Pachysomoides sp. (Hymenoptera: Ichneumonidae: Cryptinae) and *Megaselia scalaris* (Diptera: Phoridae) Parasitoids of *Mischocyttarus cassununga* (Hymenoptera: Vespidae) in Viçosa, Minas Gerais State, Brazil

by

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ABSTRACT

The *Mischocyttarus* genus has the greatest number of species among the social wasps and independent founders initiate their colonies. This group shows a greater incidence of parasitism in its nests than the swarming species. The objective of this study was to verify the occurrence and identify parasitoid species in nests of the *Mischocyttarus cassununga* (Von Ihering) (Hymenoptera: Vespidae) wasp. The experiment was carried out at the Federal University of Viçosa, Minas Gerais State, Brazil, at 25 ± 2°C, 70 ± 10% relative humidity and 12 hours light phase. Ten *M. cassununga* nests were collected from the UFV campus area and placed individually in plastic cups (0.19 x 0.145 x 01.45 cm). The number and viability of alveoli, parasitoid emergences, and *M. cassununga* nest size were observed. The *M. cassununga* nest parasitoids were identified as *Pachysomoides* sp. (Hymenoptera: Ichneumonidae: Cryptinae) and *Megaselia scalaris* (Loew) (Diptera: Phoridae), which represents the first report of these parasitoids in this host in Brazil.

Keywords: eusocial, parasitism, Vespidae, wasps, nest.

INTRODUCTION

The *Vespidae* family presents all of the known cases of eusociality in wasps with more than 800 eusocial species (Akre 1982). This group consists of the

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subfamilies Stenogastrinae, Vespinae, and Polistinae, but only the latter is found in Brazil (Malaspina *et al.* 1999). The Polistinae subfamily is divided into two groups according to nest behavior and architecture. The first is an independent foundation group (*Belonogaster*, *Mischocyttarus*, *Parapolybia* and *Polistes* genera) and the second is the swarming group with a well-defined social organization (Jeanne 1980). The *Mischocyttarus* genus contains the greatest number of species of the social wasps, with more than 200 reported (Silveira 2004).

Independent foundation wasps form relatively small colonies (less than 100 individuals) (Raghavendra 1990) and build a single exposed comb, fixed to a surface by a peduncle where the adult wasps usually apply a substance that inhibits predatory insects (Jeanne 1975). The nests of the species of the *Polistes* and *Mischocyttarus* genera are founded by a single fertilized female fixed in many substrates, including urban, semi-urbanized or agrarian ecosystems, frequently on buildings and other man-made structures (Lima *et al.* 2000).

Generally, social wasp nest construction creates an environment with a high diversity of resources (progeny, prey, shelter and defense) that consequently attracts predators and parasitoids of various insect groups. Although the cost-benefit relationship generated by the social habit has not been totally elucidated (Wcislo 2000), the nests of the wasps of the Polistinae are frequently invaded by species that predate or parasitize the larvae and pupa in established colonies and other natural enemies such as ants and birds can also damage them (Yamane 1996; Clouse 2001). Parasitism and predation incidence is greater in nests of the independent foundation than in swarming species due to the shorter time that these individuals remain protecting the colony because they need to forage for their food (Clouse 1997, 2001).

The objective of this study was to verify the occurrence and identify the parasitoid species in nests of the *Mischocyttarus cassununga* (Von Ihering) (Hymenoptera: Vespidae) wasp in the Municipality of Viçosa, State of Minas Gerais, Brazil.

MATERIAL AND METHODS

The experiment was carried out at the Federal University of Viçosa (UFV) in the Municipality of Viçosa, Minas Gerais State, Brazil at the latitude of 20°45'14" South, longitude of 42°52'55" West and altitude of 648 meters

at 25 ± 2ºC, 70 ± 10% relative humidity and 12 hours light period. Ten *M. cassununga* nests, representing the replications, were collected in the UFV campus area. The nests were selected based on observation of the adults when they presented agitated behavior easily visible by movement of the adults and wing beating (Prezotto F., personal communication).

The nests and wasps were taken to the laboratory where their area (cm^2) was measured and the total number of nest cells was obtained. The nests were then individualized in 10 plastic cups (0.19 x 0.145 x 0.145m) with lids and a structure with a ventilation area made of organdy fabric. The diet of the adult wasps consisted of water and honey in 2.5 ml dentist-type anesthetic tubes (Caitlin & Whitehouse 2004).

Cardboard scraps and caterpillars of the prey *Anticarsia gemmatalis* (Hübner) (Lepidoptera: Noctuidae) were placed in each plastic cup so that nest maintenance by the wasps would not be interrupted.

Weekly observations were made of the nests, alveoli viability and parasitoid emergence. The parasitoids were captured, photographed and placed in 70% alcohol for later identification.

RESULTS AND DISCUSSION

Two species of parasitoids were detected in the *M. cassununga* nests and identified as *Pachysomoides* sp. (Hymenoptera: Ichneumonidae: Cryptinae) and *Megaselia scalaris* (Loew) (Diptera: Phoridae) (Fig. 1). Individuals of the Ichneumonidae family are ecto- or endoparasitoids of immature stages of other insects with complete metamorphosis (holometabolous) such as Lepidoptera, Coleoptera, Diptera, Neuroptera, Trichoptera and spiders, which are important in biological control because they are parasitoids that always kill the host (Kumagai & Graf 2000). Symptoms of parasitism by Ichneumonidae are not easily perceptible, as reported for *Heteropelma scaposum* (Morley) (Hymenoptera: Ichneumonidae) in *Helicoverpa armigera* (Hübner) (Lepidoptera: Noctuidae) caterpillars, whose body surface frequently presented few symptoms that became more evident after the host entered the pupa stage when longitudinal dark spots appeared (Caitlin & Whitehouse 2004). There are few reports of parasitism by Ichneumonidae species in social wasp nests that may be due to its low occurrence or to the difficulty in detecting signs. *Pachysomoides fulvus* (Cresson) (Hymenoptera: Ichneumonidae) was reported

Pachysomoides sp. (Hymenoptera: Ichneumonidae: Cryptinae)

Megaselia scalaris (Loew) (Diptera: Phoridae)

Fig. 1. Parasitoids found in nests of the *Mischocyttarus cassununga* in the Municipality of Viçosa, State of Minas Gerais, Brazil.

parasitizing *Polistes metricus* (Say) (Hymenoptera: Vespidae) nests (Hodges *et al.* 2003). However, *Pachysomoides* sp. was less frequent (five individuals), perhaps because they may be more easily observed at the moment that they approach the nest to oviposit and are attacked by the wasps. Furthermore, its females oviposited only one egg per alveoli which reduced the possibility of occurrence of new oviposition. On the other hand, this was different from the reports for *Agrothereutes hospes* (Tschek.) (Hymenoptera: Ichneumonidae: Cryptinae) that oviposits more on the larva and pre-pupa of *Galleria mellonella* (L.) (Lepidoptera: Pyralidae) (Gürbüz *et al.* 2006). *Pachysomoides* sp. may not make multiple ovipositions to prevent harming the development of its offspring because of the reduced size of the *M. cassununga* alveoli.

Megaselia scalari was reported with greater frequency in the *M. cassununga* colonies (12 individuals). Its small size may permit an easier approximation and the development of more than one individual per alveoli without intraspecific competition. Furthermore, the Phoridae can locate their prey over long distances by their secretions, as reported for *Megaselia opacicornis* (Schmitz) (Diptera: Phoridae) parasitizing larvae of *Chrysomela lapponica* (L.) (Coleoptera; Chrysomelidae) (Zvereva & Rank 2004). The individuals of this family exploit a large variety of plant or animal food sources, including social insect nests such as ants (Mehdiabadi *et al.* 2004; Disney & Berghoff 2005; Morrison & King 2004; Morrison & Porter 2005a,b), fruit (Karunaweera *et al.* 2002; Jensen *et al.* 2005) and carrion (Disney & Manlove 2005; Sukontason *et al.* 2006).

The number of nonviable *M. cassununga* alveoli was high (41.67%), but this was not evidence of wasp population reduction by parasitism. The reduction in the number of *M. cassununga* births may have been due to the fact that the wasps interrupted the maintenance of their developing larvae that would only permit emergence of individuals that were at the more advanced stages, such as pre-pupa or pupa.

The area of the *M. cassununga* nests ranged from 2.1 to 24.5 cm^2 with a total number of cells ranging from 30 to 297. However, no correlation was observed between the nest area and total number of cells with parasitoid emergence, showing that these parameters were not involved in nest choice by the parasitoids.

Further studies are needed to understand the relationship between the *M. cassununga* wasp and its parasitoids, because this study is the first report of the occurrence of *Pachysomoides* sp. and *M. scalaris* parasitoids in the nest of this social wasp.

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