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Biology and Predator Potential of *Serangium parcesetosum* Sci. (Coleoptera : Coccinellidae), of Sugarcane Whitefly (*Aleurolobus barodensis* Mask.)

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ABSTRACT

The biology and feeding potential of *Serangium parcesetosum* Sci., coccinellid predator of sugarcane whitefly (*Aleurolobus barodensis* Mask.) were studied in laboratory of Department of Entomology, Gujarat Agricultural University, Navsari during August to October, 1993 at room temperature (Av. 27 ± 1 and 75 ± 1% RH). The details on biology, duration, behaviour etc. are described. The average developmental period for incubation, I, II, III, IV instar larvae and adult were found to be 2.64 ± 0.49, 1.2 ± 0.41, 1.12 ± 0.33, 1.08 ± 0.28, 3.76 ± 0.66 and 29.80 ± 6.445 days, respectively. A total number of 670.96 ± 103.87 whiteflies (nymph and pupae) were consumed in its total larval period of 7.12 ± 0.73 days by the predator, whereas feeding rate of adult beetle was 98.72 ± 12.09 whiteflies per day. Larvae fed the prey by alternate sucking and regurgitation, while adult beetles completely devour the prey.

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INTRODUCTION

Recently, sugarcane whitefly, *Aleurolobus barodensis* Mask, has become a serious pest of sugarcane in South Gujarat due to several reasons. Environmental concern necessitates a need for exploring effective indigenous natural enemies and informations on several natural enemies of sugarcane whitefly have been extensively reviewed by David *et al.* (1986). Among the various natural enemies surveyed in the region, especially a coccinellid predator, *Serangium parcesetosum* Sci. has been observed to be highly specific and feeding voraciously on different stages of the pest. It was first reported in India from Gujarat as a predator of *A. barodensis* by Shah *et al.* (1986). Timofeeva and Hoang (1978); Avidzba (1983) and Natarajan (1990) have reported the incidence but no such information is available on the biology and feeding potentials of *S. parcesetosum*. With this in view, studies were undertaken on this predator to know the feasibility for management of sugarcane whitefly.

MATERIALS AND METHODS

Stock culture

Adults of *Serangium* were collected from sugarcane field of the Agriculture Research Farm, Gujarat Agricultural University, Navsari during August, 1993. These were reared in

laboratory on nymphs and pupae of sugarcane whitefly. The stock culture was maintained in iron cages (45 cm height and 30 cm diameter). For the purpose, pieces of whitefly infested sugarcane leaves (all stages preferably nymph and pupa) were kept vertically in battery jar having moist sand to avoid leaf deterioration to provide food for predator's multiplication in the cages. While changing food from the cages, leaves were observed critically once a day for the presence of predator's eggs. The leaves having predator eggs were retained as such in the cages for 5-6 days. After hatching, larvae were transferred to new fresh food with the help of fine camel hair brush. Larvae themselves also crawled to new fresh food. With this procedure, beetles were maintained/raised in laboratory.

Biology and feeding efficiency of *S. parcesetosum*

The detail biology and feeding potential of *S. parcesetosum* was studied under the laboratory conditions (27 ± 1°C av. temp. 75 ± 1% av. RH.) during September-October, 1993. The eggs of predator were taken from stock culture. To begin with, pirces of leaf were clipped alongwith predator's eggs of known age and kept on pad of wet cotton in petri dishes for hatching. After hatching, larvae were reared singly on known number of nymphal and pupal stages of sugarcane whitefly. The feeding rate was assessed by means of recounting the number of nymphs and pupae of whitefly provided and the observations were recorded daily. Thus, the feeding efficiency of 50 beetles including their behaviour etc. from first larva to the death of adult were assessed individually and the mean was worked out. Size of various stages of beetles was measured with the help of occular micrometer.

RESULTS AND DISCUSSION

The data on measurement of various stage of *S. parcesetosum,* their duration and feeding rate are given in Table 1.

Description of developmental stages

Egg : Eggs were laid singly and found mostly in the vicinity of host egges. They are oval in shape. Freshly laid eggs are translucant and creamy white in colour, later turns to transparent prior to hatching. It measurers 0.525 ± 0.028 mm in length and 0.299 ± 0.0165 mm in breadth on an average. Incubation period varied from 2 to 3 days with an average of 2.64 ± 0.49 days.

Larva : Beetles in its development passes through four distinct larvae instars of compodeiform type.

Ist instar : The newly emerged larvae are creamy white. The body gradually tappers posteriorly. The larvae possess bristles on the body. (It measures 0.886 ± 0.023 mm in length and 0.316 ± 0.0217 mm in breadth on an average). They fed the whitefly (nymph & pupa) by piercing mandibles into body of the host and by a process of alternate sucking and regurgitation. Larva consumed 73.24 ± 26.04 whitefly (nymph & pupa) within an average duration of 1.2 ± 0.41 days.

IInd instar : Body colour and feeding behaviour of the larvae remained essentially the same except for sizes. It measures on an average 1.386 ± 0.0256 mm in. length and 0.393 ± 0.0151 mm in breadth. It consumed on an average 98-84 ± 25.65 whitefly within an average duration of 1.12 ± 0.33 days.

TABLE 1

Measurements, duration and feeding potential of *Serangium parcesetosum.**

Stages particulars		Egg	Larva				Total	Pupae	Adult
			First instar	Second instar	Third instar	Fourth instar			
Length (mm)	Min.	0.486	0.857	1.343	2.286	2.857	—	2.67	2.214
	Max.	0.542	0.943	1.426	2.514	3.030	—	2.92	2.614
	Av. ±	0.525 ±	0.886 ±	1.386 ±	2.387 ±	2.936 ±	—	2.86 ±	2.573 ±
	S.D.	0.028	0.02	0.0256	0.062	0.042		0.11	0.1134
Breadth (mm)	Min.	0.286	0.286	0.371	0.571	0.857	—	2.12	1.982
	Max.	0.343	0.343	0.428	0.714	.0.971	—	2.27	2.14
	AV. ±	0.299 ±	0.316 ±	0.393 ±	0.615 ±	0.908 ±	—	2.09 ±	2.05 ±
	S.D.	0.0165	0.0217	0.0151	0.0475	0.0273	—	0.912	.0.187
Duration (in days)	Min.	2	1	1	1	3	6	3	14
	Max.	3	2	2	2	5	8	4	42
	Av. ±	2.64 ±	1.20 ±	1.22 ±	1.08 ±	3.76 ±	7.12 ±	3.44 ±	29.80 ±
	S.D.	0.49	0.41	0.33	0.28	0.66	0.73	0.51	6.45
Number of whitefly (nymph + Pupa) consumed/ day	Min.	—	51	61	76	79	—	—	90
	Max.	—	89	110	135	150	—	—	123
	Av. ±	—	63.40 ±	89.84 ±	97.96 ±	104.92 ±	—	—	98.72 ±
	S.D.	—	10.65	15.99	13.50	20.18	—	—	12.09
number of whitefly (nymph and pupa consumed/ total life	Min.	—	51	61	76	255	476	—	—
	Max.	—	164	184	210	584	879	—	—
	Av. ±	—	73.24 ±	.98.84 ±	105.72 ±	393.16 ±	670.96 ±	—	—
	S.D.	—	26.04	25.65	30.70	96.13	103.87	—	—

*Based on 50 sets observations.

IIIrd instar : The distinct greyish black blotches on dorsolateral side of the body appeared from this stage. The body measured 2.387 ± 0.062 mm in length and 0.615 ± 0.048 mm in breadth. It consumed 105.72 ± 30.70 whitefly within 1.08 ± 0.28 days.

IVth instar : The full grown larvae measures on an average 2.936 ± 0.047 mm in length and 0.908 ± 0.027 mm in breadth. They have well developed thoracic legs with claws. Abdomen is made up of nine segments. Sternum and tergum are creamy coloured but later mottle with greyish black spots that contains number of short hairs. Larvae defaecate black coloured, pelletes, cylindrical in shape by extending abdominal tip upward forming tubular structure. It consumed 393.16 ± 96.13 whitefly within an average duration of 3.76 ± 0.66 days. Thus, a total of 670.96 ± 103.87 whiteflies (nymphs and pupae) are consumed in its total larval period of 7.12 ± 0.73 days.

Quiscent behaviour

Larvae before moulting into next stage, entered quiscent stage by anchoring to leaf surface with the help of abdominal tip by secretion of sticky substances which solidify soon after coming in contact with air. Insects become sluggish, shrink in size and bend a bit.

Pupal stage

In the act of pupation, last instar quiscent larvae, start casting skins from head region and the pupa appear as bulging (boil-like). It is yellowish in colour having bristles all around with maximum towards anterior region. Later, it changes to brick red. The head region first gets tanned followed by development of reddish tinge on thoracic and abdominal region.

Adult : Freshly emerged adult brickred in colour, remains motionless for a few hours just near the casted skin. Adults were observed to feed on all stages of whitefly and completely devour the pest. Feeding rate of the beetle was 98.72 ± 12.09 whiteflies per day. It measures 2.573 ± 0.1134 mm in length and 2.05 ± 0.187 mm in breadth. Duration varied from 14 to 22 days (29.80 ± 6.445 days). The antennae were lamellate type, with six segments in male and seven segments in female.

The perusal of literature indicate that very little work is done pertaining to *S. parcesetosum,* a common predator of citrus whitefly in India (Timofeeva and Hoang, 1978). The only record about this predator is that of Timofeeva and Hoang (1978) reporting successful introduction of these beetles from Indian into USSR on the Black Sea Coast of the Caucasus for the control of citrus whitefly, *Dialeurodes citri* (Ashm.) during 1973 which destroyed about 90 per cent colonies of whitefly and Avidzba (1983) reporting reduction of *D. citri* larvae from 48 larvae/cm^2 to 10 leaves/cm^2 after introduction of these beetles in USSR. In view of high feeding potential of these beetles to sugarcane whitefly, *S. parcesetosum* could be advantageously used for management of sugarcane whitefly.

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