

Comparative study between seven selective insecticides and some bio control agents for controlling *Helicoverpa armigera* on cotton

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دراسة مقارنة بيم استخدام لعض عناصر المقاومة الحيوية وسلعة مبيدات انتخابية في مقاومة
Helicoverpa armigera دودة جوز القطن الشوكية على محصول القطن

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المستخلص

تم في هذه اختبار متطفل البيض *Trichogramma chilonis* والمفترس *Chrisoperla carnea* بوجود سبعة مبيدات منتخبة . نفذت هذه الدراسة في الحقول التجريبية لوزارة العلوم والتكنولوجيا , الدائرة الزراعية للعام 2003-2005. هدفت هذه الدراسة إلى تقييم كفاءة عناصر مكافحة الحيوية (مفترسات ومتطفلات) بوجود المبيدات المنتخبة لمكافحة أو الحد من أضرار أهم آفات القطن *Helicoverpa armigera* . أظهرت الدراسة أن أعداد الآفة والمفترس ونسبة التطفل على 25 نبات من القطن قلل الرشوة الأولى قد تراوح من 0.66-3.67 , 3.33-7.66 ومن 24.3-40.00 للآفة والمفترس والمتطفل بوجود المبيدات المنتخبة على التوالي. كذلك أظهرت الدراسة أن أعداد الآفة والأعداء الحيوية مع الرشوة الأولى بوجود المبيدات المنتخبة من 0.66-2.66 , 1.00-4.66 ومن 10.00-23.00 , كذلك أظهرت الدراسة أن أعداد الأعداء الحيوية والآفة بعد الرشوة الثانية قد تراوح من 0.00-3.66 , 1.00-6.00 ومن 8.00-51.00 للآفة والمفترس والمتطفل على التوالي . أخيراً أظهرت الدراسة أن إعداد الأعداء الحيوية وكمية الحاصل لمحصول نبات القطن بالهكتار بعد الرشوة الثالثة قد ازداد في جميع المعاملات عدا مبيد ال Endosulfan كما أن كمية الحاصل قد تراوحت بين 24.00 - 34.00 كغم للهكتار , كما أظهرت الدراسة أن هنالك فرقا واضحا في كمية الحاصل بوجود مبيدي Endosulfan و Profenofos مقارنة بتجربة السيطرة .
كلمات مفتاحية : أسد المن, متطفل بيض , دودة جوز القطن الأمريكية , مقاومة حيائية

Abstract

This study tested egg parasitoid *Trichogramma chilonis* and the predator *chrysoperla carnea* in present of seven selective insecticides. The study was carried out at the field experiments of ministry of Science and Technology /Agric and Biol. Res. Center 2003 – 2005 and aimed to check the efficacy of the biological control agents as well as the selective insecticides for controlling or reducing the population density of the major pest on cotton *Helicoverpa armigera*.

The results showed that the population counts of *H. armigera* and *C. carnea* in 25 plant and parasitization percent by *T. chilonis* prior to the first spray were ranged from, 0.66 to 3.67, 3.33 to 7.66 and 24.30 to 40.00 for *H. armigera*, *C. carnea* and parasitization rate by *T. chilonis* in present of all the selective insecticides, respectively. The results also indicated that the number of the pest and Biological control agents after the first spray with the selective insecticides were ranged from 0.66 to 2.66, 1.00 to 4.66 and 10.00 and 23.00 for *H. armigera*, *C. carnea* and parasitization rate by *T. chilonis*, respectively, while the data of the current study also showed that the number of Biological control agents and the pest *H. armigera*, after second spray were fluctuated between 0.00

to 3.66, 1.00 to 6.00 and from 8.00 to 51.33 for *H.armigera*, *C.carnea* and parasitization rate by *T. chilonis*, respectively.

Finally, data regarding the population of the test insects and yield per acre from each treatment after third spray with the same insecticides showed that the population of *C. carnea* were increased in all treatments after third spray except Endosulfan treated plots, on the other hand parasitization rate by *T. chilonis* increased in all treatment except Profenofos that reduced from 12.00 percent to 8.00 percent after third spray. Yield of seed cotton was found maximum 3200 Kg/ hectare in these plots where Thiodicarb and Spinosad were applied and next highest yield was obtained in Indoxacarb and Cypermethrin treated plots, showing a yield of 2800 Kg and 2400 Kg/ hectare, respectively. Finally the results showed that there was no difference in the yield of seed cotton between Endosulfan and Profenofos, treated compared to control plot

Keyword: *C.carnea* , *T.chilonis* ,*H.armigera* ,Biological Control .

Introduction

In Pakistan Cotton (*Gossypium hirsutum*) crop has inevitably enjoyed an important place on account of its economic value and has, always strengthened the national economy. Consequently, this crop provides atonable livelihood to the farmers and to the workers of the various ginneries, textile mills and garment factories, (2, 3). Pakistan ranks 4th in cotton production and 3rd as an exporter of raw cotton to the world. Unfortunately, cotton crop like other field crops, is naturally vulnerable to many species of arthropod pests, right from the time of its germination to the final pick. Like most other cotton growing countries, Pakistan largely relies on pesticides for the control of cotton pests about 18195.2 tons of insecticides is considered to have been imported from 1980-1998 and the latest expenditure, on their import, has been reported to be a bout RS. 374000 millions, during 2000 – 2001, (7, 1). In Pakistan the agricultural researchers found that the using of commercial and noble insecticides in large quantities has been given a negative results and cause minimizing the yield of production for cotton. Due to this and according to all the reasons the experts started seeking for another approach for controlling the pests as well as to increase the yield production. One of the more important tasks is using the bio. Control agents or the IPM program (2) The curre study introduce the integrated pest management as unique method for controlling one of the key pest on cotton *Helicoverpa armigera* by using the bio- control agents(*Chrysoperla carnea* and *Trichogramma chilonis*) in presence of seven selective insecticides.

Materials and methods

1. Rearing of beneficial insects *Chrysoperla carnea* and *Trichogramma chilonis* in mass production (7)
 - A. for rearing the predator *Chrysoperla carnea* we used the eggs of *Sitotroga cerealella* with galatine capsules as new technique for this purpose.
 - B .for rearing the egg parasitoid *T. chilonis* we also used new technique for rearing and releasing in the field by using the egg of the same host *S. cerealella*
- 2 .Using of 7 selective insecticides (Abamectin, Cypermethrin, Indoxacarb , Endosulfan , Thiodicarb, Profenofos , Spinosad)along will the control Test.
A concentration, (0,125,250,500 and 1000) of each insecticide was used. Minimum of

160 insects (larvae) were tested, against of each of the insecticide treatment with the control test. 40 insect's divided in to four replicates containing 10 test- organisms in avail. The experiments were evaluated under the field conditions.

Results and Discussion

Tables (1, 2, 3 and 4), revealed that, the results of the integration between the chemicals and bio-control agents against the pest *H. armigera* under the field conditions , the tables also showed that the insecticides viz. Indoxacarb , Thiodicarb and Spinosid were found highly effective againts *H .armigera* and showed selectivity towards *C. carnea* and *T. chilonis* . Table -1 showed the results regarding the population of *H. armigera*, *C.carnea* and parasitization rate by *T.chilonis* prior to the first spray. The results also revealed that *H. armigera* , was controlled completely (0.00 larvae per 25 plant) in Thiodicarb , Profenofos and Spinosad treated plots after the first spray (table -2) , but the population rate remained the same (1.66 and 0.66) in Cypermethrin and Endosulfan treated plots in comparison with table -1 ; also the table showed that the number of *H .armigera* , was decreased from 1.33 to 0.66 per 25 plant in Abamectin treated plot (Tables.1 , 2) ,Respectively . Our findings are in agrement with results of (5), who was found that, Indoxacarb , Profenofos and Spinosad were highly effective against *H .armigera* , causing 100% mortality under the field conditions ,However (3) stated that Abamectin is weekly active effective most of the lepidopteron .

Table (1): Population of counts of *Helicoverpa armigera* and *Chrysoperla carnea* per 25 Plants and parasitization percent by *Trichogramma chilonis* prior to first spray

Treatment	<i>H. armigera</i>	<i>C.carnea</i>	Parasitization percent
T1. Abamectin	1.33	3.33	26.5
T2 = Cypermethrin	1.66	7.66	28.5
T3 = Indoxacarb	1.66	4.00	27.00
T4 = Endosulfan	0.66	4.66	40.00
T5 =Thiodicarb	3.67	5.00	24.30
T6 = Profenofos	1.66	3.66	36.33
T7 = Spinosad	2.33	5.00	35.00
T8 = Control	1.66	5.66	39.00

Table (2): Population of counts of *Helicoverpa armigera* and *Chrysoperla carnea* per 25 plants and parasitization percent by *Trichogramma chilonis* after first spray

Treatment	<i>H. armigera</i>	<i>C.carnea</i>	Parasitization percent
T1. Abamectin	0.667	3.00	14.00
T2 = Cypermethrin	1.667	1.00	10.00
T3 = Indoxacarb	0.330	0.00	23.00
T4 = Endosulfan	0.667	4.00	5.00
T5 = Thiodicarb	0.000	3.00	15.00
T6 = Profenofos	0.000	1.00	10.00
T7 = Spinosad	0.000	4.00	18.00
T8 = Control	2.667	4.66	21.00

The results also showed that, the population of *C. carnea* was increased after the first spray of Cypermethrin , Indoxacarb , Thiodicarb and Profenofos (Table -1) from 1.00 , 0.00 , 3.00 and 1.00 to 3.00 . 1.00, 6.00 and 2.00 per 25 plants Table-2, respectively .Drastic reduction in parasitization rate of *T. chilonis* was observed after the first spray, maximum parasitization was recorded in Indoxacarb treated plot 23 % per 25 plant and control plot 21% per 25 plant. Also parasitism rate did not exceed more than 18% in plots treated with all insecticides as shown in table 2..This result agreed with (5 , 6) , were they found that , parasitization rate by *T. chilonis* , was recorded highly in Indoxacarb and water treated plot for controlling of the American Boll Worm *H.armigera* , under field conditions .Table- 3 , explain that , the values for population counts of *H .armigera* , was completely controlled and 0.00 counts were observed in Thiodicarb and Spinosad treated plot , while in plot treated with Endosulfan the number of *H. armigera* ,remained 0.66 larvae per 25 plant after the first and second sprays , while the population was increased from 1.66 to 3.66 , 0.00 to 2.66 and 2.66 to 3.00 in Cypermethrin , Spinosad and control treated plots ,respectively .Our result agreed with (4 , 5) , who indicated that , Thiodicarb , Spinosad , Profenofos were highly toxic and caused 100% mortality for *H . armigera* under field conditions . Population of *C. carnea* increased in all treatments after second spray (Table- 3), while parasitization rate by *T .chilonis*, was increased in all treatments except Abamectin , Cypermethrin and Thiodicarb treated plots.

Table (3): Population of counts of *Helicoverpa armigera* and *Chrysoperla carnea* per 25plants and parasitization percent by *Trichogramma chilonis* after second spray

Treatment	<i>H. armigera</i>	<i>C.carnes</i>	Parasitization percent
T1. Aba mectin	0.33	3.66	10.00
T2 = Cypermethrin	3.66	3.00	8.00
T3 = Indoxacarb	1.00	1.00	34.33
T4 = Endosulfan	0.66	4.66	8.33
T5 = Thiodicarb	0.00	6.00	10.00
T6 = Profenofos	2.66	2.00	12.00
T7 = Spinosad	0.00	6.00	35.00
T8 = Control	3.00	6.00	51.33

Finally, the yield seed of cotton which was founded maximum i.e. .32000 Kilogram / hectare in these plots where Thiodicarb and Spinosad were applied. Next highest yield was obtained in Indoxacarb and Cypermethrin treated plot showing yield of 28000 and 24000 Kilogram / hectare, respectively.

Our results were agreed with (10,13and 6), who indicated, that Spinosad provide broad spectrum worm control with conservation of beneficial insects. According to (4), cotton aphid population were controlled by beneficial insects (Predators and Parasitoides) under Spinosad , similar results has also been reported by (8), who proved that Thiodicarb affords protection to squares and to the major predators in cotton fields , favoring natural control .

Table (4): population of counts of *Helicoverpa armigera* and *Chrysoperla carnea* per 25 plants and parasitization percent by *Trichogramma chilonis* after third spray and yield of seed cotton recorded from plots, treated with different insecticides.

Treatment	<i>H. armigera</i>	<i>C.carnea</i>	Parasitization percent	Yield (Kg/ha)
T1. Abamectin	3.00	6.00	29.33	2300
T2 = Cypermethrin	1.66	4.00	12.00	2400
T3 = Indoxacarb	0.66	6.00	54.00	2800
T4 = Endosulfan	1.66	3.00	15.00	2100
T5 = Thiodicarb	2.00	12.00	11.00	3200
T6 = Profenofos	2.66	3.00	8.00	3200
T7 = Spinosad	1.00	14.00	40.00	3200
T8 = Control	4.00	11.00	62.00	2100

After field experiments we concluded that, Spinosad, Thiodicarb Indoxacarb were found To effective in field application, Profenofos was toxic for tested beneficial under field conditions. So, Profenofos was not recommended for field use with *C.carnea* as it reduced predator population but increase the crop yield.

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