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Authors: Castrejon Gómez, Victor Rogelio, and Rojas, Julio C.

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CALLING BEHAVIOR OF *ZAMAGIRIA DIXOLOPHELLA* (LEPIDOPTERA: PYRALIDAE)

VICTOR ROGELIO CASTREJON GÓMEZ[1,2] AND JULIO C. ROJAS[1]
[1]Departamento de Entomología Tropical, El Colegio de la Frontera Sur (ECOSUR)
Apdo. Postal 36, 30700, Tapachula, Chiapas, México

[2]Becario COFAA. Departamento de Interacciones Planta-Insecto. Centro de Desarrollo de Productos Bióticos del I. P. N. (CEPROBI). Carretera Yautepec, Jojutla, Km. 8.5, Apdo. Postal 24. San Isidro, Yautepec, Morelos, México

The sapodilla bud borer, *Zamagiria dixolophella* Dyar, has been reported attacking the sapodilla *Manilkara zapota* van Royen in Mexico (Iruegas et al. 2002). The larvae feed on the tender young shoots and fruits. Current control of this species is based upon the use of insecticides; however, chemical control of this pest is difficult due to its cryptic nature. Mating disruption may be an alternative for controlling it. Although in *Z. dixolophella* the pheromone has not been identified yet, it would be worthwhile to understand the influence of different factors in the release of pheromone to obtain a complete picture of the factors governing the biology of the female sex pheromone system. Production and release of the sex pheromone in many moths is influenced by several biotic and abiotic factors (Landolt & Phillips 1997; Rafaeli 2002). In this study, we investigated the possible effect of host plant and the photoperiod on the calling behavior of *Z. dixolophella* under laboratory conditions as a first step to identify the sex pheromone.

Larvae of *Z. dixolophella* were collected in *M. zapota* orchards "El Nayar" (14°49'36"N and 92°20'52"W at 44 masl) and "Cazanares" (14°44'40"N and 92°24'20"W at 20 masl), both located between Tapachula City and Puerto Madero, Chiapas, Mexico. Larvae were held in 3-L clear plastic cylindrical containers (23 cm height × 14 cm diameter), and allowed to feed upon their host plant (tender young shoots) in controlled conditions at 25 ± 5°C and 65 ± 5% R H with a reversed photoperiod of 16: 8 h (L: D) (unless otherwise specified). Pupae obtained were placed in Petri dishes inside plastic cages (30 × 30 cm) and observed constantly one or two days before emergence. Most females emerged during the photophase, and only these were used in the observations. The experiments started during the first complete scotophase after emergence. Females were observed every 10 min throughout their first six scotophases with a red light lamp. The percentage of females calling daily, the daily onset of calling time (time after lights off), and duration of calling of each female were recorded.

The possible influence of host plant in the calling behavior was investigated in two groups of newly emerged virgin females. In the first group, 20 females were individually placed in cylindrical containers (23 cm height × 14 cm diameter). A fresh, tender young host plant shoot with leaves and flowers inserted in a plastic vial with cotton soaked in water was placed in each container. The host plant was changed daily after each scotophase. In the second group, 20 females were placed as described above but without the presence of host plant. The opening of the containers was covered with gauze to permit circulation of air. A drop of natural honey was placed daily on gauze to ensure that females had food *ad libitum*. The observations were made at 25 ± 5°C, 65 ± 5% relative humidity and at 16L: 8 D photoperiod regimen.

The effect of photoperiod on the calling behavior was examined under two different photoperiod regimes: 16L: 8D and 13L: 11: D. In both cases, larvae were collected in the field and once they have reached the pupal stage, pupae were sexed, and the female pupae were preconditioned under the experimental photoperiod at which they were to be observed. Upon emergence females were isolated, placed in individual containers with host plants at 25 ± 5°C and 65 ± 5% relative humidity. Twenty females were tested under each photoperiodic regime.

The percentages of calling females were analyzed by χ^2 test. The data for the daily onset of calling time and duration of calling were analyzed by one-way repeated measures analysis of variance (ANOVA), with age as repeated measure. Means were separated by least significant difference (LSD) at a significance level of 0.05.

Most of the females called from their first scotophase independently of the presence or absence of host plant. The mean daily onset of calling time was not affected by the presence or absence of the host plant, but it differed significantly with age. The interaction between the presence of host plant × age was not significant. Also, the presence of host plant did not affect the length of the calling period, but this parameter was influenced by female age. The interaction between the presence of host plant × age was not significant. In contrast to our results, several studies have shown that the presence of the host plant or its volatile chemicals stimulate the production and releasing of the sex pheromone in several moth species (Hendrikse & Vos-Bünnemeyer 1987; Raina 1988; Raina et al. 1992, 1997; Pittendrigh & Pivnick 1993). Virgin females of *Helicoverpa zea* (formerly

Heliothis) (Boddie) (Raina et al. 1992) and *Heliothis phloxiphaga* G. and R. (Raina 1988) synthesized and released pheromone only in presence of their host plants. However *H. zea* females reared in laboratory for many generations did not require the host plant for the production and release the pheromone (Raina 1988). In presence of its host plant, females of *Plutella xylostella* (L.) began calling at a younger age and they spent more time calling (Pittendrigh & Pivnick 1993).

The percentage of calling females was similar in the two photoperiods evaluated. The mean daily onset time of calling was significantly different under the photoperiods tested, but this parameter was not affected by female age. The interaction between age × photoperiod was significant. In overall, females maintained at 16L: 8D began to call earlier than females held at 13L: 11D, except in the fifth scotophase (Fig. 1a). The length of the calling period differed significantly between the photoperiods evaluated and this parameter was influenced by female age. Also, the interaction between age × photoperiod was significant. Females held at 16L: 8D called longer than females maintained at 13L: 11D (Fig. 1b). Our results are in agreement with the suggestion of Haynes and Birch (1984), who proposed that photoperiod would have a major influence on the calling behavior of multivoltine species such as *Z. dixolophella* because these species are exposed to different photoperiod conditions at different times of the year.

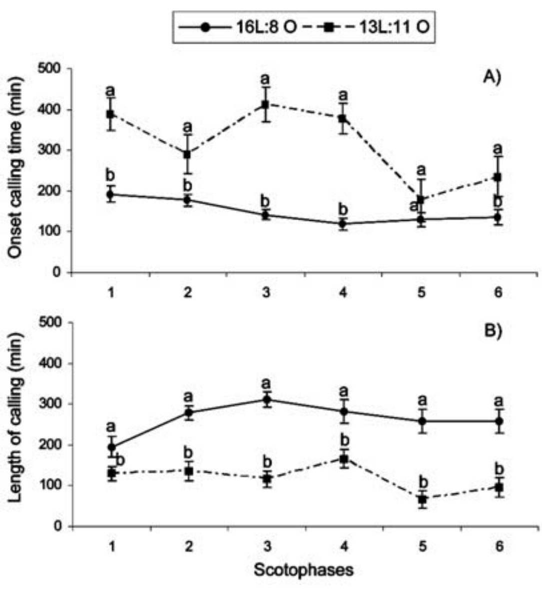

Fig. 1. Calling behavior response of *Z. dixolophella* at two different photoperiods under laboratory conditions (values are means ± SE). (A) Mean (± SE) onset time of calling. (B) Mean (± SE) time spent calling. Different letters indicate significance at $P < 0.05$.

In conclusion, this study shows that the calling behavior of *Z. dixolophella* is influenced by the photoperiod, but not by the presence of host plant. This information will be useful during the collection and identification of sex pheromone.

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Summary

The influence of host plant and photoperiod on calling behavior of the moth *Zamagiria dixolophella*, a sapodilla pest in Mexico was investigated under laboratory conditions. Most of the females called from their first scotophase independently of the presence or absence of host plant. Also, the host plant did not influence the mean onset time of calling and the mean time spent calling. There was an effect of photoperiod on the mean onset time of calling and the mean time spent calling of *Z. dixolophella*.

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