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Nymphal cannibalistic behaviour of *Rhynocoris kumarii* Ambrose and Livingstone (Heteropreta: Reduviidae) to prey deprivation and mass rearing conditions

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ABSTRACT: ***Rhynocoris kumarii*** **Ambrose and Livingstone was reared in groups in containers of two different sizes and also starved for 0, 2, 4 and 6 days to understand the cannibalistic behaviour of the different nymphal stages. Cannibalism increased when space was limited or in crowded condition. The rate of starvation has also marked influence on the cannibalistic activity. Maximum cannibalism was observed in the first and second nymphal instars. Cannibalism was very less in the third and fourth nymphal instars.**

KEY WORDS: Cannibalism, nymphs, *Rhynocoris kumarii*, starvation

Reduviids have been recorded as important natural enemies in suppressing several pests, especially hemipteran and lepidopteran. *Rhynocoris kumarii* Ambrose and Livingstone is a reduviid predator found to be predating on various insect pests. Since biological control of insect pests has been gaining momentum, conservation and augmentation of this predatory bug is very essential. Nymphal cannibalism is a major constraint in the mass multiplication of this reduviid in the laboratory. No documented evidence is available on cannibalism in reduviids except the nymphal camouflaging on cannibalism (Ambrose, 1986; Livingstone and Ambrose, 1986). In order to have a sound knowledge on the nymphal cannibalism of various nymphal instars of *R. kumarii* an attempt has been made to study the effect of starvation and insect density on the cannibalistic behaviour of *R. kumarii*.

MATERIALS AND METHODS

Adults and nymphs of *R. kumarii* were collected from Maruthuvazmalai scrub jungle a legendry hillock in Kanyakumari district, Tamilnadu, South India (altitude 50.0 ± 5.77m; longitude 77°35 E and latitude 8°14 N). They were maintained in the laboratory in plastic containers at 30± 2°C, relative humidity ranging from 75-80 per cent and photoperiod between 11and 13h on the larvae of *Spodoptera litura* (Fabricius). The freshly moulted fourth instar nymphs were used for the present experiment to study the cannibalistic behaviour.

Two hundred first instars nymphs of *R. kumarii* were recruited from the stock culture and divided into two main groups of 100 each to study the effect of mass rearing density and prey deprivation on cannibalism. The two main treatments were further sub-divided into four sub-treatments of 25 nymphs in each sub-treatment. Altogether there were 8 sub-treatments. Four sub treatments were kept in four large plastic troughs (less crowded) (16× 10cm). The other four sub-treatments were placed in small plastic troughs (much crowded) (10×7cm). The 4 sub-treatments in each group were subjected to 4 different

conditions *viz.*, daily fed, 2 day, 4 day and 6 day prey deprivation. The rate of Cannibalism in all the eight treatments was recorded. Each sub-treatment was replicated thrice. Rate of cannibalism with respect to starvation was subjected to one way ANOVA (SAS Institute, 1988) and Tukey test (Tukey, 1953) and the rate of cannibalism with respect to space was subjected to students 't' test.

The rate of cannibalism was accelerated by the deprivation of prey. In the first instar nymphs of less crowded condition the percentage of cannibalism increased from 24 in daily fed nymphs to 40, 52 and 72 in 2, 4 and 6 days prey deprived nymphs, respectively. Similar increased percentage of cannibalism was noted for all the other nymphal instars (Table 1). The results clearly confirm that prey deprivation accelerated

Table 1. Effect of space and starvation on the rate of cannibalism in *R. kumarii*

Stage of the predator	Size of the trough	Percentage of insects cannibalized after starvation			
		0 day	2 days	4 days	6 days
I	Large	24^{aA}	40^{bA}	52^{bA}	72^{cA}
	Small	32^{aB}	52^{bB}	76^{cB}	92^{dB}
II	Large	16^{aA}	32^{bA}	44^{cA}	56^{dA}
	Small	28^{aB}	44^{bB}	52^{bA}	72^{cB}
III	Large	12^{aA}	24^{bA}	32^{bA}	40^{bA}
	Small	24^{aB}	36^{bB}	44^{bB}	56^{cB}
IV	Large	12^{aA}	24^{bA}	28^{bA}	44^{cA}
	Small	24^{aB}	32^{abA}	40^{bcB}	48^{cA}
V	Large	16^{aA}	28^{bA}	40^{cA}	52^{dA}
	Small	20^{aA}	40^{bB}	52^{cB}	64^{dB}

Values carrying same small alphabet in a row and capital alphabet in a column are not statistically significant by Tukey test and 't' test, respectively (P = 0.05).

RESULTS AND DISCUSSION

Higher percentage of cannibalism was observed in the first nymphal instars irrespective of starvation and space and it was considerably lower for the succeeding nymphal instars. In the first instar nymphs in much crowded condition 32, 52, 76 and 92 per cent cannibalism was observed when starved for 0, 2, 4 and 6 days, respectively. But it was reduced to 28, 44, 52 and 72 per cent, respectively when starved for 0, 2, 4 and 6 days in the second nymphal instars. Cannibalism was still reduced in the third and fourth nymphal instars with a slight increase in V nymphal instars. Lowest cannibalism was recorded in the IV nymphal instars (Table 1). This was in agreement with the earlier findings of George and Ambrose (1999).

the cannibalism and it suggests that daily feeding is the apt feeding strategy for the laboratory mass rearing of *R. kumarii*. The present observation was in agreement with the earlier observations of Iqbal and Aziz (1976), and Sofi and Bhat (1997). The major role played by starvation on the predatory behaviour and the postembryonic development of reduviids was studied by Ambrose *et al.* (1985a & b, 1990, 1992), Ambrose and Amudha (1987) and Ambrose and Claver (1996).

The rate of cannibalism was more in the insects reared under much crowded condition than in the less crowded condition. In the first instar nymphs the cannibalism increased from 24, 40, 52 and 72 per cent when reared in less crowded condition to 32, 52, 76 and 96 per cent in much crowded condition for 0, 2, 4 and 6 days

starvation, respectively. This confirms the cannibalistic rate as a function of the density maintained per rearing unit. Acceleration of cannibalism by reduction in space was also confirmed by Iqbal and Aziz (1976) and Sofi and Bhat (1997). Ambrose *et al.* (1985a) and Ambrose and Jenoba (1988) and Vennison and Ambrose (1989) studied the effect of space on the predation and development in some reduviids and stated that the reduction of space accelerated the predatory efficiency, reproductive potential and decreased the size of the animal.

The present study outlines the conducive conditions required with respect to space and food to facilitate multiplication of this potential biological control agent.

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