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AN ACCOUNT OF SYRPHID (DIPTERA : SYRPHIDÆ) PREDATORS OF APHIDS AVAILABLE IN DARJEELING DISTRICT OF WEST BENGAL AND SIKKIM

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INTRODUCTION

Syrphids form an important component of predatory complex of aphids. It is rare to find an aphid colony on a plant without a syrphid larva. Knowledge about the syrphid predators of aphids in India has accumulated chiefly through the works of Bhatia and Shaffi (1932), Cherian (1934), Rahman (1940) and Rao (1969). Among these workers it was Rao (1969) who for the first time reported 8 syrphid species predaceous on aphids in Kalimpong of Darjeeling district, West Bengal.

The present work reports our investigations on the syrphid predators of Kalimpong and Sikkim.

MATERIALS AND METHODS

1. Syrphid flies were obtained by rearing eggs and/or maggots available on aphids during different periods of a year.
2. Adult syrphid flies were kept in dry condition and identified through the courtesy of Zoological Survey of India, Calcutta.
3. Aphid hosts were collected in 70% alcohol in the field and subjected to usual processing and mounting procedure for microscpical study.
4. Host range and seasonal occurrence of the syrphid predators were determined from the collection data of the aphid with which eggs and/or maggots of the flies were found.

5. Studies on life-history and voracity of *Sphaerophoria scripta* were conducted under room conditions at Kalimpong (*c* 1280 m). For this purpose newly laid eggs were collected from the field along with aphid infested plant parts and kept in a pair of petri dishes. Observations in respect of developmental period and voracity were made at an interval of every 24 hours.

6. Syrphid larvae were provided with fresh aphids every 24 hours till pupation.

OBSERVATIONS

1. *Allograpta javana* (Wiedmann)

Hosts: *Macrosiphum rosae* (L.) and *M. rosaeiformis* Das ex. *Rosa* sp.
Locality: Kalimpong.
Collection period: April—May.

2. *Betasyrphus serarius* (Wiedmann)

Hosts: *Macrosiphum rosae* (L.) ex. *Rosa* sp.; *Aphis spiraecola* Patch ex. *Bidens pilosa* and *Lipaphis erysimi* (Kaltenbach) ex. *Brassica oleracea* var. *capitata.*
Locality: Kalimpong.
Collection period: March—April.

3. *Dideopsis aegrota* (Fabricius)

Hosts: *Aphis spiraecola* Patch ex. *Artemisia vulgaris* and *Bidens pilosa.*
Locality: Kalimpong.
Collection period: July—October.

4. *Epistrophe griseocincta* (Brunetti)

Hosts: *Rhopalosiphum maidis* (Fitch) ex. *Hordeum vulgare.*
Localily: Sikkim.
Collection period: November.

5. *Episyrphus balteatus* (De Geer)

Hosts: *Aphis gossypii* Glover and *Myzus persicae* (Sulzer) ex. *Cyphomendra betaceae* and *Cucumis sativus; Melanaphis sacchari* (Zehntner) ex. *Zea mays; Myzus persicae* (Sulzer)* ex. *Solanum tuberosum.*
Localities: Kalimpong, Sikkim*.
Collection period: Throughout the year.

6. *Ischiodon scutellaris* (Fabricius)
Hosts : *Acyrthosiphon pisum* (Harris) ex. *Pisum sativum.*
Locality : Kalimpong.
Collection period : March—May and November—December.

7. *Melanostoma orientale* (Wiedmann)
Hosts: *Melanaphis sacchari* (Zehntner) ex. *Saccharum officinarum* and *Rhopalosiphum maidis* (Fitch) ex. *Hordeum vulgare.*
Locality : Sikkim.
Collection period—December.

8. *Paragus tibialis* (Fallen)
Hosts: *Aphis spiraecola* Patch ex. *Bidens pilosa.*
Locality : Kalimpong.
Collection period : August—October.

9. *Paragus yerburiensis* Stuckenberg.
Hosts : *Aphis spiraecola* Patch ex. *Bidens pilosa.*
Locality : Kalimpong.
Collection period : January—March and August—December.

10. *Metasyrphus confrater* (Wiedmann)
Hosts : *Aphis gossypii* Glover and *A. spiraecola* Patch ex. *Bidens pilosa.*
Locality : Kalimpong.
Collection period : Janaury—June and October—December.

11. *Sphaerophoria scripta* (Linnaeus)
Hosts : *Aphis craccivora* Koch ex. *Dolichos lablab; A. gossypii* Glover ex. *Capsicum annum; Brachycaudus helichrysi* (Kaltenbach) ex. *Ageratum conyzoides; Macrosiphum rosae* (L.) and *M. rosaeiformis* Das ex. *Rosa* sp.; *Mollitrichosiphum* (*Metatrichosiphum*) *nandii* Basu ex. *Alnus nepalensis.*
Locality : Kalimpong.
Collection period : April—May.

12. *Xanthogramma scutellare*
Hosts : *Aphis craccivora* Koch ex. not known; *A. gossypii* Glover ex. *Solanum melongena; A. spiraecola* Patch ex. not known; *Brevicoryne brassicae* (L.) ex. *Brassica caulotrapa; Lipaphis erysimi* (Kalt.) ex. *B. caulotrapa; Myzus persicae* (Sulzer) ex. *Solanum melongena.*

Locality : Kalimpong.
Collection period : Throughout the year.

Voracity and developmental period of *Sphaerophoria scripta* (L.).

At Kalimpong eggs of this fly were collected from the colonies of *Macrosiphum rosae* and *M. rosaeiformis* infesting apical shoots of rose plants. The larval period of the syrphid species lasted 13-15 days. A first day larva consumed 3-6 aphids in 24 hours. The rate of consumption increased till seventh day when a larva could devour 54-56 aphids per day. Thereafter the rate declined during the rest of the larval period. During the entire larval period a larva consumed about 321-419 aphids. Total developmental period of the syrphid has been found to vary between 32 and 36 days comprising incubation period : 5-6 days, larval period : 13-15 days and pupal period : 14-15 days when the mean temperature was between 14°C and 17°C and mean relative humidity varied between 84.5 and 87% (Fig. 2).

DISCUSSION

In nature the aphids are mostly known to be predated upon by syrphids. In India about 32 syrphid species have been reported to predate upon a number of aphid species (Bhatia and Shaffi 1932, Cherian 1934, Rahman 1940, Rattanlal and Haque 1955, Anand *et al.* 1967, Rao 1969, Saxena *et al.* 1970, Zaka ur—Rab 1972, Vadivelu *et al.* 1975, Raychaudhuri *et al.* 1978). Among these syrphid species 8 were so far known from the Darjeeling district of West Bengal (Rao, 1969) and none from Sikkim as predator of aphids. Through the present work 4 more species of syrphid predators are reported. *Betasyrphus serarius, Episyrphus balteatus, Melanostoma orientale* and *Xanthogramma scutellare* appear to be polyphagous in the area of the present study (Fig. 1). Their polyphagous nature is also known from other parts of the country (Rao 1969, Rahman 1940, Bhatia and Shaffi 1932). Notwithstanding above, *Melanaphis sacchari* and *Rhopalosiphum maidis* are reported as new hosts for *Melanostoma orientale* at least under Indian conditions. Some of the predatory syrphids e. g., *Allograpta javana, Ischiodon scutellaris, Paragus yerburiensis* and *Metasyrphus confrater* apparently appear to be monophagous in the area of investigation (Fig. 1) but Rao (1969), Rahman (1940), Anand *et al.* (1967) and Zaka ur-Rab (1972) reported some other aphid species as the host of these predators from other parts of India.

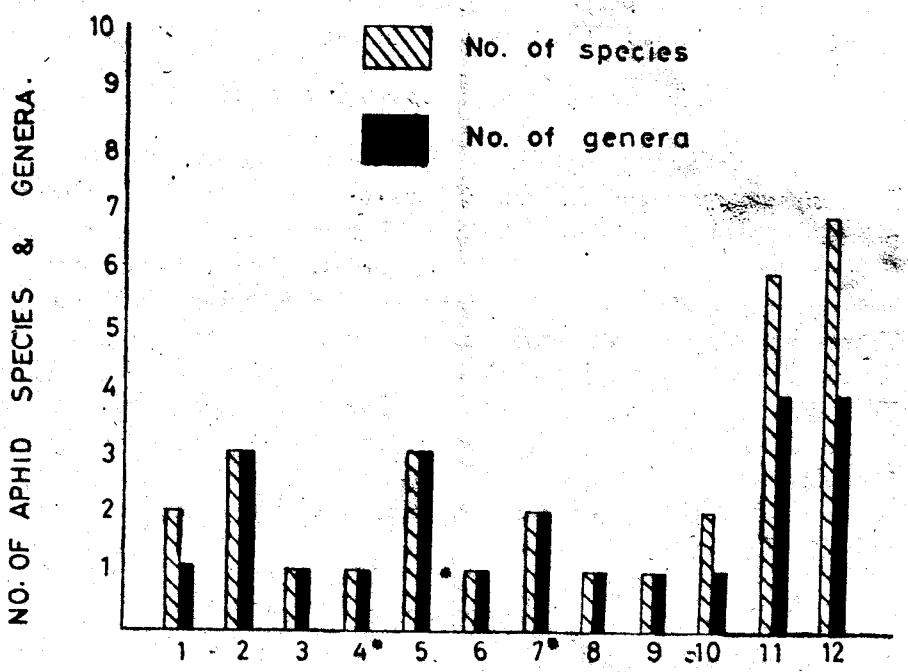

FIG 1

HOST RANGE OF SYRPHID PREDATORS FOUND IN KALIMPONG, DARJEELING DISTRICT OF WEST BENGAL AND SIKKIM.*

From the collection data it is observed that the subfamily Aphidinae is most exposed to predation by syrphids. This is because of the abundance of the members of this aphid subfamily in nature. Genus-wise break-up of the subfamily reveals that *Aphis* and *Macrosiphum* are mostly predated upon by these syrphids. The reason attributed to the phenomenon of predation on the subfamily Aphidinae holds good for the genera *Aphis* and *Macrosiphum*.

The collection data also bring out the fact that predation by syrphids is more pronounced during the period November to February. This period also coincides with the period of abundance of aphid species in nature. This may be looked upon as a case of natural check of the aphid population. Thus it appears that there exists a close relationship between the abundance of aphids and the number of syrphid larvae and thereby species. This finding also corroborates with the views of Bhatia and Shaffi (1932).

From tha observations on the developmental period of *Sphaerophoria scripta* it was found that the insect completes its life history in about 32-36 days, the incubation period being 5-6 days, the larval period 13-15 days and the pupal period 14-15 days in temperature varying between 14°C and 17°C and relative humidity 84.5 — 87% at Kalimpong. No

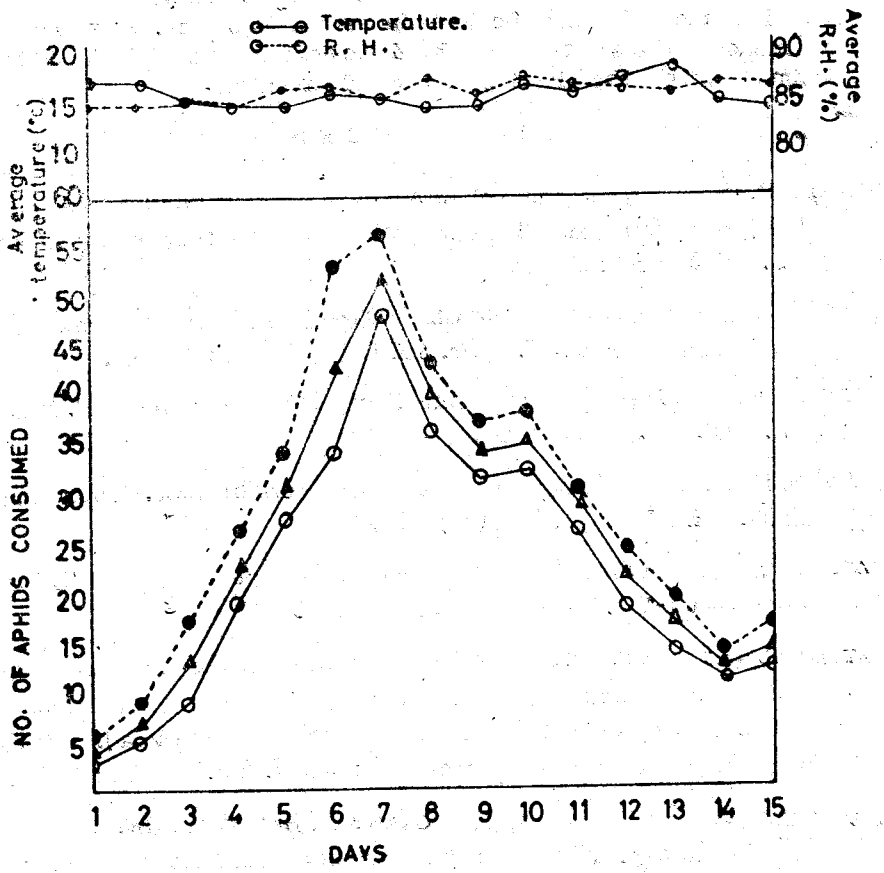

Fig.2 VORACITY OF LARVAE OF SPHAEROPHORIA SCRIPTA L. ON MACROSIPHUM ROSAE (L.) AND M. ROSAEIFORMIS DAS IN KALIMPONG, DARJEELING DISTRICT OF WEST BENGAL.

o Minimum, Δ Mean, ● Maximum.

published record is available on the life history of this particular predator. Through personal communication from another colleague of this laboratory it appears that in the neighbourhood of Calcutta the insect completes its life-history in about 14-17 days when temperature varied between 28.3°C and 34°C and relative humidity ranged between 60% and 73%.

As to the voracity of this syrphid, the first day larva consumed 3—6 aphids while a seventh day larva consumed 54—56 aphids (Fig. 2).

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