

Notas Científicas

Pachycondyla obscuricornis* as natural enemy of the spittlebug *Deois flavopicta

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Abstract – The objective of this work was to evaluate the potential control of the ant *Pachycondyla obscuricornis* Emery (Hymenoptera: Formicidae) on populations of nymphs of the spittlebug, *Deois flavopicta* Stal (Hemiptera: Cercopidae). Foraging behavior and prey consumption rate of *P. obscuricornis* were evaluated. Field data revealed that *P. obscuricornis* does not show aggressive behavior against individuals of the same species, when they are not carrying a prey; they can patrol distances larger than 10 m searching for prey, and they can build their nest as close as 1 m from each other. The ant has a solitary patrolling habit, there is no recruitment behavior, and individuals dislocate fast, browsing on soil and vegetation for prey. Predation rate on spittlebug nymphs increased relative to the spittlebug abundance, reaching 93.8% of captured prey. *Pachycondyla obscuricornis* is a voracious predator and may control the population of spittlebugs in cultivated pastures.

Index terms: Insecta, biological control, foraging behavior, predation.

Pachycondyla obscuricornis* como inimigo natural da cigarrinha-das-pastagens *Deois flavopicta

Resumo – O objetivo deste trabalho foi avaliar se a formiga *Pachycondyla obscuricornis* Emery (Hymenoptera: Formicidae) pode atuar no controle biológico de populações de ninfas da cigarrinha-das-pastagens, *Deois flavopicta* Stal (Hemiptera: Cercopidae). Foram estudados o comportamento de caça da formiga e sua taxa de consumo da presa. *Pachycondyla obscuricornis* não apresenta comportamento agressivo em relação a indivíduos da mesma espécie, quando estes não carregam presas; pode deslocar-se por distâncias superiores a 10 m em busca de presas e pode nidificar a até 1 m de ninhos da mesma espécie. A formiga apresentou hábito de caça solitário, ausência de recrutamento, e deslocamento rápido pela vegetação. A taxa de predação aumentou com a abundância da cigarrinha, chegando a representar 93,8% das presas capturadas. *Pachycondyla obscuricornis* é predadora voraz e representa potencial agente de controle de populações da cigarrinha-das-pastagens em pastagens cultivadas.

Termos para indexação: Insecta, controle biológico, comportamento de forrageamento, predação.

Spittlebugs (Hemiptera: Cercopidae) are the main pest in cultivated pastures of Central Brazil due to their frequent outbreaks and wide distribution (Valério & Koller, 1992). Production of spittle protects the nymphs against natural enemies and desiccation and, besides the high capacity of colonizing introduced grasses, represents another trait that increases spittlebug's survivor and fitness, facilitating its population growth and damage to pastures (Valério & Koller, 1992; Pires et al., 2000).

Previous studies showed that unspecific predators and parasitoids cause mortality to eggs and nymphs of *Deois*

flavopicta Stal (Hemiptera: Cercopidae), reducing their population (Sujii et al., 2002). Various species of arthropods, nematodes and birds have been reported as spittlebug's natural enemies (Carneiro, 1984; Batista Filho, 1988), including few parasitoid insects, such as the egg parasitoid *Anagrus* sp. which attacks 2% of the eggs (Pires et al., 1993), and predators, such as ants (Hymenoptera: Formicidae) (Hewitt & Nilakhe, 1986) and the fly species *Salpingogaster nigra* Schiner (Diptera: Syrphidae) (Marques, 1988).

Surveys in pastures have shown that ants are the most abundant predators and a potentially important biological control agent of spittlebug populations. Individuals of *Pachycondyla*, *Camponotus*, *Ectatoma*, *Pheidole*, *Labidus* and *Mycocepurus* were observed in pastures carrying spittlebug nymphs, and *Pachycondyla obscuricornis* outstands as the most frequent (Sujii et al., 2002).

The objective of this work was to determine if the ant *Pachycondyla obscuricornis* has potential to control spittlebug nymph populations.

Methods used focused on *P. obscuricornis* foraging behavior and prey consumption rate. The foraging behavior of *P. obscuricornis* was observed by following individuals leaving the nests, attacking prey and carrying them back to the nests, at different periods of the day. At least 40 individuals were observed, 20 in the morning and 20 in the afternoon, to confirm the behavior patterns. To further explore the potential of this species for the spittlebug's population control, this study focused on its patrolling behavior, how it locates and captures the spittlebug nymphs, and its response when encountering other ants.

To evaluate the distribution of *P. obscuricornis* in a pasture of *Brachiaria ruziziensis*, a 30x30 m grid was set, with sardine baits placed in Petri dishes 5x5 m apart. Ants foraging at the baits were followed to locate their nests. Some individuals were collected to confirm identification.

A study to evaluate the importance of *D. flavopicta* in the diet of *P. obscuricornis* was carried out by observing ants arriving at two nests during a period of intense activity (9–12 AM) on January 16 and 30. Each prey carried to the nest was taken from ants and identified. The densities and instars distribution of *D. flavopicta* in the field for the same day was estimated by sampling 10 randomly selected quadrats of 0.25 m² in the pasture. To determine occurrence of preference for prey instars, all nymphs were counted, had their developmental stage determined, and had their frequency distribution compared to the frequency distribution of nymphs observed being carried by the ants to the nests' entrances. The frequency distribution of spittlebug nymphs present in the area and captured by the ants was compared by a Kolmogorov-Smirnov test for the two samples (Wilkinson, 1990).

During the study, *D. flavopicta* was the main item found in *P. obscuricornis* diet. The ant was particularly successful in finding nymphs and attacking them inside the spittle. This ant, 12 mm long and displaying a black coloring, has a patrolling habit; individuals hunt and quickly catch all individuals observed. This species shows a

solitary foraging behavior; there is no recruitment of other ants for catching or carrying the prey. The *Pachycondyla* genus has several species specialized in preying on termites (Holldobler & Wilson, 1990). Although there is no reference of *P. obscuricornis* preying on termites, these insects could be the preferred prey attacked in the absence of spittlebugs. Longino (2003) reports *P. obscuricornis* hunting and carrying caterpillars, in Costa Rica.

P. obscuricornis does not show territorial behavior, but may aggressively dispute prey. Antagonistic or fighting behavior in defense of territories was not observed between individuals from different nests encountering each other (12 observations). The proximity of nests, which can be separated by distances shorter than 1 m (Figure 1), reinforces the absence of territorial aggressive behavior in *P. obscuricornis*, a trait that can be useful for a biological control agent. Aggressive behavior may occur however, if one of the ants is carrying a prey. In this case, the encounter usually resulted in fight for the prey (three observations). Therefore, even though individuals seem not to frequently compete by interference with each other, competition for food may occur in this system, and is more related to food exploitation, with individuals trying to attack and carry more of the same prey item to their nests.

Observation at the entrance of *P. obscuricornis* nests showed that the amount of *D. flavopicta* in ant's diet rose from 63.6% to 93.7% when prey density increased from 40 nymphs/m², at the beginning of the infestation, to 55 nymphs/m² (2nd–5th) (Figure 2). The number of nymphs removed by the ants varied from 14 to 61 nymphs, in a three-hour-period (9–12 AM). The frequency of capture was positively correlated with the relative abundance of *D. flavopicta* and the distribution of prey instars captured was positively correlated with the distribution of instars available in the field. Kolmogorov-Smirnov test on January 16 (MD = 0.75, p=0.13) and January 30 (MD = 0.50, p=0.5) showed that there is no preference for a specific stage or size of spittlebug nymphs, although relative contributions to the diet changed as spittlebug nymphs' size and abundance increased.

Even though *P. obscuricornis* patrols distances greater than 10 m from the nest (Figure 1), field observations of presence of nymphs next to the nests (<1 m) suggest that the stimulus for attack is generated by visual perception of nymph movement inside the spittle, and not by the encounter with the spittle itself. This may allow the ant to save time by not searching empty spittle.

From the observations in this study, it can be inferred that, although *D. flavopicta* is the main component of

the *P. obscuricornis* diet during some periods of the year, and although ants actively search for nymphs in the field, the presence of remaining nymphs of spittlebugs close to the nests indicates the need of further studies to evaluate the control level imposed by *P. obscuricornis* ants on the spittlebug population.

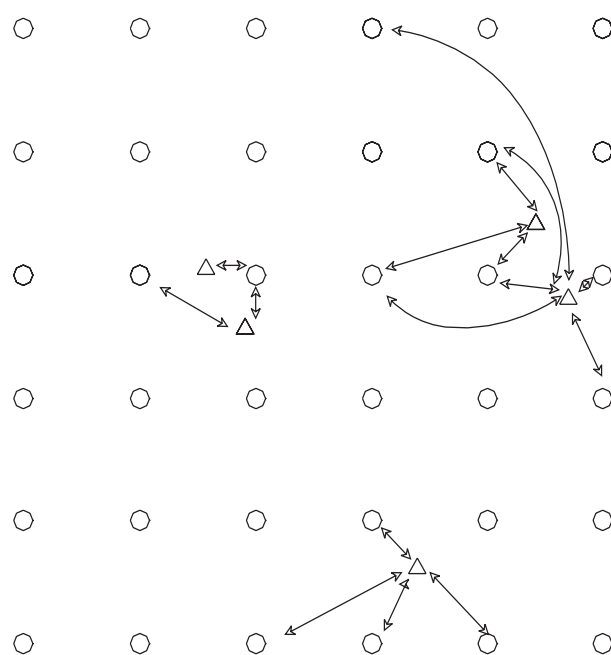


Figure 1. Distribution of sardine baits (○) grid (5x5 m) in the field, baits visited by ants and the relative location of the ant *Pachycondyla obscuricornis*'s nests (△).

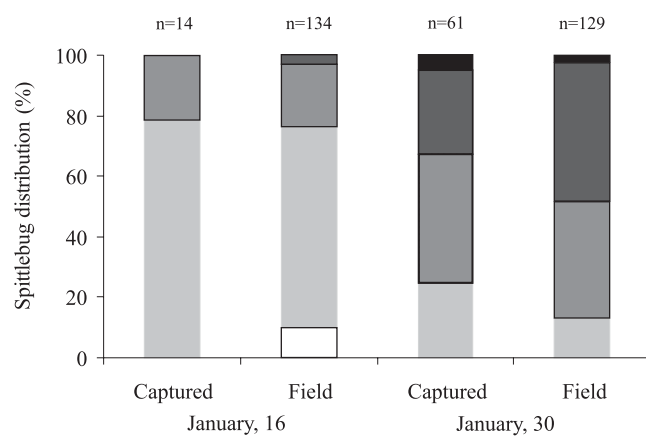


Figure 2. Relative density of spittlebugs adults (■) and 5th (■), 3/4th (■), 2nd (■) and 1st (□) instars in a *Brachiaria ruziziensis* field and captured spittlebugs being brought to nests of the ant, *Pachycondyla obscuricornis*. Observations made 9–12 AM.

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