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# Nutritional influence of prey on the biology and biochemistry in *Rhynocoris marginatus* (Fabricius) (Heteroptera: Reduviidae)

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**ABSTRACT:** **Nutritional influence of three prey species namely *Spodoptera litura* (Fabricius), *Raphidopalpa foveicollis* Lucas and *Chrotogonus* sp. on the biology and biochemistry of *Rhynocoris marginatus* (Fabricius) was examined in the laboratory at 30±2°C, 75-80 percent relative humidity and 11-13h photoperiod. Newly emerged nymphs were reared singly on the three prey species separately and followed through all life stages until the predator died. Developmental period of nymphs was longer on *R. Foevicollis* (100.08±9.06days) than on *Chrotogonus* sp. (85.52± 10.14days) and minimum developmental period was recorded on *S.litura* (69.36 ± 6.75days). Maximum fecundity and longevity was recorded on *S. Litura* fed category. The biochemical constituents such as carbohydrates, proteins and lipids were also higher in *S.litura* fed *R. marginatus*.**

**KEY WORDS:** Biochemical constituents, biology, prey influence, *Rhynocoris marginatus*

Development, growth and reproduction are influenced by a variety of factors and amongst them nutrition seems to be the most crucial factor. Impact of nutrition on the development of immature stages and the fecundity of the adult can be the reflection of differences in nourishment acquired during its immature stages (White, 1978). *Rhynocoris marginatus* (Fabricius) is a reduviid predator predominantly found in agro-ecosystems, scrub jungles and semi-arid zones bordering agro-ecosystems in India and feeds on a wide array of insect pests (Ambrose, 1999). Hence an attempt has been made by the authors to understand the prey preferences and prey influence on the development of the predator *R. marginatus* with three prey insect pests namely *Raphidopalpa foveicollis* Lucas, *Chrotogonus* sp. and *Spodoptera litura* (Fabricius).

## MATERIALS AND METHODS

The nymphs and adults of *R. marginatus* were collected from Sivanthipatti scrub jungle, Tirunelveli district, Tamil Nadu and reared in the laboratory (30± 2°C; 75-80% relative humidity and 11-13h photoperiod) in separate plastic containers (7x7x4cm) on the larvae of *S. litura* and adults of *R.. foveicollis* and *Chrotogonus* sp. The adults of *R. marginatus* reared from respective category were allowed to mate and the number of eggs in different clutches were recorded and they were kept separately for hatching in plastic containers with wet cotton swabs to maintain optimum humidity.

The hatched nymphs were reared up to adults on respective prey and observations on developmental period, nymphal mortality, longevity, preoviposition period and fecundity were recorded. The newly moulted adults were powdered and used for biochemical analysis. Total carbohydrates, proteins and lipids were estimated by the methods of Dubois *et al.* (1956), Lowry *et al.* (1951) and Bragdon (1951). All the variations caused by the prey in biology and biochemistry were analyzed by one-way ANOVA (SAS Institute, 1988) to determine if differences existed among treatment means. When significant differences among treatment means were found, differences between individual treatment means were tested by Tukey multiple range comparison test (Tukey, 1953). Statistical significance was determined by setting the aggregate type I error at $P<0.05$ for each set of comparisons.

## RESULTS AND DISCUSSION

The biological parameters such as incubation period, nymphal duration, nymphal mortality, adult longevity, pre-oviposition period and fecundity of *R. marginatus* on adults of *R. foveicollis* and *Chrotogonus* sp. and larvae of *S. litura* are presented in Table 1. The highest developmental period was observed in *R. foveicollis* fed *R. marginatus* (100.08±9.06days) followed by *Chrotogonus* sp. fed ones (85.52±10.14days) and minimum developmental period was recorded on *S. litura* (69.36±6.75days). The influence of prey species on developmental period was earlier reported in some coccinellids (Obrycki and Orr, 1990), anthocorids (Parajulee and Philips, 1993) and reduviids (Sahayaraj and Ambrose, 1994). Venkatesan *et al.* (1997) and George (2000) also reported that in reduviid *C. gilvus* and *S. collaris* the developmental period was shorter when it was reared on *S. litura* than other prey species.

Table 1. Biological data of *R. marginatus* when reared on three different prey species (mean ± SD)

| Parameters (days) | Prey species | | |
|---|---|---|---|
| | *R.. foveicollis* | *Chrotogonus sp.* | *S. litura* |
| Incubation period | 10.98±0.98[a] | 10.64±0.96[a] | 9.60±0.50[b] |
| Nymphal duration | | | |
| I instar | 14.50±1.16[a] | 12.81±1.13[b] | 9.83±0.98[c] |
| II instar | 13.43±1.29[a] | 12.11±1.81[a] | 8.93±0.84[b] |
| III instar | 19.95±1.14[a] | 16.43±2.48[b] | 12.15±0.94[c] |
| IV instar | 19.43±2.18[a] | 15.11±1.83[b] | 13.41±1.38[c] |
| V instar | 21.79±2.31[a] | 18.42±1.93[b] | 15.44±2.11[c] |
| Total Developmental period | 100.08±9.06[a] | 85.52±10.14[b] | 69.36±6.75[c] |
| Nymphal mortality (%) | 35 | 25 | 15 |
| Pre-oviposition period | 26.30±4.40[a] | 20.60±4.00[b] | 19.60±0.50[b] |
| Fecundity (Nos.) | 55.88±5.51[a] | 93.66±8.50[b] | 136.91±10.43[c] |
| Longevity | 86.74±10.38[a] | 98.46±12.41[b] | 138.40±15.49[c] |

Means carrying same alphabet in a row are not significantly by different Tukey test ($p < 0.05$).

Nymphal mortality was 15 percent on *S. litura*, whereas it was 25 percent on *Chrotogonus* sp. and 35 percent on *R. foveicollis*. The first two instars of *R. marginatus* had the highest mortality. The higher mortality of immatures on *R. foevicollis* might have a nutritional basis because no physical inhibition to feeding was observed.

The total lifespan of *R. marginatus* was the longest when reared on *S. litura* (138.40±15.49 days) than on *Chrotogonus* sp., (98.46 ± 12.41days) and *R. foveicollis* (86.74 ± 10.38 days). The duration of the preoviposition period was also affected by the prey. Similarly the fecundity of *R. marginatus* was also influenced by the type of prey, higher on *S. litura* (136.91±10.43) than on *Chrotogonus* sp. (93.66±8.50 days) and *R. foveicollis* (55.88 ±5.51 days). The shortest nymphal period, the highest longevity and fecundity of *R. marginatus* reared on *S. litura* might be due to the minimum stress developed during predation on lesser number of prey due to their comparatively larger size with richer body tissues (George, 2000).

The nutrient quality of prey insects has a direct influence on the biochemical components like carbohydrates, proteins and lipids of *R. marginatus* and is evident from the results obtained (Table 2). Protein, carbohydrate and lipid contents of *R. marginatus* were in greater quantity when fed on *S .litura* (273.00, 20.55, and 217.11 mg/g, respectively) than on *Chrotogonus* sp., (193.79, 17.83 and 148.18 mg/g, respectively) and *R. foveicollis* (171.07, 16.66 and 185.18 mg/g, respectively). Such a prey influenced biochemical composition of predator might be the reason for the better development of *R. marginatus* on *S. litura*. Similar observations were reported by Haque and Islam (1982) and George (2000).

Table 2. Influence of prey species on the biochemical constituents in *R. marginatus*.

| Prey species | Biochemical constituents | | |
|---|---|---|---|
| | Proteins | Carbohydrates | Lipids |
| *R. foveicollis* | 171.07±3.56[a] | 16.66±8.33[a] | 185.18±33.94[a] |
| *Chrotogonus* sp. | 193.79±7.83[b] | 17.83±1.49[a] | 148.18±18.92[b] |
| *S. litura* | 273.00±12.72[c] | 20.55±4.05[b] | 217.11±12.43[c] |

Means carrying same alphabet in a column are not significantly different by Tukey test ($p < 0.05$).

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