Introduction to Tomatoes!

Missouri Tomato School
Joplin, MO
August 14, 2017

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In The Beginning ...

- Tomato plants originated in Central and South America in the Andes Mountains
- Aztec word *tomatl* evolved to Spanish word *tomate*.
- Tomato USE started in Mexico
- Spread by the Spanish throughout Americas
Where Are Tomatoes Grown?

170 million tons in the world (2014 data)

31% of all tomatoes grown in China

U.S. is 3rd after India.

California grows 90% of all plum tomatoes in the U.S. and 35% of all plum tomatoes in the world.
Tomatoes in Europe

- In 2014, tomatoes made up 23% of total fresh vegetable output from European Union
- More than half from Spain, Italy, and Poland
Tomato Tips for Success

- Pick a sunny site
- Pick a good variety
- Avoid over watering
- Avoid over fertilizing
- Avoid over crowding

... and that’s about it!
Production Systems – Field, High Tunnel, Greenhouse

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Soil Test – Do it!

- Avoids wasting fertilizer
- Too much fertilizer not good for plants or environment
- Improves yield and quality
- Healthy plants resist disease
- Lime if needed (raises pH)
  - (not slag)
- pH 6 – 6.5 for tomatoes
Soil pH

- If the pH is wrong nothing works well
- Field tomatoes – 6-6.5 is ideal
- Greenhouse tomatoes 5.6–5.8
Tomato Fertilizer

- NPK of course!
- Importance of calcium
  - Blossom-end rot
  - Do not over-nitrate
- pH
  - Declines over the years and during season – Why?
Tomato Fertilizer

➢ Conventional
  ■ Preplant
  ■ Sidedress at bloom
  ■ Sidedress at quarter-size fruit

  or

➢ Fertigation
  ■ Weekly on most soils
Fertigation: The Basics of Injecting Fertilizer for Field-Grown Tomatoes

Fertigation refers to injecting fertilizer into an irrigation system. This is accomplished in drip (trickle) by using some type of injector to meter the concentrated fertilizer solution into the irrigation water. The basics of the system design are outlined in this publication.

A theory behind why fertigation has become the state of the art in vegetable nutrition is that nutrients can be applied to plants in the correct dosage and at the right time for each specific stage of plant growth. When plants receive conventional preplant fertilizer and then two (or more) sidedressings, they get more fertilizer than they need at the time it is applied. Between applications there may be a deficiency of fertilizer.

With fertigation, plants can receive small amounts of fertilizer early in the crop’s season when plants are vegetative. The dosage is increased as fruit load and nutrient demands grow and then decreased as plants approach the end of the crop’s cycle. This gives plants the needed amounts of fertilizer throughout the growth cycle, rather than just a few large doses.

Timing
Fertilizer can be provided in different frequencies—daily, every other day, several times each week, or weekly—depending on irrigation needs, soil type, and other factors. For Mississippi conditions, once per week is typically adequate. On very sandy soils, more frequent fertigation might be necessary. Don’t hesitate to irrigate if moisture is needed at times other than during the fertigation.

Rates
The amount of fertilizer to apply is recommended in terms of pounds per acre per day, week, or whatever application increment you select. The amount can vary during the growing season, starting off low, increasing as plants set fruit, and then declining toward maturity.

With tomatoes, for example, nitrogen use might be in the neighborhood of 7 pounds per acre per week early in the crop, 10 pounds per acre per week as plants approach fruit set, and 14 pounds per acre per week when plants have the heaviest load of fruit. In the last 2 weeks, the rate can be reduced to a lower level. This could be applied once per week or more frequently (7 lb/acre/week = 1 lb/acre/day) to best fit cultural practices and Mississippi conditions.

Fertilizer Choices
Typically, nitrogen (N) and/or potassium (K) are injected. Phosphorus (P) should not be injected, since it does not move much in the soil. It is best to incorporate all required P before planting.

All fertilizer sources must be highly soluble. It is difficult or impossible to unclog drip irrigation tubing once you have clogged it with insoluble fertilizers, algae, or sand.

Solid nitrogen sources include calcium nitrate, ammonium nitrate, potassium nitrate, and others. Potassium sources are usually potassium nitrate or potassium chloride. The following table has the elemental breakdown of these fertilizers. Commercially prepared liquid fertilizers for injection are also acceptable. These are usually combinations of N and K and include 4-0-8, 6-0-6, 7-0-7, 10-0-10, and others. Higher-grade liquid fertilizers are preferred to lower grade liquid fertilizers, since you get more actual fertilizer and less water.

If soil test results indicate low K, liquid fertilizers such as 7-0-7, 8-0-8, or 10-0-10 are acceptable. In those situations where soil K is already high, you can inject straight N in commercially prepared solutions made from ammonium nitrate and urea. These include 19-0-0, 28-0-0, and others. Base fertilization amounts on soil tests and crop requirements.
Each vegetable has a nutrient requirement to produce well. Follow soil test recommendations. Most growers use too much fertilizer!
Who’s In Your Family?

The Solanaceae

- Tomato
- Pepper (sweet, hot, etc.)
- Eggplant
- Potato (Irish potato)
- And? ...
- Tobacco
Plant Rotation

- Nematodes (root knot)
- Soil borne diseases
  - Fusarium wilt
  - Rhizoctonia
  - Pythium
  - Verticillium wilt
  - Southern stem blight
- Weed control
Types of Tomatoes

- **Determinate**
  - Will produce earlier
  - Harvest is shorter season
  - Celebrity, Heatwave, most Mountain vars.

- **Indeterminate**
  - Will produce later
  - Grows and produces forever
  - Better Boy, Beefsteak types, cherries

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Which variety should you grow?

About 7,500 varieties available now

Probably 20,000 total

Your choice

Thousands to choose from

Most popular in Mississippi:

Better Boy
Celebrity
Big Beef
Sweet 100

You might try:

Mountain Spring
Amelia
Sweet Million
Mini Charm


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<table>
<thead>
<tr>
<th>VARIETY $^1$</th>
<th>AL</th>
<th>GA</th>
<th>KY</th>
<th>LA</th>
<th>M8</th>
<th>NC</th>
<th>BC</th>
<th>TN</th>
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<tbody>
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<td><strong>TOMATOES (Solanum lycopersicum)</strong></td>
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**Fresh Market**

- **Amelia VR**
- **Applause**
- **Bella Ross**
- **BH-5699**
- **BH-602**
- **BH-640**
- **Big Beef**
- **Carolina Gold**
- **Celebrity**
- **Crista**
- **Defiant Flr**
- **Florida 47R**
- **Florida 91**
- **Mountain Glory**
- **Mountain Magic**
- **Mountain Majesty**
- **Mountain Magic**
- **Mountain Spring**
- **Phoenix**
- **Primo Red**
- **Red Bounty**
- **Red Defender**
- **Redline**
- **Red Deuce**
- **Red Morning**
- **Red Mountain**
- **Rocky Top**
- **Solar Fire (Fall only)**
- **Tribute**

**Cherry Types**

- **Cherry Grande**
- **Mountain Belle**
- **Sun Gold**

**Grape Types**

- **Cupid**
- **Efin**
- **Golden Sunshine**
- **Jolly Ear**
- **Mountain Honey**
- **Smarty**
- **BH-410**
- **Grenader**
- **Merion**
- **Muriet**
- **Pico**
- **Plum Crimson**
<table>
<thead>
<tr>
<th>VARIETIES 8</th>
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<th>GA</th>
<th>KY</th>
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<td>Greenhouse Types – Beefsteak</td>
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1. Abbreviations for state where recommended.
2. Tomato Spotted Wilt Virus resistance (TSWV).
4. Southern Bacterial Wilt resistance.
5. Local markets only.
7. Determinant or short internode grape tomato.
8. Alternaria Stem Canker tolerance/resistance (ASC).
10. 11, 16 Fusarium Wilt race 1, 2 or 3 tolerance/resistance (F).
13. Gray Leaf Spot resistance (St).
15. Yellow fruit.
Container Varieties

- Need smaller plants, but can still have full-sized fruit
- Tumbling Tom Red
- Tumbling Tom Yellow
- Tumbler
- Super Bush
- Sweetheart of the Patio
- Big Boy Bush
- Bush Champion
Patio Choice Yellow – All America Selections Winner for 2017

Compact determinate for containers
Tomato Pollination

pollination vs. fertilization

Female parts – ovary and pistil (style and stigma)
Male parts – anthers (form a cone) and pollen

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## Growing Vegetables

<table>
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<tr>
<th>Crop</th>
<th>Input Cost</th>
<th>Labor Cost</th>
<th>Potential Profit</th>
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<tbody>
<tr>
<td>Greens</td>
<td>$3423</td>
<td>$1593</td>
<td>$2539</td>
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<td>Okra</td>
<td>6279</td>
<td>3082</td>
<td>5564</td>
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<td>Southern Peas</td>
<td>1157</td>
<td>701</td>
<td>770</td>
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<tr>
<td>Tomatoes</td>
<td>13,051</td>
<td>5231</td>
<td>9307*</td>
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Source: 2015 Vegetable production budgets available at [http://www.agecon.msstate.edu/whatwedo/budgets.asp](http://www.agecon.msstate.edu/whatwedo/budgets.asp). Numbers are average yields and sale prices. Labor costs are figured at $9.87/hour for most operations and are a subset of the input cost column. Many beginning operators provide their own family labor so the income would be the sum of the labor and potential profit column.

* Wholesale estimate for tomatoes. Direct sales may double this amount.
Tomato Yields

Field tomatoes

- Mississippi average – 15,000 LB/A
- Average yield in U.S. – 28,000 LB/A*
- Good yield in U.S. – 41,000 LB/A*

*Fresh market, Knott’s Handbook

Greenhouse tomato yield – average

- 35 LB/plant/year (varies from 15 to 100!)
- 35 LB/plant/year = 305,000 LB/A

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Plastic Mulch and Drip Irrigation are State of the Art
Plastic Mulch Must be Applied Properly
Bed Shapers and Mechanical Mulch Layers Do a Great Job
Mulch layer

Forms bed, lays mulch in one pass

Also puts down drip tube under the mulch
Transplants can shorten the growing season in the field by 10-14 days. The root ball should always be completely buried in the fired. As long as something green is sticking out the plant is not too deep. Tomatoes BENEFIT from being planted DEEPER than in cell tray.
Staking

• Tight around stake
• Loose around stem
• Not under a flower
Caging
Florida weave is used to support tomato plants in the field. This system eliminates tying knots and greatly speeds up the process. Stakes are driven between every other plant, so use half the stakes compared to the old system. Polypropylene or other non-nylon string is tied to the end stake, then looped around each stake in the row. The string is then placed on the other side of the plant coming the other direction and the string is tied to the same end stake. Two knows per row!

Florida Weave aka Steak & Weave
Strings are added every eight to ten inches.
Stakes can be anything that will support forty pounds.
Just how big do tomatoes get?

- 2 lbs?
- 4 lbs?

The Guinness Book of Records winner is ...

- 7 lbs, 12 ounces
- Variety: Delicious
- grown by Gordon Graham of Edmond, Oklahoma in 1986
Tomato Pruning (Suckering)

- **Determinate** - only remove first suckers
- **Indeterminate** - leave one sucker under first fruit cluster
- Or, every sucker!
- Or, no suckers!
- (there are no hard rules)
Ripeness Stages

- Red
- Light red
- Pink
- Turning
- Breaker
- Green - maybe for fried green tomatoes

Red Ripe

Light Red

Green

Breaker

Turning

Pink
Blossom End Rot – Calcium AND Water Relations
What is it?
Herbicide Damage

- Do not use Roundup near tomatoes.
- Do not use 2,4-D near tomatoes.
Preventing Herbicide Damage

- Use separate sprayer just for herbicides
- Do not spray herbicides on windy day
- Use lower pressure, larger droplet size.
- Optimum spray conditions –
  - 82°F and 60% humidity
- Beware of “weed & feed” products for lawn

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Use Diagnostics Resources When Needed – send pictures by email

- Local County Director or Area Horticulture Agent
- Extension Specialist
- Digital diagnostics
- Diagnostics laboratory
Fall Flower & Garden Fest

- October 13 & 14 2017
- Crystal Springs, MS
- This is the 39th year!

Information:
- [http://extension.msstate.edu/fallfest](http://extension.msstate.edu/fallfest)
Questions?