2O_5 \times 0.437 = P$ 

•  $K_2O \times 0.83 = K$ 

 $\mathbf{N} = \mathbf{N}$ 



# How much 13-13-13 required to put out 120 lbs/ac of N?

13% of what X = 120 (.13 X = 120)

$$X = 120/.13$$
  
 $X = 923.1$  lbs/ac



# 923.1 lbs of 13-13-13 = 120 lbs of $P_2O_5$ 923.1 X .13 = 120

Which is 70 lbs/ac too much!



### 923.1 lbs of 13-13-13 = 120 lbs of $K_20$

### 923.1 X .13 = 120

Which is 80 lbs deficient.

### **Custom Blending Fertilizer**

Needed Plant Nutrients Pounds Per Acre



Ammonia Nitrate 33-0-0

33% of X = 120 lbs N

.33 X = 120lbs X = 120 /.33 X = 363.6 lbs of 33-0-0 per acre



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0-46-0 (Super phosphate)
.46 X = 50 lbs/ac
50/.46 = X
X = 108.7 lbs
Which is 50 lbs per acre
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0-0-60 (Potash) .60 X = 200 200/.60 = X X = 333.3 lbs Which is 200 lbs per acre

How are you going to put it out?



#### FERTILIZER SPREADER

- Ammonium Nitrate
  - **363.6** lbs/ac
- Super Phosphate
  - I 08.7 lbs/ac
- Potash
  - **333.3** lbs/ac

CALIBRATE FERTILIZER SPREADER

- **4.5 ft. wide X 100 ft. long = 450 square ft.**
- 43,560 square ft. per Acre
- 450/43,560 = 0.01 Acre
- B3 @ 1600 RPM for our Tractor takes 22 seconds to travel 100 ft.

#### **CALIBRATE FERTILIZER SPREADER**

#### Want <sup>1</sup>/<sub>2</sub> N and all P and K preplant

- I know I want to put out 181.8 lbs of 33-0-0
- So 100 ft of row = 450/43,560 = 0.01 ac
- 181.8 x 0.01 = 1.82 lbs
- So if I put out 1.82 lbs of Ammonia Nitrate (33-0-0) in 100 ft of my 4.5 ft wide row.
- I am applying 60 lbs of Nitrogen per acre

#### FERTILIZER REQUIREMENTS



- Put out ½ N and all P and K preplant
- How to apply the remaining <sup>1</sup>/<sub>2</sub> N to tomato plants and when?
  - Through drip irrigation (plasticulture)
  - Side dress (bareground)
- Most growers are using plasticulture
  - Calcium nitrate (GH grade) through drip irrigation at 5-10 lbs per week
  - Venturi pump, dosatron, other proportioner

#### FIELD & HT TOMATO NUTRITION

- Organic matter is the key to field and HT tomato productivity
  - Improves soil structure and drainage
  - Increases good microbes and earthworms
  - Holds, then releases mineral nutrients slowly



# Building a Foundation for Better Efficiency

- Soil Health....Soil Quality! Pivotal to sustained crop productivity
  - <u>Continued</u> capacity of soil to function as a vital living ecosystem that sustains plants, animals, and humans







# Building a Foundation for Better Efficiency: COVER CROPS

- Reduce the need for inputs
  - Smother crop that outcompetes weeds for water and nutrients
  - Residue or growing leaf canopy that blocks light, alters the frequency of light waves and changes soil surface temperatures
  - Source of root exudates or compounds that provide natural herbicidal effects
- Managing pest
  - Beneficial microbial life that discourages disease
  - Create an inhospitable soil environment for soil-borne diseases
  - Encourages beneficial insect predators to reduce insect damage
  - Produce compounds that reduce nematode pest populations

# Building a Foundation for Better Efficiency

- Cover crops and nutrient cycling
- Trap nutrients that would otherwise "leak out" during fallow periods
  - leaching <u>through</u> soil
  - losses as eroded soil or runoff
- Release nutrients later—ideally at the time needed by the next crop
- Fix N from atmosphere (legumes)
- Translocate nutrients from deeper in subsoil, to near surface after cover crop death
- Increase soil biological activity in topsoil, potentially releasing nutrients from soil minerals
- Cover crops do not "create" nutrients in soil, but can recycle and release; except legumes can add N

### Greenhouse Tomato Nutrient Management

- GH Tomato Fertility among the most common questions.
  - Complicated for beginning growers and takes time to master.
- Keys to a successful nutrition program
  - Use fertilizer specifically for GH hydroponics.
  - Know quantities of each fertilizer needed and applied.
  - Check electrical conductivity (EC) and pH levels.
  - Be observant for abnormalities.
  - Sample for tissue analysis periodically.



#### Greenhouse Tomato Nutrient Management

- Electrical conductivity (EC) is a measure of the ability of a solution to conduct electricity.
  - The more concentrated the nutrient solution the more electricity it will conduct, thus, the higher the reading of EC.
  - EC units of measure will be in millimhos (mmhos).
  - Typical reading for a nutrient solution is 0.6 to 2.2 mmhos.
    - Most EC meters measure in millisemens (mS) which are equivalent to mmhos.
- pH 5.8 (5.5-6.2)



### Greenhouse Tomato Nutrient Management

- Methods of Mixing Fertilizers
  - Bulk tanks 1,000 to 2,000 gallons
  - Cumbersome to deal with when mixing fertilizers
  - Constant mixing of solution.
- Injectors Systems (proportioners)
  - 1:100 ratio (most common)
  - Can be expensive.
  - Maintenance





# Greenhouse Tomato Nutrient Management

- Use a soluble tomato fertilizer with low N
  - Total Gro's Tomato Special (3-13-29)
  - Hydro Garden's Tomato Formula (4-18-38)
  - Peter's Professional (5-11-26)
- Fertilizers have all the minerals needed except Ca and added N



# Greenhouse Tomato Nutrient Management

- Very important to measure your water EC.
- Calculating fertilizer amounts for nutrient solution (ppm)
- ppm = (% fertilizer) x (lb added to tank) x (16 oz per lb) x (.75) x (100 / gal of concentrate) x (1 / ratio of injector).
  - 3-13-29 Total Gro tomato special
- ppm= (29)(18)(16)(.75)(100/20)(1/100)
  - =29x18x16x.75x5x0.01
  - = 313.2 ppm K<sub>2</sub>O x 0.83 = 260 ppm K



# Greenhouse Tomato Nutrient Management

- Dr. Barickman's Formula
  - Want a ratio of N K Ca (1: 1.5: 1)

|  | Stock Tank A: 20 gal                                | Amt (lbs.) | Analysis | PPM |
|--|---|------------|----------|-----|
| • 180 ppm N                                    | Master Blend (4-18-38)                              | 13.2       | N        | 179 |
| • 250 ppm K                                    |   |            | Р        | 61  |
| • 180 ppm Ca                                   | Magnesium Sulfate                                   |            |          |     |
|  | (9.5% Mg; 12.5% SO <sub>4</sub> )                   | 8.81       | К        | 250 |
|  |   |            | Са       | 180 |
| • 1 <sup>st</sup> true loaf 25%                | Stock Tank B: 20 gal                                |            | Mg       | 54  |
| I LIUE IEAI 2370                               |   |            | S        | 66  |
| <ul> <li>Transplant – Flowering 50%</li> </ul> | Calcium Nitrate<br>(15.5% NO <sub>2</sub> ; 19% Ca) | 15.8       |          |     |
|  | · · · · · · · · · · · · · · · · · · ·               |            |          |     |

• Tiny fruit on first cluster 100%





### Greenhouse Tomato Nutrient Management

- Common problems
  - Seeing problems
    - (Blossom-end rot; Mg deficiency)
  - Changing the formula to get more Ca or Mg into the nutrient solution
  - Do Not Change the formula!
- BER is an environmental issue
  - Low humidity, high humidity, etc.
- Mg deficiency is the plant translocating it to other parts of the plant.

#### SUMMARY

- Start with a good disease-resistant tomato variety.
- Soil tests are a must with field and high tunnel tomatoes.
- Custom blend the fertilizers (Ammonium Nitrate, Super Phosphate, Potash).
- Learn to calculate fertilizers and calibrate spreaders.
- Greenhouse tomato-specific fertilizers.
- Step up fertilizer concentrations as the tomato plants get older
- Stay with the ratio of I: I.5: I of N (180 ppm), K (250 ppm), and Ca (180 ppm).
- Measure EC frequently, pH 5.8, and subtract water EC readings.

# QUESTIONS?

T. CASEY BARICKMAN, PH.D T.C.BARICKMAN@MISSTATE.EDU