CHANGE IN MANDIBULAR AND MESOSOMAL GLAND CONTENTS OF MALE Xylocopa micans (HYMENOPTERA: ANTHOPHORIDAE) ASSOCIATED WITH MATING SYSTEM

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Abstract—Males of Xylocopa micans employ two mating systems in south-central Texas. They defend territories around flowering wisteria and redbud in March and April, and they maintain nonresource-based or landmark territories in July and August. Mandibular and mesosomal gland contents (analyzed by GC-MS) are different in bees employing the two mating systems. Mandibular glands contain only straight-chain hydrocarbons in bees defending floral resources, but include ethyl oleate in bees defending landmark territories. Mesosomal glands contain saturated, mono- and diunsaturated straight-chain hydrocarbons and methyl and ethyl esters of long-chain fatty acids. The major ethyl ester, ethyl oleate, comprises only 1.1% of mesosomal gland contents in bees defending floral resources but comprises 39.7% of gland content of bees defending landmark territories. These findings are discussed relative to the proposed sex pheromone function of Xylocopa gland secretions.

Key Words—Xylocopa micans, Hymenoptera, Anthophoridae, mesosomal glands, mandibular glands, hydrocarbons, fatty acid esters, territoriality, mating system.

INTRODUCTION

Male carpenter bees in the genus Xylocopa exhibit a variety of mating systems. Marshall and Alcock (1981) divided mating systems of Xylocopa into four categories: (1) female defense polygyny (male territoriality at the female emer-

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gence site), (2) resource defense polygyny (male territoriality at flowers or female nesting site), (3) lek polygyny (male territoriality at nonflowering plants and landmarks), and (4) nonterritorial patrolling. The majority of Xylocopa species maintains territories of one type or another (e.g., Barrows, 1983; Frankie et al., 1979; Gerling and Hermann, 1978; Gerling et al., 1983; Velthius and de Camargo, 1975a; Velthius and Gerling, 1980).

Chemicals from several glands of male Xylocopa have been implicated in maintaining territories and attracting females (Gerling et al., 1989). Hefetz (1983) observed that male X. sulcatipes Maa marked plants with mandibular secretion, containing guaiacol, p-cresol, and vanillin, that functions as a sex pheromone. Velthius and de Camargo (1975b) suggested that male X. hirsutissima Maidl spread mandibular secretions over the venter of the abdomen to attract females to their territory.

Dorsal mesosomal glands, described by Vinson et al. (1986), also have been proposed to contain a sex pheromone in some Xylocopa species. Two Costa Rican species, X. gualanensis Cockerell and X. fimbriata F., appear to smear mesosomal secretions on their legs, which they then use to mark vegetation (Vinson and Frankie, 1990). Andersen et al. (1988) proposed a sex pheromone role for terpenoids identified from X. varipuncta Patton and fatty acid esters and alcohols identified from X. micheneri (Hurd) mesosomal glands.

Xylocopa (Schonherria) micans Lepeletier occurs commonly in south-central Texas where Frankie et al. (1979) observed males defending nonresource-based or landmark territories (lek polygyny) in late July. In this study, we describe another mating system, that of floral resource defense (resource defense polygyny), exhibited in early spring. We isolated and identified secretions from both mandibular and mesosomal glands and compared their contents in bees displaying different mating systems.

METHODS AND MATERIALS

Behavioral Observations. Floral defense behavior of male X. micans was observed over a period of three years. Males were studied on wisteria (Wisteria macrostachys) during March 1987 and April 1989, and on redbud (Cercis canadensis) in early March 1988 within College Station city limits, Brazos County, Texas. Males also were observed during late March 1989 on wisteria in Needville, Brazoria County, Texas.

Isolation of Glandular Material. Male X. micans were collected while they defended nonresource-based territories along unpaved roads in West Columbia, Brazoria County, Texas, during August 1988 [collection area described by Frankie et al. (1979)]. Males exhibiting floral resource defense were collected while they defended flowering wisteria bushes in Needville, Brazoria County,