When Bad Things Happen to Good Tomatoes

Missouri Tomato Conference, KCMO

MAY 19, 2022

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Mississippi State University

Mississippi Greenhouse Tomato short course

When Bad Things Happen to Good Tomatoes…

Temperature Control

is it working correctly?

- Heaters (64˚ F min)
- Fans (keep it under 90˚ F)
- Vents
- HAF
- Shade Materials?
- Pad & Fan system?
- Fogging?

high/low thermometer

Avoid Overcrowding

- Plant Population
- 5 square feet per plant
  - Length X width / 5 = number of plants
  - 24 X 96 ➔ 460 plants
- 3 or 4 plants for 2 cubic foot lay-flat bag
- 2 plants per 5 or 7 ½ gallon upright bag or 5-gallon nursery bucket

Good Quality Water

- Get your water tested
  - In Mississippi –
    Mississippi State Chemical Laboratory
  - 1 Gallon in CLEAN jug (not from milk!)
    i.e. from bottled water
- Not all water is created equal
- Water quality can change over time
  - Especially community water

Tissue Analysis
How to Take Sample

- Snap off 10 to 12 leaves total
- Not more than 1 per plant
- Randomly selected from throughout greenhouse
- Choose leaf just above golf ball sized fruit
- Send to laboratory for analysis

Tissue Analysis Report

Mississippi State University
Extension Service Soil Testing Laboratory
Tissue Sample
Box 9610
Mississippi State, MS 39762

May 6, 2021

Oktibbeha County

Alan Henn
Box 9621
MSU, MS 39762

Form No. : TTT010864 **Date :** 05/06/21

Lab No.	Crop	Sample	N Nitrogen (%)	P Phosphorous (%)	K Potassium (%)	Ca Calcium (%)	Mg Magnesium (%)	S Sulfur (%)	Fe Iron (PPM)	Mn Manganese (PPM)	Zn Zinc (PPM)	Cu Copper (PPM)	Bo Boron (PPM)
5000001	TOMATO	BIG BEEF	5.2	.6	3.1	2.5	.9	.9	59	196	29	1	45
Sufficiency Levels			**3.5-5.0**	**0.3-0.65**	**3.5-4.5**	**1.0-3.0**	**0.35-1.0**	**0.2-1.0**	**50-300**	**25-200**	**18-80**	**5-35**	**30-75**

Comments :

Extension Soil Testing Specialist
Department of Plant and Soil Sciences

Maintain Your Equipment

- Heaters
  - Should be ready in advance of need
- Fans
- Vents
- Emitters
- Injectors
- Pumps

Use a Vented Heater ONLY

- Heaters must be vented to the outside with a stack.
- Do not use any space heaters in the greenhouse which exhaust into the greenhouse.
- Do not use so-called "100% efficient heaters".
- Ventless heaters may be ok for chickens, but NOT for tomatoes.
- Ethylene and carbon monoxide in exhaust gas will kill flowers, severely reducing yield.

Carbon Monoxide / Ethylene

What Ethylene Levels Are Too High for Tomatoes?

- Chronic (long-term) exposure 0.01-0.05 ppm
- Acute exposure - 3 h exposure to 1 ppm ethylene
- An estimated 15-20% of heated greenhouses experience air pollution problems.
- Heater problems
  - New heater not adjusted properly
  - Old heater starting to leak exhaust gasses

Ethylene Damage – Common Scenario

- Grower installed new propane heater (**unvented**) in fall
- Within a few days:
  - Tomato leaves start drooping (epinasty) but still turgid and root system healthy – looks like wilt but not wilt
  - Flowers fall off
  - Upper leaves twist

Humidity In The Greenhouse

- Perfect humidity for growth and pollination is around 70%
- Note – this is very difficult to maintain in hot, humid climates
- Transpiration
  - Plants naturally transpire water to keep them healthy and cool.
  - Transpiration is easier in low to mid relative humidity.
  - High humidity and low air movement inhibit transpiration.
    - Plants can get heat stressed which effects plant health.
- High humidity is caused by both transpiration from plants and evaporation from all moist surfaces.

High Humidity Problems

- Too high ➔ lower yield and fruit quality, poor fruit set
- Pollen sticks together in clumps so are not dispersed well causing reduction in fertilization (fruit set)
- [With LOW humidity, the stigma may dry out so pollen grains will not stick to it.]
- See condensation on plastic or fruit? Too humid!
- Controlling humidity helps with fruit set, fruit quality, and reduces diseases in the greenhouse.
  - Fungi need moist surface to reproduce.

Controlling High Humidity

- Exhaust fans move the plants and help with high temperature and humidity.
- HAF fans stir the air and help dry leaf and flower surfaces.
- High humidity is worse in the early mornings, especially during cooler months with limited use of exhaust fans.
- Turn on exhaust fans first thing in the morning for a few minutes.
  - This drives out moisture quickly.
  - This will cause heater to come on, which further dries the air.

What else could possibly go wrong?

Tomato

Troubles ….

What is it?

Blossom-End Rot

- Blossom-end brown to black, dry, sunken, leathery
- Lack of calcium *in the fruit*
- Keep calcium level up in fertilizer (150 to 200 ppm).
- If water source is high in Ca, use less from fertilizer.
- *Nitrogen*
  - *Do not overfertilize with nitrogen.*
  - *Do not use too much ammonium.*
- Avoid uneven water (dry periods).
- Don't let plants wilt.
- *Need young, actively growing roots for calcium uptake.*

What is it?

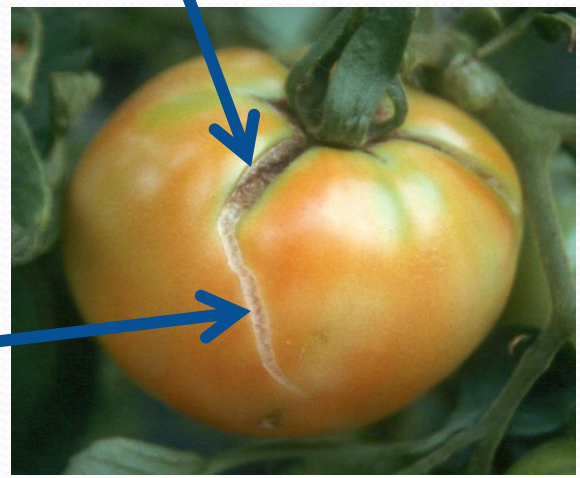
No Calcium

- Tomatoes require calcium
- Blossom-end rot
- Death of the terminals
  - Weak, brown,
  - then black
- End of crop

What is it?

Fruit Cracking/Splitting

- Radial cracking
- Concentric cracking
- Avoid sharp changes in water.
- Avoid wilting.
- Splitting is only skin deep.



What is it?

Catfacing

- Irregular, malformed fruit, especially on the bottom; crevices, scars, etc.
- Caused mainly by cool temperature (early fruit especially); can be caused by very high temperature, too.
- Some varieties more susceptible
- Fruit still tastes fine.

Leaf Roll

- Often starts at the bottom and moves up.
- This is *not* a disease; it is physiological.
- Usually occurs with wet soils, high fertility.
- Looks bad, but does not reduce yield or fruit quality.

What is it?

Blossom Drop

- Flowers fall off --> reduces yield
- Temperature too high or too low
  - Day temp above 90˚ or night temp above 75˚F interferes with fruit set.
  - Night temp above **64˚F** is ideal in greenhouse.
- Too much or too little nitrogen
- High humidity
- Ethylene
- Any stress can cause flower drop.

Why So Small?

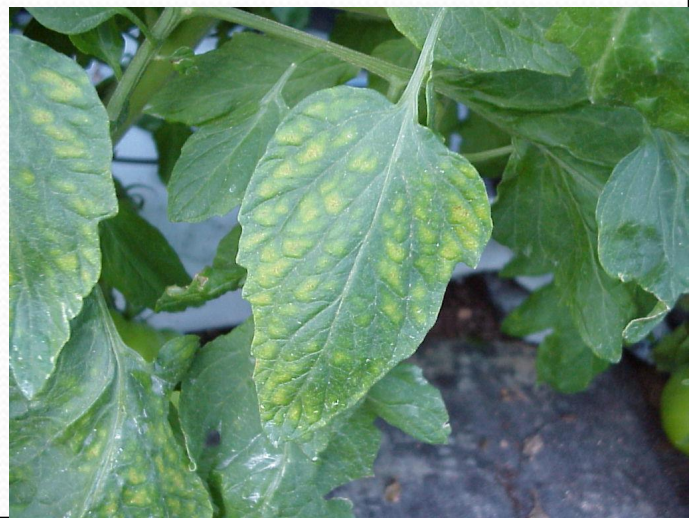
Small Tomatoes

- Fertility?
- Water?
- Poor Pollination?
  - Slice fruit transversely.
  - Check for seed numbers.
  - Other symptoms: angular, flat-sided fruit.

What is it?

Leaf Yellowing – Interveinal

- Upper Leaves
  - Iron deficiency – starts at base of leaflets
  - Manganese deficiency – starts at tips of leaflets
- Lower Leaves (or mid range)
  - Magnesium deficiency is most common culprit, especially at or after 4th cluster set.



Leaf Yellowing – Not Interveinal

- Nitrogen deficiency – general yellowing
- Senescence – bottom leaves turn yellow
  - Natural death, promoted by aging and shade
- Disease
  - Most often Early Blight / Target Spot
    - First, small brown circles on lower leaves
    - Then, larger brown circles
    - Then, yellow leaves
    - Leaf drop
    - Finally, it progresses up the plant

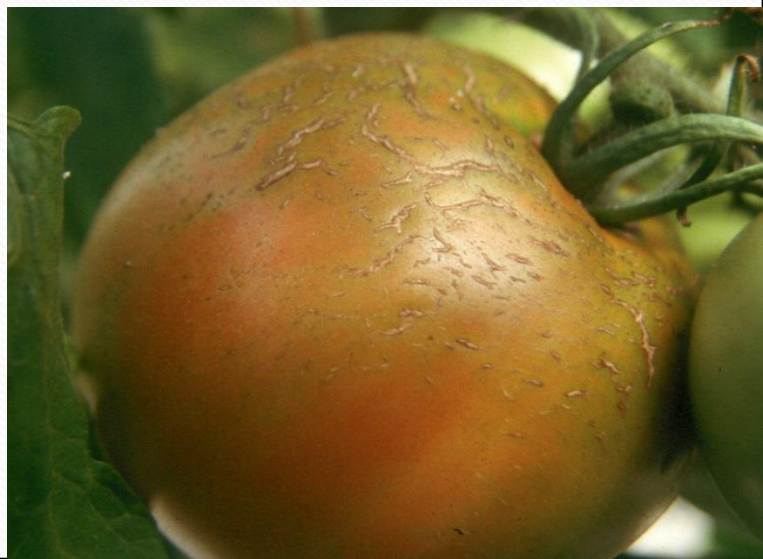
Uneven Ripening

- Green stripes, streaks, blotches, stars, shoulders, etc.
- May be caused by high fertility (N), low potassium (K), high temperature (lycopene killed), viruses, white flies.
- Maintain correct fertilizer.

What is it?

Russetting

- Many, very fine cracks on fruit surface
- Causes water loss; poor shelf life
- Believed to be due to
  - Moisture on fruit surface
  - Topping plant along with all suckers
- Use HAF fans.
- Leave 2 leaves above highest cluster when topping.



Sun Scald

- White blistered area on fruit
- Can turn leathery, can be invaded
- From fruit exposed to the sun
- Keep good leaf cover.
- Do not prune too heavily.
- When topping, leave 2 leaves at top.

Wilting – several possible causes

Abiotic (physical damage)

Biotic (disease)

Cold Damage--Oedema

Spray Injury / Burn


What is it?

A Few Suggestions…

A good way to preserve pests

One possible wiring technique

Use Diagnostics Resources When Needed.

- Local County Agent or Area Horticulture Agent
- Extension Vegetable Specialist
- Digital diagnostics
- Diagnostics laboratory
- Email list
- Friends in the business

Publication Resources

- Greenhouse Tomato Handbook
  (Guía del cultivo del tomate en invernaderos)
- Tomato Troubles: Common Problems with Tomatoes
- Greenhouse Tomato Growers' Glossary
- Environmental Control for Greenhouse Tomatoes
- Greenhouse Tomatoes - Pest Management in Mississippi
- Budget For Greenhouse Tomatoes

All are on the web site

Tomato Troubles

7/6/2022

Tomato Troubles:
Common Problems with Tomatoes

MISSISSIPPI STATE UNIVERSITY EXTENSION

Tomatoes are the most popular vegetable to grow in Mississippi in both home gardens and greenhouse hydroponic production. Not surprisingly, many questions arise from gardeners and commercial growers about various problems that occur during the season.

This Mississippi State University Extension publication discusses some of the most common problems, methods of prevention, and sources of more information. Hopefully you will see very few, if any, of these situations in your own tomato plants this year.

Misshapen Fruit

Misshapen fruit are common in home gardens. There are several factors that cause misshapen fruit, but the most likely cause is low temperature.

Tomato fruit will develop the best shape if the temperature is above the mid-60s. Lower temperatures cause ridged fruit (a bumpy shoulder) and catfacing (ugly bottom of fruit; see below). Planting a little later, when temperatures are higher, will avoid some of these problems.

Some varieties are more prone to produce misshapen fruit. Fruit of the larger beefsteak types as well as many of the older heirloom varieties are commonly misshapen.

Blossom-End Rot

BER is probably the most common problem in tomatoes (home garden, field, and greenhouse). It appears as a dry, leathery (not mushy), dark brown or black area, usually at or near the bottom of the fruit. BER can sometimes occur on the side of fruit, and occasionally only on the inside of fruit, so the BER is hidden until the tomato is sliced open. Sometimes the spot is sunken, and these tomatoes often ripen before all others.

BER is not caused by an infectious agent (pathogen) and is therefore not a disease. It is a physiological disorder caused by lack of adequate calcium in developing fruit. Most Mississippi soils have enough calcium for tomato fruits to develop properly, but it is a good idea to have the soil tested to make sure.

These tomatoes have blossom end rot.

It's common to see BER on the first tomatoes of the season. While low calcium in fruit is the cause, the real culprit is often drought. Without a steady supply of water, the tiny root hairs dry out, which limits the amount of calcium the plants can absorb and supply to developing fruit. So don't let plants wilt between waterings. The best way to reduce the chance of wilting is to mulch around plants.

BER can be especially problematic to tomatoes grown in containers because they have a tendency to dry out more easily. Be sure to provide mulch around the tomatoes to protect the roots. Some varieties are more susceptible to BER than others. If the problem continues, try planting a different variety the following season.

Internet Resources

- **Greenhouse Tomato FAQ**

  http://extension.msstate.edu/crops/commercial-horticulture/greenhouse-tomatoes

Worry!

- Check your work.
- Use pH and EC meter to check nutrient solution daily and after mixing.
- Use a gallon jug to check volume per day.
- Walk the greenhouse every day.
  - Look for wilting plants.
  - Look for critters.
    - turn some leaves over!

Just 1 more …

What is it?

Questions?