Biopesticides

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In recent years, several biopesticides have become available to the greenhouse industry. The active ingredients in biopesticides may include bacteria, fungi, nematodes or viruses. Interest in biopesticides has increased for several reasons including 1) environmental concerns due to the dependence on chemical pesticides and their effect on groundwater pollution and nontarget organisms, 2) development of resistance to chemicals, 3) increased implementation of integrated pest management (IPM) practices and 4) recent advances in biotechnology.

Some advantages of biopesticides are their selectivity to a targeted pest, lower toxicity to beneficial insects and greenhouse workers, and shorter reentry intervals (REIs) compared to traditional chemicals. Biopesticides are most effectively used as part of an IPM program. Regular monitoring ensures early detection of the targeted pest. Monitoring also will enable growers to spot treat infestations and to evaluate treatments.

However, in spite of these advantages, there are some disadvantages to the use of biopesticides. Biopesticides may be less effective than traditional pesticides. You may not see the quick knockdown of pest populations. Because biopesticides tend to be slower acting than traditional pesticides, you must not expect immediate results. Biopesticides tend to have less of an broad spectrum effect than traditional pesticides. In addition, some products are more expensive than traditional chemicals.

The following table is a partial listing of selected biopesticides (Avid, Gnatrol, Naturalis-O, Spod-x-LC, SoilGard 12 G) and materials that tend to be more compatible with biological control agents (Azatin EC, Citation, Precision, Sunspray Oil, Enstar II, Insecticidal Soap).

Future Directions

University of Vermont researchers are investigating the use of additional entompathogenic (insect-killing) fungi for use against certain greenhouse pests. These fungi are not adversely affected

Product and Active Ingredient	Trageted Pests	Comments	Cost
Avid (abamectin) that is produced by soil microorganisms *Streptomyces avermitilis*	Two-spotted mites, leafminers	Not considered disruptive to natural predators or beneficial insects. May take three to four days to see maximum effectiveness	1 quart = $206.50
Azatin EC, Neemazad (azadirachtin)	Whiteflies, thrips, leafminers, mealybugs, loopers, caterpillars, beet armyworms, aphids	Acts as insect growth regulator, feeding and oviposition deterrent. May be used on certain herbs and vegetables.	Azatin EC: 1 quart = $163.80 Neemazad: 1 quart = $225.45
Citation	Dipterous leafminer larvae, fungus gnat and shore fly larvae	Insect growth regulator. Available in water soluble packets.	1 packet = $37.60
Enstar II (kinoprene)	Aphids, whiteflies, soft-bodied and armored scales, mealybugs, larval and adult fungus gnats	Insect growth regulator. Do not apply through any type of irrigation system.	5 oz. = $74.41
Gnatrol *(Bacillus thuriengiensis* H-14)	Fungus gnat larvae	Make three weekly applications. Compatible with beneficial nematodes, Hypoaspis mites.	1 gallon = $36.74
Hot pepper wax	Aphids, spider mites, thrips, leafminers, whiteflies, lace bugs, leafhoppers and scale	Insect repellent containing hot pepper extract and paraffin wax concentrate and herbal extracts.	1 quart = $19.95

M-Pede (Insecticidal Soap)	Aphids, mealybugs, plant bugs, scales, thrips, whiteflies and spider mites	May be used on herbs, spices and vegetables applied up to day of harvest. Phytotoxicity a concern, esp. with repeated applications.	1 gallon = $29.32
Naturalis-O (*Beauveria bassiana* JW-1)	Aphids, thrips, mites and whiteflies	Three to five applications may be necessary to manage populations. Good spray coverage is essential.	1 quart = $48.43
Spod-X-LC (*Spodptera exigua*)	Beet armyworm	A nuclear polyhedrosis virus (NPV). Early instar larvae must ingest product. Temperatures above 90°F will inactivate virus.	1 gallon = $276.00
SoilGard 12G (Gliocladium virens G1-21)	Beneficial fungus that inhibits Pythium and Rhizoctonia	Suppression has been shown on geraniums, vinca and zinnia. Must be added during the media mixing process to ensure even distribution of granules.	Price not available at this time.
X-Gnat, Scanmask (*Steinernema feltiae*)	Fungus gnat larvae	Check to see that the nematodes are alive before treatment. Apply when media temperatures are between 55° and 90°F.	X-Gnat: 1 case of 12 pint containers = $290.64 ScanMask: 25 million nematodes = $37.50
Sunspray Ultrafine Horticultural Oil	Aphids, mealybugs, scales, whiteflies, spider mites	Slower drying time of oil on leaves may cause phytotoxicity. Use on noncloudy days to promote rapid drying, spot test first and avoid application on sensitive plants such as coleus, wax begonia and flowering bedding plants among others.	2.5 gal. = $31.72

Triact 90 EC (clarified hydrophobic extract of neem oil)	Black spot on roses, anthracnose, rust, powdery mildew, downy mildew, botrytis, whiteflies, thrips, mealybugs, leafminers, loopers, caterpillars, beet armyworms, aphids, psyllids, mites, scales	Do not apply through any type of irrigation system. Do not use on food crops. Apply every 7 to 14 days for disease prevention. For insects, spray every 7 to 14 days depending upon severity of pest problem.	Price not available at this time.

by short day lengths which can be a limiting factor on the use of some natural enemies such as *Orius* sp. However, thorough spray coverage is important to ensure contact with the targeted insect. Currently, application methods and compatibility issues with chemicals and biological control agents are under investigation.

Try biopesticides on a small scale to increase worker safety and to reduce the adverse environmental effects of traditional pesticides. Use biopesticides in your IPM program and treat spot pest infestations as soon as you detect them.

References

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