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THE PRESENT STATUS OF A WEST INDIAN WEEVIL (*DIAPREPES ABBREVIATA* (L.)) IN FLORIDA (COLEOPTERA: CURCULIONIDAE)[1]

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INTRODUCTION: In 1964 a single adult specimen of *Diaprepes abbreviata* (L.) was collected in a citrus nursery at Apopka, Florida (Woodruff, 1964). Since this species is a serious pest of citrus and sugar cane in the West Indies, this nursery has been under surveillance. No additional specimens were found until September, 1968, when several larvae were collected at the original site. Additional surveys were begun immediately and several hundred adults and several larvae have been collected in the vicinity of Apopka.

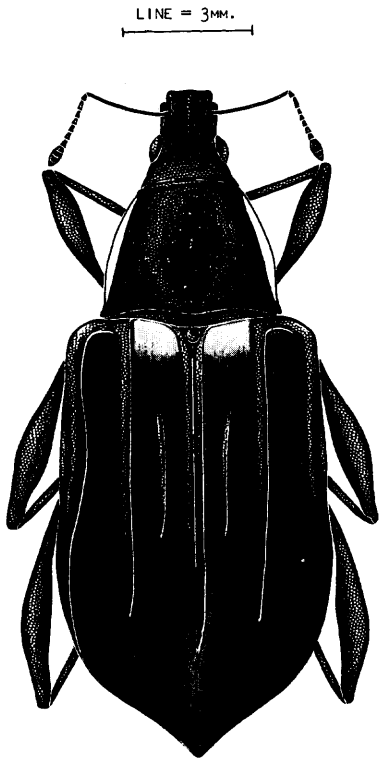

Fig. 1. Adult male *Diaprepes abbreviata.*

BIOLOGY: The common name for this species and related weevils in the West Indies is "fiddler beetle," a name also applied to members of the genus *Pachnaeus* to which the "citrus root weevil" belongs. In Puerto Rico it is called "sugar-cane root-stalk borer weevil" or "vaquita." The following resume of the biology in Puerto Rico is taken from Wolcott (1936, 1948).

The adults feed on foliage of a variety of plants (see host list below), but most of the damage is confined to tender new growth (Fig. 2). Citrus nursery trees often are affected more severely than mature grove trees. Feeding activity occurs both day and night. Adults are somewhat social in habits; often one tree may harbor hundreds while a nearby tree has none. Mating takes place on the foliage (Fig. 3). At Apopka most specimens collected in the morning of October 3, 1968 were in copulation, and the same night few pairs were noted, but oviposition was observed. Although Wolcott (1936) mentioned finding isolated individuals attracted to light, blacklight traps operated near heavily infested trees at Apopka produced no specimens.

Fig. 2. Typical adult feeding signs on citrus leaf margin.

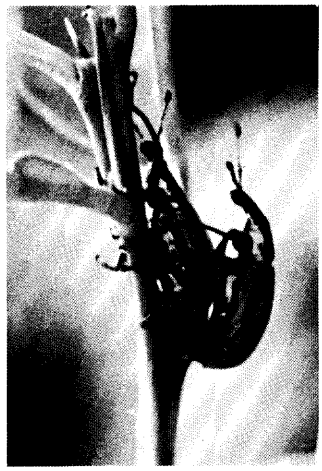

Fig. 3. Weevils in copulation on citrus.

In captivity, adults live for several months and never return to the soil from which they emerge. Eggs are laid in clusters between leaves stuck together with an adhesive produced by the female. Oviposition occurs from 3 to 7 days after emergence and often continues daily for several months. The number of eggs per cluster varies from 30 to 264, and a single female may lay more than 5000 eggs during her life. The eggs are usually of a single layer often with the cluster irregularly shaped. They are smooth, white, glistening, oblong-oval and about 1.2 mm long by 0.4mm in diameter (Fig. 4). Newly laid eggs are uniformly white, but within one or two days a clear space appears at either end. Just before hatching, the clear space disappears, the color is somewhat brownish, and the mouthparts of the larva are visible within.

The eggs hatch almost uniformly in seven days, probably the most constant aspect of an extremely variable life history. The newly hatched grubs move across the

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leaves in a ". . . peculiar galloping motion" (Wolcott, 1936) and fall off the leaf margin. They normally do not burrow into the ground immediately but continue to move over the soil surface for several days. Eventually they burrow into the ground and find suitable roots for food. There is a wide host range (see list below), including many commercial crops, especially sugarcane and citrus.

The larvae have been reared in salve tins with sprouting corn or lima beans. The small grubs feed on the

Fig. 4. Eggs deposited on a citrus leaf (covering leaf removed).

rootlets, while the third and fourth instars often burrow inside unsprouted corn kernels. The number of molts is extremely variable (from 6 to 16, with 8 being average). Wolcott (1936:898) described a diapause period before the mature larva pupates. He stated that "Its extent is not appreciably affected by previous rapidity of growth, the time of the last larval molt, humidity of the soil, temperature or time of year." This period may last from two to thirteen months. However, this does not appear to be true diapause as the grubs ". . . wander about in the soil with tremendous energy." Additional research on this aspect of the life history will be necessary before the exact nature of this "diapause" will be understood. Prior to pupation a vertical chamber is formed in the soil in which the larva in a head-up position compacts the soil by spinning on its caudal end.

Pupation occurs within two to three weeks after the chamber is formed. In Puerto Rico, pupae were found every month of the year, with about one-third of the annual total occurring in March. The pupal period lasts two to three weeks. The newly formed adult remains in the pupal chamber for a minimum of 11 days and a maximum of 126 days. This time period appears to be ". . . entirely without reference to external factors." The total life cycle may be less than one year, or it may be over two years.

DISTRIBUTION: This appears to be a West Indian species with its origin centered around Puerto Rico. Blackwelder (1947) listed it from Puerto Rico, Vieques, Mona Island, Hispaniola, Guadeloupe, Dominica, Martinique, St. Lucia, Montserrat St. Vincent, and Barbados. It has previously been intercepted at Miami (1945), Orlando (1946), and New York (1949), but these were in customs or plant quarantine inspections. There were no known established infestations as a result of these finds.

In Florida, the present distribution centers around the city of Apopka (Orange County), with most infestations north of the city. Adults have been found in nurseries and groves involving approximately 2500 acres. Approximately 6500 acres are under quarantine, which includes ½ mile barrier around the known infestation. Detection surveys are still in progress, but it is believed that the present known infestations reflect the limits of its spread.

Blackwelder (1947) listed 17 other species of *Diaprepes* from the West Indies and one from Nicaragua.

HOSTS: The most important hosts are sugarcane and citrus. Larvae have also been found in tubers of "ñame" and yuca (*Manihot esculenta* Crantz), in sprouting seed corn, and in the tap roots of seedling peppers, papaya, mahogany, and lima beans. Wolcott (1948) indicated that they ". . . feed on any kind of live roots or tubers available, by preference choosing those of sufficient size that they may bore within them. . . ." He recorded adults on leaves of ". . . sugarcane, cotton, coffee, and all kinds of native and imported vegetables as well as of practically every endemic and foreign tree." Martorell (1945) listed 41 species as adult hosts in Puerto Rico:

Amomis caryophyllata (Jacq.) Krug & Urban, *Andira jamaicensis* (W. Wright) Urban, *Byrsonima spicata* (Cav.) DC., *Cedrela mexicana* Roem., *Cedrela odorata* L., *Ceiba pentandra* (L.) Gaertn., *Chrysobalanus icaco* L., *Chrysophyllum cainito* L., *Coccolobis uvifera* (L.) Jacq., *Conocarpus erectus* L., *Cordia alliodora* (R. & P.) Cham., *Delonix regia* (Bojer) Raf., *Erythrina berteroana* Urban, *Erythrina poeppigiana* (Walp.) O. F. Cook, *Faramea occidentalis* (L.) A. Rich, *Ficus laevigata* Vahl, *Ficus stahlii* Warb., *Gliricidia sepium* (Jacq.) Steud., *Guaiacum officinale* L., *Guarea trichilioides* L., *Haematoxylon campechianum* L., *Ilex syderoxyloides* (Sw.) Griseb., *Inga vera* Willd., *Inga laurina* (Sw.) Willd., *Lagerstroemia speciosa* (L.) Pers., *Leptoglottis portoricensis* (Urban) Britton & Rose, *Lonchocarpus domingensis* (Pers.) DC., *Longhocarpus latifolius* (Willd.) H. B. K., *Melicocca bijuga* L., *Montezuma speciosissima* Sesse & Moc., *Ocotea portoricensis* Mez., *Persea gratissima* Gaertn., *Psidium guajava* L., *Spondias mombin* L., *Swietenia macrophylla* King, *Swietenia mahagoni* Jacq., *Tamarindus indicus* L., *Terminalia catappa* L., *Torrubia fragans* (Dum.-Cours.) Standley, *Triplaris caracasana* Cham., *Zanthoxylum caribaeum* Lam.

Larval damage to roots of small citrus trees is often in the form of girdling (Fig. 5), causing death of the tree. The grubs are considered serious pests of sugarcane in Barbados and Puerto Rico. Adult feeding is usually in the form of typical weevil notching (Fig. 2), primarily on new growth. Certain species of native trees in Puerto Rico are occasionally defoliated. In Florida adult feeding was also noted on maypop (*Passiflora* sp.) growing in a citrus tree.

In Puerto Rico, Jackson (1963) reported that the adults fed on female flowers and fruits (Kimri stage) of

the date palm (*Phoenix dactylifera* L.), causing the fruit to abort within 48 to 72 hours.

DESCRIPTION: The adult weevils are highly variable in color pattern and size. Figure 1 represents about the

Fig. 5. Citrus nursery tree girdled by larvae.

maximum in color intensity. The colored areas are clothed with minute scales which vary from white to bright orange. Specimens sometimes exhibit a pale green reflection, especially on the pronotum. The denuded black areas vary in length, shape, and number, partly dependent upon whether scales have been worn off certain areas. Fresh specimens have the general pattern shown in Fig. 1, although two specimens are rarely identical. Specimens vary from ½ to ¾ inch in length, the females averaging larger than the males.

The larvae are white, legless grubs about ½ inch long (Fig. 6). The head has a variable pattern of dark and light areas. Comparison with larvae of other citrus weevils is based on a questionable determination of citrus root weevil larvae (van Emden, 1952). Positive identification must await reared specimens. When this has been done, a key will be provided to distinguish these species. Suspicious specimens should be sent to the Division of Plant Industry for determination.

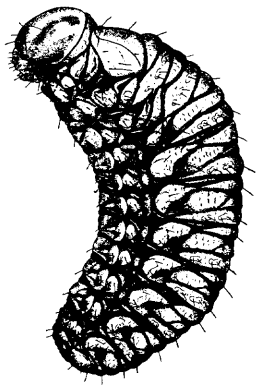

Fig. 6. Lateral view of mature larva (after Pierce, 1915).

TAXONOMY: The taxonomy of the genus *Diaprepes*, as well as several related genera, is poorly understood at present. Vaurie (1961) cited the need for a revision of *Exophthalmus* but indicated that it ". . . must also take into account the status of the genus *Diaprepes* (21+ species), which may be synonymous with *Exophthalmus*, and *Lachnopus* (50+ species), which Hustache (1929, p. 191) considered a subgenus of *Prepodes* (=*Exophthalmus*), as well as other related genera."

The great variation in color pattern, size, and biology are responsible for an equal amount of confusion in specific name. Pierce (1915) treated this name as one of six color varieties of *Diaprepes spengleri* L., a name now listed as a synonym of *D. abbreviata* L. (Blackwelder, 1947). Fennah (1946) indicated that the ". . . length and number of the smooth denuded ridges vary constantly between the populations of different islands, and each arrangement is representative of its locality." Wolcott (1948) suggested that the variation in adults ". . . may be only a reflection of the variation in duration of the stages of the immature forms resulting from intense parasitization by *Tetrastichus haitiensis* Gahan of the eggs. . . ."

In a series of more than 300 specimens collected on October 3, 1968, at Apopka, Florida, nearly all the described variants were represented. As is true with the *Exophthalmus* of Jamaica (Vaurie, 1961), most of this variation appears to be intraspecific.

CONTROL: Biological control appears to be successful in Puerto Rico. The primary factor is a wasp (*Tetrastichus haitiensis* Gahan) which is parasitic on the eggs. In fact, Wolcott (1948:391) indicated that ". . . so few grubs survive from egg-clusters laid in May and June, when the parasite is most abundant, that it would appear that the weevil primarily owes its survival to the eggs laid by a comparatively few exceptional and abnormal females emerging from the ground at other times of the year when the parasite is scarce or absent." This parasite also attacks members of the related genus *Exophthalmus*. The feasibility of importing this parasite into Florida is presently under consideration.

There has been little recent work on chemical control, and experiments are underway at Apopka to evaluate several chemicals under Florida conditions. Wolcott (1948, 1951) suggested that 2 pounds (actual material) of aldrin or lindane per acre would provide larval control, and that a 1% chlordane or DDD spray would kill adults. Jackson (1963) used a mist spray of 23% aldrin (HHDN) at the rate of 1:100 plus a suitable sticker for adult control on date palms. Mortality was effected within six hours after application. Metcalfe (1959) recommended the use of dieldrin for control of grubs in sugarcane in Barbados as follows: only if two crops are expected to be harvested after treatment; applied before planting or if after planting up to the following June; rate of application should be 2 pounds of actual dieldrin per acre (e. g. 2% granules at the rate of 100 pounds per acre).

He also estimated that larvae were responsible for losses of 10 tons on the first ratoon and 5 tons on the second ratoon per acre. In all cases, chemicals should be applied with caution, following the manufacturer's label instructions.

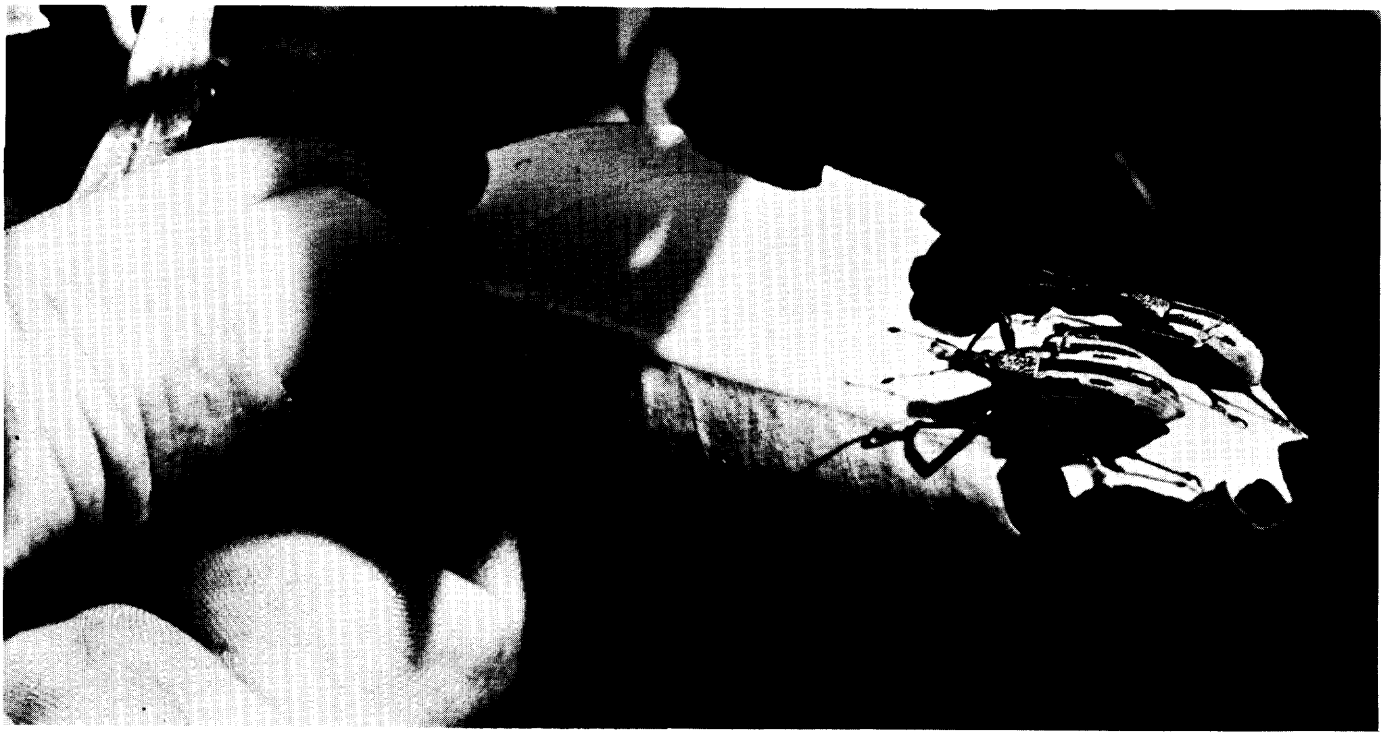

Fig. 7. Weevils and damage on citrus leaf.

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