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КОНСУМАТИВНА СПОСОБНОСТ НА ХИЩНАТА ДЪРВЕНИЦА *PODISUS MACULIVENTRIS* (SAY.)
(HETEROPTERA: PENTATOMIDAE) ПРИ ИЗХРАНВАНЕ С ЛАРВИ НА *HYPERA POSTICA* GYLL. И *GONIOCTENA*
FORNICATA BRËGG. ПРИ ЛАБОРАТОРНИ УСЛОВИЯ

**CONSUMPTION ABILITY OF SPINED SOLDIER BUG *PODISUS MACULIVENTRIS* (SAY.) (HETEROPTERA:
PENTATOMIDAE) PREYING ON *HYPERA POSTICA* GYLL. AND *GONIOCTENA FORNICATA* BRËGG. LARVAE
UNDER LABORATORY CONDITIONS**

Даниела Атанасова

Daniela Atanassova

Аграрен университет - Пловдив

Agricultural University - Plovdiv

E-mail: daniat88@yahoo.com

Резюме

Люцерната е основната фуражна култура в България. Тя се напада от голям брой неприятели, сред които най-важните листогризеци са *Hypera postica* Gyll. и *Gonioctena fornicata* Връгг. Във връзка с получаването на биологична продукция от люцерново сено беше проучена консумативната способност на хищната дървеница *Podisus maculiventris* (Say.) (Heteroptera: Pentatomidae) при изхранване с ларви на *H. postica* и *G. fornicata* при лабораторни условия. Средната консумативна способност на ларва от 4-та и 5-та възраст на *P. maculiventris* при изхранване с ларви на *H. postica* бе съответно 6,71 и 12,05 броя. При изхранване с ларви на *G. fornicata* една ларва от 4-та и 5-та възраст на хищната дървеница консумира средно съответно 4,23 и 7,73 броя. Резултатите показват, че ларвите на *H. postica* и *G. fornicata* са подходящи жертви за храна на *P. maculiventris*. Този хищник успешно може да се прилага като биоагент при отглеждането на люцерна.

Abstract

The aim of the present research was to study the feeding abilities of the spined soldier bug *Podisus maculiventris* (Say.) (Heteroptera: Pentatomidae) on *Phytonomus variabilis* Gyll. and *Phytodecta fornicata* Връгг. larvae under laboratory conditions. We found that *P. maculiventris* nymphs successfully developed while preying on *Phytonomus variabilis* and *Phytodecta fornicata* larvae. Each nymph of the predatory bug consumed an average of 18.74 *Phytonomus variabilis* larvae and 11.92 *Phytodecta fornicata* larvae respectively for about 10–11 days from L4 instars until the imago stage. The results show that *Phytonomus variabilis* and *Phytodecta fornicata* larvae are suitable prey for *P. maculiventris* and this predator could potentially be used as a biological control agent against them in alfalfa fields.

Ключови думи: *Podisus maculiventris* (Say), *Hypera postica* Gyll., *Gonioctena fornicata* Връгг, люцерна, биологичен контрол.

Key words: *Podisus maculiventris* (Say), *Hypera postica* Gyll., *Gonioctena fornicata* Връгг, alfalfa, biological control.

INTRODUCTION

Alfalfa is the main forage crop in Bulgaria. The rise in demand for organic dairy feed makes alfalfa an attractive crop for some organic farmers. According to organic standards, cows producing organic milk must be fed organic forage. This requires searching of possibilities for biological control of the main alfalfa pests. Insect pest management in an organic system depends on several factors, including climate, beneficial organisms already present in the area, and hay-cutting schemes.

The spined soldier bug, *Podisus maculiventris* (Say) is a medium-sized predatory stink bug which preys on a wide variety of many arthropods, especially lepidopteran and coleopteran larvae (Mukerji & LeRoux,

1965). This beneficial species is associated with several crops in Florida, including alfalfa, celery, soybeans, cotton, and crucifers (Stoner, 1930; Hayslip et al., 1953; Whitcomb, 1973; Deitz et al., 1976). This stink bug ranges over most of the United States and into southern Canada. *Podisus maculiventris* is not native and doesn't spread in Bulgaria, because of inability to hibernate under Bulgarian conditions.

Many authors used *P. maculiventris* for biological suppression of the Colorado potato beetle (CPB), *Leptinotarsa decemlineata* (Say) (Coleoptera: Chrysomelidae). The results showed that 5 nymphs/plant can significantly suppress CPB infestations (Aldrich, J. R. & Cantelo, 1999). Some authors investigated predation abilities of *P. maculiventris* on the tomato looper

Chrysodeixis chalcites (Esper) (De Clercq et al., 1998), on caterpillars of the beet armyworm, *Spodoptera exigua* (Hubner) (Mohaghegh, 2001) and on *Pyrrhalta viburni* (Paykull) larvae and adults (Gaylord & Weston, 2008).

In Bulgaria Draganov (2007) made evaluation of the possibilities for application of *Tenebrio molitor* L. (Coleoptera, Tenebrionidae) in technology for mass breeding of the predatory bug *P. maculiventris*. The author found that the males and females of the predatory bug live 40.8-42.2 days when they feed on larvae and pupae of *Tenebrio molitor* and the average fecundity per female was 491.2 eggs. The mortality was 1-2%, however when the predator fed on eggs mortality was 15.26-27.47%.

There is no data about development of *P. maculiventris* on larvae of main alfalfa defoliators - *H. postica* and *G. fornicata* until now. The aim of this study was to determine consumption ability of larvae 4-th and 5-th instars of the predatory bug *P. maculiventris* when preying on larvae 3-th instars of these two alfalfa defoliators in relation with possibilities for application of *P. maculiventris* in biological production of alfalfa forage.

MATERIAL AND METHODS

The experiments were conducted at the Department of Entomology, Agricultural University of Plovdiv. The study was made under laboratory conditions at temperature 24-25°C, relative humidity of 70-75% and dark/light period of 8/16 hours. The predator was used as first day larvae 4-th instar and were bred using Draganov's technology (Draganov, 1984). The trial was made in 3 replications by 20 individuals of the predator. *H. postica* (Fig. 1) and *G. fornicata* (Fig. 2) larvae 3-th instar were used as prey.



Фиг. 1. Нимфа на *P. maculiventris* хранеща се с ларва на *Hypera postica* (оригинал)

Fig. 1. *P. maculiventris* nymph preying on *Hypera postica* larvae (original)

The predators were placed individually in glass jars with fresh alfalfa stems and covered with cheese-cloth. The predator was given 5 larvae of the pests and the number of sucked out larvae was checked each day.

RESULTS AND DISCUSSIONS

The results showed that *P. maculiventris* nymphs successfully developed from 4-th instar to adult while preying on *Hypera postica* and *Gonioctena fornicata* larvae. Larvae 4-th and 5-th instars of *P. maculiventris* consumed an average of 6.71 and 12.05 larvae of *Hypera postica* respectively (Table 1).

When larvae 4-th and 5-th instars of *P. maculiventris*, preying on *Gonioctena fornicata* consumed an average of 4.23 and 7.73 larvae, respectively (Table 2).

P. maculiventris 4-th and 5-th instars larvae has greater consumption ability when preying on *Hypera postica* larvae, than on *Gonioctena fornicata* ones.

The mortality was 0%. The results shown that *Phytonomus variabilis* and *Phytodecta fornicata* larvae are suitable prey for *P. maculiventris* and this predator could potentially be developed as a biological control agent against them in alfalfa crop.

CONCLUSIONS

1. *P. maculiventris* nymphs successfully developed while preying on *H. postica* and *G. fornicata* larvae and 0% mortality was observed.
2. Preying on *H. postica* larvae each larvae 4-th and 5-th instars of the predatory bug consumed an average of 6.71 and 12.05 respectively.
3. Preying on *G. fornicata* larvae each larvae 4-th and 5-th instars of the predatory bug consumed an average of 4.23 and 7.73 respectively.



Фиг. 2. Нимфа на *P. maculiventris* хранеща се с ларва на *Gonioctena fornicata* (оригинал)

Fig. 2. *P. maculiventris* nymph preying on *Gonioctena fornicata* larvae (original)

Таблица 1. Средна консумативна способност на ларви от 4-та и 5-та възраст на *Podisus maculiventris*, изхранвани с ларви на *Hypera postica*

Table 1. Average consumption ability of larvae 4-th and 5-th instars of *Podisus maculiventris* preying on *Hypera postica* larvae

<i>P. maculiventris</i>	n	Mean	Min	Max	Standard Deviation
4-th instar larvae	60	6,71667	3,000000	12,00000	2,329557
5-th instar larvae	60	12,05000	5,000000	21,00000	4,813206

Таблица 2. Средна консумативна способност на ларви от 4-та и 5-та възраст на *Podisus maculiventris*, изхранвани с ларви на *Gonioctena fornicata*

Table 2. Average consumption ability of larvae 4-th and 5-th instars of *Podisus maculiventris* preying on *Gonioctena fornicata* larvae

<i>P. maculiventris</i>	n	Mean	Min	Max	Standard Deviation
4-th instar larvae	60	4,233333	2,000000	9,00000	1,418601
5-th instar larvae	60	7,733333	4,000000	11,00000	2,246403

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Рецензент – доц. д-р Вили Харизанова

E-mail: viliharizanova@gmail.com