EVIDENCE FOR ALLELOCHEMICAL ATTRACTION OF THE COFFEE BERRY BORER, *Hypothenemus hampei*, BY COFFEE BERRIES

PHILIPPE GIORDANENGO,¹ LUC O. BRUN,² and BRIGITTE FREROT,³,*

¹Laboratoire d'Entomologie fondamentale et appliquée
Université de Rennes
Avenue du Général Leclerc, F. 35042 Rennes Cedex, France

²Laboratoire de Zoologie appliquée
ORSTROM, BP A5, Noumea, New Caledonia

³Laboratoire des Médiateurs chimiques, INRA
Domaine de Brouessy, F. 78114 Magny les Hameaux, France

(Received June 29, 1992; accepted November 30, 1992)

Abstract—Petri dish choice tests conducted on the coffee berry borer (CBB), *Hypothenemus hampei*, showed that females were able to discriminate between coffee berries at different ripening stages. A Y-shaped glass olfactometer was used to demonstrate that coffee berries emitted volatile chemicals that elicited upwind movement by female CBB. Olfactometer tests with three different solvent extracts of berries showed that at least some of the attractive chemical(s) released by the coffee berries could be extracted with acetone.

Key Words—Coleoptera, Scolytidae, *Hypothenemus hampei*, host selection, kairomones, olfaction, *Coffea* sp.

INTRODUCTION

The coffee berry borer (CBB), *Hypothenemus hampei* Ferrari (Coleoptera: Scolytidae) feeds and develops exclusively in the berries of coffee, especially of the species *Coffea canephora* Pierre. Since the species was first described in 1867 in Uganda, *H. hampei* has spread to most of the world’s major coffee-producing areas. The last significant coffee-growing countries not yet infested are Costa Rica, Papua New Guinea, and Hawaii. The CBB is responsible for significant

*To whom correspondence should be addressed.
crop losses with infestation levels up to 60–80% per crop being reported (Schmitz and Crisinel, 1957; Le Pelley, 1968; Reid and Mansingh, 1985). In New Caledonia, CBB is the major pest of coffee. Control of this pest in New Caledonia can be difficult because it has developed resistance to endosulfan (Brun et al., 1989). In the two major coffee-growing areas of the territory, 94% and 100% of the surveyed CBB populations had resistant individuals (Brun et al., 1990). The spread of the resistant populations is of concern, and new methods to monitor this pest need to be developed.

Surprisingly, little is known about its biology considering the economic significance of this pest. Most of the work on this species has been concerned with its developmental cycle (Bartra et al., 1981; for a review see Borbon-Martinez, 1989). At about 12 days after eclosion, gravid females leave the berry and disperse to colonize and oviposit in new berries. Recently, evidence for parthenogenic reproduction has been reported (Munoz, 1989). Females are able to colonize berries throughout the year, when the harvest is incomplete. Some berries remain on the plant (Baker, 1984). Most of these berries dry on the plant, but some green and red berries can develop.

In contrast with other Scolytidae, little is known about the chemical ecology of CBB, particularly the factors that influence host colonization. Corbett (1933) and Morallo-Rejesus and Baldos (1980) reported that red, ripe berries are preferentially attacked over less ripe berries also present in the field. Morallo-Rejesus and Baldos (1980) dismissed the importance of visual cues in this preferential attack, arguing that insects are usually blind to red. They concluded that other factors, such as odors of ripe berries, may aid the insect in host choice. As a basis for developing a monitoring system for CBB based on host location, we were interested in determining how CBB females recognize a suitable host; i.e., are olfactory or visual cues involved in colonization by CBB females or is colonization of the host plant a result of random search by females. The present study describes laboratory tests determining whether volatile chemicals emitted from different stages of coffee berries are involved in host location by CBB females.

METHODS AND MATERIALS

Insects. Infested berries were collected in the field (Sarramea Valley, New Caledonia) and stored in small black-painted plastic containers in the laboratory, under ambient conditions (26 ± 2°C and relative humidity 80–85%). The positive phototactic response exhibited by female CBB leaving berries was used for collection of CBB females. A transparent plastic tube was connected to the black container so that females that had come out of the berries would walk into the tube. Females were used in experiments within 1 hr after they had left the berry.