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A SURVEY OF SAP BEETLES (COLEOPTERA: NITIDULIDAE) IN STRAWBERRY FIELDS IN WEST CENTRAL FLORIDA

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Reports of sap beetle (Nitidulidae) infestations in commercial strawberry (*Fragaria × ananassa* Duchesne; Rosaceae) originated in the early 1950s (Connell 1980). Before the 1950s, strawberries were harvested at earlier maturity when they were less attractive to the beetles in this family (Connell 1980). Strawberry fruits are attacked primarily when they are on or near the soil surface, and entry is usually from the underside. Adults are attracted to ripe or damaged fruit and damage fruit directly by feeding with chewing mouthparts. Eggs are deposited on fruit and hatching larvae feed inside fruit. Larvae pupate in the soil. Feeding damage by both adults and larvae render fruit unmarketable and make them more susceptible to infections or damage from other insects such as *Drosophila* spp. (Drosophilidae). The presence of only a few fruit with larval or adult sap beetle damage can render an entire shipment unsalable for the fresh market.

Nitidulid adults are strong fliers and possess good olfaction capabilities (Okumura & Savage 1974). They are able to respond to chemical cues associated with food odors from a distance of < 2.5 m (Blackmer & Phelan 1991). Chemicals emitted from whole-wheat bread dough inoculated with baker's yeast are similar to chemicals found in fruit attractive to the nitidulids (Lin & Phelan 1991).

Although sap beetles have been observed infesting ripe strawberry fruit in west-central Florida, little is known about the identity or seasonality of the species present. The purpose of the present study was to survey the sap beetle fauna associated with strawberry production in Florida's main strawberry production region in eastern Hillsborough County.

Sap beetle adults were surveyed by using baited pitfall traps during the 1994-1995 strawberry fruiting season and by examining plants with ripe fruit during the 1994-1995, 1999-2000 and 2000-2001 seasons. For each season, adult sap beetles collected were identified and counted.

Ten pitfall traps were placed randomly in 7 fields. A pitfall trap consisted of two 0.47 L plastic cylindrical containers nested inside one another. They were buried to the mouth of the lower

container in the middle of the strawberry bed and ethylene glycol (automotive antifreeze) was poured to 3 cm depth into the upper container. Bread dough bait was prepared by mixing 1,300 mL of whole-wheat bread flour with 520 mL of sugar and 20 mL of baker's yeast. Approximately 600 ml of water was added during mixing until the dough was stiff. A 2 cm diam dough ball was rolled to serve as the attractant and was suspended in the trap above the ethylene glycol. A 25 cm diam pie pan was inverted and supported 3 cm above the surface of the plant bed by two nails to exclude rain and sprinkler irrigation. Traps were checked weekly from 14 Nov 1994 through 4 Apr 1995 and the beetles were removed and counted, and the bait was replaced.

Twenty randomly selected strawberry plants with fruit were examined for sap beetle adults at various sites and times during periods of greatest sap beetle activity and grower concern. The 7 fields used in the pitfall trapping were sampled on 31 Mar 1995 and 5 of the fields were sampled on 4 Apr 1995. Similar surveys were performed in an abandoned production area accumulating rotting fruit on one farm on 9 Mar 1999 and 8 Mar 2000. Representative specimens of each species were placed in the Florida State Collection of Arthropods, Florida Department of Agricultural and Consumer Services, Divisions of Plant Industry, Gainesville, FL. Identifications were performed by D. H. Habeck.

Nine species of sap beetles were collected during the course of the study (Table 1). *Haptoncus luteolus* (Erichson), *Lobiopa insularis* (Castelnau) and *Carpophilus fumatus* Boheman accounted for about 95% of the 1,794 specimens collected. These 3 species predominated whether adults were collected in baited pitfall traps or whether they were observed associated with fruiting strawberry plants. *Haptoncus luteolus* was the most abundant species recovered in pitfall traps but was the third most abundant species observed during examinations of fruiting plants. The remaining 6 species were observed in very low numbers ranging from < 1 to about 2% of the specimens collected. Only 1, 3 and 5 specimens were collected

TABLE 1. NUMBERS OF ADULT SAP BEETLES (NITIDULIDAE) COLLECTED IN PITFALL TRAPS OR ON STRAWBERRY PLANTS WITH RIPE FRUIT IN EASTERN HILLSBOROUGH, COUNTY, FLORIDA.

Species	Pitfall traps		Plants		Total
	1994-95	1994-95	1999	2000	
<i>Haptoncus luteolus</i> (Erichson)	555	42	37	37	671
<i>Lobiopa insularis</i> (Castelnau)	419	24	107	16	566
<i>Carpophilus fumatus</i> Boheman	268	81	85	27	461
<i>Carpophilus humeralis</i> (F.)	27	2	0	3	32
<i>Carpophilus freemani</i> Dobson	27	6	0	0	33
<i>Stelidota geminata</i> (Say)	19	3	0	0	22
<i>Stelidota ferruginea</i> Reitter	5	0	0	0	5
<i>Carpophilus mutilatus</i> Erichson	3	0	0	0	3
<i>Colopterus truncatus</i> (Randall)	0	1	0	0	1
Total	1,323	159	229	83	1,794

for *Colopterus truncatus* (Randall), *Carpophilus mutilatus* Erichson and *Stelidota ferruginea* Reitter, respectively.

SUMMARY

Nine species of sap beetles (Nitidulidae) were collected in pitfall traps and during whole plant examinations in strawberry fields during the 1994-95, 1999 and 2000 seasons in the strawberry production area of eastern Hillsborough County, Florida. *Haptoncus luteolus* (Erichson), *Lobiopa insularis* (Castelnau) and *Carpophilus fumatus* Boheman accounted for about 95% of the specimens collected while *C. humeralis* (F.), *C. freemani* Dobson, *C. mutilatus* (Erichson), *Stelidota geminata* (Say), *S. ferruginea* Reitter and *Colopterus truncatus* (Randall) each accounted only for $\leq 2\%$ of the specimens.

Key Words: bread dough bait, ethylene glycol, *Fragaria*, pitfall traps

RESUMEN

Se recolectaron nueve especies de escarabajos de la savia (Nitidulidae) en trampas de caída durante la examinación de plantas enteras en los campos de fresa durante las temporadas de

1994/95, 1999 y el 2000 en el área de producción de fresa en el este del condado de Hillsborough en la Florida. *Haptoncus luteolus* (Erichson), *Lobiopa insularis* (Castelnau) y *Carpophilus fumatus* Boheman representaron alrededor del 95% de las muestras recogidas, mientras que cada uno de los *C. humeralis* (F.), *C. freemani* Dobson, *C. mutilatus* (Erichson), *Stelidota geminata* (Say), *S. ferruginea* Reitter y *Colopterus truncatus* (Randall), representaron sólo $\leq 2\%$ de las muestras.

Palabras Clave: cebo de masa de pan, etilenglicol, *Fragaria*, trampas de caída

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