

## Biology and predatory potential of *Micraspis univittata* (Hope), a coccinellid predator recorded in sugarcane ecosystem

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**ABSTRACT:** In a survey for natural enemies in sugarcane fields at Harinagar, West Champaran district, Bihar, the coccinellid, *Micraspis univittata* (Hope) was recorded for the first time in sugarcane ecosystem. The biology of the coccinellid and its predatory potential were worked out at Sugarcane Breeding Institute, Coimbatore, using the sugarcane aphid, *Melanaphis sacchari* (Zehnt.) as the laboratory host. The mean duration of development of *M. univittata* was  $18.8 \pm 0.6$  days and the adult longevity was  $37.7 \pm 7.7$  days. The predatory potential of grubs was  $373 \pm 39.6$  aphids while the adults preyed on  $3659.1 \pm 865.9$  aphids. The grubs and adults also preyed upon different stages of other sugarcane pests like shoot and internode borers. But they failed to feed on nymphs of whiteflies and eggs and nymphs of pyrilla.

**KEY WORDS:** Biology, *Micraspis univittata*, predatory potential, sugarcane aphids

In India, thirty three species of coccinellids are reported to occur in the sugarcane ecosystem (Easwaramoorthy *et al.*, 1988). They are found to predate mainly on different stages of soft bodied hemipterans, coccids, eggs and young larvae of lepidopteran borers and mites (Butani, 1958; Sankaran and Mahadeva, 1974; Bindra and Brar, 1978). During a recent survey in the sugarcane fields of M/s Harinagar Sugar Mills, Harinagar, West Champaran District, Bihar, for the natural enemies of Plassey borer, *Chilo tumidicostalis* (Hampson) in September 1999, the coccinellid, *Micraspis* (= *Verania*) *univittata* (Hope) was found to occur for the first time in sugarcane ecosystem. Earlier, *Verania* sp. and *V. discolor* F. were found to feed on nymphs and puparia of whiteflies, *Aleurolobus barodensis* (Mask.) (Butani, 1958) and *V. allardi* Muls. on eggs of *Pyrilla perpusilla* (Walker) (Bindra and Brar,

1978). With a view to work out the biology and feeding potential of this coccinellid, a study was conducted at Sugarcane Breeding Institute, Coimbatore, using sugarcane aphid *Melanaphis sacchari* (Zehnt.) as host and the results are presented in this paper. In addition, the other prey range of the coccinellid in the sugarcane ecosystem was determined using sugarcane shoot and internode borers, whiteflies, mealybugs and pyrilla.

The biology of the coccinellid was studied (n=10) at  $28 \pm 4^\circ\text{C}$  and  $70 \pm 10$  per cent relative humidity. Freshly laid eggs were placed in glass vials (15cm l x 2.5cm dia) and the incubation period was recorded. After hatching, the grubs were reared individually on sugarcane aphids provided *ad libitum*. Moultings and successive developmental period of each instar of the grub

and pupal period were noted. Adult gestation period and longevity were determined. For studying the feeding potential, the newly hatched grubs (n=13) were fed with known number of aphids. Observations were made at 24h interval and the unfed aphids were removed. Fresh batch of aphids were offered to the grubs everyday until pupation and upon emergence the adults (n=10) were fed with known number of aphids everyday until death.

The eggs were barrel shaped, creamy yellow and laid on the leaf surface in clusters containing 14 - 18 eggs close to the aphid colonies. The unfertilised eggs were laid individually or sometimes in groups containing less than 10 eggs. Mean fecundity was 71.3 eggs (33 - 108 eggs) laid in 5 - 7 clusters. Egg laying period lasted for 8 - 14 days. The egg period lasted for  $2.4 \pm 0.5$  days. The grub stage had four instars and each instar lasted for  $3.9 \pm 0.3$ ,  $2.0 \pm 0.0$ ,  $2.2 \pm 0.4$  and  $4.0 \pm 0.6$  days, respectively. The mean pupal period lasted for  $4.3 \pm 0.6$  days with a pre-pupal period of about one day. The mean duration of development was  $18.8 \pm 0.6$  days. The pre-oviposition period of adult female varied from 5 - 10 days. The adults lived for a period of 19 - 48 days with a mean of  $37.7 \pm 7.7$  days (Table 1).

Table 1. Mean developmental periods of *M. univittata* on *M. sacchari*

Stage of the predator	Duration (days)
Egg	$2.4 \pm 0.5$
Grub	
a) First instar	$3.9 \pm 0.3$
b) Second instar	$2.0 \pm 0.0$
c) Third instar	$2.2 \pm 0.4$
d) Fourth instar	$4.0 \pm 0.63$
Pupa	$4.3 \pm 0.64$
Toal developmental period	$18.8 \pm 0.6$
Adult longevity	$37.7 \pm 7.7$

The number of aphids preyed by *M. univittata* grubs increased steadily with age and successive moultings except for the second instar. The average feeding potential of first, second, third and fourth instar grubs was  $53.7 \pm 7.1$ ,  $46.1 \pm 3.3$ ,  $82.2 \pm 14.3$  and  $191 \pm 34.5$  aphids, respectively. During the entire period of development a single grub preyed upon  $373 \pm 39.6$  aphids (Fig.1a).

The predatory potential of adults was observed over a period of 47 days. The mean number of aphids consumed by an adult varied from 45.0 to 139.3 aphids per day. The feeding potential was at its peak when the beetles were 21 - 41 days old. A single adult preyed on a mean of  $3659.1 \pm 865.1$  aphids (1512 - 4601) during its lifetime (Fig.1b).

The preliminary host range studies showed that the grubs and adults of *M. univittata* can feed on the eggs and young larvae of shoot borer, *Chilo infuscatellus* Snellen and internode borer, *C. sacchariphagus indicus* (Kapur). They do not feed on nymphs and adults of the leaf hopper, *Pyrilla perpusilla* (Walker) and nymphs and puparia of whiteflies, *Aleurolobus barodensis* (Mask.) and *Neomaskellia bergii* Sign.

*Micraspis* spp. are found to feed on a variety of aphids (Nasiruddin and Islam, 1979; Agarwala *et al.*, 1988; Rao *et al.*, 1997). *M. discolor* larvae were found preying on nymphs and adults of *N. lugens* in rice fields (Samal and Misra, 1985). *M. crocea* (Mulsant) is reported to feed on the eggs of *Cnaphalocrocis medinalis* (Guenee) and *Marasmia patnalis* Bradley (Bandong and Litsinger, 1986) and on the pentatomid *Scotinophara coarctata* (Fabr.) (Perez *et al.*, 1989) in rice fields in Philippines. In Malaysia, *M. discolor* is found to prey on larvae of *C. medinalis* (Mun, 1982). In groundnut, *M. vincta* is found to feed on *Spodoptera litura* (F.) (Bhanukiran *et al.*, 1998). The available literature shows that *Micraspis* spp. have their host range in Hemiptera and Lepidoptera as observed in the present study for *M. univittata*. The non-acceptance of *Pyrilla* in the present study may be due to its larger body size in relation to predator

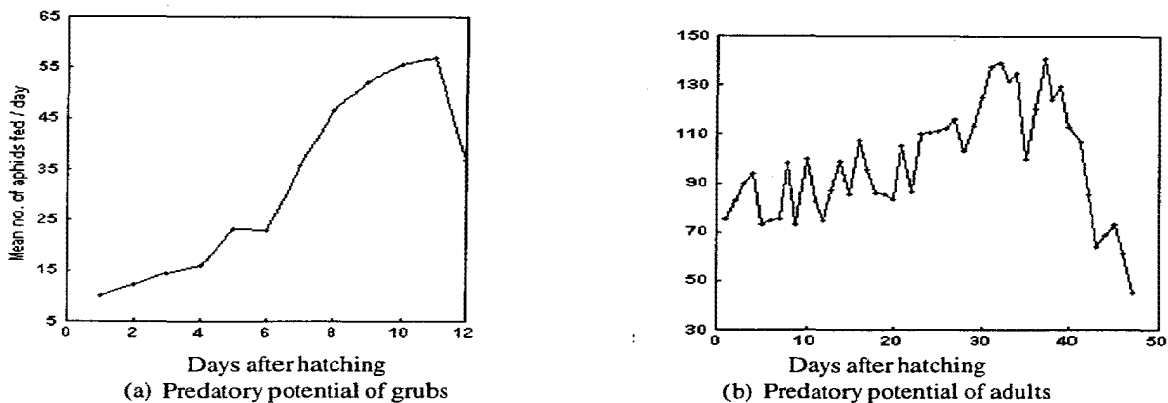


Fig.1. Feeding potential of *M. univittata* adults and grubs on *M. sacchari*

size and that of whiteflies due to its hard cuticle and waxy coating. But this is in contrast to the earlier observations made by Butani (1958) that *Verania* sp. and *V. discolor* feed on the nymphs and adults of *A. barodensis*.

During the survey at Harinagar, the adults of *M. univittata* were found to be more in number in the adjoining maize fields in flowering stage compared to sugarcane fields. *Micraspis* spp. are known to be pollen feeders. Earlier, Samal and Misra (1985) reported that the adults of *V. discolor* feed on rice pollen while the larvae feed on nymphs and adults of *N. lugens*. Shepard and Rapusas (1989) reported that *M. crocea*, a predator of *N. lugens* in Philippines, survived and developed successfully on both rice pollen and nymphs of *N. lugens* in the greenhouse. According to them, this is the reason why the coccinellid population is so abundant during rice flowering and during outbreaks of *N. lugens*.

The present study indicates the need to take up further studies on *M. univittata* to determine its role in the natural control of sugarcane pests.

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