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Growth and Development of the Coccinellid *Menochilus sexmaculatus* Fabricius. on four species of aphids.

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ABSTRACT

The Coccinellid predator *Menochilus sexmaculatus* was reared on four species of aphids, and there was a marked influence of host on the growth and development of the predator. The beetles developped faster and were heavier and larger and lived longer, when fed on *A. craccivora* while they were smaller and lighter with shorter life span on *A. malvae*. The other aphid species, viz. *A. gossypii* G. and *Rhopalosiphum maidis* Fitch. had medium effect on the predator.

INTRODUCTION

Hodek (1962) postulated that even though coccinellids accept all species of aphids in field conditions, suitability of the host for the predator is different from acceptability. *Menochilus sexmaculatus* Fabricius is the common coccinellid widely distributed in India. It feeds on a large number of species of aphids on a variety of plants. But the food preference of this predator has not been clearly understood so far. So, the present studies were undertaken to observe the influence of four host aphids on the growth and development of the beetle.

MATERIALS AND METHODS

The host aphids, *A. malvae* on pumpkin (*Cucurbita moschata*), *A. gossypii* on *bhendi* (*Abelmoscus esculentus*), *A. craccivora* on cow pea (*Vigna sinensis*) and *Rhopalosiphum maidis* on sorghum (*Sorghum vulgare*) were collected from field and cultures were maintained in the laboratory. The predator *M. sexmaculatus* was also collected from field and reared on these four host aphids separately in cylindrical jars. Leaves infested with different aphid species were confined separately in glass tubes and kept turgid by means of water-soaked cotton plugs fitted at the cut ends of stems. Rearing of the predator was done from the eggs laid by them in the laboratory. Every day morning and evening, the plant parts with aphids were changed to assure a fresh supply of sufficient quantity of aphids to the predator. Observations on the developmental period, size and weight of the grubs, pupae and adults were recorded.

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RESULTS AND DISCUSSION

There was no marked difference in the incubation period. The duration was more or less 1.75 days in all host insects.

The predator completed development on all the four species of aphids tested. It did so more rapidly on *A. craccivora* and *A. gossypii* (Table 1). The other two species, *R. maidis* and *A. malvae* were less suitable resulting in delayed larval development. The duration of larval instar was much shortened on *A. craccivora* with 35.9 per cent decrease from that on *A. malvae*. The corresponding decrease in duration was 20.0 and 7.7 per cent respectively on *A. gossypii* and *R. maidis*. Uniformly four distinct instars were observed. The shortest larval duration noted was 5.55 days on *A. craccivora* while the longest being 13.75 days on *A. malvae*. The grub pupated in 7.08 days when fed on *A. gossypii*. Likewise the pupal period was much shorter on favourable prey like *A. craccivora* and prolonged on unsuitable prey like *A. malvae*. The

TABLE 1. Effect of host aphids on the larval duration size and weight of *Menochilus sexmaculatus* F.

	I instar	II instar	III instar	IV instar
A.* Larval duration (days)[a]				
Aphis craccivora	1.60	1.20	1.00	1.85
Aphis gossypii	1.55	1.85	1.80	1.85
Rhopalosiphum maidis	2.10	1.85	1.95	2.25
Aphis malvae	2.10	2.20	2 15	2.35
Mean	1.83	1.77	1.72	2.06
B.* Size of the larvae (Length × breadth in sq. mm)[b]				
Aphis craccivora	2.06	6.01	11.13	21.17
Aphis gossypii	1.45	4.84	8.62	12.63
Rhopalosiphum maidis	2.00	4.83	7.44	10.78
Aphis malvae	0.98	3.86	5.20	8.67
Mean	1.67	4.88	8.10	13.31
C.* Weight of the larvae (mg)[b]				
Aphis craccivora	1.90	3.70	7.60	14.50
Aphis gossypii	1.63	2.75	5.45	9.85
Rhopalosiphum maidis	1.56	2.61	5.09	8.87
Aphis malvae	1.44	2.49	4.86	9.47
Mean	1.63	2.88	5.75	10.19

All highly significant at 1% probability level.

CD (P=0.05)

	Host	Instars	Interaction
*A	0.494	0.494	0.192
B	1.393	1.246	0.248
C	1.315	1.315	0.262

a – Mean of 10 replications

b – Mean of 30 replications

post-embryonic development of the predator was significantly rapid (8.60 days) in beetles reared on *A. craccivora* A prolonged life-cycle of 13.75 days was observed on *A. malvae* (Table 2)

TABLE 2. Influence of host aphid on the post embroyonic development period o *M. sexmaculatus* F. (in days) (Mean of 10 replications)

	Larval period	Pupal period	Post-embroyonic development period
Aphis craccivora	5.55	3.05	8.60
Aphis gossypii	7.05	3.60	10.65
Rhopalosiphum maidis	8.15	4.10	12.25
Aphis malvae	8.89	4.90	13.75
Mean	7.38	3.83	11.31

Difference between hosts is significant at 1% probability level C. D. (P=0,05) = 0.170

Interaction between hosts and period is significant at 1% probability level C. D. (P = 005) = 0.164

The size and weight of the different instars of the predator fed on four species of aphids are presented in Table 1 The grubs grew rapidly on *A. craccivora*,, attained bigger size and reached the pupal stage much earlier. On the other hand, the larvae fed on *A. malvae* showed retarded growth and pupated much later. In the same manner, the predatory grubs reared on *A. craccivora* attained maximum weight in all instars, the increase being more pronounced during third and fourth instars. Those fed on *A. malvae* recorded the lowest weight in all instars. Correspondingly, the maximum pupal weight (15.77 mg) and bigger size of pupa (14.90 sq. mm) was noted when the grubs were fed on *A. craccivora* compared to other aphid species (Table 3). Similarly striking difference was observed in the weight and size of the adult beetles when reared on different prey. The adult beetles reared on *A. craccivora* weighed significantly more than on other aphids, and size also was greater. But those on *A. malvae* recorded the lowest weight and size. The female beetles lived significantly longer than male on all aphid species. The females and males on *A. craccivora* lived up to 24.4 and 18.0 days respectively and showed greater life span than on other aphid species. The longevity of both sexes was very short on *A. malvae*. Irrespective of host insects on which they were fed, the predatory grubs normally pupated without any mortality and the imagines emerged normally.

Consistent data have been gathered and presented that certain aphid species can influence the growth and development of the coccinellid predator, *M. sexmaculatus*. The incubation period of the predator on all the host insects was more or less the same and it is in accordance with the findings of Blackman (1966) who has reported

TABLE 3. Influence of host aphids on the size and weight of pupae and adults and longevity of *M. sexmaculatus* F. [Mean of 30 observations]

	Pupae		Adult				Longevity (days)	
			Female		Male			
	Size	Weight	Size	Weight	Size	Weight	Female	Male
A. craccivora	14.90	15.77	20.57	16.97	16.95	8.69	24.4	18.0
A. gossypii	11.87	13.28	18.18	15.99	16.06	7.59	19.3	16.0
R. maidis	10.92	12.89	16.79	13.53	14.64	6.79	17.0	12.8
A. malvae	8.54	10.75	15.59	8.48	13.23	5.76	13.7	10.0
Mean	11.56	13.17	17.78	83.24	15.22	7.20	18.5	14.2
C. D. (P=0.05)	0.97	2.42	0.89	0.33	0.89	0.33	0.46	

Size is expressed as length x breadth in sq. mm. Significant at 1% level of probability

that the egg period of *Adalia bipunctata* fed on different aphids did not differ.

The four species of aphids tested enabled the predator to complete its larval growth successfully. Among the four hosts, the duration was shorter on *A. craccivora* while it was prolonged on *A. malvae*. The larval development was hastened when fed on *A. gossypii* and *R maidis* but not to the extent on *A. craccivora*. Diadechko (1954) noted different rates of development of several coccinellids on some aphids. The develpment of *Coccinella 7-punctata* was retarded when fed on *Aphis sambuci* (Hodek, 1957). Reduced rate of growth of *Coccinella 7-punctata* on *Megovea viciae* was reported by Blackman (1965) but the development was normal on *Acyrthosiphon pisum*. He also reported (Blackman 1966) that the rate of development of *Adalia bipunctata* was very slow when it was fed on *Aphi fabae* and *A. sambuci* but rapid when fed on *Myzus persicae*, *Aulacorthum circumflexum*, *Acyrthosiphon pisum* and *Microlophium evansi*. All the ten species of coccinellids studied by Smith (1965) completed development more rapidly on *Acyrthosipon pisum* than on *Rhapalosiphum maidis* and *Aphis fabae*. In general, in the present studies, the predator larva on *A. craccivora* completed development in a short time while the unsuitable prey like *A. malvae* prolonged the larval development.

The size of successive instars of the larvae of the predator was larger when fed on *A. craccivora* than on *A. gossypii*, *R. maidis* and *A. malvae*. Corresponding to the size, the weight of the grubs was also high on *A.*

craccivora while it was very low on *A. malvae*. The other two host aphids viz., *A. gossypii* and *R. maidis* showed an increase in size and weight of the predatory larvae over *A. malvae* but decrease when compared to *A. craccivora* proving that they were better food than *A. malvae* but less suitable when compared to *A. craccivora*. Similarly increase in size and weight of the larvae of *Adalia bipunctata* was noted when fed on *Myzus persicae* rather than on *Aphis fabae* (Blackmen 1966). Smith (1965) noticed difference in size and weight of the grubs of *Coccinella maculata* and reported the findings that the index of relative growth was higher when reared on *Acyrthosiphon pisum* than on *Rhopalosiphum maidis*.

The post-embryonic development of the predator was very rapid in beetles reared on *A. craccivora* but a prolonged life cycle was observed on *A. malvae*. Similarly lon er life-cycle period of *Adalia bipunctata* on *Aphis fabae* and *A. sambuci* was observed than on *Myzus persicae* and *Acyrthosiphon pisum* (Blackman, 1965).

The weight and size of both the sexes were more on *A. craccivora* and less on *A. malvae* and both had prolonged adult life span on the former aphid. Similar results were reported by Smith (1965) that the live weight of adults of *Coleomegilla maculata* was more on *Acyrthosiphon pisum* and adults of *Hippodamia tredecimpunctata* were smaller when fed on the unfavourable aphid *Aphis fabae*. Another species, *Hippodamia convergens* lived longer when fed on *Acyrthosiphon pisum* than on *Therioaphis trifolii* (Hagen and Sluss, 1966).

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