HS1018

UNIVERSITY OF FLORIDA
IFAS EXTENSION

Strawberries: Main Pests and Beneficials in Florida[1]

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The strawberry, *Fragaria x ananassa*, is an important small fruit crop in Florida. The sunshine state leads the southeastern U.S. in strawberry production and ranks second to California nationwide. The mild weather of Florida's fall and winter seasons sustain the nation's second largest strawberry production. These conditions, unfortunately, are also suitable for several arthropod pests to multiply and feed on the crop. Strawberry plants are quickly established two weeks after the transplanting irrigation is turned off. This is the time growers must begin to scout their fields at least once a week to assess the status of pests, such as spider mites, cyclamen mites, lepidopterous larvae, aphids, thrips, and sap beetles. The ability to recognize these pests, their damage, and their natural enemies is important in determining the best control methods for each situation. Keep in mind that miticide or insecticide choices are limited if you participate in a biological control program.

Spider Mites

The twospotted spider mite, *Tetranychus urticae*, is the most significant arthropod pest in strawberry production. It attacks strawberry plants in nurseries, greenhouses, and open fields. The twospotted spider mite feeds on the sap of the leaves causing chlorosis (Fig. 1). As few as 10 or even fewer mites per leaflet can cause economic losses. They disperse easily by walking from leaflet to leaflet or by winding through their spider web-like system (Fig. 2). They develop through an incomplete metamorphosis including eggs, nymphs, and adults (Fig. 3).

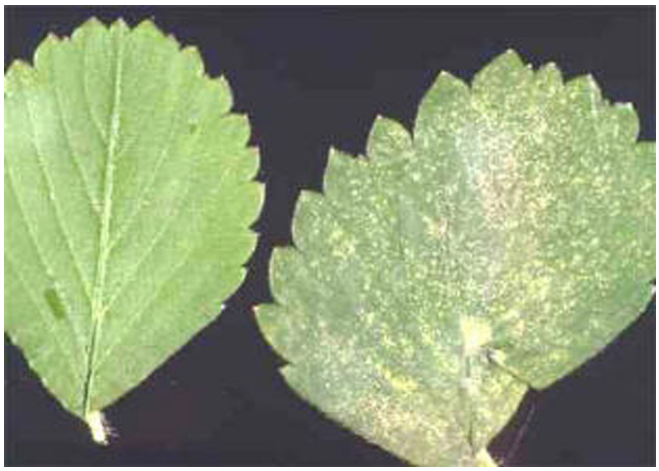

Figure 1. Damage caused by the twospotted spider mite on strawberries. Upper side of leaflet undamaged (left) and damaged (right) by spider mites. Credits: J.F. Price, UF/IFAS

1. This document is HS1018, one of a series of the Horticultural Sciences Department, Florida Cooperative Extension Service, Institute of Food and Agricultural Sciences, University of Florida. Publication date: July 2005. Please visit the EDIS Web site at http://edis.ifas.ufl.edu.

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Figure 2. Twospotted spider mite's web-like system used as a means of transportation. Credits: S.I. Rondon, UF/IFAS

Figure 3. Eggs, nymphs, and adults of the twospotted spider mite on a strawberry leaflet. Credits: S.I. Rondon, UF/IFAS

Control

Traditionally, control strategies for twospotted spider mite require applications of miticides during the production season (e.g. abamectin, hexythiazox, or fenbutatin-oxidate). A small number of growers use an excitatory pheromone (Stirrup M®) to increase mite and miticide contact. In many cases, miticides are applied when about 5-10% of the leaflets possess one or more spider mites. As a biological control method, the predatory mite *Phytoseiulus persimilis* (Fig. 4) has been released in the Plant City, Florida. area and it can provide excellent long-season control. Predators can be introduced into the field soon after strawberry transplants are established. *Neoseiulus californicus* (Fig. 5), another predatory mite, has been used successfully in north Florida production. Naturally occurring thrips also prey on the twospotted spider mite (Fig. 6).

Figure 4. *Phytoseiulus persimilis*, predatory mite that feeds on the twospotted spider mite. Credits: S.I. Rondon, UF/IFAS

Figure 5. *Neoseiulus californicus*, predatory mite that feeds on the twospotted spider mite. Credits: E. Jovicich, UF/IFAS

There is a second spider mite of moderate concern found occasionally in Florida. The tumid mite, *Tetranychus tumidus*, is a dark red to purplish, robust mite (Fig. 7). The injury sustained by the strawberry plants resembles the damage caused by the twospotted spider mite. The tumid mite and the twospotted spider mite can coexist in the strawberry crop. In some instances, tumid mite densities have been higher than densities of the twospotted spider mite. Control of this pest is somewhat easier to accomplish than that of the twospotted spider mite. In general, miticides that control twospotted spider mite will control the tumid mite. Some broad-spectrum

insecticides, such as methomyl, kill the tumid mite but not the twospotted spider mite. Accordingly, applications of such broad-spectrum insecticides may render the tumid mite unnoticeable.

Figure 6. The six-spotted thrips, *Scolothrips sexmaculatus,* a predatory thrips that feeds on the twospotted spider mite. Credits: J.K. Clark, Univ. Calif.

Figure 7. Eggs (a) and adult (b) of the tumid mite on strawberries. Credits: S.I. Rondon, UF/IFAS

Lepidopterous Larvae (Worms)

Two species of worms can cause early losses in Florida: the fall armyworm, *Spodoptera frugiperda* (Fig. 8), and the southern armyworm, *Spodoptera eridania* (Fig. 9). These worms are the immature stage of moths and develop through a complete metamorphosis including egg (Fig. 10), plant eating larvae (worms), hidden and resting pupae, and the night-flying adult moth stages. Larvae feed on young strawberry leaflets and buds as they develop. Small, dark fecal pellets on the tops of the leaves or on the plastic mulch indicate larval feeding (Fig. 11). Cutworms, such as *Agrotis ipsilon*, and other types of worms can occasionally be present in strawberries (Fig. 12).

Figure 8. Larvae of the fall armyworm, *Spodoptera frugiperda*. Larvae possess two dark bands along the side of the body and an inverted "Y" on the head. Credits: J.L. Capinera, UF/IFAS

Figure 9. Larvae of the southern armyworm, *Spodoptera eridania*. Larvae possess dark triangular marks along the sides of the body. Credits: J.L. Capinera, UF/IFAS

Figure 10. Egg mass of armyworms. Credits: J.L. Capinera, UF/IFAS

Figure 11. Feeding damage of lepidopterous larvae in strawberries. Credits: S.I. Rondon, UF/IFAS

Figure 12. The cutworm, *Agrotis ipsilon,* can occasionally be present in the strawberry crop. Credits: S.I. Rondon, UF/IFAS

Control

Scouting should be performed once or twice per week, particularly during the early season. Check for young leaves with holes and missing margins. Several products are available to control these worms, some of which are biologically based and very compatible with biological control of spider mites. Several parasitoids wasps are commonly associated with worm control (Figs. 13 and 14).

Aphids

There are two species of aphids frequently found in Florida strawberries, the strawberry root aphid (*Aphis forbesi*) and the cotton aphid (also known as the melon aphid) (*Aphis gossypii*) (Fig. 15). In 2005, the yellow rose aphid, *Rhodobium porosum* (Fig. 16), has been added as a new record for strawberries in Florida. In general, aphids may be green, black,

Figure 13. *Cotesia spp.*, a parasitoid wasp of armyworms. Credits: A. Sourakov, USDA

Figure 14. *Meteorus spp.*, a parasitic wasp of armyworms. Credits: A. Sourakov, USDA

brown or some other color depending on the sap color of the host plant. These slow-moving insects with pear-shaped bodies range from 1/16 to 1/8 inch long. A few aphids have wings but all have a pair of cornicles (or “exhaust pipes"), one on each side of the rear end.

Aphids are sucking insects that feed by thrusting their long beaks into the plant tissue-causing wrinkling of the leaves that can reduce photosynthesis (Fig. 17). They remove great quantities of sap, then excrete the sticky, sugary excess as "honeydew."

Figure 15. The cotton aphid, *Aphis gossypii*. It can be recognized by its characteristic dark, relatively short cornicles. Credits: S.I. Rondon, UF/IFAS

Figure 16. The yellow rose aphid, *Rhodobium porosum*, a new host record for Florida. Credits: L. Castner, UF/IFAS

Figure 17. Damage caused by aphids on strawberries. Characteristic sooty mold (black fungi). Credits: J.K. Clark, Univ. Calif.

Control

Well-established strawberry plants can tolerate low (1-5 aphids per leaflet) to medium (10-15 aphids per leaflet) levels of aphids. Usually, parasitic wasps (Fig. 18), predators (Figs. 19 and 20), and diseases that contribute to aphid control can be found in the field. Several insecticides are available to control aphids when necessary (e.g., methomyl).

Figure 18. Aphid parasitized (right) by the wasp *Aphidius colemani.* Credits: E. Jovicich, UF/IFAS

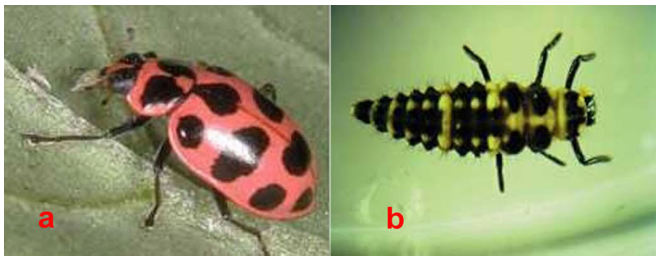

Figure 19. Lady beetle adults (a) and larvae (b), such as the ones of *Coleomegilla maculata,* can control aphids. Credits: M.E. Rice, Kansas State Univ.

Thrips

The most common thrips in Florida strawberries is *Frankliniella bispinosa* (Fig. 21). Flower thrips are slender and very small (about 0.03 in. long). Adults have four feathery wings and vary from yellow to dark brown; nymphs are pale and without wings (Fig. 22). Nymphs and adult thrips can injure the plant by rasping the plant tissues and sucking the exuding sap. Thrips feed on strawberry blossoms and cause the stigmas and anthers to turn brown and abort prematurely (Fig. 23).

Figure 20. Lacewing adults (a) and larvae (b), such as *Chrysoperla* spp., can control aphids. Credits: K. Gray, O.S.U.

Figure 21. *Frankliniella bispinosa*, the most common thrips in Florida strawberries. Credits: S.I. Rondon, UF/IFAS

Figure 22. Immature stages of thrips (nymphs). Credits: K. Gray, O.S.U.

Figure 23. Damage caused by thrips on strawberries. Thrips rasp portions of the strawberry flower. Credits: S.I. Rondon, UF/IFAS

Control

Sample thrips by randomly collecting flower blossoms; then slap the blossoms onto white paper or blow on the flowers to cause the thrips to run about. Flower thrips rarely cause economic damage at low population densities. Sprays (compatible and incompatible with biological control) are available to control excessive thrips (e.g. SpinTor). The predatory bug, *Orius* spp., can provide good control (Fig. 24).

Cyclamen Mites

The cyclamen mite, *Polyphagotarsonemus latus* (Fig. 25), can be a very serious pest in Florida. Infested strawberry leaves are small, chlorotic, highly wrinkled, thickened and have short petioles. Runners often have numerous small "thorns" rather than a smooth texture. Additional symptoms include flowers that are dark brown and dry, russeted berries, and poorly developed root systems. In general, plants look stunted and produce fruit late (Fig. 26).

Figure 24. *Orius* spp, the insidious predatory flower bug. Credits: K. Kallagher, Entomos

Widespread infestations in Florida strawberry fields occur only occasionally and usually are related to an infested northern nursery. Cyclamen mites can be found in the crevices of leaf wrinkles, on unopened and opened flowers, on newly formed fruit and in the plant bud. Once these pests are introduced into a field in Florida, they can move along runners to infest neighboring plants and they can be carried by bees, other insects, birds, field workers, or machinery to infest other fields. The movement of mites along the soil or on plastic mulch is not likely since the mite requires the humid environment of plant surfaces.

Figure 25. Heavy infestation of cyclamen mite in strawberries. Credits: J.K. Clark, Univ. Calif.

Figure 26. Damage caused by cyclamen mites.

Control

Control strategies should be directed toward preventing an outbreak through the use of plants certified to be free of the pest. To prevent significant losses from cyclamen mites established in a fruiting crop in Florida, it is important to detect the infestation before plant growth has been significantly affected. A regular program of crop scouting should ensure the earliest detection of this pest. A few miticides are available to control cyclamen mites on strawberries. High volumes of spray preparations, perhaps 400 gallons per acre, are necessary to contact the mites deep in the plant bud.

Sap Beetles

Sap beetles feed on flowers, fruits, sap, fungi, stored products, and decaying and fermenting plant tissues from diverse trees and crops including strawberries. They work in association with yeasts and other fungi to cause the fermentation of infested fruit, although their main impact is the presence of the larvae or adults among the packed fruit. Sap beetles develop through a complete metamorphosis: eggs, larvae, pupae, and adults (Fig. 27). Sap beetles fly into strawberry fields from wooded areas or citrus orchards around the time temperatures exceed 60^0F degrees in the late winter. In managing this pest, it is important to pick berries before they become overripe and to remove all damaged or overripe fruit from the field (or at least place it into row middles where it can decompose more quickly), especially in warm weather. Several insecticides are available to control sap beetles, but most are hazardous to *P. persimilis*

predator mites. Growers who use beneficial programs can use methomyl at the end of the season to manage sap beetles and fruit flies.

Other problematic insects and mites can occur on Florida strawberries and occasionally reduce yields. The above, however, are the ones normally encountered and the ones for which growers should be best schooled. Keen attention to these pests can go a long way toward ensuring a successful year of strawberry production.

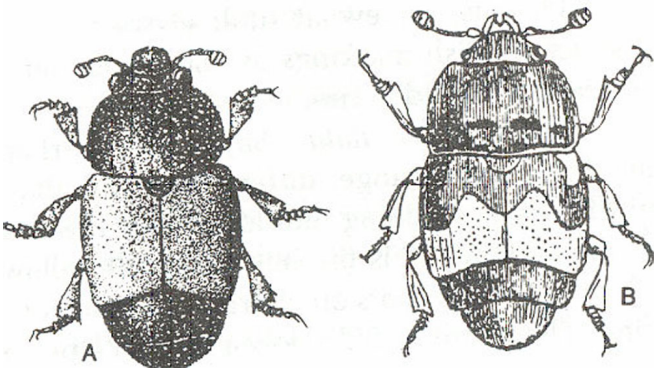

Figure 27. Sap beetles. Nitidulid adults can be recognized by the unexposed tip of abdomen heavily sclerotized and a "club" at the end of the antennae.

Additional Information

UF/IFAS Department of Entomology and Nematology and FDACS Division of Plant Industry - Featured Creatures. http://creatures.ifas.ufl.edu/

UF/IFAS GCREC-Dover - Entomology. http://strawberry.ifas.ufl.edu/

UF/IFAS Horticultural Sciences Department - The Protected Agriculture Project. http://www.hos.ufl.edu/protectedag/

UF/IFAS Horticultural Sciences Department - Vegetarian Newsletter. http://www.hos.ufl.edu/vegetarian/index.htm

NSF Center for Integrated Pest Management - Crop Profile for Strawberry in Florida. http://cipm.ncsu.edu/cropprofiles/docs/FLstrawberries.html

UF/IFAS, Fla. Coop. Ext. Serv. - HS736, Strawberry Production in Florida. http://edis.ifas.ufl.edu/pdffiles/CV/CV13400.pdf