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UPDATING OF CHANGES IN PESTS, PESTICIDES AND OTHER FACTORS AFFECTING SUBTROPICAL INSECT PEST CONTROL

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Updating of changes in pests, pesticides, and related matters affecting subtropical insect pests implies comparisons of past with present conditions. This presumes that changes have taken and are taking place. Some changes are slow and subtle, others are sudden and harsh. Changes occur in insects pest's usages of pesticides, in plants, in public opinion, and in grove management. Grove owners and managers may control many changes but some are outside their influence and may be dominant factors affecting the commercial production of fruits.

Insect pests affecting avocados, limes, and mangos, the three major fruit crops of south Florida, have varied considerably in the last 30-35 years. Annual infestations of the avocado red mite, *Tetranychus yothersii* (McG.) on avocados and mangos have changed less than certain other pests. These infestations exist on some trees each year but increase greatly in other years then recede to low numbers. Scale insects infest these trees much more some years than others. The avocado tree girdler, *Heilipus squamosus* Leconte, was abundant during the 1950's but is now rarely observed. An ambrosia bettle, *Xylosandrus compactus* Eichoff, although it has been recognized for many years, was recently and locally abundant in some groves but practically absent in others. The Mediterranean fly, *Ceratitis capitata* Wiedemann, threatened Florida's crops in the late 1950's and was destroyed but it may be reintroduced. Currently the Caribbean fruit fly, *Anastrepha suspensa* (Loew), is destructive to peach, guava, rose apple, and Surinam-cherry crops. Wide variations are shown, therefore, in tropical insect pest populations.

High populations arise from favorable conditions. Sometimes one may comprehend, other times he may "guess" at the factor or factors which aid and abet the abundances. Our pests are, apparently, always present either on plants in very low numbers or near the threshold of injurious numbers awaiting favorable conditions. Epidemic population levels arise at times and the causes are often not understood by man.

Various species of scale, whitefly, leafhopper, mealybug, and other insects feeding in abundance excrete waste products which fall to surfaces of leaves, fruits, twigs, and other objects beneath. Fungi develop in these materials and black sooty covering results which reduces fruit quality. Control of the insects controls the black sooty mold on fruit, leaves and bark.

AVOCADOS

The blossom anomala, *Anomala undulata* Melsheimer, apparently very abundant years

ago, is seldom a current problem. Red-banded thrips, *Selenothrips rubrocinctus* Giard, which defoliated trees in 1947-48 are seldom seen today but may be expected to appear again. Two leaf feeding insects, the avocado leafhopper, *Adona minuenda* (Ball), and the avocado lacebug, *Acysta persea* Heid, are present and may be destructive. Although the avocado leafhopper is occasionally destructive to leaves and may be increasing, it needs watching since its relatives are often very destructive to their host plants. Infestations of the avocado leaf roller, *Gracilaria perseae* Busck, infest newly developing leaves and doubtless are injurious. It seems that control would not be economically justified unless the trees are in nurseries or have high values. Mirids, true bugs, are occasionally very destructive to flowers and young fruit. Scale insects may be injurious at times.

LIMES

Lime insect pests are similar to those affecting other citrus trees in middle Florida. Certain differences are observed, however, between south Florida and "the Ridge section." Broad mite, *Hemitarsonemus latus* Banks, infestations, although undoubtedly present throughout Florida, are very damaging to fruit production in some lime groves than in others. Chaff scales, Parlatorio, pergandii Comstock, infestations were very heavy on tree trunks above and below ground level, as found after a hurricane blew the trees over. The citrus root weevil, *Pachnaeus litus* (Germar), is very localized and sporadic; it attacks limes more than avocado or mango trees.

MANGOS

Various scale insects, pyriform, *Protopulvinaria pyriformis* Ckll.; mango shield, *Coccus mangiferae* (Green) ; acuminate, *C. acuminatus* (Sign) ; Florida wax, *Ceroplastes floridanus* Comstock and lesser snow, *Pinnaspis strachini* (Cooley), infest mango trees, branches, and twigs. Trees are injured more by these insects, probably than by others. It is highly recommended that scale control treatments be applied to trees immediately after the fruit is harvested. Such treatments will usually reduce the population until another crop has been harvested. The avocado red mite or other mite species may become abundant following the rainy season in December and January. The grower should consider this and preparations should be made to treat where control is needed.

Red-banded thrips has defoliated trees and will likely do so again when conditions become favorable for development of dense populations. Flower thrips are nearly always present in mango, avocado and other flowers and are often blamed for deficient fruit set. It is suggested that flower thrips may actually be agents of pollination unless they become too abundant (more than, perhaps, 8 to 10 insects per floret). Although spray treatments can reduce thrips infestations, yield increases have not followed such reductions.

An ambrosia beetle, *Xylosandrus compactus* Eichoff, sometimes attack branches and trunks of mango trees until the tree is killed after which another tree may become infested by the beetles which emerged from the first tree. Removal and burning of infested branches and trees is highly recommended. Maintenance of trees in healthy

conditions is highly recommended since healthy trees are not subject to beetle attacks as those having low vitality.

The blossom anomala, *Anomala undulata* Melsheimer, feeds on mango flowers and where it is abundant it reduces fruit set.

CONTROL

Oil emulsions were the usual spray treatments for scale, whitefly, and mealybug in pre-DDT times. Parathion, malathion, and other materials which followed DDT were useful in controlling many pests affecting avocados, limes, and mangos. These materials are still iiseful but have been nearly superseded by other materials. Currently a combination of ethion and oil emulsion is widely used. There are those who have great fears of using parathion and to a lesser extent other insecticides of the phosphatic group. Although use of these materials may be followed by mite increases oil combined with them seems to prevent mite increases and to aid in reducing scale, whitefly, and mealybug populations. Mites, with short life cycles, egg-to-egg in a week, might be expected to develop resistance quickly. Observations verify the expectation. Two quarts of oil per 100 gallons of water combined with 1/2 to 3/4 pound actual ethion, malathion, parathion and some other insecticides effectively control most insect-mite pests without causing plant injury. Oil has remained effective through the decades. Replacements of older effective, suitable insecticides, however, have not been developed for a number of pests.

Sulfur in dust or spray formulations gives control of the avocado red mite, broad mite and rust mite although its effectiveness may be subsiding, requiring repeat applications sooner than in the past. A need for newer miticides is apparent. Morestan 25W (6-Methyl-2, 3-quinoxaline dithiol cyclic S, 5-dithio-carbonate) and binapacryl, 50W, have been effective on avocados, at 1 and 2 pounds per 100 gallons, respectively. Infestations of the avocado red mite, however, in recent years have been so low that control treatments in most groves were unnecessary. Mites on limes may be controlled with carbophenothion, dioxathion, or dicofol, all comparatively new materials but these do not have approval for use on avocado nor mango trees.

Some materials, known as "systemics" are taken through the roots and translocated to leaves and branches where they kill insect pests. Application and use of such materials has many advantages, but they are not widely used. In a test on mango trees mites but not scale insects were controlled. Much more research is needed on systemic pesticides.

A rapid change in effectiveness of insecticides and acaricides necessitates changes in materials or frequent updating of recommendations and use. This has been observed frequently before and since the advent of DDT and will likely continue. Such changes, combined with restrictions on use, high costs and other factors have greatly reduced and are seriously limiting new pesticides. The many millions of dollars required to develop new materials hardly justify the expenses required.

FRUIT FLY INFESTATIONS

The Mediterranean fruit fly was eradicated in the 1950's by area-wide, aerial spray applications of malathion combined with a protein hydrolysate attractant, although against considerable opposition. Control of the Caribbean fruit fly might be obtained similarly except that spray applications over urban areas are objectionable. Research on a more subtle fly control program and an expensive one, using irradiated male flies is underway but results of this program have not been announced. Experiments were conducted to develop a spray program which a homeowner can use to protect his peaches, guavas, or other fruit from Caribbean fruit fly infestations. Dimethoate, approved and used for years on tomatoes, strawberries, peppers, beans, and other plants gives control. One teaspoon of 2.67 E dimethoate per gallon of water (1 pt/100 gals.) Sprayed to wet the fruit, beginning with the initial ripening and applied weekly through the ripening period gives control of fly infestations.

PEST CONTROL AND PUBLIC RELATIONS

An abrupt change in public opinion regarding use of pesticides has occurred in recent years. DDT became available in the 1940's, was tested, used widely and successfully and lauded by news media as a wonder insecticide. Within a quarter century

DDT was condemned, its use outlawed, and the application of other pesticides was threatened as storms of protest arose over pollution and contamination from the necessary use of pesticides, fertilizers, detergents and other materials. Changes in pesticidal use will continue but these must be in the form of corrections that are safe, sane, practical, and otherwise progressive.

Movements of man and his chattels have long contributed to the spread of harmful pests and disease organisms which prey on our crop plants. Quarantine and regulatory work by the U.S. Department of Agriculture and the Plant Industry Division, of the Florida Department of Agriculture and Consumer Services has been quite successful. This must continue owing to increase population levels and increased travel. As a people we must apply and use materials, such as pesticides, which have the potential of contaminating the environment, well and sanely or we will be restricted in or prevented from using them. *Insect pest and disease controls, however, must be used or agricultural production will not be sufficient to feed our populations.*