

OHP INSECT SOLUTIONS[®]



GREENHOUSE & NURSERY PRODUCTION

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Greenhouse and Nursery **PESTS**

Aphids

Order Hemiptera, Family Aphididae



Adult aphid and nymph

Adult winged aphid

Aphids and white cast-off skins

Aphids are sucking insects that feed on plant fluids. The presence of aphids or white cast-off skins on leaves or flowers may reduce plant value. Heavy aphid infestations reduce plant growth and development. Honeydew produced by aphids makes leaves and fruits sticky and is a substrate for black sooty mold. Many aphid species transmit viruses affecting vegetable and ornamental plants.

Aphid developmental stages are egg, nymph and adult. In greenhouses and during the warm season adults are all females that produce live young. Outdoors, aphids overwinter as eggs, which hatch in the spring as females. Adult aphids may or may not have wings. Winged aphids can disperse over long distances using wind currents. The best temperatures for development vary with the species. For example the chrysanthemum aphid develops best at 68°F (20°C), the green peach aphid at 73°F (23°C), and the melon aphid at temperatures above 75°F (24°C). Plant nutrition affects aphid development and size. Moisture stress often increases aphid numbers. Temperatures above 86°F (30°C) and humidities above 85% reduce green peach aphid longevity and reproduction.

Boxwood Psyllid

Order Hemiptera, Family Psyllidae

The boxwood psyllid, *Cacopsylla busi* (Linnaeus) occurs wherever boxwoods are grown, but are more common in temperate climate regions. Both adults and nymphs feed by sucking plant sap causing terminals to become cupped and reducing twig growth. Feeding by nymphs causes more damage than adult feeding.



Boxwood psyllid nymph

Boxwood psyllids overwinter as first instars remaining in the egg until their emergence in the spring. Nymphs are flat, mottled-colored with green and brown and covered with white, wax filaments. After feeding damage occurs, the nymphs are protected within the cupped leaves. Adults emerge in May or June. Boxwood psyllid adults are small (about 3 mm) green insects with transparent wings, resembling tiny cicadas. The adults feed for a time, then produce the eggs for the following year – usually in August. The small, spindle-shaped orange eggs are deposited between the bud scales, with only the tip of the egg protruding past the edge of the scale. Each female produces only one to seven eggs per batch. There is one generation per year.

Caterpillars (worms)

Order Lepidoptera, Several families such as Noctuidae, Tortricidae, Pyralidae, Arctiidae



Adult beet armyworm

Beet armyworm larva

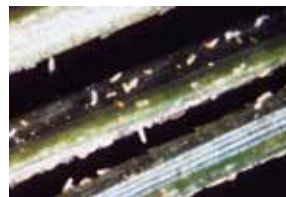
Cabbage looper larva

Plant injury is caused only by the larval (worm) stages. Larvae are chewing insects and can eat entire leaves and flowers, bore into stems and roll/tie leaves. Nearly all parts of the plant can be infested. Cutworm larvae may be in the growing media or beneath pots.

Lepidoptera developmental stages are egg, larva (number of instars depends on the species), pupa, adult (moth). The complete life cycle may take 30 days but it depends upon the species and the prevailing temperatures. Plants high in nitrogen may be more heavily damaged.

Eriophyid, Gall and Rust mites

Order Acari, Family Eriophyidae



Eriophyid mite, infestation
Andrew J. Boone, South Carolina Forestry Commission, Bugwood.org



Eriophyid mite, adult(s)
Tracy Wootton, University of Delaware, Bugwood.org

Eriophyids are very small mites, extremely difficult to see with the naked eye requiring a 20X or greater magnification hand lens. Although most Eriophyid mites only cause minor aesthetic damage to plants, some may vector plant diseases including viruses that may severely damage and kill host plants. Symptoms of Eriophyid mite damage include leaf galls, bud or flower galls, blisters and leaf and shoot deformities. Eriophyid mites have been associated with transmission plant pathogens including the rose rosette virus that causes Rose Rosette Disease.

Mites may overwinter on plants under bud scales and emerge when new buds start breaking in the spring. Under favorable conditions mites reproduce continuously and several 2-3 week long generations may occur in a growing season. Mites may be introduced into the greenhouse and nursery crops with propagation materials from infested areas. Control involves quick detection of symptoms and sanitation. Several miticides are registered for Eriophyid mite control. When needed treatment should be made preventively during bud break to avoid or minimize damage and disease transmission risk.



Rose rosette symptoms

Flathead and Roundheaded Borers

Order Coleoptera Families Buprestidae and Cerambycidae



Flatheaded borer adult



Flatheaded borer larva

Flatheaded borer (Buprestidae) adults are usually bright colored metallic beetles just under 1 inch long. Larvae do not have legs and have obviously enlarged segment toward the head (the flat-head look). Roundheaded borer (Cerambycidae) adults are fairly large, from 0.5 to 2 inches and have very long antennae – often longer than the body.

Flatheaded borers tunnel under the bark in the cambium layer; roundheaded borers tunnel through the cambium into the hardwood. Flatheaded borer galleries are tightly packed with very fine dust, whereas galleries of roundheaded borers contain coarser material. Exit holes of flatheaded borers tend to be flattened or oval and roundheaded borer exit holes tend to be more rounded.

Both borer types tend to attack weakened – or even recently dead – trees, but some species including flatheaded borers (e.g. emerald ash borer) will attack apparently healthy trees.

Most of these borers have one generation per year, but some have more than one generation per year, and others have a multi year life cycle.

Fungus Gnats

Order Diptera, Family Sciaridae



Fungus gnat adult female



Fungus gnat larvae



Poinsettias with roots damaged by fungus gnat larvae

Fungus gnat adults are small midge-like flies that cause no direct plant damage. However, the larvae can feed on roots or root hairs, stunting or killing young plants. Fungus gnats have been associated with several plant pathogens. Larval feeding damage may provide an entry point for root pathogens.

Fungus gnat developmental stages are egg, larva (four instars), pupa, adult. Development from egg to adult takes about 12 days (80°F, 27°C) to 27 days (55°F, 13°C). High moisture and organic matter content in the growing media (composted manure, bark, leaf litter) are most favorable for fungus gnat development. Adults are usually seen near the growing medium surface, but may be seen resting on plants. Larvae are in the growing medium or in plant stems below the medium surface.

Lace Bugs

Order Hemiptera, Family Tingidae

Lace bugs are sucking insects that feed on plant fluids. Feeding injury causes yellow spotting on leaves, which may turn brown and become small holes on the leaves.



Lace bug adult

Lace bug developmental stages are egg, nymph (five instars) and adult. Development time varies with species geographic location and weather conditions. There are multiple generations per year. Nymphs have spine-like projections on their bodies. Adults have very elaborate lace-like patterns on their wings. Depending on the species Lace bugs overwinter as eggs or adults, and become active in the spring.

Flea Beetles and other leaf feeding beetles

Order Coleoptera, Family Chrysomelidae

There are numerous species of beetles in this family – about 1500 – that feed on plant leaves, including many ornamental plants. Some of the more important members of this group for ornamentals producers include flea beetles, cucumber beetles (also known as corn rootworm adults), elm leaf beetles, viburnum leaf beetles, and cranberry rootworm adults.



Redheaded flea beetle and feeding damage

As their name implies, most leaf beetles feed on leaves and flowers as adults and larvae, but some are root feeders.

Larvae of some species feed on plant roots. Adults can disperse over long distances and large aggregations can quickly defoliate plants and cause severe plant damage. Larvae often eat only part way through the leaf surface leaving a thin semi-transparent window of tissue between the leaf veins.

Adults chew holes completely through the leaf. Injury is usually on the interior areas of leaves, not the edges as with root weevil adults. The life cycles of different species varies. Some overwinter as adults, others as larvae and still others as eggs. The number of annual generations also varies with species and geography.

Leafhoppers and Sharpshooters

Order Hemiptera, Family Cicadellidae



Rose leafhopper adult



Glassywinged sharpshooter adult

Some of the most important leafhopper and sharpshooter species in greenhouse and nursery production include the potato leafhopper, rose leafhopper, aster leafhopper and glassywinged sharpshooter.

Leafhoppers are small sucking insects. Adults are usually quite small, about 1/4-inch long and wedge-shaped – although some are 1/2-inch or more long. Most species feed on phloem or xylem

tissue, but some (e.g. potato leafhopper) also feed in leaf mesophyll. Damage ranges from leaf stippling and distortion to marginal necrosis ("hopperburn"). Damage from potato leafhoppers can be quite severe on some nursery grown trees. In addition to feeding injury, some species can transmit plant pathogens. The aster leafhopper transmits a phytoplasma causing aster yellows, which affects a wide range of ornamental and vegetable crops. Glassy-winged sharpshooters transmit the bacteria which causes Pierce's Disease on grapes. This is a quarantine issue for nursery ornamentals producers in California. Sharpshooters feed on xylem tissue.

Female leafhopper adults insert their eggs inside the leaf and stem tissues, in small batches. Nymphs and adults are active, moving sideways on the leaf surface when disturbed. Adults are capable of flying considerable distances. Potato leafhoppers overwinter as adults near the Gulf coast and migrate to northern states in the spring and summer.

Leafminers

Order Diptera, Family Agromyzidae



Leafminer adult

Leafminer larva in leaf mine

Leafminer adult and leaf punctures for feeding and egg laying

Primary leafminer injury is from the larvae feeding within leaves, making a narrow winding trail, or mine. Larval mines disfigure ornamental plants and vegetable plants may have reduced yields if populations are high. During heavy infestations, larvae may produce leaf mines in flowers.

Adult *Liriomyza trifolii* leafminer flies puncture leaves for feeding and egg-laying, and the small white spots will indicate leafminer activity. Leafminers have a very wide host plant range.

L. trifolii develop from egg to adult in 14 days (95°F, 35°C) to 64 days (59°F, 15°C). Other species have different lower and upper limits for development, but development trends are similar.

The developmental stages are egg, larva (three instars), and pupa (depending on the species, this stage may occur on or off the plant). Leafminers generally do best when plants are high in nitrogen.

Mealybugs - Soft Scales - Armored Scales

Order Hemiptera, Family Pseudococcidae – Order Hemiptera, Family Coccidae – Order Hemiptera, Family Diaspididae



Citrus mealybug

Soft scale female

Armored scales on rose stem

Mealybugs are sucking insects that feed on plant fluids. Feeding weakens and may kill plants. Honeydew produced by mealybugs can cover leaves and flowers, and is a substrate for black sooty mold. Mealybug developmental stages are egg, nymph (females, four in-

stars; males, five instars), and adult. Egg to adult development takes 30 to 60 days, but varies widely with individual species. It may take up to one year in cool temperatures. Adult males resemble small midges and appear totally different than adult females.

Soft and armored scales are sucking insects that feed on plant fluids. Feeding weakens and may kill plants. Honeydew produced by soft scales can cover leaves and flowers, and is a substrate for black sooty mold. Armored scales do not produce honeydew.

Soft and armored scale developmental stages are egg (or live nymph), nymph (females, three instars; males, five-instars) and adult. Females of some species reproduce without mating (parthenogenesis). Soft scale development from egg to adult is about 60 days, and armored scale development is about 180 days, but varies widely with individual species.

Plant Bugs

Order Hemiptera, Family Miridae



Four-lined plant bug

Tarnished plant bug adult

Plant bug feeding injury

Plant bugs are part of the so called "true bugs." Plant bugs are sucking insects that feed on plant fluids. Damage includes a variety of symptoms, from dark leaf spots to deformed terminal growth. One of the most serious pests among the true bugs is the tarnished plant bug, *Lygus lineolaris*. This pest occurs throughout much of North America and has been recorded from nearly 400 host plants, including many herbaceous and woody ornamentals.

Tarnished plant bugs overwinter as adults in sheltered areas (e.g. leaf debris, under bark, in rock piles) and become active when temperatures warm in the spring. Adults fly to host plants and begin feeding. Eggs are laid into plant tissue such as leaf petioles, the base of the leaf blade or small flowers.

Root Aphids

Order Hemiptera, Family Aphididae

Root aphids colonize roots of several plant species grown as ornamentals, and suck juices of plants in many types of soil and soilless media found in greenhouses and nurseries. Much like their above-ground relatives, they feed by sucking sap from the roots instead of the stems or leaves. The plant may exhibit symptoms such as wilting, stunted growth, and yellow-colored leaves. Sometimes an infestation is mistaken for a fertility or pH problem, or over-watering.



Root aphids

Root aphids are small, light-green, or off-white insects that are difficult to spot. Winged and wingless nymphs are usually found in an infestation but the winged nymphs do not fly. A plant affected by root aphids may show white wax on the infected root system. Root aphids tend to build populations at the edge of root balls.

Female aphids give live birth to nymphs. There are four nymph stages in 12-15 days in optimum conditions. The number of nymphs produced varies with temperatures. Generally, the higher the temperatures, the fewer the number of nymphs produced.

Root Mealybugs

Order Hemiptera, Family Pseudococcidae



Root mealybugs on outside of root ball

Root mealybugs are in the Genus *Rhizoecus*. They are sucking pests similar to other mealybugs that feed on stems and leaves, but are adapted to feed on plant roots. Adults resemble small insects that have been rolled in white flour. Adults and their cottony egg masses are usually on the outside of the root ball, and can be seen when the plant is lifted from the container.

Damage symptoms are non specific and usually involve slow or stunted plant growth, resulting in generally unhealthy looking plants. Plants that are root bound or under environmental or nutritional stress seem to be more susceptible to root mealybugs.

Females (there are no males) lay eggs in cottony masses, which hatch into tiny crawlers. The crawler stage is the most important for root mealybug dispersal among plants – often in irrigation water, but also in potting media. The initial infestation is often from purchasing infested plants. The life cycle from egg to adult is from 2–4 months. Adults can live nearly 60 days and produce three batches of eggs.

Root Weevils

Order Coleoptera, Family Curculionidae



Black vine weevil adult

Black vine weevil larva

Larvae of some snout nosed beetles (weevils) feed on the roots of a variety of plants including many species. Several species can be serious pests in nurseries and greenhouses. Root weevil pests include the black vine weevil, strawberry root weevil, rough strawberry root weevil, clay colored weevil and woods weevil. Depending on the species, adult body size ranges from 1/5 to 1/2 inches in length.

Root weevils will spend the winter as adults in some parts of the U.S., but in most areas root weevils overwinter as larvae in the soil.

Larva pupate in the soil and in many species adults emerge in early to late spring. In greenhouses emergence can be much earlier. In the Pacific Northwest, adults can emerge well into summer. Adult females need to feed on plants for 3 – 6 weeks before beginning to lay eggs. Adult weevil injury usually appears as semicircular notches on leaf margins. Developing buds may also be damaged. Feeding may occur at night. Adults can remain active and continue to reproduce for several months.

Eggs are deposited in the soil but may also be laid on leaves or plant debris. Larvae feed on roots and root hairs, passing through five or six instars.

Older larvae may girdle entire stems. Larvae have brown heads, are usually white to cream colored, legless and C-shaped.

Injured plants in nurseries and greenhouses may die suddenly. Outdoors there is one generation per year. In greenhouses there may be two generations.

Shore Flies

Order Diptera, Family Ephydriidae



Shore fly adult

Shore fly larvae

Shore fly adult and black fecal spots on leaf

Shore fly adults are small flies that resemble fruit flies in shape, but are smaller and have black bodies with red eyes. When at rest white spots can be seen on the wings. Both adults and larvae feed on algae, bacteria and protozoa. Direct feeding injury to plants is rare, but adults may help spread plant pathogens.

Shore fly development stages are egg, larva, pupa and adult. Development time from egg to adult is about 10 days (93°F, 34°C) to 16 days (73°F, 23°C). Larvae and adults are found in areas with algae – growing media surfaces, benches and floors. Adults often occur in large numbers, and will produce black fecal spots on leaves, plug tray surfaces, etc. This is unsightly at best, and the fecal spots can contain one or more plant pathogens.

Spider Mites

Order Acari, Family Tetranychidae



Spider mite adult female and egg

Webbing produced by heavy spider mite infestation

Spider mites have puncturing-sucking mouthparts. Feeding damage appears as light-colored spots, or stipples on upper leaf surfaces.

Spider mites also produce webbing. Heavy infestations can kill plants or cause leaves to drop off, and webbing can cover leaves and flowers resulting in aesthetic injury.

Spider mite developmental stages are egg, larva, protonymph, deutonymph, and adult. Development from egg to adult takes about 8 days (77° to 95°F, 25° to 35°C) to 28 days (50° to 68°F, 10° to 20°C). Hot and dry conditions are most favorable. Spider mite development is affected by the host plant, plant nutrition, leaf age, and moisture stress. Moisture stressed plants often have higher spider mite populations. High moisture slows mite dispersal.

Spider mites are usually on undersides of leaves, but may be on/in flowers in heavy infestations.

Tarsonemid Mites (Broad Mite, Cyclamen Mite)

Order Acarina, Family Tarsonemidae

Feeding injury by these tiny mites causes leaf distortion, stunting, and sometimes flower bud abortion.

Both species have a very wide host plant range. Because these mites are so tiny, an infestation is usually recognized by the feeding injury symptoms.

Broad mites are about 0.2mm long and cyclamen mites about 0.3mm long. Both species are colorless to light brown. Broad mites are more active than cyclamen mites. Magnification is necessary to see them.

Female broad mites will lay 30 to 75 eggs and female cyclamen mites about 12 to 16. Developmental stages are egg, larva, resting, pupa and adult. The development time from egg to adult ranges from one to three weeks. These mites do best in warm and humid conditions.



Broad mite

Thrips

Order Thysanoptera, Family Thripidae



Adult western flower thrips

Immature western flower thrips

Gerbera flower damaged by western flower thrips

Thrips feed by rasping plant tissue and sucking fluids. Feeding injury distorts and discolors leaves and flowers. Feeding on pollen by some thrips species (e.g. western flower thrips) causes premature senescence. Several species transmit viruses, including tomato spotted wilt virus (TSWV) and impatiens necrotic spot virus (INSV). Western flower thrips prefer to feed in flowers, but will also feed on and injure leaves. The chilli thrips, a pest to the United States, feeds only on leaves. Different species of thrips can occur and cause problems on nearly all greenhouse plants. Thrips parvispinus, also known as pepper thrips or tobacco thrips is a new invasive pest to the US causing damage to young stems, leaves and flowers of several ornamental crops.

Thrips develop from egg to adult in 10 to 15 days (76° to 86°F, 25° to 30°C) to 57 days (54°F, 12°C). Hot and dry conditions are best for development. The developmental stages are egg, larva (two instars), pseudopupa (two instars in the soil), and adult. In general, any environmental stress that weakens plants makes them more thrips-susceptible (e.g. moisture stress, mildew). Wet conditions retard development.

Whiteflies

Order Hemiptera, Family Aleyrodidae



Whitefly adult

Bemisia whiteflies and eggs

Poinsettia leaf with large number of immature whitefly stages

Whiteflies are sucking insects as adults and nymphs. Their presence detracts from plants' value, and high numbers can reduce plant growth or vegetable yields.

Bemisia whiteflies can cause leaf spotting, white stem and bract deformation on poinsettia. Honeydew from whiteflies makes leaves and fruits sticky and is a substrate for black sooty mold. Whiteflies can transmit many plant viruses affecting vegetable and ornamental plants.

The developmental stages are egg, nymph (three instars), 'pupa' and adult. Greenhouse whiteflies develop from egg to adult in 21 to 26 days (81°F, 27°C) and silverleaf whiteflies in 16 days (86°F, 30°C) to 31 days (68°F, 20°C). All stages normally occur on undersides of leaves. Infestations are localized at first, spreading to all areas later.

White Grubs

Order Coleoptera, Family Scarabaeidae



White grub larva

Japanese beetle adult

White grubs are the larvae of several species of beetles. Some of the more important white grub pests in nurseries include the Japanese beetle, green June beetle, European chafer, Oriental beetle, Asiatic garden beetle and rose chafer.

Larvae are C-shaped and have only three pairs of legs. The larvae can be quite large, about 1–2 inches when fully developed. The larvae damage plants by feeding on plant roots. Some (e.g. Japanese beetle) are quarantine pests, requiring special treatment before plants can be shipped. The adults of some species feed during the day, others feed at night – usually on leaves and flowers.

White grub larvae develop in the soil. There usually is one generation per year, but some species (e.g. May–June beetles) have two year larval development cycles where adults emerge every three years. Adult emergence is in the spring and summer. After mating, eggs are deposited in/on the soil, and larvae move down into the soil to feed following egg hatch.

OHP QUICK REFERENCE

Insecticides / IGRs / Miticides Product Rate Guide

<i>Products</i>	<i>Rate per 100 gallons</i>	<i>Rate per 1 gallon</i>
Adept®	½ ounce (drench) or 2 ounces (spray)	See label for more information
Ancora®	14 to 28 ounces	4 to 8 grams
Azatin® 0	4 to 16 fluid ounces (118.8 to 475.0 mL)	¼ tsp to 1 tsp (1.2 to 4.8 mL)
Decathlon® 20 WP	1.3 to 1.9 ounces (36.9 to 53.9 g)	½ tsp to ¼ tsp (0.4 to 0.5 g)
Discus® L	25 to 50 fluid ounces (742.2 to 1484.4 mL)	1½ tsp to 3 tsp (7.4 to 14.8 mL)
Floramite® SC and SC/LS	4 to 8 fluid ounces (118.8 to 237.5 mL)	¼ tsp to ½ tsp (1.2 to 2.4 mL)
Fulcrum®	2 to 12 fluid ounces (59.4 to 356.3 mL)	⅛ tsp to ¾ tsp (0.6 to 3.6 mL)
Kopa™ Insecticidal Soap	1 to 2 gallons	1.3 to 2.6 fl oz (39 to 75 mL)
Marathon® 1% G	see label	⅛ to 1½ tsp per pot depending on size
Marathon® II	1.7 fluid ounces (50.5 mL)	⅒ tsp (0.5 mL)
Notavo®	2 to 8 fluid ounces (59.4 to 237.5 mL)	⅛ tsp to ½ tsp (0.6 to 2.4 mL)
Pedestal®	6 to 8 fluid ounces (178.1 to 237.5 mL)	⅜ tsp to ½ tsp (1.8 to 2.4 mL)
Pradia®	10 to 17.5 fluid ounces (300 to 518 mL)	0.1 to 0.175 fl oz (3 to 5 mL)
Pycana®	1 to 2 gallons	1.3 to 2.6 fl oz (39 to 75 mL)
Sarisa®	10.9 to 27 fluid ounces (322 to 800 mL)	0.1 to 0.27 fl oz (3 to 8 mL)
Shuttle® 0	6.4 to 12.8 fluid ounces (190 to 380 mL)	⅜ tsp to ¾ tsp (1.9 to 3.8 mL)
Sirocco®	3 to 6 fluid ounces (89.1 to 178.2 mL)	⅜ tsp to ¾ tsp (0.9 to 1.8 mL)
Triact® 70	0.5 gallon, 1 gallon, 2 gallons	3¾ tsp to 7½ tsp to 15 tsp (5 TBS)

Users should read the entire label for full information and application instructions.

TBS = tablespoon tsp = teaspoon mL = milliliter 1 fl oz = 29.6 mL 1 tsp = 5 mL 1 TBS = 15 mL g = gram

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INSECTICIDES / IGRs / MITICIDES CHART

Trade Name	Adept®	Ancora®	Azatin® 0	Decathlon®	Discus® L	Dimilin® 25W	Floramite®	Fulcrum®	Kopa™ Insecticidal Soap
Class	Benzoyl Urea IGR	Biopesticides: Fungal Agents	Biopesticide IGR	Pyrethroid	Pyrethroid + Neonicotinoid	Benzoyl Urea IGR	Carbazates	Pyridine IGR	Biopesticide - Soaps
MOA Group	15	UNF	UN	3	3 + 4A	15	20D	7C	UNM
OMRI Listed		✓	✓						✓

Pest

Aphids, Root Aphids		✓	✓	✓	✓				✓
Beetles, Leaf Feeding		✓	✓	✓	✓				
Borers, Flatheaded					✓				
Caterpillars	✓	✓	✓	✓	✓	✓			
Fungus Gnats	✓	✓	✓	✓	✓			✓	
Grubs		✓	✓		✓				
Mealybugs, Root Mealybugs		✓	✓	✓	✓				✓
Lace Bugs				✓	✓				
Leafhoppers		✓	✓	✓	✓				✓
Leafminers	✓*	✓	✓	✓	✓	✓		✓	
Mites, Eriophyid									
Mites, Spider		✓					✓		✓
Mites, Tarsonemid									✓
Psyllid		✓	✓	✓	✓				
Shore Flies	✓			✓				✓	
Scales, Hard (armored)		✓	✓	✓	✓			✓	✓
Scales, Soft		✓	✓	✓	✓			✓	✓
Thrips		✓	✓	✓	✓				
Weevils		✓	✓		✓	✓			
Whiteflies	✓	✓	✓	✓	✓			✓	✓

*Lepidoptera leafminers

**Suppression

+ Immature

Read label directions and cautions before use.

Marathon®	Notavo®	Pedestal®	Pradia®	Pycana®	Sarisa®	Shuttle® 0	Sirocco®	Triact® 70	Trade Name
Neonicotinoid	Tetrazines	Benzoyl Urea IGR	Anthranillic diamide + Pyridine carboxamides	Botanical Insecticide	Anthranillic diamide	Napthoquinone derivative	Glycosides + Carbazates	Oils	Class
4A	10A	15	28 + 29	3 + UNE	28	20B	6 + 20D	UNE	MOA Group
				✓				✓	OMRI Listed

Pest

✓			✓	✓	✓		✓**	✓	Aphids, Root Aphids
✓			✓		✓				Beetles, Leaf Feeding
✓			✓		✓				Borers, Flatheaded
		✓	✓		✓			✓	Caterpillars
✓									Fungus Gnats
✓			✓		✓				Grubs
✓			✓	✓	✓**			✓	Mealybugs, Root Mealybugs
✓			✓		✓				Lace Bugs
✓			✓	✓	✓			✓	Leafhoppers
✓		✓	✓		✓		✓		Leafminers
							✓		Mites, Eriophyid
	✓			✓		✓	✓	✓	Mites, Spider
				✓			✓	✓	Mites, Tarsonemid
✓			✓		✓				Psyllid
									Shore Flies
✓				✓				✓	Scales, Hard (armored)
✓			✓	✓	✓			✓	Scales, Soft
✓		✓	✓**		✓**		✓**		Thrips
✓			✓		✓				Weevils
✓		✓	✓	✓	✓		✓**	✓	Whiteflies

5151 McCrimmon Pkwy, Suite 275
 Morrisville NC 27560
 Technical Service: (800) 356-4647
 ohp.com



OHP, Inc.
5151 McCrimmon Pkwy.
Suite 275
Morrisville NC 27560
Technical Service: (800) 356-4647
ohp.com

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