

Role of Semiochemicals in the Host Colonization Behavior of the Peach Bark Beetle, *Phloeotribus liminaris* (Coleoptera: Curculionidae: Scolytinae)

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ABSTRACT

Black cherry, *Prunus serotina*, is among the most marketable hardwoods in the U.S. Widespread infestations of the peach bark beetle, *Phloeotribus liminaris* (Harris), keep many of these trees from reaching veneer quality and significantly reduce their value. Nevertheless, the host colonization behavior of this beetle is poorly understood.

In this study, we test the hypothesis that the host colonization behavior of *P. liminaris* is chemically mediated. To determine whether adults are attracted to host compounds, we measured the walking response of males and females to bolts of black cherry in a glass tube olfactometer. As feeding stimulates pheromone production in other bark beetles, we also tested the response of the sexes to bolts of black cherry colonized by either males or females. Males were significantly attracted to female infested bolts of black cherry, suggesting the presence of a female-produced sex pheromone. Information on the colonization behavior of the peach bark beetle will aid in establishing effective management programs, such as improving detection methods and optimizing survey strategies.

INTRODUCTION

- Little is known of the colonization and mating behavior of bark beetles that attack hardwood trees.
- Peach bark beetle (PBB), *Phloeotribus liminaris* (Harris) (Fig.1), is a pest of black cherry.
- PBB attacks induce gummosis in trees (Fig. 2), leaving gum spots in the wood and reducing its value by up to 90%.
- Conventional control methods are ineffective because the beetles feed underneath the bark where they are physically protected from sprayed insecticides.
- Information on the colonization behavior of PBB will aid in establishing effective management programs, such as improving detection methods and optimizing survey strategies.



Fig. 1: *Phloeotribus liminaris* Fig. 2: Gummosis in black cherry

OBJECTIVE

Test the hypothesis that host colonization in the peach bark beetle is chemically mediated.

METHODS

- Measured walking response of PBB beetles ($n=60-80$) in a straight-tube glass olfactometer (3 cm dia. x 30 cm length) divided into five 2.5 cm sectors (Fig. 3) to the following odor sources:
 - Blank
 - Cherry bolt
 - Male-infested bolt ($n=20$)
 - Female-infested bolt ($n=20$)
- Twenty holes (0.4 cm) were drilled through the bark of black cherry bolts used in bioassays.
- In the male- and female-infested bolts, individual beetles were placed in the holes and allowed to feed for 24 hours before being used in bioassays.
- Filtered air was drawn through a glass chamber containing the odor source before entering the olfactometer.
- Beetles (5/trial) were placed at the down-wind end of the olfactometer (sector 0, see Fig. 3).
- Location of beetles within the olfactometer was recorded every minute, for a total of ten minutes.
- Attractivity index (D) was calculated per Zagatti et al. 1987. This index has been used to assess the colonization behavior of a congener *Phloeotribus scarabaeioides* (Bernard) (Pena et al. 1992)

$$D = X/D_{max} * 100, \text{ where } X = \sum_{i=10}^{4} n_i$$

n_i is the number of beetles in sector i at 10 minutes
 $D_{max} = 4n$ (the value if all beetles were in sector 4 at the end of the assay)

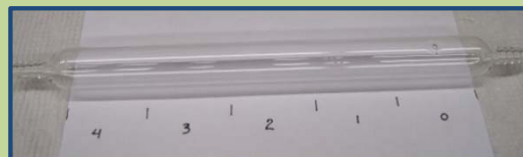


Fig. 3: Olfactometer used for bioassays

RESULTS

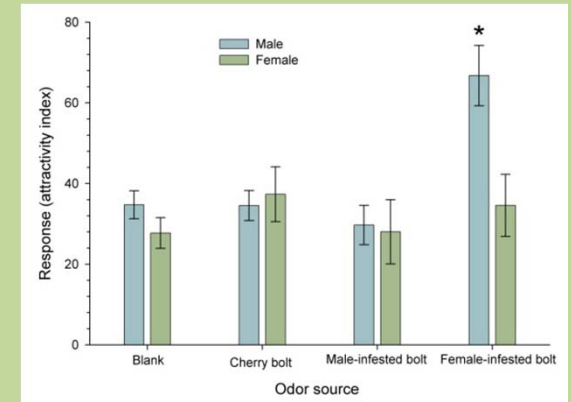


Fig. 4: Attraction of male and female PBB to uninfested and infested bolts of black cherry. (ANOVA $F_{7,114}=4.3$, (P)<0.0003). Bar marked with (*) is significantly different when compared to control (LSD, P <0.05).

CONCLUSIONS

Male PBB were significantly attracted to bolts of black cherry infested with female beetles, suggesting that females release a sex pheromone.

FUTURE DIRECTIONS

- Identify female produced pheromone.
- Test response of males and females to volatile pheromone in field.
- Investigate water stress and susceptibility of colonization of black cherry by peach bark beetles.

REFERENCES

1. Zagatti et al. 1987. J. Chem. Ecol. 13:1561-73.
2. Pena et al. 1992. Entomol. Exp. Appl. 63:81-86.

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