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CITRUS WHITEFLY, DIALEURODES CITRI (ASHMEAD) (HOMOPTERA: ALEYRODIDAE) 1/

H. V. WEEMS, JR.

SYNONYM: ALEYRODES CITRI RILEY AND HOWARD

INTRODUCTION: THE CITRUS WHITEFLY, DIALEURODES CITRI (ASHMEAD), WAS ONCE THE MOST IMPORTANT CITRUS PEST IN FLORIDA, BUT TODAY IT RANKS BELOW THE PURPLE SCALE, FLORIDA RED SCALE, RUST MITE, AND POSSIBLY OTHERS. IT IS NEVERTHELESS A SERIOUS PEST IN FLORIDA. A NATIVE OF INDIA, IT APPEARS TO HAVE BEEN INTRODUCED INTO FLORIDA SOME TIME BETWEEN 1858 AND 1885 (MORRILL AND BACK, 1911). IT IS NOW FOUND OUT-OF-DOORS THROUGHOUT FLORIDA AND PARTS OF OTHER GULF STATES AND CALIFORNIA[2] AND IN GREENHOUSES IN MANY PARTS OF THE UNITED STATES.

THE WHITEFLY INJURES THE PLANT BY CONSUMING LARGE QUANTITIES OF SAP, WHICH IT OBTAINS WITH ITS SUCKING MOUTH PARTS. FURTHER INJURY IS CAUSED BY SOOTY MOLD FUNGUS WHICH GROWS OVER FRUIT AND FOLIAGE IN THE COPIOUS AMOUNT OF HONEYDEW EXCRETED BY THE WHITEFLY. THIS BLACK FUNGUS MAY COVER THE LEAVES AND FRUIT SO COMPLETELY THAT IT INTERFERES WITH THE PROPER PHYSIOLOGICAL ACTIVITIES OF THE TREES. HEAVILY-INFESTED TREES BECOME WEAK AND PRODUCE SMALL CROPS OF INSIPID FRUIT. ALSO, FRUIT COVERED WITH SOOTY MOLD WILL BE RETARDED IN RIPENING AND LATE IN COLORING, ESPECIALLY THE UPPER PART, WHICH MAY REMAIN GREEN AFTER THE LOWER PORTION HAS ASSUMED THE COLOR OF RIPE FRUIT. THE FRUIT OFTEN MUST BE WASHED BEFORE IT IS PUT ON THE MARKET. A SECONDARY INJURY TO THE TREES MAY RESULT FROM AN EXCESSIVE INCREASE OF THE COMMON SCALES OF CITRUS WHICH FIND PROTECTION UNDER THE SOOTY MOLD THAT COVERS LEAVES AND BRANCHES.

DISTRIBUTION: FLORIDA, GEORGIA, SOUTH CAROLINA, NORTH CAROLINA, EASTERN VIRGINIA, ALABAMA, MISSISSIPPI, LOUISIANA (NEW ORLEANS), TEXAS (RIO GRAND VALLEY), AND CALIFORNIA; MEXICO (VERACRUZ AREA)[4]; GUATEMALA; BERMUDA; CHILE; PERU; ARGENTINA; BRAZIL[3]; FRANCE (ALPES-MARITIMES); CEYLON; CHINA; FORMOSA; INDIA; INDO-CHINA (NORTH VIETNAM, SOUTH VIETNAM); JAPAN; MACAO; PAKISTAN; SIKKIM. SOME RECORDS OF D. CITRI APPLY TO D. CITRIFOLII (MORGAN).

HOSTS: CITRUS IS THE MOST IMPORTANT HOST, BUT THE FOLLOWING ARE ALSO FOOD PLANTS---ALLAMANDA, BANANA SHRUB, BOSTON IVY, CAPE JASMINE, CHINABERRY, LAUREL CHERRY, CRAPE MYRTLE, COFFEE, ENGLISH IVY, FICUS MACROPHYLLA, GARDENIA, GREEN ASH, JASMINE, LILAC, MYRTLE, MOCK OLIVE, PEAR, PRIVET, OSAGE ORANGE, PORTUGAL CHERRY, POMEGRANATE, PRICKLY ASH, SMILAX, TREE OF HEAVEN, TRUMPET VINE, UMBRELLA TREE, WATER OAK, PERSIMMON, AND DEVILWOOD OR WILD OLIVE.

IDENTIFICATION: THE ADULT IS A TINY, MEALY-WHITE INSECT WITH FOUR MEALY-WHITE WINGS THAT EXPAND LESS THAN 1/8 OF AN INCH. THE NYMPH IS A FLAT, ELLIPTICAL, SCALE-LIKE OBJECT, CLOSELY FASTENED TO THE UNDERSIDE OF A LEAF. IT BECOMES FIXED AFTER THE FIRST MOLT. THE ADULTS OF BOTH SEXES HAVE TWO PAIRS OF WINGS COVERED WITH A WHITE, POWDERY WAX WHICH GIVES THE INSECTS THEIR COMMON NAME. THE NYMPHS, AFTER THE FIRST INSTAR, ARE FLATTENED, OVAL, AND ARE SIMILAR IN APPEARANCE TO THE EARLY INSTARS OF THE UNARMORED SCALE INSECTS. LIKE THE SCALE INSECTS, WHITEFLIES LOSE THEIR NORMAL LEGS AND ANTENNAE AFTER THE FIRST MOLT (THEY ARE KEPT, BUT ARE ABBREVIATED), BUT UNLIKE THE SCALE INSECTS, THE FEMALES GAIN THEM BACK IN THE ADULT STAGE. THE NYMPHS OF THE CITRUS WHITEFLY LACK A FRINGE OF CONSPICUOUS, WHITE, WAXY PLATES OR RODS EXTENDING OUT FROM THE MARGIN OF THE BODY, WHICH CHARACTERIZES SOME SPECIES OF WHITEFLIES. THE CITRUS WHITEFLY LAYS YELLOW EGGS WITH A SURFACE WHICH IS NEARLY SMOOTH, DISTINGUISHING THEM FROM EGGS OF THE CLOUDYWINGED WHITEFLY (DIALEURODES CITRIFOLII (MORGAN)) WHICH ARE YELLOW WHEN FRESHLY LAID BUT SOON TURN BLACK AND HAVE A SURFACE THAT IS NETTED WITH A SYSTEM OF RIDGES. NYMPHS AND PUPAE OF THE TWO SPECIES ARE ALMOST INDISTINGUISHABLE. IN THE MIDDLE OF EACH WING, CLOUDYWINGED WHITEFLY ADULTS HAVE A DARKENED AREA WHICH IS LACKING IN THE WINGS OF THE CITRUS WHITEFLY, AND THE WINGS FOLD TO A FLATTER POSITION THAN THOSE OF THE CITRUS WHITEFLY. NYMPHS OF BOTH SPECIES ARE TRANSLUCENT, OVAL IN OUTLINE, AND VERY THIN. BECAUSE THE GREEN COLOR OF THE LEAF SHOWS THROUGH THE BODY, NYMPHS ARE DIFFICULT TO SEE. PUPAE ARE SIMILAR BUT ARE THICKENED AND ARE SOMEWHAT OPAQUE, AND EYE SPOTS OF THE DEVELOPING ADULT MAY SHOW THROUGH THE PUPAL SKIN. THE CITRUS WHITEFLY IS MORE ABUNDANT IN THE NORTHERN PART OF THE FLORIDA CITRUS AREA; WHEREAS, THE CLOUDYWINGED WHITEFLY IS MORE COMMON IN THE CENTRAL AND SOUTHERN PARTS.

LIFE HISTORY AND HABITS: WINTER IS PASSED IN THE MATURE LARVAL OR NYMPHAL STAGE, USUALLY ON THE UNDER SIDES OF THE LEAVES. EARLY IN THE SPRING PUPAE APPEAR, AND IN MARCH AND APRIL ADULTS EMERGE. EGGS ARE DEPOSITED ON FOLIAGE AND HATCH IN 8-24 DAYS, DEPENDING ON THE SEASON. UNFERTILIZED EGGS DEVELOP INTO MALES ONLY. THE LARVAE SOON SETTLE TO FEED AND DO NOT MOVE ABOUT UNTIL THE ADULT STAGE IS REACHED. THERE ARE SEVERAL OVERLAPPING BROODS EACH YEAR. NYMPHAL LIFE AVERAGES 23-30 DAYS. PUPAL DEVELOPMENT REQUIRES 13-30[4] DAYS. THE ADULT LIVES AN AVERAGE OF ABOUT 10 DAYS, BUT HAS BEEN KNOWN TO LIVE FOR AS LONG AS 27 DAYS. THE ADULT FEMALE LAYS ABOUT 150 EGGS UNDER OUTDOOR CONDITIONS. THE ENTIRE LIFE CYCLE FROM EGG TO ADULT REQUIRES FROM 41 TO 333 DAYS, BUT A GREAT VARIATION HAS BEEN NOTED EVEN AMONG EGGS LAID ON THE SAME LEAF ON THE SAME DAY.

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2/ ERADICATION ATTEMPTS HAVE BEEN UNSUCCESSFUL.

3/ THE ONLY RECORD FOR BRAZIL WAS BY KIRKALDY (1970). HE GAVE NO DETAILS OF LOCALITIES, AND THEREFORE A "TOKEN" AREA HAS BEEN ASSIGNED IN THE VICINITY OF RIO DE JANEIRO.

4/ FIRST OBSERVED ON CITRUS IN 1945-46.

INSECT PARASITES AND PREDATORS: Several parasites and predators attack the citrus whitefly, but neither singly nor in the aggregate do these species effect an adequate control, particularly in the United States. Woglum (1913), in India, discovered an internal parasite (Prospaltella lahornesis How.) of the citrus whitefly, but he indicated that this parasite was not effective in reducing whitefly populations in India. There high temperatures were much more important. It is possible that this parasite might thrive better in some parts of the southern United States. Watson (1932) reported the two-stabbed ladybird beetle (Chilocorus bivulnerus Muls.) as destroying some crawlers and, occasionally, an older larva of a whitefly. Delphastus pusillus (Lec.), a small dark brown ladybird beetle, feeds on the eggs but is never abundant. Delphastus catalinae (Horn), a California species, was introduced into Florida by the Florida Experiment Station, and it also feeds on whitefly eggs. Cryptognatha flavescens Motsch., a coccinellid about 1/10 inch long and reddish brown, and another ladybird beetle, Verania cardoni Weise, were found by Woglum to feed on the citrus whitefly in India. Morrill and Back (1911) recorded two other ladybird beetles, Cycloneda sanguinea L. and Scymnus punctatus Melsh., that feed on the citrus whitefly in Florida, a mirid bug, lacewings, mites, ants, and a species of thrips, Aleurodothrips fasciapennis Franklin.

CONTROL: In large commercial plantings of citrus, citrus whitefly and cloudywinged whitefly are largely controlled in rainy weather by whitefly fungi. Some important species are the red fungus (Aschersonia aleyrodis Webber) and the brown fungus (Aegerita webberi Fawcett). These fungi are generally present in all citrus groves in Florida and increase in numbers when the proper environmental conditions prevail. Whiteflies also are controlled by oil, parathion, or Guthion sprays applied primarily for control of scale insects. Spraying of commercial citrus exclusively for whitefly control is no longer practiced in Florida. When whiteflies are abundant on dooryard plantings of citrus, gardenia, or other hosts, 1.0% oil or parathion or Guthion or 0.5% to 0.7% oil plus either parathion or Ethion may be used effectively. Parathion or Guthion are preferred in spring and fall; these or others are preferred in summer. The first spraying in the spring in Florida, for the whitefly when it occurs alone, should be made some time in May when the spring flush of growth has matured and the fruit has reached the diameter of approximately one inch. Thorough spraying of the undersurfaces of the leaves is important. A repeat application may be needed about 10 days later to eliminate an infestation.

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