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Development and predatory potential of the green lacewing, *Mallada astur* (Banks) (Neuroptera: Chrysopidae) on the spiralling whitefly, *Aleurodicus dispersus* Russell (Homoptera: Aleyrodidae)

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ABSTRACT: A study on the development and predatory potential of *Mallada astur* (Banks) indicated that developmental time of *M. astur* larvae was longer when the nymphs of spiralling whitefly, *Aleurodicus dispersus* Russell were provided as compared to developmental period when provided with eggs of rice moth, *Corcyra cephalonica* (Stainton). The predatory larvae took a mean of 15.6 days on the whitefly nymphs but only 13.19 days on rice moth eggs. The number of whitefly nymphs preyed during first, second and third instar larvae was 60.2 ± 3.21, 36.4 ± 3.26 and 138.4 ± 6.55 nymphs, respectively. The chrysopid larva consumed a total of 234.9 nymphs of *A. dispersus* during its larval development.

KEY WORDS: *Aleurodicus dispersus,* chrysopid, development, *Mallada astur,* predatory potential, spiralling whitefly

The green lacewings have been reported as predators of whiteflies (Greathead and Bennet, 1981; Legaspi *et al.*, 1994; Mani and Krishnamoorthy, 1995; Senior and McEwen, 1998). The spiralling whitefly, *Aleurodicus dispersus* Russell was also found to be predated by several species of *Chrysopa* in Indonesia (Kajita *et al.*, 1991), Guam (Nechols, 1982), Phonpei (Esguerra, 1987), Fiji (Waterhouse and Norris, 1989), Sri Lanka (Chandrasekara, 1990) and Hawaii (Paulson and Kumashiro, 1985). In India, five species *viz.*, *Apertochrysa* sp., *Chrysoperla carnea* (Stephens), *Mallada boninensis* (Okamoto), *Mallada astur* (Banks) and *Nobilinus* sp. were known to feed on the spiralling whitefly (Mani and Krishnamoorthy, 1999b). Among them, *M. astur* was more frequently encountered on *A. dispersus* in South India (Mani and Krishnamoorthy, 1999a). Though *M. astur*

was also reported to feed on *Aphis gossypii* Glover (Jalali and Singh, 1994), *Helicoverpa armigera* (Hubn.) (Bakthavatsalam *et al.*, 1996) and *Chloropulvinaria polygonata* (Ckll.) (Mani and Krishnamoorthy, 1998), no detailed studies were made on *M. astur* with whiteflies as prey. The spiralling whitefly which is spreading at an alarming rate has become a major pest of several horticultural crops in peninsular India. Efforts to control the spiralling whitefly by biological control method was identified as a high priority (Ranjith *et al.*, 1996). With a hope to utilise *M. astur* in the suppression of spiralling whitefly, a study was undertaken to determine its predatory potential and development on *A. dispersus*.

MATERIALS AND METHODS

The culture of *M. astur* was obtained from guava plants infested with the spiralling whitefly and maintained on the eggs of rice moth, *Corcyra cephalonica* (Stainton) by the method developed by Krishnamoorthy and Nagarkatti (1981). Freshly laid eggs of *M. astur* were held individually in glass vials (7.5 x 2.5 cm) and closed with cloth walled cotton plugs. Newly hatched larvae were provided with eggs of *C. cephalonica* until pupation. A total of 20 such predatory larvae were maintained on rice moth considering a single larva as one replicate. Development time of each instar of the predatory larvae and also the pupal period were recorded.

The culture of the spiralling whitefly was maintained on potted guava plants. Newly hatched larvae of *M. astur* were provided with a bouquet containing known number of nymphs of *A. dispersus* in a round bottom plastic jar (12 x 10cm). The jars were closed with aerated lids. Twenty such larvae of *M. astur* were fed with the whitefly nymphs until pupation and each larva was considered as one replicate. At 24h interval, the number of nymphs preyed and the larval development of *M. astur* were recorded. The bouquet was replaced daily with fresh leaves containing known number of whitefly nymphs. The larval developmental time and the prey consumption were calculated for each instar of *M. astur*. The pupal period was also recorded individually. All the studies were conducted at 26 ± 2°C and 60-75 per cent relative humidity in the laboratory.

The data on the number of whitefly nymphs consumed by different larval instars of *M. astur* were converted into log values and then analysed using 'F' test. An independent 't' test was employed to compare the developmental time of *M. astur* on *C. cephalonica* with those reared on *A. dispersus*.

RESULTS AND DISCUSSION

Mallada astur completed its development on the nymphs of the spiralling whitefly. Incubation period ranged from 4 to 5 days. Data on the developmental time of *M. astur* fed with the spiralling whitefly and rice moth eggs are presented in Table 1. The duration of first, second and third instar larvae of *M. astur* was 5.40, 2.80 and 5.30 days, respectively, when they were fed with the whitefly nymphs.

Table 1. Development of *M. astur* on *C. cephalonica* and *A. dispersus*

Larval instar of *M. astur*	*Developmental time (days) on	
	A. dispersus	*C. cephalonica*
I	5.40 ± 9.42	5.09 ± 0.39
II	3.40 ± 0.26	2.80 ± 0.24
III	6.80 ± 0.72	5.30 ± 0.62
Total	15.60	13.19

	Calculated 't'	Table 't' P = 0.05	Table 't' P = 0.01
Developmental time	= 9.434	2.083	2.861

Developmental time of all the larval instars of *M. astur* larvae was longer when given the whitefly nymphs compared to *M. astur* larvae provided with rice moth eggs. The predatory larva took a mean of 15.6 days to complete its larva development on *A. dispersus* whereas only 13.19 days were required on rice moth. Bakthavatsalam *et al.* (1994) recorded the larval developmental time of 14.3 days for *M. astur* on *C. cephalonica*. The difference in the total larval developmental time between the predatory larvae reared on rice moth and the spiralling whitefly was highly significant (t = 9.434).

Similar difference in the length of developmental time among the larvae of *Chrysoperla rufilabris* (Burmeister) reared on the whitefly, *Bemisia tabaci* (Gennadius) and the traditional laboratory host *Sitotroga cerealella* (Olivier) has been reported by Legaspi *et al.* (1994). Perusal of literature revealed that there was a significant variation in the developmental time of chrysopid larvae fed on different larval diets. The larval developmental time of 15.60 days of *M. astur* on *A. dispersus* in the present study was found to be more compared to 11.6 days on *Aphis gossypii* Glover (Jalali and Singh, 1994). In all, the total life cycle of *M. astur*, including the same incubation period of 4.5 days and the same pupal period of 10.7 days, took 28.39 days on *C. cephalonica* and 30.8 days on the spiralling whitefly.

The data on the consumption of spiralling whitefly nymphs by the larvae of *M. astur* are given in Table 2. The mean number of whitefly nymphs preyed by first, second and third instar larvae of *M. astur* was 60.2, 36.4 and 138.3, respectively. Among the larval instars, third instar larvae consumed maximum number of whitefly nymphs. Significant differences were found in the number of whitefly nymphs preyed by different larval instars. In the present study, a total of 234.9 nymphs of *A. dispersus* were eaten by *M. astur* during its larval development. Legaspi *et al.* (1994) had reported that the larvae of *C. rufilabris* attacked an average of 532 *B. tabaci* per day when the prey was mainly egg.

Table 2. Predation of spiralling whitefly by *M. astur*

Larval instar of *M. astur*	No. of whitefly nymphs consumed (Mean ± SD)
I	60.20 ± 3.21 (4.11)
II	36.40 ± 3.26 (3.61)
III	138.30 ± 6.55 (4.94)
Total	234.90 ± 7.21

Figures in parentheses are log- transformed values.

	SEM±	C D (P = 0.05)
Prey consumption of different larval instars	0.40	1.17

REFERENCES

Bakthavatsalam, N., Singh, S. P., Pushpalatha, N. A. and Bhumannavar, B. S. 1994. Life tables of four species of chrysopids (Neuroptera: Chrysopidae). *Journal of Entomological Research,* **18**: 357-360.

Bakthavatsalam, N., Singh, S. P., Pushpalatha, N. A. and Bhumannavar, B. S. 1996. Comparative biology and feeding potential of four species of chrysopids (Neuroptera: Chrysopidae). *Hexapoda,* **8**: 45-53.

Chandrasekara, D. K. 1990. Effect of weather and natural enemies on population variation of the spiralling whitefly (SWF), *Aleurodicus dispersus* Russell (Homoptera: Aleurodidae) Resesrch Report submitted for the degree of B.Sc., University of Peradeniya, 26 pp.

Esguerra, N. M. 1987. The spiralling whitefly, *Aleurodicus dispersus* Russell. *Entomology Bulletin* No.1, 1 p.

Greathead, D. J. and Bennet, F. D. 1981. Possibilities for the use of biotic agents in the control of the whitefly *Bemisia tabaci. Biocontrol News and Information.* **2**: 7-13.

Kajita, H., Samudra, M. and Natto, A. 1991. Discovery of the spiralling whitefly *Aleurodicus dispersus* Russell (Homoptera: Aleurodidae) from Indonesia with notes on its host plants and natural enemies. *Applied Entomology and Zoology,* **26**: 397-400.

Jalali, S. K. and Singh, S. P. 1994. Effect of *Aphis gossypii* Glover number on *Mallada astur* (Banks) and *Cheilomenes sexmaculata* (Fabricius). *Biological Control,* **4**: 45-47.

Krishnamoorthy, A. and Nagarkatti, S. 1981. A mass rearing technique for *Chrysopa scelestes* Banks (Neuroptera: Chrysopidae). *Journal of Entomological Research,* **5**: 93-97.

Legaspi, J. C., Carruthers, R. I. and Nordlund, D. A. 1994. Life history of *Chrysoperla rufilabris* (Neuroptera: Chrysopidae) provided sweet potato whitefly, *Bemisia tabaci* (Homoptera:

Aleyrodidae) and other food. *Biological Control*, **4**: 178-184.

Mani, M. and Krishnamoorthy, A. 1995. Natural enemies of the whitefly, *Lipaleyrodes euphorbiae* David and Subramanian (Homoptera: Aleyrodidae). *Journal of Biological Control*, **9**: 102-104.

Mani, M. and Krishnamoorthy, A. 1998. Biological control studies on the mango green shield scale, *Chloropulvinaria polygonata* (Ckll.) (Homoptera: Coccidae) in India. *Entomon*, **23**: 105-110.

Mani, M. and Krishnamoorthy, A. 1999a. Natural enemies and host plants of spiralling whitefly, *Aleurodicus dispersus* (Homoptera: Aleyrodidae) in Bangalore, Karnataka. *Entomon*. **24**: 75-80.

Mani, M. and Krishnamoorthy, A. 1999b. Population dynamics of the spiralling whitefly, *Aleurodicus dispersus* Russell (Aleyrodidae, Homoptera) and its natural enemies on guava in India. *Entomon* (In Press).

Mani, M. and Krishnamoorthy, A. 1999. Bionomics and biological control of spiralling whitefly, *Aleurodicus dispersus* Russell (Aleyrodidae, Homoptera). *Madras Agricultural Journal* (In Press).

Nechols, J. R. 1982. Entomology: biological control. *Annual Report 1983. Guam Agricultural Experimental Station*, pp. 26-27.

Paulson, G. S. and Kumashiro, B. R. 1985. Hawaiian Aleyrodidae. *Proceedings of the Hawaiian Entomological Society*. **25**: 103-129.

Ranjith, A. M., Sitarama Rao, D. and Thomas, J. 1996. New host records of the mealy whitefly, *Aleurodicus dispersus* Russell in Kerala. *Insect Environment*, **2**(2): 35.

Senior, L. J. and McEwen, P. K. 1998. Laboratory study of *Chrysoperla carnea* (Stephens) (Neuroptera, Chrysopidae) predation on *Trialeurodes vaporariorum* (Westwood) (Homoptera: Aleyrodidae). *Journal of Applied Entomology*, **122**: 99-101.

Waterhouse, D. F. and Norris, K. R. 1989. Biological control, Pacific prospects – supplement 1. *ACIAR Monograph* No.12, 125 pp.