

Pomegranate Pest Management in the San Joaquin Valley

Authors and contributors: Devin Carroll, Bernard Puget, Brad Higbee, Matt Quist, Octavio Magallenes, Norman Smith, Andrea Gjerde, and Ken Schneider. 2006.

Pomegranates have not received much attention from researchers in California. They are not yet included on the UCIPM website or by a UC Pest Management manual. James LaRue, a Tulare County Farm Advisor, authored a pomegranate fact sheet in 1980, but it does not cover all of the pests.³

The present document is a collaboration of several pest management professionals to provide a basic overview of the pests of pomegranates and some advice on their management.

Because of the minor crop status of pomegranates, pest control is hampered by a short list of registered chemicals. Lannate is about the only conventional insecticide available. Recently Admire has been registered for whiteflies. Some chemicals with reduced-risk or tolerance-exempt status have labels allowing use on any crop, making them legal on pomegranates. Some examples are most B. t. sprays, soaps such as M-Pede and Green Valley Plant Wash, pyrethrin (PyGanic, Evergreen), and specialty plant oils such as Ecotrol or CedarGard. OLR pheromone disruption is also registered.

Aphids

Aphids are among the most serious and widespread pests in pomegranate orchards, but they are often sufficiently controlled by natural enemies. Two species are damaging.



Cotton aphids, syrphid maggots, and grey field ants. *photo by Devin Carroll*

The cotton aphid, *Aphis gossypii*, builds up on rapidly growing shoots in the spring, and often returns in the late summer or fall. It probably overwinters on pomegranate and nearby weeds. Damage is usually not major even if spring populations are high, although heavy populations might stunt young trees. Dense colonies can even occur on young fruit without causing any visible damage.

Later in the season, as fruit approaches ripening in August, aphid honeydew that collects between touching fruit may result in rotten spots on the skin. This is the most serious damage aphids can cause.

Biological control is effective. In most years, parasites (Aphidiidae) and lady beetles (Coccinellidae) quickly control spring populations. Biological

control is typically slower in summer and fall, but even then, most of the aphids will eventually be parasitized. In Kern County, observers report more parasites in the spring, with more lady beetles and lacewings (Chrysopidae) mid- to late season. Flies (Syrphidae, Cecidomyiidae), and other predators also contribute to control.



Aphidiid parasite mummies.
photo by Devin Carroll

Observations near Mendota in 2006, an unusually heavy year, suggested that pomegranates can tolerate at least three weeks of extreme spring populations (May, during bloom time) without noticeable damage to the fruit or to the vigor of the trees. This was during the period of red flower buds to young fruit, and at their peak the aphids covered the buds so thickly that the buds were hard to find. Lady beetles cleaned up most areas of the orchard. Honeydew and sooty mold were not a problem (one rainstorm helped clean up).

In a few areas, probably those with weak trees, lady beetle predation was not enough, and heavy populations persisted for up to four more weeks. At the fifth week of the infestation (June 5), the trees appeared to be suffering. A week later some flowers were falling, although some of this is normal. Lannate was applied to the worst areas, and parasites eventually cleaned up the others.

The second aphid, which we have not identified, we will refer to unofficially as the “pomegranate aphid”. This small aphid is pale-green with short, pale cornicles. (Cotton aphid has black cornicles) It infests leaves of all ages, congregating around the veins on the leaf tops. It may persist all season because biological control is not effective. Parasitism is rare, and lady beetles do not congregate. The accumulating honeydew provides a substrate for black sooty mold, which can become quite serious. “Pomegranate” aphids can also contribute to the rotten spots caused by honeydew accumulating between fruit (see above).



“Pomegranate aphid”. *Photo by Devin Carroll*

Sometimes large numbers of “pomegranate” aphids die from what appears to be a fungal disease. This suggests that experiments with *Beauveria* might be warranted.

Lannate is effective against both species of aphids. But Lannate can lead to disruptions in biological control of other pests, such as mealybugs and soft scale. Admire in the drip irrigation would probably also work.



Lady beetle larvae. *photo by Devin Carroll*

Moderately effective control can be achieved with pyrethrum, Ecotrol, soap, other tolerance-exempt products, or some combination of these. Two or more applications may be necessary. More work needs to be done to find the most effective alternative to Lannate. One hopeful product in testing is an aphid alarm pheromone.



Small spot of rot on rind, caused by cotton aphids late in season.
photo by Devin Carroll

Mealybug

Grape mealybug, *Pseudococcus maritimus*, is common on pomegranates. Comstock mealybug, *Pseudococcus comstocki*, has also been observed.³ Damage occurs when the mealybugs settle where two fruit touch, or inside the flower end of the fruit. Rot can occur where the mealybugs deposit honeydew between fruit. (See photograph of similar rind rot in aphid section.)

Grape mealybug has two generations, as in grapes, but the stages occur a week or two earlier than in grapes. Most of the mealybugs overwinter as egg masses. They hatch and the crawlers move out to the young shoots soon after budbreak in March. The crawlers can be found nestled

between the leaf petioles and the shoots. This may be the window when the largest proportion of the population is exposed to chemical treatment. Unfortunately, the weather is usually too cool for Lannate to be effective. More experiments need to be made with alternative sprays, and new products such as Applaud need to be registered.

After several weeks, the growing nymphs return to under the bark, where they mature and deposit egg masses around May. The new crawlers spread out after hatching in June and July. Many can be found on sucker growth at the base of trees. They seem to favor leaves covered with small spider webs made by *Dictyna* sp. Lannate is effective, but a single spray will only control the part of the population moving between the bark and the fruit, which is never more than half. The mealybugs hidden between fruit or inside the flower end are protected from the spray. Materials with better residual action are not registered in pomegranates.

Mealybug biocontrol consists mainly of two kinds of parasites. The Encyrtidae parasites that help control mealybugs in grapes are also effective in pomegranates. Another larger Encyrtidae, not typically found in grapes, also is important in pomegranates. The predaceous midge that is very effective in grapes has not been observed in pomegranates. Lady beetles with larvae similar in appearance to *Cryptolaemus* have been observed, but some of them are other species that prey on aphids.



Small Encyrtidae make mummies with multiple exit holes. photo by Devin Carroll



Grape mealybugs. photo by Devin Carroll

The smaller Encyrtidae parasites may first appear under the bark in the first mealybug generation. There are probably five parasite generations for each mealybug generation, as in grapes. The last parasite generation occurs in mealybugs which have already deposited half of an egg mass.

The second Encyrtidae generation begins by parasitizing crawlers under the bark and on the leaves, including those protected by the *Dictyna* spider webs.

The larger parasite typically attacks large mealybugs under the bark, so it appears late in each generation.

Biological control is effective unless disrupted by Lannate or by ants. Unfortunately, the ants can be very heavy, and we have no effective methods of ant control. The main culprits are the grey field ant, *Formica aerata*, and the Argentine ant, *Iridomyrmex humilis*.

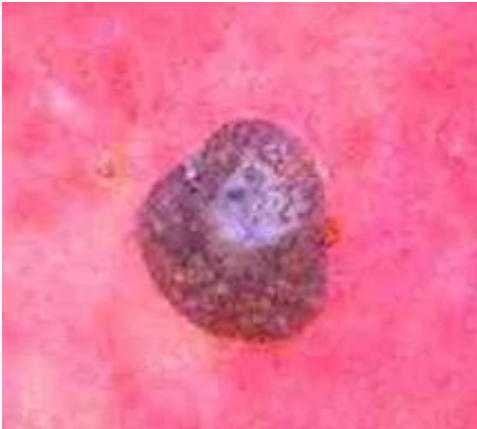


The large Encyrtidae parasite has bulky antennae. *photo by Devin Carroll*



Only one large Encyrtidae develops in a mature mealybug mummy, shown here with mealybug egg masses. *photo by Devin Carroll*

Soft scales



Soft brown scale?
photo by Devin Carroll

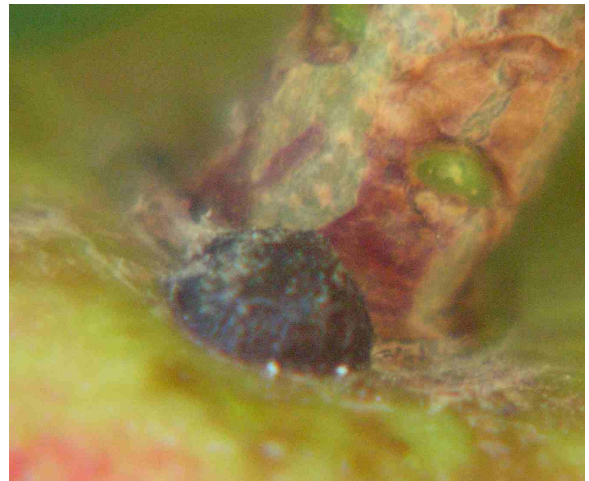
Citricola scale, *Coccus pseudomagnoliarum*, and black scale, *Saissetia oleae*, both occur on pomegranate.^{1,3}

The common soft scale causing problems near Mendota may be citricola, but the phenology and appearance are more like soft brown scale, *Coccus hesperidum*. There are at least two generations, with overlapping stages.

Soft scales produce honeydew which may lead to some sooty mold that is easily washed off. The more important damage is the green spot left when the scale is removed, where the protection from sunlight has prevented coloring. If there are many green spots, the fruit is down-graded.

“Soft brown” scale overwinters as partially grown nymphs under bark. The first generation is usually difficult to find as it moves to twigs, probably leaves, and eventually the young fruit. During the second generation, in June, the population begins to build up on the fruit. If populations are heavy, many nymphs will also be found on leaves. Lannate is effective, and probably some of the soft chemicals would also work. The best timing is when young nymphs are found on leaves in June.

Parasites provide effective control of the soft scale in the absence of interference by disruptive chemicals or ants. The parasites presumably belong to one or more species of *Metaphycus* or related genera.



Black scale? photo by Devin Carroll

Whitefly

Both the greenhouse whitefly, *Trialeurodes vaporariorum*, and the ash whitefly, *Siphoninus phillyreae*, occur on pomegranates in California. They sometimes reach nuisance levels, depositing some honeydew on leaves and fruit. The ash whitefly is most often the pest in California. *Encarsia inaron* parasites usually provide good biological control.

If orchards border cotton, such as in Kern County, the ash whitefly may migrate into pomegranates in July and August in such large numbers that severe damage may result from honeydew and sooty mold. Cotton defoliation may lead to especially heavy migration.

Whiteflies can be controlled with Admire applied through drip, with Lannate, or with soft chemicals.

Omnivorous leafroller (OLR)

OLR, *Platynota stultana*, is a pest of many crops in the San Joaquin Valley. On pomegranates, the caterpillars typically carve surface grooves where two fruit touch, or where the caterpillar has tied a leaf to the fruit surface. Often, the caterpillar will tunnel into the fruit. If skin penetration has occurred, even small openings, pathogens become established internally and grow on the arils with no visual, external symptoms. If the fruit is not culled before juicing, the product may be ruined. Usually, even if no control measures are taken, the damage will not be overwhelming, but in some locations damage may reach 20% or more. Even a 1-2% loss is worth taking control measures.

OLR can be monitored using pheromone traps. The biofix is the first consistent moth catch, usually in the second half of February. The second flight begins about 1200 degree days (min 48 max 87) after the first, in late June. At this time, larvae begin appearing on shoot tips.³

The first flight oviposits on weed hosts near the orchard, so weed control in the early season will minimize the second flight that may attack the pomegranates. This behavior may also be manipulated by using a trap crop system to target the first flight.

Control measures should be aimed at the second OLR flight. Two options are available. OLR pheromone disruption can be applied in late June just before the flight begins. Pheromone brands include Checkmate OLR and Isomate OmLR, which are OMRI approved, and Checkmate OLR flowable and NoMate OLR spiral, which are not.

The second option is a B. t. spray such as Dipel or Deliver. These should be applied at least twice, 700-900 degrees after the second flight begins, and 7-10 days later.

The third generation causes most of the damage, in late summer. If moth catches or fruit inspection indicate a continuing problem, more B. t. sprays can be aimed at the third moth flight.

Navel orangeworm & carob moth

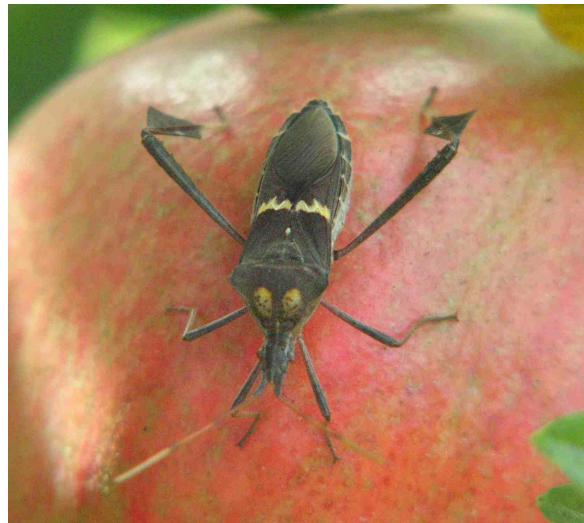
Navel orangeworms, *Amyelois transitella*, can occasionally be found tunneling into pomegranates. Usually they enter through wounds or in rotten spots. Treatment is not worthwhile.

Carob moth, *Ectomyelois ceratoniae*, has also been collected on pomegranates. It looks almost identical to NOW and causes similar damage.

Leaf-footed plant bugs

Leaf-footed plant bug (*Leptoglossus clypealis* and perhaps *L. occidentalis*), was identified as a pest of pomegranates by Quayle.⁴

Leaf-footed plant bugs can build up to very large populations in pomegranate



Leptoglossus clypealis. photo by Devin Carroll



Adult, large and small nymphs.
photo by Matt Quist



Aril damage – photo by Matt Quist

sunflower, bean, bell pepper, okra, cucurbits, sorghum, blueberry, Chinese tallow, juniper, arbor vitae and “to a lesser extent” rye, barley, wheat, and soybean.

Low populations of leaf-footed populations may not cause much damage, but they should not be allowed to build up. Lannate is the best available treatment.

Organic growers might try pyrethrin or Ecotrol on young stages.

Removal of all fruit from the trees, including split fruit, might reduce the overwintering population.

orchards, and can be found in “herds” with more than 100 nymphs on a single piece of fruit. They feed through piercing/sucking mouthparts that penetrate the thick skin of the pomegranate fruit to the arils, where feeding causes withering of stung arils. They especially like fruit already split. They can be found in pomegranates all year, but damage has not been observed until late in the season.

Occasionally diseases are introduced into regions of the fruit that have been fed upon, but it is not certain whether the insect vectors the pathogen directly, or fungal spores in the environment are able to enter through damaged feeding sites.

Feeding damage is not easy to see on the outside of the fruit. But high populations of feeding insects leads to thick layers of insect scat on fruit surfaces, which aggravates disease pressures.

Leaf-footed plant bugs have many hosts besides pomegranates.^{2,5} Heavy immigration may come from pistachios, almonds, pecans, or urban yards. Other known food plants include oranges, limes, guava, avocado, peach, plum, loquat, pear, apple, persimmon, melons, cotton, sorghum, corn, tomato, potato, cucurbits, eggplant,



Resulting soft rot. photo by Matt Quist

False Chinch Bug

False chinch bug, *Nysius raphanus*, is a threat to young pomegranate trees. Dense masses of nymphs can kill infested shoots in less than a day. Adults are less damaging, even when swarming.

These bugs build up on many weed species, especially London rocket. When their food source is mowed or dries up, the nymphs march over the ground in extended swarms. They are not likely to climb trees above the first 1-2 feet. Sucker grow at the base of trees may be attacked.

To prevent attacks, weeds should be kept controlled in the first 1-2 years after planting pomegranates. If weeds are present, monitor for developing infestations. If necessary, treat the weeds, ground and infested trees with Lannate. Organic growers can try pyrethrin or Ecotrol.



Photo by Jack Kelly Clark - UCIPM website

Cherry leafhopper

The cherry leafhopper, *Fieberiella florii*, has been observed as a perennial minor pest in a pomegranate orchard in the foothills near Dinuba. This orchard is adjacent to a Cherry orchard.

Nymphs were observed developing in April, with adults appearing by the end of April. The larger nymphs and adults deposit white frass that resembles salt granules, which easily wash off. Most of the deposition occurs from April to June.

After the introduction of Admire to control whitefly, the leafhopper was no longer a problem.

Thrips

Citrus thrips and greenhouse thrips both occur on pomegranate, but have not been observed causing serious damage.¹

Alfalfa weevil

The alfalfa weevil, *Hypera postica*, has been found hiding in the calyx of pomegranates during the summer. This is a potential quarantine problem, because some countries such as Japan forbid importing fruit carrying this pest.

Flat mite

Flat mite, *Brevipalpus lewisi*, causes leathering or “alligator skin” damage to pomegranate rinds, similar to their damage in citrus and pistachios.^{1,3} Occasionally, this damage can be quite serious. Flat mites are very tiny and difficult to monitor.

Similar damage by an unknown cause may be confused with flat mite damage.¹ Flat mite damage starts at the stem end, and the brown discoloration extends further than the cracking. The mites and their cast skins may be found in the cracks. The other blemish occurs anywhere on the fruit, and has no extra discoloration beyond the cracked area.

Flat mites overwinter under flakes of bark on large branches.³ They move to leaves and fruit in summer.

Many pomegranate farmers routinely use one to three applications of sulfur dust as a prophylactic against flat mite.^{1,3} Wettable sulfur also works. The applications start in late June, and may be repeated about once a month until August.



Flat mite damage. *photo by Matt Quist*



Not flat mite damage. *photo by Devin Carroll*

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