DIAPREPES ABBREVIATUS[1] RESPONSE TO LIGHT TRAPS IN FIELD AND CAGE TESTS[2]

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ABSTRACT

Using electroretinogram techniques spectral sensitivity of the compound eyes of *Diaprepes abbreviatus* (L.) was determined as 510-550 nm with peak sensitivity at 530 nm. Cage and field tests of gravity and electrocutor light traps with a fluorescent lamp having maximum output of light in this spectral region were made to develop a survey method for this weevil. Of 4 types of traps tested, an electrocutor trap equipped with a funnel and holding chamber collected more weevils in cage and field tests than omnidirectional gravity light traps, stainless steel electrocutor traps, or tree traps. The capture efficiency of the electrocutor trap is not considered sufficient to recommend it as a survey tool for *D. abbreviatus*.

An exotic curculionid, the sugarcane rootstalk borer weevil, *Diaprepes abbreviatus* (L.), an economically important pest of sugarcane and citrus in the West Indies, was first found infesting citrus near Apopka, Orange County, Florida, in 1964. By 1968, a quarantine area of ca. 2600 ha containing ca. 1000 ha of citrus was established (Woodruff 1968). The original quarantine area has been extended 3 times and now encompasses ca. 31,000 ha, which includes 4000 ha of citrus. The pest may have spread even farther, since the present detection technique consists of visual inspection to locate infested areas.

Because an excessive amount of time is required to survey for *D. abbreviatus*-infested areas using the visual inspection method for adults on host plants, we initiated a series of tests with a variety of traps for collecting weevils. Preliminary studies of light traps as a detection method for *D. abbreviatus* were initiated with a single stainless steel electrocutor light trap (Stanley et al. 1977). Seven colors of fluorescent lamps were each tested for 3 nights at Apopka and 3 nights at Mayaguez, PR. Results were not encouraging; no weevils were caught in Apoka and only 3 weevils were caught at Mayaguez. Four types of traps were tested to develop a more efficient technique for detecting infestations and surveying populations of *D. abbreviatus* than the visual inspection method. Three designs of light traps were tested in screen cages and in the field. A 4th trap was tested only in the field.

METHODS AND MATERIALS

Spectral sensitivity of the compound eyes of 13 field-collected males was determined using the electroretinogram techniques of Agee (1973). Weevil

[1]Coleoptera: Curculionidae.

[2]This paper reports the results of research only. Mention of a commercial or proprietary product does not constitute an endorsement by the U.S. Department of Agriculture nor does it imply registration under FIFRA as amended.

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eyes were most sensitive to wavelengths of 510-550 nm with peak sensitivity at 530 nm, the yellow-green region of the spectrum. For our trapping trials we selected a green lamp (General Electric® F15T8) that had a maximum output of light in the spectral region to which the weevil eye was most sensitive.

SCREEN-CAGE TESTS—Three light trap designs were individually tested for effectiveness in collecting *D. abbreviatus* for 1-2 night intervals between June and October 1976. In the late afternoon of each trial 100 adults were released into a 12 x 6 x 2 m screen cage. A potted citrus tree, ca. 1 m tall, was placed at each end of the cage. The 3 types of traps used were: Type A, an omnidirectional gravity light trap similar to that described by Harding et al. (1966) (Fig. 1A); Type B, a stainless steel electrocutor trap (Stanley et al. 1977) (Fig. 1B); and Type C, an electrocutor trap (Rid-O-Ray® Model S15-D-15, Hudson, NH) (Fig. 1C) that contained 2 fluorescent lamps and had been modified by placing a sheetmetal funnel (61 cm diameter at the top and 7.6 cm diameter at the bottom) on the bottom of the trap. An escape-proof, 1.9-liter plastic canister perforated with small holes was taped to the bottom of the funnel to collect the weevils.

FIELD TESTS—Tests were made between June and October of 1976 near Apopka in a 10-ha weevil-infested grove of 2.5- to 3-m-tall 'Hamlin' variety orange trees, *Citrus sinensis* (L.) Osbeck. In 1 section of the grove, 1 Type A (Fig. 1A) light trap was placed in each of the 4 cardinal directions (W,N,E,S) at a distance of 30 m from a central power supply. Two additional Type A traps were placed 39 m east (X) and west (Y) of a 2nd power source that was 76 m south of the 1st source. From 23-25 June Type A traps were placed between the trees (trees spaced at 7.6 m) with the top of the traps 1.5 m above the ground. From 25-28 June a Type B electrocutor trap (Fig. 1B) was substituted for the Type A trap at position E. From 28 June-13 July, the trap in position W was raised to a height of 2.6 m; the remaining traps were left in their original positions. From 13-20 July, all traps except the Type B electrocutor trap were placed within the canopy of trees at a height of 2.6 m. On 19 July, panels painted with Pittsburg Paint® No. 3391, 3392, and 3394, which had peak light reflectances of 540, 535, and 530 nm, respectively, (measured with a Beckman® Ratio Recording spectrophotometer with reflectance unit) were placed on the baffles of gravity traps in positions N, S, and X. On 20 July 2 Type D tree traps (Tedders and Edwards 1974) were added at positions W and Y. The total output of the 15-W lamp in these traps was reduced by covering each end with tape a distance of 6.4 cm, thereby exposing only the portion of the lamp within the funnel. Finally, between 9 September-1 October, 3 Type C electrocutor traps containing 2 15-W F15T8/G fluorescent lamps (Fig. 1C) were substituted for the Type A traps in positions N, S, and X.

SMALL-PLOT FIELD TESTS—Tests were made in a plot (ca. 0.5 ha) of small citrus trees (1-1.5 m tall). From 17 May-30 August, 1 Type A light trap (Fig. 1A) was placed in the plot, and a 2nd Type A trap modified by spraying the baffles with a reflective paint (White 7216, 3M Co.®, St. Paul, MN) was placed ca. 30 m west from the 1st trap. From 30 August-1 October, one Type C electrocutor trap (Fig. 1C) was substituted for the 2 Type A traps.

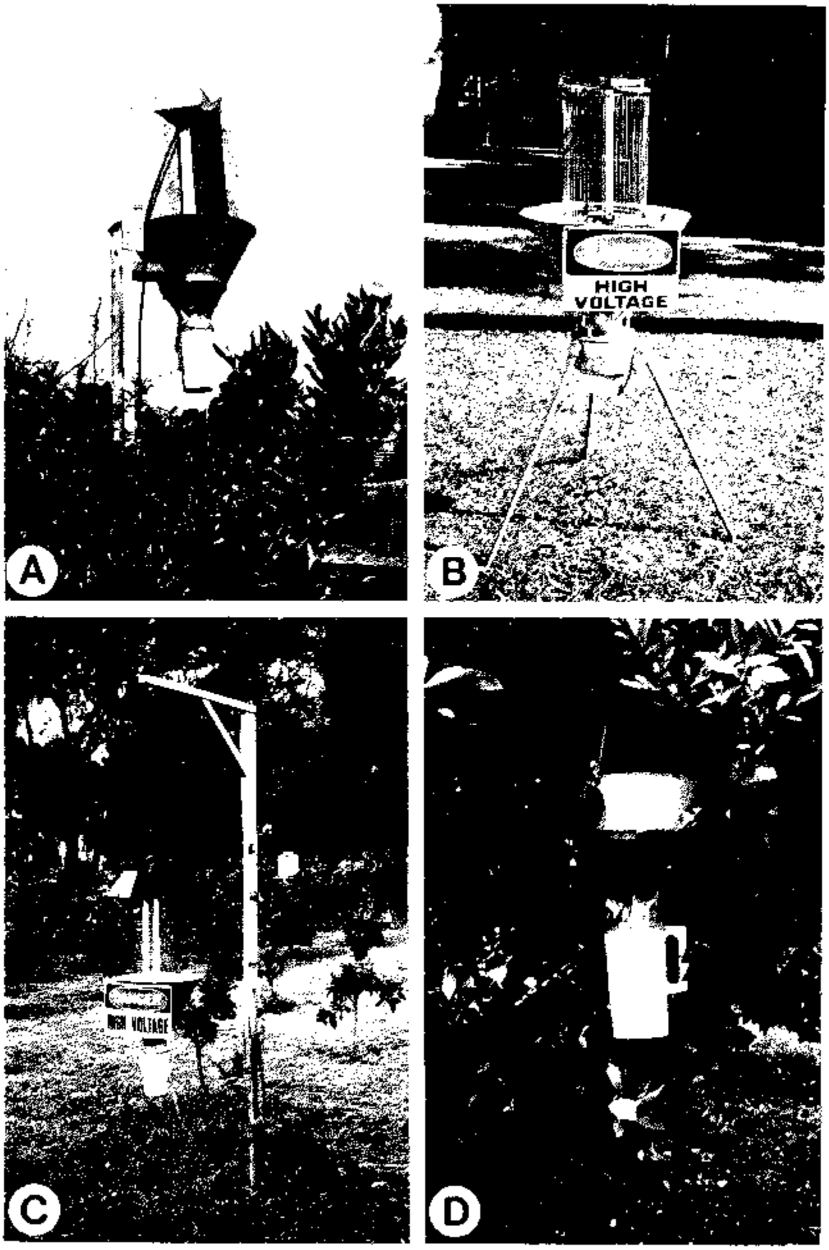

Fig. 1. Four types of modified light traps used in cage and field trials for attracting adult *Diaprepes abbreviatus* (L.): A: gravity, B: stainless steel electrocutor, C: modified Rid-O-Ray electrocutor, and D: tree trap.

Results and Discussion

The period during which the tests were conducted, from 17 May to 1 October, corresponds to the higher adult populations of *D. abbreviatus* in the infested area of Florida (Beavers and Selhime 1976).

In the screen-cage tests, the Type C electrocutor trap was the most effective. Of the 100 adults/night released on each of the 2 nights, 38 and 28% were collected, respectively by the 2 Type C models. The Type A and the Type B traps each collected 8 adults/night. The Type D tree trap (Tedders and Edwards 1974) was not tested in the screen cage.

Results of the field grove tests indicated little response of *D. abbreviatus* to the 4 types of traps tested with green fluorescent lamps as attractants. The number of *D. abbreviatus* caught in the various traps during the test period were 1, 1, 6, and 18 for the Type D, Type B, Type C, and the Type A traps, respectively. The Type C traps were in position from 9 September to 1 October, while the Type A traps were in place throughout the test period.

In the small-plot tests, a total of 38 *D. abbreviatus* was collected with the Type A and the Type C traps. The Type A trap caught 26 *D. abbreviatus* from 24 May-27 August; the Type A trap with the white reflective paint on the baffles caught 8 weevils from 19 July-23 August; the Type C trap caught 4 weevils from 30 August-1 October.

Studies of the flight behavior and dispersal of *D. abbreviatus* (Beavers and Selhime 1978) indicated that the insect flies short distances from a release site. The maximum single flight observed was 45 m. The weevils were quite sedentary; many of the adults remained on the same tree up to 16 days. The weevils were attracted to light traps at night, exhibiting some nocturnal activity. The Type C modified electrocutor traps caught larger numbers of insects per trap night than the other types tested.

At present, we do not consider the efficiency of any of the traps great enough to merit recommendation for detection of infestations or for population survey for *D. abbreviatus.*

Literature Cited

Agee, H. R. 1973. Spectral sensitivity of the compound eyes of the field collected bollworms and tobacco budworms. Ann. Ent. Soc. Amer. 66: 613-5.

Beavers, J. B., and A. G. Selhime. 1976. Population dynamics of *Diaprepes abbreviatus* in an isolated citrus grove in central Florida. J. Econ. Ent. 69:9-10.

———, and ———. 1978. Flight behavior and dispersal of *Diaprepes abbreviatus.* Fla. Ent. 61:89-91.

Harding, W. C., Jr., J. G. Hartstock, and G. G. Rohwer. 1966. Blacklight trap standards for general insect surveys. Bull. Ent. Soc. Amer. 12: 31-2.

Stanley, J. M., J. C. Webb, W. W. Wolf, and E. R. Mitchell. 1977. Electrocutor grid insect traps for research purposes. Trans. Amer. Soc. Agric. Eng. 20:175-8.

Tedders, W. L., and G. W. Edwards. 1974. A blacklight trap for surveys of hickory shuckworm moths. J. Ga. Ent. Soc. 9:176-81.

Woodruff, R. E. 1968. The present status of a West Indian weevil *Diaprepes abbreviata* (L.) in Florida. Fla. Dep. Agric., Div. Plant Ind. Ent. Circ. 30:1-2.