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EFFECT OF SOME INSECTICIDES ON GREEN LACEWING, *CHRYSOPERLA CARNEA* (STEPHENS) UNDER LABORATORY CONDITIONS

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Author's contribution
K.K.K carried out this research, S.A.H.S planned this idea, R.H.C compile the result, M.I.J confirmed the result and revised the manuscript and H.M.S look after all the experiments under laboratory condition.

Key words:
Toxicity, Chrysoperla carnea, Mortality, Egg hatching.

ABSTRACT

The present study was conducted at Department of Entomology, Sindh Agriculture University, Tando jam, during 2016-2017. During this study six selected insecticides viz., Emamectin Chlorantraniliprole, Benzoate, Spinosad, Imidacloprid, Diafenthiuron and Thiamethoxam were used at recommended dose against of *Chrysoperla carnea.* Data were recorded on the egg hatchability, larval mortality, pupation percent, adult emergence and mortality of *C. carnea*. Imidacloprid was found less toxic with highest egg hatching % (86.67), while Thiamethoxam was found highly toxic with least egg hatchability (51.67). After 24 and 48 hours treatments of Chlorantraniliprole has recorded maximum mortality on treated eggs (26.67 and 46.67 %), and larvae (26.67 and 63.33 %), showing its toxic effects. On the other hand, the minimum mortality (3.33 and 6.67 %) was noted by Spinosad after 24 hours in both the conditions. But, after 48 hours, Imidacloprid registered the slightest mortality of 13.33 and 26.67 when fed on treated eggs respectively. In case of adult (male and female) mortality, Thiamethoxam registered complete mortality and Diafenthiuron caused least mortality after 48 hours of treatments.

1. INTRODUCTION

Green lacewing, *Chrysoperla carnea* (Stephens) (Neuroptera: Chrysopidae) also known as golden eyes and aphid lions, it is a cosmopolitan polyphagous and efficient predator commonly found in a wide range of agricultural habitat [1]. It has a wide range of prey with enhanced searching capacity and voracious feeding habits. It constitutes a prominent group of predators due to their amenability to mass production and potential for their use in varied ecosystems [2]. Its larvae are voracious and polyphagous predators, feeding on leafhoppers, psyllids, aphids, coccids and mites, of which aphids are the most preferred host. As one larva may devour as many as 500 aphids in its lifetime. It plays an important role in natural control of sucking pest. Effectiveness of *C. carnea* as a biological control agent has been demonstrated in field crops, orchards and green houses [3]. As insecticides continued to be the preferred component of IPM in many crops, they show adverse impact on natural enemies which could be mitigated through impact on natural enemies which could be mitigated through choice of insecticides, dosage, or timing of insecticide application. Integrating biological control with selective insecticides also can minimize the likelihood of pest resurgence and possibly reduce the number of insecticide applications [4] and it is essential to assess their safety to natural enemies before recommending them. Subsequently, to strengthen the natural biotic activity, the successful natural enemies were artificially multiplied in abundance and released in the field when situation warranted combating it. The effect of insecticides on non-target organisms was categorized as per the recommendations of the International Organization for Biological Control [5]. Biological control is involvement of parasitoids, predators and pathogens in maintaining other organism's density at a lower average level than would occur in their absence [6]. The predators are scattered in about 167 families of 14 orders of class Insecta. Among the predacious insect orders, Coleoptera, Neuroptera, Hymenoptera, Diptera and Hemiptera contain exclusively predators and parasitoids (natural enemies).

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It is estimated that possibly up to one third of the successful biological insect pest control programmes are attributable to introduction and release of insect predators [7]. The present study is therefore designed to explore the selective insecticide safer for *C.carnea* so as to integrate biological control with chemical control in a safe mood.

2. MATERIAL AND METHODS

2.1 Insecticide used

There were six treatments:

T^1 = Chlorantraniliprole Coragen 18.5 SC Anthralinic Diamides.
T^2 = Imidacloprid Confidor 17.8 SL 0.4 Chloronicotinyl
T^3 = Spinosad Tracer 240 SC 0.3 Spinosyns.
T^4 = Emamectin benzoate Logo 1.9 EC Avermectins.
T^5 = Thiamethoxam Actara 25 WG 0.2 Thia - nicotinyl.
T^6 = Diafenthiuron Pegasus 50 WP 1.0 Thiourea.

Experimental Design

Experimental design was CRD. Each treatment was replicated thrice.

Experimental procedure

The desired concentration of the above selected insecticides was prepared by diluting the formulated insecticide in water at recommended doses. Different stages of *C. carnea* were obtained from stock culture. Uniformity in age and size of the test insect was thoroughly observed during their selection, to minimize the chances of natural mortality of insects while experimentation. The black paper strips containing 200 stalked eggs of *C. carnea* were uniformly sprayed with the recommended dose of insecticides using an atomizer. Observations were recorded on % larval mortality for every 24 and 48 hours after the treatment. Data was recorded on percent egg hatching larval, Mortality percent, pupation and adult emergence.

Statistical Analysis

Data collected on the observations made during the experimentation period was analyzed by the required statistical methods. Biology and development of *C. carnea* on each prey was compared by ANOVA for individual instars.

3. RESULTS AND DISCUSSION

Effect of insecticides against egg hatchability

The results are summarized in Table-1 that the Imidacloprid was found less toxic and recorded maximum egg hatching 86.67 percent, followed by Diafenthiuron (83.33%), and Spinosad (73.33%). Similar observation was made by [8] who didn‘t found any adverse effect due to Diafenthiuron on hatchability of *C. carnea.* Present findings also recorded Emamectin benzoate with 71.67, % egg hatchability which could be partially compared with results of [9] who has reported that with Emamectin benzoate the hatchability of *C. carnea* eggs ranged from 79.27 to 91.67 percent and was found to be less toxic. Further result was in accordance with the observations of [10] who have reported that no significant adverse effect was observed due to Imidacloprid at 0.28 ml/l and 0.58 ml/l on egg hatchability of *C. carnea*. However, [11] recorded moderate ovicidal action of Imidacloprid against *C. carnea*.

Mortality of larvae after 24 and 48 hours

Among the treatments, the lowest larval mortality was recorded by Spinosad (3.33%), followed by Imidacloprid (6.67%) and Diafenthiuron (6.67%). Our results generally agrees with [12] that reported spinosad was less toxic and proved safer to third instar larvae of *C. carnea*. On the other hand, present result differ from the observation of [13] With regard to Diafenthiuron it didn‘t show any toxic effect to larvae and could be declared as harmless insecticide at low recommended dose to *C. carnea* where higher doses might be slightly harmful. The Emamectin benzoate with novel mode of action was generally more selective and required at lower rate than conventional insecticides and has shown low to moderate impact on beneficial insects. Highest mortality was recorded by Chlorantraniliprole (26.67%), which was significantly different from other treatments.
Furthermore! Results examined after 48 hours, the maximum mortality of *C. carnea* was recorded (46.67), in Chlorantraniliprole and Emamectin benzoate respectively. Thiamethoxam recorded 33.33, percent mortality followed by Spinosad (36.67%) and Emamectin benzoate (40.00%). Present results are in conformity by [8] who evaluated that Diafenthiuron did not show any adverse effect on egg hatchability and larval development both by contact and as stomach poison. As per the safety norms, Diafenthiuron could be declared as a harmless insecticide and reporting that low and recommended dose of Diafenthiuron was harmless to *C. carnea* though higher dose was slightly harmful. Among the treatments, least mortality was caused by Imidacloprid (13.33%) followed by Diafenthiuron (20.00%). This investigation also obtained by [14] that Imidacloprid showed low toxicity to *C. carnea* larvae in dipping test.

Effect of insecticides against pupation and adult emergence

Imidacloprid showed highest pupation (83.33%) followed by Diafenthiuron (80.00%). These results agreed by [15] whom observed that the Diafenthiuron found maximum 96.30, percent pupation and 90.00, pupation with Imidacloprid 95.65. Thiamethoxam and Spinosad recorded 66.67 and 63.33 percent respectively, and Emamectin benzoate (60.00%). [16] Have obtained 84.62 percent pupation with Thiamethoxam, 71.43 with Spinosad and 90.00 per cent with Emamectin benzoate which were said to be harmless as observed in the present study. However, lowest pupation of (43.33) was seen in the Chlorantraniliprole which was significantly different from other treatments. With regard to maximum adult emergence, 80.00 percent was recorded by Diafenthiuron which followed by Imidacloprid (73.33%). Similarly to the present result, [15] examined highest adult emergence 92.59 % with Diafenthiuron and least of 50 percent with Chlorantraniliprole. On the other hand, Emamectin benzoate and Spinosad have recorded 56.67 and 60.00 % adult emergence respectively. [16] Also found 63.33 with Spinosad and more than 70 percent with Emamectin benzoate.

Table 1 - Effect of Different insecticides on *C. carnea*

Treatments	Dose	Egg hatchability (%)	Egg Mortality (%)	24 hrs Mortality %	48 hrs Mortality %	Pupation %	Adult Emergence %
Chlorantraniliprole 18.5 SC	0.3 ml/1	66.67b	33.33b	26.67d	46.67d	43.33a	40.00a
Imidacloprid 17.8 SL	0.4 ml/1	86.67b	13.33a	6.67ab	13.33b	83.33c	73.33de
Spinosad 240 SC	0.3 ml/1	73.33c	26.67ab	3.33ab	36.67c	63.33b	60.00bc
Emamectin benzoate 1.9 E	0.5 ml/1	71.67cd	28.33bc	10.00bcd	40.00cd	60.00b	56.67b
Thiamethoxam 25 WG	0.2 g/1	51.67ab	48.33c	16.67c	33.33c	66.67b	66.67cd
Diafenthiuron 50 WP	1.0 g/1	83.33a	16.67a	6.67ab	20.00b	80.00c	80.00e
S.E. M ±		2.21	1.10	2.82	2.52	2.52	3.09

4. CONCLUSION

From this study, it could be concluded that Diafenthiuron and Imidacloprid showed least toxic effect towards *C. carnea* at all stages and can be used along with *C. carnea* under field condition.

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6. CONFILICT OF INTEREST

The authors have declared that there is no conflict of interest regarding the publication of this article.

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