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EFFECT OF BIOPESTICIDES ON THE LARVAL MORTALITY OF *CHRYSOPERLA ZASTROWI SILLEMI* (ESBEN-PETERSON)

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ABSTRACT

The efficacy of biopesticides; *Bacillus thuringiensis, Lecanicillium lecani, Beauveria bassiana*, Azadirachtin and fipronil (chemical check) on the larval mortality of *Chrysoperla zastrowi sillemi* was carried out during the year 2020-21 by two different methods viz. residue deposit and diet contamination, under laboratory conditions Result showed that in residue deposit method, the lowest larval mortality after 7 days was observed in *Bacillus thuringiensis* (9.33%) followed by *Metarhizium anisopliae, Lecanicillium lecani* and *Beauveria bassiana* (23.0, 24.0 and 26.67%, respectively). In diet contamination method, the lowest larval mortality (10.00%) was observed in *Lecanicillium lecani* followed by *Metarhizium anisopliae, Beauveria bassiana* and *Bacillus thuringiensis* (11.33% , 13.67% and 28.33%, respectively). The highest larval mortality in both the methods were observed in the check chemical fipronil (82.67% in residue deposit and 89.33% in diet contamination) followed by Azadirachtin (40.33% in residue and 58.00% in diet contamination). Keeping in view, the results demonstrated from the investigation the microbial pesticides was found to be compatible with *Chrysoperla zastrowi sillemi* and can safely be included in the integrated pest management programme against the pests.

Key words: biopesticides, petridishes, residue deposit method, diet contamination method, chemical check, entomopathogenic fungi, entomopathogenic bacteria, integrated pest management, natural enemies, low toxicity

Green lacewings has a significant role to play in biocontrol of insect pests for having high host searching ability, voracious feeding habit and accountable to mass production.Sixty nine species of Lacewings belonging to 21 genera have been reported from different crop systems in India. Among them *Chrysoperla zastrowi sillemi, C. scelestes, Mallada boninensis* are efficiently used. In India*, Chrysoperla zastrowi sillemi* (older name *Chrysoperla carnea*) where, *sillemi* was ascertain to be a subspecies of *Chrysoperla zastrowi* and scientific name has been recoined as *Chrysoperla zastrowi sillemi* (Esben-Peterson). The efficacy of C*hrysoperla* sp was demonstrated as a biological control agent in field crops, orchards and green house crops (Nasreen et al., 2004). On the other hand, a good number of microbial pesticides viz.,entomopathogenic fungi, entomopathogenic bacteria and botanicals have great potential in pest management and act as a component in integrated pest management system. Successfulness of these components as an efficient control tactics not only relies on its effectiveness against insect pests, but also on its low toxicity to non target insects (Natural enemies).Taking into account, the importance of both the natural predator and the biopesticides, the present investigation was conducted to determine the compatibility of the predator, *Chrysoperla zastrowi sillemi* with the microbial pesticides for their inclusion in integrated pest management programme.

MATERIALS AND METHODS

The laboratory experiment study of the efficacy of microbials and botanical pesticides on *Chrysoperla zastrowi sillemi,* was conducted in the Biocontrol laboratory, Department of Entomology, College of Agriculture, OUAT, Bhubaneswar during 2020-21. The experiment was laid out in completely randomized design with 7 treatments (at field recommended doses) each replicated thrice at 27$\pm$ 2ºC and relative humidity of 65%. *C. zastrowi sillemi* adults were procured from the National Bureau of Agriculturally Important Insects (NBAII), Bengaluru, Karnataka, India. Eggs of *Corcyra cephalonica*, the factitious host of *C. zastrowi sillemii* were obtained from the Biocontrol Laboratory, Department of Entomology, OUAT, Bhubaneswar. The adults were reared in controlled condition in the Laboratory in one litre capacity glass jars to maintain the stock culture. For the experiment 7 treatments with 3 replications each are taken into account From the stock culture, the first instar larvae were separated out

Table 1. *Chrysoperla zastrowi sillemi* larval mortality as influenced by biopesticides by residue deposit method and diet contamination method

Treatments	Concentration	Dose	Mortality of larvae (%)						Decrease in mortality at 7 DAT over chemical check (%)	
			Residue deposit Method			Diet contamination method			Residue deposit Method	Diet contamination method
			3 DAT	5 DAT	7 DAT	3 DAT	5 DAT	7 DAT		
T_{1-} *Bacillus thuringiensis*	1.77x10^9 cfu/ml	2 ml/L	5.00* (12.74)**	8.67* (17.06)**	9.33* (17.76)**	8.67* (17.118**)	20.67* (27.03)**	28.3* (32.15)**	88.71	68.29
T_{2-} *Lecanicillium lecani*	2.13x10^9 spores/ml	5 ml/L	2.67* (9.30)**	11.33* (19.64)**	24.00* (29.31)**	0.67* (4.693)**	3.33* (10.51)**	10.00* (18.41)**	70.97	88.81
T_{3-} *Beauveria bassiana*	2.03x10^9 spores/ml	5 ml/L	3.00* (9.85)**	13.33* (21.39)**	26.67* (31.07)**	1.33* (6.62)**	5.00* (12.87)**	13.67* (21.69)**	67.74	85.03
T_{4-} *Metarhizium anisopliae*	2.27x10^9 spores/ml	5 ml/L	1.67* (7.36)**	10.33* (18.69)**	23.00* (28.64)**	0.67* (4.693)**	3.67* (11.04)**	11.33* (19.66)**	72.18	87.32
T_{5-} Azadirachtin	1500 ppm	5 ml/L	23.67* (29.06)**	37.00* (37.44)**	40.33* (39.40)**	38.6* (38.436)**	51.33* (45.74)**	58.00* (49.58)**	51.22	35.07
T_{6-} Fipronil (chemical check)	5%SC	2 ml/L	63.33* (52.71)**	79.00* (62.70)**	82.67* (65.39)**	68.00* (55.529)**	81.67* (64.63)**	89.33* (70.90)**	-	-
T_{7-} Untreated control	-	-	0.67* (4.56)**	2.67* (9.32)**	5.33* (13.22)**	0.33* (3.292)**	4.33* (12.01)**	6.67* (14.96)**	93.55	92.53
SE(m)±			1.031	0.734	0.726	0.136	0.33	0.329	-	-
CD (0.05)			3.159	2.247	2.223	0.417	1.01	1.007	-	-

DAT-Days after treatment,*Mean of three replications,**Figures in the parenthesis are arc sin values.

and the mortality effect of biopesticides was studied by the Residual Deposit and the Diet Contamination methods. In Residual Deposit method, inner surface of the glass petridishes were sprayed with different treatments separately at maximum recommended doses by means of a pneumatic polysprayer and air dried followed by placing 10 numbers of first instar larvae. In Diet Contamination Method, UV treated *Corcyra* eggs were sprayed with different treatments separately at the maximum field recommended doses and air dried. Larval mortality in both the methods were observed at 3rd, 5th and 7th day after treatment (DAT) and mortality percentage was worked out. Decrease percentage in mortality at 7 DAT over chemical check was determined. Data collected on the relevant observations made during the investigation was subjected to the required statistical analysis analyzed with OPSTAT statistical software with one factor analysis involving arc sine transformation in complete randomized design (CRD).

RESULTS AND DISCUSSION

Mortality of *Chrysoperla zastrowi sillemi* larvae at 3 DAT after treatment of pesticides ranged from 1.67 to 63.33% in Residue Deposit method and 0.67% to 68% in Diet Contamination method (Table 1). In Residue Deposit method, the lowest mortality was observed in *Metarhizium anisopliae* treated larvae and in Diet Contamination method, lowest mortality was observed in *Lecanicillium lecani* (0.67%) and highest mortality was observed in Fipronil (63.33% in residue deposit and 68.00% in diet contamination).

At 5 DAT, mortality percentage ranged from 8.67- 79% in residue deposit method and 3.33- 81.67 per cent in diet contamination method. The larval mortality determined by residue deposit method and diet contamination method (Table 1) revealed that the cumulative mortality at 7 DAT varied from 9.33 to 82.67 percent in residue deposit method and 10.00 to 89.33% in diet contamination method. In residue deposit method, lowest cumulative mortality at the end of 7 DAT was in *Bacillus thuringiensis* accounting 9.33% larval mortality followed by *Metarhizium anisopliae* with 23.00% larval mortality. In diet contamination method, *Lecanicillium lecani* recorded the lowest mortality (10.00%) followed by *Metarhizium anisopliae* (11.33%). Lower mortality due to the treatments clearly depicted that microbial pesticides can be recommended along with the predator, green lacewing in IPM programme. Fipronil followed by Azadirachtin proved to be toxic to *C. zastrowi sillemi* by recording higher larval mortality. With respect to decrease percentage in mortality on 7 DAT, *Bacillus thuringiensis* showed 88.71% decrease mortality over chemical check clearly indicated that Bt was the safest among the pesticides used in residue deposit method. In case of Diet contamination method, *Lecanicillium lecani* showed 88.81 percent decrease in mortality over chemical check confirming its compatibility with the bioagent *Chrysoperla*.

Working on effect of biopesticides, Thungrabaeb and Thongma (2007) also found low larval mortality in *M. anisopliae* and the present findings were in opine with the findings of above authors. Mortality per cent of Bt in the present investigation corroborate the findings of Morsy (2017). Larval mortality in Azadirachtin in the present finding contradicted the finding of Vinuela et al. (2000) which reported that Azadirachtin had no significant effect on *Chrysoperla* larvae. Imam et al. (2015) reported that *B. bassiana* caused death of larval instar between 9 and 41% which was correspondingly at the same range as that of present findings.

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AUTHOR CONTRIBUTION STATEMENT

The authors contributed to the design and implementation of the research, to the analysis of the results and to the writing of the manuscript.

CONFLICT OF INTEREST

No conflict of interest.

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