Reproductive potential of the predator *Supputius cincticeps* (Heteroptera: Pentatomidae) affected by female body weight

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ABSTRACT. The reproductive potential of *Supputius cincticeps* (Stal) (Heteroptera: Pentatomidae) females of two weight classes was evaluated with males and females of this predator obtained from nymphs fed on *Tenebrio molitor* L. (Coleoptera: Tenebrionidae) pupae. Females of *S. cincticeps* weighing less than 45 mg (light females) and more than 60 mg (heavy females) constituted the treatments. Pre-oviposition, oviposition and post-oviposition periods besides adult longevity were similar between treatments while number of egg masses, eggs, eggs/egg mass and number of nymphs hatched were higher for heavier females. Periods between egg mass laying and egg incubation were shorter for insects of the last treatment. These results are discussed in relation to the use of heavier females of *S. cincticeps* to improve mass rearing of this predator in laboratory.

Key words: Asopinae, mass rearing, weight classes.

RESUMO. Potencial reprodutivo de *Supputius cincticeps* (Stal) (Heteroptera: Pentatomidae) influenciado pelo peso do corpo da fêmea. O potencial reprodutivo de fêmeas de *Supputius cincticeps* (Stal) (Heteroptera: Pentatomidae) de duas classes de peso foi avaliado. Machos e fêmeas desse predador foram obtidos de ninhias alimentadas com pupas de *Tenebrio molitor* L. (Coleoptera: Tenebrionidae). Foram analisadas fêmeas com peso inferior a 45 mg (fêmeas leves) e superior a 60 mg (fêmeas pesadas). A longevidade e os períodos de pré-oviposição, oviposição e pós-oviposição foram semelhantes entre fêmeas das duas classes de peso, enquanto aquelas mais pesadas apresentaram maior número de posturas, ovos, ovos/postura e ninhias. Períodos entre posturas e de incubação dos ovos foram menores para fêmeas com peso superior a 60mg. Esses resultados são discutidos em relação ao uso de fêmeas mais pesadas de *S. cincticeps* para aumentar a produção em criação massal desse predador.

Palavras-chave: Asopinae, criação massal, classes de peso.

Introduction

Defoliator caterpillars are important pests because they can reduce production in crops of economic relevance including eucalyptus (Zanuncio et al., 1994). *Supputius cincticeps* (Stal) (Heteroptera: Pentatomidae) and other Asopinae species can be used to control eucalyptus defoliator caterpillars and its biology, behavior and insecticide. The impact on these organisms has been studied (Zanuncio et al., 1992a, 1993, 1996/1997, 1998; Molina-Rugama et al., 1998; Torres et al., 1998; Assis Junior et al., 1999).

Males and females of *S. cincticeps* are heavier when fed on *Tenebrio molitor* L. (Coleoptera: Tenebrionidae) pupae than with *Musca domestica* L. (Diptera: Muscidae) larvae (Zanuncio et al., 1992a). Intraspecific competition also affects weight, body size, fecundity, development period and behavior of insects and Zanuncio et al. (1993) obtained heavier females of *S. cincticeps* when rearing a maximum of 20 nymphs of this predator per 500 mL container.

Body weight as a quality control parameter for stinkbug predators should be used with caution especially when compared individuals reared in laboratory with those ones collected in the field (Mohaghegh-Neyshabouri et al., 1996).

Fecundity of insects can be affected by female body weight (Honek, 1993) such as reported for *Podisus maculiventris* (Say) (Heteroptera: Pentatomidae) by Evans (1992) and *Podisus nigrispinus* (Dallas, 1851) (Heteroptera: Pentatomidae) by Zanuncio et al. (1992b) with better reproductive performance of heavier females including higher number of egg masses, eggs and nymphs. *S. cincticeps* has been presenting individuals...
of different body weight in the same population. For this reason it is necessary to study the effect of this parameter on reproductive capacity of this predator. Thus, the purpose of this study was to evaluate the reproductive performance of *S. cincticeps* females of two weight classes when fed with *T. molitor* pupae.

**Material and methods**

This research was conducted by the Laboratory of Biological Control of Insects (Núcleo de Biotecnologia Aplicada à Agropecuária - BIOAGRO) of the Federal University of Viçosa (UFV), in Viçosa, State of Minas Gerais, Brazil. *S. cincticeps* was maintained at constant temperature of 25 ± 2°C, relative humidity of 60 ± 5% and 13 h photoperiod. Males and females of *S. cincticeps* were obtained from nymphs fed with *T. molitor* pupae from a rearing facility maintained according to the procedures described by Zanuncio et al. (1992a) at UFV.

Newly emerged males and females of *S. cincticeps* were weighted after 24 hours of starvation. Females of treatment T₁ weighed less than 45 mg (light females) while their males weighted less than 35 mg. Those of treatment T₂ weighed more than 60 mg (heavy females) and its males more than 35 mg. Thirty pairs were formed per treatment with a total of 10 replications being each one constituted by three pairs of *S. cincticeps*. Each pair of this predator was placed in a 500 ml plastic cup with two holes in its cover. One had a plastic cup (40 ml) with its bottom substituted by a nylon mesh where *T. molitor* pupae were placed ad lib. A 2 mm cylindrical plastic tube filled with water was placed in the other hole (Zanuncio et al., 2001; Torres and Zanuncio, 2001). Males and females of this predator were weighed after their first mating. Pairs of *S. cincticeps* were observed every hour for the determination of mating duration.

Egg masses of *S. cincticeps* were daily collected and placed in Petri dishes (9.0 x 1.2 cm) with a moistened cotton ball (Zanuncio et al., 2001).

Duration of first mating, pre-oviposition, oviposition and post-oviposition periods, percentage of nymph hatched and longevity of *S. cincticeps* were similar (F, p > 0.05) for females of both weight classes (Table 2).

### Table 1. Length and width (mean ± sd) of body size of *Supputius cincticeps* of two weight classes maintained at 25 ± 2°C, 60 ± 5% relative humidity and 13 hours photoperiod

<table>
<thead>
<tr>
<th>Weight class (mg)</th>
<th>Biological parameters</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>T₁(&lt;35)</td>
<td>T₁(&gt; 35)</td>
<td>T₂(&lt;45)</td>
</tr>
<tr>
<td>Length (mm)*</td>
<td>8.92 ± 0.06</td>
<td>9.21 ± 0.05</td>
<td>10.24 ± 0.06</td>
</tr>
<tr>
<td>Width (mm)*</td>
<td>4.88 ± 0.02</td>
<td>5.20 ± 0.02</td>
<td>5.33 ± 0.04</td>
</tr>
<tr>
<td>* Significant at 1% probability level by the F test</td>
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</tbody>
</table>

Duration of first mating, pre-oviposition, oviposition and post-oviposition periods, percentage of nymph hatched and longevity of *S. cincticeps* were similar (F, p > 0.05) for females of both weight classes (Table 2).

### Table 2. Reproductive parameters and longevity (mean ± sd) of females of *Supputius cincticeps* (Heteroptera: Pentatomidae) of two weight classes maintained at 25 ± 2°C, 60 ± 5% relative humidity and 13 hours photoperiod

<table>
<thead>
<tr>
<th>Biological parameters</th>
<th>Weight class (mg)</th>
<th>T₁(&lt;45)</th>
<th>T₁(&gt;60)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration of first mating (min)*</td>
<td>813.56 ± 48.79</td>
<td>839.06 ± 45.58</td>
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</tr>
<tr>
<td>Pre-oviposition period (days)*</td>
<td>13.20 ± 1.91</td>
<td>8.86 ± 0.90</td>
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<tr>
<td>Oviposition period (days)*</td>
<td>25.61 ± 6.79</td>
<td>29.10 ± 5.56</td>
<td></td>
</tr>
<tr>
<td>Post-oviposition period (days)*</td>
<td>5.16 ± 0.76</td>
<td>5.09 ± 1.22</td>
<td></td>
</tr>
<tr>
<td>Number of egg masses**</td>
<td>4.73 ± 1.21</td>
<td>12.50 ± 1.84</td>
<td></td>
</tr>
<tr>
<td>Interval between egg laying (days)*</td>
<td>6.01 ± 1.51</td>
<td>2.41 ± 0.16</td>
<td></td>
</tr>
<tr>
<td>Total number of eggs**</td>
<td>44.58 ± 13.15</td>
<td>128.27 ± 14.19</td>
<td></td>
</tr>
<tr>
<td>Eggs/egg mass*</td>
<td>8.62 ± 0.81</td>
<td>10.71 ± 0.41</td>
<td></td>
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<tr>
<td>Egg incubation (days)**</td>
<td>6.48 ± 0.10</td>
<td>5.89 ± 0.16</td>
<td></td>
</tr>
<tr>
<td>Nymphs hatched (%)*</td>
<td>65.27 ± 5.78</td>
<td>49.93 ± 6.07</td>
<td></td>
</tr>
<tr>
<td>Nymphs hatched/egg mass*</td>
<td>30.60 ± 9.90</td>
<td>64.76 ± 11.40</td>
<td></td>
</tr>
<tr>
<td>Longevity (days)**</td>
<td>36.03 ± 4.51</td>
<td>42.07 ± 3.93</td>
<td></td>
</tr>
</tbody>
</table>

* non significant at 5% probability level by F test. * significant at 1% probability level by F test. ** significant at 1% probability level by F test

Heavier females presented higher number of egg masses (F, p<0.05) and shorter egg incubation period (F, p<0.001) and interval between laid...
periods (F, p<0.05). Total number of eggs (F, p<0.01), eggs/egg mass and nymphs hatched/egg mass (F, p<0.05) were higher for females in T2 than in T1 (Table 2), although lower percentage of nymph hatched occurred in the last egg masses (Figure 1).

Higher number of egg masses and nymphs/egg mass were found for females of treatment T2 (Figure 1). Mean number of eggs/day/female and nymphs/day/female were higher for heavier females (Figures 2, 3, 4, 5).

Nine females of the treatment T1 and two of T2 died before the tenth day after emergence and they were replaced by other ones. Nine females laid no eggs in treatment T1 while all those of T2 laid eggs. A total of 142 egg masses were obtained in treatments T1 with 29 (20.42%) of them being infertile and 25 (86.20%) were laid after the death of the respective male. From a total of 113 fertile egg masses, 42 (37.16%) were laid after the death of their males. Heavier females (T2) produced 375 egg masses being 126 of them (33.6%) infertile from which 64.28% were laid after male death. Besides 66.40% of the 249 egg masses were fertile, with a total of 76 (30.52%) being laid in the absence of the respective male.

One male of treatment T1 and four of treatment T2 were substituted, because they died before the tenth day after emergence. After death of the respective male, one female produced two egg masses without nymph hatching in treatment T1, while all females of treatment T2 laid eggs, with two of them producing five and 23 infertile egg masses. Twelve females laid 17 fertile egg masses in treatment T1 after male death. However, the last nine ones were laid by only one female which might have been due to a higher mating success of this female (Figure 4).

Heavier females of S. cincticeps reached 50% of their egg production 20 days after emergence (Figure 3). These females had higher accumulated production of eggs and nymphs per day than lighter ones whose egg production reached 25 days after their emergence (Figures 2, 3, 4, 5).

Nymph hatching began between the 10th and 15th days (Figures 4, 5) and extended to the 50th day after adult emergence for heavier females of S. cincticeps, followed by a sharp decline on this parameter.
Barcelos showed similar longevity but McLain (1991) found
period for heavier females of egg masses, eggs/egg mass and longer oviposition
parameters that can be used to evaluate reproductive
capacity of P. maculiventris (Mukerji and LeRoux, 1969) and Geocoris puncticeps Say (Heteroptera: Lygaeidae)
(Cohen and Urias, 1988). Therefore, Zanuncio et al.
(2000), Beserra et al. (1995) and Azevedo and Ramalho (1999) recommended the use of T. molitor for rearing S. cincticeps because this predator
presented higher body weight when fed with this
prey. Our results reinforce the use of T. molitor,
because heavier females of S. cincticeps showed better reproductive performance than the lighter ones.

S. cincticeps nymphs well fed and of good genetic
potential can produce heavier females. They can
present better reproductive capacity what may be
due to higher quantity of stored resources and
energy for reproduction besides shorter time for egg
maturatation. Shorter intervals between egg laying and
period of egg incubation indicate that heavier
females was not measured, we can suggest
that lighter females of this predator have lower
amount of reserves, such as that found by Legaspi et al. (1996), what could reduce oviposition rate of
these females.

Nourishment has been a constant subject matter in
systems of insect rearing and studies have shown
correlation between number and prey type with
growth of predators. Generalist predators can feed
on different prey in the field, but in the laboratory
they are usually fed with a single prey type what can
affect their reproductive performance such as found
for P. maculiventris (Mukerji and LeRoux, 1969) and Geocoris puncticeps Say (Heteroptera: Lygaeidae)
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this predator.

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References

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