Influence of larval diet on pupal period and size of cocoon of *Chrysoperla zastrowi sillemi* (Esben-Peterson)

Abstract

A study was conducted in the Biocontrol Laboratory, Department of Entomology, College of Agriculture, OUAT, Bhubaneswar, Odisha during 2020-21 to record the influence of larval diets on pupal period and size of cocoon of *Chrysoperla zastrowi sillemi* (Esben-Peterson). Six larval diets *i.e.* T_1 (Purple aphid, *Aphis craccivora* Koch.), T_2 (Green aphid, *Myzus persicae* (Sulzer)), T_3 (Mustard aphid, *Lipaphis erysimi* (Kalt.)), T_4 (Papaya mealy bug, *Paracoccus marginatus* Williams and Granara de Willink), T_5 (Pink mealy bug, *Maconellicoccus hirsutus* (Green)) and T_6 (*Corcyra cephalonica* Stainton 1st instar larva) were tested along with one control (T_7= *Corcyra cephalonica* egg). T_1 was detected as the best larval diet which produced maximum pupal period of 8.90 days with 16.80% increased over control. Maximum cocoon diameter was also recorded in T1 *i.e.* 3.28 mm with 11.95% increased over control. T1 was closely followed by T3 with respect to pupal period (8.74 days with 14.70% increase over control) and diameter of cocoon (3.20 mm with 9.22% increase over control) of *C. zastrowi sillemi*.

Key words: Larval diets, *Chrysoperla zastrowi sillemi*, pupal period, diameter of cocoon

Introduction

Chrysoperla zastrowi sillemi (Neuroptera: Chrysopidae) is a generalist predator of soft bodied sucking insects like aphids, mealy bugs, immature scales, whiteflies, thrips, spider mites and other sucking insect pests (Saminathan and Baskaran, 1999). The larvae of *Chrysoperla* is a voracious predator of soft bodies insects and their adults are free living in nature feeding upon the pollen and nectar (Villenave *et al.,* 2005). The larvae of *C. carnea* are voracious feeder and very efficient biological control agents for various phytophagous arthropods (McEwen *et al*., 2001). It is quite obvious that rearing of natural enemies in the laboratory with preferred food will positively influence the duration and vigour of different life stages which in turn will increase the feeding potentiality in the field after release (Nandan *et al.,* 2014). Keeping this objective in view, six larval diets comprising three species of aphid (Purple aphid, *Aphis craccivora;* Green aphid, *Myzus persicae* and Mustard aphid, *Lipaphis erysimi*), two species of mealybug (Papaya mealy bug, *Paracoccus marginatus* and Pink mealy bug, *Maconellicoccus hirsutus*) and first instar larva of *Corcyra cephalonica* were tested in the present investigation along with one control (egg of *Corcyra cephalonica*) to determine their effects on pupal period and size of cocoon.

Materials and Methods

The experiment was conducted during 2020-21 in the Biocontrol Laboratory of Department of Entomology, Odisha University of Agriculture and Technology, Bhubaneswar, Odisha. The experiment was laid out in CRD with three replications and seven treatments. In each replication of a treatment, five neonate larvae of *Chrysoperla zastrowi sillemi* (just after their hatching out of eggs) were placed in glass petri dishes individually to avoid cannibalism. Thus, fifteen petri dishes were maintained for each treatment. A total of hundred and five such petri dishes were maintained for seven treatments and three replications at 28± 2 ^{0}C with 65±5% relative humidity throughout the experiment. Foods (preys) were provided (ad libitum) along with the infested twigs or portions of leaf in the petri dishes everyday at fixed time till the larvae pupate. All the pupae (cocoons) of a replication of a particular treatment were transferred to a petri dish immediately after pupation. The dates of pupation of the larvae and the emergence of adults from pupae were recorded and the pupal periods were determined on five natural hosts and one laboratory host *i.e.* Purple aphid, *Aphis craccivora* (Koch), Green aphid, *Myzus persicae* (Sulzer), Mustard aphid, *Lipaphis erysimi* (Kaltenbach), Papaya mealy bug, *Paracoccus marginatus* (Williams and Willink), Pink mealy bug, *Maconellicoccus hirsutus* (Green) and Rice moth, *Corcyra cephalonica* (Stainton). The diameter of cocoons was measured using a stereo zoom trinocular microscope. The data so obtained were subjected to statistical analysis using OPSTAT software for logistical interpretations.

Result

Data on pupal period have been presented in Table 1. Maximum pupal period of 8.90 days was recorded in T_1 (Purple aphid, *Aphis craccivora*) followed by T_3 (Mustard aphid, *Lipaphis erysimi*) *i.e.* 8.74 days with 16.80% and 14.70% increase in pupal period over control (T_7= *Corcyra cephalonica* egg). These two treatments were statistically at par and significantly superior to all other treatments. Lowest pupal period of 7.39 days was recorded in T_6 (*Corcyra cephalonica* 1st instar larva).

Data on diameter of cocoon have been presented in Table 2 and Figure 1. Highest diameter of cocoon of 3.28 mm was recorded in T_1 (Purple aphid, *Aphis craccivora*) with 11.95% increase over control (T_7= *Corcyra cephalonica* egg) followed by 3.20 mm and 3.12 mm in T_3 (Mustard aphid, *Lipaphis erysimi*) and T_2 (Green aphid, *Myzus persicae*) with 9.22% and 6.48% increase in cocoon diameter over control, respectively. These three treatments were statistically at par and significantly superior to all other treatments. Lowest cocoon diameter of 2.93 mm was observed in control along with T_5 (Pink mealy bug, *Maconellicoccus hirsutus*) and T_6 (*Corcyra cephalonica* 1st instar larva).

Discussion

It was evident from the results that the pupal period and diameter of *Chrysoperla zastrowi sillemi* were higher when the larvae were fed with aphid species than the mealybugs and first instar larva and egg of rice moth. Hence, it may be assumed that the aphids are the preferred

hosts over mealybugs and rice moth (larva and egg). This may be the reason that the green lacewings are otherwise named as aphid lions. The data on pupal period recorded in the present investigation are almost similar to the data reported by Cohen and Smith (1998), Alghamdi and Sayed (2017) and Naruka *et al.* (2017). Shaukat (2017) also reported the pupal period of *C. carnea i.e.* 7.75, 7.75, 8.37, 8.50, 7.37 and 8.25 days fed on *A. gossypii*, *P. solenopsis*, *H. armigera*, *P. gossypiella*, *S. cerealella*, and mixed host diet, respectively, which was almost similar to our finds. The cocoon diameters recorded in the present investigation are almost similar to the values reported by Chakraborty and Korat (2010) *i.e.* ranged from 2.5 to 4.5 mm. More or less similar diameter to our find was also reported by other workers [El-Dakroury *et al.* (1979), Patel and Vyas (1985) and Jalali *et al.* (2003)].

Table 1. Influence of larval diet on pupal period of *C. zastrowi sillemi*

Tr. no.	Treatments	Pupal period (days)	
		Mean	Increase (%) over control
T_1	Purple aphid, *Aphis craccivora*	8.90	16.80
T_2	Green aphid, *Myzus persicae*	8.61	12.99
T_3	Mustard aphid, *Lipaphis erysimi*	8.74	14.70
T_4	Papaya mealy bug, *Paracoccus marginatus*	8.21	7.79
T_5	Pink mealy bug, *Maconellicoccus hirsutus*	8.07	5.95
T_6	*Corcyra cephalonica* 1st instar larva	7.39	-2.98
T_7	*Corcyra cephalonica* egg (Control)	7.62	-
	SE(m)±	0.062	-
	CD (P=0.05)	0.19	-

Conclusion

From the obtained results in this study, it could be concluded that the purple aphid, *Aphis craccivora* was evaluated as the best larval diet which recorded highest increase in pupal period and cocoon diameter of *C. zastrowi sillemi* followed by mustard aphid, *Lipaphis erysimi*. The predatory larvae fed on different prey species and hence, these potential to utilize for biological control agent for management of the soft bodied insects. This result guides the entomologist to consider the *C. zastrowi sillemi* as efficient bio-control agent in eco-friendly management of soft bodied insects on agricultural crops and so, enhancing the potential of predators.

Table 2. Influence of larval diet on diameter of cocoon of *C. zastrowi sillemi*

Tr. no.	Treatments	Diameter of cocoon (mm)	Increase (%) over control
T_1	Purple aphid, *Aphis craccivora*	3.28	11.95
T_2	Green aphid, *Myzus persicae*	3.12	6.48

T_3	Mustard aphid, *Lipaphis erysimi*	3.20	9.22
T_4	Papaya mealy bug, *Paracoccus marginatus*	3.04	3.64
T_5	Pink mealy bug, *Maconellicoccus hirsutus*	2.93	0.00
T_6	*Corcyra cephalonica* 1st instar larva	2.93	0.00
T_7	*Corcyra cephalonica* egg (Control)	2.93	-
	SE(m)±	0.055	-
	CD $_{(P=0.05)}$	0.17	-

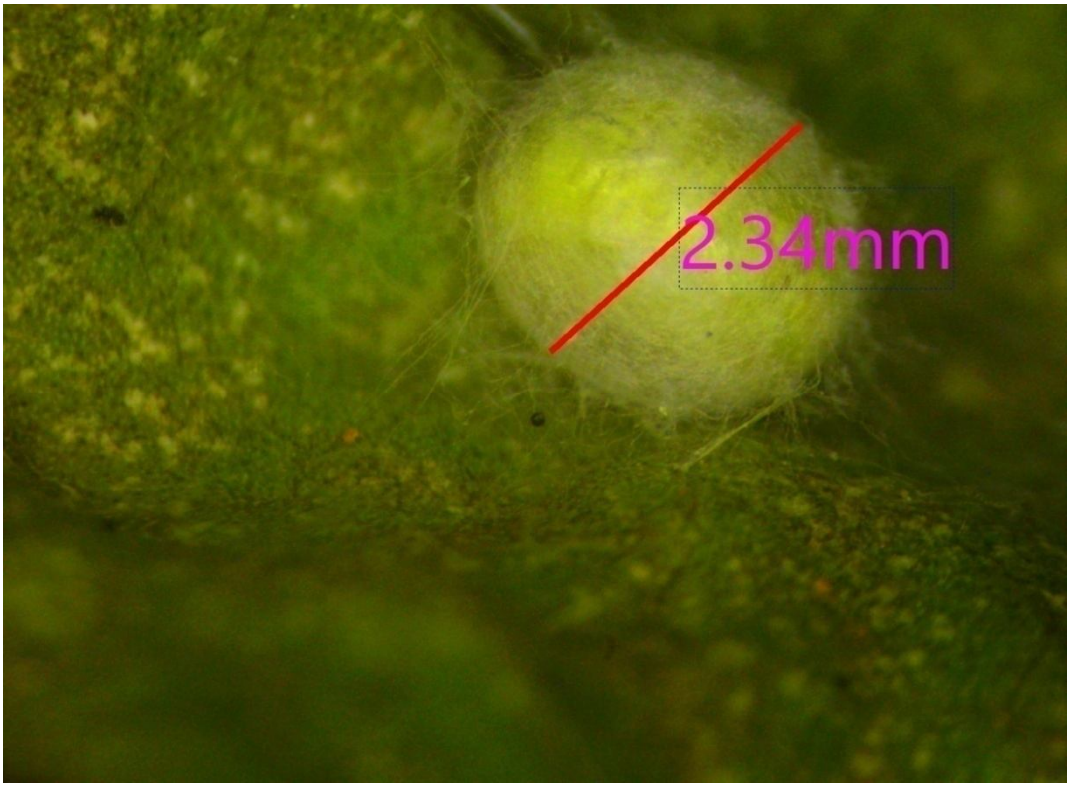

Figure 1. Diameter of cocoon of *C. zastrowi sillemi*

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