Growing Terrific Tomatoes in Wisconsin

University of Wisconsin - Madison
Division of Extension Horticulture Program

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Presentation Overview

- Introduction
- Choosing Varieties
- Growing from Seed and Transplants
- Proper Planting
- Watering and Fertilizing
- Maintaining your Plants
- Harvesting and Storing
- Disorders, Diseases & Insects

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Tomato *(Lycopersicon esculentum)*

- Origin is Andes mountain region of South America; many related species there
- Domesticated in Mexico; travelled to Europe
- "Tomati" was the name used by Indians of Mexico
- Was considered poisonous until 1700's; related to other poisonous nightshades
- Thomas Jefferson was one of the first to grow tomatoes in the US; called "Love Apples" at the time

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Choosing Tomato Types and Varieties

Consider your tomato goals when choosing varieties

- Fresh eating
- Sauce-making
- Drying
- Roasting
- Grilling
- Etc.

Choose the best type of tomato and varieties based on your expected uses.

1000's of varieties exist

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Choosing Tomato Types and Varieties

Consider available space and choose plant sizes accordingly.

- "Patio Tomatoes" are smaller plants, only about 2 feet tall, developed for growing in containers.
- Some varieties get as tall as 15 feet, and can produce a tremendous amount of fruit!

Dwarf varieties for containers

Large plants where space permits

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Choosing Tomato Types and Varieties

Determinate

- Grow 3-4 feet tall
- Flower buds form at branch ends
- Most fruits ripen at once, then plant stops producing
- Includes paste or "Roma" type tomatoes, and most "Patio" tomatoes

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Choosing Tomato Types and Varieties

Indeterminate

- Can grow to 15 feet tall
- Flowers form in leaf axils
- New blooms and fruits form and ripen until frost
- Includes cherry and most slicing types

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Choosing Tomato Types and Varieties

Choose disease-resistant varieties

- V, VF, LB, TSWV indicate *resistance*, not *immunity*, to common tomato diseases.
- Grafted tomatoes provide some disease protection.
  - Purchase grafted plants or graft yourself: Watch how-to videos on-line.

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Growing Tomatoes from Transplants

Purchasing Transplants

- Look for stocky, sturdy, dark-green plants.
- Avoid transplants with yellowing, spotted, or curling leaves.
- Inspect plants for insects or insect eggs.
- Choose transplants that have not yet flowered.

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Growing Tomatoes from Seed

Start seeds indoors 5-8 weeks before the expected plant-out date.

Plant-out date may vary depending on spring weather and soil temperatures.

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Growing Tomatoes from Seed

Use purchased sterile seed-starting mix in 2-inch deep containers.

Many different containers can be used, such as:

- Purchased seed-starting kits with planting cells and domes
- Peat pots/tabs
- Homemade newspaper pots
- Egg cartons
- Recycled containers

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Growing Tomatoes from Seed

Moisten planting soil mix media; place seeds on top and cover with 1/8 to 1/4-inch of media.

Mist and cover with plastic or dome to keep seeds moist until germination.

Place in optimal temperature of 70-85 degrees until germination, usually 4-12 days. Bottom heat can help speed germination.

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Growing Tomatoes from Seed

When germination begins, remove the plastic cover.

- Heat can build under plastic.
- High humidity encourages diseases.

Place growing tomato seedlings in high light and temperatures in the 65-75 degree range.

- High heat/low light results in lanky, spindly plants.
- Allow surface to dry slightly between waterings.


Excess humidity and heat can build under covers

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Growing Tomatoes from Seed

Natural light

- South facing windows are best.
- Rotate plants as they bend toward light.
- Be sure the windowsill area doesn't get too cool at night.
- Be sure the room temperature doesn't get too warm.

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Growing Tomatoes from Seed

Artificial Light

- Fluorescent or LED bulbs are more energy efficient and cooler than incandescent bulbs.
- Cool fluorescent bulbs are adequate; a combination of warm and cool bulbs or full spectrum grow lights may be better.
- Provide 16 hours of light each day.
- Place lights no more than 4 inches from top of foliage and adjust as plants grow.


Microgreens under supplemental light

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Growing Tomatoes from Seed

Watering

Keep seedlings moist but not wet.

- Bottom water or carefully use a fine-stream watering can so seedlings aren't dislodged.
- Do not allow containers to sit in water over 30 minutes.
- Allow surface to dry before watering to reduce damping off.
- Do not allow seedlings to wilt before watering.


Bottom watering

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Growing Tomatoes from Seed

Humidity: Too little in homes can cause leaf damage.


Leaf tips can brown from low humidity.


Excess humidity and heat can build under covers

Humidity: Too much humidity can cause disease.

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Growing Tomatoes from Seed

Fertilizing Seedlings

- Start when seedlings are 1-inch tall.
- Use water-soluble fertilizers with 10-10-10 analysis diluted to half strength.
- Fertilize every other week.
- Increase concentration to full strength when seedlings are 4-inches tall.
  - Organic products may need more frequent application.
  - Slow-release granular products also work well.

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Hardening Off

Introduce seedlings to outdoors gradually to prevent sunscorch.

- 2-week process
- Start with 1 hour of early morning sun and increase by 15 minutes per day
- Protect from strong winds, storms, and wildlife

Sunscorched plant

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Transplanting

Soil temperature should be 60° F.	• Use a thermometer to monitor soil temperature.
Overnight lows should be above 45-50° F.	• Plants will not produce flowers and fruit until nights are over 55° F.
Avoid planting where tomatoes or other "nightshade" plants were recently grown.	• Diseases can build up in soil.

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Transplanting

Plant deep: leggy plants will produce adventitious roots along buried stems.

Space to promote good air circulation and maximize sunlight.

Distance Between Plants Depends on:

- Plant Size
- Cages or Trellis System Used

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Fertilizing

Start with a soil test from a qualified lab and amend soil according to lab recommendations.

pH — 6.2-6.8 optimal
5.5 to 7.5 tolerated

Incorporate organic matter (compost) to improve soil structure and provide trace nutrients.

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Fertilizing

Fertilize by side-dressing at planting time, following soil test recommendations.

Side-dress with fertilizer after first fruit set, and a couple weeks later.

Over-fertilizing with nitrogen can cause large, bushy, leafy plants with few fruits.

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Early Season Protection

Protect new transplants from unexpected cold weather.

- Individual plant protection
- Hoop houses
- Floating row covers

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Trellising

Trellising tomatoes is important to:

- Increase air circulation to reduce foliar diseases
- Make weed control easier
- Keep developing fruit off ground

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Trellising

Use tomato cages or a trellis type that fits your plant size and garden space.

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Mulching

Mulch immediately after planting:

- Maintains more even soil moisture
- Prevents soil splashing that can lead to disease
- Reduces weeds

A layer of cardboard or newspapers (about 6-sheets thick) covered with leaves, straw, dry grass clippings, etc., eliminates weeds and adds organic matter to soil.

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Flowering

Flowering can be affected by several things:

- Excess nitrogen
- Uneven watering
- Temperature

Tomatoes are self-fertile and pollinate mostly by flower movement. Insects are not needed, although bumble bees are helpful.

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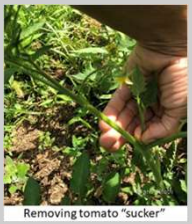
Pruning

Removing some branch and sucker growth can improve air circulation and sunlight penetration which reduces diseases and increases fruit production.

- For indeterminate plants only, not determinate.
- Remove suckers that form where stems and branches meet.
- Fact sheet at pddc.wisc.edu



Removing tomato "sucker"

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Watering

Water Evenly!

- Water extremes promote blossom end rot and cracking
- Provide 1 – 1 ½ inches of water per week
- Water soil, not foliage

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Harvesting Tomatoes

Harvest before fruits become overripe.

- Color is not always the best guide; fruit should be slightly soft.
- Tomatoes continue to ripen after harvesting, as long as the process has started.
- Some varieties crack as they ripen outdoors and should be harvested early.
- Ripening slows in cooler weather, and flavor will not be as sweet.

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Harvesting Tomatoes

Green tomatoes can be harvested and ripened indoors.

Speed ripening by placing in a paper bag out of direct sunlight.

Use, freeze, dehydrate, or can within several days of ripening.

Do not refrigerate tomatoes; flavor declines as sugars change to starch in cool temperatures.

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Saving Seeds

Only for non-hybrid, open-pollinated varieties

- Allow fruit to fully ripen
- Remove pulp and separate seeds
- Dry and store properly

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End of Season Extension

Protect from first frosts with covers

- Use fabric, not plastic if touching plants
- Harvest fruits before hard freeze

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Cultural Disorders, Diseases and Insects

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Cultural Disorders of Tomatoes

BLOSSOM END ROT

- Calcium uptake problem, not a disease
- Usually enough calcium in soil, but not getting to developing fruit
- Common causes:
  - Uneven soil moisture
  - Cool temperatures

Factsheet at pddc.wisc.edu

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Cultural Disorders of Tomatoes

CAT-FACING

- More common on heirloom and beefsteak types
- More common when temps are below 50 degrees when tomatoes flower
- Can be caused by herbicide drift
- Avoid high nitrogen levels, especially in cool, wet soil

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Cultural Disorders of Tomatoes

CRACKING

- Cracking is mostly caused by uneven watering
- Some varieties are more susceptible

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Cultural Disorders of Tomatoes

SUNSCALD

- Shiny white or yellow area
- Caused by sudden sun exposure on fruit
- Avoid sudden removal of foliage canopy

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Cultural Disorders of Tomatoes

JUGLONE TOXICITY

- Juglone comes from Black Walnut trees
- Causes wilting and death of plants
- Avoid growing tomatoes in root zone of black walnut trees
  - Use raised beds or containers

Fact sheet at: pddc.wisc.edu

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Cultural Disorders of Tomatoes

GREEN SHOULDERS

- More common on heirloom varieties
- Caused by high temperatures and direct sun
  - Plant resistant varieties
  - Maintain foliage canopy

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CommonTomato Diseases

EARLY BLIGHT

Fungal pathogen in soil

- Symptoms:
  - Dark brown spots on older leaves, concentric rings
  - Defoliation, stem or fruit lesions
- Overwinters on plant debris

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Common Tomato Diseases

EARLY BLIGHT – Control

- Use proper crop rotation
- Mulch to avoid soil splash
- Avoid overhead watering
- Encourage good air circulation
- Use good garden clean-up practices
- Use preventative copper or chlorothalonil-based treatments
- Plant resistant varieties

Factsheet at: pddc.wisc.edu

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Common Tomato Diseases

SEPTORIA LEAF SPOT

Fungal pathogen in soil

- Symptoms:
  - Affects leaves and stems, not fruit
  - Small gray circular leaf spots with dark borders
  - May see black dots in centers
  - Usually starts on lower leaves
  - Rapidly progresses in warm, wet weather
- Overwinters on plant debris

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Common Tomato Diseases

SEPTORIA LEAF SPOT – Control

- Use proper crop rotation
- Mulch to avoid soil splash
- Avoid overhead watering
- Encourage good air circulation
- Use good garden clean-up practices
- Use copper or chlorothalonil-based treatments
- Plant resistant varieties

Fact sheet at: pddc.wisc.edu

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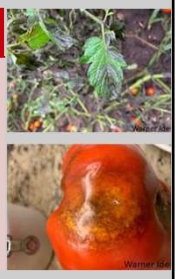
Common Tomato Diseases

LATE BLIGHT

Water mold pathogen (*Phytopthora infestans)*

- Windborne or comes with transplants or volunteer seedlings.
- Symptoms:
  - Irregular grayish, water-soaked leaf and stem lesions
  - Leathery brown areas on fruits
  - Occurs quickly, with rapid plant collapse and death
- Overwinters only on live plant material



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Common Tomato Diseases

LATE BLIGHT – Control

- Choose late blight-resistant varieties
- Keep foliage dry with good air circulation
- Use preventative copper-based treatments
- Remove affected plants immediately
- Dispose in plastic bags
- Do not compost

Factsheet at: pddc.wisc.edu

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Common Tomato Insect Pests

TOMATO HORNWORM

Large (up to 4" long) blue-green caterpillar with large spine on rear end

- Late season feeder on tomatoes
- Feed mostly on leaves but can scar fruit
- Adults are large hawkmoth with wingspan up to 5"

CONTROL: Remove by hand

Factsheet at pddc.wisc.edu

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Common Tomato Insect Pests

BROWN MARMORATED STINKBUG

New pest spreading across Wisconsin.

- Piercing mouthpart feeds on tomato and other fruits.
- Yellow blotches form if bugs fed on green fruit.
- Subtle white cloudy spots if bugs fed on red fruit

CONTROL:

- Netting/row covers
- Hand picking
- Insecticides: pyrethroids, with cautions

Factsheet at pddc.wisc.edu

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Less Common Tomato Diseases

VERTICILLIUM WILT

Soil-borne fungal pathogen

- Symptoms:
  - Sudden yellowing of foliage, especially on one side
  - Eventually entire plant wilts and dies

CONTROL:

- Affected plants cannot be saved
- Avoid bringing it into your garden
- Plant resistant varieties

Factsheet at: pddc.wisc.edu

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Less Common Tomato Diseases

FUSARIUM WILT

Soil-borne fungal pathogen

- Symptoms:
  - Yellowing of older leaves, often starting on one side of plant
  - Wilting during heat of the day

CONTROL:

- Affected plants cannot be saved
- Plant resistant varieties
- Avoid bringing it into your garden on infected plants

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Less Common Tomato Diseases

BACTERIAL SPECK OF TOMATO

Caused by Pseudomonas syringae pv. tomato

- Symptoms:
  - Small black ⅛ to ¼ inch leafspots
  - Small pinpoint-like dark specks on fruits

CONTROL:

- Avoid bringing into garden on infected seeds or plants
- Avoid spread by splashing water or mechanical means
- Remove infected plant debris
- Use good crop rotation practices

Factsheet at: pddc.wisc.edu

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Less Common Tomato Diseases

BACTERIAL SPOT OF TOMATO

Caused by *Xanthomonas spp.*

- Symptoms:
  - Affects stems, leaves and fruit
  - On mature fruit, brown, scabby and rough ¼ inch spots

CONTROL

- Avoid bringing into garden on infected seeds or plants
- Avoid spread by splashing water or mechanical means
- Remove infected plant debris
- Use good crop rotation practices

Factsheet at: pddc.wisc.edu

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Less Common Tomato Insect Pests

CUTWORM

Several species of moth larva affect tomato

- Cut off young plants by feeding low on stems
- Can crawl up stems and feed on foliage and flowers

CONTROL:

- Place collars around base of young plants
- Scout for cutworms and physically remove
- Reduce plant debris and weeds where cutworms hide
- Till soil spring and fall to expose larva and pupae

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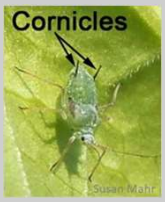
Less Common Tomato Insect Pests

APHIDS

Small soft-bodied insects
- Feed on sap
- Excrete sticky substance
- Can spread pathogens (i.e., cucumber mosaic virus)

CONTROL:
- Strong streams of water dislodge insects
- Encourage beneficial insects



Factsheet at: pddc.wisc.edu

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Find More Information

More information about vegetable gardening can be found at:

- University of Wisconsin-Madison Division of Extension Horticulture Website: https://hort.extension.wisc.edu/
- University of Wisconsin Plant Disease Diagnostics Clinic: www.pddc.wisc.edu
- Find your local Extension contact at: https://counties.extension.wisc.edu/

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