Journal of Biological Control, 24 (2): 173–174, 2010

Research Note

Predatory potential of *Episyrphus balteatus* (De Geer), an effective predator of *Lipaphis erysimi* (Kaltenbach)

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ABSTRACT: Predatory potential of aphidophagous syrphid fly, *Episyrphus balteatus* (De Geer) (Diptera: Syrphidae) against *Lipaphis erysimi* (Kaltenbach) was studied under laboratory conditions. The first instar larvae of *E. balteatus* were less voracious than older instars. The voracity (no. of aphid consumed / 24 hr) of *E. balteatus* increased with succeeding instars. The third instar larva of *E. balteatus* consumed 120.2 apterous adults of *L. erysimi* in 24 hrs and during its entire third instar, it consumed 499.24 apterous adults. The theoretical effectiveness was worked out as 84.57, which was the product of multiplication of its seasonal average numbers in the field by its average daily consumption, which showed its potential for use as an effective biocontrol agent against mustard aphid.

KEY WORDS: *Episyrphus balteatus,* Syrphidae, feeding potential, *Lipaphis erysimi*

(Article chronicle – Received: 27.11.2009; Sent for revision: 23.02.2010; Accepted: 25.02.2010)

INTRODUCTION

Several species of syrphida (Diptera: Syrphidae) have been recorded as predators of aphids attacking cruciferous crops (Ghosh *et al*., 1981; Agarwala *et al*., 1984; Chitra Devi *et al*., 1997, 2002; Singh and Rai, 2000). Amongst them, *Episyrphus balteatus* (De Geer) has been reported as an important predator of mustard aphid, *Lipaphis erysimi* (Kaltenbach) (Hemiptera: Aphididae) in several parts of India (Brunetti,1923; Ghorpade,1981; Chitra Devi *et al*., 1997, 2002). No information is available on the predatory potential of *E. balteatus* on *L. erysimi* from Assam. The potential of this predator is evident from its role in regulating *L. erysimi* in *toria* fields during 2006-07 and 2007-08 *rabi* seasons as it constituted 20-24% of the total natural enemy population (Borah and Dutta, unpublished). The efficiency of a predator in the control of aphids depends upon a number of factors including predatory potential, fecundity, and its relative abundance (Yakhontov, 1966). Chitra Devi *et al*. (1996) reported that *E. balteatus* consumed 392 individuals of *L. erysimi*, while *E. viridaureus* (Wiedemann) consumed 464 *Brevicoryne brassicae* during its larval period (Kotwal *et al*., 1984). Keeping in view its abundance and future prospect of utilization in biocontrol programmes, attempts were made to study its predatory potential utilising *L. erysimi* as host.

Toria variety TS-36 was grown in a plot of 160 sq.m at ICR Farm, Assam Agricultural University, Jorhat, during the *rabi* seasons of 2006-07 and 2007-08. The crop was allowed to be naturally infested by *L. erysimi* and regular monitoring was done for appearance of *E. balteatus*. The initial culture of *E. balteatus* was raised by collecting large numbers of syrphid larvae from this heavily infested *toria* plot. The larvae thus collected were reared on mustard aphid in the laboratory. The larvae were kept inside plastic containers (9 cm dia x 19 cm high) till pupation. The pupae thus obtained were transferred into glass chimneys (5 cm dia x 20 cm hight) for emergence of adults. Ten newly emerged male and female adults were introduced into an oviposition cage (90 x 60 x 60 cm) made of iron framework and acrylic mesh. The cage contained two aphid infested potted plants of *toria* and 5% honey solution in cotton swabs was provided as food for the flies. The eggs were removed by cutting the aphid infested twigs along with the deposited eggs. The larvae that hatched were transferred to vials (15 x 1.5 cm) and provided with *toria* twigs infested with prey aphids offered as groups of young nymphs (instars I & II), old nymphs (instars III, IV and V), apterous adults and alate adults. Hundred individuals of each group were offered to the predator as food. Fresh prey individuals were introduced into the vials as and when necessary. The number of aphids consumed by the larva in 24h was recorded. The feeding potential of the remaining instars of the predator was recorded by transferring the individuals into vials containing prey aphid as described earlier. The theoretical effectiveness of the predator was calculated by multiplying the seasonal average numbers of the predator in the field (Borah and Dutta, unpublished) by the average daily consumption of each predator in the feeding potential study (Simpson and Burkhardt, 1960). The feeding potential (no. of aphids consumed / day) of the first instar larvae of *E. balteatus* was less compared to the older instars and it increased in succeeding instars. The third instar larvae were the most voracious consuming 120.2 apterous adults of *L. erysimi* in 24h. Irrespective of the stage of *L. erysimi,* the first, second and third instar larvae of *E. balteatus* consumed 13.65, 46.15 and 83.15 aphids, respectively (Table 1). Earlier studies also revealed that the feeding rate of syrphid species increased with age / instar and the third instar exhibited higher efficiency than the rest of the instars (Singh and Mishra, 1988; Radhakrishnan and Muraleedharan, 1993; Chitra Devi *et al.,* 1996). Chitra Devi *et al.* (1996) reported that the third instar larva of *E. balteatus* consumed 392 individuals of *L. erysimi*. The first instar larva of *E. balteatus* preferred young nymphs to older nymphs and adults of *L. erysimi*.

Table 1. Predatory potential of *Episyrphus balteatus* feeding on *L. erysimi*

Larval instar of *E. balteatus*	Prey Stage				
	YN	ON	Ap. A	Al. A	Mean
I	21.20	16.40	14.40	2.20	13.65
II	55.20	59.20	65.20	5.00	46.15
III	90.20	110.20	120.20	11.60	83.15
Mean	56.60	62.00	66.66	6.33	47.65

Data based on 5 replications; YN = young nymph; ON = old nymph; Ap.A = apterous adult; Al.A = alate adult

The theoretical effectiveness of *E. balteatus* worked out by multiplying its seasonal average number of 1.77 larvae / plant in the field (Borah and Dutta, unpublished) by average daily consumption (47.65 aphids / predator) was 84.57, which showed its potential for use as an effective biocontrol agent against mustard aphid.

ACKNOWLEDGEMENT

The authors are grateful to Dr. T. Kameshwar Singh, Department of Life Sciences, Manipur University, Imphal for identification of the predator.

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