

MALE RESPONSE TO NATURAL SEX PHEROMONE OF
Migdolus fryanus WESTWOOD (COLEOPTERA:
CERAMBYCIDAE) FEMALES AS AFFECTED BY DAILY
CLIMATIC FACTORS

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Abstract—Males of the sugarcane borer, *Migdolus fryanus* (Coleoptera: Cerambycidae), are attracted to females by means of a sex pheromone. Mating usually occurs during a few days from October to March under field conditions in São Paulo State, Brazil. This work reports on mating of this species as affected by daily climatic factors, during a single nuptial flight. Maximum male capture by the natural sex pheromone occurred from 10:00 to 11:00 AM at air and soil temperatures of 30.0°C and relative humidity of 57.0%. As these temperatures increased, females burrowed into the soil, as they are more sensitive to heat than males. Thus, it was concluded that sex pheromone-mediated mating in this cerambycid is directly affected by temperatures of air and soil.

Key Words—*Migdolus fryanus*, Coleoptera, Cerambycidae, mating behavior, sex pheromone, climatic factors.

INTRODUCTION

Adult males of *Migdolus fryanus* respond strongly to the female sex pheromone (Bento et al., 1992). This sexual attraction can be observed during several consecutive days in the same area (Arrigoni et al., 1986). Observations in many localities have indicated differences in mating time relative to the local climatic

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conditions so that mating occurs from October (Novaretti et al., 1983) through March (Roccia, 1977; Arrigoni et al., 1986) in São Paulo State, Brazil.

Mating is apparently restricted to a narrow range of time during each day, independent of the place. Adult males fly to the ground to locate the apterous female, which remains at soil level with only head and thorax exposed (Roccia, 1977). Then she emerges for mating, possibly with more than one male (Roccia, 1977; Terán et al., 1984). She again burrows into the soil to various depths for egg-laying. Bento et al. (1992) have suggested that females can not tolerate hot and sunny weather and that they die if they remain exposed at the soil surface for more than 24 hr during mating days.

Very little has been done on the behavioral aspects of this species, which is the key pest of sugarcane in South America. Thus, our work was conducted with the following objectives: (1) to determine the peak of response of *M. fryanus* males using traps baited with the natural sex pheromone; and (2) to relate the catch to weather factors such as relative humidity and soil and air temperatures.

METHODS AND MATERIALS

The experiment was set up in Olímpia County, São Paulo State (latitude 20°46'S; longitude 49°40'W) on February 22, 1992, in sugarcane plantation areas. The number of males captured was determined for each hour during 24 consecutive hours using the UFV design traps as described in Bento et al. (1992). This trap consists of a plastic water container, 20-liter volume, with sections of the large sides cut out, leaving two rectangular windows. In the center of this, a PVC tube (85 mm diameter × 40 mm long), which had the ends covered with a nylon screen, was hung by wire. Four treatments in four replicates were set up in a completely randomized experimental design as follows: (A) two virgin females; (B) rubber septum impregnated with material extracted from virgin females + hexane; (C) rubber septum + hexane (control); and (D) unbaited (control).

All traps were placed at the soil level with a distance of 22 m between traps in an area prepared for sugarcane planting which had a high incidence of *M. fryanus* in previous years. The extraction of natural sex pheromone was carried out as in Bento et al. (1992) using hexane instead of dichloromethane as the solvent. Thirty females were aerated through 1 g of Porapak Q for 24 hr and 2.0 female equivalents were used on each septum.

Local air temperature, relative humidity, and soil temperature at 5 cm depth were taken hourly during the 24-hr period beginning at 6:00 PM.

RESULTS

Field trapping of *M. fryanus* males occurred from 7:00 AM to 3:00 PM. During this period, the air and soil temperatures increased from 23.0 to 33.0°C and from 26.3 to 32.9°C, respectively, and there was a reduction in relative humidity from 82.0 to 55.0% (Figure 1).

Maximum male capture occurred from 10:00 to 11:00 AM at air and soil temperatures of approximately 30°C and relative humidity of 57.0%.

The time of male and female occurrence in the field was also recorded. Females were found in the field from 8:00 AM until noon, when the air temperature was 27.0–30.0°C, soil temperature 28.2–30.3°C, and relative humidity 68.0–57.0%. Males were found from 7:00 AM to 3:00 PM.

DISCUSSION

Females remained on the soil surface for a shorter period of time, suggesting that they are more sensitive to higher temperatures than males. Males penetrate into the soil or die when air or soil temperature reaches 33.0°C. They live for two or three days (Roccia, 1977). Their energy reserves are apparently insufficient for soil excavation or for returning to the soil surface to compete further for females.

There was no significant difference between the number of males captured by traps baited with two females or with the rubber septum + extract + hexane during the peak of capture. This may suggest that pheromone release by the females was more intense from 10:00 to 11:00 AM. As the males come to the surface, they are able to respond to the female sex pheromone. Early catches were low (Figure 1B) due to the absence of females.

The natural sex pheromone in the septum has attracted the males with a similar intensity as virgin females and during the same period. This indicates that the cessation of male response is associated with environmental factors such as an increase in air and soil temperatures.

The male catch demonstrates that the highest period of attractiveness occurs from 8:00 AM to noon. This is the period in which the females are above the soil surface. We believe that females start releasing pheromone immediately after emerging from soil. They probably stop pheromone release only because they reenter the soil in response to high temperature (Bento et al., 1992). Another possibility is that females release pheromone continuously, but it is not detected by the males due to the soil acting as a physical barrier as females reenter the soil.

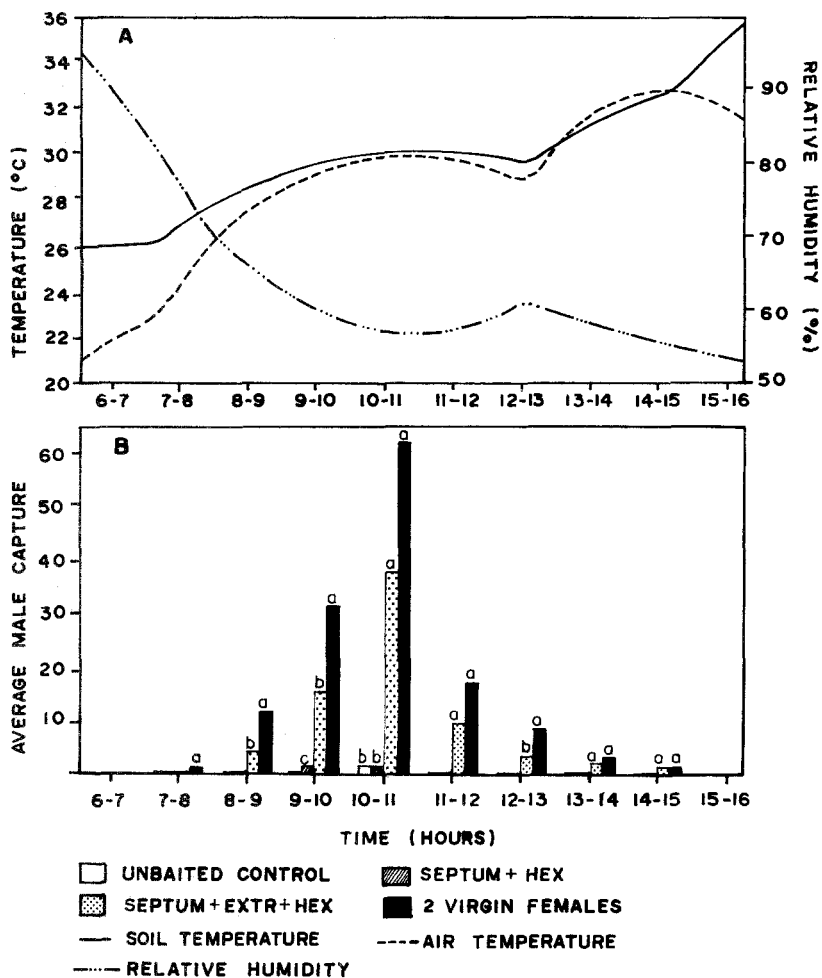


FIG. 1. Average catch of *Migdolus fryanus* using traps baited with two virgin females; rubber septum + female extract + hexane; rubber septum + hexane (control) and no bait (control), and relative humidity, and air and soil temperature during 24 consecutive hours of the trapping period. (Means followed by the same letter within time periods are not different $P < 0.05$ by Ducan's multiple-range test.)

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