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VENDORS OF MICROBIAL AND BOTANICAL INSECTICIDES AND INSECT MONITORING DEVICES

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Inclusion in this publication does not imply any endorsement nor does exclusion imply any criticism of suppliers or their products. Microbial (single celled) organisms that are used to repel, prevent, or destroy pests are considered pesticides under current government regulations. Before using these biologicals, consult your Extension agent for information concerning legal use.

INTRODUCTION

Current attitudes in the U.S. concerning food safety and environmental quality have raised the general public's interest in alternative (non-synthetic pesticide) pest controls. Although "natural" or "organic" insecticides appear to be logical alternatives, their use is not quite as clear cut as one might expect. First, there is a difference of opinion about the definitions of what products are natural and/or organic. (Although Kentucky now has a law which defines organic for purposes of commerce.) What is called natural by one person may not be considered so by another. Additionally, some products generally considered to be natural or organic are more toxic to mammals than some synthetic insecticides. For example, nicotine (a natural product) has an LD50 (rat oral) of 50 to 60 mg/kg whereas Sevin (a common synthetic pesticide) has an LD50 (rat oral) of 246 to 283 mg/kg. This means that it takes 5X more Sevin to cause lethal toxicity to rats than nicotine: the natural product is much more toxic. The moral: answers that appear to be too simple and too good, probably are.

BOTANICAL INSECTICIDES AND INSECTICIDAL SOAPS

Botanical insecticides and insecticidal soaps are promising alternatives for use in insect management. However, like conventional synthetic insecticides, botanicals and insecticidal soaps have advantages and disadvantages and should be judged accordingly. **Each compound must be evaluated in terms of toxicity, effectiveness, environmental impacts and costs.** Even though botanicals and insecticidal soaps are naturally derived and are relatively safe if used properly, they are poisons and should be handled with the same caution as synthetic insecticides.

What are botanical insecticides and insecticidal soaps? Botanicals are naturally occurring insecticidal compounds derived from plants. They are processed into various forms which include:

- preparations of crude plant material;
- plant extracts or resins; and
- pure chemicals isolated from plants.

Advantages

- **Rapid degradation** -- less persistence in environment and reduced risks to non-target organisms. May be applied shortly before harvest without leaving excessive residues.
- **Rapid action** -- act very quickly to stop feeding by pest insects. They may not cause death for hours or days, but they often cause immediate paralysis or cessation of feeding.
- **Low mammalian toxicity** -- most botanicals and insecticidal soaps have low to moderate mammalian toxicity.
- **Selectivity** -- in the field, their rapid degradation and action as stomach poisons make them more selective in some instances for plant-feeding pest insects and less harmful to beneficial insects.
- **Low toxicity to plants** -- Many botanicals are not phytotoxic (toxic to plants). However, phytotoxicity is sometimes observed, particularly with insecticidal soaps and ornamentals. It is always best to test a new product on few plants first before applying on a large scale.

Disadvantages

- **Rapid degradation** -- this characteristic, although desirable in some respects, creates a need for more precise timing or more frequent applications.
- **Toxicity** -- all toxins used in pest control pose some hazard to the user and to the environment.
- **Cost and availability** -- botanicals tend to be more expensive than synthetics, and some are not as widely available.
- **Lack of test data** -- data on effectiveness and long-term (chronic) toxicity are unavailable for some botanicals, and tolerances for some have not been established.

Types of Botanical Insecticides

- **Insecticidal Soaps** -- Insecticidal soaps generally are not considered to be botanical insecticides, although the oils from which they are produced may be of plant origin. In general terms, insecticidal soaps are made from the salts of fatty acids. Oleic acid, present in olive oil and other vegetable oils, is especially effective. *Caution:* Homemade soap spray "recipes" can be dangerous and harmful, calling for cleaning agents, fuel oils, polishes, solvents, and other materials that are toxic to plants and many animals (including humans).
- **Neem** -- Neem products are derived from the neem tree, *Azadirachta indica*, that grows in arid tropical and subtropical regions on several continents. The active ingredient, azadirachtin, is both a feeding deterrent and a growth regulator.

- **Citrus Oil Extracts: Limonene and Linalool** -- Crude citrus oils and refined compounds are extracted from orange and other citrus fruit peels.
- **Other Essential Plant Oils: Repellents and Insecticides** -- The most common essential oils are the oils of cedar, lavender, eucalyptus, pennyroyal and citronella.
- **Pyrethrum and Pyrethrins** -- Pyrethrum is the powdered dried flower head of the pyrethrum daisy, *Chrysanthemum cinerariefolium*. The word "pyrethrum" is the name for the crude flower dust itself, and the term "pyrethrins" refers to the six related insecticidal compounds that occur naturally in the crude material. *Note:* Pyrethroids are not botanical insecticides. They are synthetic compounds that are based on the chemical structure of natural pyrethrins.
- **Spinosad –** Spinosad is not, strictly speaking, a botanical, since it is derived from a fungus, rather than a plant. It is produced by fermentation of an actinomycete, *Saccharopolyspora spinosa.* It is toxic both through contact and ingestion to a wide variety of insects, and has low mammalian toxicity. It is available both in organic (OMRI) and non-organic products.

MICROBIAL INSECTICIDES

Microbial insecticides are products containing microorganisms (or their byproducts) which result in insect diseases. Like botanical insecticides, they are of natural origin and have similar advantages and disadvantages. However, unlike botanicals, microbials have no effect on mammals. In fact, any given microbial will kill only a very limited group of insects.

Types of microbial insecticides

- ***Beauveria bassiana***—Strains of this soil fungus attack a wide range of insects. Commercial formulations are labelled for control of many softbodied sap feeders (e.g. aphids, whiteflies and mealybugs) as well as orthopterans (grasshoppers, locusts, and mormon crickets).
- ***Bacillus thuringiensis* (*B.t.*)** -- This is probably the most common microbial "active ingredient." This organism is incorporated into several products, most of which are used to control caterpillar pests. Specific strains of *B.t.* have been selected for the ability to control mosquitos, black flies and other organisms. For example: *B.t.* strains 'kurstaki', 'berliner' and 'aizawai' are used for controlling larvae of many lepidoptera, while *B.t.* 'tenebrionis' is used against larvae of Colorado potato beetle and *B.t.* 'israelensis' is used to control mosquito larvae. Be sure the product you choose is labeled to control the pest you are targeting.
- Additionally, while some crops have been modified to express the insecticidal protein produced by *Bacillus thuringiensis* these genetically altered plants are not considered in this publication.
- ***Bacillus popilliae* or *B. lentimorbus*** -- These microbes are used to control the larval stage (white grub) of Japanese beetle. They, too, are formulated into several different products.
- ***Nosema locustae*** -- This microscopic protozoan is used in several products to control grasshoppers.

Because of the very selective nature of microbial insecticides, users must know what pest they are after and read the label of the selected product to ensure a proper selection.

In addition to using commercial products, it often is possible to collect diseased insects in the field. By grinding and spreading this "disease," you may be able to produce your own "insecticide."

Note: Many vendors listed in this publication also are listed in: White, J.A. & Johnson, D.W. 2010. ENTFACT-125,Vendors of Beneficial Organisms in North America. University of Kentucky College of Agriculture Cooperative Extension Service.

These two publications in conjunction with the appropriate publication listing synthetic insecticides for your crop will give you the widest possible range of insect control tactics.

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Abbreviations Used in This Publication

Insect Diseases	"Natural" Insecticides	Traps	Collecting Equipment
BB – *Beauveria bassiana* BP -- *Bacillus popilliae* BTH -- *Bacillus thuringiensis* NL -- *Nosema locustae*	IS -- Insecticidal Soaps NE -- Neem OL -- Oils PY -- Pyrethrum SP --Spinosad	FT -- Food Traps PT -- Pheremone Traps RS -- Red Spheres (apple mimic) YST -- Yellow Sticky Traps	MA -- Magnifying Device SD -- Saving Device (live trap) SN – Sweep Nets SU -- Sticky Stuff for replenishing sticky traps WMD -- Weather Monitoring Device

RETAIL AND WHOLESALE SUPPLIERS
Note that this list is not exhaustive. Many products are also available at big box retail and online stores.

ARBICO, Inc.
PO Box 8910
Tucson AZ 85738
(800) 827-2847
www.arbico.com
Insect Diseases: BB, BT, NL
"Natural" Insecticides: IS, NE, OL, PY
Traps: FT, PT, RS, YST
Collecting Equipment: SU

Biocontrol Network
5116 Williamsburg Rd.
Brentwood, TN 37027
(800) 441-2847
www.biconet.com
Insect Diseases: BP, BT, NL
"Natural" Insecticides: NE, OL, PY, SP
Traps: FT, PT, RS, YST
Collecting Equipment: SU

Gardens Alive!
5100 Schenley Place,
Lawrenceburg, IN 47025
(513) 354-1482
www.gardensalive.com
Insect Diseases: BTH
"Natural" Insecticides: IS, PY, OL
Traps: PT, RS, YST FT

Garden Safe
www.gardensafe.com
Insect Diseases: BTH
"Natural" Insecticides: NE, PY, IS

Great Lakes IPM
10220 E Church Rd
Vestaburg, MI 48891
800-235-0285
www.greatlakesipm.com
Traps: PT, FT, RS, YST
Collecting Equipment: SU, SN, MA, SD

Green Methods
93 Priest Rd.
Nottingham, NH
03290-6204 USA
Phone: 603.942.8925
www.greenmethods.com
Insect Diseases: BP, BTH, NL
"Natural" Insecticides: IS, OL
Traps: PT, YST, RS
Collecting Equipment: SU, SN, MA

Harmony Farm Supply
3244 Hwy. 116
North Sebastopol, CA 95472
(707) 823-9125
www.harmonyfarm.com
Insect Diseases: BTH, NL
"Natural" Insecticides: IS, OL, NE, PY, SP
Traps: PT, YST
Collecting Equipment: SU, WMD

Hydro-Gardens, HGI Worldwide Inc.
P.O. Box 25845
Colorado Springs, CO 80936
(888) 693-0578
www.hydro-gardens.com
Insect Diseases: BB, BTH, NL
"Natural" Insecticides: OL
Traps: YST
Collecting Equipment: MA, SU

IPM Laboratories, Inc.
Locke, New York
(315) 497-2063
www.ipmlabs.com
Traps: YST

Koppert Biological Systems, Inc.
28465 Beverly Rd
Romulus MI 48174
(734) 641-3763
www.koppertonline.com
Insect Diseases: BTH
Natural Insecticides: OL
Traps: PT, YST
Collecting Equipment: MA

Monterey Lawn and Garden Products, Inc.
P.O. Box 3500
Fresno, CA 93745
559-499-2100
www.montereylawngarden.com
"Natural" Insecticides: OL, NE, PY, SP
Traps: FT, PT, RS, YST

Nature's Control
P.O. Box 35
Medford OR 97501
(541) 245-6033
www.naturescontrol.com
Traps: YST
Collecting Equipment: MA

Pharm Solutions Inc.
PO Box 1500
Cambria, CA 93428
(805) 927-7500
www.pharmsolutionsinc.com
"Natural" Insecticides: IS, OL

Planet Natural
1612 Gold Ave.
Bozeman, MT 59715
(800) 289-6656
www.planetnatural.com
Insect Diseases: BP, BTH, NL
"Natural" Insecticides: IS, OL, NE, PY, SP
Traps: FT, PT, RS, YST
Collecting Equipment: MA, SU

Rincon-Vitova Insectaries, Inc.
PO Box 1555
Ventura, CA 93002-1555
(800) 248-2847
www.rinconvitova.com
Insect Diseases:BB, BTH, NL
"Natural" Insecticides: IS, NE, OL, SP
Traps: FT, PT, YST
Collecting Equipment: MA, SU

Safer Brand
Woodstream Corp.
69 N. Locust St.
Lititz, PA 17543
855-767-4264
www.saferbrand.com
Insect Diseases: BTH
"Natural" Insecticides: IS, NE, PY
Traps: FT, PT, YST

Trece, Inc.
P.O. Box 129,
Adair, Oklahoma 74330
(866) 785-1313 or
(918) 785-3061
www.trece.com
Traps: FT, PT, YST
Collecting Equipment: SD, SU

Worm's Way Inc.
7850 North State Road 37
Bloomington, IN 47404
(800) 274-9676
www.wormsway.com
Insect Diseases: BP, BTH
"Natural" Insecticides: IS, OL, NE, SP
Traps: YST

Pesticide recommendations in this publication are registered for use in Kentucky, USA. The use of some products may not be legal in your state or country. Please check with your local county agent or regulatory official before using any pesticide mentioned in this publication.

Of course, **ALWAYS READ AND FOLLOW LABEL DIRECTIONS FOR SAFE USE OF ANY PESTICIDE!**

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Comments, corrections and updates are welcome. Please contact Jen White at the Entomology Dept., University of Kentucky