

Disease Management in Organic Vegetables

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Organic Disease Management

- Importance of diseases varies among crops, locations
 - “Diseases are the Achilles heel of organic tomato production” Diver, Kuepper & Born 1995
- Management requires an integrated [systems] approach

Choose the Best Site

- Well-drained fields
 - Water molds *Pythium*, *Phytophthora*
- Good air movement
 - Promote rapid plant drying
- Physical separation from other crops
 - Potatoes: late blight
 - Peppers: bacterial leaf spot
 - Conventionally produced crops

Improve Soil Quality

- Reduce diseases by soilborne pathogens
- Enhance composition of “beneficial” organisms
 - Increase the abundance and diversity of the soil microbial community
- Increase soil organic matter
 - Cover crops
 - Green manures
 - Composts
 - Animal manures

Rotate Crops

- Break the life cycles of pathogens
 - ≥ 3 yrs between crops in the same family
 - Some pathogens cause disease among multiple plant families
- Include appropriate rotational crops to increase soil organic matter

Exclude Pathogens

- Destroy vines, etc. post-season
 - Removes sources of inoculum
- Sterilize plant stakes between crops
- Clean tools, equipment frequently
- Prohibit tobacco use

Make Life Difficult for Pathogens

- Mulches
 - Plastic or plant-based
 - Reduce splash dispersal of pathogens
 - Protect fruit from soilborne pathogens
- Row orientation
 - Maximize air movement
 - Minimize leaf wetness periods
- Irrigation management

Variety Selection

- Use resistant or tolerant varieties wherever possible

Angular Leaf Spot - Cucumber



- Favored by cool, wet weather
- Affects foliage and fruit
- Seedborne
- Some cultivars advertised as resistant

Cucumber Cultivars

Cultivar	Seed Source	Type	Resistance
Slice More	Siegers	S	-
Talladega	Seminis	S	-
Thunder	Seminis	S	-
Thunderbird	Seminis	S	R
Stonewall	Harris Moran.	S	T
Green Slam	Siegers	S	-
Indy	Seminis	S	R
Intimidator	Seminis	S	R
Speedway	Seminis	S	R
Classy	Harris Moran	P	R
2409	Seminis	P	-
Sassy	Harris Moran	P	R

Cultivar		Foliar AUDPC	Fruit inc. (%)	Fruit severity
Classy	R	408.4 d ^y	0.2 d	3.0 ab
Slice More	-	563.4 cd	1.0 bcd	2.8 de
Talladega	-	571.6 dc	6.7 a	2.9 cde
2409	-	600.9 bcd	2.9 a	2.9 cde
Thunder	-	733.7 a-d	7.2 a	2.9 bcd
Thunderbird	R	799.8 a-d	3.7 ab	2.9 de
Stonewall	T	902.0 abc	4.7 a	2.9 b-e
Sassy	R	907.0 abc	0.7 cd	3.0 a
Green Slam	-	926.9 abc	0.3 cd	2.9 b-e
Indy	R	985.4 ab	4.6 a	2.9 de
Intimidator	R	1074.1 a	7.5 a	2.9 abc
Speedway	R	1129.3 a	4.5 a	2.8 e

Use “Clean” Seeds

- Sanitizing seed treatment may be needed:
hot water treatment

Water Bath Temperatures and Treatment Times

Seed	°F	Minutes
Brussels sprouts, eggplant, spinach, cabbage, tomato	122	25
Broccoli, cauliflower, cucumber*, carrot, collard, kale, kohlrabi, rutabaga, turnip	122	20
Mustard, cress, radish	122	15
Pepper	125	30
Lettuce, celery, celeriac	118	30

* Cucurbit seeds may be damaged by hot water treatment

Seed Treatment Cautions

- Use new, high quality seed
- Treat a small sample first and test for germination
- Treat close to time of planting (within weeks)
- Treat only once

Producing “Clean” Transplants

- Practice good sanitation in the greenhouse
 - Use new or sanitized plug trays or flats and pathogen-free mixes
 - Sanitize equipment
 - Install solid flooring; raise seedling trays
 - Limit movement of personnel and equipment between greenhouses
 - Clean benches, greenhouse structure thoroughly after the crop; close up greenhouse

- Do not raise exotic or experimental vegetable varieties, or plants from saved seed, in the same greenhouse with commercial seedlings unless all seeds are treated
- Avoid raising or holding ornamental plants and vegetables in the same greenhouse
- Exclude insects (may carry viruses)

- Maintain conditions in the greenhouse that do not favor disease development
 - Maintain relative humidity as low as possible
 - Good air circulation
 - Proper temperatures
 - Do not overwater
 - Handle plants as little as possible

Post-Planting Options



- Bringing out the Band-Aids
- Biological products
- Chemical products
- Plant extracts/oils
- Compost teas

Disease Management Alternatives for Organic Tomatoes

Treatment	% Foliar disease
Control- water to run off	66.0 ab
Humega	75.9 a
Timor	67.6 ab
StorOx	61.4 ab
Biodynamic 508- <i>Equisetum arvense</i>	59.0 ab
Kaligreen	47.9 abc
Sonata + Champion WP	45.6 abc
Serenade	44.3 abc
Timorex	44.1 abc
Trilogy	39.5 bcd
Garlic Barrier	39.4 bcd
SW-3	37.1 bcd
Sonata	37.0 bcd
StorOx alternated with Champion WP	25.0 cde
Serenade + Champion WP	21.4 cde
Champion WP	10.8 de
Bordeaux mixture	5.0 e

Disease Management: Squash



- Winter squash ‘Taybelle’
- Floating row covers + pyrethrum to protect plants from beetles
- Foliar sprays
 - Armicarb
 - Milk
 - Stylet oil
 - Neem oil
 - Serenade
 - Compost tea
 - Sulfur

Powdery Mildew Management

Treatment and rate	Powdery mildew	
	% foliar upper	% foliar lower
Armcarb- 100 5.0 lb/A+ Biolink 1.5 qts/100 gal	11.6 f	19.7 ef
Armcarb-100 2.5 lb/A + Biolink 1.5 qts/100 gal	14.7 ef	21.7 de
Whole milk 50%.....	5.9 g	18.7 efg
Mineral oil (stylet-oil) 3.5 qts/100 gals.....	11.8 ef	18.6 efg
Neem oil 0.75 %.....	23.1 d	32.9 c
Serenade Max 1 lb/A + Kocide 2 lb/A.....	2.9 g	10.3 gh
Serenade Max 2 lb/A + Kocide 2 lb/A.....	2.2 g	5.6 h
Soil soup compost tea 33%.....	31.8 c	31.8 c
Soil soup compost tea 100%.....	17.0 e	28.8 cd
Sulfur 16 lb/A	5.0 g	11.3 fgh
Untreated control, protected	52.9 b	45.7 b
Untreated control, non-protected.....	80.7 a	77.2 a

Phytophthora Blight, Bacterial Wilt

Treatment and rate	Bacterial wilt	Phytophthora blight	Marketable yield
	% wilted	% dead plants	(Tons/A)
Armicarb- 100 5.0 lb/A+ Biolink 1.5 qts/100 gal ...	0.0 b ^{**}	8.3 a	2.0 a
Armicarb-100 2.5 lb/A + Biolink 1.5 qts/100 gal ...	3.3 b	31.7 a	2.2 a
Whole milk 50%.....	0.0 b	21.7 a	3.3 a
Mineral oil (Stylet-oil) 3.5 qts/100 gals	1.7 b	28.3 a	2.7 a
Neem oil 0.75 %.....	0.0 b	10.0 a	3.2 a
Serenade Max 1 lb/A + Kocide 2 lb/A.....	0.0 b	8.3 a	2.1 a
Serenade Max 2 lb/A + Kocide 2 lb/A.....	0.0 b	0.0 a	3.7 a
Soil soup compost tea 33%.....	0.0 b	23.3 a	2.6 a
Soil soup compost tea 100%.....	0.0 b	28.3 a	2.6 a
Sulfur 16 lb/A	0.0 b	10.0 a	2.9 a
Untreated control, protected	0.0 b	6.7 a	3.0 a
Untreated control, non-protected.....	13.3 a	15.0 a	4.4 a

National Organic Standards/Related Subjects

- The National Organic Program
 - <http://www.ams.usda.gov/nop/>
- USDA links to organic-related material
 - <http://www.ams.usda.gov/nop/nop2000/nop2/fedorganlinks.htm>
- Organic Materials Review Institute
 - <http://www.omri.org/>

Additional Information.....

- ATTRA (Appropriate Technology Transfer for Rural Areas)
 - <http://www.attra.org>
- Organic Agriculture Consortium
 - <http://www.organicaginfo.org>
- NEON (Northeast Organic Network)
 - <http://www.neon.cornell.edu/>
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