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Release of *Chrysoperla carnea* (Stephens) (Neruoptera : Chrysopidae) as a Biological Control Agent against Tetranychid Mites, *Tetranychus urticae* (Koch), on *Phaseolus vulgaris* L. Plantations under Semi Field Conditions.

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ABSTRACT

This study was outlined to evaluate the effect of releases second larval instar of *Chrysoperla carnea* (Stephens) at different predators: prey ratios (P:p) to control tetranychid mites on the kidney bean, *Phaseolus vulgaris* L. plants under semi field conditions during summer 2016. The results revealed that the effective control of *Tetranychus urticae* Koch was realized after six days from introducing *C.carnea* larvae when the P: p ratio was 1:10 or 1:20, while at higher ratios (1:40 and1: 50), the tetranychid mites numbers decreased after 12 days from the release. The results assured that the numbers of kidney bean tetranychid mites decreased after 6 days from release by 100 and 86.6% at 1:10 and 1:20 P: p ratios, respectively.While the larvae of *C.carnea* which released after nine days the percentage redaction of *T.urticae* was100,100, 93.3,90.2 % and 84.7 days with P:p releases of 1:10, 1:20, 1:30, 1:40 and1:50 , respectively. The obtained results showed that the number of tetranychid mites remained zero for a period of 12 days after the release. Regression analysis demonstrated a strong negative relationship between P:p ratios and reduction percentage of the Kidney bean tetranychid mites.

Keywords: *Chrysoprela carnea* , predator: prey ratio, *Tetranychus urticae*.

INTRODUCTION

In recent years, the Kidney bean tetranychid mites*Tetranychus urticae* koch, (Tetranychidae) has become a serious mites pest of several economic vegetable crops including Kidney bean necessitating the need to investigate the efficacy of the lacewing, *Chrysoprela carnea* (Steph) as a biological agent against many sucking pests (Cander and Duelli ,1984).The common green lacewing, *C. carnea* appears to be a good candidate for use in I.P.M programs (Aziz .,2007) . A control option for this insect pests reviewed her includes using 2nd instar larvae of *C. carnea* in an attempt to control *T.urticae* on Kidney bean in green house.

Methods were used to quantify the effect of predators on *T.urticae* populations (Rautapaa ,1977 ; Hanafy, 2004, and EL- Masselati *et al* , 2017). One common technique is to use field cage to enclose known numbers of predatory species with known numbers of mites species.

Therefore, the aims of the current study were to evaluate the optimal predator: prey ratio of second larval instar *C. carnea* to control *T.urticae* infesting kidney bean plants under semi field conditions.

MATERIALS AND METHODS

The experimental traits were conducted at Mansoura district, Dakahlia Governate , during the summer of 2016. The *Phaseolus vulgaris* L. plants under cages were sprayed with Malathion 57%. E.C. to kill any insects on the plants before releasing the predators. Two weeks after spraying, plants were infested with two- spotted spider mites*T.urticae* (ten females and two males per/pot).Stems of kidney bean plants were ringed with sticky material (Tangle-foot) to prevent mite escape. Kidney bean pots were maintained under a net green house.The aim of this experiment is to study the efficiency of 2nd instar larvae of *C.carnea* as bio control agent against *T.urticae*.The second larval instar of *C.carnea* were obtained from mass rearing unit of the laboratory, which were used for transportation of larvae . After five days kidney bean plants were divided into six treatment groups , each one consists of four replicate pots .The first group of pots was received ten second larval instar of *C.carne*a per/pots the second group received 20 predators individuals per/pots , the third groups received 30 predators individuals per/pot ,the fourth groups received 40 predators individuals per/pot but the fifth group received was 50 predators individuals per/pot. While the sixth group was left without releasing lacewing larvae and served as a control . Both prey and predator individuals were transferred to the kidney bean leaves by using a fine camel hair brush. Counts of motile stages of both *T.urticae* and *C.carne*a was estimated in each pot just before predator release and then every 3 days by a special magnified hand lens(20x).

Data analysis:

Tetranychid mites numbers at predator: prey ratios were subjected to one way analysis of variance (ANOVA), and the means separated using Duncan's Multiple Range Test (Costat, 1990). In addition, simple linear regression between predator: prey ratio and reduction percentage was run .The reduction percentage was adjusted to changes in control according to Abbott (1925).

Abbott's formula :

$$\text{Reduction \%} = \left(1 - \frac{\text{n in T. after treatment}}{\text{n in Co. after treatment}}\right) * 100$$

Where : n = Insect population , T = treated , Co = control

RESULTS AND DISCUSSION

Effective control by the *C.carnea* larvae of two spotted tetranychid mites populations was achieved after nine days from release of the 2nd larval instar with predator: prey ratios of 1:10 and1 :20 (Table 1). The reduction percentage of these ratios was 62.5 and 48 after one day, 86.6 and 69.8 after three days, 100 and 86.6 after sex day, 100 and100 % after nine days, respectively. It was observed that the number of tetranychid mites at these release rate remained 0 for a period of 9 days after release of the predaceous 2nd instar larvae.

When the predator: prey ratios was 1:30, the reduction percentage was 44 , 62 and 77.9 after one, three and six days 93.3 and 100, % after nine and 12 days from introducing the predators, then the tetranychid mites numbers remained at 0 after 12 days from release. Whereas, at 1:40 and 1:50, the tetranychid mites reduced by 32.6 and 30.4 after one days, 54 and 46.2 after three days, 67.8 and 62.2 after six days 90.2 and 84.7% after nine day, 99.3 and 98.9% after 12 days,(Table1) .

Based on these results, effective control of *T. urticae* was obtained after nine days by introducing 2nd larval instar of the *C. carnea* P:p ratios of 1:10 or 1:20, while at lower ratios (1:30 ; 1:40 and 1: 50) of *C. carnea* larvae ,effective

control was not realized 12 days from release. The statistical analysis showed that there was a significant decrease of the two spotted tetranychid mites numbers of predators as bio control agents to control *Aphis gossypii* Glov, *Myzus persica* (Sulzer) . and *Bemisia tabaci* (Gennadius) in different areas of the world (Ermolaev,2003) . Hanafy (2004) studied in Egypt the efficacy of releasing 2nd larval instar of *C. carnea* at different levels (3, 6 and 9 larvae / plant) to control *A. gossypii* , *M. persica* and *B. tabaci* attacking cucumber (Medina variety) and came to a similar conclusion with the obtained results in the present study which revealed that there was a positive relationship between the different levels and the reduction percentage of the treated pest . Abd El-Salam *et al* (2005). recoded that *C. carnea* larvae a predator: prey ratio of 1:15 yielded excellent control of *A. gossypii* with the reduction percentage of 88.3% after one day from the release.

Table 1. Percentages reduction of *T. urticae* after releaseing the 2nd larval instar of *C. carnea* at different predator: prey ratios under semi field conditions.

Days after release	P: p ratio				
	1:10	1:20	1:30	1:40	1: 50
1	62.5	48.0	44.0	32.6	30.4
3	86.6	69.8	62.0.	54.0	46.2
6	100	86.6	77.9	67.8	62.2
9	100	100	93.3	90.2	84.7
12	100	100	100	99.3	98.9

Based on simple linear regression between P: p ratios of 2nd larval instar of *C. carnea* and reduction percentage of the tetranychid mites, there were negatively strong relationship after one, three and six days from the release of the *C. carnea*. The regression equations were, y =66.63 - 0.721 x, y =92.67 -0.965 x , y = 107.2 x + 0.966 x, y =105.2 -0.404 x and, y =100.5 -0.029 x respectively. The values of R^2 were 0.940, 0.966, 0.981, 0.944, and 0.799 in succession (Fig. 1,2,3,4 and 5). This result closely matches with those Abd El-salam *et al* (2005) which studied that the regression analysis between P: p ratios of *C.carnea* to control *A.gossypii* negatively strong relationship after 1 and 12 days from the release of predators. The reduction rate increased with lower P:p ratios and vice versa.

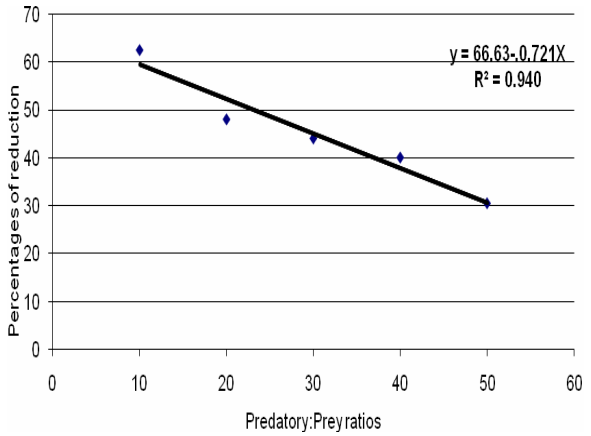

Fig. 1. Simple linear regression between predator: prey ratios(1:10) (X) and the reduction percentages (Y) of *C. carnea* 2nd instar larvae under semi field conditions.

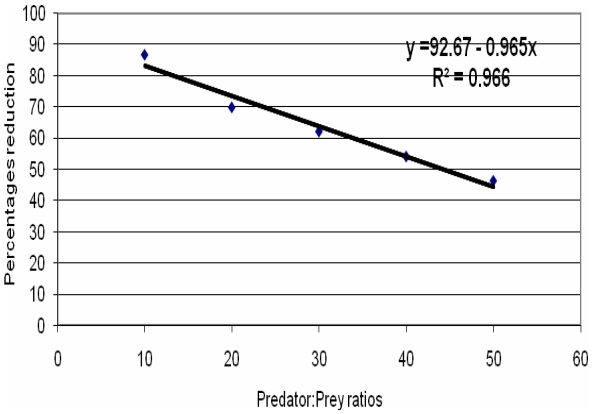

Fig. 2. Simple linear regression between predator: prey ratios(1:20) (X) and the reduction percentages (Y) of *C. carnea* 2nd larvae under semi field conditions.

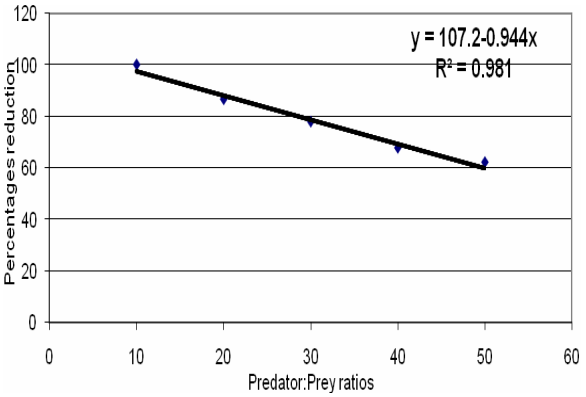

Fig. 3. Simple linear regression between predator: prey ratios(1:30) (X) and the reduction percentages (Y) of *C. carnea* 2nd larvae under semi field conditions.

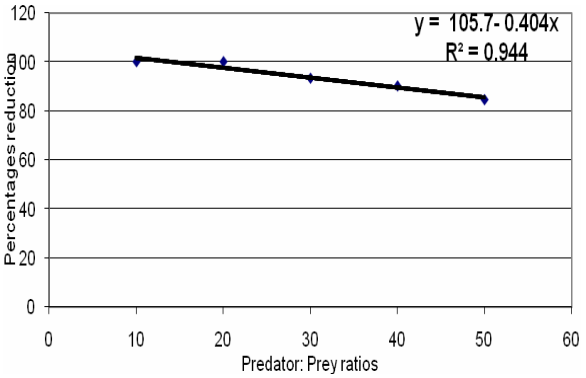

Fig. 4. Simple linear regression between predator: prey ratios (1:40) (X) and the reduction percentages (Y) of C. carnea 2nd larvae under semi field conditions.

In the check cages (without predator release), the numbers of kidney bean mites per plant increased over the course of the study: 191.9, 283, 510 on days X,Y,and Z,respectively.. Up to 1000%, increasing rate of kidney bean tetranychid mites occurred after 12 days from initial artificial infestation (Fig. 6). The number of mites increased sharply resulting in severe damage to the kidney bean plants. These results confirmed the effect of the predators in suppressing

the number of Kidney bean tetranychid mites. Based on the regression analysis, there was a highly negative relationship between initial artificial infestation of *T. urticae* and average final of increasing number of the kidney bean tetranychid mites.

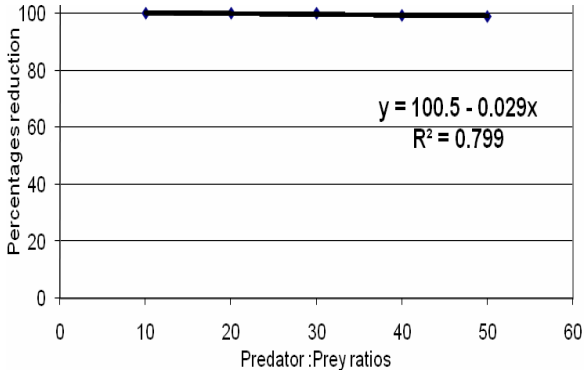

Fig. 5. Simple linear regression between predator: prey ratios (1:50) (X) and the reduction percentages (Y) of *C. carnea* 2nd instar larvae under semi field conditions.

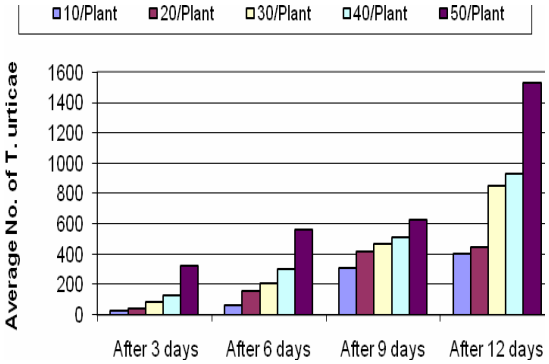

Fig. 6. Average of increasing numbers of *T. urticae*- under semi field conditions on Kidney bean Plants were initially inoculated with10 ,20 , 30 ,40 and 50 tetranychid mites/plants.

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أطلاق المفترسِ اسد المن *Chrysoperla carnea* (Stephens) كوسيلة مكافحة بيولوجية للعنكبوت الاحمر على نباتات الفاصوليا تحت ظروف شبه حقلية.

فاطمة محمد فتحى صالح ، علياء عبد القادر توفيق و مرفت قاسم جبر الشربينى

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هدفت هذه الدراسة إلي تقيم تأثير إطلاق كل من يرقات العمر الثانى للمفترس اسد المن وذلك بنسب إطلاق مختلفة لمكافحة العنكبوت الأحمر على نباتات الفاصوليا تحت ظروف شبه الحقلية و ذلك خلال موسم 2016 . أظهرت الدراسة كفاءه يرقات العمر الثانى لاسد المن تحقيق مكافحة حيوية مؤثرة للعنكبوت الأحمر بعد 6أيام من الأطلاق في حاله نسب الأطلاق 1: 10 ، 1: 20 بينما فى نسب الاطلاق 1: 30 ، إنخفضت أعداد العنكبوت الأحمر بعد 9 يوم من نسب الأطلاق المختلفة نسب الاطلاق 1: 30 و40:1 ، إنخفضت أعداد العنكبوت الأحمر بعد 12يوم و بناءا على نتائج التحليل الاحصائى وجد فرق معنوى بين أعداد العنكبوت الأحمر عند نسب الأطلاق المختلفة و كذلك بين النسب الزمنية (الأيام) بعد إطلاق يرقات اسد المن. و أوضحت النتائج ان أعداد العنكبوت الأحمر قد أنخفضت بنسبة 86.6 و100%عند الأطلاق 10:1 ، 20:1 وبعد سته يوما من الاطلاق على التوالى .بعد تسعه ايام لم تتواجد أى أعداد من العنكبوت الأحمر على الاطلاق. بعد 12 يوم من الاطلاق كان معدل الانخفاض (7. 84 - 9. 98- 3. 99- 100 -100%) عند نسب الاطلاق (1: 10-1:20-1:30-1:40و1:50)على التوالى. و بناء على تحليل الأنحدار بين نسب الأطلاق المختلفة للمفترس أ سد المن من ناحية ونسب الأنخفاض في أعداد العنكبوت الأحمر من ناحية أخرى اتضح وجود علاقة سالبة قويه بينها وهذا يعنى أن نسب الأنخفاض تتزايد مع نسب الأطلاق العاليه للمفترس والمنخفضه من العنكبوت الاحمر.