J.Biol.Control, 8 (1), 54-55, 1994

A Semi-Synthetic Larval Diet for *Chrysoperla carnea* (Stephens) (Neuroptera : Chrysopidae)

N.A. PUSHPALATHA, S.P. SINGH, N. BAKTHAVATSALAM, and B.S. BHUMANNAVAR

Project Directorate of Biological Control,
Hebbal, Bangalore - 560 024.

The value of chrysopids as a biological control agent in IPM programme has been appreciated in recent times. Efforts to mass rear them, investigations on dietary requirements and artificial diets with varying degrees of success have been reported (Hassen and Hagen, 1978; Gautam and Paul, 1987; Vanderzant, 1973). In the present studies, attempts were made using the available laboratory wastes like the spent or dead adults of *Corcyra cephalonica, Spodoptera litura, Helicoverpa armigera*, mealy bugs and bees. They were further enriched by adding yeast extract, egg yolk and honey. The senescent insects were killed by deep freezing, dried in an oven at 100°C for 90 to 120 minutes and powdered. The diet ingredients were mixed in a beaker, and placed in a water bath. A small quantity of wax (52° C MP) and vaseline were added to the diets to place them as droplets on polythene sheet. Fresh droplets were provided every day to the larvae. The composition of the diets developed after trying various combinations are presented in Table 1.

Table 1. Different semi-synthetic diets for *Chrysoperla carnea* larvae

A.	Mealy bug diet (MD)	
	Mealy bug powder	0.2g
	Egg yolk	5.0g
	Honey	0.5g
	Yeast extract	0.2g
	Distilled water	6.0ml
B.	*Corcyra cephalonica* abdomen diet (CAD)	
	C. cephalonica abdomen powder	0.2g
	Egg yolk	5.0g
	Honey	0.5g
	Yeast extract	0.2g
	Distilled water	6.0ml
C.	Protinex diet (PD)	
	Protinex	0.2g
	Egg yolk	5.0g
	Honey	0.5g
	Yeast extract	0.2g
	Distilled water	6.0ml
D.	Bee diet (BD)	
	Bee powder	0.2g
	Egg yolk	5.0g
	Honey	0.5g
	Yeast extract	0.2g
	Distilled water	6.0ml
E.	*Spodoptera litura* abdomen diet (SAD)	
	S. litura abdomen powder	0.2g
	Egg yolk	5.0g
	Honey	0.5g
	Yeast extract	0.2g
	Distilled water	6.0ml
F.	*Helicoverpa armigera* abdomen diet (HAD)	
	H. armigera abdomen powder	0.2g
	Egg yolk	5.0g
	Honey	0.5g
	Yeast extract	0.2g
	Distilled water	6.0ml
G.	Control	
	(*C.cephalonica* eggs)	

In all the treatments, larval feeding was noticed on the diets, while pupation was observed in varying degrees (Table 2). Adult emergence was nil of mealy bug powder diet (MD) and Protinex diet (PD) and per cent adult emergence was very low (0.38) in *Corcyra* abdomen powder diet (CAD), conforming to the earlier studies (Singh and Verma, 1989). Hence the data collected on the above three diets were not subjected to statistical analysis. When the larvae were fed on semi-synthetic diets, the larval periods ranged from 11.7 to 27.3 days. With reference to larval period, *Spodoptera* abdomen diet (SAD) was on par with control. The prolonged larval duration in the other treatments could be due to inadequate nutrition leading to the inability of the larvae to pupate at the optimum time. The per cent pupation in all the larvae fed on semi synthetic diets was significantly lower than the control. However,

Contribution No: 9181001

Table 2. Development of *Chrysoperla carnea* larvae on semi synthetic diets

Diet	Average larval period (days)	% pupation	Average pupal weight (mg)	Average pupal period (days)	% adult emergence
Mealy bug Diet (MD)*	26.5	17.5	3.6	0.0	0.0
Corcyra abdomen Diet (CAD)*	27.3	34.6	3.5	12.0	0.38
Protinex Diet (PD)*	22.0	0.76	3.3	0.0	0.0
Bee Diet (BD)	14.64	75.5	3.6	6.9	16.22
Spodoptera abdomen Diet (SAD)	11.70	77.14	4.2	8.2	29.63
Helicoverpa abdomen Diet (HAD)	23.41	48.57	4.0	8.5	23.53
CONTROL	8.18	96.00	9.2	6.4	90.00
S.Em+	1.32	0.24	0.003	0.71	0.28
CD 5%	3.76	0.69	0.009	2.03	0.81
CV %	37.61	20.26	169.42	43.01	44.25

* Not subjected to statistical analysis due to poor performance of the diet.

among the three semi synthetic diets, SAD proved to be superior followed by Bee diet (BD), while minimum per cent pupation was observed in the case of *H. armigera* abdomen diet (HAD). Larvae fed on SAD and HAD spinned heavier cocoons in comparison with BD, but still they were far behind that of the control. Pupal periods in all the three treatments were similar. While BD and SAD were on par with the control, the pupal period in the HAD treatment was significantly prolonged. Adult emergence in varying degrees were observed in the BD (16.22%), SAD (29.63%) and HAD (23.53%) and the inadequacy of the semi synthetic diets was evident because of the poor adult emergence in comparison with the control. This is in comparison with Vanderzant (1969) where, larvae fed twice daily, matured faster, grew larger, and gave better emergence than larvae fed only once daily.

Although the data from this study indicates that the diets are not perfect, considering the developmental period and per cent pupation, SAD seems to be promising. However, steps have to be taken to modify the diets in order to improve the cocoon weight and adult emergence. Hence this study can be a step towards development of a semi-synthetic diet for successful mass multiplication of *Chrysoperla*.

ACKNOWLEDGEMENT

Thanks are due to Mr.Birendra Kumar Chaubey, T-II-3, for his technical assistance and to Mrs.Chandish R. Ballal for her help in improving the write up of the article. The financial assistance received from the Department of Biotechnology, New Delhi is gratefully acknowledged.

KEY-WORDS: *Chrysoperla carnea*, semi-synthetic diet

REFERENCES

HASSEN, S.A. and HAGEN, K.S. 1978. A new artifical diet for rearing *Chrysopa carnea* larvae (Neuroptera, Chrysopidae). *Zeit. fur Ange. ent.*, **86** (3), 315-320.

GAUTAM, R.D. and PAUL, A.V.N. 1987. A new artificial diet for the larvae of green lacewing, *Chrysopa scelestes* Banks (Neuroptera: Chrysopidae). *J. Ent. Res.*, **11**(1), 69-72.

SINGH, P.P. and VARMA, G.C. 1989. Evaluation of the suitability of spent or dead *Corcyra cephalonica* (Pyralidae: Lepidoptera) moths as food for rearing *Chrysoperla carnea* (Chrysopidae : Neuroptera). *Biological wastes*, **28**, 309-311.

VANDERZANT, E.S. 1973. Improvements in the rearing diet for *Chrysopa carnea* and the amino acid requirements for growth. *J. Econ. Entomol.*, **66**(2), 336-338.