



Vegetable Disease Control for the Organic Farmer/Gardener

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Foreword

A widespread misconception!

OMRI (Organic Materials Review Institute) does NOT determine which products are allowed for use in organic production. Only the NOP (National Organics Program) makes that determination, and a certifying agency can further refine the list.

OMRI is a private, non-profit organization that reviews products only for companies that request the review and pay the review fee.

NOP is a USDA agency charged with establishing the standards to be used in certified organic production.

Your organic certifying agency reserves the right to disallow products allowed by NOP. Submit to your certifying agency the list of products you plan to use, and get their approval prior to use.

What is a disease?

How does it differ from other plant problems?

- Disease - caused by a pathogen, such as a fungus, bacterium, virus, or nematode.
- Disorder - caused by cultural or environmental factors, a.k.a. "abiotic problems."
- Pest damage - caused by insects or other animals that feed on or otherwise damage plants.

THE DISEASE TRIANGLE

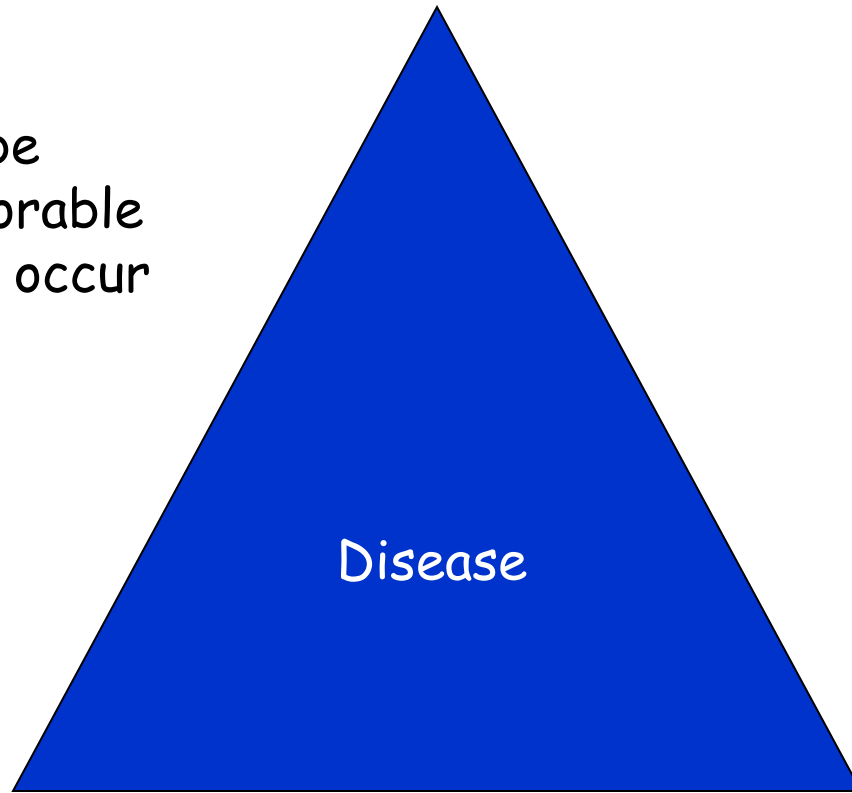
Pathogen

All 3 have to be present & favorable for disease to occur

Disease

Host

Environment



Disease Control for the Organic Producer

- Plan ahead
- Must be integrated
 - with general production practices
- Must have an ecological basis
 - Manage soil
 - Encourage diversity of beneficial microorganisms
 - Crop diversity

Disease Control for the Organic Producer

- Good crop husbandry
- Site selection
 - Good water drainage
 - Good air drainage
 - No history of problems
- Exclusion
 - Seed treatments
 - Certified seed
 - Disease-free transplants
 - Avoid chain-store plants
 - Infested soil on tractor equipment
- Protection materials
 - Copper
 - Sulfur
 - Biologicals
 - Bicarbonates
 - Bacteriophages
 - Oils (mineral, essential)
- Cultural practices

Good crop husbandry

Happy plants resist disease better

Plants more susceptible to disease if:

- improper pH
- crowded
- weed competition
- seeded in cool soil
- inadequate fertilization
- excessive fertilization
(poor drying conditions)



Site selection for disease control



Good water drainage

Surface drainage prevents
standing water

Phytophthora capsici
on pepper

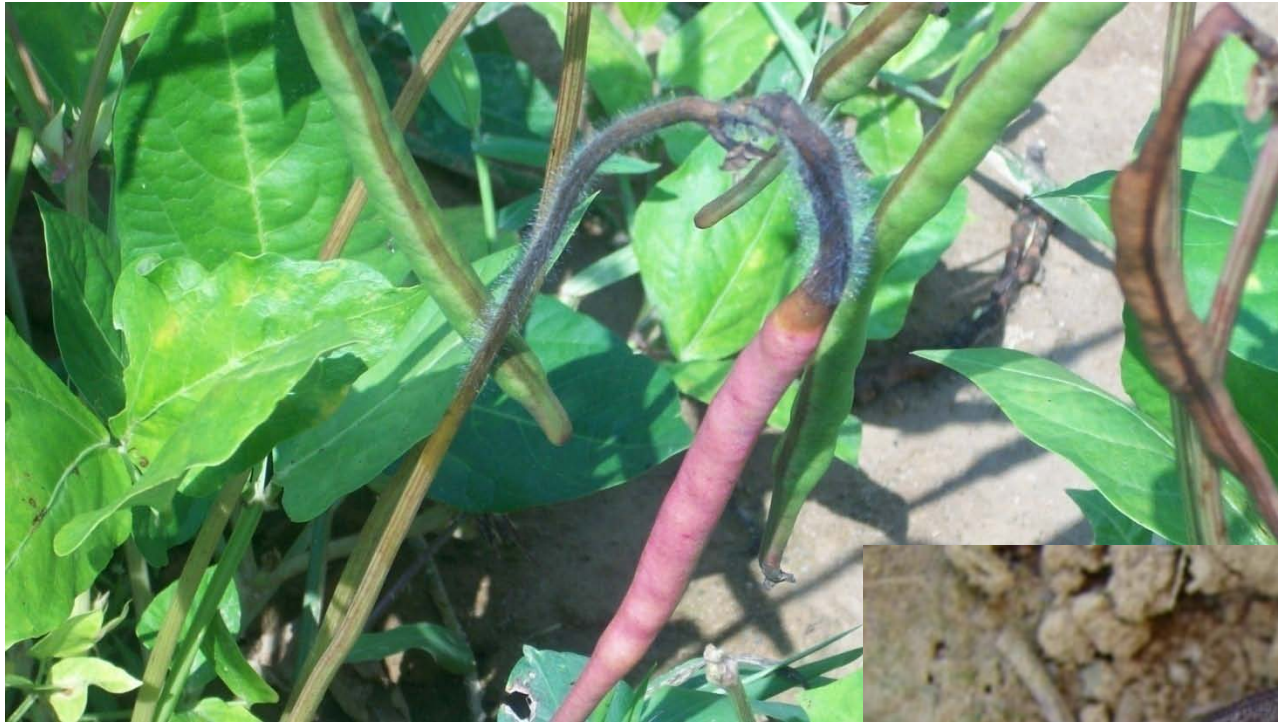


Good internal drainage
very important

Fusarium crown of pumpkin
on Dickson silt loam soil



Air drainage



Wet rot
(whisker rot,
Choanephora)

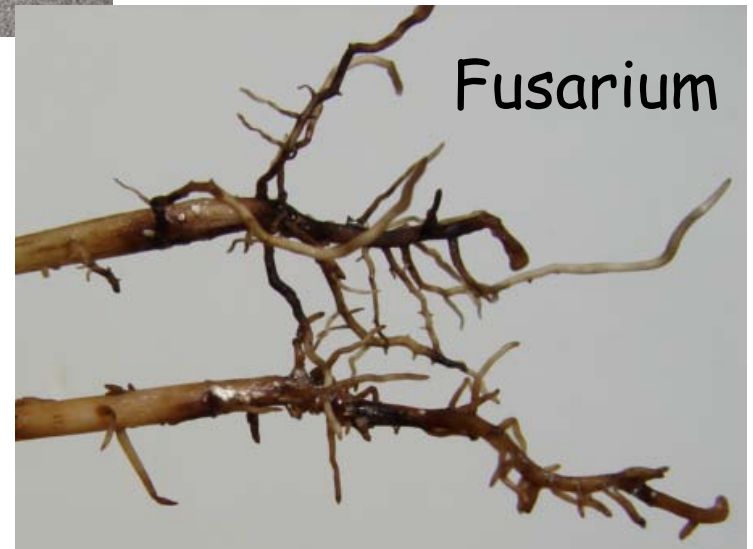
Controllable with site
selection & planting
density. Avoid tree-lined
fields.



Field disease history

Keep records

Some soil-borne pathogens are in all soils and are unavoidable



Field disease history

Keep records

Some pathogens are limited in occurrence and clean fields should be available



Phytophthora capsici

Southern
blight



Fusarium wilt

Exclusion

Keeping the pathogen out

- Seed disinfestation
- Certified seed
- Disease-free transplants
 - Avoid chain-store plants
- Cleaning infested soil from tractor equipment
- Sanitizing transplant production tools

Seed treatment

- Seed disinfestation -- Hot water
- Seed protection -- Kodiak, T-22, Actinovate

Crop	Temp (F)	Minutes
Brussels sprouts, cabbage, eggplant, spinach, tomato	122	25
Broccoli, cauliflower, cucumber, carrot, collard, kale, kohlrabi, rutabaga, turnip	122	20
Mustard, cress, radish	122	15
Pepper	125	30
Lettuce, celery	118	30

Must be adhered to, exactly. Hot water treatment has many drawbacks. See discussion in *Commercial Vegetable Disease Control Guide*, <http://www.utextension.utk.edu/publications/wfiles/W141.pdf>



Late blight
of tomato



Bacterial
spot of
tomato

Diseases recently obtained
from
chain store garden centers



Pythium
root rot
of several
vegetables

Bacterial
spot of
pepper



Clean equipment between fields

After working infested field, before working non-infested field

Clean tractor tires, plows, other implements if a difficult-to-control disease is present in some, but not all, fields.

E.g., Phytophthora blight, fusarium wilt, bacterial diseases



Prevent pathogen introduction into transplant production system

- Clean and disinfect any re-used trays, pots, tools, or surfaces, using 10% bleach (NOP approved) or a hydrogen peroxide (NOP and OMRI approved) product.
- Do not allow soil particles to contact potting mix.
 - Do not store or mix potting media on ground
 - Wash hands before working
 - Especially if you smoke! (viruses)



 **OxiDATE**
EPA REGISTERED DISINFECTANT

Protection materials I

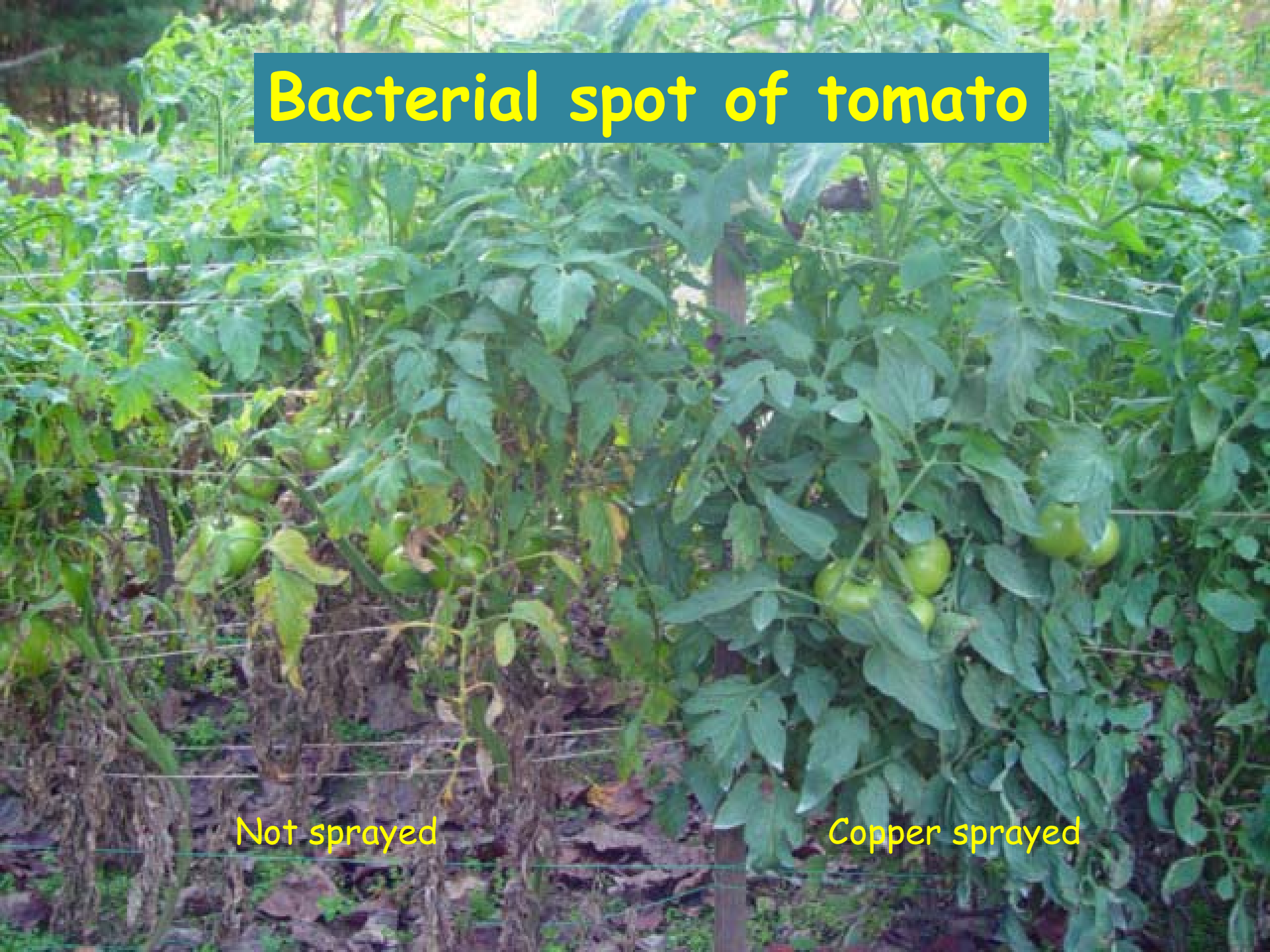
- **Copper** - Good control of bacterial diseases; fair to moderate control of some fungal diseases.
Note: There are some restrictions on how copper is used, but most copper products are NOP approved.
- **Sulfur** - Excellent control of powdery mildews; good control of peach scab; slight rust control.
- **Biologicals (biocontrols)** - Can provide fair control, but high pathogen population overwhelms them. Mostly for soil-borne diseases.

cont'd

Bacterial spot of tomato

Not sprayed

Copper sprayed



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cont'd

Cucurbit powdery mildew



No Fungicide

Sulfur

Bean rust control

Resistant varieties and sulfur sprays



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cont'd

Biologicals

- Serenade
- Actinovate
- Companion
- RootShield, PlantShield, T-22
- SoilGard
- Kodiak
- Contans

A word about float beds:

Don't use them.

If you do use them, mix your biofungicide with the soil before seeding.



Pythium root rot

Pythium root rot



Actinovate treated

Untreated

Protection materials II

- Bicarbonates
- Bacteriophages
- Oils
 - Mineral oils
 - Essential oils

Bicarbonates

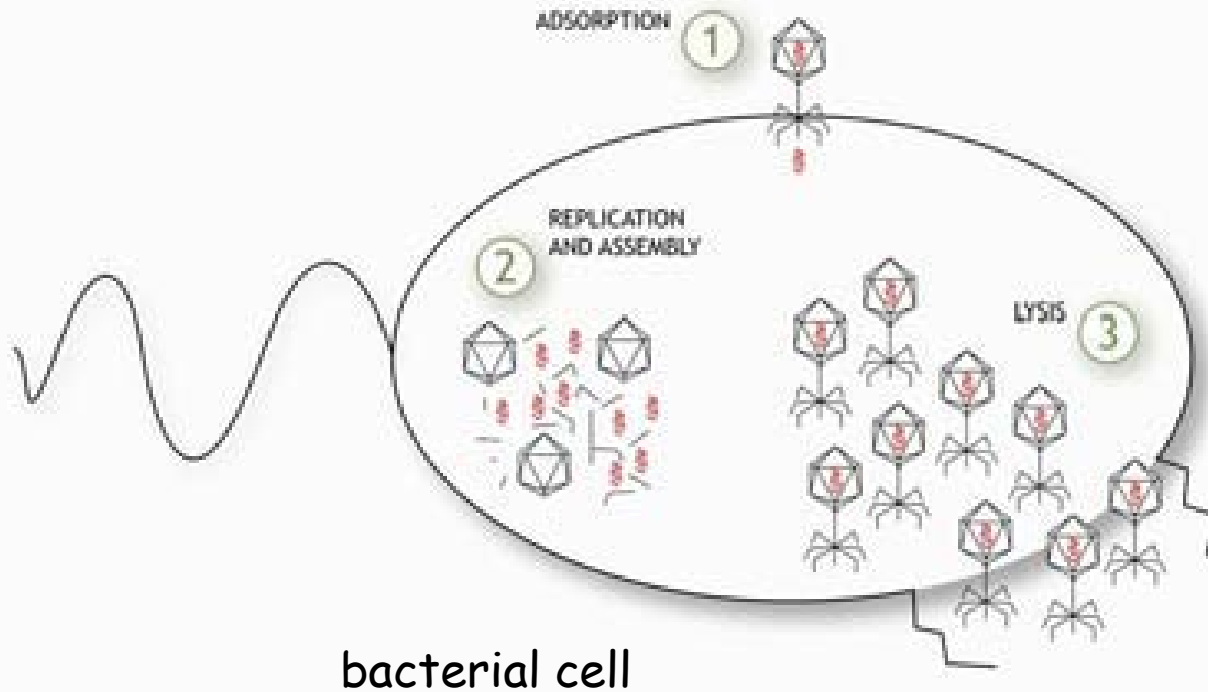
Slight control of powdery mildews and a few other fungal diseases.

- sodium bicarbonate (baking soda)
- potassium bicarbonate
 - Armicarb
 - Kaligreen

Bacteriophages

AgriPhage™ by Omnilytics

Viruses that attack bacteria. Specific for bacterial spot and speck of tomato and bacterial spot of pepper.



Mineral Oils

Petroleum oils; OMRI listed

Moderate control of powdery mildews and some control of viruses vectored by aphids.

- JMS Stylet Oil
- Purespray Oil

Essential Oils

Plant extracts

Only slight disease control activity has been demonstrated.

- Neem, thyme, rosemary, clove, sesame, etc.
- Examples include Trilogy, Proud 3, Sporatec, Regalia (*Reynutria*)

Miscellaneous

- streptomycin sulfate, e.g., AgriStrep
- fish oil, e.g., Organocide
- humic acid, e.g., Humega

How to apply foliar disease-control products



boom air blast



backpack
mist blower



Pumpkin powdery mildew control

2009 trial

Percent defoliation at harvest:

Treatment	Boom	Mist blower
unsprayed check	66 ab	64 b
bicarbonate	72 a	65 ab
fish oil	60 b	60 b
copper	48 c	17 d
sulfur	42 c	10 d

Values followed by same letter do not significantly differ.

Disease Control for the Organic Producer

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 - ✓ Good air drainage
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