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BIOLOGY OF TWO COCCINELLID PREDATORS ON THREE SPECIES OF APHIDS INFESTING DIFFERENT CROPS

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ABSTRACT

Two coccinellid predators, *Menochilus sexmaculata* (Fabricius) and *Verania vincta* Gorham were reared on three species of aphids, *Aphis craccivora* Koch on cowpea and beans, *Lipaphis erysimi* (Kalt.) on mustard and cabbage and *Aphis gossypii* Glover on brinjal. Marked difference in growth and development of the predators was observed when reared on different aphids and the same aphid infesting different crops. Size and fecundity of both the predators were greater when reared on *A. craccivora* (cowpea), *M.sexmaculata* developed faster on *A.craccivora* (cowpea) while *V.vincta* on *L. erysimi* (cabbage). Irrespective of the host aphid, the females of both the predators were bigger in size and also survived longer than males. *M.sexmaculata* prefers *L.erysimi* on cabbage than on mustard. Longevity of both adult predators was increased when fed on ten per cent sucrose followed by honey solution. But they failed to lay egges when fed on artificial foods.

KEY WORDS : Coccinellids, predators, aphids, host plants, biology

Ladybird beetles occupy a unique place among the aphido phagouspredators by virtue of their wide distribution and good predating ability both in the larval and adult stages. A good number of species of this group have been very effective in bringing down the field population of aphids (Chowdhuri and Pal, 1985). *Menochilus sexmaculata* (Fab.) and *Vernia vincta* Gorham were reported to contain the aphid populations on a variety of field crops in Northern circar districts of Andhra Pradesh (Rao, 1958). Only a few workers have studied their biology. Rajamohan and Jayaraj (1974) and Saharia (1980) studied the biology of *M.sexmaculata* on different species of aphids However, the effect of host plant on the biology of predators through the host aphid was not properly understood. Hence, an attempt was made to know the biology of two cocoinellid predators, *M.sexmaculata* and *V.vincta* on *Aphis craccivora* Koch. infesting cowpea and beans, *Lipaphis erysimi*(Kalt.) on mustard and cabbage and *Aphis gossypii* Glover on brinjal, and also to know the effect of artificial foods on the biology of these predators in the Department ofd Entomology, Agricultural College. Bapatla.

MATERIALS AND METHODS

The adult predatory beetles soon after their emergence from pupae were kept in glass jars (15 x 5 cm) for mating. Immediately after pairing, they were transferred to a glass tube (7.5 x 2.5 cm) containing plant material infested with aphids. Soon after oviposition, each pair was transferred to a fresh glass tube to prevent the males from feeding on eggs. On hatching, each larva was transferred to a fresh glass tube to prevent the canniblism and provided with fresh plant material infested with aphids. The plants were changed daily to assure regular food supply to the developing predators Aphids were maintained separately on different staggered sown crops. Observations on fecundity, growth, measurements of different stages of the predators, developmental period and longevity of adults were recorded. In an attempt to increase the longevity of adult predators, different artificial foods like sucrose, honey, yeast, maize pollen, brinjal pollen at ten per cent solutions and their combinations were provided on wax strips in the form of tiny droplets and were changed at 12 h interval. Adults after 12 h of emergence were used in this experiment and observations were made at 12 h interval.

RESULTS AND DISCUSSION

Cent per cent hatching of the eggs of both predators was noticed when reared on different aphid hosts.

Egg period

The egg period of both the predators reared on different aphid hosts was almost the same. The eggs hatched within 2.0 to 2.17 days when

M.sexmaculata was reared on different aphids and 3.65 to 3.95 days for *V.vincta* (Table 1).

These results confirm the findings of Saharia (1980) who reported that the egg period of four predators reared on different aphids did not differ much.

Larval period

The two predators completed their development on all the aphid species tested (Table 1). However, larva of *M.sexmaculata* completed its development in 6.23 days when reared on *A.craccivora* (cowpea) and these results were in conformity with those of Rajamohan and Jayaraj (1974) and Saharia (1980). *V.vincta* took 13.02 days on *L.erysimi* (cabbage) to complete the larval period.

Pupal period

The pupal development of *M.sexmaculata* and *V.vincta* was 3.03 and 3.83 days respectively when reared on *A.gossypii* (brinjal) while it was longer when reared on *A. craccivora* (beans).

Developmental period

The developmental period of both the predators from egg deposition to adult emergence varied when reared on different aphid species. *M.sexmaculata* and *V.vincta* developed faster (11.84 and 20.82 days) on *A.craccivora* (cowpea) and *L.erysimi* (cabbage) respectively. Reports of Rajamohan and Jayaraj (1974) and Saharia (1980) confirm the present findings. Delayed development of 13.44 and 24.06 days respectively was observed for both the predators on *L.erysimi* (mustard).

Pre-oviposition and oviposition periods

The pre-oviposition period of *M.sexmaculata* and *V.vincta* differed slightly when fed on different host aphids (Table 1). However, the oviposition period was greatly varied and prolonged upto 64.88 and 58.80 days in case of *M.sexmaculata* and *V.vincta* respectively when reared on *A.craccivora* (cowpea), as against 24.60 and 27.25 days on *L.erysimi*(cabbage).

Fecundity

High fecundity of 281 and 115.4 eggs/female was observed by *M.sexmaculata* and *V.vincta* respectively when reared on *A. craccivora* (cowpea), whereas it was very low when fed on *L. erysimi* collected from mustard and cabbage.

Adult longevity

Significant differences in longevity between the sexes were observed. Irrespective of the host aphid, the female beetles lived significantly longer than males. It is possible because, males and females shall have different nutritional reguirements which in turn may influence the metabolic activity and consequently on the life span (Saharia, 1980). The males and females of both the predators survived longer (Table 1) when reared on *A.craccivora* (cowpea) than on *L.erysimi* (cabbage and mustard).

Growth measurements

The grubs and adults of both the predators were bigger in size (Table 2), when reared on *A.craccivora* (beans and cowpea). However, the females of both the predators were bigger in size than males irrespective of the host aphid on which

Table 1. Mean developmental periods of *M.sexmaculata* and *V.vincta* on different aphids

Stage of the predator	*A.craccivora*				L.Erysimi				*A.gossypii*	
	Cowpea		Beans		Cowpea		Cabbage		Brinjal	
	M.s	V.v	M.s	V.v	M.s	V.v	M.s	V.v	M.s	V.v
Egg period(days)	2.04	3.95	2.00	3.80	2.17	3.79	2.10	3.88	2.17	3.65
Larval period(days)	6.23	13.46	6.83	14.29	8.17	16.24	7.84	13.02	7.20	13.60
Pupal period(days)	3.57	5.30	3.68	5.33	3.10	4.03	3.17	4.92	3.03	3.83
Total development period (days)	11.84	22.71	12.53	23.42	13.44	24.06	13.11	20.82	12.40	21.08
Pre-oviposition period(days)	3.25	6.10	2.75	6.10	4.33	6.50	4.10	6.25	3.83	6.40
Oviposition period(days)	64.88	58.80	37.75	38.70	26.00	29.75	24.60	27.25	33.83	40.90
Fecundity(number)	281.00	115.40	254.25	95.20	118.33	62.25	96.40	75.00	192.67	88.40
Male longevity(days)	78.75	92.80	54.00	86.00	39.83	40.75	38.20	38.25	43.67	56.40
Female longevity(days)	82.50	96.70	56.25	91.10	43.33	45.00	42.00	42.50	47.67	59.80

M.s = *M.sexmaculata*; V.v = *V.vincta*

Table 2. Growth measurements (mm) of *M.sexmaculata* and *V.vincta* on different aphids

Stage of the Predator	*Aphis craccivora*								*L.erysimi*								*A.gossypii*			
	Cowpea				Beans				Mustard				Cabbage				Brinjal			
	M.s		V.v		M.s		V.v		M.s		V.v		M.s		V.v		M.s		V.v	
	L	B	L	B	L	B	L	B	L	B	L	B	L	B	L	B	L	B	L	B
Egg	1.13	0.47	1.06	0.49	1.13	0.47	1.07	0.48	1.12	0.46	1.08	0.48	1.12	0.47	1.05	0.49	1.13	0.47	1.11	0.49
Larva																				
I instar	1.32	0.45	1.51	0.45	1.29	0.44	1.50	0.43	1.31	0.45	1.49	0.46	1.31	0.46	1.51	0.45	1.32	0.43	1.50	0.44
II instar	2.75	0.73	2.76	0.67	2.77	0.74	2.88	0.73	2.73	0.65	2.69	0.66	2.68	0.62	2.44	0.65	2.56	0.75	2.62	0.65
III instar	4.00	1.12	4.18	1.04	4.04	1.15	4.16	1.00	3.65	0.89	3.75	0.92	3.65	0.86	3.94	1.03	3.27	0.87	3.78	0.97
IV instar	6.48	1.59	5.50	1.33	6.56	1.62	6.10	1.38	5.34	1.30	5.29	1.27	5.34	1.28	5.44	1.39	5.14	1.27	5.58	1.29
Pupa																				
Adult	4.45	3.26	3.72	2.48	4.46	3.30	4.10	2.78	3.81	2.68	3.62	2.32	3.87	2.68	3.68	2.48	3.87	2.87	3.47	2.15
Male	4.37	3.90	3.93	3.42	4.30	3.87	3.99	3.38	4.25	3.88	3.94	3.43	4.35	3.94	3.96	4.46	4.27	3.87	3.92	3.37
Female	5.37	4.26	4.58	3.80	5.35	4.24	4.61	3.98	5.32	4.21	4.16	3.91	5.43	4.26	4.59	3.80	5.36	4.22	4.61	3.99

L : Length ; B : Breadth ; M.s = *M.sexmaculata* ; V.v = *V.vincta*

Table 3. Effect of artificial foods on the adult longevity of *M. sexmaculata* and *V.vincta*

Type of food provided	Longevity(days)	
	M.sexmaculata	V.vincta
Sucrose solution (10%)	37.06	33.89
Honey solutin (10%)	16.39	27.67
Maize pollen	3.17	4.22
Brinjal pollen	3.11	4.00
Yeast	3.33	5.16
Sucrose + maize pollen	4.55	6.78
Sucrose + Brinjal pollen	4.55	13.67
Sucrose + Yeast	5.67	10.11
Honey + Maize pollen	4.50	8.70
Honey + Brinjal pollen	4.60	4.07
Honey + Yeast	5.28	3.16
Water alone	2.89	3.67
Without food	2.44	3.06
S.Ed	0.42	1.40
C.D(5%)	0.87	2.88

they fed. Rajamohan and Jayaraj (1974) reported similar findings with *M.sexmaculata*.

The fecundity, oviposition period and longevity of *M.sexmaculata* adults showed considerable variation when the host aphid, *A craccivora* was reared on two different crops *i.e.*, cowpea and beans. Similarly, the larval and developmental periods of *V.vincta* also varied when fed on *L.erysimi* infesting cabbage and mustard. This denotes that the host plants of aphid also have an effect on the biology of the predator.

Adult longevity and fecundity on artificial foods

It is evident (Table 3) that the adults of *M.sexmaculata* and *V.vincta* were able to survive for 37.06 and 33.89 days respectively when fed with ten per cent sucrose solution, while they lived only for 2.44 and 3.66 days when starved. Ten per cent honey solution also increased their longevity. However, the adults reared on these artificial foods failed to lay eggs. Hence, it is presumed that the artificial foods may serve as a source of energy for survival but may not provide the required nutrition for perpetuation of species.

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CHEMICAL CONTROL OF SUGARCANE WILT UNDER SOUTH GUJARAT CONDITIONS*

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ABSTRACT

Eleven fungicides were evaluated as a soil drench in a field trial at three locations *viz.*, Dhamdod, Butwada and Ganeshsisodra of Valsad district on highly susceptible variety CoC-671 in wilt-sick plot by drenching the fungicides first at planting and second 90 days after planting. Among the fungicides M.E.M.C. (Emisan-6 @ 0.2 %), carbendazim (Bavistin @ 0.1 %), micronised sulphate (Micron-S-3 @ 0.3 %) and Amurt-G (@ 62.5 kg/ha) proved quite effective upto 120 days of planting but at harvest, chlorothalanil 75 % (Kavach @ 0.15 %), Amrut-G (62.5 kg/ha) carbendazim (0.1 %), Ovis-G (Ovis-G 20 % w/w @ 25 kg/ha), M.E.M.C. (Bagalal-6 @ 0.2) and M.E.M.C. (Emisan-6 @ 0.2 %) gave higher yield over control. Thus, two drenching of either of carbendazim, M.E.M.C. (Emisan-6 @ 0.2 %), micronised sulphate, Amrut-G or Ovis-G seem to be quite effective in checking the wilt infection under field conditions.

KEY WORDS : Chemical control, sugarcane wilt

Sugarcane wilt (*Fusarium moniliforme* Sheld.) has been gaining prominence in Gujarat for the last few years. The symptoms are observed 60-70 days after planting. It becomes more severe with the onset of monsoon. The infected canes remained stunted and at this stage, splitted canes showed white pith formation from the base upward and causing considerable loss in affected crop. Parthasarthy (1972) recorded 2 to 10 t/ha of dried and dead canes in wilt infected fields at harvest in South India. According to Sarma (1976), the yield reduction may go as high as 60 per cent. The control of sugarcane wilt has been attempted by several workers (Ganguly, 1964; Singh *et al.*, 1971; Singh *et al.*, 1985; Deshmukh and Patel, 1992). Looking into the seriousness of the disease in South Gujarat area, present investigation was carried out employing fungicides to control wilt disease.

MATERIALS AND METHODS

Field experiment was conducted during 1990 in naturally wilt-sick fields of farmers at three locations *viz.*, Dhamdod, Butwada and Ganesh-Sisodra village on the highly susceptible variety CoC- 671 with 12 treatments (including check) by giving two drenching. Each one was replicated thrice. The first application of fungicides was made just before planting and second 90 days after planting. The first half application of fungicides was made by opening furrow and second half beside the planting and covering the furrow with soil after application. The plot size was 6 x 6 m consisting of six rows keeping 21 sets/row. A total of 126 single eye budded setts/plot was maintained. The fungicides were tested (Amrut-G, Ovis-G, Phytoalexin-15 G, Micron-S-20, Amrut guard, Bagalol-6, Venus, Bavistin, Emisan, Antiwilt and Kavach) as per dosase (Table 1). The natural disease incidence after 120 days of planting and at harvest and cane yield were recorded.

RESULTS AND DISCUSSION

The results of pooled analysis of the data for three locations conducted in wilt-sick field in regard to germination, wilt incidence and yield presented (Table 1) reveal that differences in

* Mention of proprietory names in the article is not an endorsement by the MASU