

Urban Agriculture Series



Tomato Love!

April 2019



Master Gardeners of Northern Virginia

- Virginia Cooperative Extension (VCE) www.ext.vt.edu
- Volunteers serving Arlington & Alexandria
- Since 1985, promoting public education on environmentally sound gardening practices
 - Help Desk
 - Farmers Markets Plant Clinics
 - Arlington Central Library Plant Clinic
 - Classes
 - Demonstration gardens, incl. organic vegetable garden
- Website: www.mgnv.org
- Search tip — site:edu, site:gov

NOTE: Surveys collect information to verify MGNV's community service and justify funding. Please complete!



Potomac Overlook Organic Vegetable Garden

What We'll Cover

- History of the Tomato
- Selecting Varieties
- Planting and Caring for Tomatoes
- Keeping Tomatoes Happy
- Identifying Problems (Diseases, Deformities & Pests)
- Best Cultural Practices

Tomato Provenance

- Originated in South and Central America; domesticated in Mexico - originally desert plants
- Used by Native Americans (Mayans and Aztec) “tomatl” means round and plump
- Brought to Europe by the Spanish in 1535; to the east (1604) and South Africa (1850) by the Portuguese
- In 1700s, were called “love apples”
- Not recognized as useful in US until 1800s
- French: pommes d’amour; Italian: pomo d’oro (golden apple); Afrikans: Tomatie; Malay: Tamatte

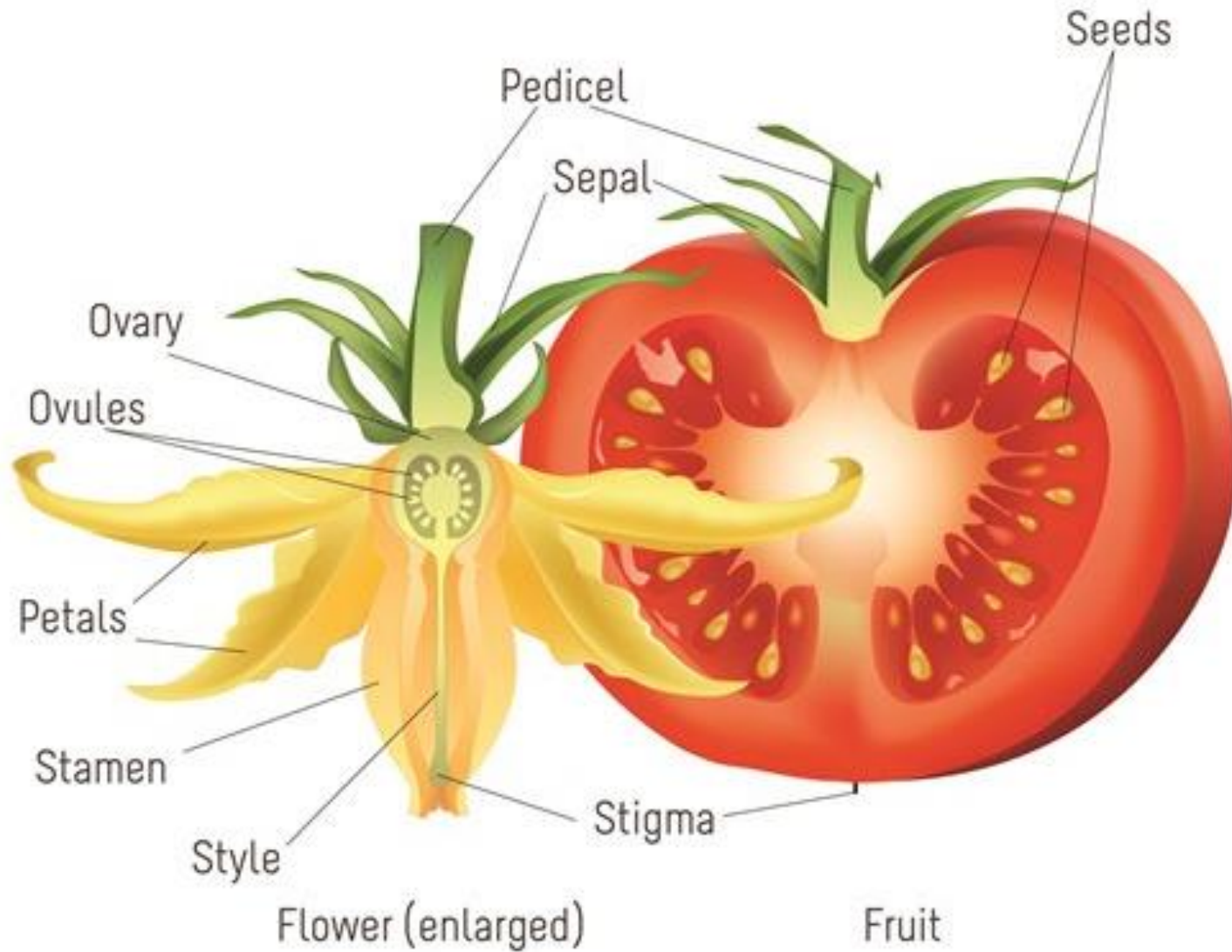


Tomato Facts

- Second most consumed vegetable in the world
- World production: 161.7 mil. metric tons;
USA production: 13.2 mil. metric tons
- World crop \$59 billion; USA \$5 billion
- Largest producers:
 1. China
 2. India
 3. USA
- 20-25 lbs. consumed per person per annum
- Carotenoid lycopene gives red color



Tomato Anatomy



Fruit



Seed



Seedling



Mature Plant



Flower

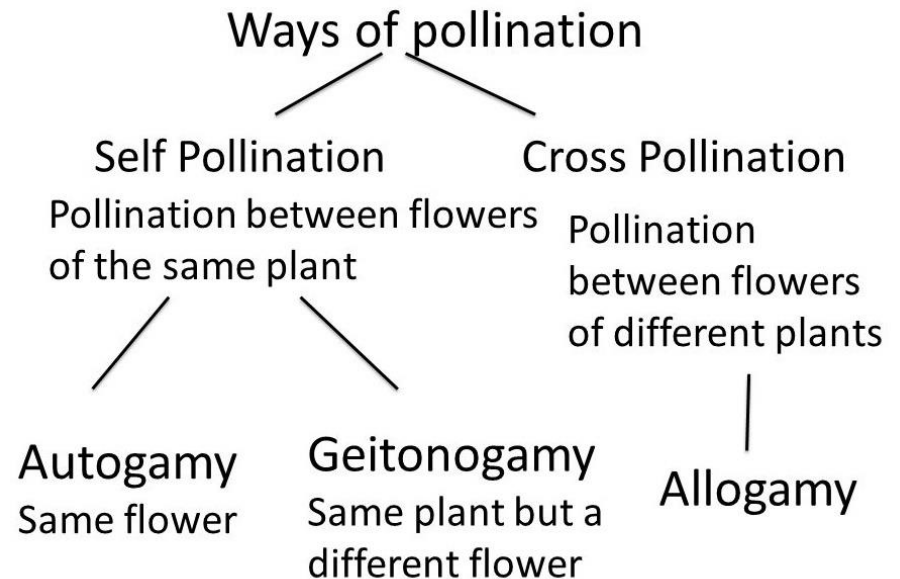
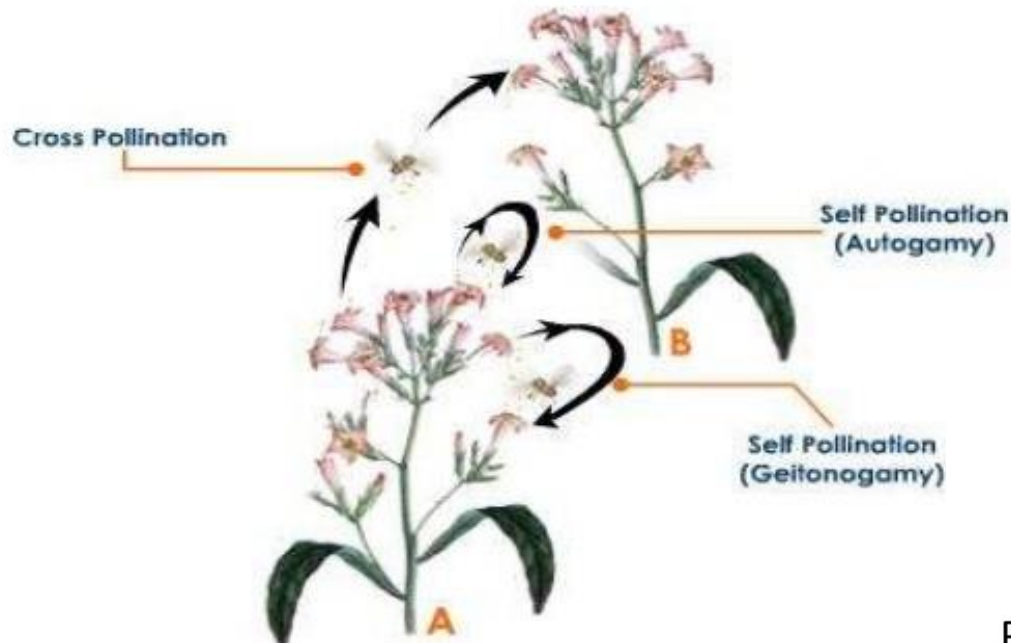


Life Cycle

Typical Growth

- 6-12 days: seedlings emerge
- 70-90 days: harvest
- Progression:
 - Green
 - Mature green
 - Color breaker
 - 1/2 ripe
 - Ripe
 - Red ripe
 - Full ripe
- 8-10 tomatoes per plant

Pollination

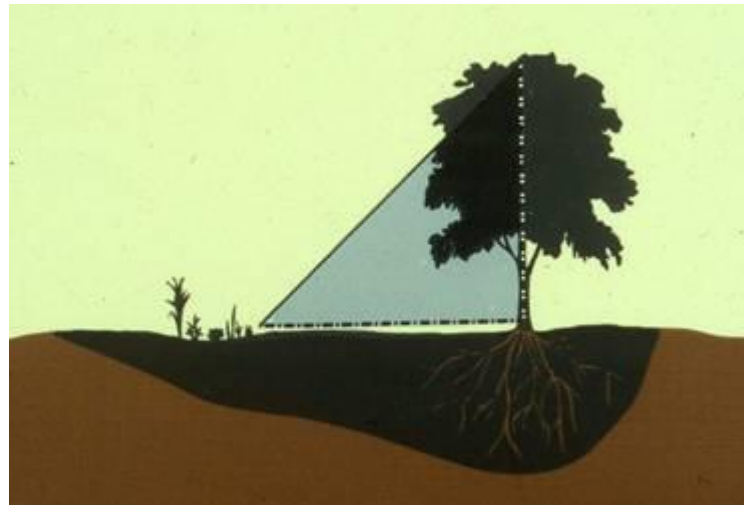


Getting Started...

- Consider where you will plant & how much space you have
- Grow what you like to eat.
 - Basic Fruit Types: Cherry, Beefsteak, Paste, Winter Storage
 - Colors: Red, Pink, Green, Orange, Yellow, Black/Purple, Striped
- Length of growing season is very important; impacts what/when
- Northern Virginia is in Zone 7 with ~180-day growing season

Optimum Growing Conditions

- 6-8+ hrs of sunlight
- Healthy soil
 - Prefers pH 6.5-6.8
 - N-P-K Balance
 - Organic Matter
- Good air flow & drainage
- Adequate water supply
- Wind protection

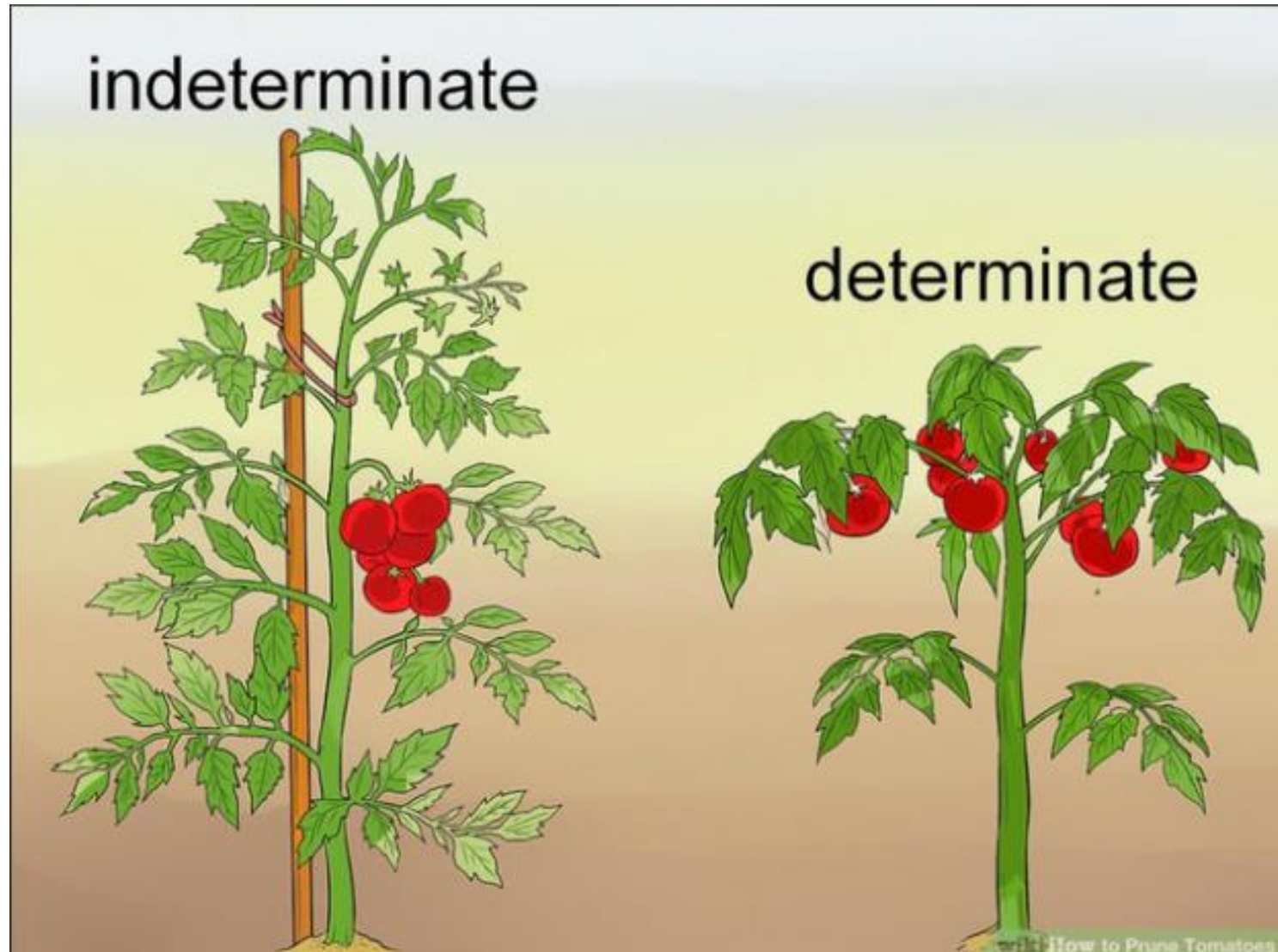


Growing Medium for Containers

- Select a high quality, organic potting mix
 - Good soil structure and nutrients
- Avoid garden soil
 - Insects, weeds, and disease
 - Clay holds too much water and too little air
- Avoid soilless mixes
 - Sterile with few nutrients
 - Too light to support plant roots
 - In light containers, taller plants may blow over
- Avoid mixes with water-absorbing polymer products
 - Can pull moisture OUT of tiny root hairs



Indeterminate vs. Determinate



Plant Characteristics: Indeterminate vs. Determinate

• Vine

- 3 – 4 leaves between flower clusters
- Shoot does not terminate in flower cluster
- Plant continues to elongate, grow larger
- Requires staking or caging
- Can grow up to 10 ft.
- Fruits ripen throughout growing season
- Grow until frost or disease kills them

• Bush

- Flower clusters produced with 1 or 2 leaves between them
- After several clusters, shoots terminate in flower cluster
- Early-ripening
- Smaller plants; suited for caging or sprawling
- Typically grow to 4 ft.
- Fruit ripens all at once
- Reach a certain stage, set fruit and then decline
- Commonly used as patio plants

Hybrid vs. Heirloom

- Created from 2 or more tomato varieties
 - Pros: harvest green, withstand shipping, maintain a good, uniform appearance
 - Will revert to one of the parents (not the combination) if seed is saved and planted
 - Produce more tomatoes; more disease resistant
- Treasures from the past.
 - Pros: outstanding flavor, color, or overall performance
 - Heirloom varieties are open-pollinated
 - Will remain true to the parent plant if seed is saved and planted

Sampling of Varieties

- Cherry Tomatoes
 - Super Sweet 100, Sun Gold, Sweet Millions, Amethyst Cream, Sun Sugar
- Best Taste
 - Brandywine, Mortgage Lifter, Ferris Wheel, Sicilian Saucer
- Low Acid
 - Lemon Boy, Oxheart Lemon, Yellow Pear
- Black/Purple
 - Black Zebra, Black Krim, Black Russian, Purple Cherokee
- Best All-Around
 - Beefsteak, Italian Heirloom, Celebrity, Primo Red
- Great in Sauces (Paste)
 - Roma, Amish Paste, San Mariano, Supremo
- Best in Containers
 - Bush Early Girl, Bush Beefsteak, Celebrity Hybrid, Sweetheart of the Patio, Tumbling Tom, Patio Princess, Basket King Hybrid
- Long Lasting
 - Long Keeper

Vegetable Varieties for Gardeners

http://vegvariety.cce.cornell.edu/main/showVarieties.php?searchCriteria=tomatoes&searchIn=0&crop_id=0&sortBy=overallrating&order=DESC&sideSearch=Search

Resistant Cultivars



	CHERRY	PLUM	BEEFSTEAK
Early Blight	Mountain Magic, Jasper	Plum Regal, Juliet	Defiant PhR
Late Blight	Prudens Purple, Mountain	Plum Regal, Juliet	Iron Lady, Defiant PhR, Damsel
	Magic, Cherry Bomb, Jasper		Mountain Merit
Fusarium	Supersweet 100, Apero	Tiren, Chiquita	Celebrity, Marbonne, Marnero
Verticillium	Supersweet 100	Grandero	Big Beef, Defiant PhR, Celebrity,

Planting

- Can start seeds indoors 1 Mar-1 May
- Plant outdoors 1 May-15 June
- Space 18-30" apart
- Rows 30-48" apart
- Can be trenched
- Can interplant with lettuce, carrots, parsley, onions, chives, basil, and nasturtiums
- Do not plant with corn, dill, or potato

Seed-Starting Supplies

- South facing window or grow light(s)
- Seed-starting soil
- Containers
- Tray with cover or plastic wrap
- Tomato seeds;
seeds viable for 4 years
- Spray bottle with water
- Heat pad (optional)
- Fan or other air source



More Info: VCE Publication 426-001 Plant Propagation From Seed

Planting Seeds & Caring for Transplants

- Fill your container with soil and add 2-3 seeds to each section or container and soak with warm water
- Then cover lightly with additional soil and cover with plastic top or plastic wrap and place in warm place to germinate or on heat pad or refrigerator top
- Keep moist but not soaking wet; remove top or wrap if condensation forms and drain off.
- When seedlings poke through in 7-14 days, these are the cotyledon leaves, remove top/plastic wrap and place them in south-facing window or under grow lights
- Keep plants 1-2 inches from grow light or other light source to avoid weak, leggy seedlings, turning frequently
- Water from the bottom but do not allow them to sit in water; it's best for your plants to dry out a little bit

Hardening Off Transplants

- Decrease watering & stop fertilizing 2 weeks before transplanting
- Lower temperature before transplanting
- Gradually expose to
 - Wind
 - Sunlight
 - Fluctuating temperatures

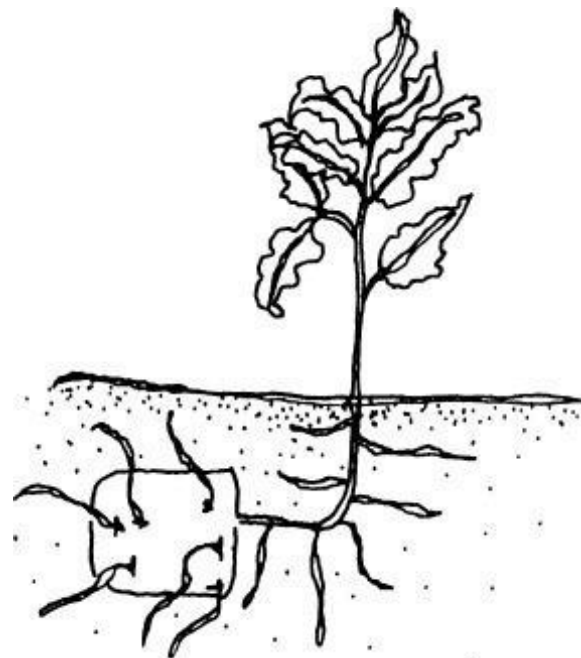


Preparing Transplants for Planting

- About 1 week before planting them, place plants outside in a shady, protected spot for a couple of days; take them in at night
- Then put them out in a spot with some dappled sun bringing them in at night
- Then put them out in a sunny spot leaving them out overnight

How To Plant

- Plant mid-afternoon with expected evening temps at least 50 deg with no high winds or heavy rain
- Dig a shallow trench, pinch off all but the very top 2-3 sets of leaves and lay the tomato seedling in the ground horizontally, with just the top few inches showing above ground
- Press the soil firmly around the transplant so that a slight depression is formed for holding water.
- Pour approximately one pint of diluted fish emulsion around each plant to wash the soil around the roots.



Tomato Supports



**Staked
Tomatoes**



**Caged
Tomatoes**



Florida or Basket Weave or Trellised

Care

- Optimum temperature: 65-85°
- Critical to water when flowering or fruiting
- Poor fruit set if heavy rain
- Fruit set hampered by:
 - Day temperature >90°
 - Night temp > 70°
- Tolerates any day length but retarded with continuous light

Fertilizing

- Use starter solution for transplants.
- Side dress one to two weeks after the first cluster of tomatoes begins to develop with 3 tablespoons 33-0-0 per 10-foot row.
- Side dress again two weeks after the first ripe tomato with a balanced fertilizer such as 5-10-5; repeat one month later.

Best Management Practices: Cultural

- Choose resistant cultivars (Exclusion)
- Test soil for pH and nutrients and organic matter
- Aerate, add organic matter to improve soil and drainage
- Water in am with drip irrigation or soaker hose 1"/week
- Avoid injury to plants or their roots
- Inspect daily
- Don't overfertilize



Best Management Practices: Environmental

- Mulch plants
- Avoid overcrowding (promote air circulation)
- Trellis plants
- Consider using raised beds
- Add companion planting
- Right plant, right place



Tomato Diseases

- **Foliar Disease:** Early Blight, Late Blight, Septoria
- **Fruit Disease:** Anthracnose
- **Soil-borne, Root-delivered Disease:** Fusarium Wilt, Verticillium Wilt

Early Blight



Concentric Or “Target”
Lesions, 1/4-1/2”
May Be Bound By
Larger Leaf Veins

Leathery, Depressed
Black Spots
On Fruit



Late Blight



Blue Grey Spots
On Leaves

Brown Spots
On Fruits



Septoria lycopersici



- Appears on underside of lower leaves
- Spots circular 1/16 to 1/4 in diameter
- Centers with small black fruiting structures “pycnidia”
- Many spots per leaf

Anthracnose



Darkened, depressed lesions

Fusarium Wilt



- Girdling can develop on stem at its junction with root
- Very few tomatoes produced and plant often dies
- Signs:
 - Yellowing and wilting on one side of plant (could be leaf, single shoot, branch or several branches)
 - Lower leaves turn yellow and may fall off
 - Browning of vascular tissue(xylem), core remains healthy

Verticillium Wilt



Brown Color
In Xylem



Yellow
Leaves

Exclusion

Purchase
Disease-free
plants



Crimson Crush F1



Mountain Magic F1



Lizzano F1

Tomato Disease Resistance Codes

V - Verticillium Wilt
F - Fusarium Wilt (FF - Races 1 & 2; FFF - Races 1, 2, & 3)
N - Nematodes
T - Tobacco Mosaic Virus
A - Alternaria Stem Canker
St - Stemphylium Gray Leaf Spot
TSWV - Tomato Spotted Wilt Virus

Purchase
Disease-free seeds

Inoculum Reduction

- Remove and destroy infected plants (Do not compost)
- Get rid of harboring weeds which can act as overwintering hosts
- Rotate crops every three years
- Wash hands and disinfect tools

Disease Mimics: Catfacing

Occurs at blossom end

Inconsistent watering and cold temperatures when the plant is flowering



More prevalent in larger tomatoes and heirlooms

Disease Mimics: Blossom End Rot

- Caused by Calcium imbalance usually as result of fluctuation in moisture (not enough water to get Ca^{+} to the plant)
- Too much Nitrogen
- Too high or too low pH



Disease Mimics: Cracking and Splitting

- Excessive watering after drought
- Precipitous temperature change or temperature extreme
- Flesh grows faster than skin which splits
- Can be radial or concentric
- Cracks are portals for bacterial or fungal infections



Disease Mimics: Sunscald

- Loss of leaves; excessive pruning
- Fruit becomes lighter in color and develops a papery texture



Disease Mimics: Yellow or Green Shoulders

- Happens when lycopene production is inhibited
- Lycopene production ceases at temperatures greater than 80 degrees and above
- Proper airflow and ventilation can help



Disease Mimics: Misshapen Fruit

- Inadequate Pollination secondary to:
 - Temperature and humidity outside ideal range
 - Lack of water
 - Nutrient deficiencies or toxicities
 - Low wind (lack of pollen transfer)



Learn to ID Ones That Really Bug Us.....



Cutworm



Cabbage Looper



Colorado Potato Beetle



Hornworm



Whitefly



Aphids

Insects Impacting Tomatoes

- Blister
- Hornworms
- Tomato Russet Mite
- Cabbage Looper
- Colorado Potato Beetle
- Cutworms
- Flea Beetle
- Stink Bugs
- Grasshoppers
- Leaf footed Bugs
- Fruitworms
- Spider Mites
- Thrips
- Aphids
- Whitefly

*Home Vegetables: **Organic Controls for Insects***

https://www.pubs.ext.vt.edu/content/dam/pubs_ext_vt_edu/456/456-018/ENTO-289B.pdf

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"I need everybody to come down to the garden to cheer on the tomatoes."

Tomato Diseases

	Anthracnose	Early Blight	Late Blight	Fusarium Wilt	Verticillium Wilt	Septoria
When Occurs	on green and ripe fruit	early to mid season greatest damage after fruit set	mid to late season			anytime in season
Part Of Plant Affected	apparent on ripe fruit	leaves, flowers, stems and fruit	leaves, petioles, stems, fruit	xylem, leaves, stem	xylem, leaves	stems, calyxes, blossoms
How Spread?	can colonize already compromised leaves	water, wind, tools hands clothing insects	airborne spores	enters through broken roots nematode damage	broken roots, nematode damage	water, wind, tools, hands, clothing, insects spread spores (conidia)
Optimum Temp	80	82-86		78-90	75	60-80
Conditions That Favor	wet weather, splashing water	humid weather, heavy rainfall	cool, wet	excessive nitrogen	cool wet soils	wet weather splashing water
Appearance	darkened depressed lesions	target lesions, may be bound by leaf veins, dropped leaves result in sun scald	blue, grey spots on leaves, dropped leaves, brown spots on fruit	yellowing and wilting on one side of plant; leaves turn yellow and fall off; brown xylem	brown color in xylem. yellow leaves	multiple spots, yellow and brown, leaves may wither, pycnidia
Where Does It Live	infested tomato debris	plant debris, weeds		soil	soil	plant debris, solanaceous weeds
Resistant Varieties	No	Yes	Yes	Yes	Yes	no commercial
Chemical RX	fungicides	fungicides	fungicides	none	none	fungicide, copper
Fungus	Colletotrichum coccodes	Alternaria solani	Phytophthora Infestans	Fusarium Oxysporum; Fusarium Lycopersici	Verticillium albo-atrum	

Resistant Tomato Varieties

Cultivar	Disease Resistance/Tolerance
Beef Master	VT; F1; N; AS; M
Better Boy	VT; F1; N; AS
Big Beef	F12; GL; N; TM; VT; AS; EB
Carnival	F12; GL; N; TM; VT; AS
Celebrity	F12; GL; N; TM; VT; AS
Floralina	F12; GL; VT
Florida 47	F12; VT
Jet Star	F1; VT
Mt. Delight	F12; VT; BE
Mt. Fresh	F12; VT; BE; EB
Mt. Gold	F12; VT
Mt. Pride	F12; VT; AS
Mt. Spring	F12; VT; BE
Mt. Supreme	F12; VT; EB
Pink Girl	F12; GL; VT; AS
Spitfire	F12; GL; VT; EB



LEGEND:

AS = Alternaria stem canker

GL = Gray leaf spot

BE = Blossom end rot

N = Root-knot nematode

EB = Early blight

TM = Tobacco mosaic

F12 = Fusarium wilt races 1,2

VT = Verticillium wilt