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Feeding efficiency of the larval predator, *Rhynocoris marginatus* Fabricius (Hemiptera: Reduviidae) on *Corcyra cephalonica* Stainton (Lepidoptera: Pyralidae) larvae reared on Rice under *In vitro* condition

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Abstract
Natural enemies like reduviid predators could be used in insect pest management particularly to manage many polyphagous lepidopteran larvae which are serious pests on a number of agricultural crops. They are less specific in their choice of prey and kill more prey than they need to satiate themselves.. Keeping this in mind an experiment was conducted in the Biocontrol laboratory, Indira Gandhi Krishi Vishwavidyalaya, Raipur (Chhattisgarh) during 2018-19 to check the feeding potential of the reduviid larval predator, *Rhynocoris marginatus* on the factitious host *Corcyra cephalonica* Stainton larvae reared on crushed rice cereal under *in vitro* condition. It was found that the average feeding potential of first instar was 5.67 larvae/ bug, while 2nd instar nymph showed predation of 8.33 larvae/ bug. Third instar nymph showed better predatory activity than the two early instars (18.67 larvae/ bug). In the fourth instar, the mean consumption was estimated to be (27.00 larvae/ bug), whereas in fifth instar (43.67 larvae/ bug) and adults devoured a maximum number of 82.00 larvae/ bug. Hence, *R. marginatus* can be used as a promising bioagent for management of different lepidopteran insect-pests in all the crops which will ultimately help in sustainable crop production.

Keywords: reduviid, larval predators, *Rhynocoris marginatus*, *Corcyra cephalonica*, rice, feeding potential

Introduction

Presently, people are becoming increasingly aware that the harmful effect of the insecticides far outweighs the advantage of chemical pest control. Biological and non-chemical methods of pest management have gained importance in the recent years, as a policy aiming to minimize the application of chemical insecticides (Fields and White, 2002) [4]. The strategy for utilization of biological control of many species of economic insect pests in India has been intensively investigated by the researchers since 1987, which revealed that natural enemies like reduviid predators could be used in insect pest management particularly to manage many polyphagous lepidopteran larvae which are serious pests on a number of agricultural crops. Biological methods of pest management are said to be ecologically sound, economically viable and socially acceptable (de Bach and Hagen, 1991) [3].

Biological control using predaceous arthropods particularly predaceous reduviids in agricultural crops is receiving much attention (Grundy and Maelzer 2000) [5]. Reduviid bug, commonly called as 'assassin bug' or 'kissing bug' belongs to family Reduviidae of the suborder Heteroptera under the order Hemiptera. The members of family are mostly carnivorous and predaceous in habit preying upon other invertebrates. Adults are either nocturnal or diurnal. The nocturnal species hide under bark or amongst foliage during daylight

hours and emerge only during the night to seek their prey which usually consists of soft-bodied larvae, moths and bark and foliage dwelling insects. The diurnal predatory bugs usually inhabit flowers and foliage and attack flower–visitors, and insect pests.

Reduviids are abundant, occuring worldwide and are highly successful polyphagous and valuable predators playing a major role in suppressing the pest population in situations where a variety of insect pests occur. These insects are of considerable economic importance, as they keep a check on important pests of agriculture and forests. They are less specific in their choice of prey and kill more prey than they need to satiate themselves. Reduviid bugs like *R. marginatus* (Fab.) are widely used in IPM and for mass multiplication. They are alate, entomo-succivorous, polyphagus, polymorphic, crepuscular, multi-voltine assassin bugs, predominantly found in the jungles, semi-arid zones, tropical rain forests and agro-ecosystems (Sahayaraj, 1994 and 2002, Singh *et al*. 2017a; Singh *et al*. 2017b; Singh *et al*. 2017c; Singh *et al*. 2018; Tiwari *et al*. 2018; Tiwari *et al*. 2019a; Tiwari *et al*. 2019b; Kour *et al*. 2019; Singh *et al*. 2019) [6-16]. They play a vital role in the biological control of >20 lepidopterans, few coleopteran and hemipteran pests (Ambrose, 1999) [1]. It is also a potential larval predator on lepidopteran pests in various agro-ecosystems *viz.* rice, sugarcane, cotton, soybean, pigeonpea, castor, tobacco, okra, pumpkin, brinjal, citrus, etc. (Sahayaraj and Sathiamoorthi, 2002) [17]. Their success in every ecosystem or trophic niche is due to their morphological and physiological adaptations in predation and extra-oral digestion. Effectiveness of these as bio-control agents have been demonstrated, and the field releases usually result in quick and effective control of the target (Ambrose, 2010) [2].

Materials and Methods

Following materials were used in present experiment -

- Reduviid bug (preferably egg stage to start experiment)
- Petriplates (5-15cm dia.)
- Forceps
- Corcyra larvae (reared on rice)

The studies on predatory potential of *R. marginatus*on *C. cephalonica* larvae reared on rice were carried out in completely randomized design replicated thrice under laboratory controlled conditions of 27 ± 2 °C temperature and 70 ± 10% relative humidity.

Thirty nymphs of *R. marginatus* comprising of ten nymphs in each replication were used to feed upon the larvae reared on rice separately. Counted number of larvae of suitable instar with respect to instar of nymph was provided daily throughout their life. The observations on the number of prey consumed by each of nymphal instars of *R. marginatus* were recorded daily till death of adult. The number of larvae fed by different nymphal instars were recorded daily to get the data on feeding potential. The data obtained were subjected to statistical analysis.

Result and Discussion

Feeding potential of different nymphal instars and adults of *R. marginatus* total number of *C. cephalonica* larvae consumed throughout their developmental period fed on rice cereal was computed and significant differences were observed in the feeding efficiency of all nymphal instars and adult stages as represented in Table 1 and Fig. 1

The predatory efficiency of the nymphs was determined by counting total number of larvae consumed by each nymphal instar. The data presented in Table 1 show that the rate of consumption increased gradually from the first instar to adult stage. The average consumption of first instar was 5.67 larvae/ bug, while 2nd instar nymph showed predation of 8.33 larvae/ bug. Third instar nymph showed better predatory activity than first two instars (18.67 larvae/ bug). In the fourth instar, the mean consumption was estimated to be (27.00 larvae/ bug), whereas in fifth instar (43.67 larvae/ bug) and adults devoured a maximum number of 82.00 larvae/ bug. They required more food than the previous instar may be for growth and development.

Table 1: Feeding efficiency of different stages of *R.marginatus* fed on *C. cephalonica* larvae reared on different diets

Nymphal instars	Feeding efficiency (no. of larvae fed/ bug)			Total (no. of larvae fed/ bug)	Average (no. of larvae fed/bug)
	R1	R2	R3		
I	5	6	6	17	5.67 (2.58)
II	8	9	8	25	8.33 (3.05)
III	19	18	19	56	18.67 (4.43)
IV	26	28	27	81	27.00 (5.29)
V	42	44	45	131	43.67 (6.68)
Adult	85	82	79	246	82.00 (9.10)
SE(m)±					0.86 (0.065)
C.D. at 5%					2.68 (0.201)

The figures in parantheses represents square root transformed values

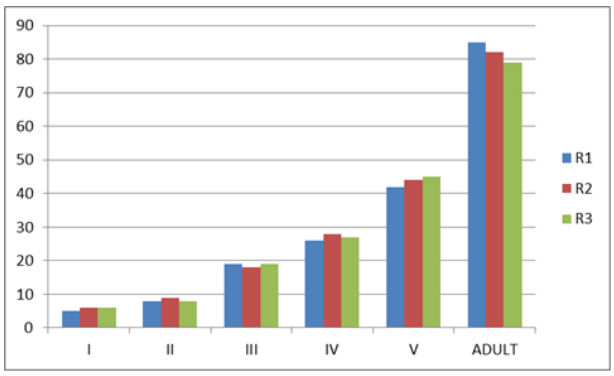

Fig. 1: Graphical representation of feeding efficiency of different stages of *R. marginatus*fed on *C. cephalonica* larvae reared on different diets

Summary and Conclusion

Thus, from the present studies it can be concluded that the feeding efficiency of different stages of *R. marginatus* clearly revealed that almost all the nymphal instars and adult stage recorded significant feeding potential on *Corcyra* larvae and has the potential to feed on other lepidopterous larvae in field. Hence can be used as a promising bioagent for management of different economically important lepidopteran insect-pests in all the crops which will ultimately help in residue free sustainable crop production.

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