Organic Pesticide Update

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LINCOLN University Cooperative Extension

- The National Organic Program (NOP) final rule (USDA, 2000) emphasizes the use of **preventive** and **cultural** practices that enhance crop health:
  - crop rotation, cover cropping, sanitation measures, disease-resistant cultivars, etc.
- Organic farmers need to develop a system of cultural, biological, and/or genetic strategies in a comprehensive pest management program, and describe this program in the **Organic System Plan**, before applying a pesticide as a control measure

Only when preventive practices are insufficient to prevent or control crop pests may an organic farm manager apply either

(1) a **biological** or **botanical** material not on the National List of nonsynthetic substances prohibited for use in organic crop production (§205.602), or

(2) a substance included on the National List of synthetic substances allowed for use in organic crop production (§205.601(e)–(f), to prevent, suppress, or control pests

However, the conditions for using the substance must be anticipated and documented in the organic system plan

Organic IPM Triangle

Increased intervention and toxicity

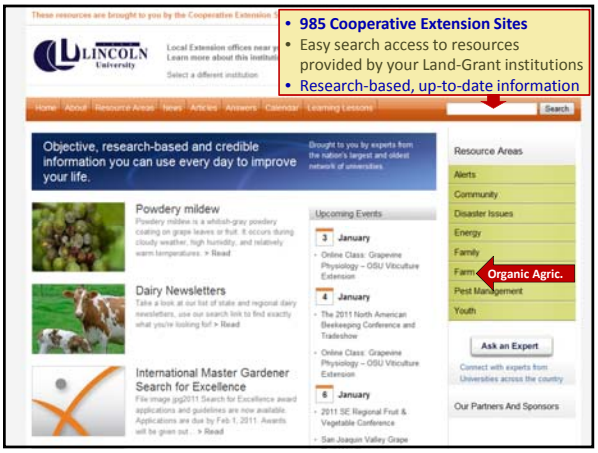
Emphasis is on maintaining optimal soil and plant conditions to prevent pest problems

Prevention

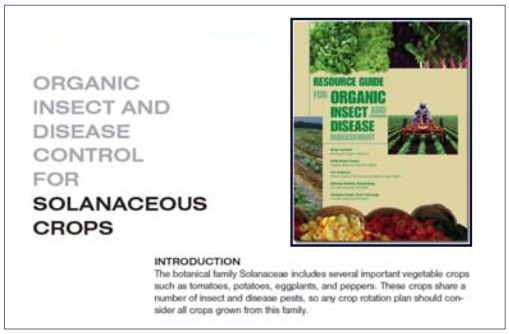
INFORMATION

1. Information

- **985 Cooperative Extension Sites**
- Easy search access to resources provided by your Land-Grant institutions
- Research-based, up-to-date information

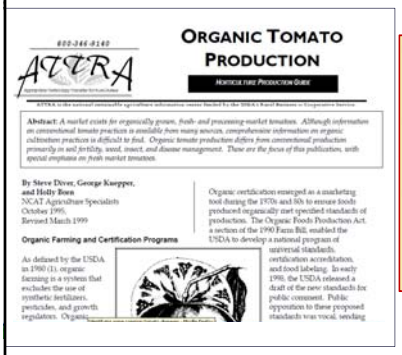


Resources on organic pest management



http://www.nysaes.cornell.edu/pp/resourceguide/

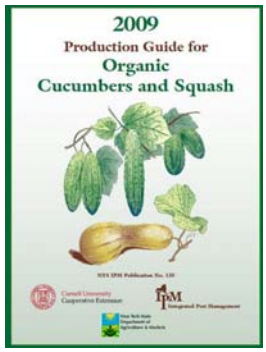
ATTRA (Natl. Sustainable Agric. Information Service)

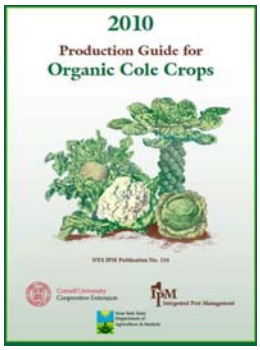


- A project of the National Center for Appropriate Technology (NCAT)
- NCAT is a private nonprofit organization, founded in 1976
- ATTRA provides sustainable agriculture and **organic farming** news, events and funding opportunities

http://attra.ncat.org Search for: "Tomato"

OTHER **FREE** RESOURCES



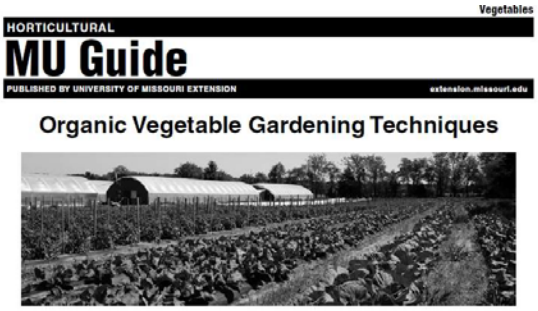


http://www.nysipm.cornell.edu/organic_guide/

SARE (Sustainable Agriculture Research and Education)

http://www.sare.org/publications/

MU Extension

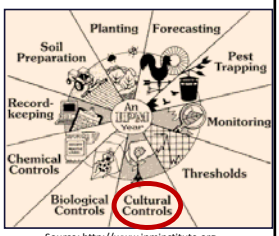


http://extension.missouri.edu Search for: "G6220"

2. Cultural Controls

Cultural controls

- Host plant resistance
- Crop rotation
- Soil quality management
- Sanitation
- Trap crops
- **Farmscaping/habitat manipulation**
- **Cover crops**
- Use of mulches
- Intercropping
- Alter planting/harvest dates



Source: http://www.ipminstitute.org

Farmscaping

- A whole-farm, ecological approach to increase and manage biodiversity with the goal of increasing the presence of **beneficial organisms**
- Ideal farmscape plantings:
  - (1) provide food and shelter for beneficial organisms
  - (2) suppress weeds
  - (3) grow in close proximity to the cash crop without competing for light, water, and nutrients
- http://attra.ncat.org


New England Aster- *Aster novae angliae*
Picture: Randy Tindall

Cover Crops

- **Type:** Annual (usually winter or spring; summer use possible)
- **Roles:** Prevent erosion, suppress weeds and soilborne pests, alleviate soil compaction and scavenge nutrients
- **Mix with:** Other brassicas or mustards, small grains or crimson clover
- **Species:** *Brassica napus* (rapeseed), *B. rapa* (field mustard), *B. juncea* (Indian/Chinese mustard), *B. hirta* (mustard), *Raphanus sativus* (cultivated raddish), *Sinapis alba* (white mustard)


This rye–vetch cover crop mulch delayed weed growth sufficiently to prevent significant weed competition against the broccoli. The cover crop was mowed and the broccoli transplanted about 7 weeks before this picture was taken on Cape Cod, MA. Figure credit: Mark Schonbeck, Virginia Assoc. for Biological Farming

http:// www.extension.org **http://www.cornell.edu** In search box: "Cover Crops"

BIOfumigation

- When plants such as broccoli, cauliflower, mustard, rapeseed, and horseradish are damaged, they release biologically active chemicals (e.g., isothiocyanate = ITC)
- ITCs behave like commercial pesticides
- Being adopted by growers in the Pacific Northwest to control nematodes, other soil-borne pathogens and insects

Incorporation of soil amendment (fresh plant mass, manure) into the soil which will release active volatile compounds able to suppress soil-borne pests

3. Biologically-based IPM technologies

BIOlogical Control

- Three major categories: predators, parasitoids, and pathogens
- Conserving natural enemies is one aspect of biological control that can effectively reduce pest populations and damage
- Each time a spray is applied, more predators and parasites are killed

Any activity involv
of natural enem
populations belo

Particle Film Technology

- Particle film barriers provide a promising new approach to insect control for organic producers
- Surround WP acts as a repellent, mechanical barrier and irritant. It also disrupts the insect's host-finding abilities
- The active ingredient is specially processed **kaolin clay**, an naturally-occurring edible mineral used as an anti-caking agent in processed foods
- May be effective when combined with other methods

% REDUCTION:	24 h	96 h
STRIPED CB:	83 %	76%
SPOTTED CB:	78 %	68%

- Air blast sprayer to achieve good coverage
- Apply the product under the leaves
- Apply Surround WP early in the growing season
- Reapply after a heavy rain
- Continuously agitate the solution while applying it

4. Pesticide Options

OMRI-listed FUNGICIDES

Product (company)	Type of product	Active Ingredient	Crops
Badge X_2 (Isagro USA Inc.)	Fixed copper (fungicide/bactericide)	copper hydroxide (24.6%) + copper oxychloride (22.9%)	Many, including vegetables
Cueva (W Neudorff GmbH KG)	Fixed copper (fungicide/bactericide)	Copper octanoate (10%) (copper salt of fatty acid)	Many, including vegetables
Champ WG (NuFarm Americas, Inc.)	Fixed copper (fungicide/bactericide)	Copper hydroxide 77%	Many, including vegetables
Actinovate STP (Nat. Industries, Inc.)	Biofungicide	*Streptomyces lydicus* WYEC 108 (0.0375%)	For use as a drench or for foliar use
Actino-Iron (Nat. Industries, Inc.)	Biofungicide	*Streptomyces lydicus* WYEC108 (1.3%) + iron (21.9%) and humic & fulvic acids (47%)	General agricultural use (soil application)
Trilogy (Certis)	Fungicide/insecticide/ miticide	Clarified hydrophobic extract of neem oil (70%)	Many, including vegetables

FIXED COPPER: May not be used as an herbicide. Shall be used in a manner that prevents excessive copper accumulation in the soil and contamination of run-off water

Before use on an organic operation, make sure that the substance, including its brand name and formulation, is listed in your organic system plan, reviewed, and approved by your USDA-accredited certification agency.

Organic Insect Pest Control

Insecticides allowed for organic production kill a smaller percentage of the pest population, and have a shorter residual effect

OMRI-listed INSECTICIDES

Insect	Product
Aphids (green peach aphid and potato aphid)	Pyrethrum (e.g., PyGanic EC 5.0 II), neem (e.g., Neemix), *Beauveria bassiana* (Mycotrol)
Flea beetles	Pyrethrum (e.g., PyGanic EC 5.0 II), neem (e.g., Neemix)
Hornworms	Pyrethrum, Dipel 150 dust *(Bacillus thuringiensis kurstaki)*
Thrips	Entrust (spinosad),
Fruitworms	Dipel 150 dust *(Bacillus thuringiensis kurstaki),* Entrust (spinosad)
Stinkbugs	Pyrethrum, neem
Cucumber beetles and squash bugs	Pyrethrum (some control)

Source: 2010 Midwest Veg. Prod. Guide, ATTRA, Cornell Univ., Oklahoma State Univ., eXtension, Michigan State Univ.

Effects of *Beauveria bassiana*

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OMRI-listed Insecticidal Soaps and Oils

Soaps: Selected fatty acid salts that penetrate the body of pests and results in rapid death. **Oils:** act mainly by suffocation

Product (Company)	A.I.	Pest
DES-X (soap) (Certis)	Potassium salts of fatty acids	aphids, lacebugs, mealybugs, mites, leafhoppers, scale insects, plant bugs, psyllids, spider mites, whiteflies
M-Pede (Mycogen Co.)	Potassium salts of fatty acids (49%)	Aphids, mealybugs, mites, leafhoppers, scale insects, plant bugs, psyllids, spider mites, mites, powdery mildew
PureSpray™ Green (oil) (BASF)	Petroleum oil (98%)	Aphids, mites, fungus gnats, leaf miners, mealybugs, scales, thrips, whiteflies, powdery mildew
Phyta-Guard (Phyta-Oil Garlic & Citronella) (California Organic Fertilizers, Inc.)	Soybean oil (81.5%) citronella oil (3%), garlic oil (0.5%)	Aphids and other soft-bodied insects

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Neem and azadirachtin

- **Azadirachtin**: chemical compound present in seeds of neem trees (India)
- It deters feeding and/or disrupts the growth of many insects
- Biodegradable (it degrades within 100 hours when exposed to light and water) and very low toxicity to mammals
- Neem extracts and derivatives: 62 OMRI-listed products
- Good control of **caterpillars** and **aphids**, fair control of **stink bugs**, promising against **squash bug** and **Col. potato beetle**
- Most effective OMRI-listed: Neemix (Certis), AZA-Direct (Gowan Co.)

Pyrethrum and pyrethrins

- **Pyrethrum:** botanical insecticide produced by grinding the flower heads of certain species of chrysanthemums (*Chrysanthemum cinerariaefolium).* One of the first insecticides
- **Pyrethrins:** Pyrethrins are the actual insecticidal compounds (there are 6 active ingredients) found in pyrethrum
- Pyrethrins break down quickly in sunlight, so they have little residual activity. They are particularly toxic to soft-bodied insects because they are absorbed through the skin. They are not effective against spider mites
- 24 OMRI-listed products

Pyrethroids: 'Pyrethrin-like' compounds that have been chemically synthesized based on the structure of pyrethrin molecules

BIOpesticides

(1) **Microbial:** Relatively specific for its target pest(s). Fungi, bacteria, viruses.

(2) **Biochemical:** Naturally occurring substances that control pests by non-toxic mechanisms (e.g., insect sex pheromones that interfere with mating, plant-derived lures)

Slow-acting materials

Example: *Bacillus subtilis* products. For many uses.

Product	Disease
Sonata *(B. pumilus)*	Fungal diseases
Serenade *(B. subtilis)*	Fungi and bacteria
SoilGard *(Trichoderma virens)*	*Phythium, Rhizoctonia* and root rots

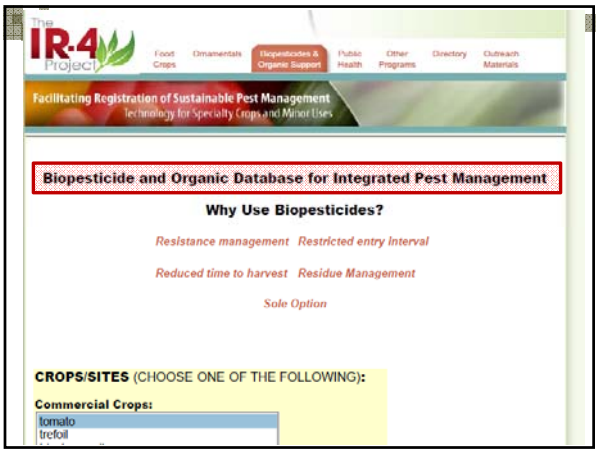
outcompeting disease organisms that attack root systems

...certain types of pe... natural materials suc... bacteria, and ce...

BIO-pesticides

An important option for sustainable management of insect pests and plant diseases

Search for "biopesticides"



Results: Commodity: TOMATO States: AR, IA, Organic: YES

Trade Name	Label (pdf)	EPA Registration Number	Company Name	Company Contact	Company Website	Worker Reentry	PreHarvest Interval	Organic	Active Ingredient	Efficacy Data
Actinovate-AG	Click Here	73314-1	Natural Industries Inc.	Matt Kowalski 6223 Theall Road, Houston, Texas 77066 281-580-1643	www.naturalindustries.com	1 hour	0 days	YES	Streptomyces lydicus WYEC 108	
Aza-Direct	Click Here	71908-1-10163	Gowan	P.O. Box 5569 Yuma, AZ 85366 800-883-1844	www.gowanco.com	4 hours	0 days	YES	Azadirachtin	
Biobit HP Biological Insecticide	Click Here	73049-54	Valent Biosciences	Steve Zimmerman	www.valentbiosciences.com	4 hours	0 days	YES	Bacillus thuringiensis subsp. kurstaki	
Keyplex 350 OR	Click Here	73512-4	KeyPlex	Dan Brunetti 1-800-433-7017	http://www.keyplex.com/	None stated	None stated	YES	Yeast extract Hydrolysate from Saccharomyces cerevisiae	
Oxidate Broad Spectrum Bactericide/Fungicide	Click Here	70299-2	BioSafe Systems	MKristen Knox P.O. Box 936 36 Commerce Street Glastonbury, CT 06033	www.biosafesystems.com	0 hours	0 days	YES	Hydrogen dioxide	
Serenade ASO	Click Here	69592-12	Agraquest Inc	Nevada Smith 530-750-0153	www.agraquest.com	4 hours	0 days	YES	Bacillus subtilis strain QST 713	
Serenade MAX	Click Here	69592-11	Agraquest Inc	Nevada Smith 530-750-0153	www.agraquest.com	4 hours	0 days	YES	Bacillus subtilis strain QST 713	
Sluggo-AG	Click Here	67702-3	Monterey Lawn and Garden Products Inc.	Tom Thomson (559)-499-2100	http://www.montereylawngarden.com	0 hours	0 days	YES	Iron phosphate	

Results: Commodity: TOMATO State: KS Organic: YES

Trade Name	Label (pdf)	EPA Registration Number	Company Name	Company Contact	Company Website	Worker Reentry	PreHarvest Interval	Organic	Active Ingredient	Efficacy Data
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Serenade MAX	Click Here	69592-11	Agraquest Inc	Nevada Smith 530-750-0153	www.agraquest.com	4 hours	0 days	YES	Bacillus subtilis strain QST 713	
Sluggo-AG	Click Here	67702-3	Monterey Lawn and Garden Products Inc.	Tom Thomson (559)-499-2100	http://www.montereylawngarden.com	0 hours	0 days	YES	Iron phosphate	

Keyplex not registered for use in KS

Results: Commodity: TOMATO State: MO Organic: YES

Trade Name	Label (pdf)	EPA Registration Number	Company Name	Company Contact	Company Website	Worker Reentry	PreHarvest Interval	Organic	Active Ingredient	Efficacy Data
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Aza-Direct	Click Here	71908-1-10163	Gowan	P.O. Box 5569 Yuma, AZ 85366 800-883-1844	www.gowanco.com	4 hours	0 days	YES	Azadirachtin	
Biobit HP Biological Insecticide	Click Here	73049-54	Valent Biosciences	Steve Zimmerman	www.valentbiosciences.com	4 hours	0 days	YES	Bacillus thuringiensis subsp. kurstaki	
Keyplex 350 OR	Click Here	73512-4	KeyPlex	Dan Brunetti 1-800-433-7017	http://www.keyplex.com/	None stated	None stated	YES	Yeast extract Hydrolysate from Saccharomyces cerevisiae	
Oxidate Broad Spectrum Bactericide/Fungicide	Click Here	70299-2	BioSafe Systems	MKristen Knox P.O. Box 936 36 Commerce Street Glastonbury, CT 06033	www.biosafesystems.com	0 hours	0 days	YES	Hydrogen dioxide	
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Sonata	Click Here	69592-13	Agraquest Inc	Nevada Smith 530-	www.agraquest.com	4 hours	0 days	YES	Bacillus pumilus strain QST	

Biopesticides should be used in a **preventative** and not a curative manner, as they typically lack the breadth of activity, efficacy, or residual activity of conventional pesticides

Some Facts about *Bacillus thuringiensis* (B.t.)

- Large group of spore-forming bacteria that occur naturally in the soil
- Bacteria are toxic to certain species of insects and can be used as insecticides. **Spores must be eaten by the insect**
- Once ingested by larvae, Bt bacteria release a toxic protein into the insect digestive system, causing death by rupture of the gut

- Different strains of Bt are toxic to specific groups of insects
- Young larvae are generally more susceptible than older larvae
- Spray deposit may only last a few days before it is broken down by sunlight
- Some insect species are already developing resistance

Before use on an organic operation, make sure that the substance, including its brand name and formulation, is listed in your organic system plan, reviewed, and approved by your USDA-accredited certification agency

Bacillus thuringiensis (B.t.)

21 OMRI-approved products

Bt	Trade Names (and Company)	Target
Var. *aizawai* strain NB200	**Agree** (Certis), **Xentari** (Valent BioSciences)	E.g., Loopers, codling moth, Imported cabbageworm, fruitworm, Diamondback moth, European corn borer
Var. *kurstaki*	**Biobit**, **Dipel** (Valent) **Javelin** (Certis)	Lepidopteran larvae
Var. *tenebrionis* (= san diego)	**Novodor** (Valent BioSciences)* only in the European Union	Beetle larvae (e.g., Colorado potato beetle)
Var. *israelensis*	**VectoBac** (Valent)	Fly larvae (including fungus gnats, blackflies, and mosquitoes)

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SOMETHING TO CONSIDER: REGALIA

***"Best New Biopesticide"* at Agrow Awards (London)**
11/03/2010

- AI's trigger the plant's natural defense systems, leading to **inhibition of fungal and bacterial growth**
- In hundreds of third-party trials and on-farm demos, **Regalia** has provided equal or superior disease management when compared with standard fungicide programs
- For crops such as **vegetables**, leafy greens, tree fruits, grape vines, nuts and ornamentals in which diseases are a constant problem and **fungicide resistance** to existing chemical fungicides is a continual threat
- Examples: bacterial spot and late blight of tomatoes

National Organic Program Compliant, OMRI-listed

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SOMETHING TO CONSIDER: GreenMatch EX

- Active ingredient: **lemongrass oil**, a powerful, **herbicidal**, essential oil that strips away the waxy cuticle from weeds' leaves, causing fast wilting (necrosis), dehydration and death
- Lemongrass oil provides a longer lasting burndown than other essential oils, and is further strengthened by other natural oils and surfactants in the GreenMatch EX formula

National Organic Program Compliant, OMRI-listed

Not registered for sale in KS

Before use on an organic operation, make sure that the substance, including its brand name and formulation, is listed in your organic system plan, reviewed, and approved by your USDA-accredited certification agency

DISINFECTANTS

- The four substances, approved for use as an "algicide, disinfectant, or sanitizer," are:
  1) alcohols - ethanol and isopropanol
  2) chlorine materials (calcium hypochlorite, chlorine dioxide, and sodium hypochlorite) below maximum residual disinfectant limit under the Safe Drinking Water Act (5ppm)
  3) hydrogen peroxide (ca. $ 28/gallon)
  4) peracetic acid (highly irritant) (ca. $ 50/gallon)

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Thank You!

Questions?