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Predatory efficiency of *Rhynocoris marginatus* (Fabricius) (Heteroptera: Reduviidae) on *Helicoverpa armigera* (Hübner) and *Spodoptera litura* (Fabricius)

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ABSTRACT: Comparative predatory efficiency of *Rhynocoris marginatus* (Fabricius) was assessed on two cotton pests namely, *Helicoverpa armigera* (Hübner) and *Spodoptera litura* (Fabricius). Gradual increase in prey consumption was recorded by the progression of the developmental stages of the predator. Adult females consumed more than males and consumption decreased with the later prey instars. Among the two prey species, *S. litura* was more preferred.

KEY WORDS: *Helicoverpa armigera*, Predatory efficiency, *Rhynocoris marginatus*, *Spodoptera litura*

Reduviids are essentially predatory on insect pests of crops and play a significant role in keeping pest populations in check (Schaefer, 1988; Ambrose, 1995). *Rhynocoris marginatus* (Fabricius) is a reduviid predator predominantly found in agroecosystems, scrub jungles and semi-arid zones bordering agroecosystems in India. Livingstone and Ambrose (1978) studied the feeding behaviour and predatory efficiency of *R. marginatus*. Although, *R. marginatus* was reported as a potential predator on many lepidopteran insect like *Earias vittella* (Fabricius), *Achaea janata* Linnaeus, *Helicoverpa armigera* (Hübner) and *Spodoptera litura* (Fabricius) (Joseph, 1959; Bhatnager *et al.*, 1983; Prabakar, 1994; Sahayaraj, 1994), there is no information available on the comparative predatory efficiency of the nymphal instars and adults. Hence, an attempt was made to study the comparative predatory efficiency of *R. marginatus* on three size groups of *S. litura* and *H.*

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armigera to understand the preferred prey and the size of the prey to evolve strategies for mass rearing and subsequent release of this predator into the cotton agroecosystem to manage *S. litura* and *H. armigera*.

MATERIALS AND METHODS

The nymphs and adults of *R. marginatus* were collected from the foot hills of Kodaikanal (altitude 300 m; latitude 10.0°N, 78.0°E) in Madurai district of Tamil Nadu, India and reared in the laboratory (Temperature: 30-32°C; RH: 75-80%; Photoperiod: 11-13 h) in separate plastic containers (7 x 7 x 4 cm) on *S. litura* and *H. armigera* larvae. Newly moulted nymphs and adults of *R. marginatus* were used in this experiment. Predatory efficiency experiments were conducted in the cotton fields at Theni (9° 59'N, 77° 25'E), in Tamil Nadu. The branch terminals of cotton plants were covered with small nylon mesh cages (10 x 15 cm). Predators starved for 48 h, were used in this experiment.

Comparative predatory efficiency of each nymphal instar (I, II, II, IV and V) and adult males and females of *R. marginatus* were evaluated on different size groups of *S. litura* and *H. armigera* (0.1-1.0, 1.1-2.0 and 2.1-3.0 cm long) separately by no-choice test. One reduviid predator and 20 nymphs of a particular instar were introduced into the mesh cage. Nymphs were placed on the leaves of cotton plants. Predatory efficiency was assessed in terms of number of prey consumed and killed by the predator in 24 h. Experiment was repeated separately for all the three size groups of *S. litura* and *H. armigera*. The number of prey consumed and number of prey killed were evaluated separately because they killed more insects than they consumed. The number of prey killed also included the cumulative number of those consumed. Six replicates were maintained for each life stage of the predator and for each prey group. The mean predation between the two prey species was compared by students 't' test.

RESULTS AND DISCUSSION

All nymphal instars and adults of *R. marginatus* preferred *S. litura* than *H. armigera*, irrespective of the prey size. When smaller prey was provided (0.1-1.0 cm long), the first instar of *R. marginatus* consumed 4.00 ± 0.63 and 2.50 ± 0.55 larvae of *S. litura* and *H. armigera*, respectively. This preference of *S. litura* might be due to the defensive secretion of *H. armigera* which compelled the predator to leave off the prey for some time (3-5 minutes). But the defensive secretion of the prey did not deter the predator from attacking and capturing the prey. Similar reports were made by Sahayaraj and Ambrose (1994) in case of *Acanthaspis pedestris* Stål. on four cotton pests. The consumption increased with the progression of nymphal instars and maximum consumption was observed in the adults. Adults female consumed more than male (9.67 ± 0.82 and 8..33 ± 0.82 larvae of *S. litura* and *H. armigera*, respectively) (Table 1). Increased consumption by the progression of nymphal instars in all the size groups of prey is due to their increased nutritional requirement (Sahayaraj and

Table 1. Comparative predatory efficiency of *R. marginatus* on small sized larvae of *S. litura* and *H. armigera*

Predatory stage	Prey Consumed (Mean ± SD)		't' value	Prey killed (Mean ± SD)		't' value
	S. litura	*H. armigera*		*S. litura*	*H. armigera*	
I instar nymph	4.00 ± 0.63	2.50 ± 0.55	4.35**	6.50 ± 0.55	3.83 ± 0.41	9.52***
II instar nymph	4.83 ± 0.75	3.67 ± 0.52	3.08**	8.67 ± 0.52	5.67 ± 0.52	10.03***
III instar nymph	5.50 ± 1.05	5.17 ± 0.75	0.45	11.83 ± 0.75	8.50 ± 0.55	8.73***
IV instar nymph	5.83 ± 0.75	6.17 ± 0.98	0.67	12.00 ± 1.09	10.67 ± 0.82	2.39**
V instar nymph	7.33 ± 0.82	7.00 ± 0.63	0.78	14.50 ± 0.55	12.00 ± 0.89	4.65***
Adult male	8.50 ± 0.55	7.50 ± 0.55	3.14*	16.33 ± 0.82	12.50 ± 1.05	7.04***
Adult female	9.67 ± 0.82	8.33 ± 0.82	2.82*	17.00 ± 0.89	13.33 ± 0.82	7.39***

Significance at P= 0.05 (*), 0.01 (**) and 0.001 (***).

Ambrose, 1994). The female predator consumed/killed more prey than the male predator, obviously due to the higher nutritional requirement of the females for reproduction.

When medium sized prey was given (1.1-2.0 cm long) the number of prey consumed by the predators was reduced. The I instar nymphs did not consume this size of prey while the second instar nymphs consumed 3.50 ± 1.05 and 2.33 ± 0.52 larvae of *S. litura* and *H. armigera*, respectively. the consumption increased with the progression of nymphal instars and the prey consumption by the adult female was 7.83 ± 0.75 and 5.50 ± 0.55 larvae of *S. litura* and *H. armigera*, respectively. The prey killed by the predator was more than the prey consumed (Table 2).

When large sized preys were provided for feeding (2.1-3.0 cm long), the I and II nymphal instars of *R. marginatus* did not consume or kill both the prey species. This showed that *R. marginatus* nymphs preferred small prey than the large ones in both the species. Similar observations were made by Bose (1949) and Weseloh (1988). Capturing success of a prey would greatly dependent on the relative size and strength of the prey and predator which seems to be correlated with the body weight (Sahayaraj, 1994). Considering the prey size when compared with their own body size, the I and II instar predator nymphs did not attempt to prey upon the larger *S. litura* and *H. armigera*. A similar observation was made by Sahayaraj (1994). The III nymphal instars consumed 1.67 ± 0.82 and 1.00 ± 0.63 prey in *S. litura* and *H. armigera*, respectively (Table 3).

The present study revealed the predatory efficiency as well as stage specific preference of the predator of *S. litura* and *H. armigera*. Timely release of the predator *R. marginatus* into the *S. litura* and

Table 2. Comparative predatory efficiency of *R. marginatus* on the medium sized larvae of *S. litura* and *H. armigera*

Predatory stage	Prey Consumed (Mean ± SD)		't' value	Prey killed (Mean ± SD)		't' value
	S. litura	*H. armigera*		*S. litura*	*H. armigera*	
I instar nymph	-	-	-	-	-	-
II instar nymph	3.50 ± 1.05	2.33 ± 0.52	2.44*	5.83 ± 0.75	4.33 ± 0.52	4.01**
III instar nymph	3.83 ± 1.17	3.00 ± 0.63	1.52	7.83 ± 0.75	5.00 ± 0.63	7.03***
IV instar nymph	4.83 ± 0.98	4.17 ± 0.41	1.52	7.50 ± 0.55	6.83 ± 0.98	1.45
V instar nymph	5.83 ± 0.98	4.83 ± 0.75	1.98	8.67 ± 0.52	8.67 ± 0.52	0.00
Adult male	7.17 ± 0.75	5.17 ± 0.75	4.60***	12.67 ± 0.52	9.00 ± 0.63	10.96***
Adult female	7.83 ± 0.75	5.50 ± 0.55	6.11***	12.50 ± 0.84	11.33 ± 0.82	2.44*

Significance at P= 0.05 (*), 0.01 (**) and 0.001 (***).

Table 3. Comparative predatory efficiency of *R. marginatus* on the large sized larvae of *S. litura* and *H. armigera*

Predatory stage	Prey Consumed (Mean ± SD)		't' value	Prey killed (Mean ± SD)		't' value
	S. litura	*H. armigera*		*S. litura*	*H. armigera*	
I instar nymph	-	-	-	-	-	-
II instar nymph	-	-	-	-	-	-
III instar nymph	1.67 ± 0.82	1.00 ± 0.63	1.58	3.50 ± 0.55	3.00 ± 0.00	2.23
IV instar nymph	2.17 ± 0.41	1.83 ± 0.41	1.43	3.67 ± 0.52	3.67 ± 0.52	0.00
V instar nymph	3.50 ± 0.55	2.17 ± 0.75	3.49**	5.33 ± 0.82	4.50 ± 1.05	1.53
Adult male	4.17 ± 0.98	2.83 ± 0.41	3.08*	9.33 ± 0.52	4.83 ± 0.41	16.68***
Adult female	4.50 ± 1.05	3.83 ± 0.41	1.45	9.67 ± 0.52	5.50 ± 0.55	13.50***

Significance at P=0.05 (*), 0.01 (**) and 0.001 (***).

H. armigera infested cotton fields could lead to effective controlling of pests.

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