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Control of Insects, Mites and Diseases of Florida's Dooryard Citrus Trees¹

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Insects, mites, and diseases are common problems to the Florida homeowner with a dooryard planting of citrus. The object of this circular is to aid him in the control of these pests.

Frequently, more harm than good comes from an attempt to control these pests with pesticides. To be successful, the **right material** should be applied at the **right time** using the **right amount** in the **right manner**. If any of these conditions cannot be met, it is usually better not to spray at all.

In order to acquaint the home citrus grower with insects, mites, and diseases and their control, the subjects are discussed in the following order: individual problems; beneficial insects, mites, and fungi; approaches to the control of citrus pests; dooryard pest control chart; suggested spray programs; sprayers; and precautions in the use of pesticides.

INDIVIDUAL PROBLEMS

Mites

Citrus rust mites have an annulate, wedge-shaped body, lemon-yellow in color and about 1/200 inch in length. They have 2 pairs of legs and piercing-sucking

mouthparts. They can just barely be seen with the naked eye and can be seen better with a 10-power magnifying glass.

The life cycle of the citrus rust mite is completed within 5-7 days during the summer. Eggs are spherical (round), transparent, and laid singly on leaves, stems, and fruit of all commercial citrus varieties. The mite has 2 immature stages that are similar to the adult in appearance. Although present throughout the year, in Florida the citrus rust mite is most prevalent during the summer months.

Injury from extensive citrus rust mite feeding causes surface blemish to the fruit. This can reduce the external quality of marketable fruit, and reduce yield by causing premature fruit drop and reduced fruit size. None of these affects the internal fruit quality.

Citrus red mites (purple mites) are only about 1/50 inch long. They are bright red to deep purple in color and infest leaves, fruit, and new growth. Injury results from feeding and appears as a scratching or etching of fruit and the upper surface of leaves. In periods of prolonged dry weather, they can cause a collapse of leaf cells and even leaf drop. Use a 10X magnifying glass to inspect for citrus red mites and

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eggs on the upper surface of the leaf, looking especially along the midrib, as well as in angular crevices of the leaf stems and the young, tender twigs. Citrus red mites are more numerous from May through July, but can be the most damaging in the fall and winter months during periods of low rainfall or inadequate irrigation.

Texas citrus mites are about the same size as citrus red mites, but are brownish-green in color with dark brown to greenish spots or bars near the lateral margins (edges). Numbers of mites are generally much heavier along the midrib on the upper surface of leaves. They also are most numerous May through July, and most damaging October through February.

Six-spotted mites are also about the same size as citrus red mites but are white-yellow to sulfur-yellow in color. Adults usually have six dark spots that are barely visible with a 10-power magnifying glass, arranged in two rows on the back or abdomen. These mites live in colonies on the under surface of leaves, especially along the veins and midribs. Injury appears as yellow spots, often cupped toward the top of the leaf. Six-spotted mites prefer grapefruit, but can be found occasionally on other varieties of citrus. They usually appear in early February and have disappeared by mid July.

Insects

Purple scale and **Glover scale** (long scale) are very similar in appearance and habits, but Glover scale is longer and narrower. The covering of the mature scale is purplish-brown in color and about 1/8 inch long. These scales suck juices from leaves, fruit, twigs, and branches. Injury to leaves results in yellow or chlorotic spots. These scales can cause leaves and fruit to drop, as well as cause twigs and branches to die. They are often overlooked because they are found primarily on the inner parts of the tree.

Chaff scale forms a light brown, nearly round armor closely resembling a piece of wheat chaff. Where abundant on the bark, the limbs appear to be covered with chaff. This scale infests leaves, fruit, and bark, causing green spots on the fruit.

Citrus snow scale is a pest in most parts of citrus growing areas of Florida. Male scales have elongated white armor, while females are mahogany colored, making them inconspicuous and hard to see against tree bark. They are largely confined to the trunk, limbs, and twigs.

If its parasite is not active in your area, chemical control may be necessary. Be sure to thoroughly wet all infested bark.

Florida Red scale and **Yellow scale** are armored scales of similar size and shape. The armor or covering of the adult female is almost circular in outline for both scales; however, the yellow scale is yellow to light orange in color, while Florida Red scale is dark reddish-brown with a nipple-shaped center that is grayish to reddish-yellow. These insects infest leaves and fruit, and can cause them to drop.

Do not mistake Florida Red scale for fungus killed whiteflies.

Cottony cushion scale is rarely of economic importance except in nurseries and on young trees. The mature female is conspicuous because of her fluted white egg sac. The Vedalia ladybeetle feeds on this scale and usually keeps it under control but cannot always be depended upon on young trees.

Whiteflies primarily attack new growth. The nymph (immature stage), which is transparent and seldom recognized, infests the underside of the leaves, withdrawing copious quantities of sap, resulting in some injury to the trees. Dooryard growers also object to sooty mold fungus, which in turn grows in the honey-dew excreted by the immature stages of the whitefly. Never spray the trees when a large number of adult whiteflies are present. Instead, wait 10 to 12 days until most of the adult whiteflies have disappeared. This will allow enough time for the eggs to hatch and the young to be killed before they can cause much damage.

The citrus blackfly is a close relative of the common whitefly often seen in Florida. The adult fly is about 1/25 of an inch long and slate blue-black in color. Eggs are laid in a distinctive spiral pattern on the underside of leaves with about 28 to 34 eggs in each spiral. The larvae change from dusky color through dark brown to black as they grow. The pupae are shiny black, spiny, and oval in shape. Homeowners should look for this insect on the underside of leaves and report suspected infestations to the local county Extension office.

Mealybugs have a segmented body which is covered with mealy white wax. They are most common during the spring and early summer, but are frequently found during the winter in tree crotches and under loose bark. Mealybugs may become so

numerous following fruit set that their feeding under the button of young fruit may cause the fruit to drop. They also collect in masses between fruit clusters. Sooty mold can also be severe following a mealybug infestation.

Aphids or plant lice attack young, tender growth and cause leaves to wrinkle and curl. Insecticides should be applied to infested young growth **before the leaves curl**. There is little value in applying an insecticide after many leaves are curled or new growth is nearly mature.

The **orange dog** is often a pest of young citrus trees. As an adult, the species is a large black and yellow swallowtail butterfly. However, it is named from the larva, which is an ugly brown and white caterpillar which grows to a length of 1 1/2 to 2 inches. During the summer and early fall, these caterpillars may be quite destructive on young trees. Pick caterpillars off young trees by hand.

Several kinds of **grasshoppers** and **katydids** feed on the leaves of citrus trees, but usually are not important pests of dooryard trees. Eggs of the broad-winged katydid are laid along the leaf margins and arouse the interest of many home gardeners.

SOME BENEFICIAL ORGANISMS

There are many beneficial parasites (tiny, wasp-like insects), predators (insect and mite) and pathogens (predominantly fungi) that attack various pests of citrus. In many cases, natural enemies regulate potential pests. This is referred to as biological control.

Parasitic wasps. Many wasp-like parasites, particularly of the genus *Aphytis*, effectively control a wide range of armored and soft scale pests. Most noteworthy are the parasites of purple scale, Florida Red scale (Plate 33), and citrus snow scale.

Fungi. Two parasitic fungi, *Aschersonia* spp. and *Aegerita* sp. are commonly found infecting immature whiteflies of citrus. Red *Aschersonia* forms pink and reddish pustules 1/8 inch or less in diameter on the underside of leaves. It is so colorful that many growers are quite concerned when it appears and usually think it is harmful. *Aegerita* or brown whitefly fungus appears as cinnamon pustules about 1/8 inch in diameter on the underside of leaves. This fungus is often confused with Florida Red scale.

Other fungi such as *Hirsutella thompsonii* and *Triplosporium floridana* attack citrus rust mite and Texas citrus mite, respectively. *H. thompsonii* is particularly important in reducing citrus rust mite populations in the summer.

Predators. Several insect and mite predators such as the ladybeetles (adult and larvae) and lacewings (larvae) feed upon eggs and other stages of insects and mites. Most are general in their feeding habits and exhibit an overall effect on pests throughout the year.

DISEASES

Scab is a fungus disease that attacks young leaves, small fruit, and tender twigs of grapefruit, Temple, Murcott honey orange, lemons, sour orange, Satsumas, and some varieties of tangelos. It causes raised, light brown, corky areas on fruit and leaves.

Melanose is a fungus disease that attacks young fruit primarily of grapefruit, however, other citrus varieties may be affected. The injury to fruit is often confused with rust mite injury, which has a smoother feel. This rind blemish does not affect the quality of the fruit. While scab is more important on young trees, melanose is more injurious to older trees. Trees are usually over 10 years of age before melanose becomes a problem. Since melanose grows in dead wood, keeping the trees free of such wood will aid in the control of this disease.

Greasy spot is a fungus disease that attacks all varieties of citrus grown in Florida. Infection occurs mostly in the summer, but symptoms do not appear until two to nine months later. Symptoms first show up as yellowish-brown spots on the leaves. The spots develop a slightly blistered appearance on the underside of the leaves, and ultimately become oily brown or black. Spots vary in size from small dots to 1/4 inch in diameter. Where several spots coalesce (grow together), the areas covered may be considerably larger. This disease can cause serious premature defoliation during the winter. This disease may also infect the fruit rind, especially on grapefruit, causing specks to appear in areas between the oil glands.

Good spray coverage of the lower leaf surface is essential for satisfactory control.

Sooty mold may blacken leaves of the entire tree. Aphids, mealybugs, certain soft scales, and

particularly immature whiteflies excrete a sweet, syrupy material known as honey-dew. The sooty mold fungus grows wherever this material falls. Controlling these insects will prevent sooty mold, and oil sprays will usually cause it to flake off, making the leaves and fruit bright and shiny.

APPROACHES TO THE CONTROL OF CITRUS PESTS

Homeowners with a few citrus trees should follow one of the following courses in the control of insects and diseases:

1. **Do not apply pesticides.** Depend entirely on natural control of predaceous insects and mites, parasitic insects and diseases, weather, and other factors. There are many instances where dooryard, and even commercial plantings are never sprayed or dusted, and yet the trees survive and produce good crops of satisfactory fruit. Under this program, yield may be reduced and external quality will usually be low.
2. **Control individual problems when they first appear.** Make frequent inspections, identify the problems, and apply the recommended pesticides before infestations can become severe. These steps require: 1) learning to identify the more common pests of citrus; 2) detecting their presence early; 3) sprays timed to give effective control. Unfortunately, most homeowners do not find this practice easy to follow and the results are often unsatisfactory. Frequently, the pests cause severe damage before they are detected.
3. **Follow the spray program suggested in this circular.** This schedule may need to be supplemented in the event insects such as grasshoppers, katydids, and other less common pests attack citrus trees between the regular sprays.

Suggested Spray Program

There is no simple rule one can follow which will always result in bright fruit and vigorous trees. However, there is a rather simple spray schedule that can be followed which will control most pests and result in thrifty trees producing fruit of good quality, but not necessarily always of a bright color. A schedule of this type usually requires three or possibly four spray applications per year. A suggested spray

program follows. (Substitutes can be made - see Table 1.)

- Postbloom (4 weeks after petals fall) - Copper plus a recommended miticide.
- Summer (July) - Benlate or copper plus Ethion plus .5% spray oil.
- Fall - Recommended miticide for citrus rust mite and spider mite control.

Sprayers

Many of the failures to control citrus pests that are charged against the pesticide are quite often the result of **improper application and timing**. A gardener who has a substantial number of citrus trees is advised to get a good sprayer. One to three-gallon compressed air models can be used while trees are small. These models are not expensive. Air pressure is pumped up by hand, and the nozzle, which is at the end of a short wand, delivers a fine spray which can be accurately directed to all surfaces.

When trees become large and cannot be thoroughly covered by this type of sprayer, dooryard citrus growers should either obtain a small power sprayer or hire someone with adequate equipment to insure thorough coverage of the entire tree. If these conditions cannot be met, it is generally better not to apply sprays at all.

Sprayers which attach to the end of garden hoses are generally not satisfactory for use on mature citrus trees. The spray pattern is usually coarse, and it is very difficult to direct the spray to reach and adequately cover the undersides of the leaves, especially those near the ground, and the side of plants close to a building or fence. If a hose attachment sprayer is used, the emulsion concentrate formulation of insecticide is preferred over the wettable powder.

PRECAUTIONS IN THE USE OF PESTICIDES

Care in Handling Pesticides. Treat all pesticides as poisons and handle according to the cautions on the manufacturer's product labels. **Always read the label** carefully and completely before using any pesticide.

Pesticide Residues. Citrus consumed by the producer should be prepared by the generally

accepted practices of washing, peeling, etc. Dooryard fruit that is offered for sale must conform with federal and/or state food and drug pesticide residue regulations. Copper and oil emulsions are exempt from a tolerance, and no waiting period is required. Waiting periods between last application of certain pesticides and harvest of fruit are as follows: Benlate - no time limitation; Ethion - 21 days on lemons and limes; no time limitation on orange, grapefruit, tangelo, tangerine; do not repeat application within 90 days; Kelthane - 7 days; Malathion - 7 days.

Oil Emulsion Sprays. Do not apply oil emulsion sprays during the fall or winter months or to a tree that shows signs of wilting. Allow at least 6 weeks to elapse between applications. Do not mix oil with sulfur. Apply the two separately, allowing at least a

three-week interval between applications, or injury to fruit and foliage may result.

Herbicides (weed killers). Another problem that should be of concern to dooryard citrus growers is the use of weed killers on lawns. If a weed killer is used, be sure it is not used close enough to citrus to result in residues in the fruit; or be sure it is approved for use around citrus trees.

Household Sprays. Several homeowners have made the mistake of spraying citrus trees and other plants with sprays formulated specifically for use inside homes to control household pests. These sprays, in general, have the insecticide dissolved in some type of petroleum solvent such as refined (deodorized) kerosene and should not be applied to plants because injury to the plants usually results.

Table 1. Dooryard Citrus Pest Control Chart.

Pest	Material ¹	Other Pests Controlled	Remarks
Scale	Ethion	Rust mites Spider mites	Controls citrus snow scale only.
	Ethion + oil	Rust mites Spider mites Aphids	Controls most species of scale insects.
	Malathion	Mealybugs Whiteflies Grasshoppers & katydids	Does not control chaff scale.
	Oil	Whiteflies Spider mites Greasy spot Loosens sooty mold	Does not control snow scale. Do not apply if trees are wilting or in a near wilt state. Do not apply within 3 weeks of sulfur. Oil applied after October may increase susceptibility of trees to cold damage and may reduce the crop the following year. Oil applied in the fall may inhibit solids formation and retard fruit coloring.
Rust mites	Ethion	Spider mites Citrus snow scale	

Table 1. Dooryard Citrus Pest Control Chart.

Pest	Material ¹	Other Pests Controlled	Remarks
	Ethion + oil	Most species of scale insects Spider mites	
	Kelthane	Spider mites	
Spider mites	Ethion	Rust mites	
	Ethion + oil	Rust mites Most species of scale insects	
	Kelthane	Rust mites	
	Oil	Scale (does not control citrus snow scale) Whiteflies Greasy spot Loosens sooty mold	See comments under scale pests.
Aphids	Malathion	Mealybugs Scale Whiteflies Grasshoppers & katydids	
Mealybugs	Malathion	Scale Aphids Whiteflies Grasshoppers & katydids	
Whiteflies	Oil	Scale Spider mites Greasy spot Loosens sooty mold	
	Malathion	Scale Mealybugs Aphids	
Grasshoppers & katydids	Malathion	Scale Mealybugs Aphids Whiteflies	
Scab	Copper fungicide spray		Apply before new growth starts in the spring and when 2/3 of petals have fallen.
	Benlate		

Table 1. Dooryard Citrus Pest Control Chart.

Pest	Material ¹	Other Pests Controlled	Remarks
Melanose	Copper fungicide spray	Scab	Apply spray thoroughly to young fruit, 4 weeks after the flowers shed.
Greasy spot	Copper fungicide spray		July. Sprays of copper may blacken existing corky areas of the rinds, but this will not affect eating quality.
	Benlate		July.
	Oil		July. See comments under scale pests.
¹ Read label thoroughly; follow label directions for mixing and application rates.			