

A REVIEW OF PEST CONTROL IN AVOCADOS

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Introduction

The avocado orchards in California are under good biological pest control. Due to climatic conditions and good farm management, the avocado grower enjoys the best pest control of almost any crop grown in California, if not in the United States. It is a natural pest control where beneficial insects (predators and parasites) prey on harmful insects. The biological balance is maintained naturally, making unnecessary the use of insecticides to control the pests. This situation has existed since the industry began in the early 1920s.

In the past, where individuals used insecticides to reduce an infestation of a certain pest, the results were usually more devastating than if no chemical had been used. What happens when a chemical spray is applied is that all natural enemies of other pests, including the pest being controlled, are killed. This causes a reduction in the population of beneficial insects, which in turn permits the eventual buildup of harmful insects to do more damage to the trees and fruit since there is a greater number of harmful insects than beneficials. Beneficial insects take longer to become re-established than the harmful ones. Therefore, unless there is an extremely bad infestation of harmful insects, it is wise to take the damage and wait for the beneficials to begin attacking and destroying the bad insects.

Following is a list of alternatives regarding whether or not a spray should be applied: (The first choice is to not spray.)

1. Do not spray — permit the natural enemies to do their job.
2. If pest population is high enough to warrant a spray, spray on a spot basis, treating only the trees where the pest infestation is highest. This method permits the parasites and predators from the untreated trees to migrate and populate the treated area in quicker time than if the whole orchard had been sprayed.
3. Spray entire orchard with recommended and registered material only. Be prepared, however, to endure future buildup of harmful insect infestations that could do more harm than if no spray had been applied to the present pest attacking the tree.

Description of Insects

AVOCADO BROWN MITE

Avocado brown mite damage is first seen as light green or yellow areas on the upper

surface on the leaf along the midrib. This area later extends along the smaller veins, gradually spreading over the leaf as the mites increase in number. The areas of severe feeding later turn brown, and the leaf may drop. The tree is injured in proportion to the amount of green leaf area which is lost.

The avocado brown mite is brownish in color and about the size of the dot over the "i" on this page.

Key to Insects and Damage on Trees

| | | |
|--------|--|---|
| LEAVES | Holes Eaten in the Leaves | Omnivorous Looper Amorbia Moth Snails Grasshoppers June beetles |
| | Only Margins of Leaf Eaten | Fuller Rose Beetles |
| | Ends of Leaves and Shoots Eaten | Deer Rabbits |
| | Silvery Gray Areas on Leaf | Thrips |
| | Brown Areas | |
| | Along Midrib | Avocado Brown Mite |
| | Irregular Areas on Leaf | Thrips |
| | Greenish-Yellow Areas Along Midrib | Six Spotted Mite |
| | Small Gray Spots on Leaves | Latania Scale |
| FRUIT | Holes Chewed in Mature Fruit | Rats |
| | Silvery Gray Areas on Fruit | Thrips |
| | Scarred Fruit | Omnivorous Looper Amorbia Moth Thrips Snails |
| | Small Gray Spots on Fruit | Latania Scale |
| BARK | Bark Removed from Small Branches in Tree | Rats |
| | Bark Removed at Ground Level or Below | Field Mice Gophers |
| | Small Gray Spots on Limbs and Twigs | Latania Scale |
| | Small White Soft Insects on Any Part of Tree | Mealybug |
| ANTS | May be Found on Any Part of the Tree or on the Ground Near the Tree | Ants |

OMNIVOROUS LOOPER

The omnivorous looper eats holes in avocado leaves, sometimes skeletonizing them so that only the midrib and larger veins remain. It may also feed on the fruit and cause a scar which will reduce the marketing grade of the fruit. It is commonly found in groves and occasionally causes serious damage. This worm crawls with a looping motion and can usually be found near the damaged leaves. When not eating, it retreats into a protective covering formed by webbing leaves together. When disturbed it may drop suddenly, spinning a silken thread from which it hangs suspended. This worm varies considerably in color from a pale green to a pink or yellow with various markings. The length depends upon the stage of growth and when full grown it is 1½ to 2 inches long. The adult is a yellowish brown night-flying moth.

AMORBIA MOTH

The amorbia moth is another leaf-eating worm, which webs leaves together to form a

protective retreat. When disturbed, it wriggles and drops to the ground. This worm is yellowish green in color with a darker line on the back. When fully grown it is about one inch long. The amorbia is not usually numerous but it is important because it sometimes feeds on the small immature fruit. The damage is often done before you know the worm is there. The scars from feeding reduce the marketing grade of the fruit. The adult is a reddish brown night flying moth.

GREENHOUSE THRIPS

Greenhouse Thrips damage shows first as silvery gray areas on the upper surfaces of the leaves, and then on the fruit. These areas enlarge as the population of the thrips increases. Later in the season the silvery areas turn brown. The damaged skin on the fruit thickens and cracks. This corky blemish reduces the grade of the fruit, even though the flesh is not damaged. Characteristic black specks of thrips' excrement are found in the damaged areas.

Watch the leaves in June and July for thrips injury. Thrips like the shade, so look for damage on the north side and inside the tree. These insects start to increase in June and reach a peak in October.

Thrips are most abundant in coastal areas. Some avocado varieties are more likely to be injured than others, although all varieties may be severely damaged in years when thrips are plentiful.

LATANIA SCALE

Latania Scale occurs generally in avocado plantings but only as a light infestation. It is a light gray color, nearly round and about the size of the small letter "o" on this page. It is usually found incrusting on twigs although it also occurs on leaves and fruit. A heavy infestation will reduce the grade of the fruit. This scale is difficult to distinguish from several less important scale pests sometimes found on avocados.

SIX SPOTTED MITE

The six spotted mite is a pest of avocados in coastal areas. Damage can be seen as yellow areas along the midrib and larger veins of the leaves. It feeds on the underside of the leaf. Heavy infestations can cause a serious leaf drop. The mite is yellow to pale green in color and about the size of the period on this page.

MEALYBUGS

Mealybugs have a flattened body and when mature are about $\frac{1}{8}$ inch long. They are covered with a powdery wax and have a series of short wax threads extending from the sides. They usually remain in one place feeding on the new growth although they sometimes move about searching for food. They have been most harmful in coastal areas.

ANTS

Ants do not feed on avocado trees but are important because they drive away the natural enemies of insects which are pests on avocados. Any ant activity in an avocado grove is a danger sign. Eliminate the pests.

Other Pests

SNAILS

The presence of snails may be first noticed by the holes they eat in avocado leaves. A characteristic slime trail is left where they crawl. The loss of only a few leaves eaten from small trees or tip grafts is so damaging that control is desirable. Serious losses occur where snails feed on the fruit. The fruit is then permanently scarred, reducing the grade.

Snails are most active after a rain, or an irrigation by sprinkler. Baits applied at that time are most effective. Another application, perhaps ten days later, may be necessary as all the snails may not be active at one time.

RATS

Rats damage avocados by feeding on the fruit and bark,

FIELD MICE

Field mice at times eat the bark of avocado trees just at the ground level. They feed particularly on young trees and are frequently more damaging in groves located near brushland. The best plan is to remove the leaves and twigs which accumulate at the base of the tree trunk. The field mice prefer to have some cover for protection and are not likely to damage trees where the ground is clean a short distance from the tree trunk.

GOPHERS

Gophers damage avocado trees by eating the bark from the roots. Evidence of gopher activity is shown by the mounds which they make, usually several in a small area. Occasionally a gopher may take over a tunnel system abandoned by another and fill some of the old burrows with soil from the new tunnels which he digs. In this case there may be gopher damage with no surface mounds. Any tree showing sudden wilting, reduced vigor, or other signs of distress may have been injured by gophers.

To determine gopher damage, examine the large roots and trunk below the ground to see if the bark is eaten. Trees with bark removed completely around the trunk (girdled) die. Young trees are more likely to be damaged than older ones. If furrow irrigation is used on sloping ground, the gopher tunnels interfere with the proper distribution of water.

If gophers are in nearby vacant areas, eliminate the pests there before they move into the avocado plantings.

Pests of Young Avocado Trees

The control of pests on young trees is considered as a separate section because such trees have several additional pests which usually are not serious on large trees. Examine young trees frequently for pests, because a small infestation can do a considerable amount of damage in a short time.

FULLER ROSE BEETLES

The Fuller Rose Beetle attacks avocado trees, particularly those planted in old citrus

locations. It eats the leaves of the young growth, chewing irregular notches in from the margin.

This insect is about 3/8 inch long and grayish-brown in color. When not feeding it may remain motionless on the stem. It often drops to the ground when disturbed.

JUNE BEETLES

The June Beetle eats the leaves and buds of avocado trees, sometimes completely defoliating young trees. The beetles may be difficult to find as they feed at night and hide during the day just under the surface of the soil. The June beetle is 3/8 to 1/2 inch long and is protected by a hard reddish-brown covering over the wings and body. They are frequently more damaging when plantings are made near uncultivated areas and brushland. They first appear in the spring.

GRASSHOPPERS

Grasshoppers feed on the young avocado foliage, chewing irregular areas from the leaves.

DEER

Deer eat the leaves of avocado trees, sometimes completely defoliating small trees.

In some localities about the only way that little trees can be protected from deer is to construct a small cage of chicken wire around each tree. Caging with chicken wire will keep out both deer and rabbits. While expensive to build, an eight-foot high fence will protect orchards.

RABBITS

Rabbits eat leaves and shoots of avocado trees. Use protective measures such as chicken wire and cardboard wrappings.

Beneficial Insects [Parasites and Predators]

There are many beneficial insects that keep avocado pests under biological control. The best way a grower can assist nature in providing this biological balance is to: 1) do not spray with any chemical pesticide, 2) control ants, and 3) control dust. All three, chemicals, ants, and dust interfere with the predator and parasite activity.

Over forty species of mites and insects are predaceous on avocado infesting mites. General predators include green and brown lacewings, dusty wings, and certain ladybird beetles. The Stethorus beetle is considered one of the best mite-feeding predators. Predaceous mites are also very effective on plant-feeding mites.

Following is a list of the most common pests found on avocado trees in California and the most effective predator/parasite:

| PEST | PREDATOR |
|--------------------|--|
| Avocado Brown Mite | Stethorus Beetle (<i>Stethorus picipes</i> (Casey)) Predaceous Mites (<i>Typhlodromus finlandicus</i>) |
| Latania Scale | Twice-Stubbed Ladybird Beetle (<i>Chilocorus stigma</i> (Day)) |

| | |
|--------------------------|--|
| Greenhouse Thrips | Hymenopterous Egg Parasite (Megaphragma mymaripenne (Timberlake)) |
| Omnivorous Looper | Viruses and Fungi Habrobracon xanthonotus |
| Amorbia Moth Leaf Roller | Phorocera erecta (Coquillett) |

Chemical Control

According to the State Department of Food and Agriculture and San Diego County Department of Food and Agriculture, the following chemicals, with their specific use, are cleared for use as listed:

| CHEMICAL | PEST | USE |
|--|--|--|
| Malathion ULV Concentrate | Grasshoppers | Special Local Need San Diego & Riverside |
| Sevin 5 Bail | Grasshoppers | Special Local Need San Diego, Riverside, and San Bernardino on Non-bearing Avocados (Border Treatment on Bearing Avocados) |
| Thuricide HPC | Amorbia Moth, Orange Tortrix, Omnivorous Looper and Omnivorous leafroller | Special Local Need Statewide |
| Dipel (Bacillus thuringiensis) | Amorbia Moth, Orange Tortrix, Omnivorous leafroller, Omnivorous looper | Special Local Need Statewide |
| Best Snail & Slug Bait M. | Snails | Special Local Need Statewide |
| Mollus 2% bait | Snails | Special Local Need Statewide |
| Alco Slug 'M | Snails | Special Local Need Statewide |
| Ortho Slug-Geta Snail and Slug Bait | Snails | Special Local Need Statewide |
| Lannate L Methomyl Insecticide | Western Yellow-Stripe Armyworm & Beet Army- worm | Special Local Need Statewide Non-bearing avocados |
| Other Pests | | |
| CHEMICAL | PEST | USE |
| ? | Ants | |
| Diphacin | Rats and Mice | No Permit Required |
| Strychnine-coated Barley | Gophers | Permit Required for Large Amounts |

If a grower is to use any of the above materials he must first obtain a permit from the

County Department of Food and Agriculture. To be safe, whenever a chemical is to be used in an avocado orchard, check with the district inspector from the Department of Food and Agriculture. Following is the disclaimer issued regarding the use of a specific chemical that is registered to be used under the Special Local Need registration:

"A special permit must be obtained from the County Agricultural Commissioner prior to this use. This does not constitute a recommendation of the Department of Food and Agriculture and will not prevent quarantine action if illegal residues are found on or in the crop. Neither the Department nor the manufacturer or formulator makes any warranty of merchantability, fitness of purpose, or otherwise, expressed or implied, concerning the use of a pesticide in accordance with these provisions. The user and/or grower acknowledges the preceding disclaimer and accepts liability for any possible damage resulting from this use. Do not use in mixture with other pesticides unless provided for in the labeling. Trial on a small area to check out unanticipated problems is suggested."

Growers are urged to be especially cautious when using a chemical spray. Be sure what is being done is going to help the situation, not only presently, but in the future. Contemplate the long-term results. Ask the question — will what I use to eliminate one pest today result in the increase of other pests that could do more damage in the near future?

Avocado pests begin to appear in the summer months, and continue to increase as fall and early winter approaches. Now is the time to survey your orchard to determine the extent of a pest buildup. During the last three to four years the weather in Southern California during August and September has changed somewhat. A more humid weather pattern has developed as the area receives moist air from hurricane-prone Baja California. The extra moisture and accompanying heat are conducive to the buildup of pests. There has been a noticeable increase in the number of pests and the amount of damage during the last couple of years from Greenhouse Thrips, Avocado Brown Mite, Omnivorous Looper, and Amorbia Moth. Two years ago there was a serious outbreak of the various species of Armyworms.

What the future holds for the avocado industry in regard to pests is difficult to predict. With the large increase in acreage in the state, the apparent change in climate, and the constant moving of people and machinery within and without our state and country, anything can happen. There could be an increase in all kinds of harmful insects that would require some type of chemical control because the parasites/predators could not keep the pests under control.

The pest watchword in the future is: Be alert and watch the trees carefully for any unusual build up of pests.