In Search of the Perfect Tomato

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Tomatoes

- Gardening is the country’s national pastime
- Tomatoes are America’s favorite vegetable
- Americans consume 90 pounds per person per year
- Florida is #1 in fresh market production
A Native American

- The tomato, like its relative the potato, originated in South America.
- It was domesticated in Mexico.
- It’s name is derived from the Aztec "tomatl".

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World Traveler

- Spanish explorers introduced the tomato to Europe in the 1600's.
- It was embraced by the Spaniards and Italians.
- Northern Europeans suspected the "wolf peach" was poisonous and only grew it for decoration.
- Some felt it was an aphrodisiac and began calling it the "love apple".
Homeward Bound

- The tomato arrived in America in the late 1700's along with all of the myth surrounding it
- Adventuresome gardeners, like Thomas Jefferson, helped it gain popularity
- By 1835, tomatoes were widely consumed in the US
Fruit or Vegetable

- Botanically a fruit – the mature ovary of a plant
- A vegetable is the edible part of a plant such as a root, stem or leaf
- The U.S. Supreme Court ruled the tomato was a vegetable in 1893 (NIX v. HEDDEN, 149 U.S. 304)
- Import tax placed on vegetables (but not fruits) protected U.S. tomato growers from international markets
You’ve Come A Long Way - Baby

- Fruit or vegetable – tomatoes have come a long way from their humble beginnings
- Amateur and commercial breeders have produced thousands of varieties
- Improved quality and disease resistance, as well as a wealth of sizes, colors and flavors for the consumer to enjoy
Climate

- Warm season
- Tomato plants grow best between 68°F and 80.6°F
- Fruit set is reduced if temperature exceeds 86°F or below 50°F
- Plant early fall – early spring
Varieties

- How to chose?
- Do your homework – “nothing more optimistic than a seed catalog”
Determinate vs Indeterminate

- Determinate plants stop growing once the flower buds emerge.
- Fruit ripens within a short window of time - 10 – 20 days.
- Smaller size bush may not need staking or caging, but providing support can improve the quality of the fruit.
- Indeterminate varieties continue to grow and set fruit throughout the season.
- Good for the gardener who prefers to have a fewer number of tomatoes over a longer period of time.
Varieties

- Days to maturity - "early," "midseason," or "late" - indicate when the variety should start ripening
- Disease Resistance - VFN
- Best to choose tried and proven varieties at first
- Large fruited types - Better Boy, Celebrity, Duke, Floramerica, Flora-Dade, Floradel, Manalucie, Solar Set, Sun Coast, Walter
Tomato Varieties

- Beefsteak
  - Bragger, Beefmaster, Beefsteak, Super Beefsteak
- Pear or Plum
  - Roma, La Roma
- Heirlooms
- Small Fruit
- Cherries –
  - Chelsea, Cherry, Cherry Grande, Sugar Lump, Sweet 100, Tiny Tim, Florida Basket, Florida Lanai, Florida Petite, Micro Tom, Patio Cherry
- Grapes – Santa, Juliet
Experiment

- Talk to other gardeners
- That heirloom while ugly and susceptible to disease may produce the world’s most delicious tomatoes
- Experimentation is part of the joy of gardening, and part of your harvest is the knowledge you gain along the way
Recipe for Success

- Soil fertility
- Watering
- Mulching
- Pest and disease control
Soil pH

- **Acidity/alkalinity**
- **Best range:** 5.8-6.5
- **Soil test**
- **Too acid?** Lime with Dolomite
- **Too alkaline?**
  - Add micro-nutrients
  - Add sulfur only if over-limed

<table>
<thead>
<tr>
<th>pH and Nutrient Availability</th>
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<tbody>
<tr>
<td>NITROGEN</td>
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<tr>
<td>IRON</td>
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</table>
Organic Matter

- Use liberally
- Conditions soil
- Improves water holding
- Improves nutrient holding
- Supplies nutrients – slow release
- Buffers soil
- Increases soil “life”
Fertilizing Tomatoes

- Tomatoes are "heavy feeders"
- Growth of, branches, leaves, blossoms and roots; and developing, nurturing and ripening fruits > 20 lbs per plant
- All this work requires a steady diet of water and nutrients
Plant Nutrients

Macro-nutrients
- Primary
  N (nitrogen)
  P (phosphorus)
  K (potassium)
- Secondary
  Ca (calcium)
  Mg (magnesium)
  S (sulfur)

Micro-nutrients
- B (boron)
- Cl (chlorine)
- Cu (copper)
- Fe (iron)
- Mn (manganese)
- Mo (molybdenum)
- Zn (zinc)
Fertilizer

- NPK plus micro-nutrients
- Organic vs inorganic - plants don’t care
- Cost, convenience, availability
- Foliar feeding
- Fertigation
### Florida Garden Amounts

<table>
<thead>
<tr>
<th>Soil Type</th>
<th>N-P-K Ratio</th>
<th>Amount banded per 10 ft row</th>
<th>Amount broadcast per 100 sq ft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sand, marl or clay</td>
<td>6-6-6</td>
<td>5 oz</td>
<td>2-3 lbs</td>
</tr>
<tr>
<td>Organic (muck or peat)</td>
<td>0-12-20</td>
<td>2 oz</td>
<td>1-2 lbs</td>
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</table>
Manure/Composts

Rates:
- Before planting broadcast 25-100 lbs / 100 sq. ft. or more
- Supplement with 2-3 lbs fertilizer
- After planting side dress 5 lbs / 100 sq. ft.

Compost to avoid food borne pathogens
Fertilizer Tips

- Avoid high-nitrogen fertilizers such as urea, ammonium sulfate or fresh manure. Too much N will produce tall, dark green plants with few tomatoes.
- Start side-dressing when the first tomatoes have just formed - when they're about the size of golf balls.
- Repeat side-dressings every three weeks.
Bedding

- Water control - drainage
- Elevated rows
  - 6-8 inches high
  - 12-48 inches wide
- Hills (mounds 12-18 inch wide)
- Different techniques
Transplants

**Advantages**
- Early start
- Avoid bad weather
- Choice of plants
- Instant success
- Ideal seed germination
- Reduce pest and disease control
Buy or grow your own
Success with Transplants

- Select only strong, stocky, healthy, disease-free plants
- Younger plants produce better plants that are too old or too hard
- Transplant late in the day, after a rain or when overcast
- Protect new transplants if needed
Setting Plants

- 4-6 weeks old
- Do not disturb roots
- Set in moist soil
- Water around roots
- Set at proper depths
- Starter solution helpful
Spacing

- rows 36" - 48" apart
- 18 - 24" between plants
Watering

- Tomatoes need 1 – 2 inches of water per week depending on season, soil, stage of growth etc.
- One inch of water equals about 60 gallons for each 100 square feet of garden
- Water young plants frequently, older plants more but less often
Overhead Sprinklers

- Overhead sprinkler irrigation is most commonly used.
- Overhead irrigation is inefficient and may contribute to disease problems.
- Water early in the day to allow drying.
Drip Irrigation

- Drip irrigation on mulched beds is hard to beat
- Although efficient in terms of water use, drip irrigation is somewhat technical
- It is expensive and requires good quality water supplies
Other methods
Considerations

- Water quality – pH, salinity, other
- Over watering can cause numerous problems
- Fertilizer and water management are closely linked - the goal is to keep the irrigation water and the fertilizer in the root zone
- Water conservation techniques
- Supply the proper amount of water at the proper time
Mulching

- Retains soil moisture
- Reduces weeds
- Moderates soil temperatures
- Less fruit disease (no contact with soil)
Mulch effects

No mulch - more disease  Mulch - less disease
Mulches

Organic Mulches
- Hay/pine straw
- Leaves
- Bark/wood chips
- Yard waste
- Sawdust
- Peanut hulls

Inorganic Mulches
- Poly-plastic
- Newspaper
- Cardboard
- Carpet
Staking, Trellising etc

Benefits
- Optimize space
- Reduce disease problems
- Cleaner fruit
- Earlier fruit

Problems
- Wind
- More BER
- Cracking
- Access
- Difficult to
- spray

Essential for indeterminate types
Trellising Methods

- Stakes – single, multiple
- Cages
- Spirals
- Tripods, Quadrupods
- European trellis
Tomato Cage

Spiral

Tomato Ladder
Pruning Tomatoes

- **Purpose**
  - Larger fruit
  - Train indeterminate types

- **Optional**
  - Remove young suckers
  - Leave two main stems
  - Don’t remove leaves on main stems – avoid excessive pruning
Auxillary Shoot or Suck
Troubleshooting Tomato Problems

- Everyone likes tomatoes
- Biotic causes
  - Weeds
  - Insects
  - Diseases
  - Nematodes
- Abiotic Causes
Who done it?
"Blossom-End Rot"

Calcium Deficiency
Catfacing – deformed fruit
Weeds

- Normally not a major problem
- Compete for water and nutrients
- Harbor pests and diseases

Control
- Mulches
- Cultivation
- Hand pulling
- Off season control
  important
Nematodes

- Microscopic soil dwelling worms
- Aboveground symptoms
  - Stunting
  - Yellowing
  - Wilting
- Root knots or galls
Soil Solarization
Soil Solarization Steps

- Remove all vegetation
- Add soil amendments (compost, etc)
- Turn/roto-till soil
- Wet soil to activate nematodes
- Cover with plastic (1-6 mil, UV resistant)
- Bury edges of plastic for a good seal
- Leave plastic in place for 4-6 weeks (June-September best)
Insects

- Many good insects
- Proper identification is important
- Thresholds
- Control on an as needed rather than preventative basis
Chewing Insects
(Insects that damage leaves and fruits)

• Worms/Caterpillars *
• Beetles
• Grasshoppers
Worms/Caterpillars
Caterpillars

- Many different kinds in a variety of colors and sizes – armyworms, cutworms, loopers, pinworms
- Control is easy when young
- Hand pick when only a few are present
- Biological control – *Bacillus thuringiensis* (Bt), many wasps parasitize caterpillars
- Soap
- Chemicals – malathion, pyrethrin, rotenone, Sevin, Conserve
Piercing – Sucking Insects

- Whiteflies
- Aphids
- Spider mite
- Thrips
- Leaf-footed plant bug
- Squash bug
- Stink bug
- Leafhoppers

Many transmit diseases and/or cause physiological disorders
Whiteflies

- Tiny white insects that fly up in a cloud when disturbed
- Secrete honeydew
- Sucking insects that generally weaken plants and spread a number of virus diseases – such as the tomato yellow leaf curl virus
Whiteflies

- Whitefly feeding can also result in several physiological disorders
  - Irregular ripening in tomato

- Biocontrol - Beauvaria

- Chemical controls include soaps, oil, malathion, pyrethrins
Spider Mites

- Spider mites are very small and are easily visible only under magnification.
- Mite populations can build quickly in dry weather.
- Look for infestations to start along edges and sides of garden.
Mites

- Foliage silvers, browns and plants may die
- Control with oil, soaps, sulfur
- Short life cycle – timing is important
Stinkbug

- Piercing sucking mouth parts can damage and distort fruit
- Numbers are often low and may not require control
- Some are beneficial
- Chemical controls include malathion, pyrethrin, Sevin and soaps
Leafminers damage tomatoes and many other crops.
Larvae burrow inside leaf reducing photosynthesis.
Damage is often cosmetic.
Heavy infestation can cause leaf desiccation and abscission.
Leafminers

- Stippling pattern and serpentine mines in leaves are indicative of leafminers
- Beneficial wasps provide some control
- Feeding habits can make leafminers difficult to control
- Oils, Neem, systemic products like spinosad, dimethoate provide the most effective control
Managing Insects

- Timely planting
- Scout & handpick
- Beneficial insects and fungi
- Soap & Oil Sprays, Bt, Neem
- Chemical insecticides
Tomato Diseases

- Susceptible host, pathogen, proper environment must all be present
- Unlike insects, many diseases must be prevented with protective sprays of fungicides or other strategies (rotation, solarization, etc)

Late blight
Disease Triangle

Host

Man

Pathogen

Environment
Tomato diseases

- Rots, spots, wilts, blights, mosaic, mildews
- Bacteria, fungi, virus
- Roots, stems, leaves, fruit can all be affected
Disease Control

- **Biological**
  - Resistance varieties, beneficial organisms, antagonism

- **Physical**
  - Soil solarization, pruning

- **Cultural**
  - Rotation, mulching, staking, irrigation management

- **Chemical** – fungicides, bactericides
Chemical Disease Control

- Protectants must be present on surface of plant to prevent infection by pathogen
  - Copper compounds
  - Various fungicides – Bravo, Dithane

- Systemic chemical can be translocated internally throughout host plant and can kill or prevent fungal reproduction
  - Thiophanate methyl, mefenoxam
Florida Tomato Scouting Guide
with Insect and Disease Identification Keys

http://ftsg.ifas.ufl.edu
Leaf spots

Bacterial spot

Late blight

Leaf mold

Early Blight
Root/Stem Problems

- Early Blight
- Southern blight
- White mold
- Fusarium crown rot
Viruses

- Tobacco etch
- Tomato Yellow Leaf Curl
- Tomato Mottle
- Cucumber mosaic virus
Fruit Spots and Rots

Early Blight

Bacterial speck

Late blight

Buckeye rot
Use Pesticides Safely

- Follow the label
- Use on listed crops only
- Measure correctly
- Follow application intervals
- Wear protective gear
- Use, store, and dispose of containers correctly
- Wash produce before eating
Tasty Tomatoes

- Variety – personal preferences
- Proper nutrition and water
- Disease control – protect the foliage
- Long days
- Let mature on vine
- Store properly > 55°F
Sources

- Vince and Linda Sapp
- Tomato Growers Supply Company
- P.O. Box 2237
  Fort Myers, FL 33902
- Phone 239-768-1119
- Email - http://www.tomatogrowers.com/
Sources

Cross Country Nurseries
199 Kingwood-Locktown Road
Rosemont, NJ 08556-0170

Phone: 908-996-4646
Fax: 908-996-4638
www.chileplants.com
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