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PESTS OF AVOCADO IN FLORIDA

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SUMMARY

The current pest situation on Florida avocado is reviewed. Status of research for pests such as, the Caribbean fruit fly, *Anastrepha suspensa,* the loopers. *Epimeces detexta* (Walker), *E. matronaria* (Guenée), *Anacamptodes defectaria* (Guenée) and *Oxydia vesulia transponens* (Walker), the avocado lacebug, *Pseudacysta perseae* Heat., the avocado miner, *Gracillia perseae*, avocado leafroller, *Caloptilia* sp., the mite *Oligonychus yothersi* (McGregor), the mirids *Dagbertus fasciatus* (Reuter), the mite *Tegolophus perseaflorae* Keiffer is discussed.

Key Words: *Anastrepha suspensa, Pseudacysta, Oligonychus, Dagbertus,. Epimeces, Tegolophus*

INTRODUCTION

Avocado (*Persea americana*) like most fruit tree crops, is usually attacked by two to three key pests, several secondary pests and a large number of occasional pests (Table 1). In the "short list of known pests" that I include here, of 22 species, there are few pests that require annual control measures. Secondary pests generally occur at sub-economic levels, but can become serious pests if their natural enemies are eliminated due to continuous applications of pesticides. Major pests of avocado in Florida were reviewed by Wolfenbarger (1963). They include foliage feeders, e.g., *Epimeces detexta* (Walker), *E. matronaria* (Guenée), *Anacamptodes defectaria* (Guenée) and *Oxydia vesulia transponens* (Walker), the avocado lacebug, *Pseudacysta perseae* Heat., the avocado miner, *Gracillia perseae*, avocado leafroller, *Caloptilia* sp., and the mite *Oligonychus yothersi* (McGregor), flower and fruit feeders such as the mirids *Dagbertus fasciatus* (Reuter), the thrips, *Frankliniella bispinosa* Morgan and the mite *Tegolophus perseaflorae* Keiffer. The objective of this paper is to present current information on the most frequent pests affecting avocado in the state of Florida.

Caribbean Fruit Fly, *Anastrepha suspensa* (Loew)

Avocado fruits are listed as hosts of the Caribbean fruit fly, Anastrepha suspensa (Loew) (Norrbom and Kim, 1988). However, under field conditions infestations are not observed indicating that avocado fruits are not the preferred host for the Caribbean fruit fly (Peña, pers.obs). Studies on resistance of avocado cultivars tested under forced laboratory conditions suggest that some factors may prevent infestation by this species (Hennessey et al., 1996). Studies on dynamics and infestation levels of the Caribbean fruit fly on avocado are needed to clarify that avocado is not a preferred host for *A. suspensa*.

Avocado red mite, *Oligonychus yothersi (McGregor)*

In Florida, the avocado red mite is a common pest of avocados. Feeding is initially confined to the upper surface of avocado leaves; it is found first along the midrib and secondary leaf veins. The areas along the veins become reddish-brown. During heavy infestations, leaves can be covered with mites' cast skins. Damage to the leaf area is regularly observed from October through February, causing up to a 30% reduction in leaf photosynthetic activity. Leaves affected by this mite regularly drop earlier (45-60 days after infestation) than their uninfested counterparts. This mite is an occasional pest in some orchards and is seldom observed in others. Periodic inspections are recommended during December, January and February.. The duration of the life stages varies from 14 to 15 days. Females are capable of laying 40 to 50 eggs during their life span (Peña and Johnson, 1999). In Florida, few miticides are registered for use on avocados when fruit is present. Sulphur or oil emulsion sprays are recommended (Peña and Johnson, 1999). There was a significant linear relationship between the number of cumulative mite-days (y) and cumulative damage index (x) ($y = -26.46 + 89.92x$; $r^2 = 0.98$, $P > 0.001$). There was a less than intermediate negative linear relationship between the number of fruit per tree (y) and the damage index (x) ($y = 89.45 - 22.59x$; $r^2 = 0.24$; $P > 0.001$) (Peña, unpubl.). However, if avocado trees infested with avocado mite maintain an average of 245 mite days, and are left untreated, 36.45% of the yield could be reduced (Peña, unpubl.).

Eriophyidae

In Florida, *Tegolophus perseaflorae* is observed in developing buds, flowers and fruitlets. Peña and Denmark (1996) related the presence of this mite with excessive flower drop and fruit deformation. The mites cause necrotic spots, and sub-circular and irregular openings on apical leaves. Feeding by this mite may cause fruit deformation and discoloration. The adult avocado bud mite has a yellowish appearance. Its life cycle has not been determined. Avocado bud mite populations begin to increase from March to May (Peña and Johnson, 1999). There are no recommendations for management and control of these species.

Mirids, *Dagbertus fasciatus* (Reuter), *D. olivaceous* (Reuter), *Rhinacloa* sp.

In Florida, a number of mirids (*Dagbertus fasciatus* (Reuter), *D. olivaceous* (Reuter) and *Rhinacloa* sp.) feed and insert their eggs on opening buds, leaves, flowers and small fruit. Attacks seem to especially affect flowers and recently set fruit, causing them to drop. Wounds on fruit may serve as a point of entry for decay organisms. These insects are green-brown, comparatively small, 1 cm in length. Mirids usually appear during the bloom and early fruit-setting stages. Mirid populations are most common from January through April, when avocado flowers are fully open. Mirids have been associated in the past with injuring the fruit causing 'pimply' elevations. However, a relationship between the average number of mirids and percentage of fruit 'pimpling' was not observed (Peña et al., 2003).

The parasitoid, *Leiophron,* probably *fumipennis* Loan, has been registered in Florida (Table 2). Sprays during flowering should be applied later in the afternoon to reduce loss of honeybees (Peña and Johnson, 1999).-

Tingidae

Avocado lace bug, Pseudacysta perseae (Heidemann)

The avocado lace bug was described in 1908 as *Acysta perseae* from Florida specimens and considered a minor pest of avocado for several years. However, persistent population outbreaks of *P. perseae* observed since the mid-1990s in Florida and in the Caribbean region, reveal that *P. persae* has become one of the most important pests of avocado (Abud-Antum, 1991; Medina-Gaud *et al.*, 1991). *P. persae* is found in Florida and Georgia in the USA, Bermuda, the Dominican Republic, Puerto Rico and Mexico (Mead and Peña, 1991). Common hosts for this pest, besides avocado, are red bay, *Persea borbonia* (L.) and camphor, *Cinnamomum camphora* (L.). The life cycle of *P. persae* was reported by Abud-Antum (1991). It requires 22 days from egg stage to adult. The most complete description of adults and late-instar nymphs was given by Heidemann (1908).

Pseudacysta persae confines its attack to the lower surface of the foliage, causing chlorosis, necrosis and severe defoliation of avocado, reducing yields (Peña *et al.,* 1998)[Plate 52]. This bug usually lives in colonies, depositing eggs upright in irregular rows in clusters on the lower leaf surface. This insect opens an avenue of penetration for the leaf anthracnose fungus, *Colletotrichum gloeosporioides* (Mead and Peña, 1991). Since the avocado lace bug was not considered an important pest, it is suggested that in recent times, suitable natural enemies were decimated by application of pesticides or by some other type of environmental disequilibria.

In Florida, avocado lace bug population densities increase during the dry season (November-February), and decline during spring and summer (Peña *et al.*, 1998). The cvs. 'Waldin', 'Booth 8' and 'Loretta' have the highest natural infestation levels. The most susceptible cv. appears to be 'Booth 8', with average damage levels of 20 to 28% to the leaf area. Leaf photosynthesis is reduced by 50% when the leaves sustain 40% damage. Cultivars (e.g., 'Simmonds') with 100% of their leaves infested exhibited early leaf drop and an overall reduction in fruit set. By contrast, a West Indies x Guatemala hybrid was scarcely affected by the pest.

The major biological control agents in Florida are two egg parasitoids, *Oligosita* sp. (Hymenoptera: Trichogrammatidae), and an unidentified mymarid wasp; if undisturbed by chemical applications, the green lace wing *Chrysoperla rufilabris* Burmeister and a mirid, *Hyaliodes vitripennis* Say keep avocado lace bug densities from reaching economic levels.

Several pesticides—M-Pede (soap), citrus oil and Mycotrol (*Beauveria bassiana* (Balsamo) Vuillemin) significantly reduced lace bug densities compared to the untreated control (Peña *et al.*, 1998) (Table 2).

Avocado leaf roller, Caloptilia sp., Avocado Miner, Phyllocnistis sp.

Young leafroller larvae typically feed only on the surface of avocado leaves, leaving a thin brown membrane. Mature avocado trees can tolerate considerable leaf damage by the amorbia larvae without severely affecting tree growth or fruit yield. *Phyllocnistis* spp. (Lepidoptera:Gracillariidae) mining on the leaves is considered a minor pest problem.

Avocado loopers—*Anacamptodes defectaria* (Guenee), *Epimeces detexta* (Walker), *Epimeces matronaria* (Guenee), *Oxydia vesulia transponens* (Walker).

Several loopers, namely *E. detexta*, *E. matronaria*, *Anacamptodes defectaria*

(Gueneé) and *O. vesulia transponens*, feed on avocado leaves in Florida. The most common of these is *E. detexta*, a medium-sized grey or greyish-white moth. Young larvae are 0.6 cm or less in size, usually grey or greyish-black. They grow rapidly to 3 to 4 cm in length. Older larvae are generally tan or greenish-yellow in colour. *E. detexta* larvae also feed on flower panicles, even fruit, but prefer the tender growth in the upper part of the tree. Looper infestations appear to be somewhat seasonal and are more severe in spring and summer, generally becoming less of a problem in fall and winter. Defoliation and fruit damage has been sporadic during the last 15 years. However, during 2002 and summer 2003, defoliation has been observed demanding several insecticide applications. The adult *E. detexta* is short-lived, and mates and oviposits soon after emergence from the pupa. Eggs are laid in narrow elongated masses, preferentially on needles of Australian pine (*Casuarina* sp.), and they hatch in about 5 days. The larvae grow rapidly and pupate 17 to 22 days after egg hatch. The pupal stage can last 10 days. Thus a full generation is expected to last between 34 and 37 days. Pupae drop to the ground and the adult emerges in 12 days to start the cycle over. Some avocados are culled because of damage from feeding on the fruit by two or three kinds of small caterpillars (Peña and Johnson, 1999). Native natural enemies of *E. detexta* include the predators *Calleida decora* (Fabricius) and *Podisus maculiventris* (Say). *Alcaerrhynchus grandis* (Dallas), *Parapanteles* sp. and *Trichospilus diatreae* Cherian are natural enemies of *E. matronaria*, *A. defectaria* and *O. vesulia transponens*, respectively (Peña *et al.*,1996). Several attempts to introduce exotic biological control agents, e.g., *Telenomus* sp. and *Trichogramma platneri* Nagarkatti, failed (H. Glenn, personal communication).

CONCLUSIONS

In general, avocado pest management is largely dependent on the use of pesticides. Costs of pest control, and the current lack of information and lack of registration for a new generation of pesticides (Wysoki *et al*., 1999), is complicating the continuation or development of pest-management programs in avocado.

In Florida, where the most important cultivars grown are Guatemalan or West Indian in origin are attacked by two to three key pests which are currently controlled through the use of chemical products, applied on a calendar schedule. This practice continues despite the presence of several native biological control agents for some insect pests such as mirids, avocado lace bug, and several attempts to introduce exotic biological control agents. Timid efforts on he development of IPM include determining economic thresholds for the avocado mite and sampling techniques for mirids (Peña *et al*., 1996) and loopers. Assessments of economic damage for mirids and for *Tegolophus perseaflorae* are needed in order to determine their injury to flowers and fruitlets.

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Table 1. Pests of Avocado in Florida

Order	Family	Species Name	
Acarina	Eriophyidae	Tegolophus perseaflorae Keifer	
		Aceria sp.	
	Tenuipalpidae	Brevipalpus phoenicis (Geijskes)	
	Tetranychidae	Oligonychus yothersi (McG.)	avocado red mite
Coleoptera	Curculionidae	Heilipus squamosus	
		Caulophilus (latinasus) oryzae (Gyll.)	Collected from seeds
	Scarabeidae	Euphoria sepulchralis (Fab.)	
		Pachystethus marginata (Fab.)	
	Scolytidae	Xylosandrus compactus (Eich)	
Hemiptera	Tingidae	Pseudacysta perseae	avocado lace bug
	Miridae	Dagbertus sp.	avocado mirids
Homoptera	Cicadellidae	Idona minuenda (Ball)	avocado leafhopper
	Coccidae	Ceroplastesceriferus (Fabricius)	Indian wax scale
		C. floridensis Comstock	Florida wax scale
		Coccus acutissimum Green	banana shaped scale
		C. hesperidum L.	Brown soft scale
		C. viridis (Green)	Green Scale
		Eucalymnatus tssellatus (Signoret)	tessellated scale
		Kilifia acuminata (Signoret)	acuminate scale
		Protopulvinaria pyrifornis (Cockerell)	Pyriform scale
		Pulvinaria psidii Maskell	Green shield scale
		Saissetia neglecta DeLotto	Caribbean black scale
		Saissetia oleae (Olivier)	Black scale
	Diaspididae	Acutaspis perseae (Comstock)	Red bay scale
		Aonidiella orientalis (Newst.)	Oriental scale

Order	Family	Species Name
		Aspidiotus destructor Signoret Coconut scale
Aspidiotus spinosus		Comst., Spinose scale
		Chrysomphalum dictyospermi (Morgan) Dictyospermum scale
		C. ficus Ashmead Florida red scale
		Fiorinia fioriniae (Targ.) fiorinia scale
		Hemiberlesia diffinis (Newst.) Diffinis scale
		Hemiberlesia lataniae (Signoret) Latania scale
		Morganella cueroensis (Ckll.) Cuero scale
		Parlatoria pergandii Comst. Chaff scale
		Parlatoria proteus (Curtis) Proteus scale
		Pseudoparlatoria parlatorioides (Comst.) False parlatoria
		Quadraspidiotus juglansregiae (Comst.) English walnut scale
		Velataspis dentata (Hoke) Dentate scale
	Pseudococcidae	Pseudococcus sp. nr. maritimus (Her.)]
Lepidoptera	Gracillariidae	Phyllocnistis n. sp. Leaf miner
		Caloptilia sp. Leaf roller
	Geometridae	Epimecis detexta(Wlk.) Avocado loopers
		E, matronaria, Oxydia vesulia
		transponens, Anacamptodes defectaria
	Tortricidae	Argyrotaenia amatana (Dyar)
Thysanoptera	Thripidae	Selenothrips rubrocinctus (Giard)
		Heliothrips haemorroidalis
		Frankliniella bispinosa (Morgan)

Table 2. Natural Enemies Collected in Florida from Avocado Pests

Pest	Natural Enemy		Predator	Parasitoid
Pseudacysta perseae	Trirchogrammatidae	Oligoseta spp.		x
	Miridae	Hyalodes vitripennis	x	
Argyrotaenia sp.	Chalcididae	Conura sp.		x
Epimeces detexta		Calleida decora (Fabricius)	x	
		Podisus maculiventris (Say)	x	
E. matronaria		Alcaerrhynchus grandis (Dallas)	x	
Anacapmtodes defectaria		Parapanteles sp.		x
Dagbertus spp.	Braconidae	Leiophron prob. funipennis	x	
Oligonychus yothersi sp.	Phytoseiidae	Typhlodromus peregrinus (Muma)	x	
		Euseius hibisci (Chant)	x	
Phyllocnistis n. sp.	Eulophidae	Zagrammosoma multilineatum (Ashmead)		x