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EFFECT OF SOME BIOINSECTICIDES ON THE PREDATOR *Chrysoperla carnea* (STEPHENS).

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ABSTRACT

Chrysoperla camea (Stephens), (aphid lion, green lacewing) larvae active predators and feed on aphids and other small insects. It has been used in the biological control of insect pests on crops. While The adults feed on nectar, pollen and aphid honeydew and are not predatory

Tracer (Spinosad) is primarily a stomach poison with some contact activity and is particularly active against Lepidoptera and Diptera.

In this study, tested the effect of bio-pesticide Tracer on percentage of mortality on different larval instars of aphid lion,

The results showed 63% mortality of first instar larvae after 72 h of exposure in high concentration when recorded 52% and 30% mortality of second and third instars larvae after the same time

The study has proved that, the mortality percentages for the first instar larvae were high, But they modularity in second instar and no significant in third instar.

INTRODUCTION

The adverse impact of insecticides on natural enemies can be mitigated through choice of insecticide, dosage, or timing of insecticide application. Biological control and selective insecticides proved to be compatible tactics in Integrated Pest Management (IPM) programs (Galvan *et al.* 2005). Integrating biological control with selective insecticides also can reduce the number of insecticide applications (Hutchison *et al.* 2004). The role of generalist predators as effective control agents is being supported by both biocontrol theory and practice (Symondson *et al.* 2002)

Chrysoperla carnea (Stephens), known as the common aphid lion or green lacewing, is an insect in the Chrysopidae family. The adults feed on nectar, pollen and aphid honeydew and are not predatory, but the larvae are efficient biocontrolling predators against many key pests including aphids, whiteflies, young larvae and eggs of Lepidoptera, mealybugs, spider mites and soft bodied arthropods (El-Arnaouty and Ferran, 1993 ; Hassan, 2003). It can be mass reared in the laboratory and released against pests in field and green houses (Mirnoayedi, 2001).

Tracer (Spinosad) is primarily a stomach poison with some contact activity and is particularly active against Lepidoptera and Diptera (Xian-Hu *et al.* 2008).

Tracer is a neurotoxic insecticide produced by fermentation of an actinomycete. Tracer is classified as an environmentally and toxicologically reduced risk material and has been embraced by IPM practitioners as a biorational pesticide (Salgado 1998). According to a recent review by (Williams *et al.* 2003), among 25 parasitoid species tested, 78% of the laboratory studies and 86% of the field studies reported that Spinosad was harmful to the parasitoids. The objective of this study is to evaluate the toxicity of Spinosad on *C. carnea* larvae under laboratory conditions with the purpose of generating IPM guidelines for natural enemy conservation.

MATERIALS AND METHODS

Tested insect:

The predator, *Chrysoperla carnea* (Stephens) was initially collected from the cotton field and reared on Angoumois grain moth, *Sitotroga cerealella* (Olivier) at the same mentioned laboratory conditions. The adults of *C. carnea* were sexed and 10 pairs of adults were placed in plastic boxes (22x13x10 cm) covered with black muslin for deposited eggs and changed daily. Drops of Semi artificial diet solution consists of 2g yeast extract, 1g fructose and 1cm distilled water were provided on tape stacked on the muslin cover. The deposited eggs were collected daily and kept in glass jars until hatching. The hatched larvae were reared on *S. cerealella* eggs. (Hassan and Ezz 2009).

The original colony of the predator was supplied from the Plant Protection Research Institute, Agriculture Research Centre. Mass rearing was carried out in the laboratory of the Economic Entomology Unit, Plant Protection Department, Desert Research Center.

Toxicity bioassays:

A sample of the commercial formulation of Spinosad (Tracer) was obtained.

Tracer was applied at the concentration of 250, 500, 1000 and 1500 ppm for first instar and 500, 1000, 1500 and 2000 ppm for second and third instars larvae. Each dose was replicated 5 times, with 20 individuals per replication. Required solutions were prepared in distilled water. A Petri dish was lined with damp filter paper, and allowed to dry up for 1 h under laboratory conditions. In all experiments for a treatment, 15 larvae were placed into plastic Petri dishes (150 x 15 mm). The larvae were fed on eggs of *S. cerealella* throughout the experiment. The Petri dishes were placed in incubators set at 27°C and 60±5% relative humidity. Mortality was recorded after 24, 48, and 72 h of exposure. Larvae were considered dead if they did not move when prodded with a soft paint brush.

Statistical Analysis and Assessment of Results:

Data obtained in different tests were subjected to statistical analysis to evaluate the relative efficiency of the isolates. Mortalities were corrected for the natural mortality according to (Abbott's formula, 1925).

The corrected percent = (Observed %-Control %) x 100/ (100-Control %)

The LC_{50} and LC_{90} values were calculated according to probane program.

RESULTS AND DISCUSSION

First instar:

The tested concentrations of Tracer 250, 500, 1000 and 1500 ppm showed lethal effects to *C. carnea* larvae 26, 34, 42 and 63% respectively, the mortality in all treatments was significantly more than in untreated (control) 7% (Table 1). Survival of *C. carnea* treated with Tracer at 250 ppm was significantly higher than that of larvae which were treated with Tracer at 250 ppm. There was a highly significant mortality effect of the concentration of Tracer on first instars after one day post exposure 7% increasing through to 3 days post exposure 4%.

Table (1): Mortality percentage of first instar larvae of *C. carnea* treated with different concentration of tracer after different hours of treatment.

Conc. (ppm.)	Mortality % after indicated hours			Total mortality %	
	24	48	72	Obs.	Corr.
0	1	2	4	7	0
250	11	9	6	26	20.43
500	14	11	9	34	29.03
1000	18	15	12	45	40.86
1500	25	23	15	63	60.21

Second instar:

In these experiments we used 500, 1000, 1500 and 2000 ppm of Tracer. A direct relationship was detected between mortality rate and Tracer concentration. Mortality percentages were increased significantly according to the concentration of Tracer to which larvae were exposed from 19% to 52% after the initiation of the experiment (Table 2). When the mortality in control record 7% after 3 days, whereas 3 day post treatment, mortality was moderately.

Table (2): Mortality percentage of second instar larvae of *C. carnea* treated with different concentration of tracer after different hours of treatment.

Conc. (ppm.)	Mortality % after indicated hours			Total mortality %	
	24	48	72	Obs.	Corr.
0	1	2	4	7	0
250	9	6	4	19	12.90
500	14	10	7	31	25.80
1000	16	13	11	40	35.48
1500	26	15	11	52	48.38

Third instar:

Survival of third instars of *C. carnea* treated with Tracer did not differ significantly from the untreated control. After Three days of exposure, significantly lower mortalities, ranging from 10, 16, 23 and 30% at 500 to 2000 ppm, respectively, were recorded on third instar (Table 3). Tracer was much less effective on third instar of *C. carnea*.

Table (3): Mortality percentage of third instar larvae of *C. carnea* treated with different concentration of tracer after different hours of treatment.

Conc. (ppm.)	Mortality % after indicated hours			Total mortality %	
	24	48	72	Obs.	Corr.
0	1	2	4	7	0
250	5	2	3	10	3.22
500	7	5	4	16	9.67
1000	11	7	5	23	17.20
1500	13	9	8	30	24.73

LC_{50} and LC_{90} of Tracer:

The LC_{50} and LC_{90} values of the tested potent insecticide were computed from the data obtained on the percentage of larval mortality at each of the tested concentration through probit analyses within 95% confidence limits. The calculated LC_{50} and LC_{90} values recorded 1184.3235, 10779.55 for first instar larvae, 2255.0893, 11842.6490 for second instar larvae and 4527.7274, 20480.6430 for third instar larvae, respectively, (Table 4). On the basis of LC_{50} and LC_{90} values, first instars larvae of *C. carnea* were more susceptible than the other two larval instars.

Table (4): LC_{50} and LC_{90} (ppm.) at Confidence limits (95%) of potent Tracer against larvae of *C. carnea*.

Larval stage	LC_{50} (Confidence limits at 95%)	LC_{90} (Confidence limits at 95%)
First instar	1184.3235 (931.55 - 1715.49)	10779.55 (5296.05 -43801.69)
Second instar	2255.0893 (1805.54 -3371.03)	11842.6490 (6396.42 – 42471.13)
Third instar	4527.7274 (3027.94 -12047.73)	20480.6430 (8804.18 -1.73617E+05)

However, the results of this study showed that Tracer at the high concentration resulted in 63% mortality of first instar larvae after 72 h of exposure. Selectivity of Tracer on predators is under discussion because Tracer is highly toxic by ingestion treatment to the earwing *Doru taeniatum* and to a lesser extention to the staphylinid *Aleochara bilineata* (Cisneros *et al.* 2002). (Viñuela *et al.* 1998) reported a significant mortality of *Podisus maculiventris* (Say) nymphs when treated via ingestion and topical treatment with 15 and 50 mg. Tracer also showed high toxicity to second instars of predatory thrips *Scolothrips takahashii* (Priesner) and lady beetle *Stethorus* *japonicus* (Kamiya) (Mori and Gotoh 2001), and sublethal effects to adults of predatory mites and lacewings (Williams *et al.* 2003). In a particular case of *C. carnea* (Medina *et al.* 2001) pointed out that Tracer is practically non-toxic to larvae, it was show to be harmful to adults. It is evident that the safety profile of Tracer is not so clear. The effect of Tracer on *C. carnea* strongly depends on the concentration applied.

This study provides data on a comprehensive examination of the acute toxicity of commonly used agricultural insecticide to various stages of *C. carnea*. Overall, results of the laboratory studies indicated that Tracer was moderately toxic to *C. carnea* compared with conventional insecticides. The use of this insecticide would likely contribute to successful conservation of biological control in crops where common green lacewings are the most common natural enemies.

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تأثيربعض االمستحضرات البيولوجيه علي المفترس أسد المن ***Chrysoperla carnea* (Stephens).**

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تكمن الأهمية الأقتصادية للمفترس أسد المن في افتراسها لكثير من الأفات الزراعية والحشرات الضارة مثل يرقاته المن والتربس والذباب الأبيض والحشرات القشرية والفقس الحديث لعديد من حرشفية الأجنحة والتي تسبب خسائر اقتصادية للمحاصيل الزراعية، بينما تعيش الحشرات الكاملة في معظم الأنواع معيشة حرة غير مفترسة.

التريسر(سبينوساد): هو ناتج تخمر بكتريا أكتينومايست *Saccaropolyspora spinosa* ويتبع رتبة جديدة من رتب كيمياء المبيدات تسمى (الطبيعية) وهو مبيد حيوى له مدى واسع لمكافحة كثير من الآفات الحشرية الضارة. يتميز عن غيره من المبيدات التقليدية بالجمع بين قوة وسرعة القتل بالإضافة إلى الآمان على الإنسان والبيئة والحشرات النافعة.

وفي هذة الدراسه تم أختبار تأثير المبيد الحيوي التريسر علي الأعمار اليرقيه المختلفه للمفترس أسد المن وقد وجد ان نسبة الموت بالنسبه للعمر اليرقي الاول ٦٣% عند أستخدام اعلي تركيز بعد ٧٢ ساعه من المعامله في حين كانت ٥٢% و٣٠% بالتوالي بالنسبه للعمر الثاني والثالث بعد نفس المده. وقد اثبتت الدراسه ان نسب الموت للعمر اليرقي الاول كانت عاليه في حين كانت متوسطه ليرقات العمر الثاني وتعتبر غير مؤثره ليرقات العمر الثالث.