

Rearing of *Pseudacteon* spp. (Dipt., Phoridae), parasitoids of fire ants (*Solenopsis* spp.) (Hym., Formicidae)

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Abstract: After exposure of *Solenopsis saevissima* colonies maintained in plastic trays to phorid attack in the field, and subsequent transfer of colonies to covered plastic buckets, we confirmed that *P. wasmanni* and *P. litoralis* are indeed parasitoids of fire ant workers. The period from attack to emergence of phorid adults ranged from 35 to 46 days. Adult phorids were maintained live in glass vials with sugar water as a food source for 5 days. These results indicate that *Pseudacteon* can be reared for biological control release programs with minimal difficulty. Furthermore, parasitized workers could be easily transferred from South America to quarantine laboratories within the egg to adult emergence time period.

1 Introduction

Fire ants (*Solenopsis* spp.) are a notorious invading species, both in their native homeland of South America and in those parts of the world into which they were accidentally introduced (PORTER et al., 1992). Because of problems relating to their chemical control, and the apparent lack of natural enemies in those areas into which fire ants were accidentally introduced, efforts to obtain biological control agents have occurred sporadically during the last 3 decades (JOUVENAZ, 1983). Of the possible biological control agents identified, phorids of the genus *Pseudacteon* have often been cited (JOUVENAZ, 1983; WILLIAMS and BANKS, 1987; WILLIAMS et al., 1973; PESQUERO et al., 1993). However, until now these reports have suggested that these phorids are parasitoids, but none have ever been reared under laboratory conditions from fire ants. Although female phorid attack behavior is highly reminiscent of oviposition, no conclusive proof has been provided that they are actually parasitizing fire ants, in spite of the fact that a number of phorid parasitoids of ants are known (JOUVENAZ, 1983).

Several lines of evidence, however, suggest that *Pseudacteon* may indeed be true parasitoids. The first is the number of cases in which they were reported attacking fire ants under field conditions (JOUVENAZ, 1983). The second line of evidence comes from the characteristic defensive posture of workers when phorids are flying above (FEENER and BROWN, 1992), suggesting an evolutionary response to parasitism.

Here we report on a simple rearing procedure to detect if *Pseudacteon* spp. are indeed parasitoids of *Solenopsis* spp., and demonstrate that it is indeed easily possible to rear them under crude laboratory conditions.

2 Materials and methods

Studies were performed in Rio Claro, SP, Brazil, during February and March, 1994. Six colonies of *S. saevissima* (Fr.

Smith) were collected in the field and, transferred by flotation to plastic petri plate nest boxes which were placed individually into teflon coated plastic trays. Trays containing colonies were taken once from the laboratory to the field between 07.00 and 08.00, and 17.00 and 18.00 hours. The top of the petri plate nest box was opened and trays were agitated to provoke aggressive behavior in the ants, and to attract phorid parasitoids. After this time, trays were taken to the laboratory and nest boxes were transferred to 20 l plastic buckets with sterilized soil, covered entirely with a plastic bag to retain emerged phorids. This was done to examine if phorids needed a soil substrate for pupation. Buckets were kept at room temperature, and were examined daily for a period of 2 months to detect phorid emergence, while colonies were fed *ad libitum* on sugar water and insects every 2 days.

Emerged phorids were removed, identified and transferred to glass vials with a wick containing a sugar solution as a food source.

3 Results and discussion

When exposed in the field, all trays were intensely attacked by phorids (*P. wasmanni* and *P. litoralis*). However, because of the large number present, it was impossible to quantify the number of workers attacked.

Six phorids emerged between 35 and 46 days after exposure of the colonies to phorid attack. Two were male *Pseudacteon*, two were *P. wasmanni* and two were *P. litoralis*. This time period was much longer than we had waited in previous rearing attempts in other years (15-30 days). This long time period would be sufficient to expose colonies as we did here under field conditions to phorid attack, and easily transport these colonies to quarantine laboratories for adult emergence. This procedure would greatly facilitate the beginning of a mass-production program for parasitoid release.

Although the number of emerged flies was low, it is likely that they were preyed upon by workers following emergence. Examination of cadavers revealed puparia in the head capsules of workers, and thus soil is not

necessary for pupation. Indeed, dead workers may be buried to inhibit phorid emergence.

The emerged adults lived 4 or 5 days in individual glass vials with only sugar water as a food source. This period may represent a mean longevity for phorids under field conditions. All material is deposited in the collection of H. G. FOWLER.

These results provide proof that *Pseudacteon* spp., at least *P. wasmanni* and *P. litoralis*, are indeed parasitoids of members of the *S. saevissima* complex. This trial rearing system proved to be suitable due to its simplicity and low cost. However, technical adjustments could greatly enhance rearing success, such as temperature and humidity controls, and maintenance without soil.

Based upon our observations in the field (FOWLER and ROMAGNANO, 1992), and those of other researchers (FEENER and BROWN, 1992), we do not expect that species of *Pseudacteon* would act as direct biological control agents in the classical sense of reducing the number of ants or of inducing colony mortality. Rather, when phorids are present, ant activity declines favoring other potential competing species. Thus, we predict that the effect of phorids would be to change competitive hierarchies, and not greatly increase worker mortality.

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