HYPOCALA ANDREMONA (LEPIDOPTERA: NOCTUIDAE) DEVELOPMENT ON EIGHT SPECIES OF *DIOSPYROS* (EBENACEAE)

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ABSTRACT

Damage by *Hypocala andremona* (Cramer) (Lepidoptera: Noctuidae) larvae to *Diospyros* spp. (Ebenaceae) was observed on the U. S. Department of Agriculture, Subtropical Horticulture Research Station in Miami, Florida. The larvae caused severe damage to black sapote, *D. digyna* Jacq., and Japanese persimmon, *D. kaki* L. Damage was also observed on *D. sonorae* Standl. and *D. texana* Scheele. Percentage survival of *H. andremona* larvae ranged from 0% for *D. montana* Roxb. and *D. mespiliformis* Hochst. ex A. DC. to 64% for tender foliage of *D. digyna*. The larval stage lasted 19 d on tender foliage of *D. digyna* and 28-32 d for other *Diospyros* spp. No parasites emerged from *H. andremona* collected in the field. These results indicate that *D. digyna* was the most favorable of the hosts of *H. andremona* studied; however, tender foliage was necessary for early instars to complete development. Also, the importation of parasites of *H. andremona* might help reduce the equilibrium density of the pest.

Key Words: Larval damage, black sapote, parasites.

RESUMEN

El daño causado por larvas de *Hypocala andremona* (Cramer) (Lepidoptera: Noctuidae) a *Diosporos* spp. (Ebenaceae) fué observado en la Estación de Investigación de Horticultura Subtropical del Departamento de Agricultura de los los Estados Unidos, en Miami, Florida. Las larvas causaron daños severos al sapote negro, *D. digyna* Jacq. y *D. kaki* L. También se observó daño en *D. sonorae* Standl. y *D. texana* Scheele. El porcentaje de sobrevivencia de larvas de *H. andremona* fué de un mínimo del 0% para *D. montana* Roxb. y *D. mespiliformis* Hochst. ex A. DC. a un máximo del 64% en el follaje tierno de *D. digyna*. El estado larval duró 19 días comiendo follaje tierno de *D. digyna* y 28-32 días para otras especies de *Diospyros*. No se encontró ningún parásito en larvas de *H. andremona* recogidas en el campo. Estos resultados indican que *D. digyna* fué el mejor de los hospederos de *H. andremona*; sin embargo, se necesitó follaje tierno para cumplir el desarrollo de los primeros instares. La importación de parasitos de *H. andremona* podría ayudar a reducir la densidad de equilibrio de la plaga.

Species of *Hypocala* (Lepidoptera: Noctuidae) feed on foliage of *Diospyros* spp. (Ebenaceae), although Beeson (1941), cited by Thakur et al. (1984), gives *Erioglossum rubiginosum* (Roxb.) Blume (Sapindaceae) as a host of *H. rostrata* F. in India. *H. rostrata* has been referred to as the persimmon leafroller or tendu defoliator and was recorded on foliage of *Diospyros kaki* L. (Japanese persimmon), *D. lotus* L. (date plum), *D. ehretioides* Wall., and *D. melanoxylon* Roxb. in India (Beeson 1941, Thakur et al. 1984, Kumar et al. 1989). *H. subsatura* Guenée fed on foliage of *D. kaki* in India (Pruthi & Batra 1960).

In March, 1990, *H. andremona* (Cramer) (syn. *hilli* Litner) was found heavily defoliating black sapote, *D. digyna* Jacq., at the U. S. Department of Agriculture Subtropical

Horticulture Research Station (SHRS), Miami, Florida. Defoliation averaged approximately 20%, with some trees suffering 50%. A review of the literature retrieved little information on *H. andremona*. This insect is common in the neotropics, and adult specimens have been found as far north as Maine and Ontario (Forbes 1954, Holland 1968). The objectives of this research were to obtain information on field biology of *H. andremona*, observe damage to black sapote, compare different species of *Diospyros* as hosts of *H. andremona* and survey for parasites.

MATERIALS AND METHODS

Observations were made on *H. andremona* attacking *Diospyros* spp. trees at the SHRS. The following species of *Diospyros* are in the clonal germplasm collection at the SHRS: *D. digyna*, *D. kaki*, *D. mespiliformis* Hochst. ex A. DC. (monkey guava), *D. montana* Roxb., *D. pallens* (Thunb.) F. White, *D. sonorae* Standl., and *D. texana* Scheele (black persimmon). *D. digyna*, *D. sonorae*, and *D. texana* are native to Mexico, and the others are Old World tropical and subtropical species. A tree of *D. virginiana* L. (common persimmon), native to the southeastern United States, located 3 km southwest of the station (on Old Cutler Road near SW 160 Street) was also observed.

H. andremona larvae were collected from black sapote and reared at 24 ± 1°C and 70-90% RH on branches of excised black sapote foliage of different ages placed in water. Observations were made for parasitism of these larvae. Emerging pupae were placed in cages (0.2 m^3) with the floors, tops, and frames made of Plexiglas™ (3 mm thick). Three sides consisted of aluminum screen (1 mm spacing between the threads), and the front was a sliding Plexiglas door with a sleeved access port (0.1 m diam). Water for the adults was provided from two plastic vials (20 ml) with the bottoms and part of the sides cut out. A cylindrical sponge (25 mm diam, 35 mm long) was placed in the vial and kept saturated with water. The vials were suspended in holes (29 mm diam) in the back corners at the top of the cages. Several sucrose cubes (13 mm) were placed inside the cages for adult nourishment.

Adults mated inside the cages, and eggs were laid mostly on the screen, with a few laid on pieces of paper or black sapote foliage placed inside the cages. Ten to 25 neonate larvae were collected from the cages with a fine-tipped paint brush and placed on foliage of eight accessions of *Diospyros* (Table 1) located inside cages made from Petri dishes (0.145 m diam). Both tender and mature foliage of *D. digyna* were used because tender foliage of this tree is available year-round. A hole (3.1 cm diam) for inserting larvae was cut into the top of the Petri dish and plugged with a rubber stopper (#7). A slit (6 × 20 mm) was cut down the side of the bottom half of the Petri dish to allow the end of the stem to be inserted in water. Cylinders of dental cotton (7 mm diam, 35 mm long) were used to plug the hole around the stem to keep larvae from escaping. The larvae were kept at 24 ± 1°C, 70-90% RH, and foliage was replaced every 1-3 d as needed. When larvae were 1-1.5 cm in length they were transferred to the Plexiglas cages described above. Data on mortality and length of larvae were noted when the foliage was changed. Cages were checked for pupae daily. The experiment was replicated four times. The following data were analyzed as completely randomized models using the ANOVA procedure (SAS Insitute 1989): percentage survival of larvae, number of days to pupation, duration of the pupal stage, pupal weight, and percentage survival of pupae. Means were compared using the Ryan-Einot-Gabriel-Welsch multiple F test.

RESULTS AND DISCUSSION

All 54 trees of *D. digyna* (PI-133380) on the station showed considerable defoliation (15-50%) by *H. andremona* during the spring of 1990. Eggs were laid individually on

TABLE 1. PERCENTAGE SURVIVAL AND DURATION OF PUPAL AND LARVAL STAGES AND PUPAL WEIGHT OF *H. ANDREMONA* REARED ON *DIOSPYROS* SPP. (24 ± 1°C, 70-90% RH).

Diospyros	Accession Number	Tree Number	Percentage Survival		Duration (d)		Pupal Weight, g[2]
			Larvae[1]	Pupae[2]	Larvae[1]	Pupae[2]	
digyna[3]	PI-133380	WA-3-25-3-58	64 a	98	19 a	11.8	0.37
virginiana	—	—	44 a	83	28 ab	13.3	0.33
kaki	PI-82033	N-4-1-2-10	41 ab	100	30 b	12.6	0.31
texana	M-1408	S-2-1-1-10	18 bc	73	30 b	12.3	0.22
pallens	M-23197	S-1-6-14-1	3 c	100	30 b	12.5	0.32
sonorae	PI-76090	W-2-5-4-1	3 c	100	32 b	12.5	0.29
digyna[4]	PI-133380	WA-3-25-3-58	0 c	—	—	—	—
montana	PI-149828	S-1-5-13-8	0 c	—	—	—	—
mespiliformis	PI-61810	S-2-1-4-9	0 c	—	—	—	—

[1]Means followed by the same letter are not significantly different, Ryan-Einot-Gabriel-Welsch multiple *F* test, P = 0.05. (SAS Institute 1989).
[2]No significant differences between means, Ryan-Einot-Gabriel-Welsch multiple *F* test, P = 0.05.
[3]New, tender foliage.
[4]Mature foliage.

newly forming (pale green) leaves and vegetative and flower buds; early instars fed on these structures. Early instars also fed at the tips of leaves with their bodies parallel to the leaf mid-vein. From there, they worked their way up the leaf removing large sections of it. Early-instar larvae bored inside flowering buds causing them to abort. Very few black sapote fruits set in 1990. When larvae were approximately 1/3 to 1/2 grown, they began to feed on mature (dark green) foliage, as well as newly forming foliage. Early instars were not observed to feed on mature foliage in the field. Large larvae bored into mature black sapote fruits as well as feeding on foliage. They were always observed to enter the fruit at the edge of the calyx but would not penetrate very far under the epidermis without boring far from the entrance. Sometimes the entire larva entered the fruit, but would not remove > 5 ml of pulp. Occassionally, the fruit would rot at this site; at other times the wound would become sealed and the fruit continued to ripen normally. In any case, even if the wound healed, black sapote fruits damaged by *H. andremona* were culled in local packing houses.

The continual destruction of newly emerging foliage caused a "witches broom" effect as new branches developed below the destroyed vegetative shoots. There was considerable deformation and death of branches. Although various Lepidoptera and Coleoptera larvae bore into damaged *D. kaki* in Florida (Miller & Crocker 1991), we did not observe a borer problem in *D. digyna* damaged by *H. andremona*.

The lone female tree of *D. kaki*, PI-82033, was heavily damaged by *H. andremona*. All of the flower buds had been eaten and defoliation was approximately 60%.

All three *D. mespiliformis* trees (PI-61810, PI-78256: two trees), all six *D. montana* trees (two trees each of PI-119828, PI-124229, and M-10380), all three of *D. pallens* bushes (M-23197), and both trees of *Diospyros* sp. (PI-52510) showed no damage by *H. andremona*, nor were larvae found on the foliage.

Two of three *D. sonorae* trees (PI-76090) showed possible minor damage by *H. andremona*, but no insects were found on the trees. One large male *D. texana* bush (M-1408) had approximately 10% defoliation and some larvae of *H. andremona*. The *D. virginiana* off-station had no damage from *H. andremona*.

Percentage survival of *H. andremona* larvae on *Diospyros* spp. ranged from 0% for *D. montana*, *D. mespiliformis*, and mature *D. digyna* foliage to 64% for new, succulent *D. digyna* foliage (Table 1). Survival was also high on *D. kaki* and *D. virginiana*, two economic species in the southeastern United States. Larvae that died feeding on *D. digyna* and *D. kaki* did so within the first 11-13 d, after which almost all of the surviving larvae reached the pupal stage. Larvae that died feeding on *D. virginiana* did so within the first 13-18 d. For larvae reared on *D. texana*, 40-60% mortality occurred within the first 3-5 d, after which the mortality rate was low but constant until pupation. Although larval survival for *H. andremona* fed *D. pallens* and *D. sonorae* was 3%, mortality was higher on *D. pallens* initially and more gradual on *D. sonorae*. First instars placed on mature foliage of *D. digyna* fed very little, did not grow, and died within 6 d. Mortality of larvae placed on *D. montana* reached 50% in 4-7 d; some larvae survived 14-19 d, although they never reached > 10 mm in length. First instars fed *D. mespiliformis* died within 6-14 d and did not grow longer than 7 mm. Infectious diseases and cannibalism were not noted to cause any mortality.

Duration of the larval period was shortest for larvae reared on new foliage of *D. digyna* (Table 1). There were no significant differences in duration of the pupal stage, pupal weight, or pupal survival (Table 1).

H. andremona developed best on tender foliage of *D. digyna*. Percentage survival of larvae and pupal weight were highest, and duration of larval and pupal stages was shortest on tender foliage of *D. digyna*, indicating that it was the most favorable host. This might be partly due to conditioning of the pest on *D. digyna*, because the insects used in these studies were collected from this host. Larvae were not often found on other species of *Diospyros* in the field.

Of 306 *H. andremona* larvae of different sizes collected on *D. digyna* trees from March, 1990, to June, 1991, and reared in the laboratory, none were observed to be parasitized. It is rare for noctuids to lack larval parasites. A search for parasites of *H. andremona* in the neotropics might be beneficial in reducing the amount of damage this insect causes to *Diospyros* in Florida.

END NOTE

Mention of a proprietary product does not constitute an endorsement by the USDA. J. Heppner, Department of Plant Industries, Florida Department of Agriculture & Consumer Services, identified *H. andremona*. Wilhelmina Wasik and Elena Schnell provided technical assistance.

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MOVEMENT AND ESTABLISHMENT OF SUGARCANE BORER (LEPIDOPTERA: PYRALIDAE) LARVAE ON RESISTANT AND SUSCEPTIBLE SUGARCANE

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ABSTRACT

The movement and establishment of sugarcane borer, *Diatraea saccharalis* (F.), larvae was studied on resistant and susceptible sugarcane. A field study was conducted over three years on the cultivars 'CP 74-383' (susceptible), 'CP 65-357' (intermediate), and 'CP 70-321' (resistant). Stalks of each cultivar were artificially infested with neonate