will bring this potentially serious disease to the attention of growers so that they will be watching for it and will report its appearance to us if it attacks their trees.

Dusting the blossom panicles with finely ground sulfur just before the opening of the flowers and again in about two weeks is said to give effective control in India. Sulfur has not been tested under Florida conditions. A proprietary dinitrophenyl crotonate (Karathane WD) was used on mango bloom at the rate of 0.5 pound per 100 gallons of water of a formulation containing 25 percent of the active ingredient at Boynton in 1954 and again in 1955. No checks were left but the grower is of the opinion that the treatment was effective. A 0.6 pound per 100 gallons rate was used once on severely infected bloom in a grove on Merritt Island in 1955. Little fruit set on the sprayed blooms of Zill trees which appeared to be more severely attacked than trees of other varieties, but the trees put forth a second bloom less severely attacked from which considerable fruit set, so presumably the treatment was effective. Dinitrophenyl crotonate is compatible with and may be added to the carbamate fungicides in the anthracnose program.

INSECTS AND MITES OF MANGOS AND AVOCADOS

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Of the different sub-tropical fruits grown in Florida, mangos and avocados make up the largest commercial production.

Numerous insects and mites infest these sub-tropical fruits, but most of them can be controlled satisfactorily if inspections and thorough pesticide applications are made at the proper time.

MANGO

SCALES

Among the most important pests that attack mangos are scales that infest the leaves. Soft scales commonly observed include pyriform scale, *Protopulvinaria pyriformis* Ckll.; mango shield, *Coccus mangiferae* (Green); acuminate, *Coccus acuminatus* (Sign.) and Florida wax, *Ceroplastes floridensis* Comst. Florida red, *Chrysomphalus aonidium* (L.) and dictyospermum, *Chrysomphalus dictyospermi* (morg.), are armored scales that may infest leaves and twigs.

Lesser snow scale, *Pinnaspis strachani* (Cooley), is common on the trunks, branches and twigs and gives the appearance of a whitish mold.

An excellent time to control scales is the period immediately following harvest. Emulsive oil, parathion or malathion, may be used for control of pyriform, mango shield and acuminate scales. One pound of 15% parathion wettable powder or 1 gallon of 80 to 90% emulsive oil per 100 gallons of water is effective. Three to 4 pounds of 25% malathion wettable powder per 100 gallons may be used. In a recent test by Dr. D. O. Wolfenbarger, 1 pound of 15% parathion wettable powder was more effective than 2, 4 or 6 pounds of 25% malathion wettable powder in control of pyriform scale on avocado leaves. Control of Florida wax scale is apparently more difficult than that of other soft scales. A spray application by Dr. Wolfenbarger last December of 1½ gallons of emulsive oil combined with 1½ pounds of 15% parathion wettable powder in 100 gallons of water was very effective.

For control of lesser snow, Florida red and dictyospermum scales, 1 to 1½ gallons of 80 to 90% emulsive oil or 1½ to 2 pounds of 15% parathion wettable powder per 100 gallons of water is recommended.

MITES

Two species of mites have been recognized infesting mango leaves. The avocado red mite, *Paratetranychus yothersii* (McG.), and the tumid mite, *Septanychus tumidus* (Banks), infest primarily the upper surface of leaves and remove leaf juices, causing a stippling or etching of the leaf. Leaves frequently become reddish or bronze colored and may drop.

Three to 4 quarts of emulsive oil per 100 gallons of water will give good control of both

species of mites. It kills mites and eggs. Wettable sulfur at 10 pounds per 100 gallons of water or sulfur dust will control the avocado red mite, but apparently does not control the tumid mite. Do not mix oil with sulfur or use one within 3 or 4 weeks of the other.

A combination of 3 quarts of emulsive oil plus 1 pound of 15% parathion wettable powder is effective for control of scales and mites. The amount of oil is low and not likely to cause injury to the trees. One application of this combination made after harvest will ordinarily give satisfactory scale control for a year.

Thrips

Red-banded thrips, *Selenothrips rubrocinctus* (Giard.) infest the underside of the leaves. Populations usually remain low because of natural enemies and unfavorable conditions, but they become numerous enough at times to cause defoliation. Characteristic dark spots on the underside of the leaves resulting from deposits of fecal waste are associated with thrips.

Benzene hexachloride (BHC), 2 pounds of 10% gamma isomer wettable powder per 100 gallons of water, has been recommended. Dr. Wolfenbarger has recently found 1 pound of 25% (½ pound of 50%) dieldrin wettable powder or 1 pint of the emulsifiable concentrate (containing 1.5 pounds of dieldrin per gallon) per 100 gallons of water to be the most effective material for thrips control. Dieldrin may be used satisfactorily with copper or carbamate fungicides for disease control or with parathion or sulfur for insect control.

Infestations of Florida flower thrips, *Frankliniella cephalica* (D. L. Crawford), are common in mango bloom, but it is doubtful that their control would cause any increase in fruit.

Mealybugs

The citrus mealybug, *Pseudococcus citri* (Risso), may become abundant on growing mango fruit. Only a few fruit on a tree may become infested and result in spotted, unattractive fruit. Sprays of 1 pound 15% parathion wettable powder or 4 pounds of 25% malathion may be used. If the infestations are not large, it may be practical to remove the insects with a stream of water under pressure or a soft-bristled brush.

Banded Cucumber Beetle

The banded cucumber beetle, *Diabrotica balteata* Lec., may damage tender new growth. Young trees are more severely infested. Benzene hexachloride (BHC) at the rates listed under thrips is recommended for control.

Caterpillars

Two lepidopterous larvae, *Argyrotaenia amatana* (Dyar) (no common name), and the cotton square borer, *Strymon melinus* (Dyar), feed in bloom panicles. The populations of these caterpillars have not been sufficient to warrant a control recommendation.

Borers

Several species of ambrosia beetles (family Scolytidae) may attack mango trees. These beetles make small tunnels into the trunk or branches or may burrow around the bases of twigs or grafts. They may kill trees. They may attack trees cut back for grafting or injured by wind or large trees that have been transplanted.

Healthy, vigorously growing trees provide best control of ambrosia beetles. Two pounds of benzene hexachloride (BHC) wettable powder (10% gamma isomer) or 1 pound of lindane wettable powder (25% gamma isomer) have been suggested for those who desire to spray.

Dr. D. O. Wolfenbarger suggests a schedule for making inspections of pests on bearing mangos.

AVOCADOS

Mites

Avocado red mites discussed above under mangos are usually most abundant in January and February. Their injury to avocado is very similar to that of mango. Sulfur dust at 40 pounds per acre or a spray containing 8 pounds of wettable sulfur per 100 gallons of water is recommended. Oil emulsion sprays for scale control will also control these mites.

Scales, Mealybugs, Whiteflies

Dictyospermum scale is the most important scale on avocado and is usually present throughout the year. Florida wax, pyriform and latania scale, *Aspidiotus lataniae* Sign., are frequently found on avocado leaves but are usually of little economic importance. Spot

Period	Pest to look for	Where to look	Control
Pre-bloom (November to March)	Mites	On upper leaf surface, along midrib, near terminus.	Sulfur 1/
	Scales	Leaf surfaces, upper and lower	Parathion or emulsive oil
Bloom	Mites	On upper leaf surfaces along midrib, near terminus of leaf	Sulfur 1/
Fruit	Mealybug	Surface of fruit, in clusters behind leaves	Mechanical
Post-harvest (Immediately after harvest until pre-bloom)	Scales 2/	Leaf surfaces, upper and lower	Parathion or emulsive oil
	Red-banded thrips 3/	Lower leaf surfaces, along midribs	Dieldrin

1/ If sulfur is not satisfactory in control another miticide should be used.

2/ A most opportune time for scale insect control is the period immediately following harvest.

3/ These insects may be found soon after harvest until the pre-bloom period.

spraying of individual infested trees is recommended.

Mealybugs are occasionally abundant on fruit and leaves on individual trees in summer and fall. Spot spraying of individual trees or dislodging mealybugs with water under pressure or with a soft-bristled brush are recommended controls.

The avocado whitefly, *Trialeurodes floridensis* Q. is not as large as the citrus whitefly. They are frequently abundant on young leaves and are more common on young trees than mature trees. There has been little need for control.

Where chemical treatment of the above scales, mealybugs or whiteflies is needed, a spray combination of 1 pound of 15% parathion wettable powder plus 3 quarts of emulsive oil per 100 gallons of water is the suggested control.

Red-Banded and Greenhouse Thrips

Red-banded thrips, *Selenothrips rubrocinctus* (Giard.), may become numerous enough to cause defoliation of trees, especially during dry weather. Look for characteristic dark specks on the undersides of the leaves. Feeding of red-banded and greenhouse thrips, *Heliothrips haemorrhoidalis* Bouche, on maturing fruit has become an economic problem and many fruits are reduced to culls. Thrips are commonly found on fruit in areas that are in contact with another fruit or leaves. Feeding in this area causes the fruit to become rusty colored. Cracking of the skin and fruit rot may result. Control measures are the same as for red-banded thrips under mangos.

Mirids, Lace Bugs, Cucumber Beetles

As the trees come into bloom, small brownish-green plant bugs with piercing sucking mouthparts, which have been feeding on Span-

ish needle or other plants, may be found in avocado flower clusters and opening buds. They are believed to feed on buds, flowers and recently set fruit, causing reduced fruit set and dropping of young fruit.

The avocado lace bug, *Acysta perseae* Heid., is rarely a problem, but may become abundant and cause severe defoliation. It is very small with sucking mouthparts and is more common in warmer, dry spring months.

Banded cucumber beetles as discussed under mangos may occasionally cause serious damage in their feeding on the tender leaves of new avocado growth. Young trees have been more heavily infested.

Mirids, avocado lace bugs and banded cucumber beetles may be controlled with a spray made of 2 pounds of benzene hexachloride wettable powder (10% gamma isomer) or 1 pound of lindane wettable powder (25% gamma isomer) per 100 gallons of water. Parathion at 1 pound of 15% wettable powder per 100 gallons of water may be expected to control these insects.

Caterpillars

The avocado leaf-roller, *Gracilaria perseae* Busck, may be found feeding on avocado leaves throughout the year. The larvae roll the leaves and feed within the roll. This insect is believed to cause most of the holes in the leaves. Repeated applications of insecticide may be needed to control. The cost of control is usually considered to be greater than justified by the results.

A leaf tier type of insect, *Argyrotaenia amatana* (Dyar) (no common name), is among the lepidopterous larvae that are present in most groves about blossoming time. The caterpillars feed on flowers, leaves and young fruit. They spin webs and the petals, stems and other parts are massed together. There may be several species. Feeding of the larvae causes loss of some fruit and fruit injury. It is suggested that controls be made as the trees reach the peak of bloom.

Bagworms may be abundant on some trees. Most damage appears to be on foliage on the upper branches.

Where treatment is needed, the above three groups of lepidopterous larvae discussed under the general heading of caterpillars can be controlled by a spray containing 3 pounds of lead arsenate per 100 gallons of water.

Pumpkin Bugs

These sucking insects are more commonly found on mature fruit. Parathion at 1½ to 2 pounds of 15% wettable powder per 100 gallons of water is recommended for control.

Avocado Tree Girdler

The avocado tree girdler, *Heilipus squamosus* Lec., is a native pest of avocado in southern Florida. Larvae feed in the inner bark of trees at the ground level, occasionally killing young trees. The bark of young trees is so thin the larvae burrow in the sap wood. Reddish-colored frass on the ground around trees is a sign of an infestation. Adults feed on leaf buds, young leaves, flower buds, flowers and young fruit. This insect has been decreasing in abundance since 1950. No control measures are recommended other than digging out the larvae from infested trees.

Termites

Termites occasionally kill young trees. This usually results from a mulch that contains cellulose material like chips, shavings, roots or paper bags. Termites get into these materials and then attack the young trees. Chlordane, aldrin or heptachlor may be used for control.

Grasshoppers and Katydids

Young trees and lower leaves of older trees may be attacked by these insects. Grasshoppers usually migrate from the ground cover vegetation in the grove and around the margins of the grove. If control is needed, apply dieldrin, aldrin or heptachlor at 4 ounces technical insecticide per acre to the ground cover before grasshoppers migrate to the trees.

Avocado Leafhopper

This insect is small greenish colored with sucking mouthparts. It seems to be more prevalent in the ridge section than in Dade County. Sucking out the leaf juices causes whitened or stippled areas in the leaves. Benzene hexachloride or parathion at rates under mirids are recommended for control.

Sooty Mold

Aphids, mealybugs, immature whiteflies and certain soft scales excrete a sweet, syrupy material called "honeydew". This provides an excellent medium for the fungus commonly

called sooty mold to develop. Sooty mold is common on mangos and avocados and can be prevented by controlling the insects that provide the medium for its growth.

Cautions In Use Of Insecticides

Sprays containing oil may be injurious to trees, especially under certain weather conditions and if more than 1½% oil emulsion sprays are applied. If trees are suffering from lack of moisture, as near the end of the dry season, oil sprays may cause leaves to drop, especially if unusually low temperatures follow soon after application is made. Oil emulsion sprays generally used for armored scales may "burn" many leaves if the temperature goes above 90°F. soon after application. Oil should not be mixed with sulfur or one used within 3 to 4 weeks of the other. Parathion is a phosphate insecticide that is especially toxic to humans. It should be used with caution and with safety to the operator the foremost consideration.

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A NEW HYBRID PAPAYA BACKCROSS BLUE SOLO ON SOLO

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Papaya farming anywhere is dependent on the growing of fruit from seedling plants. Papaya seedling plants are notoriously irregular in all characters. This irregularity of seedling character has been a long time and very serious detriment to the commercial production of Papaya. This paper deals with a new method in Papaya breeding that promises to solve a lot of the problems of the past.

There has been in use in the Hawaiian Islands since about 1917 a Papaya variety called Solo. This Solo variety of Papaya is certainly the oldest one in the point of years of continuous production that we know anything about.

Some 27 years ago, as the result of a series of three crosses between 4 more or less, specific varieties of Papaya, I originated the type called the Blue Solo. Technically then, the Blue Solo is a complex hybrid that is typically hermaphroditic in character. This variety has been carried on from 1928 until now by a series of different methods of inbreeding.

In the beginning, a fortuitous method of inbreeding was used. That is, a particular perfect flowered plant having the desired characters was selected out of the Blue Solo hybrid group. Seed was saved from that one plant so that plants enough could be produced to make an entire planting with a single parent plant that was hermaphroditic in character. By this method, each plant in that particular planting certainly had the same female parent and in a large majority of the seedlings the male parent was the same because of a high percentage of natural close fertilization. This practice may have had virtues that we did not realize at the time but was given up for the practice of inbreeding by self-pollination on an enforced basis.

Enforced self-pollination was carried out by tying paper bags over the flowers of a selected hermaphroditic plants, small paper bags. This resulted in no pollination except by pollen originating from the selected plant. This practice is very satisfactory but for only 3 generations. Beginning with fourth selfed-generation inbreeding degeneration sets in and it is possible to destroy a strain by this method.

By 1938 I began to practice hand pollination from selected perfect flowered plants within the Blue Solo strain onto selected female plants that were full sisters. This practice has been carried on until today and has been very satisfactory in that no degeneration is involved and that with this practice the Blue Solo has gradually evolved a fairly stable type of Papaya of reasonably suitable character for the market in the United States.