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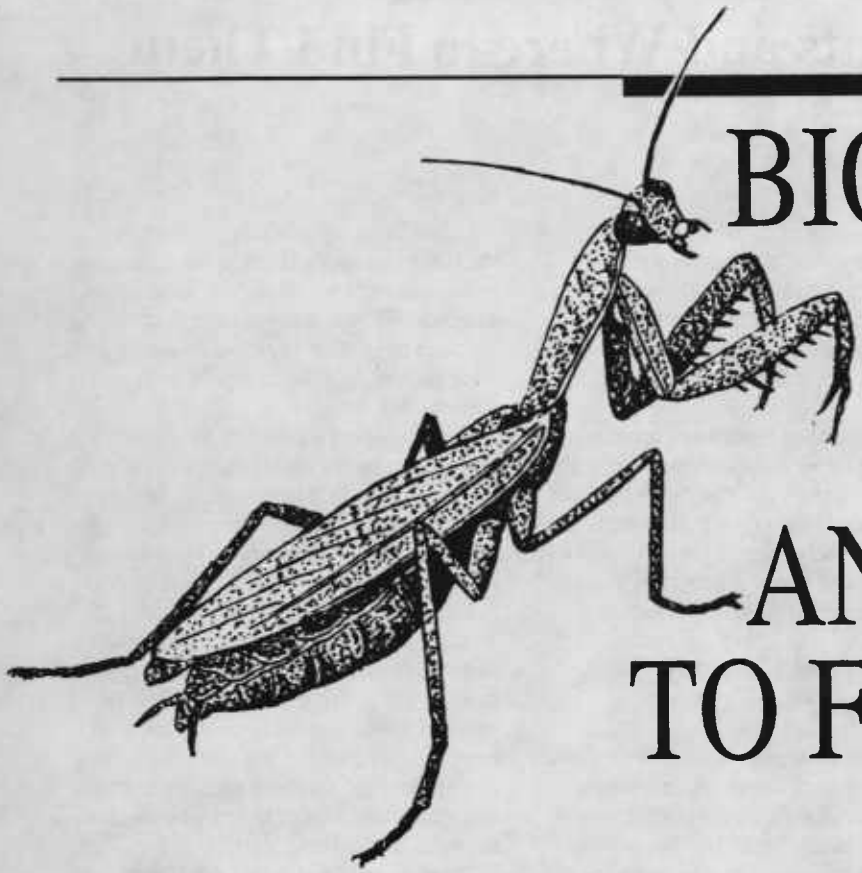

BIOLOGICAL CONTROL AGENTS AND WHERE TO FIND THEM

OREGON STATE UNIVERSITY
EXTENSION SERVICE

Biological Control Agents and Where to Find Them

A. Dreves and G.C. Fisher

Take a closer look at using biological control to suppress insect and mite pests. Our interest is to provide information on the availability of biological control agents—predators, parasites, and pathogens—to reinforce or replace insecticides and miticides where desired and feasible. It's obvious that a number of problems can occur as a result of relying strictly on a one-sided form of pest control such as pesticides:

- secondary pest outbreaks;
- pest resistance;
- destruction of effective, naturally occurring biological control;
- increased costs of pesticides; and
- environmental and human health hazards.

These problems provide the incentive to explore possible means of pest management other than pesticides.

The Integrated System of Pest Management (IPM) includes pest and beneficial identification and a combination of tools:

- monitoring,
- pest-resistant varieties,
- cultural practices (proper irrigation, pruning, adequately balanced fertilization),
- physical controls (barriers, traps, hand-picking),
- chemical controls, and
- biological controls.

IPM can provide a more balanced and sustainable system that, in the end, may result in less cost for pest control.

The objective of an IPM program is *to suppress* pest populations below certain population or damage levels, *not attempt to eradicate* them. Generally, it's considered desirable to allow the pest to survive at some low level in order to maintain the presence of natural enemies.

Using biological control agents has been proven to be an effective means of controlling pests. Biological control agents are natural enemies such as predators, parasites, and pathogens that influence populations of insect and mite pests.

These beneficial organisms are not harmful to people, and they're compatible with the environment. They may be quite specific, attacking only a particular host species or closely related group of pests such as aphids, mites, or caterpillars.

An example is *Encarsia formosa,* a parasitic wasp that attacks only the greenhouse whitefly. The tiny *Trichogramma* wasp is a parasite of several caterpillar pests.

Most insect parasites usually complete their development on or inside a single host pest, ultimately destroying it. Usually, parasites are either fly or wasp species and are parasitic during their own larval stages.

Predators feed on many different kinds of pests, usually during both the immature and adult stages. For example, ladybugs feed on many different species of aphids, in addition to mites, soft scales, and eggs. Some predators (for example, praying mantids) seize, overpower, or immobilize prey and then consume it entirely or suck it dry of body fluids.

Pathogens (fungal, viral, or bacterial diseases) both infect and kill pests. *Bacillus thuringiensis* (Bt) is a widely used bacterial pathogen with various strains that infect and kill different species of caterpillars and certain fly larvae.

Using these beneficials is effective, but you must apply them at the right time and in the right manner. You need to determine if you really have a pest problem or if plant injury is caused by other factors such as heavy rains or soil-nutrient deficiency.

If you suspect a pest, try to identify it. Since most beneficial insects kill only selected pests, it's important to find out which pest is causing your problem. Refer to insect books or ask your county Extension agent for professional advice.

Become aware of the extent and biology of the pests present. Be attentive to details in the field or garden by monitoring it. By monitoring closely, you can determine which organisms are key pests, and which are secondary. You can understand the biological limitations and vulnerabilities of the pests as well as the roles of the beneficials.

You can gain a simple understanding of the life cycles and complexes of insects and plants through consistent monitoring. Some pest problems can be successfully managed by monitoring pests and choosing cultural methods.

In addition, you can prevent population explosions of pests if you act early to suppress egg-laying adults, egg masses, and young larvae. Spend the time and make regular inspections in the field or garden to estimate the levels and stages of pests and beneficial insects present. This will indicate when pests are becoming sufficiently established to warrant a control that will be most effective.

Don't worry when you see "bugs" in your field or garden. You could count hundreds of different kinds there, if you watch closely enough. But most are doing no harm at all. Remember: There can be a level of "bad guys" or pests

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living on the plants without reducing the yield, too.

Attempt to understand that nature can keep potential pests in check rather than completely eliminating them. All insect and mite populations are subject to natural enemies that normally keep their numbers well below damaging levels.

The natural controls include not only predators, parasites, and pathogens but also weather, availability of food and shelter, and conditions for mating. When the pest population has been brought down to its normal range in nature, the reduced amount of food will cause the predator and parasitic populations to be reduced again, through starvation or dispersion in search of hosts elsewhere.

Thus nature maintains a fluctuating balance, which is actually a series of population peaks and valleys through the season.

Various companies and distributors supply beneficial predators, parasites, and pathogens that are used for pest suppression. Beginning on page 4, we list suppliers of beneficial organisms. General information on dosage and handling is usually supplied with the insect shipment. Any questions about quantities to order, timing, and procedures for releasing the natural enemies can be answered by the producers.

When you make inquiries, please specify pest species, approximate number of plants (for example, acreage, bench space, etc.), estimate of numbers of pests (use the number per sample leaf or percent of crop infested), and life stage of pest (adult, larvae, etc.).

For general garden pest suppression of leaf-feeding caterpillars, aphids and mites, the beneficials—green lacewings, *Trichogramma* wasps, predatory mites, and ladybugs—are usually employed.

The number of beneficials required depends on the natural enemy complex already present in the garden, the extent of the pest problem, the weather, and other factors. There is no fixed amount to purchase for any one situation. Results depend on timing of releases and placement of the beneficials where the insect pests will be.

You can't just put out the insects. You have to do it at the right time and use the right numbers. Beneficial releases should begin when pest densities are low to medium for maximum effectiveness. When releasing the beneficials, gently scatter or spread them out so each one has a chance to find food immediately.

Nectar, pollen, or honeydew can be good alternate energy food for some beneficials. Sugar water is sometimes sprayed on lady bugs to slow their tendency to disperse.

It may be necessary to make a series of releases, to provide effective, longer-lasting pest suppression. Also some beneficials, such as ladybugs, should be released at night to prevent immediate emigration.

Introducing biological control takes knowledge, work, time, patience, and observation. It can at times provide sufficient suppression of pests rather than a short-term quick kill that might not last. If you successfully establish them, beneficials may work on their own for the rest of the growing season, too.

Where to find commercial suppliers

The list that begins on page 4 is accurate as of the date of this publication. It's supplied for the convenience of Oregonians who want to order beneficial organisms—predators, parasites, or pathogens—to control their pests biologically.

Column 1 lists the supplier. Columns 2 to 4 show key predators: green lacewings (GL), ladybugs (LB), and praying mantids (PRM). Column 5 shows a key parasite, egg wasps (TW). Column 6 shows all other organisms.

The organism codes, as well as several codes for traps and control materials, are explained on pages 9-11.

These commercial sources and trade-name products are listed as a service only. The OSU Extension Service does not endorse *any* commercial source or trade-name product. The OSU Extension Service does not intend to discriminate against commercial sources or trade-name products not listed.

Commercial suppliers of biological agents

Supplier	Organisms: Predators: Green lacewings (GL)	Organisms: Predators: Lady-bugs (LB)	Organisms: Predators: Praying mantids (PRM)	Organisms: Parasite: Egg wasps (TW) *Trichogramma* sp.	Organisms: Others
1	2	3	4	5	6
Abbott Laboratories 14th and Sheridan Rds North Chicago, IL 60064 (312) 937-6100					BT
AgBioChem, Inc. 3 Fleetwood Ct Orinda, CA 94563 (415) 254-0789					CGP
Alternative Garden Supply, Inc. 108 N Barrington Rd Streamwood, IL 60107 1-800-444-2837 (312) 289-4545					IS, PMC, PMI, PML, PMP, TS, YSC
Applied Bio-Nomics, Ltd. PO Box 2637 Sidney, BC Canada V8L 4C1 (604) 656-2123 (*U.S. distributors:* Rincon Vitova Insectaries, Nature's Control, Organic Pest Control, Troy Hygro Systems		•			AA, AC, GWP, PMP, YSC
Arizona Biological Control, Inc. PO Box 4247 CRB Tucson, AZ 85738 (602) 825-9785 Bug hotline: 1-800-433-9230	•	•	•	•	FP, FPM, FPN, FPS, FPZ
Associates Insectary PO Box 969 Santa Paula, CA 93060 (805) 933-1301 *Note:* Small-scale sales only, to member growers.					DS, MD, RSM
Beneficial Insectary 14751 Oak Run Rd Oak Run, CA 96069 (916) 472-3715	•	•	•	•	BT, FPM, FPN, FPS, FPT, FPZ, GHP, GWP, PMC, PML, PMO, PMP, PN
Better Yield Insects PO Box 3451 Tecumseh Station Windsor, ON Canada N8N 3C4 (519) 727-6108 *U.S. distributor:* Hydro Gardens, Inc. 8765 Vollmer Rd Colorado Springs, CO 80932					GWP, PMP
Bio-Control Company PO Box 337 Berry Creek, CA 95916 (916) 589-5227	•	•	•	•	FP
BIOFAC, Inc. PO Box 87 Mathis, TX 78368 (512) 547-3259	•			•	COC, FPC FPM, LBH, SPP, WCP, WPB

Commercial suppliers of biological agents (continued)

Supplier	Organisms: Predators: Green lacewings (GL)	Organisms: Predators: Lady-bugs (LB)	Organisms: Predators: Praying mantids (PRM)	Organisms: Parasite: Egg wasps (TW) *Trichogramma* sp.	Others
1	2	3	4	5	6
Bio Agr. Insect Control Supply 1710 S Broadway Plainview, TX 79072 (806) 293-5861	•	•	•	•	BSP, BT, FPM, FPS, GHP, GWP, MD, NPV, PMC, PMO, PMP, RSM
Biologic 418 Briar Lane Chambersburg, PA 17201 (717) 263-2789					PNC
BioProducts 5014 NW 41st St Gainesville, FL 32606 (904) 454-2620 (904) 397-8442					BT, OPC
BioResources PO Box 902 1210 Birch St Santa Paula, CA 93060 (805) 525-0526	•	•		•	FP, FPS, FPM, GWP, MD, PM
BIOSYS 1057 E Meadow Circle Palo Alto, CA 94303 (415) 856-9500					PN
Biotactics, Inc. 7765 Lakeside Dr Riverside, CA 92509 (714) 685-7681 (after 6 pm)					PMC, PML, PMO, PMP
W. Atlee Burpee Seed Co. Retail Garden Store 300 Park Ave Warminster, PA 18974 (215) 674-8233	•	•	•	•	BT, FP, FPM, FPS, IS, OPC, TS
BoBiotrol PO Box 2495 Merced, CA 95340 (209) 722-4985 *Note:* Local sales only	•			•	FP, NOW
Evans BioControl 895 Interlocken Pkwy Unit A Broomfield, CO 80020 (303) 460-1780					GHP, PNC
Farmer Seed and Nursery 818 NW 4th St Faribault, MN 55021					BT, IS
Foothill Ag. Research, Inc. 510 W Chase Dr Corona, CA 91720 (714) 371-0120	•	•	•	•	BSP, DS, FP, FPM, FPS, GWP, MD, PM, RSM
Fountain's Sierra Bug Co. PO Box 114 Rough & Ready, CA 95975 (916) 273-0513		•			

Commercial suppliers of biological agents (continued)

Supplier	Organisms				
	Predators			Parasite	
	Green lacewings (GL)	Lady-bugs (LB)	Praying mantids (PRM)	Egg wasps (TW) *Trichogramma* sp.	Others
1	2	3	4	5	6
Gardener's Supply Co. 128 Intervale Rd Burlington, VT 05401 (802) 863-1700					BT, OPC, PNC
Gerhart, Inc. 6346 Avon Belden Rd N Ridgeville, OH 44039 (216) 327-8056					AC, BT, GWP, LMP, PMP
Great Lakes IPM 10220 Church Rd NE Vestaburg, MI 48891 (517) 268-5693					TS
Gurney Seed & Nursery Co. 110 Capitol Yankton, SD 57079 (605) 665-1671	•	•	•	•	EW, FP, GHP
Harmony Farm Supply PO Box 451 Graton, CA 95444 (707) 823-9125	•	•	•	•	AA, AC, BSP, FP, GWP, IS, MD, PMC, PML, PMO, PMP, PN, RSM, TS
Integrated Orchard Management 821 N Stevenson St Visalia, CA 93291					PMO
IPM Labs, Inc. Main St Locke, NY 13092 (315) 497-3129					AC, FPC, FPS, FPZ
Kunafin Trichogramma Insectaries Rt 1, Box 39 Quemado, TX 78877 (512) 757-1468 or (512) 773-0149				•	
Lakeland Nurseries Sales, Inc. Unique Merchandise Mart Bldg 1 340 Poplar St Hanover, PA 17333 (717) 637-5555		•	•		
Mellinger's Nursery 2310 W South Range Rd North Lima, OH 44452 (216) 549-9861 1-800-321-7444	•	•	•	•	BT, FP, GHP, GWP, IS, MD, PN, TS
MicroGeneSys 400 Frontage Rd West Haven, CT 06516 (203) 932-3203					CMV, NPV
National Gypsy Moth Management Group, Inc. RD 1, Box 715 Landisburg, PA 17040 (717) 789-3434					GMP

Commercial suppliers of biological agents (continued)

Supplier	Organisms: Predators: Green lacewings (GL)	Predators: Lady-bugs (LB)	Predators: Praying mantids (PRM)	Parasite: Egg wasps (TW) *Trichogramma* sp.	Others
1	2	3	4	5	6
Natural Gardening Research Center PO Box 149, Hwy 48 Sunman, IN 47041 (812) 623-3800	•	•	•	•	BT, GHP, IS, PM, PN, TS, YSC
Natural Pest Controls 8864 Little Creek Dr Orangevale, CA 95662 (916) 726-0855	•	•	•	•	BSP, BT, FPM, FPP, FPS, GWP, MD, MF, PBP, PMC, PMO, PMP, RSM
Nature's Control Box 35 Medford, OR 97501 (503) 899-8318	•	•			AA, FP, GWP, IS, MD, PMC, PMO, PMP, TS, YSC
Oregon distributors: Down to Earth 500 Olive St Eugene, OR 97401 (503) 344-6357	Light Manufacturing 1634 SE Brookland Portland, OR 97202 (503) 231-1582				
Full Moon 217 SW 2nd Corvallis, OR 97330 (503) 757-2532	Northwest Garden Center 9915 SE Foster Portland, OR 97266 (503) 771-6804				
Hellide of Oregon 9220 SE Stark Portland, OR 97216 (503) 256-2400	Rain or Shine 886 W 6th St Eugene, OR 97402 (503) 484-7467				
Hydro Tech 10929 NE Sandy Blvd Portland, OR 97220 (503) 253-4097	Territorial Seeds PO Box 27 80030 Territorial Rd Lorane, OR 97451 (503) 942-9547				
Nature's Way Products Earlee, Inc. 726 Spring St Jeffersonville, IN 47130 (812) 282-9134					BT
Necessary Trading Co. Biological Pest Management 468 Salem Ave New Castle, VA 24127 (703) 864-5103	•	•		•	BT, FP, GWP, IS, MD, PM, TS, YSC
ORCON Organic Control, Inc. 5132 Venice Blvd Los Angeles, CA 90019 (213) 937-7444		•	•		BSP, BT, PMC, PMP, PMO
Organic Pest Management Control Box 55267 Seattle, WA 98115 (206) 367-0707 Distributor for Biotactic and Rincon-Vitova	•	•			AA, AC, BT, GWP, P, PMP
Pacific Agricultural Labs., Inc. PO Box 439 San Luis Rey, CA 92608 (714) 439-6921					DS

Commercial suppliers of biological agents (continued)

Supplier	Organisms: Predators: Green lacewings (GL)	Organisms: Predators: Lady-bugs (LB)	Organisms: Predators: Praying mantids (PRM)	Organisms: Parasite: Egg wasps (TW) *Trichogramma* sp.	Organisms: Others
1	2	3	4	5	6
Peaceful Valley Farm Supply 11173 Peaceful Valley Rd Nevada City, CA 95959 (916) 265-3276	•	•	•	•	AA, BSP, BT, CGP, DS, FPG, FPM, FPN, FPP, FPS, FPZ, GHP, GWP, IS, MD, MF, NOW, NPV, OPC, PMC, PML, PMO, PMP, PN, PNC, RSB, RSM, TS
Pest Management Supply Co. PO Box 938 Amherst, MA 01004 (413) 253-3747					IS, TS, YSC
Phero-Tech, Inc. 1140 Clark Dr Vancouver, BC Canada					PN, TS
Reuter Laboratories, Inc. PO Box 551648 Dallas, TX 75355-1648 1-800-368-2244I In Virginia: (703) 361-2500					BT, GHP
Rincon-Vitova Insectaries, Inc. PO Box 95 Oak View, CA 93022 (805) 643-5407	•	•		•	AA, AC, AP, BSP, DS, FP, FPM, FPP, FPS, GWP, MD, NOW, PBP, PMC, PMO, PMP, RSB, RSP, TZ
Ringer Research 6860 Flying Cloud Dr Dept PC Eden Prairie, MN 55344-3429 (612) 941-4180					OPC
Safer, Inc. 4817 Palm Ave La Mesa, CA 92041 (619) 464-0775, Technical Resources (617) 237-9600, Headquarters					BT, IS
Spalding Laboratories 760 Printz Rd Arroyo Grande, CA 93420 (805) 489-5946	•			•	FPG, FPM, FPP, FPR, FPS, MD, TS, TZ
Troy Hygro Systems 4096 Hwy ES East Troy, WI 53120 (414) 642-5928		•			AA, GWP, PMP, YSC
Unique Insect Control PO Box 15376 Sacramento, CA 95852? (916) 961-7945 *or* 5504 Sperry Dr Citrus Heights, CA 95621 (916) 967-7082	•	•	•	•	FP, FPM, FPS
West Coast Ladybug Sales Box 903 Gridley, CA 95948 (916) 534-0840		•	•	•	FP

Commercial suppliers of biological agents (continued)

Supplier	Organisms				
	Predators			Parasite	
	Green lacewings (GL)	Lady-bugs (LB)	Praying mantids (PRM)	Egg wasps (TW) *Trichogramma* sp.	Others
1	2	3	4	5	6
Zoecon Corp. 1220 Denton Dr Dallas, TX 75234 1-800-527-0512, ext 8732					BT

Codes for organisms

Code	Beneficial organism (natural enemy)	Type of organism	Target pests(s) attacked
AA	*Aphidoletes aphidimyza*	Predatory midge	Aphids (all types), especially in greenhouses and indoors.
AC	*Amblyseius cucumeris* *Amblyseius mckenziei* *Amblyseius bakeri*	Predatory mite	Thrips larvae.
AP	*Chelonus texanus*	Braconidae parasitic wasp	Armyworm parasite.
BSP	*Metaphycus helvolus*	Scale parasitoid	Citrus black scale, black/brown hemispherical nigra scales, and other soft scales.
BT	*Bacillus thuringiensis*	Bacterial endotoxin	
	var. *aizawai* (e.g., Certan)	Bacterial endotoxin	Wax moth larvae in honeycombs.
	var. *israelensis* (e.g., Bactimos, Vectobac, Teknar)	Bacterial endotoxin	Water-breeding mosquito and black fly larvae.
	var. *kurstaki* (e.g., Dipel, Javelin, Attack, Thuricide, Bactospeine)	Bacterial endotoxin	Many species of caterpillars (e.g., codling moth, cabbage worm, loopers, webworms, etc.).
CGP	*Agrobacterium radiobacter*	Antagonistic bacteria	Crown gall bacteria on most fruit and nut trees, grapes, and berries.
COC	*Tetrastichoides* spp.	Eulophidae parasitic wasp	Cockroach ootheca (egg cases).
CMV	Codling moth virus	Granulosis virus	Codling moth.
DS	*Ruminia decollata*	Predatory decollate snail	Common brown garden snail slugs (Mollusca).
FP	Various spp. of fly parasites: *Goniozus legneri*, etc. *Tachinaephagus zealandicus*	Pupal fly parasites	Many species of garbage- and manure-breeding flies.
FPC	*Spalangia cameroni*	Pupal fly parasite	Many species of garbage- and manure-breeding flies.
FPG	*Sphegigaster* sp.	Pupal fly parasite	Many species of garbage- and manure-breeding flies.
FPM	*Muscidifurax raptor*	Pupal fly parasite	Many species of garbage- and manure-breeding flies.
FPN	*Nasonia vitripennis*	Pupal fly parasite	Many species of garbage- and manure-breeding flies.
FPP	*Pachycrepodeus vindeminae*	Pupal fly parasite	Many species of garbage- and manure-breeding flies.
FPS	*Spalangia endius*	Pupal fly parasite	Many species of garbage- and manure-breeding flies.
FPT	*Muscidifurax raptorellus*	Pupal fly parasite	Many species of garbage- and manure-breeding flies.

Codes for organisms (continued)

Code	Beneficial organism (natural enemy)	Type of organism	Target pests(s) attacked
FPZ	*Muscidifurax zaraptor*	Pupal fly parasite	Many species of garbage- and manure-breeding flies.
FPR	*Carcinops* sp.	Fly predator	Many species of garbage- and manure-breeding flies.
GHP	*Nosema locustae*	Protozoan parasite	Nymph and young adult grasshoppers.
GL	*Chrysopa carnea* (green lacewing)	Predator (in larval stage)	All species of soft-bodied insects, thrips, spider mites, and eggs.
GMP	*Cotesia melanoscela* *Glyptapantes flavicoxis* *Meteorus pulchricornis*	Braconidae parasitic wasps	Gypsy moth larvae.
GWP	*Encarsia formosa*	Egg parasite	Greenhouse whitefly eggs (*Trialeurodes vaporariorum*).
LB	*Chilocorus nigritus* *Hippodamia convergens* (ladybugs)	Predators (adult and larvae)	All species of soft-bodied insects, scales, mites, aphids, thrips, fruit scales, and eggs of many other harmful insects.
LT	*Lysiphlebus testaceipes*	Aphididae parasitic wasp	Greenbugs, aphids.
LBH	*Bracon hebeter*	Larval parasitic wasp	Lepidopterous larval pests in stored grains (almond moths, Indian meal moths, etc.).
LMP	*Dacnusa sibirica* *Diglyphus isaea*	Larval parasite	Leafminers.
MD	*Cryptolaemus montrouzieri*	Ladybug predator (adult and larvae)	Citrus, citrophilus, longtailed and other mealybugs; other soft-bodied insects; all stages.
MF	*Gambusia affinis* sp.	Predatory fish	Mosquitos that breed in water.
NOW	*Goniozus legneri* *Pentalitomastix plethoricus*	Pupal parasite (navel orangeworm parasitoid)	Navel orangeworm, *Paramyelois transitella*, in almonds and walnuts.
NPV	Nuclear polyhedrosis virus	Larval invasive virus	Cabbage loopers, corn earworms, beet armyworm, imported cabbage worm, tomato fruitworm, gypsy moth, pink bollworm, and tobacco budworm.
PBP	*Microchelonus blackburni*	Branonidae larval wasp parasite	Pink bollworm larvae.
PH	Pteromalids	Fly parasite	Many species of feedlot flies.
PM	Various spp. of predatory mites: *Euseius tularensis*	Predatory mite	Various pest mites, Acarina.
PMC	*Amblyseius californicus*	Predatory mite	On mites such as Willamette mite.
PMH	*Amblyseius hibisci*	Predatory mite	On many mites.
PMI	*Israeli persimilis*	Predatory mite	On many mites.
PML	*Phytoseiulus longipes*	Predatory mite	On many mites.
PMO	*Metaseiulus occidentalis*	Predatory mite	On spider mites such as Pacific mite.
PMP	*Phytoseiulus persimilis*	Predatory mite	On two-spotted mite (*Tetranychus urticae*).
PN	Various spp. of predatory nematodes: *Neoplectana glaseri, Heterorhabditis heliothidis*, etc.	Larval and pupal predatory nematode	Soil insect larvae and grubs.
PNC	*Neaplectana carpocapsae* (currently *Steinernema feltia*)	Pupal and larval nematode parasite	Many species of insects, larvae, and grubs that pupate in the soil; wireworms, root beetle, root weevils, flea beetles, dampwood termites, etc.
PRM	*Tenodera ardefolia sinensis* (praying mantids)	Predator	General predator on most insects, mites, and eggs.
RSB	*Comperiella bifasciata*	Scale parasite	Citrus yellow scale, citrus red scale (*Aonidiella aurantii*).

Codes for organisms (continued)

Code	Beneficial organism (natural enemy)	Type of organism	Target pests(s) attacked
RSM	*Aphelinus melinus* (golden chalcid wasp)	Scale parasite	Citrus red scale, citrus yellow scale, oleander scale, other soft scales, San Jose scale, ivy scale.
SPP	*Pyemotes tritici*	Parasitic mite	Hymenoptera fire ants.
TP	*Apantales scutellaris*	Larval wasp parasite	Tomato pinworm.
TW	Egg wasps: *Trichogramma minutum* *Trichogramma platneri* *Trichogramma pretiosum*	Egg parasites	Eggs of most species of butterflies and moths (e.g., cabbage looper, cutworms, armyworms, codling moth, diamondback moth, orchard moth pests, etc.)
TZ	*Tachinaephagus zealandicus*	Pupal fly parasite	Feedlot manure flies.
WLP	*Anisopteromalus calandrae*	Larval parasitic wasp	Weevils.
WPB	*Xylocoris flavipes*	Anthocoridae pirate bug predator	Misc. small, early instar insects and insect eggs of beetles and moths that infest stored grain products.

Codes for traps and control materials

Code	Useful materials	Type	Target pest(s) attacked
IS	Insecticidal soap spray	Commercial spray	Aphids, leafhoppers, mealybugs, mites, psylla, slugs, tent caterpillars, thrips, whitefly.
OPC	Misc. organic pest control materials		IPM supplies.
TS	Lures, baits, traps, various pheromones, etc.		Armyworms, codling moth, budworms, pink bollworm, meal moths, Japanese beetles, etc.
YSC	Yellow sticky plastic traps	Nonchemical colored attractant	Whitefly, aphids, gnats.

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