FIRST REPORT OF DAMAGE BY THE SUGARCANE ROOT WEEVIL *DIAPREPES ABBREVIATUS* (COLEOPTERA: CURCULIONIDAE) TO FLORIDA SUGARCANE

RON CHERRY, DAVID G. HALL[1], ALVIN WILSON AND LES BAUCUM[2]
Everglades Research and Education Center, 3200 E. Palm Beach Road, Belle Glade, FL

[1]Formerly with United States Sugar Cooperation, current address 2400 River Hammock Lane, Fort Pierce, FL 34981

[2]UF/IFAS Hendry County Extension

The weevil *Diaprepes abbreviatus* (L.) occurs naturally in the Lesser and Greater Antilles where it is considered an important pest of sugarcane and citrus, particularly in Barbados and Puerto Rico (Woodruff 1968). Woodruff (1968) presents a review of *D. abbreviatus* with respect to geographical distribution, biology, damage (emphasizing citrus) and control. The importance of the weevil as a pest of sugarcane is evidenced by common use in early literature of the following name for the weevil: the sugarcane rootstock borer weevil. *D. abbreviatus* was first reported in Florida during 1964 in citrus near the town of Apopka (Schroeder & Jones 1983). An eradication effort was made, but the weevil was rediscovered in this area during 1968. The weevil has subsequently spread across Florida, although secondary introductions from the Caribbean may have occurred. Regarded to be a poor flier, the spread of the weevil is usually attributed to the movement of infested ornamental plants. Larvae and adults are highly polyphagous (Simpson et al. 1996), although cane and citrus have been shown to support larval development better than any of 71 other plant species (Schroeder et al. 1979).

The presence and spread of the weevil in Florida during the 1970s and 1980s alarmed the sugar industry. By 1981, 61,700 acres (24,978 ha) had been quarantined for the weevil across a number of counties, yet at that time the weevil had not been found attacking sugarcane in the Everglades Agricultural Area where most sugarcane is grown. *D. abbreviatus* was found in South Bay during 1992, Moore Haven during 1993, and in Canal Point during 1995 (all in ornamental plant nurseries), placing known infestations within the heart of the sugar production area. United States Sugar Corporation, one company particularly concerned about the weevil, monitored sugarcane in the vicinity of these three towns for infestations of the weevil during the late 1990s and early 2000s. Adult weevils were sometimes found in the vicinity of commercial sugarcane in association with weeds such as hemp sesbania (*Sesbania macrocarpa* Muhl.), sickle pod (*Cassia obtusifolia* L.), pigeon pea (*Cajanus cajan* (L.) Millsp.), Brazilian peppertree (*Schinus terbinthifolius* Radd.), and other plants growing in or near cane fields, but no larval infestations or signs of damage to cane by the weevil were found (Hall, personal communication).

In Feb 2010, Ron Cherry was contacted by extension specialist Les Baucum concerning a potential grub problem in commercial sugarcane fields. These fields were located ca. 5 km south of Clewiston, FL (Clewiston location). Grubs (Scarabaeidae) in the genera *Anomola*, *Cyclocephala*, *Phyllophaga*, and *Tomarus* are well documented pests of Florida sugarcane (Stansly et al. 1994). A visit to damage in these fields showed sugarcane stunted, lodged, and many plants upturned. These are typical grub damage signs in Florida sugarcane due to root damage by larvae (grubs). However, digging under sugarcane plants yielded no scarabaeid grubs, but rather what appeared to be curculionid grubs (larvae). No other life stage was observed in the soil. Curculionids are infrequent soil pests of Florida sugarcane (Hall 1988). Approximately 20 larvae were collected and returned to the Everglades Research and Education Center. These larvae were held individually in small cans at 24 °C with moist soil and raw carrots for food in order to obtain adults for species identification. After eight months, one larva pupated and emerged as an adult. The adult appeared to be the sugarcane root weevil, *Diaprepes abbreviatus* (L.) which was confirmed in Nov 2010 by Dr. Michael Thompson, Florida Division of Plant Industry, Gainesville, Florida. Hence this was the first finding of *D. abbreviatus* causing damage in Florida sugarcane.

After the identification of *D. abbreviatus*, a pest alert was sent out in Dec 2010 alerting Florida sugarcane growers of a new potential pest problem. Thereafter, a grower contacted Ron Cherry in Dec 2010 of similar damage in a field located ca. 7 km south of Pahokee, FL (Pahokee location). In Dec, Ron Cherry visited the field and saw damage similar to the previous *D. abbreviatus* infestation. In examining the field, curculionid larvae were again found underneath the plants and these larvae were identified by Michael Thompson as being *D. abbreviatus*. Few other soil insects were present making it obvious the damage (Fig. 1) was caused by *D. abbreviatus*. As in the Clewiston infestation, the damage observed was consistent with damage expected in sugarcane due to *D. abbreviatus*. In Mar 2011,

Fig. 1. *Diaprepes abbreviatus* damage in Florida sugarcane field in Dec 2010. Sugarcane has not been harvested and should be 3 to 4 m high.

sugarcane fields at the Pahokee location were harvested allowing easy access to the fields. Thus a visual survey for *D. abbreviatus* was conducted there by digging up 20 randomly located sugarcane plants in the known infested field and 7 other fields immediately surrounding the field. *Diaprepes* larvae were found in 6 fields with means ranging from 0.1 to 2.1 larvae/stool. Larvae were the only life stage observed and ranged in size from 5 to 15 mm.

Based on experiences with *D. abbreviatus* in the Lesser and Greater Antilles, a front-line defense against the weevil is to eliminate weed species utilized by the weevil as host plants. Most infestations in cane fields develop in association with weeds such as hemp sesbania (*Sesbania macrocarpa* Muhl.) and pigeon pea [*Cajanus cajan* (L.) Millsp.] because the adult weevils prefer the leaves of these plants over sugarcane leaves as a food source and site for oviposition. While sugarcane may be a poor adult host, it is an excellent host of larvae. Natural control of *D. abbreviatus* is sometimes provided by entomopathogenic nematodes attacking larvae and pupae in the soil (Duncan et al. 2011) and by insect parasitoids attacking weevil eggs. Efforts have been made to boost biological control of weevil eggs in Florida by establishing parasitoids such as *Quadrastichus haitiensis* Gahan and *Aprostocetus vaquitarum* Wolcott (Hymenoptera: Eulophidae), and some success has been achieved in establishing these parasitoids in southern areas of Florida (Jacas et al. 2005; Castillo et al. 2006)—whether populations of these parasitoids occur and have any impact against the weevil in Florida sugarcane have not been evaluated. There is little information pertaining to controlling the weevil in cane using insecticides. However, in citrus and some other crops, foliar insecticide sprays against adult weevils and granular insecticides applied to the soil to kill neonates can help limit infestations (Duncan et al. 2011). Once a cane field is infested by large numbers of weevil larvae, a grower may have few management options.

Entomopathogenic nematodes can be purchased and applied to the soil to control larvae and pupae (Schroeder 1994; Hall & Bennett 1994), but such nematodes are not always avail-

able, can be relatively expensive, and research on application methods and release rates in sugarcane are lacking. Under laboratory conditions depending on temperature, flooding has been shown to be an effective tactic against weevil larvae (Shapiro et al. 1997), but no research on flooding has been conducted in a field situation - flood waters might not reach all larvae boring into a cane stool. Ultimately, a grower may have no choice but to disk out an infested field, work the soil and dislodged stubble to kill weevils, and replant.

In summary, for the first time, 2 infestations of *D. abbreviatus* were observed causing damage to Florida sugarcane. These were distinctly separate infestations being located ca. 50 km apart. The Clewiston location was on sandy muck soil (15% organic matter) and the Pahokee location was on muck soil (70% organic matter). Discussions with sugarcane growers showed the following was consistent at both locations. First, multiple fields were infested at each location. Second, different varieties were infested at each location. Third, fields were infested over a range of crop age from plant cane (1 year old) to fourth stubble (4 years old). Sugarcane growers at both locations are planning to try to control these infestations by disking and replanting fields and/or controlled flooding (Shapiro et al. 1997).

Summary

The sugarcane root weevil, *Diaprepes abbreviatus* is an important sugarcane pest in the Caribbean. In 2010, 2 infestations of *Diaprepes abbreviatus* were observed in Florida causing damage to sugarcane for the first time.

References Cited

Castillo, J., Jacas, J. A., Peña, J. E., Ulmer, B. J., and Hall, D. G. 2006. Effect of temperature on life history of *Quadrastichus haitiensis* (Hymenoptera: Eulophidae), an endoparasitoid of *Diaprepes abbreviatus* (Coleoptera: Curculionidae). Biol. Control 36: 189-196.

Duncan, L. W., Rogers, M. E., Mccoy, C. W., Futch, S. H., Graham, J. H., and Nigg, H. N. 2011. Florida citrus pest management guide: citrus root weevils. University of Florida IFAS Extension publication #ENY-611. http://edis.ifas.ufl.edu/cg006

Hall, D. 1988. Insects and mites associated with sugarcane in Florida. Florida Entomol. 71: 138-150.

Hall, D. G., and Bennett, F. D. 1994. Biological control and IPM of sugarcane pests in Florida, pp 297-325 *In* Rosen, D., Capinera, J. L., and Bennett, F. D. [eds.], Pest Management in the Subtropics: Biological Control - a Florida Perspective. Intercept (Andover). 737 pp.

Jacas, J. A., Peña, J. E., and Duncan, R. E. 2005. Successful oviposition and reproductive biology of *Aprostocetus vaquitarum* (Hymenoptera: Eulophidae): a predator of *Diaprepes abbreviatus* (Coleoptera: Curculionidae). Biol. Control 33: 352-359.

Schroeder, W. J., Hamlen, R. A., and Beavers, J. B. 1979. Survival of *Diaprepes abbreviatus* larvae on selected native and ornamental Florida plants. Fla. Entomol. 62: 309-312.

Schroeder, W. J., and Jones, I. F. 1983. Capture of *Diaprepes abbreviatus* (Coleoptera: Curculionidae) in traps: effects of location in a citrus tree and wick materials for release of the attractant. J. Econ. Entomol. 76: 1312-1314.

Schroeder, W. J. 1994. Entomopathogenic nematodes for the control of root weevils in citrus, pp. 289-295 *In* Rosen, D., Capinera, J. L., and Bennett, F. D. [eds.], Pest Management in the Subtropics: Biological Control - a Florida Perspective. Intercept (Andover). 737 pp.

Shapiro, J., Hall, D., and Niedz, R. 1997. Mortality of the larval root weevil *Diaprepes abbreviatus* (Coleoptera: Curculionidae) in simulated flooding. Florida Entomol. 80: 277-285.

Simpson, S. E., Nigg, H. N., Coile, N. C., and Adair, R. A. 1996. *Diaprepes abbreviatus* (Coleoptera: Curculionidae): host plant associations. Environ. Entomol. 25: 333-349.

Stansly, P., Cherry, R., and Sosa, O. 1994. Relative abundance of white grubs (Coleoptera: Scarabaeidae) in Florida sugarcane on sand and muck soils. J. Am. Soc. Sugar Cane Tech. 14: 19-24.

Woodruff, R. E. 1968. The present status of a West Indian weevil (*Diaprepes abbreviatus* (L.) in Florida (Coleoptera: Curculionidae). Fla. Dept. Agri., Div. Plant Industry, Entomol. Circ. No. 77.