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Biocontrol potential of *Chrysoperla carnea* (Stephens) on *Melanaphis sacchari* (Zehntner) and *Uroleucon compositae* (Theobald)

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ABSTRACT: **The detailed bio-potentiality of *Chrysoperla carnea* was studied in the laboratory on eggs and I instar larvae of *Corcyra cephalonica*, sorghum aphid, *Melanaphis sacchari* and safflower aphid, *Uroleucon compositae*. Incubation, larval and pupal periods, longevity of female and male were observed. A single female laid 164.03 eggs when reared on *M. sacchari*. A single larva consumed 683.83 eggs or 611.5 first instar larvae of *C. cephalonica*, 284.0 and 239.44 nymphs of *M. sacchari* and *U. compositae*, respectively.**

KEY WORDS: *Chrysoperla carnea*, *Corcyra cephalonica*, host, predator and safflower aphid

INTRODUCTION

The aphid, *Uroleucon compositae* Theobald, is the most formidable pest causing severe economic loss to safflower crop by sucking the sap from leaves, tender stems, florets and developing capitula (Dhoble, 1984). Infestation leads to stunted plant growth and poor flowering resulting in less number of capitula with negligible seeds. In severe conditions the plants dry up prematurely without putting any reproductive growth. The yield loss has been documented at 24-60 per cent by various workers (Bhumannavar and Thontadarya, 1979; Basavanagouda *et al.*, 1981 and Shetgar *et al.*, 1992). The green lacewing, *Chrysoperla carnea* (Stephens) is the most efficient predator on soft-bodied insects including aphids. It plays an important role in checking the population of aphids and mites in cotton fields in USSR (Ishanulleva, 1979). The predatory potential of this insect is considerably higher compared to other aphid predators (Sundby, 1966). It is thought to exert a significant restraint on the increase of aphids on a variety of crops. Therefore the present investigation on its biology and feeding potential on different hosts was taken up to understand its potential role in suppressing safflower and sorghum aphids.

MATERIALS AND METHODS

The biology and feeding potential of *C. carnea* on different hosts, *viz.*, *C. cephalonica* eggs and I instar larvae, nymphs of sorghum aphid, *M. sacchari* and safflower aphid, *U. compositae*, were studied in the laboratory at University of Agricultural Sciences, Dharwad. Fifty eggs of *C. carnea* were kept individually in specimen tubes (10 x 2.5cm). After hatching, the food was given to each larva. Every day fresh food was provided. Observations on incubation period, larval duration of first, second and third instar, pupal period, adult longevity of both female and male and sex ratio were recorded on each host. For feeding potential study, ten emerged first instar larvae were taken and placed in specimen tubes (10 x 2.5cm) individually. Every day known number of each host material was given to larvae and observations were taken on the number of prey eaten at every 24 hours. Surviving prey were counted and removed and fresh prey provided to the predatory larvae every day until pupation. Finally the number of hosts consumed by the predator larvae in each instar and the total number of each host consumed during the larval period were recorded. Each set was replicated five times. The data were subjected to ANOVA for completely randomized design.

RESULTS AND DISCUSSION

Feeding potential

A single larva of *C. carnea* consumed on an average 683.83 eggs or 611.50 I instar larvae of *C. cephalonica* or 286.02 nymphs of *M. sacchari* or 239.44 nymphs of *U. compositae* (Table 1). The third instar larva consumed more than 70 per cent followed by second and first instars, which consumed more than 20 and five per cent of total consumption, respectively.

C. carnea devoured more eggs of *C. cephalonica* than the other hosts because of their small size. Sorghum aphids were preferred and consumed more than safflower aphids. *U. compositae* are bigger with thick cuticle, long legs and well-developed cornicles endowed with dark pigments, which made them not unpalatable to the predator. Rana and Srivastava (1998) reported that *C. carnea* larva consumed 349.80 nymphs of *Lipaphis erysimi* and 321.10 nymphs of *Dactynotus carthami*. The difference in the rate of consumption must be attributed to differential size of aphid species. The results of the study indicated that *C.carnea* has good feeding potential and ability to enter into leaf sheath and floral brackets and feed on emerging aphids. Indigenous predators have not been utilized to their complete potential. *C.carnea*, a potential predator, if conserved in large numbers in the safflower and sorghum eco-system, may prove its usefulness against aphid pest.

Biology

The incubation period of *C. carnea* eggs ranged from 3.61 days on *M. sacchari* to 3.77 days on early instar larvae of *C. cephalonica*. However, it was 3.72 days and 3.74 days on *U. compositae* nymphs and *C. cephalonica* eggs, respectively (Table 2). This is in accordance with the studies made by Varma and Shenhmar (1983), Jai Rao *et al.* (1986) and Afzal and Khan (1978). The larval periods ranged from 2.76 days to 3.17 days, 2.81 to 3.64 days and 3.35 days to 3.84 days on different hosts for first, second and third instar larvae of *C. carnea*, respectively (Table 2).

The larval periods of different instars are in conformity with the work of Varma and Shenhmar (1983), Jai Rao *et al.* (1986) and Afzal and Khan (1978). The pupal period of *C. carnea* was maximum (9.38 days) on *M. sacchari* and minimum (6.78 days) on *U. compositae*. However, it was found to be 8.9 and 8.36 days on *C. cephalonica* eggs and larvae, respectively. The results are in agreement with the investigations of Varma and Shenhmar (1983), Afzal and Khan (1978) and Jai Rao *et al.* (1986). The maximum adult longevity of female and male were 53.12 and 50.36 days, respectively on *M. sacchari*. Maximum number of eggs laid by single female was 104.03, when it was reared on *M. sacchari*. Varma and Shenhmar (1983) observed that a single female laid an average of 51.9 eggs.

Table 1. Feeding potentiality of *Chrysoperla carnea* on different hosts

T. No.	Hosts	Rate of consumption by *C. carnea*			Total
		I[st] instar	2[nd] instar	3[rd] instar	
T_1	*C.cephalonica* eggs	38.40 ± 1.82 (5.62)	137.60 ± 2.97(20.12)	507.83 ± 5.27(74.26)	683.83
T_2	*C.cephalonica* I instar larvae	30.66 ± 1.57(5.02)	134.92 ± 2.79(22.06)	445.92 ± 4.71(72.92)	611.50
T_3	*M. sacchari* nymphs	14.7± 1.23(5.15)	64.12 ± 2.13(22.41)	207.2 ± 4.01(72.44)	286.02
T_4	*U. compositae* nymphs	11.7 ± 1.13(4.90)	53.62 ± 2.37(22.40)	174.12 ± 3.98(72.70)	239.44
	SEM ±				0.15
	CD at 1%				0.64

Figures in parentheses indicate per cent consumption

Table 2. Biology of *C. carnea* on different hosts

T. No.	Hosts	Incubation period (days)	Larval period (days)			Pupal period (days)	Adult longevity (days)		Fecundity	Sex ratio *
			First instar	Second instar	Third instar		Female	Male		
T_1	*C.cephalonica* eggs	3.4(2.18)	3.17(2.04)	3.38(2.09)	3.80(2.19)	8.9(3.15)	46.54(6.89)	45.73(6.84)	65.57(8.16)	0.88
T_2	*C.cephalonica* I instar larvae	3.77(2.18)	2.76(1.94)	3.63(2.15)	3.35(2.04)	8.36(2.99)	46.78(6.91)	47.12(6.95)	59.95(7.81)	0.61
T_3	*M. sacchari* mymphs	3.61(2.15)	2.92(1.96)	3.64(2.15)	3.84(2.20)	9.38(3.22)	53.12(7.36)	50.36(7.17)	104.03(10.25)	0.60
T_4	*U. compositae* nymphs	3.72(2.17)	2.87(1.98)	2.81(1.95)	3.50(2.12)	6.78(2.79)	52.72(7.33)	48.85(7.06)	79.22(8.96)	0.69
	SEM ± 0.01	0.01	0.01	0.24	0.02	0.02	0.02	0.13	-	
	CD at 1% NS	0.03	0.03	0.97	0.09	0.06	0.08	0.53	-	

Figures in parenthes are x + 1 values; * Number of females per male adults

REFERENCES

Afzal, M. and Khan, M. R. 1978. Life history and feeding behaviour of green lacewing *Chrysoperla carnea* (Stephens) (Neuroptera: Chrysopidae). *Pakistan Journal of Zoology*, **10**: 83-90.

Balasubramani, V. and Swamiappan, M. 1994. Development and feeding potential of green lacewing, *Chrysoperla carnea* (Stephens) (Neuroptera: Chrysopidae) on different insect pests of cotton. *Anzeiger fiir Schaedlingskunde, Pflanzenschutz Umweitschutz*, **67**: 165-167.

Basavana Goud, K., Kulkarni, K. A. and Thontadarya, T. S. 1981. Estimation of crop loss in safflower due to aphid, *Dactynotus compositae* Theobald. *Mysore Journal of Agriculture Sciences*, **15**: 279-282.

Bhumannavar, B. S. and Thontadarya, T. S. 1979. Estimation of the safflower crop loss due to aphid, *Dactynotus compositae* Theobald. *Pestology*, **3**: 18-19.

Dhoble, S. P. 1984. Breeding for aphid tolerance/ resistance in safflower: Actincal appraisal of screening technique. *Paper presented in Annual Rabi Oilseeds Workshop of Rapeseed Mustard, Safflower and Linseed* held at Sukhadia University, Durgapur, Jaipur on 6-10th August.

Ishanulleva, T. 1979. The use of the larvae of the common lacewing in the control of pests of cotton. *Izvestiya Akademii Mank Turmenskoissr Biolagiche Skiah Navk*, **1**: 17-21.

Jai Rao, K., Thontadarya, T. S. and Suhas, Y. 1986. Investigations on parasitoids and predators of sorghum pests. *Sorghum Newsletter*, **29**: 56-60.

Rana, B. S. and Srivastava, R. C. 1998. Feeding potential and growth rate index of aphid lion, *Chrysoperla carnea* on different species of aphid. Paper presented in National Seminar on Entomology in 21st Century. Biodiversity, Sustainability, Environmental safety and human health. April 30 to May 2, 1998, Rajasthan College of Agriculture, Udaipur, P.204.

Sengonca, C. and Grootermorst, A. 1985. The feeding activity of *Chrysoperla carnea* Stephens on *Barathra brassicae* and *Spodoptera littoralis* Boisd. *Zeitschrift fiir Angewandte Entomologie*, **100**: 219-223.

Shetgar S. S., Biplapate, G. G., Puri, S. N., Patil, V. M. and Londe, G. M. 1992. Assessment of yield loss in safflower due to aphids. *Journal of Maharashtra Agricultural Universities*, **17**: 303-304.

Sundby, R. A. 1966. A comparative study of the efficiency of three predatory insects – *Coccinella septempunctata* L., (Coleptera: Coccinellidae), *Chrysopa carnea* St. (Neuroptera: Chrysopidae) and *Syrphus ribesii* L. (Diptera: Syrphidae) – at two different temperatures. *Entomophaga*, **11**: 395-404.

Varma, G. C. and Shenhmar, M. 1983. Some observations on the biology of *Chrysoperla carnea* (Stephens). *Journal of Research, Punjab Agricultural University*, **20**: 222-223.

Zaki, F. N. 1987. Larval durations and food consumption of the predator *Chrysoperla carnea* Stephens under different region. *Annals of Agricultural Sciences*, **32**: 1827-1836.