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# Functional Response of the Reduviid Predator *Rhinocoris marginatus* Fabr. on the Cotton Stainer *Dysdercus cingulatus* Fabr.

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ABSTRACT

**The present work elucidates the functional response of the reduviid predator *Rhinocoris marginatus* Fabricius on the prey *Dysdercus cingulatus* Fabricius, showing a linear relationship between the amount of food consumption and the prey density. The female and male *R. marginatus* consumed 1.7 and 1.9 prey/predator, respectively at the density of 2 red cotton bugs, but consumed more number of bugs (13.166 and 20 prey/predator respectively) at the density of 32 red cotton bugs during the same duration (24 h). This response, exhibits the predator's searching capacity, which increases with prey population and thus reflecting its utility value as a biocontrol agent of red cotton bug *D. cingulatus*.**

Key Words : *Rhinocoris marginatus*, bio-control agent, *Dysdercus cingulatus*, cotton stainer, functional response

*Dysdercus* spp. are serious pests of cotton (Leakey and Perry, 1966; David and Kumaraswami, 1978). The reduviid *Rhinocoris marginatus* fabr, has been reported as a predator of the cotton stainer *Dysdercus cingulatus* (Ambrose, 1985, 1988). The predator may respond to the increased prey density by increasing their own numbers (numerical response) or each predator may respond by destroying more number of preys (functional response) (Solomon, 1949). An attempt has been made to study the functional response of *R. marginatus* in the laboratory and the results are presented in this paper.

## MATERIALS AND METHODS

The red cotton bugs *D. cingulatus* were collected from the cotton fields located at the bottom of the Muthurmalai scrub jungle and were reared on soaked cotton seeds in plastic troughs. The nymphs of *R. marginatus* were also collected near Palayankottai (77°. 44'.54" E and 8° .43'.14"N) and were reared in the laboratory (temperature 30-32°C; RH 75-85%; photoperiod 11-13 hours) in separate plastic containers (8x6x4 cm) fed on *Corcyra cephalonica* Staint. The third instar nymphs of red cotton bug were placed in the container (160 ml cap.) and were allowed to settle for some time. Ten day old adult males and females starved for 24 h, were utilized as predators. The functional response was observed at varying levels of red cotton bug densities *viz.*, 2,4,8,16 and 32. In each set, a single predator was released. The experiment was run for 24 h and, thereafter the number of prey consumed was calculated. The experiment was replicated ten times. Regression analysis was made to determine the relationship between the prey density and the prey consumption as per Holling (1966) and Sinha *et al.* (1982).

## RESULTS AND DISCUSSION

The functional response of *R. marginatus* was of type 2 of Holling (1959) and could be explained by a linear relationship between the log number of prey consumed and the log of initial number of prey (Fig. 1 and 2). In female

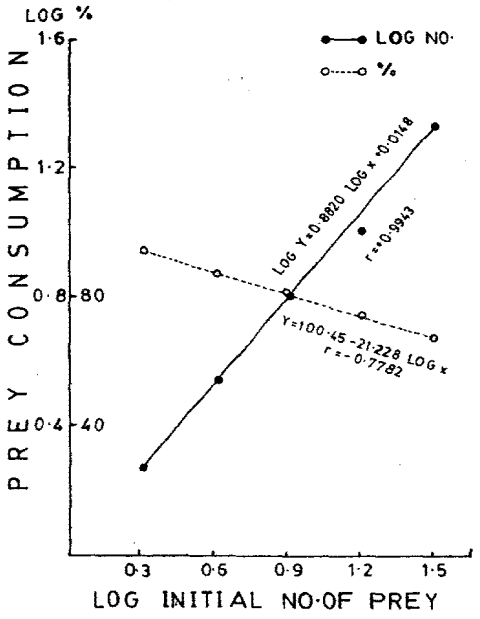


Fig. 1. Regression analysis depicting the relationship between the prey *(D.cingulatus)* density and the prey consumption of female predator *(R.marginatus)*.

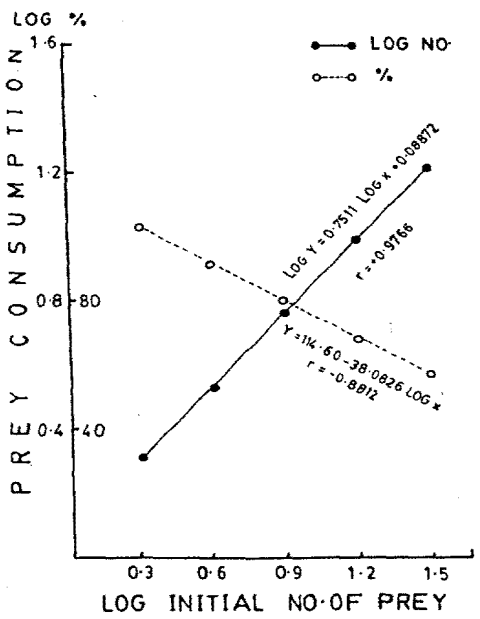


Fig. 2. Regression analysis depicting the relationship between the prey *(D.cingulatus)* density and the prey consumption of male predator *(R.marginatus)*.

*R. marginatus*, the number of prey consumption increased with all the densities of prey whereas the percentage of consumption tended to increase from 85% to 92.8% and then gradually declined from 8 to 32 prey density levels. However, in the male, the number of prey consumption steadily increased up to the density of 16 prey/predator and thereafter the consumption level tended to stabilize. The percentage of prey consumption in males declined up to the density of 8 prey/ predator and stabilized on the density of 16 prey/predator and then declined abruptly.

In *R. marginatus*, an increase in the prey consumption number and a decrease in percentage of prey consumption were observed with the increase in the prey density. This trend was well established in the male which showed a linear relationship between the log number of prey consumed and the log of initial number of prey (log Y = 0.7511 logx + 0.08872; r = +0.9766) and between the percentage of prey consumed and the log of initial number of prey (Y = 114.60- 38.0826 logx; r = -0.8812) (Fig.2). However, in the female, the prey consumption increased linearly with the increase in the prey density and was more pronounced (log Y = 0.8820 logx + 0.0148; r = +0.9943) than male. The percentage of consumption in the female decreased linearly with the increase in the prey density (Y = 100.45 - 2.228 logx) but the r value was not statistically significant (r = -0.7782). This could be due to the poor searching ability of the female at lower prey densities.

The female and male *R. marginatus*, which consumed 1.7 and 1.9 preys, respectively at the density of 2 *D. cingulatus*, consumed 20 and 13.166 preys at the density of 32 *D. cingulatus*. The present findings corroborates the view of Sinha *et al.* (1988) that the prey density has a significant influence on the prey consumption and confirms to the type 2 model of Holling (1959). The prey consumption potential of female *R. marginatus* at the density of 32 *D. cingulatus*/predator is higher than that of the male which confirms the observations of Holling (1966) in the preying mantid *Hierodula crassa* Higlio- Tos, that the female has more prey consumption potential than the

male. The present observations suggest that *R.marginatus* is responding functionally in suppressing the increased prey population as its searching capacity and prey consumption potential are increasing with the increased prey density and thus reflecting its utility as a biocontrol agent of the cotton stainer *D.cingulatus*.

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