BIOLOGY OF *Brontocoris tabidus* (HETEROPTERA: PENTATOMIDAE) FED WITH *Musca domestica* (DIPTERA: MUSCIDAE) LARVAE

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(With 3 figures)

ABSTRACT

Development and reproductive performance of *Brontocoris tabidus* (Signoret) (Heteroptera: Pentatomidae) fed with *Musca domestica* L. (Diptera: Muscidae) larvae was evaluated. Duration of the nymphal phase of this predator was 31.2 days, with a 44.1% survival rate. Preoviposition and egg incubation periods and number of eggs/egg mass were 8.14 days, 5.6 days, and 45.4, respectively. *B. tabidus* presented 44.7% egg viability. Female longevity of this predator was 18.4 days. Results are discussed based on this prey use in mass rearing and maintenance of colonies of *B. tabidus* under laboratory conditions.

Key words: *Brontocoris tabidus*, *Musca domestica,* reproduction, insect rearing.

RESUMO

Biologia de *Brontocoris tabidus* (Heteroptera: Pentatomidae) alimentado com larvas de *Musca domestica* (Diptera: Muscidae)

A performance reprodutiva e o desenvolvimento de *Brontocoris tabidus* (Signoret) (Heteroptera: Pentatomidae) alimentado com larvas de *Musca domestica* L. (Diptera: Muscidae) foram investigados. A duração da fase ninfal desse predador foi de 31,2 dias, com sobrevivência de 44,1%. Os períodos de pré-oviposição e de incubação e o número de ovos por postura foram de 8,14 dias, 5,6 dias e 45,4 dias, respectivamente. *B. tabidus* apresentou viabilidade de ovos de 44,7%. A longevidade das fêmeas desse predador foi de 18,4 dias. Esses resultados são discutidos com ênfase ao uso de *M. domestica* em criação massal e manutenção de colônias de *B. tabidus* em condições de laboratório.

Palavras-chave: *Brontocoris tabidus*, *Musca domestica*, reprodução, criação de inseto.

INTRODUCTION

Biological control is an important method for reducing the dependence on chemical control and reestablishing the balance between pests and their natural enemies (Metcalf & Luckmann, 1982). The first of these, however, became the main method of pest control since the appearance of organic-synthetic insecticides in the 1940s. But the indiscriminate use of insecticides can cause negative impacts, including destruction of non-target insects such as predators, parasitoids, and pollinators, besides environmental contamination, human health problems, and pest resistance and resurgence (Metcalf & Luckmann, 1982; Guedes & Fragoso, 1999). These impacts have increased the use of biological control agents as part of pest management.

Natural enemies for biological control programs can be reared with natural, alternative prey or hosts, or artificial diets (Cohen, 1985). Pentatomidae predators have been reared and used against eucalyptus defoliating caterpillars such as *Blera* sp., *Blera varana* Schaus (Notodontidae); *Eupseudosoma aberrans* Schaus, *Eupseudosoma involuta* Sepp (Arctiidae); *Glena* spp., *Thyrinteina arnobia* Stoll (Geometridae); and *Sarsina violascens* (Herrich-Schaeffer) (Lymantriidae) in eucalyptus plantations in Brazil (Zanuncio *et al.,* 1991, 1996, 1998; Saavedra *et al.,* 1998). *Brontocoris tabidus* Signoret (Heteroptera: Pentatomidae) are reared in the laboratory and released to control these pests and others in eucalyptus plantations (Zanuncio *et al.,* 1991; Jusselino-Filho *et al.,* 2001).

For this reason, the purpose of this research was to study in the laboratory nymphal development and reproductive characteristics of *B. tabidus* fed with larvae of the alternative prey *Musca domestica* L. (Diptera: Muscidae).

MATERIAL AND METHODS

Adults of *B. tabidus* were collected in a plantation of *Eucalyptus cloesiana* and *Eucalyptus urophylla* of Refloralje (Reforestation, Farming, and Cattle Raising) in Montes Claros, State of Minas Gerais, Brazil, established in the laboratory, and fed with larva of *M. domestica*. The colony developed under 25 ± 2°C, 70 ± 10% RH, and in a 12 h photoperiod.

Adults of *B. tabidus* were maintained in 500 ml plastic cups with two holes in their covers. Each one had a 40 ml cup with its bottom substituted by nylon mesh where *M. domestica* larvae were supplied daily. In the other hole a 2 ml cylindrical plastic tube filled with water was placed.

Eggs of *B. tabidus* were maintened in Petri dishes (9.0 x 1.2 cm) with a moist cotton ball. These eggs were used to determine the incubation period and egg viability of *B. tabidus.* First instar nymphs of *B. tabidus* received only water through a moist cotton ball, because this species does not present predatory habits during this instar (Jusselino-Filho *et al.,* 2001).

Samples of 10 second instar nymphs of *B. tabidus* were placed in 15 plastic cups (500 ml). Duration of each instar, and survival and weight of fifth instar *B. tabidus* nymphs were evaluated 24 hours after molt. Sex ratio; weight; preoviposition period; number of egg masses per female; number of eggs per egg mass; total number of eggs and eggs per female/day; and longevity of *B. tabidus* were evaluated during the adult stage.

One gram of *M. domestica* larvae and *Tenebrio molitor* L. (Coleoptera: Tenebrionidae) larvae and pupae were macerated in the presence of phosphate buffer 0.1 M, pH 7.5 with 0.3% Triton-X100 for protein determination. Samples were centrifugated at 8000 rpm at 4ºC for 15 min. using supernatant for protein determination according to Bradford (1976), with bovine serum albumine as the standard.

RESULTS AND DISCUSSION

Larvae of *M. domestica* presented higher levels of total protein (Fig. 1) than larvae and pupae of *T. molitor*.

Duration of first *B. tabidus* instar (Fig. 2) was similar to that reported by other authors for this predator. This was an expected result, because *B. tabidus* do not feed on prey during first instar in a way similar to that of most species of Pentatomidae predators (Barcelos *et al.,* 1991; Jusselino-Filho *et al.,* 2001).

B. tabidus fed with *M. domestica* larvae presented longer duration of each first and of the entire nymphal phase (Table 1) when compared with those reared with other prey or on artificial diets (Zanuncio *et al.,* 1996; Jusselino-Filho *et al.,* 2001). Longer duration of the nymphal phase can be an advantage as it increases the period of feeding on caterpillars in outbreak conditions. On the other hand, it may represent a problem because lower duration of this phase is important for this predator in supplanting insect pests in number of individuals and generations which can contribute to faster reestablishment of the prey-predator balance.

Survival during the nymphal phase of *B. tabidus* reached 44.1% (Fig. 3) showing that it varies with prey type and nutritional quality, as found for *Podisus maculiventris* by De Clercq *et al*. (1998), suggesting that food quality can be more important than its quantity. This was also found by Stamp *et al*. (1997) who showed that food quality can interfere with the feeding period and survival rate of Pentatomidae predators. Thus, it appears that *M. domestica* larvae have lower nutritive quality than other prey.

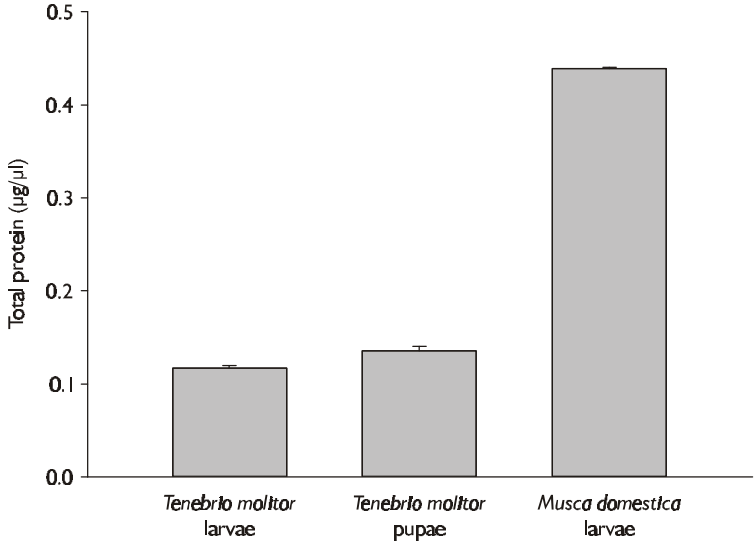

Fig. 1 — Total protein (µg/µl) in three prey used to rear *Brontocoris tabibus* (Heteroptera: Pentatomidae).

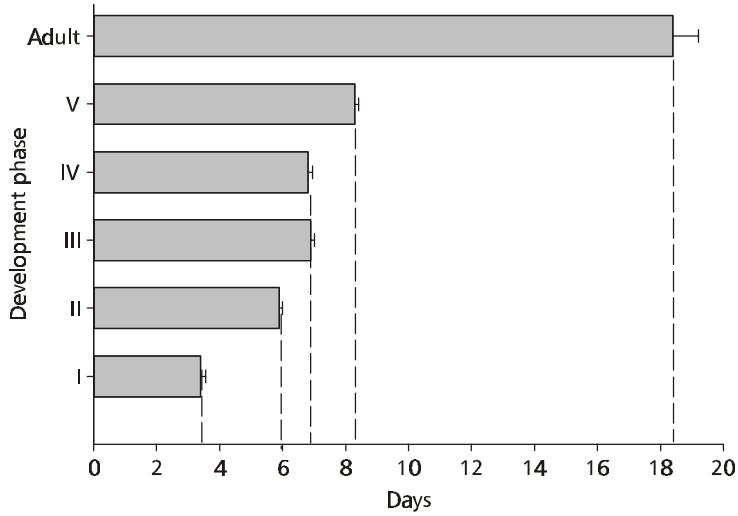

Fig. 2 — Duration (days) per instar and of the nymphal period of *Brontocoris tabidus* (Heteroptera: Pentatomidae) fed with *Musca domestica* (Diptera: Muscidae) larvae at 25 ± 2ºC, 70 ± 10% RH, and 12 h photophase.

TABLE 1

Duration of each instar and of the nymphal phase, range, and survival (percentage) per instar for *Brontocoris tabidus* (Heteroptera: Pentatomidae) fed with *Musca domestica* (Diptera: Muscidae) larvae at 25 ± 2ºC, 70 ± 10% RH, and in 12 h photophase.

Instar	Duration of nymphal phase (days)	Variation interval (days)	Survival (%)
I	3.4 ± 0.5	3.0-4.0	100.0 ± 0.0
II	5.9 ± 0.3	4.8-8.2	79.3 ± 1.0
III	6.9 ± 0.4	4.8-9.5	63.9 ± 1.4
IV	6.8 ± 0.5	4.0-9.0	65.6 ± 1.5
V	8.3 ± 0.4	4.5-11.0	44.1 ± 1.4
Total	31.2 ± 0.9	30.5-31.8	–

Fifth instar nymphs and male and female adults of *B. tabidus* presented weights of 61.2 mg, 72.0 mg, and 89.0 mg, respectively (Table 2). These values are lower than those found for this predator fed with other prey (Jusselino-Filho *et al.,* 2001).

Females of predatory Pentatomidae are heavier than the males and diet affects survival of their nymphs (Jusselino-Filho *et al.,* 2001; Lemos *et al.,* 2001). Females of these predators have lower weights when fed on artificial diet (De Clercq & Degheele, 1992; Saavedra *et al*., 1996), which thus shows a quality level inferior to that of alternative prey such as *M. domestica* larvae.

B. tabidus presented preoviposition period of 8.1 days (Table 2), a value similar to those obtained by other authors using different prey (Barcelos *et al*., 1991; Jusselino-Filho *et al*., 2001). This shows that this characteristic is not affected by prey type.

Number of egg masses and eggs/egg mass of *B. tabidus* was 1.5 and 45.4, while the number of eggs/female and eggs/female/day was 50.7 and 2.4, respectively, with an incubation period and egg viability of 5.6 days and 44.7%, respectively (Table 2). These values are lower than those found with *B. tabidus* fed on larvae of *B. mori* and *T. molitor* (Zanuncio *et al*., 1996; Jusselino-Filho *et al*., 2001) which demonstrates the lower dietary quality of *M. domestica* larvae during the reproductive stage of *B. tabidus*. These results may, however, improve if this prey is used in combination with *T. molitor*, as was found for *P. nigrispinus* (Zanuncio *et al*., 2001).

Longevity of *B. tabidus* was 18.4 days for mated females, a result lower than those for this predator fed with *B. mori* larvae (Zanuncio *et al*., 1996) and agreeing with those of other authors who found that *B. tabidus* longevity varies according to prey type (Zanuncio *et al*., 1996; Jusselino-Filho *et al*., 2001).

Feeding of *B. tabidus* on larvae of *M. domestica* affected its life cycle, weight, and survival, with lower values for some biological parameters in relation to those for other preys. This shows that larvae of this prey have low nutritional quality which can affect weight, stored reserves, and reproductive success of this predator. The lesser performance of *B. tabidus* with *M. domestica* larvae shown here has been found for other species of predatory Pentatomidae fed with this prey such as *Podisus nigrispinus* Dallas (Heteroptera: Pentatomidae) which presented a longer nymphal period and lower egg production when on both an artificial diet and *M. domestica* larvae (Lemos *et al*., 2001).

In spite of its inexpensive rearing and higher total protein level as compared to *T. molitor*, larvae of *M. domestica* are not suitable prey for mass production of *B. tabidus* but is potential useful in maintaining this predator under laboratory conditions.

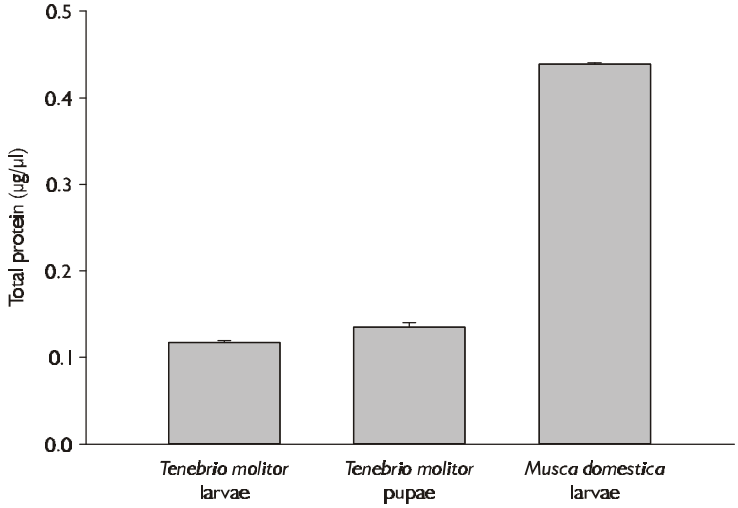

Fig. 3 — Survival (percentage) per instar and of the nymphal period of *Brontocoris tabidus* (Heteroptera: Pentatomidae) fed with *Musca domestica* (Diptera: Muscidae) larvae at 25 ± 2ºC, 70 ± 10% RH, and 12 h photophase.

TABLE 2

Reproductive parameters and range of *Brontocoris tabidus* (Heteroptera: Pentatomidae) fed with *Musca domestica* (Diptera: Muscidae) larvae at 25 ± 2ºC, 70 ± 10% RH, and in 12 h photophase.

Characteristics evaluated	Values	Range
Preoviposition (days)	8.1 ± 0.3	7.4-8.8
Egg masses/female	1.5 ± 0.1	0.8-2.3
Eggs/egg mass	45.4 ± 8.6	24.3-66.4
Eggs/female	50.7 ± 6.3	30.3-90.8
Eggs/female/day	2.4 ± 0.8	1.7-3.2
Incubation period (days)	5.6 ± 0.1	5.3-5.8
Egg viability (%)	44.7 ± 2.3	42.7-46.6
Nymphs/female	22.7 ± 7.1	5.3-40.0
Weight of fifth instar nymphs (mg)	61.2 ± 0.5	59.9-62.4
Weigh of male adults (mg)	72.0 ± 0.7	70.2-73.7
Weigh of female adults (mg)	89.0 ± 2.4	83.1-94.8
Longevity of mated females (days)	18.4 ± 0.9	16.1-20.6
Sex ratio	0.6	–

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