

Mealybugs on Orchids

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Mealybugs are serious pests of orchids and next to scale insects are probably the most difficult to control pests of orchids in homes and greenhouses. Most definitely, they need to be dealt with immediately upon discovery. The damage done to plants by mealybugs is considerable, causing a loss of vigor and a weakening and loss of leaves, buds, and

flowers through their feeding. In addition, mealybugs create copious amounts of honeydew which make plant parts sticky, attracts ants, and provides a substrate for sooty mold. Though some mealybugs vector plant viruses apparently no orchid viruses are known to be transmitted by these insects. Mealybugs are not particular about their host and probably all species of orchids are susceptible to mealybugs, especially when cultivated.



Identification

Nearly 300 species of mealybugs are known from Canada and the United States. Fortunately, only a few species are common or serious pests of orchids.

Mealybugs are classified in the family Pseudococcidae, and are closely related to the scale insects. In fact, mealybugs can be thought of as a kind of soft scale that does not form the protective cover that most scales produce for protection. The pest

species are in the genera *Pseudococcus*, *Planococcus*, *Phenacoccus*, and *Dysmicoccus*. Immature to adult mealybugs may measure 0.5-8.0 mm in body length. All of the known orchid feeding species are coated with a waxy secretion that hides the body of these insects. The more common species of these odd insects that infest orchids are immediately recognized in the adult stage by the white, yellowish-white, whitish-grey, or pale pink to pale blue in color coating. The body is oval and the sides of the body have short waxy filaments and there may be 2-4 short to long filaments on the posterior end of the body. These filaments sometimes give the impression of numerous legs.

Mealybugs can be found on all plant parts, but especially roots, rhizomes, pseudobulbs, and the underside of leaves. They are adept at hiding on roots and rhizomes deep in the potting media, in crevices and under sheaths. Unlike scales, mealybugs wander in search of feeding places and will leave plants, be sure to check for them in cracks and in joints on benches, under lips of pots and trays, and other hiding places. The immatures are small, and white to yellowish or pale pink. Hatchling nymphs, or crawlers, are not easily seen without a magnifier and hide under cover, but older nymphs appear like diminutive adults.

Orchids become infested with mealybugs in some combination of three methods: purchase of an infested plant, movement from infested to un-infested plants that are in contact with each other, and windblown colonization. Mealybugs are active and will crawl from one plant to another, pot to pot, and across benches. Mealybugs will leave plants and hide under rims of pots and trays, in bench crevices, and even drop from overhead plants. Spread of crawlers can occur both indoors and outdoors by floating on breezes or air currents produced by circulating and heater fans. The occurrence of infestation hotspots may be due to crawlers settling on plants where the air currents are the weakest. Similar effects are found with aphids, scales, and spider mites. The identification of mealybugs is difficult and often requires the services of a taxonomic entomologist specializing on these insects. Because of this difficulty, accurate information on the identification and biology of species that may infest orchids is much poorer than one would hope. Undoubtedly, all the orchid infesting species were tropical or subtropical in origin, but the most problematic species have adapted to indoor life and may feed on hundreds of species of ornamental plants other than orchids.



According to identification records kept by the Systematic Entomology Laboratory, U.S. Dept. of Agriculture, 39 species of mealybug are reported from orchids. Fortunately, only a few species are problematic in Canada and the United States. However, it is very easy for any of these species to be transported unseen. Consequently, extreme caution and due care is urged to anyone transporting orchids between states or countries. In most of Canada and the United States, the longtailed mealybug (*Pseudococcus longispinus*) is probably the most common and problematic species on orchids, particularly in homes and greenhouses. This is also the most easily recognized species because of a pair of very

long filaments on the posterior of the body.

In California the longtailed is very common. However, five additional orchid feeding species are known: orchid mealybug (*Pseudococcus microcirculus*), imported mealybug (*Pseudococcus importatus*), obscure mealybug (*Pseudococcus obscurus*), pineapple mealybug (*Dysmicoccus brevipes*), and the solanum mealybug (*Phenacoccus solani*). Apparently, the orchid mealybug is the most problematic species in California, particularly in greenhouses.



In Hawaii the longtailed and pineapple mealybugs are common on orchids. In addition there is the dendrobium mealybug (*Pseudococcus dendrobiorum*), Jack Beardsley's mealybug (*Pseudococcus jackbeardsleyi*), and the grape mealybug (*Pseudococcus maritimus*).

Life Cycle

Mealybugs have a three-stage life history: egg, larva (nymph or crawler), and adult. Eggs are laid within a waxy coated egg sac produced by the female. The eggs hatch after about a 10 days into the mobile nymphs, the crawlers, that appear as diminutive adults. The crawlers are the most active stage that can move between plants and will develop through several growth periods before becoming adults. Adults of most species are also active. Thus, unlike scales where the crawler finds a suitable site for feeding and remains fixed, mealybugs will move about to find feeding sites. However, the most common pest species is the longtailed mealybug and it is parthenogenetic; no males are known of this species.

Male mealybugs do little feeding and only in their youngest crawler stages. Mature males are small (1.5-2.5 mm) winged creatures whose primary function is to mate, and then die. Females and immatures do not fly, but they will crawl off of the plant and migrate throughout a growing area.

In temperate regions, mealybugs usually have only one or two generations per season. In a warm greenhouse or indoors there may be upwards of 8 overlapping generations per year. Out-of-doors in cold climates, cold-tolerant species of mealybugs hide in protected places, such as under tree bark, among roots, and in compost.

Management

Outdoor mealybugs are vulnerable to a variety of parasitic and predatory insects, including wasps, brown and green lacewings, and lady beetles. Weather, especially heavy rains, also help to keep mealybug populations low. Indoors, mealybug management is difficult because of their propensity to move into the potting medium and feed on roots, or for the crawlers to work their way into tight places. Repeated application of any treatment is required to kill the immatures, and treatments are at their

greatest effectiveness against the small crawlers. Hand removal is effective only for the obvious adults and larger nymphs. All control efforts must begin immediately following discovery. Even light infestations restricted to one or a few plants can explode rapidly and necessitate chemical methods. When possible, immediately isolate infested plants from others to prevent the mealybugs from moving amongst them. Also, check the lips and cracks of pots, trays, and benches because females will wander and leave the plant to hiding places. If plants other than orchids grown, check those also as they may be a source of infestation.



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Because the life cycle of mealybugs can be so short combined with the overlapping of generations, you will need to do a treatment every 10-14 days in order to bring a serious problem under control. Because mealybugs are such a problem there are few effective "home remedies" available. To deal with an established infestation, the use of an insecticide will likely be necessary. Be aware that non-insecticidal treatments are often not very effective for elimination of mealybugs without diligent application and follow-up treatments.

Rubbing Alcohol

Probably the most popular home remedy against mealybugs is to swab and daub plants with a cotton-tipped swab or ball of cotton dipped in isopropyl (rubbing) alcohol. Do not use other alcohols, such as ethanol or methanol, that can penetrate the plant tissues and cause considerable damage! The common 70% isopropyl available in stores is satisfactory. On hard-leaved plants, gentle rubbing with the fingers, a cotton ball, cotton-tipped swab, or a soft infants toothbrush is effective. Remove all mealybugs, large and small. Afterwards, you will still need to repeat the alcohol treatment to remove the tiny yellowish spots which are the recently hatched crawlers. Pay particular attention to the folds, crotches, branch bases, midrib areas, and roots. Spraying the alcohol with a misting bottle or small pump sprayer is effective, but dribbling alcohol into tight areas is necessary. To avoid get a spray solution on window-sills, table tops, furniture, non-target plants, etc., move the plant(s) to a large sink, bathtub, or shower stall, then move them back to the growing area when they dry.

Many home growers will mix with alcohol a small amount of mild liquid dish detergent, and sometimes mineral oil, neem oil, or horticultural oil. Vegetable oils will work, too, but in sunlight they can turn rancid quickly, and become smelly and lose effectiveness.

One recipe for a 1.5 liter spray bottle is to mix a 50:50 solution of isopropyl and water, with a few drops to about a teaspoon of liquid soap to act as a spreader, and a teaspoon of one of the oils. But, it seems that every grower has their own proportions of these ingredients, none of which seem to work significantly better than another. Caution is urged, however, as excessive amounts or too strong of a detergent, or use of an ammonia-based chemical cleaner may damage your plants, particularly buds and flowers. This is

true of dish-soaps and household detergents that could remove natural protective waxes from plant tissues. Also, spraying of alcohol is not always effective against eggs which are often well hidden, hence the need for thoroughness and repetition.

Repotting

Even a light to moderate infestation of mealybugs should be of concern. These insects like to move into the potting media and feed on roots, or move off of the plant to find hiding places to lay eggs. Unless the roots are checked and the media changed, removal of mealybugs from only the upper plant portions is not a guarantee of success. The potting medium can harbor eggs and crawlers, so dispose of it in a compost pile or in the garbage. When repotting, a close inspection, and if necessary a very gentle cleaning and spraying of the roots before repotting is essential.

Oils and Soaps

Horticultural oil, neem oil, mineral oil, and insecticidal soaps are effective for mealybug suppression. The oils and soaps are often regarded as "organic" or non-chemical methods, but this is a misconception or an extremely broad and nearly meaningless concept of "organic." Indeed, neem oil is extracted from the neem tree, but horticultural oils and mineral oil are petroleum distillates. Likewise, insecticidal soaps are a solution of synthetic pyrethroids mixed with a mild detergent that is made from petroleum products. However, all of these solutions are generally considered safer for humans, pets, and plants than usual insecticides. None provide absolute control over mealybugs, but frequent use during the presence of crawlers can serve to reduce their populations dramatically.

Horticultural, mineral, or neem oil solutions smother the insects, so complete coverage of all sprayed plants is essential. These oils are mixed with water and usually a plant-safe detergent for enhancing the spreading and sticking of the oil. The main caution with these oil solutions is that they should never be applied to plants on hot days (>85° F) or in direct sunlight, as to prevent burning of tissues. Leave the plant in shade until the application has dried. Unpublished anecdotes suggest that the flowers of some orchids are sensitive to neem oil, such as species of *Miltonia* and *Masdevallia*.

Insecticidal soaps are usually solutions of a synthetic pyrethrin and a plant-safe detergent. As with oils the detergent acts as a surfactant and spreader for dispersing the pyrethrin evenly, and as a mild caustic against the insects. Also, to prevent sunburning apply the chemical and allow it to dry in shade. Pyrethrins are synthetic analogs of

pyrethrum, the natural extract from certain Asteraceae. Caution should be urged with so-called "safe" insecticidal soaps as some plants are sensitive, particularly tender new tissues. Some non-orchid ornamentals will drop leaves and abort flowers when sprayed with insecticidal soaps, so caution is urged with prized orchids.



Long-tailed mealybugs
on floral clip

Photo by P. Johnson 2008

Insecticides

Persistent populations of mealybugs or infestation in many plants may demand the need for use of synthetic insecticides.

There are several common, inexpensive, home-and-garden use pesticides labeled for ornamental plants. Insecticide formulations not labeled for ornamental plants are often mixed with solvents that

aid in the application of the active ingredient for specific purposes. These solvents, not necessarily the insecticide itself, often produce phytotoxicity and may seriously damage or kill plants. Thus, never use any insecticide that is not specifically labeled for ornamental plants. Some of the more available and effective insecticides that come in various brand names are acephate (e.g., orthene), malathion, carbaryl, and diazinon. Pyrethrins and rotenone have limited effectiveness. Of course, always follow label directions and never exceed the minimum recommended concentration given in mixing directions! Recommended solutions are based on extensive testing for selected pests and plants. Orchids are tough plants, but are sensitive to many chemicals, particularly under direct sunlight or high heat, and while certain species may not react to a given formulation others may, so testing is justifiable.

Some insecticides are occasionally discontinued for use because of some discovered hazard. For example, Cygon used to be available, but it no longer recommended and labeled for orchids because it will damage many plants, especially the buds and flowers, and is extremely hazardous to use. Although most insecticides with discontinued labels are legally allowed to be "used up", it may be best to dispose of such chemicals rather than continue their use and risk damage or loss of plants, or increase your own health hazard.

Most home orchid keepers and growers in northern states that need to apply insecticides during inclement weather need special care for applications. If you cannot spray out of doors, place your plant(s) inside a large plastic bag (remove the bag after the spray has settled!) and let the plant ventilate where the fumes will not be wafted around the house or work area. Again, you may have to consider removing the potting medium, spraying the plant, and repotting it with new media in a clean pot when the spray has dried.

Growth Regulators and Chitin Inhibitors

These classes of insecticides have great potential for use in orchid pest management. Growth regulators are relatively expensive, but the cost per application is less than botanical oils.

Kinoprene (tradename = Enstar II) is a synthetic form of juvenile hormone which is highly important in insects at critical stages of their metamorphosis. The use of kinoprene interrupts the normal development of the insects, including mealybugs, scales, aphids, and whiteflies. This insect hormone appears safe for humans and pets under usual use precautions. Experience on its use in greenhouses and home collections suggest that this may be the best new generation pesticide for controlling many orchid pests, including mealybugs.

Bifenthrin and other growth regulators are also available for use on ornamentals, but little information is available for orchids. Some of these new chemicals are very effective but are also highly regulated and may not be available in some states for non-commercial uses.

Azadirachtin (tradenames = Azatin and Neemazad) is a plant derived chemical that is a chitin inhibitor. Chitin is a primary compound used by insects when developing their integument, or exoskeleton. Azadirachtin reduces the insects' ability to properly develop its integument and causes mortality through incomplete development. There is little information available on this chemical for use on orchids, but it is available on a wide variety of ornamentals, is labeled for greenhouse applications, but may be too expensive for most home greenhouse uses.

Biological Control

There are many parasitic wasps and various predatory insects that feed on mealybugs outdoors, but these species are rarely of value in a small greenhouse or in the home. Usually for the small collection orchid keeper the use of biological control agents in general is very limited or not effective. However, the keeper of many plants in a large greenhouse or a commercial grower may wish to consider the use of one or more parasitic or predatory insects to help keep mealybugs under control. As in all biological control efforts eradication is not possible. Also, anyone wishing to use



biological control agents needs to balance their use with proper timing or avoid the use of insecticides so as not to kill the beneficial insects.

Biological control agents that are available commercially include a variety of tiny parasitic wasps, brown lacewings, green lacewings, and lady beetles.

Montrouzier's lady beetle, or mealybug destroyer, *Cryptolaemus montrouzieri*, is highly effective for control of mealybugs in greenhouses.

Final Considerations

Heavy infestations of mealybugs, especially on many plants, may require severe control methods using insecticides. On the extreme side if you have a plant showing signs of decline from infestation you may have to seriously consider destroying that plant, as the low likelihood of rejuvenating that plant may not justify the expense and effort of continued treatments. Too, destruction of a sick plant can be used to justify the purchase of a new and healthier plant!

If you are battling mealybugs for long periods of time (e.g., >9 months) and have been using the same insecticidal control method then you probably developed a resistant population. The best resolution to this is to change methods and chemicals occasionally; that is, do not use the same chemical mix more than 3-4 times sequentially. After isolating infested plants give them a thorough application of something different from what you have been using. For example, if you used insecticide then switch to an oil, soap, or different insecticide. Resistance is not generally a problem with growth regulators, such as kinoprene.

Generally, never use an insecticide not labeled for ornamental plants.

Whenever using oils, soaps, and insecticides, be thorough, change formulations frequently, and do not use less than the minimum concentration of mixture, or more than normally recommended. Too little of a chemical enhances resistance, while too high of a concentration may damage the plant. Unless you are a commercial grower rotating mixtures of chemicals do not use chemicals prophylactically, that is do not routinely use chemicals as a preventative as it is a waste of chemical (and money!) and such use allows resistant mealybugs to develop. Finally, keep up the manual removal of all mealybugs, if possible.

Mealybugs are an excellent example of pests that are easily transported and create tremendous problems. Although most orchid keepers in North America obtain their plants from conscientious growers in either Canada or the U.S., many persons do purchase plants while traveling, in exchange from friends, or from questionable sources. Everyone needs to be aware of the great potential of inadvertently dispersing species to new areas, particularly from international

originations. There cannot be enough stress placed on the recommendation that all plants come from a reputable and quality grower, and are clean of pests.
