

UC IPM Pest Management Guidelines: FIG

January 2009

Contents (Dates in parenthesis indicate when each topic was updated)

General Information

| | |
|---|---|
| Relative Toxicities of Insecticides and Miticides Used in Figs to Natural Enemies and Honey Bees (1/09) | 1 |
|---|---|

Insects and Mites (section reviewed 7/06)

| | |
|--|---|
| Carpenterworm (7/06) | 2 |
| Darkling Ground Beetle (7/06) | 2 |
| Driedfruit Beetles (1/09) | 3 |
| Fig Beetle (7/06) | 6 |
| Fig Mite (1/09) | 6 |
| Fig Scale (1/09) | 7 |
| Navel Orangeworm (7/06) | 8 |
| Vinegar Flies (7/06) | 8 |
| Web-spinning Spider Mites (1/09) | 9 |

Diseases (section reviewed 7/06)

| | |
|-----------------------------------|----|
| Alternaria Rot (1/09) | 10 |
| Aspergillus Rot (1/09) | 11 |
| Botrytis Limb Blight (1/09) | 11 |
| Fig Endosepsis (1/09) | 12 |
| Fig Mosaic (7/06) | 14 |
| Smut (1/09) | 14 |
| Sour Rot (7/06) | 15 |

| | |
|--|----|
| Nematodes (7/06) (section reviewed 7/06) | 16 |
|--|----|

| | |
|--|----|
| Precautions for Using Pesticides | 17 |
|--|----|

An illustrated version of this guideline is available online at <http://www.ipm.ucdavis.edu/PMG/selectnewpest.figs.html>

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Updates: These guidelines are updated regularly. Check with your University of California Cooperative Extension Office or the UC IPM World Wide Web site for information on updates.

Note to readers: These guidelines represent the best information currently available to the authors and are intended to help you in making the best choices for an IPM program. Not all formulations or registered materials are mentioned. Always check the label and with local authorities for the most up-to-date information regarding registration and restrictions on pesticide use. Check with your agricultural commissioner for latest restricted entry intervals.

General Information

RELATIVE TOXICITIES OF INSECTICIDES AND MITICIDES USED IN FIGS TO NATURAL ENEMIES AND HONEY BEES (1/09)

| Common name (trade name) | Mode of Action ¹ | Selectivity ² (affected groups) | Predatory Mites ³ | General Predators ⁴ | Parasites ⁴ | Honey Bees ⁵ | Duration of impact to natural enemies ⁶ |
|-----------------------------|--------------------------------|---|---------------------------------|-----------------------------------|------------------------|----------------------------|---|
| bifenazate (Acrامة) | 25 | narrow (spider mites) | L | L | L | IV | short |
| chlorpyrifos (Lorsban) | 1B | broad (insects, mites) | M | H | H | I ⁷ | moderate |
| malathion | 1B | broad (insects, mites) | H | H | H | II | moderate |
| petroleum oil | — | broad (exposed insects, mites) | L ⁸ | L | L | III | short to none |

H = high

M = moderate

L = low

— = no information

¹ Rotate chemicals with a different mode-of-action Group number, and do not use products with the same mode-of-action Group number more than twice per season to help prevent the development of resistance. For example, the organophosphates have a Group number of 1B; chemicals with a 1B Group number should be alternated with chemicals that have a Group number other than 1B. Mode of action Group numbers are assigned by IRAC (Insecticide Resistance Action Committee). For additional information, see their Web site at <http://www.irac-online.org/>.

² Selectivity: *broad* means it affects most groups of insects and mites; *narrow* means it affects only a few specific groups.

³ Generally, toxicities are to western predatory mite, *Galendromus occidentalis*. Where differences have been measured in toxicity of the pesticide-resistant strain versus the native strain, these are listed as pesticide-resistant strain/native strain.

⁴ Toxicities are averages of reported effects and should be used only as a general guide. Actual toxicity of a specific chemical depends on the species of predator or parasite, environmental conditions, and application rate.

⁵ Ratings are as follows: I-Do not apply to blooming plants; II-Apply only during late evening; III-Apply only during late evening, night, or early morning; and IV-Apply at any time with reasonable safety to bees. For more information, see *How to Reduce Bee Poisoning From Pesticides*, Pacific Northwest Extension Publication PNW591.

⁶ Duration: *short* means hours to days; *moderate* means days to 2 weeks; and *long* means many weeks or months.

⁷ If rate is 0.05 lb a.i./acre or less, rating is III.

⁸ Rating depends on rate used.

Acknowledgements: This table was compiled based on research data and experience of University of California scientists who work on a variety of crops and contribute to the Pest Management Guideline database, and from Flint, M.L. and S.H. Dreistadt. 1998. *Natural Enemies Handbook: An Illustrated Guide to Biological Pest Control*, ANR Publication 3386.

Insects and Mites

CARPENTERWORM (7/06)

Scientific Name: *Prionoxystus robiniae*

DESCRIPTION OF THE PEST

Carpenterworm larvae are woodboring insects and attack many species of deciduous fruit trees. Eggs are laid in crevices in the bark; the larvae hatch out by boring through the bottom of the egg directly into the wood. Larvae are cream colored with a brown head capsule and have conspicuous spots surrounding the scattered hairs on the body. They grow to about 2 inches long. The adult carpenterworm is a large, gray and brown, mottled moth with a wing span of about 2.25 inches. Females are heavy bodied and cannot fly more than a few yards. They have one generation per year with the adults emerging from pupation in late April through June.

DAMAGE

Carpenterworm larvae burrow in the cambium layer of the tree and eventually girdle the limb, causing it to die. Active galleries can be recognized by copious amounts of sap and sawdust that result from the larvae cleaning out their burrows.

MANAGEMENT

Carpenterworms infest several species of native hosts in river bottom areas. Therefore, orchards planted near riparian habitats are more prone to attack. Because adults cannot fly very far, the infestation is slow to spread through the orchard. Prune infested wood judiciously to slow down the spread of the insect. Maintain trees in vigorous growth to help them tolerate damage longer.

Commercial preparations of the entomophagous nematode *Steinernema feltiae* (*Neoplectana carpocapsae*), such as Scanmask, have been found to give good control of the carpenterworm. Follow supplier's directions for application of their particular preparation.

DARKLING GROUND BEETLE (7/06)

Scientific Name: *Blapstinus fuliginosus*

DESCRIPTION OF THE PEST

The adult beetle is oval shaped, dull black in color, and is about 0.25 inch long by 0.12 inch wide. The larvae, called false wireworms, are up to 0.5 inch long and cream to pale tan in color.

DAMAGE

Damage is caused by adults feeding in the fruit.

MANAGEMENT

Larvae feed on decaying organic matter in and on the soil surface. Remove or hasten the breakdown of organic matter to reduce the available host material for larvae. This should reduce the population. Complete harvest rapidly and remove figs from the orchard to reduce exposure to infestation by adults. No chemical controls are recommended.

DRIEDFRUIT BEETLES (1/09)

Scientific Names: Driedfruit beetle: *Carpophilus hemipterus*
 Freeman sap beetle: *Carpophilus freemani*
 Confused sap beetle: *Carpophilus mutilatus*

DESCRIPTION OF THE PESTS

Driedfruit beetles, also known as sap beetles, are a complex of several closely related species in the family Nitidulidae that have similar life histories and resemble each other in appearance. The driedfruit beetle, *Carpophilus hemipterus*, is the most common species, but the Freeman sap beetle, *C. freemani*, and the confused sap beetle, *C. mutilatus*, are also common and can be the most abundant in some orchards. *Carpophilus marginellus*, *Haptoncus luteolus*, and *Urophorus humeralis* are sometimes present in lesser numbers.

Adults are small brown or black beetles with or without lighter spots on the wings, depending on the species. They range in size from 0.1 to 0.2 inch long and have clubbed antennae. The wings do not cover the last two to three abdominal segments. Larvae are white and 0.1 to 0.2 inch long when mature. They have tan head capsules, three pairs of true legs, and two hornlike structures on the anal end.

DAMAGE

Driedfruit beetles damage figs in three ways: their presence in the fruit causes downgrading or rejection of the fruit, they transmit spoilage organisms that cause fruit souring, and they increase the attractiveness of the fruit to other pests such as vinegar flies and navel orangeworm.

MANAGEMENT

Early harvest and orchard sanitation can help reduce the damage potential of these pests as can the use of less susceptible varieties. Trapping of driedfruit beetles in large containers containing cull fruit, water, and yeast as a bait may be effective in reducing the population if done before the fruit ripens and becomes attractive. Once the fruit begins to ripen, insecticides may be necessary.

Cultural Control

Because driedfruit beetles can feed on moldy, mummified fruit left in the orchard during winter, remove all cull fruit from the orchard as soon as possible after harvest to reduce the overwintering population. Harvest early and rapidly to remove infested fruit from the orchard before the larvae are mature enough to drop to the soil and pupate, thus preventing the subsequent emergence of adults from the soil to infest later crops. Fumigate first crop Missions, Conadrias, and Adriatics, as well as Calimyrnas, which are harvested over a period of up to 2 months. Driedfruit beetles that are not removed by early harvesting will complete development and emerge to infest the later maturing portion of the crop.

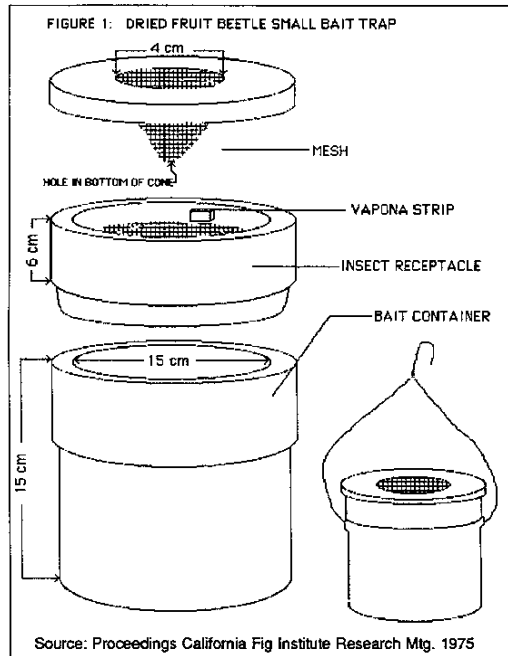
Driedfruit beetles have an extremely wide host range and will infest any ripe or fermenting fruit. They can fly distances of several miles to find a suitable host. If possible, locate fig orchards as far as possible from other host orchards such as stone fruits and citrus.

Resistant Varieties

All commercial varieties of figs are susceptible to infestation by driedfruit beetles. However, varieties that have small eyes, such as Missions, are usually less affected. The major commercial drying variety, Calimyrna, has a large eye that renders it easily infested. It also sets fruit after the first crop of other varieties in which the beetle population builds up. A relatively new variety, Tina, has similar fruit characteristics to Calimyrna but has a smaller eye and does not appear to be as susceptible to driedfruit beetles.

Monitoring and Treatment Decisions

To monitor, place small bait traps (Figure 1) in the orchard before the crop begins to ripen. Bait the traps with cull fruit, water, and yeast. Remove beetles from the traps twice a week and replenish the water as needed.



Spray the trees when trap counts begin to drop off; driedfruit beetles are infesting the fruit at this time. Several sprays may be necessary under heavy beetle population pressure. Treat from a few hours before to just after sunset, which is the period of greatest beetle activity.

A dormant treatment may be useful in reducing overwintering populations in isolated orchards that have experienced severe problems with this pest. This treatment is useful only if the population resides within the orchard and there are no nearby citrus groves, vineyards or other hosts. To determine if the population comes from within the orchard, evaluate trap catches. If beetles are migrating into the orchard, trap catches will be higher in border traps; if not, they should be uniform throughout the orchard.

| Common name (trade name) | Amount/ Acre | R.E.I.+ (hours) | P.H.I.+ (days) |
|-----------------------------|--------------|--------------------|-------------------|
|-----------------------------|--------------|--------------------|-------------------|

When choosing a pesticide, consider information relating to impact on natural enemies and honey bees and environmental impact.

DORMANT

| | | | |
|--|------|--------|----------|
| A. CHLORPYRIFOS* (Lorsban) 4EC | 2 qt | 4 days | 7 months |
| MODE OF ACTION GROUP NUMBER ¹ : 1B | | | |
| COMMENTS: Apply to the soil surface in sufficient water and incorporate to 3 inch depth. For dormant use only. See comments in MONITORING AND TREATMENT DECISIONS section. Make only 1 application/year. | | | |

| Common name (trade name) | Amount/Acre | R.E.I.+ (hours) | P.H.I.+ (days) |
|-----------------------------|-------------|--------------------|-------------------|
|-----------------------------|-------------|--------------------|-------------------|

PREHARVEST

- A. MALATHION 8 spray 2.5 pt
 MODE OF ACTION GROUP NUMBER¹: 1B
 COMMENTS: Apply with a sugar-base spray adjuvant.

12 3

- + Restricted entry interval (R.E.I.) is the number of hours (unless otherwise noted) from treatment until the treated area can be safely entered without protective clothing. Preharvest interval (P.H.I.) is the number of days from treatment to harvest. In some cases the REI exceeds the PHI. The longer of two intervals is the minimum time that must elapse before harvest.

- ¹ Rotate chemicals with a different mode-of-action Group number, and do not use products with the same mode-of-action Group number more than twice per season to help prevent the development of resistance. For example, the organophosphates have a Group number of 1B; chemicals with a 1B Group number should be alternated with chemicals that have a Group number other than 1B. Mode of action Group numbers are assigned by IRAC (Insecticide Resistance Action Committee). For additional information, see their Web site at <http://www.irac-online.org/>.

FIG BEETLE (7/06)**Scientific Name:** *Cotinis texana***DESCRIPTION OF THE PEST**

The adult fig beetle (family Scarabaeidae) is 0.75 to 1.25 inches long, velvet green on top with a brownish yellow band around the edge of the wings and a bright metallic green color on its ventral side. The head has a short, hornlike process on the front. Larvae are soil dwelling and feed on organic matter on the soil surface. They may be 2 inches long when mature and are cream colored with tan head capsules and legs. Rows of short, stiff, brown hairs on the back of thorax are used for locomotion rather than the legs. Mature larvae form hollow cells in the soil and pupate there.

DAMAGE

Damage is done by the adults scraping a hole in the fruit and feeding on the flesh inside. Their excrement stains the skin of the fruit.

MANAGEMENT

Remove leaf litter and other organic matter from the soil surface in spring to starve larvae. Also, allow the soil surface to dry out and harden to imprison the adults before they emerge. Flood irrigate to destroy eggs and young larvae; they cannot tolerate saturated soil for over 2 days. No chemical controls are recommended.

FIG MITE (1/09)**Scientific Name:** *Aceria fici***DESCRIPTION OF THE PEST**

The fig mite is a widely distributed, microscopic mite (0.003 to 0.005 inch long) that has two pairs of legs near the anterior end of a wedge-shaped, pale yellow body.

DAMAGE

The fig mite infests bud scales and young leaves. Feeding causes a faint russetting of the leaves, generally in the interior portion of the canopy and may result in leaf drop and stunting of twigs. More importantly, this mite transmits the fig mosaic virus. The virus is not present in the egg stage of the mite, but once acquired through feeding is retained through molts.

MANAGEMENT

To help reduce virus transmission, monitor leaves about a month after they emerge (May) to detect fig mites. Use a 20X hand lens to examine leaves. Treat when foliage damage appears. A second application may be necessary.

| Common name (trade name) | Amount to Use | R.E.I.+ (hours) | P.H.I.+ (days) |
|-----------------------------|---------------|--------------------|-------------------|
|-----------------------------|---------------|--------------------|-------------------|

When choosing a pesticide, consider information relating to impact on natural enemies and honey bees and environmental impact.

| | | | | |
|----|---|-------|----|---|
| A. | SULFUR# | 40 lb | 24 | 0 |
| | MODE OF ACTION: Unknown. An inorganic insecticide. | | | |
| + | Restricted entry interval (R.E.I.) is the number of hours (unless otherwise noted) from treatment until the treated area can be safely entered without protective clothing. Preharvest interval (P.H.I.) is the number of days from treatment to harvest. In some cases the REI exceeds the PHI. The longer of two intervals is the minimum time that must elapse before harvest. | | | |
| # | Acceptable for use on organically grown produce. | | | |

FIG SCALE (1/09)**Scientific Name:** *Lepidosaphes conchiformis***DESCRIPTION OF THE PEST**

Overwintering adults are dark brown with a greasy-appearing wax coating; summer broods and younger scales are lighter in color. Overwintering females are found on 1- to 2-year-old wood. Eggs are laid in spring, and crawlers hatch when leaves are unfolding. First generation scales settle on leaves, but later generations settle on leaves, twigs, or fruit. Adult female scales are oystershell shaped and about 0.1 inch long. There are usually three generations with occasionally a partial fourth.

DAMAGE

Damage is caused when scales settle on fruit. Their feeding causes a kind of callous tissue to form on the skin, which gives the fruit a warty appearance. It is particularly noticeable if the fruit is canned or candied.

MANAGEMENT

A wasp parasite (*Aphytis* sp.), imported in 1949 from France, generally gives excellent control of the fig scale. If the scale parasite has been disrupted for some reason, chemical control may be necessary. Treatments applied during the dormant season will adequately control the scale in most cases and have the least disruptive effect on the parasites.

| Common name (trade name) | Amount to Use | R.E.I.+ (hours) | P.H.I.+ (days) |
|-----------------------------|---------------|--------------------|-------------------|
|-----------------------------|---------------|--------------------|-------------------|

When choosing a pesticide, consider information relating to impact on natural enemies and honey bees and environmental impact.

DORMANT

| | | | | |
|----|---|--------------------------------------|---|---|
| A. | NARROW RANGE OIL # (Omni Supreme Spray) | 3 gal/acre or 2 gal/100 gal water | 4 | 0 |
| | MODE OF ACTION: Contact including smothering and barrier effect. | | | |
| + | Restricted entry interval (R.E.I.) is the number of hours (unless otherwise noted) from treatment until the treated area can be safely entered without protective clothing. Preharvest interval (P.H.I.) is the number of days from treatment to harvest. In some cases the REI exceeds the PHI. The longer of two intervals is the minimum time that must elapse before harvest. | | | |
| # | Acceptable for use on organically grown produce. | | | |

NAVEL ORANGEWORM (7/06)

Scientific Name: *Amyelois transitella*

DESCRIPTION OF THE PEST

The adult navel orangeworm moth is about 0.6 inch long and has short snoutlike projections from the front of the head. It is grayish brown in color with irregular silver and dark markings on the wings. Larvae are caterpillars that vary in color from white to a deep pink and are up to 0.8 inch in length when mature. A crescent-shaped marking on each side of the second segment behind the head distinguishes this worm from others. Eggs are white when laid, but turn pink within a few days. They are usually laid in fissures on the ripening fruit or under the scales around the eye.

DAMAGE

Damage is caused when the worm feeds in the fruit.

MANAGEMENT

Navel orangeworms have a wide host range, primarily infesting damaged and overripe fruits and nuts. They overwinter in mummified fruits hanging on trees. Complete harvest rapidly and early, and remove and destroy leftover cull fruit. Clean up surrounding hosts such as almonds during the winter as well. Chemicals applied for the control of driedfruit beetles may partially control navel orangeworm populations. No chemical control guidelines have been developed for navel orangeworm in figs.

An introduced parasite, *Goniozus legneri*, has been released with limited success into some almond orchards for control of navel orangeworm. No data has been developed for the efficacy of the wasp in fig orchards.

VINEGAR FLIES (7/06)

Scientific Name: *Drosophila* spp., principally *D. melanogaster*

DESCRIPTION OF THE PEST

Drosophila adults are small, tan to amber-colored flies with red eyes, about 0.12 inch long. Larvae are small, white, legless maggots that are up to 0.2 inch long when mature. They differ from driedfruit beetle larvae in that they do not have a sclerotized head capsule.

DAMAGE

Damage is similar to the driedfruit beetle in that presence of vinegar flies in the fruit causes downgrading or rejection of the fruit. Vinegar flies are also responsible for transmitting spoilage organisms to sound fruit. Late ripening varieties are especially susceptible to damage.

MANAGEMENT

Vinegar flies breed in any fermenting or decaying fruit. Remove or disc under these hosts to reduce the population. The flies are cool season pests; complete harvest rapidly and early to reduce exposure of fruit to infestation. Chemicals applied for driedfruit beetle control will partially reduce vinegar fly populations.

WEBSPINNING SPIDER MITES (1/09)

Scientific Names: Pacific spider mite: *Tetranychus pacificus*
Twospotted spider mite: *Tetranychus urticae*

DESCRIPTION OF THE PESTS

The twospotted spider mite is most common in the Sacramento Valley and the Pacific spider mite in the San Joaquin Valley. Both species produce abundant webbing on both sides of the leaves. The two mites are not easily distinguished. Both have two black spots on their yellow green bodies. In fall they turn orange red. The twospotted spider mite and Pacific spider mite overwinter as adult females under bark and in weeds. When weeds dry in spring, the mites move to trees and feed on lower leaves first. There are many overlapping generations each summer, with eggs being laid on the underleaf surface.

DAMAGE

Spider mites feed by sucking the contents out of leaf cells. Such leaf damage reduces tree vitality. Most feeding takes place on the underside of leaves. Heavy feeding causes browning of leaves and defoliation.

MANAGEMENT

Vigorously growing trees are much more tolerant to mite attack than trees under stress. Maintain trees with optimum irrigation and fertilization. Reducing dust not only reduces spider mite populations but also may limit *Alternaria* rot disease.

Predaceous mites, *Metaseiulus* spp., and the sixspotted thrips, *Scolothrips sexmaculatus*, feed heavily on web-spinning mites and may give complete control in the orchard. The western flower thrips, *Frankliniella occidentalis*, feeds on mite eggs and may prevent a mite population from increasing.

No economic threshold levels have been established for spider mites on figs. Apply treatments before leaf damage becomes severe and defoliation from mite damage ensues.

| Common name (trade name) | Amount to Use | R.E.I.+ (hours) | P.H.I.+ (hours) |
|-----------------------------|---------------|--------------------|--------------------|
|-----------------------------|---------------|--------------------|--------------------|

When choosing a pesticide, consider information relating to impact on natural enemies and honey bees and environmental impact.

| | | | | |
|----|--|-------------------------|----|-----|
| A. | NARROW RANGE OIL# (Omni Supreme Spray) MODE OF ACTION: Contact including smothering and barrier effects. | 1.5–2 gal/100 gal water | 4 | 0 |
| B. | BIFENAZATE (Acramite) 50WS MODE OF ACTION GROUP NUMBER ¹ : 25 COMMENTS: For use on nonbearing figs only. Do not apply more than 1 application/year | 0.75–1 lb/acre | 12 | 365 |

+ Restricted entry interval (R.E.I.) is the number of hours (unless otherwise noted) from treatment until the treated area can be safely entered without protective clothing. Preharvest interval (P.H.I.) is the number of days from treatment to harvest. In some cases the REI exceeds the PHI. The longer of two intervals is the minimum time that must elapse before harvest.

Acceptable for use on organically grown produce.

¹ Rotate chemicals with a different mode-of-action Group number, and do not use products with the same mode-of-action Group number more than twice per season to help prevent the development of resistance. For example, the organophosphates have a Group number of 1B; chemicals with a 1B Group number should be alternated with chemicals that have a Group number other than 1B. Mode of action Group numbers are assigned by IRAC (Insecticide Resistance Action Committee). For additional information, see their Web site at <http://www.irac-online.org/>.

Diseases

ALTERNARIA ROT (1/09)

Pathogens: *Alternaria alternata*, or other *Alternaria* species, *Cladosporium herbarum* and *Ulocladium altum*

SYMPTOMS

Alternaria rot, also known as surface mold, contact spot, or Alternaria internal rot, is a limiting factor in the production of figs for fresh market or for canning. All cultivars are susceptible, but the disease is most severe on Kadota, Conadria, and Calimyrna.

Surface mold caused by *Cladosporium herbarum* occurs on both green and ripe fruit, but tends to be more common on green fruit. The lesions usually occur in areas of fruit contact. Initially they are small, olive-green specks; as they enlarge the infected area turns yellowish olive and becomes sunken.

Rain or dew when figs are ripening will result in surface spotting. These spots are up to 0.2 inch in diameter, are light brown to black in color, sunken, and distributed over the entire surface of the fruit.

Alternaria is primarily a problem on ripe fruit, especially when rains occur during harvest. The first symptoms of Alternaria fruit rot are water-soaked areas, usually developing on the surface where two or three figs touch. These lesions soon are covered with dark green spores. Alternaria rot also develops as black fungal mats inside the cavity of Calimyrna and Conadria figs, beginning at the eye (ostiole) end.

COMMENTS ON THE DISEASE

Alternaria alternata, *Ulocladium altum*, and *Cladosporium herbarum* commonly occur on plant surfaces or in dying or dead tissues of plants. The pathogens overwinter on plant debris in or on the soil. After sporulation, the spores become airborne. The fungi can be carried inside fruit as conidia and/or along with soil dust.

MANAGEMENT

Rot in Kadota is reduced by picking fruit before it is overripe. Clean picking boxes and containers also reduce rot during storage. Reducing dust in the fig orchards may also limit the disease as well as reduce spider mite populations.

ASPERGILLUS ROT (1/09)

Pathogens: *Aspergillus flavus*, *Aspergillus parasiticus*, and other *Aspergillus* species

SYMPTOMS

Infection by these *Aspergilli* fungi causes the internal tissues of the cavity of fresh figs to turn bright yellow (*A. ochraceus* and *A. melleus*), bright green (*A. flavus*), brown green (*A. tamaritii*), or dark green to olive color (*A. parasiticus*). Eventually the tissues become powdery from the production of masses of spores. Parts of the cavity (usually close to the ostiole – eye of fig) or the entire interior of the figs can be infected and turn into a mass of powder (conidia of *Aspergillus* fungi).

COMMENTS ON THE DISEASE

Similar to smut, which is caused by other *Aspergillus* spp., Aspergillus rot refers to symptoms seen on fresh figs, whereas smut occurs on dried figs. Most cultivars of figs are affected by *Aspergillus* fungi, but the Calimyrna and Conadria figs are affected the most. In general, cultivars with small ostioles suffer less disease than those with larger ostioles. Decay usually begins at the eye-end of the figs when they are still green. In later stages, when the fruit is ripe, the fungus produces abundant powdery spore masses. The incidence of this type of rot is very small, for instance 1 in 2,500 figs can be infected by *A. flavus* or 1 in 10,000 figs can be infected by *A. parasiticus*. However, figs infected by *A. flavus* or *A. parasiticus* usually are contaminated with aflatoxins. Figs that are infected by *A. flavus* usually show a yellowish green fluorescence under UV light, which can be used to separate contaminated figs from uncontaminated ones.

MANAGEMENT

Avoid creating excess dust or letting the trees become water stressed. Choose cultivars with a small ostiole. No chemical treatments are recommended for this disease. For dried figs, remove figs at the processing plant that show characteristic yellowish green fluorescence.

BOTRYTIS LIMB BLIGHT (1/09)

Pathogen: *Botrytis cinerea*

SYMPTOMS

Development of Botrytis limb blight, also referred to as Botrytis dieback, begins when the fungus enters overwintering fruit and tips of shoots that have been damaged by frost. After invading fruit, the pathogen then moves into the shoots and causes cankers above and below the infected fruit, resulting in shoot dieback. The fungus can also infect through fruit or leaf scars, causing defined shoot cankers. In late winter and early spring, abundant buff-colored spores develop on the infected shoots, on blighted fruits and on cankers. In addition, if cool, wet weather prevails in spring, the pathogen infects young developing shoots, causing shoot blight. Foliage of blighted shoots wilts, becomes light green, and then eventually turns brown. Often several blighted shoots can be found per tree in spring.

COMMENTS ON THE DISEASE

Wet and cool springs favor disease development. The spores of *Botrytis* that develop on the surface of infected fruits and shoots are easily disseminated by air. Botrytis shoot blight is more common on caprifig trees than other fig cultivars because caprifigs bear fruit that is often damaged by frost in spring. Spores of *B. cinerea* contaminate the healthy mamme caprifig crop and result in significant damage when mamme fruit are stored at 50°F.

MANAGEMENT

Prune infected shoots below the cankered area to remove source of inoculum.

FIG ENDOSEPSIS (1/09)

Pathogens: *Fusarium moniliforme*, *Fusarium solani*, and *Fusarium dimerum* (= *F. episphaeria*)

SYMPTOMS

Fig endosepsis is also called internal rot, brown rot, eye-end rot, pink rot, and soft rot. When green, a cross-section of either infected caprifigs or edible figs will show internal streaks of pink or brown, discolored areas on the base of flowers, or sometimes entire flowers are brown. As figs ripen, the brown streaks become rusty colored spots affecting many flowers within the fig. Usually these colored spots are first found in the pulp near the eye of the fig but they can develop on any part of the pulp. No external symptoms are noticeable at this stage of infection.

As figs soften with maturity, a circular area of skin, usually beginning around the eye (ostiole), becomes water soaked in appearance. The water-soaked area eventually extends up the sides to the neck and turns purple in color. Occasionally a clear or amber-colored syrupy liquid exudes from the eye of the fig, especially in fruit of the Calimyrna variety. Even partial infection of the pulp causes off-flavor of the fruit.

In dried figs, fig endosepsis appears as a white powdery layer on the surface of the pulp in the cavity; this is the sporulation of the pathogens at the end of the drying process.

COMMENTS ON THE DISEASE

The main causal agent of fig endosepsis is *Fusarium moniliforme*, but other species of *Fusarium* can also cause endosepsis. The fungus overwinters in the summer (mamme) crop of the caprifig or as conidia in and on mummified fruit of the summer caprifig crop. In spring, it produces spores that are transferred by the wasp, *Blastophaga psenes*, when it emerges from the fruit to "pollinate" (caprify) the spring caprifig crop (profichi). The same process occurs on the summer crop of caprifigs. Wasps contaminated with spores of the fungus transmit the disease to edible Calimyrna figs when infected profichi caprifigs are transferred to the Calimyrna orchards for pollination.

Wasps carrying pollen and the fungus enter the Calimyrna figs when they are still green to lay eggs. The wasp dies inside the fruit and the fungus develops on its body. The fungus is unable to invade unripe fig tissue; infection of the pulp occurs later when the fruit begins to ripen. Both caprifigs and Calimyrna figs are affected by endosepsis as are other varieties that are pollinated by the wasp. The disease is also common in volunteer figs. Parthenocarpic (those that do not require pollination) cultivars occasionally develop fig endosepsis.

MANAGEMENT

Collect mamme caprifigs in early March as the wasps start emerging, split the fruit and discard any with internal discoloration. Treat the healthy looking split mammae figs by dipping or spraying with a registered fungicide. Hang treated figs in the profichi (spring) crop of caprifigs.

When selecting profichi caprifigs to transfer to Calimyrna orchards for pollination, discard any that show external discoloration. Also, avoid using too many profichi caprifigs when pollinating the Calimyrna crop. The best way to determine this is to sample 20 or so Calimyrna figs every 2 to 3 days during the pollination period. Split the figs in half and count the number of wasps. An average of one to two wasps per fig is ideal. If there are more than this, reduce the number of profichi figs being used; if there are less, increase it.

| Common name (trade name) | Amount to Use | R.E.I.+ (hours) | P.H.I.+ (days) |
|---|---------------|--------------------|-------------------|
| <i>When choosing a pesticide, consider information relating to impact on natural enemies and honey bees and environmental impact.</i> | | | |
| A. SULFUR# | Label rates | 24 | 0 |
| MODE OF ACTION GROUP NAME (NUMBER ¹): Multi-site contact (M2) | | | |
| + Restricted entry interval (R.E.I.) is the number of hours (unless otherwise noted) from treatment until the treated area can be safely entered without protective clothing. Preharvest interval (P.H.I.) is the number of days from treatment to harvest. In some cases the REI exceeds the PHI. The longer of two intervals is the minimum time that must elapse before harvest. | | | |
| # Acceptable for use on organically grown produce. | | | |

- ¹ Group numbers are assigned by the Fungicide Resistance Action Committee (FRAC) according to different modes of actions (for more information, see <http://www.frac.info/>). Fungicides with a different group number are suitable to alternate in a resistance management program. In California, make no more than one application of fungicides with mode of action Group numbers 1,4,9,11, or 17 before rotating to a fungicide with a different mode of action Group number; for fungicides with other Group numbers, make no more than two consecutive applications before rotating to fungicide with a different mode of action Group number.

FIG MOSAIC (7/06)

Pathogen: Fig Mosaic Virus (FMV - The virus agent has not yet been isolated, purified, and characterized.)

SYMPTOMS

Fig mosaic can cause symptoms on both leaves and fruits. On leaves, mosaic spots are distinctly yellow, contrasting with normal green color of the foliage. The margins of the yellow spots blend gradually from a light yellow color into the dark green of healthy tissue. Mosaic spots or lesions may be uniformly scattered over the surface of the leaves or may appear as irregular patches of light green diffused widely throughout the leaf blade. Later in the season, a rust-colored band develops along the border of the mosaic spots, apparently caused by the death of epidermal or subepidermal cells.

Deformed leaves may occur on the same twig as normal leaves. Mosaic spots on fruits are very similar to those on leaves, but less conspicuous. Premature fruit drop may also occur in certain cultivars. Infected Calimyrna trees seem to produce smaller and fewer fruit.

COMMENTS ON THE DISEASE

Black Mission is the most seriously damaged cultivar; Kadota and Calimyrna are the least affected. *Ficus palmata*, or trees derived from seedlings having *F. palmata* as the male parent, appear to be immune to mosaic. The fig mosaic is vectored by the eriophyid mite *Aceria fici*; feeding by a single mite is sufficient to transmit the virus to a healthy seedling of *F. carica*. The virus can also be transmitted by grafting, but it is not seed borne.

MANAGEMENT

For tree propagation material, choose trees that do not show symptoms of mosaic. Examine propagated young plants carefully for symptoms of mosaic before planting them in the field. Never plant fig cultivars that are propagated from mosaic-infected trees. Controlling fig mites may help reduce incidence of this disease.

SMUT (1/09)

Pathogen: *Aspergillus niger*, *Aspergillus japonicus*, or *Aspergillus carbonarius*

SYMPTOMS

Smut causes the internal tissues of the fig cavity to turn black and powdery from the production of black spores produced by the three *Aspergillus* spp. Parts of the cavity (usually close to the ostiole) or the entire interior of the fig can be infected and converted to a mass of black powder, which is conidia of the *Aspergillus* fungi. When the dried fig is pressed, a clout of spores can erupt from the ostiole.

COMMENTS ON THE DISEASE

Similar to *Aspergillus* rot, which is caused by other *Aspergillus* spp., smut refers to symptoms seen on dried figs whereas *Aspergillus* rot occurs on fresh figs.

Most cultivars of figs are affected by the smut fungus, but the Black Mission, Brown Turkey, and Kadota cultivars experience less damage than Adriatic and Calimyrna. In general, cultivars with small ostioles (pores) suffer less disease than those with larger ostioles. Decay usually begins at the eye-end of the figs when they are still green. In later stages, when the fruit is ripe, the fungus produces abundant black spore masses that are transferred to healthy fruit by nitidulid beetles, vinegar flies, and thrips. In some years up to 30% of the crop can be infected by the smut fungi, causing significant losses. Infected fruit is worthless and cannot be used except for feeding cattle.

MANAGEMENT

Remove all old fruit culls and refuse from the orchard on which driedfruit beetles and vinegar flies might breed. Also, avoid creating excess dust, especially during August when fruit becomes susceptible to the smut fungi. No chemical treatments are recommended for this disease.

SOUR ROT (7/06)

Pathogens: Various yeasts (*Saccharomyces*, *Pichia*, *Hanseniaspora*, *Kloeckera*, *Candida*, *Torulopsis* spp.) and bacteria

SYMPTOMS

Symptoms of sour rot, or souring, are more distinct on fruit of cultivars that need no caprification (pollination), such as Adriatic figs. In cultivars needing caprification (e.g., Calimyrna), the symptoms of souring may be confused with the symptoms of endosepsis. The symptoms of souring become noticeable only when the fruit ripens and the eye opens.

Infected figs develop a pink color and later become water soaked. A pink syrupy liquid exudes through the eye, dropping on to the leaves or jellying at the eye; gas bubbles and the odor of fermentation are characteristic of this disease. In later stages the pulp disintegrates and usually is covered by a white scum. The affected figs turn soft and black, sag, shrivel, dry up, and either drop or hang on the twig until harvest. A dead spot or eye canker often develops in the bark around the attachment of the stem of the fruit.

COMMENTS ON THE DISEASE

Nitidulid beetles and vinegar fruit flies are the primary carriers of yeasts and other microflora that cause souring.

MANAGEMENT

No chemical controls are suggested. However, controlling driedfruit beetles, *Carpophilus hemipterus*, and vinegar (fruit) flies, *Drosophila melanogaster* and *D. ampelophila*, may have some benefit in reducing souring.

Nematodes (7/06)

Scientific Names: Lesion nematode: *Pratylenchus vulnus*
 Root knot nematode: *Meloidogyne incognita* and *M. javanica*
 Dagger nematode: *Xiphinema index*

DESCRIPTION OF THE PESTS

Nematodes are microscopic roundworms that live in diverse habitats. Plant parasitic nematodes live in soil and plant tissues and feed on plants by puncturing and sucking the cell contents with a spearlike mouthpart called a stylet.

DAMAGE

Little information is available on damage to figs resulting from a nematode infestation. Lesion, root knot, and dagger nematodes are known to cause reduction in growth and yield. The trees are likely to be more susceptible to temperature and water stress.

SYMPTOMS

The symptoms described below are indicative of a nematode problem, but are not diagnostic as they could result from other causes as well. Lesion nematode infested trees may appear stunted with very few feeder roots. The roots may have reddish brown lesions that eventually turn dark. Root knot nematode infested trees are also likely to have reduced growth and appear stunted. The roots have distinctive swellings, called galls. Dagger nematode causes gall formation on root tips.

FIELD EVALUATION

If the symptoms described above are present and no cause is evident, sample the orchard to determine if lesion, root knot, dagger, or other plant parasitic nematodes are present.

If nematode species have not previously been identified, take soil samples and send them to a diagnostic laboratory for identification. Divide the field into sampling blocks of not more than five acres each that are representative of cropping history, crop injury, or soil texture. Within each block, take several subsamples randomly from the frequently wetted zones at the edge of the tree canopy. Take samples from within the root zone (6 to 36 inch depth) and include some feeder roots when possible. Mix the subsamples thoroughly and make a composite sample of about 1 quart (1 liter) for each block. Place the samples in separate plastic bags, seal them and place a label on the outside with your name, address, location, and the current/previous crop and the crop you intend to grow. Keep samples cool (do not freeze), and transport as soon as possible to a diagnostic laboratory. Contact your farm advisor for more details about sampling, to help you find a laboratory for extracting and identifying nematodes, and for help in interpreting sample results.

MANAGEMENT

Nematode problems on fig in California have not been extensively studied, so no specific treatment recommendations are made. However, trees planted in fumigated soil are known to grow considerably better than trees planted in nonfumigated soil. Metam sodium* (Vapam, Soil Prep) and 1,3-dichloropropene* (Telone 11) are available for preplant use on figs. Fumigants such as metam sodium* (Vapam, Soil Prep) and 1,3-dichloropropene* (Telone 11) are a prime source of volatile organic compounds (VOCs), which are a major air quality issue. Fumigate only as a last resort when other management strategies have not been successful or are not available.

* Permit required from county agricultural commissioner for purchase or use.

This material is partially based upon work supported by the Extension Service, U.S. Department of Agriculture, under special project Section 3(d), Integrated Pest Management.

PRECAUTIONS FOR USING PESTICIDES

Pesticides are poisonous and must be used with caution. READ THE LABEL BEFORE OPENING A PESTICIDE CONTAINER. Follow all label precautions and directions, including requirements for protective equipment. Apply pesticides only on the crops or in the situations listed on the label. Apply pesticides at the rates specified on the label or at lower rates if suggested in this publication. In California, all agricultural uses of pesticides must be reported. Contact your county agricultural commissioner for further details. Laws, regulations, and information concerning pesticides change frequently. This publication reflects legal restrictions current on the date next to each pest's name.

Legal Responsibility. The user is legally responsible for any damage due to misuse of pesticides. Responsibility extends to effects caused by drift, runoff, or residues.

Transportation. Do not ship or carry pesticides together with food or feed in a way that allows contamination of the edible items. Never transport pesticides in a closed passenger vehicle or in a closed cab.

Storage. Keep pesticides in original containers until used. Store them in a locked cabinet, building, or fenced area where they are not accessible to children, unauthorized persons, pets, or livestock. DO NOT store pesticides with foods, feed, fertilizers, or other materials that may become contaminated by the pesticides.

Container Disposal. Dispose of empty containers carefully. Never reuse them. Make sure empty containers are not accessible to children or animals. Never dispose of containers where they may contaminate water supplies or natural waterways. Consult your county agricultural commissioner for correct procedures for handling and disposal of large quantities of empty containers.

Protection of Nonpest Animals and Plants. Many pesticides are toxic to useful or desirable animals, including honey bees, natural enemies, fish, domestic animals, and birds. Crops and other plants may also be damaged by misapplied pesticides. Take precautions to protect nonpest species from direct exposure to pesticides and from contamination due to drift, runoff, or residues. Certain rodenticides may pose a special hazard to animals that eat poisoned rodents.

Posting Treated Fields. For some materials, *restricted entry intervals* are established to protect field workers. Keep workers out of the field for the required time after application and, when required by regulations, post the treated areas with signs indicating the safe re-entry date. Check with your county agricultural commissioner for latest restricted entry interval.

Preharvest Intervals. Some materials or rates cannot be used in certain crops within a specified time before harvest. Follow pesticide label instructions and allow the required time between application and harvest.

Permit Requirements. Many pesticides require a permit from the county agricultural commissioner before possession or use. When such materials are recommended, they are marked with an asterisk (*) in the treatment tables or chemical sections of this publication.

Processed Crops. Some processors will not accept a crop treated with certain chemicals. If your crop is going to a processor, be sure to check with the processor before applying a pesticide.

Crop Injury. Certain chemicals may cause injury to crops (phytotoxicity) under certain conditions. Always consult the label for limitations. Before applying any pesticide, take into account the stage of plant development, the soil type and condition, the temperature, moisture, and wind. Injury may also result from the use of incompatible materials.

Personal Safety. Follow label directions carefully. Avoid splashing, spilling, leaks, spray drift, and contamination of clothing. NEVER eat, smoke, drink, or chew while using pesticides. Provide for emergency medical care IN ADVANCE as required by regulation.

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