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PERSEA MITE BIOLOGY AND CONTROL

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Persea Mite Identification

Persea mites, *Oligonychus perseae*, feed in colonies beneath protective webbing in nests that are formed along midribs and veins on the undersides of avocado leaves. Feeding damage produces characteristic circular yellow to dark brown necrotic spots. Persea mite populations typically begin building in mid-summer and cause most damage to leaves by late summer when defoliation of leaves with heavy feeding damage commences.

The closely related avocado brown mite, *Oligonychus punicae*, feeds on upper leaf surfaces and, feeding damage by avocado brown mite results in bronzing of upper leaf surfaces. Six-spotted mite, *Eotetranychus sexmaculatus*, is very similar in appearance to persea mite and it also feeds on undersides of leaves. Six-spotted mites prefer to feed adjacent to the midrib and large lateral veins. Feeding damage is different from that caused by persea mite in that six-spotted mites do not produce circular feeding colonies covered with dense webbing and necrotic spotting is purplish and irregular in appearance. All three pest mites damage leaves by removing chlorophyll during feeding.

Figure 1. Necrotic spots caused by persea mites feeding on the underside of an avocado leaf.

Monitoring Persea Mite Populations

It appears that the probability of leaf drop as a result of persea mite feeding increases greatly once 7.5-10% of the leaf surface is damaged. Generally, control measures may need to be implemented before this level of damage is observed.

Alternatively, an estimate of the number of mites infesting leaves and the percentage of leaves infested on trees can be made using a counting technique that records the number of motile mites infesting the half second vein. The average number of mites counted on 10 randomly selected leaves along this vein are multiplied by a correlation factor (= 12) to provide an estimate of the average number of mites per leaf (see Machlitt, 1998). (See Figure 4)

Some PCAs recommend spray treatments when sampling indicates there are 70-100 persea mites per leaf.

Population Cycles

High density persea mite populations typically undergo rapid crashes towards the end of summer. Three mechanisms have been proposed to account for this.

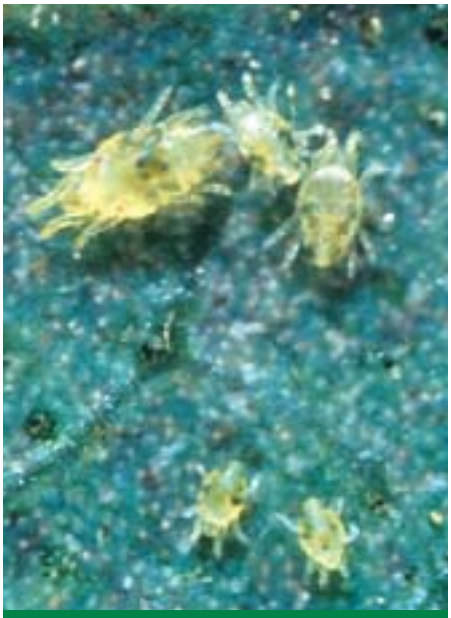

Figure 2. Adult and immature persea mites feeding on the underside of an avocado leaf.

(1) Natural enemies, in particular, the naturally occurring predatory mite, *Euseius hibisci*, build up over the summer and control persea mite late in the summer. (2) Heat waves (several consecutive days with temperatures exceeding 100°F accompanied with low humidity < 50%) cause mortality of immature and adult mites. (3) A lack of healthy undamaged leaves to be used as food or nest sites contribute to population declines. Field work suggests that natural enemies are probably not the major factor causing mite population crashes, rather heat waves and lack of food are major contributors to mite mortality. Long-term monitoring studies have shown that persea mite is not a persistent problem in orchards > 20 miles inland, probably because consistently high summer temperatures are unfavorable for mite population growth. Additionally, these studies have shown that persea mite ballooning

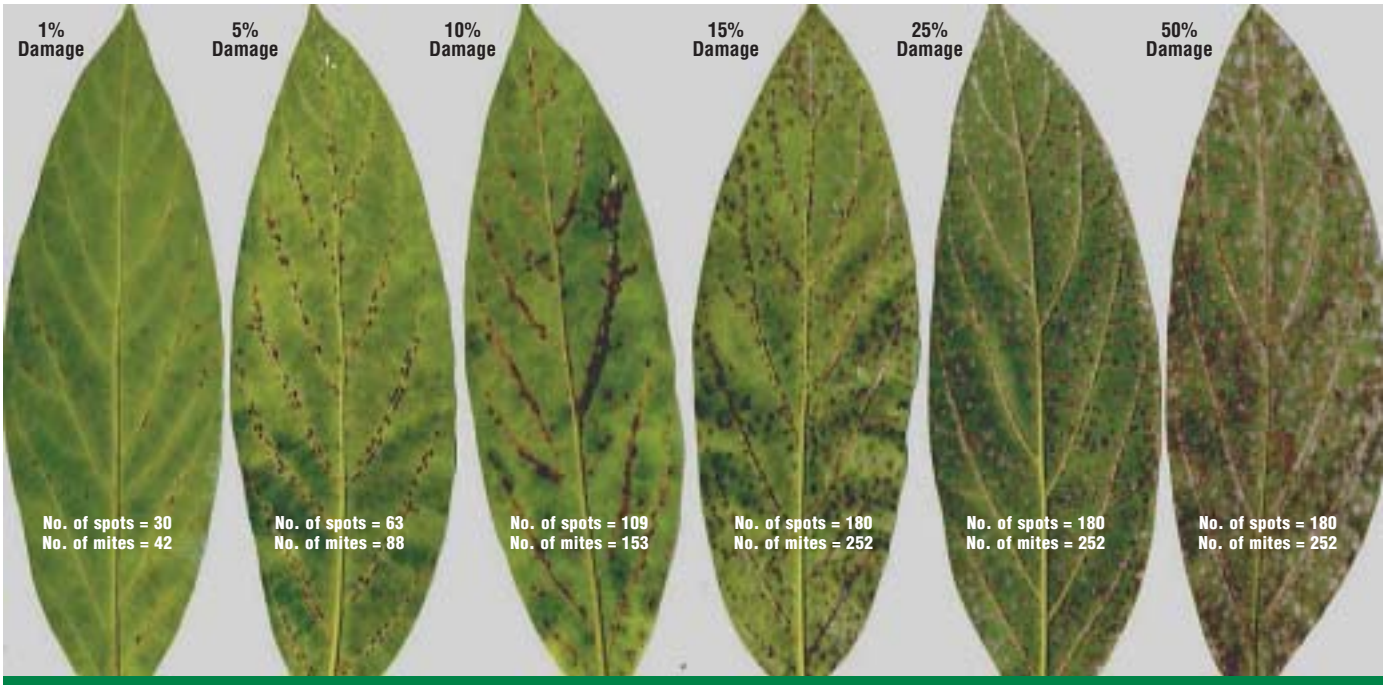

Figure 3. As persea mite feeding damage increases, the number of individual necrotic spots on leaves declines as nests begin to merge. Consequently, persea mite numbers decline as there is less food for them to survive on.

(i.e., aerial migration by mites using silk strands that act as sails or balloons) from avocados occurs as populations increase and are correlated with increasing competition (many mites on leaves) and a deteriorating food supply (numerous necrotic spots on leaves). It is probable that all three factors either alone or in some combination contribute to the rapid declines of high density persea mite populations at the end of summer.

Controlling Persea Mite on Avocados

Predatory Mites

Based on the results of field trials, the commercially available predatory mites with the most potential for controlling persea mite are *Galendromus helveolus* and *Neoseiulus californicus*. The use of *N. californicus* is recommended because this predator costs less than *G. helveolus* from commercial insectories and leaves suffer less persea mite feeding damage when *N. californicus* is used. *N. californicus* can be released manually into the grove. Experiments have shown that when manually releasing *N. californicus* by introducing small paper cups attached to branches on 15 foot avocado trees, a minimum of 2000 predators per tree is required to control persea mite (See Figure 7). Releasing fewer than 2000 *N. californicus* per tree by hand will not result in successful biological control of persea mite. Effective releases of 2000 *N. californicus* per tree can be achieved by either releasing 1000 *N. californicus* twice or 2000 *N. californicus* once. Releases should begin when 50% of sampled leaves have one or more motile

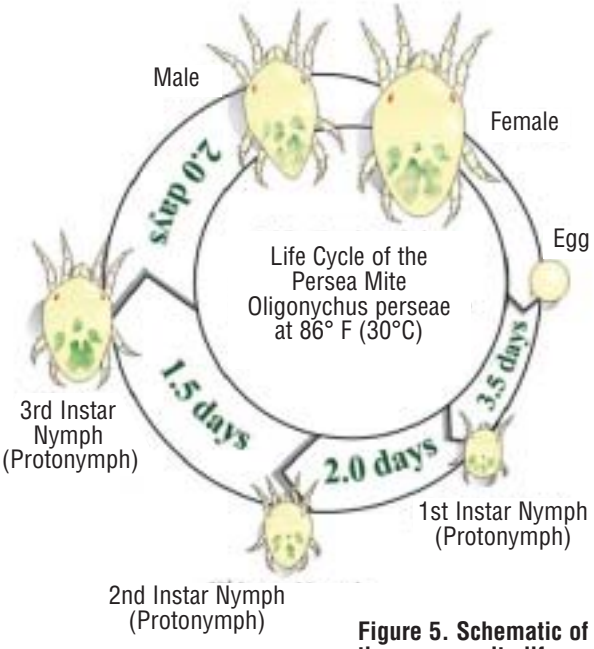

Figure 5. Schematic of the persea mite life cycle

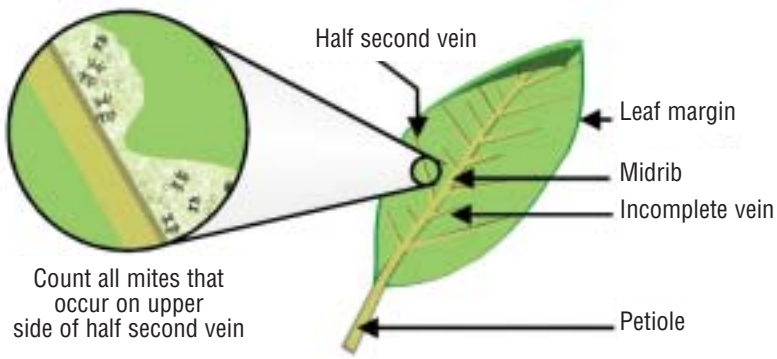

Figure 4. Estimating persea mite density (Machlitt, 1998)

persea mites (not eggs) per leaf. If releases are made too early (i.e., at 25% leaf infestation) there is not enough food for predators to establish. If releases are made too late (i.e., at 95% leaf infestation) persea mite numbers are too high for the predators to control and significant leaf damage will result. A second release of predators can be made when 75% of sampled leaves have more than one motile persea mite. To estimate the number of leaves infested with persea mite, choose 50 leaves at random from several trees and calculate the percentage infestation by multiplying the total number of leaves with one or more motile persea mites by two (e.g., 15 infested leaves out of 50 is 30% leaf infestation). *Neoseiulus californicus* does not appear to over-winter in large numbers in California avocado orchards and predator releases need to be made each year. Furthermore, field studies suggest that *N. californicus* will not disperse from central release points in orchards and this predator needs to be released onto each tree in the orchard if it is to be effective. At this time, it is believed that predator mite releases for persea mite control are *not* economically competitive with pesticides.

Figure 6. Persea mites in nest.

Some PCAs have reported good control of persea mite by making releases of *N. californicus* or *G. helveolus* at a rate of 5000 per acre. PCAs make predator mite releases by spritzing infested leaves with water. A small amount of corn grits with predators is then sprinkled onto the dampened leaf. The water traps the grits with predators. As the water dries the predators free themselves and commence searching for prey. Every tree in an infested block is treated in this manner. A list of suppliers of predatory mites in California is available at your local University of California Cooperative Extension office or at: http://www.cdpr.ca.gov/docs/ipminov/bensuppl.htm

Figure 7. Paper cup attached to branch with binder clip. Predator mites are released into cups from where they disperse into the canopy searching for persea mites.

Insecticides

Legal pesticide control options for persea mite are limited. Narrow range 415 petroleum oil can be used to control persea mite populations. In some instances application of NR 415 oil may lead to persea mite resurgence, that is, mite populations rebound to higher densities than those seen at the time of spraying. Resurgence occurs because generalist natural enemies (e.g., predatory thrips, flies, and mites) that were providing some suppression of persea mite have been eliminated from trees. Abamectin (Agri-Mek) mixed with NR 415 oil applied for avocado thrips control in late spring or early summer has been demonstrated in several field evaluations to have a strong and prolonged impact on persea mite populations.

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Figure 8. *Neoseiulus californicus.*

Figure 9. *Galendromus helveolus.*

Help With Treatment Decisions

Control decisions for persea mite should be based on population monitoring of the pest and its natural enemies. Consultation with a Pest Control Advisor (PCA) or UC Farm Advisor for recommendations specific to your situation is recommended.

Cultivar Susceptibility and Alternative Host Plants

Avocado cultivars vary in their susceptibility to persea mite feeding damage. By calculating the average percentage of leaf area damaged by mite feeding, cultivars can be ranked from least susceptible to most susceptible. When cultivars are ordered in this manner the following ranking is attained: Fuerte (average leaf area damaged by feeding persea mites is 13.3%) <Lamb Hass (16.9%) = Reed (16.9%) <Esther (29.7%) <Pinkerton (30.2%) <Gwen (37.4%) <Hass (38.4%). The mechanism by which Fuerte and Lamb Hass reduce feeding damage is unknown, but it could be related leaf chemistry or morphology which may reduce mite survivorship or reproduction rates, or both. In addition to avocados, persea mite can develop on a wide range of fruit, ornamental, and weed plants. This pest has been recorded feeding on leaves of Thompson and Flame seedless grapes (*Vitus* sp.), apricots, peaches, plums and nectarines (all *Prunus* spp.), persimmons (*Disopyrus* spp.), milkweed (*Asclepias fuscicularis*), sow thistle (*Sonchus* sp.), lamb's quarters (*Chenopodium album*), sumac (*Rhus* sp.), carob (*Ceratonia siliqua*), camphor (*Camphora officinalis*), roses (*Rosa* spp.), acacias (*Acacia* spp.), annatto (*Bixa orellana*), willows (*Salix* spp.), and bamboo (*Bambusa* spp.). Good sanitation practices (i.e., elimination of favored weed species) and removal of alternate host plants (i.e., ornamental plants and non-commercial fruit trees in orchards) that act as persea mite reservoirs are useful cultural control practices that should be employed in an integrated persea mite management program.

For Further Information on the Persea Mite:

Faber, B.A., Wee, Y.L., Phillips, P.A. and Rakha, M. 2000. Effect of predaceous mite release timing on persea mite (Acari: Tetranychidae) populations in avocado orchards. California Avocado Society Yearbook 84: 111-125.

Faber, B.A, Yee, W.L., and Phillips, P.A. 2000. Effect of abamectin treatment for avocado thrips on populations of persea and avocado bud mite and their associated damage to leaves and fruit. California Avocado Society Yearbook 84: 95-109.

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Machlitt, D. (1998). Persea mite on avocados – a quick field counting method. Subtropical Fruit News 6:1-4.

Morse, J.G., Hoddle, M.S., and Urena, A.A. 2000. Persea mite pesticide efficacy trial. California Avocado Society Yearbook 84: 127-137.

More information can be found at: www.biocontrol.ucr.edu

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