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EFFICIENCY OF SOME CONVENTIONAL INSECTICIDES ON CONTROLLING THE LARVAE OF THE BOLLWORMS *Pectinophora gossypiella* AND *Earias insulana*

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ABSTRACT

Field experiments were conducted at two successive growing seasons (2000 & 2001) at Sakha Agricultural Research Station to evaluate the efficiency of some conventional insecticides on the larvae of bollworms. Data showed that in general, pyrethroides were the most efficient compounds during the two seasons. The effect of all tested compounds seems to be cumulative from one spray to the other. It can concluded that most of the obtained percant of reduction reflected a moderate effect and so, repeated application of any insecticides during the same season must avoided.

INTRODUCTION

Cotton is grown in more than 60 countries and plays a major role in the economy of these countries. In fact, many insect species have been reported on cotton, and some of these species are regarded as major pests that can destroy the plants in a few days (Mireulle *et al.*, 1999). The pink bollworm *Pectinophora gossypiella* (Saund.) and the spiny bollworm, *Earias insulana* (Boisd.) are major pests attacking cotton in Egypt, which cause a severe reduction in its yield and quality (Rizk *et al.*, 1983 and Abou Kahla *et al.*, 1990).

There is a considerable body of literature documenting the efficiency of different insecticides on the bollworms during the last ten years in Egypt (Awad *et al.*, 1993, El-Feel *et al.*, 1993, Abo-Sholoa *et al.*, 1995, Khidr, 1996 a & b), El-Sorady *et al.*, 1998, Nassef and Watson, 1999 and Abu-Sholoa *et al.*, 2000).

The use of many conventional insecticide, for controlling the bollworms has been recommended by the Ministry of Agriculture in Egypt.

Based on the protocol of the Ministry of Agriculture, the current research was conducted in order to determine if some insecticides which still used in the field of bollworm's control are efficient or not. These insecticides are mainly pyrethroid comparing with O.P and carbamate insecticides.

MATERIALS AND METHODS

Experimental sites:

Experiments were conducted during 2000 and 2001 cotton growing seasons at Sakha Agricultural Research Station Farm. The cultivated cotton varieties were Giza 89 and Giza 86 for 2000 and 2001 seasons, respectively. Trails were carried out on an area of about one feddan. Treatments were arranged in a completely randomized blocks with four replicates. The area of each replicate was half kirate and four kirate was used as untreated control area and all agricultural processes were carried out as usual.

Experimental procedures:

According to the protocol of the Ministry of Agriculture, Four applications of each insecticide took place at two or three weeks intervals according to the insecticides. In other words the interval between each spray was three weeks in the case of the used pyrethroids, while it was two weeks only with O.P and carbamate compounds. The tested insecticides were used at their recommended concentrations. Insecticides were diluted with water 200 L/fed and sprayed using knapsack sprayer with one nozzle (Mod CP3). *The first spray took place on* 31st *of July and* 7th of August for pyrethroids and (O.P and carbamate) in the two seasons.

To evaluate the effect of the tested insecticides against cotton bollworms, samples of 100 green boll per treatment (25 bolls for each replicate) were taken at random and dissected. The initial percent of infestation *with bollworms was estimated immediately before the first spray* and then bolls samples and estimation level took place every week throughout the period of experiment. In order to measure the efficiency of the tested insecticides Henderson and Tilton equation (1955) was used to calculate the reduction percentage of the examined pest.

The used insecticides:

Synthetic pyrethroids:

1.Alphacypermethrin:

It is a racemete comprising (s)-α-cyano-3-phenoxybenzyl (IR, 3R)-3)2,2-dichlorovinyl)-2,2-dimethyl cyclopropane carboxylate and (R)-α-cyano-3-phenoxybenzyl (1S, 3S)-3 (2,2 dichlorovinyl) 2,2-dimethyl cyclopropare carboxylate. EC 10% at rate of 250 cm/fed.

2.Cypermethrin = sybarkel El-Naser

(RS)-α-cyano-3-phenoxybenzyl (*IRS-cis; trans-3-(2,2 dichloro-vinyl)*-2, 2 dimethyl cyclopropan carboxylate. EC 10% at rate of 600 cm/fed.

3.Cyhalothrin = karylot:

a 1: 1 mixture of (s)-α cyano-3-phenoxy benzyl (2)-(IR)-cis-3-(2-chloro-3,3,3-trifluoropropenzyl)-2,2 dimethyl-cyclopropane-carboxylate and (R) α cyano-3-phenoxy benzyl(2)-(TS)-cis-3 (2, chloro 3,3,3-trifluoropropenyl) 2,2-dimethyl cyclopropanecarboxylate. EC 2.5% at rate of 750 cm/fed.

4.Deltamethrin = Decis:

(S)-α-cyano-3-phenoxy benzyl (IR)-cis-3-(2,2-dibromovinyl) 2,2-*dimethy cyclopropane* carboxilate. EC 2.5% at rate of 750 cm/fed.

5.Fenpropathrin = Ram

(RS) α-cyano-3-phenoxybenzyl-2,2,3,3-tetramethyl-cyclopropanecarboxylate. EC 30% at rate of 500 cm/fed.

b.Organophosphorus:

1.Dursban (chlorpyrifos)

O, O diethyl-o-()3, 5, 6-tri-chloro-2-pyrinly phosphorothioate E.C. 48% at rate of 1 l /fed.

2.Byryban:

The active ingredient is chloropyrifos with the same aforementioned structure. EC 48% at rate of 1 L-/fed.

3.Carbamate:

1.Pyrophane

W.P 75% at rate of 300 g/fed.

RESULTS AND DISCUSSION

The efficiency of eight insecticides belonging to three different chemical groups, pyrethroides, O.P and carbamate) on the bollworms which infested cotton plants in Egypt was evaluated in a field trail at Sakha Agricultural Research Station. Trials were carried out at two following growing seasons (2000 and 2001). The number of the larvae of bollworms in the green bolls was recorded before and after treatment and so the percent of reduction was calculated.

Table (1): Mean number of cotton bollworms larvae and mean percent of reduction following application of insecticides during 2000 season.

Insecticides	Pretreat	1st spray		2nd spray		3rd spray		General mean	
		N	%	N	%	N	%	N	%
Pyrethroides:									
Alphacypermethrin	5	9.0	57 54	15.5	51.50	13.0	71.68	12.5	60.24
Cypermethrin	5	8.5	59.65	7.5	77.75	8.0	82.75	8.0	72.58
Cyhalothrin	3	7.0	46.93	10.5	61.18	7.5	87.75	8.33	65.89
Deltamethrin	4	9.0	46.10	9.5	44.32	4.5	72 79	7.67	54.42
Fenpropathrin	4	8.0	57.91	5.5	73.18	2.0	93.15	5.17	74.89
O.P									
Oursban	5	8.5	53.32	13.0	59.3	16.5	60.06	13.83	57.56
Byryban	3	10 5	17.72	16.0	15.40	11.5	58.14	12.67	30.43
Carbamate									
byrophone	4	9.5	44.20	14.5	42.83	18.0	51.32	14.0	46.14

N = number of bollworm larvae/100 green bolls.
% = Percentage of reduction.

The obtained results are presented in Tables (1) and (2). Data in Table (1) indicated that at the growing season 2000, although the tested pyrethroid in general can be considered the most efficient compounds but their effect is moderate. In term of figure fenpropathrin although prove to be the superior in the current evaluation but the corresponding value of percentage of reduction after the three spray was only 74.89 which is not satisfying ratio in this respect. Among the tested pyrethroids, fenpropathrin was the most efficient compound while deltamethrin was the least toxic one. The efficiency of the tested pyrethroids seems to be chemical structure dependent. In other words, cypermethrin in which dichloro substitution is presented on the vinyl moiety was more effective than deltamethrin which has dibromo substitution on the same moiety. On the other hand α-cypermethrin which is a mixture of R and S isomers of cypermethrin had intermediate efficiency. In term of figures the corresponding percentage of population reduction were 72.58, 54.42 and 60.24, respectively with these three

'pyrethroid compounds. Moreover, the pyrethroid compound, fenpropathrin which doesn't contain the moiety of vinyl group had the super effect.

Table (2): Mean number of cotton bollworms larvae and mean percent of reduction following application of insecticides during 2001 season.

Insecticides	Pretreat.	1st spray		2nd spray		3rd spray		General mean	
		N	%	N	%	N	%	N	%
Pyrethroides:									
Alphacypermethrin	4	3.67	62.1	3.00	85.8	3.00	91.4	3.22	79.8
Cypermethrin	4	3.33	64.3	3.33	84.2	2.33	93.2	3.00	80.6
Cyhalothrin	4	3.67	62.1	3 33	85.8	3.33	90.7	3.44	78.8
Deltamethrin	3	4.0	76.5	4.33	83.2	2.67	93.5	2.22	60.6
Fenpropathrin	5	2.0	72.0	2.00	87.3	2.67	89.2	3.67	82.9
O.P									
Dursban	6	8.0	54.0	7.5	84.7	6.0	79.9	6.5	66.2
Byryban	4	3.5	52.8	3.0	54.2	3.5	68.1	3.67	60.0
Carbamate									
Byrophone	5	5.5	47.3	3.5	79.5	4.0	84.2	4.33	70.32

It is of interest to notice that although the two tested O.P. compounds dursban and byryban has the same active ingredient, chlorpyrifos but the additive materials may play a role in the possibility of penetration of the insecticides to the green bolls or the resulted residue in it's surface which may affect the potential of the used compound. Comparing the percentages of population reduction obtained with the two compounds it was found to be 57.56 and 30.43 with dursban and byryban respectively. Also, the evaluation conducted after any spray with the two compounds, revealed the same trend of results.

Finally, the used carbamate insecticides had intermediate position between the two tested O.P. insecticides compound either at the end of any application or at the end of the seasons. Careful observity reflected that the effect of all tested compounds is cumulative, since the percentage of reduction increased from one spray to the other. This result was expected since any spray resulted in an amount of residue either from the parent compound or its metabolite which if even degraded but certeiraly it still present at any level of concentration.

In general all the obtained results are considered moderate (30.43 to 74.89%) and this may be due to the possibility that bollworms larvae had acquired resistance by different rates towards the tested insecticides as a result of repeated usage of these compounds year after year.

Regarding the results obtained at the growing season 2001 (Table 2) it was noticed that all the recorded percentage of reduction are higher than those obtained with the growing season 2000.

The obtained percentages of reduction ranged from 60 to 82.9 comparing with 74.89 and 30.43 with the previous season. These results may due to differences in the weathering factors, (temperature α relative humidity) which may affect the efficiency of the tested insecticides. Another interpretion is the possibility of the effect of other factors on the natural enemies which

differ from season to season and may affect the net result of reduction recorded at any season.

Another differences in the results obtained with the two seasons is that all the tested pyrethroids have a narrow range of efficiency in contrast to the previous results but it still superior than the used O.P and carbamate compounds.

For the 2nd time dursban is more efficient than byryban which emphasize the previous finding.

On contrary to the results obtained at season 2000, the tested carbamate insecticide was more efficient in controlling the larval population of the bollworms than the used O.P. compounds This may due to differences in composition of the population with regard to the tolerance or resistance individuals. However similar to the aforementioned results, pyrethroid are the most efficient compounds and also the effect was cumulative from one spray to the other.

It can concluded that, based on the obtained results (the moderate effect with all applications), repeated usage of any compound more than one time at the same season must be avoided in order to 1st achieve the best control 2nd to avoid acquiring resistance towards these insecticides especially it's well known that till now there is no good alternative means can used in the field of bollworm control in cotton.

However, the current results are confirmed by the finding of some authors who reported the superiority of pyrethroids for bollworm larvae control or with the relation between chemical structure and activity of pyrethroids (Watson *et al.*, 1981 a and b, Abo-El-Ghar et al., 1984, Watson *et al.*, 1986, Abo-Sholoa *et al.*, 1995, Khidr *et al.*, 1996a and Abo Sholoa *et al.*, 2000).

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فعالية بعض المبيدات فى مكافحة يرقات ديدان اللوز القرنفلية والشوكية

سوزان احمد البسيونى

مركز البحوث الزراعية ـ معهد وقاية النباتات ـ محطة بحوث سخا

أجريت التجارب الحقلية فى مزرعة محطة بحوث سخا خلال موسمى ٢٠٠٠ ، ٢٠٠١ بغرض تقييم كفـاءة بعض المبيدات على يرقات ديدان اللوز. وقد أظهرت النتائج المتحصل عليها أن مركبات البيرثرويد كانت الاكثر فعاليـة خلال الموسمين، كما أظهرت النتائج أنه ربما يكون تأثير كل المركبات المستعملة تراكمي من رشة للاخرى. ويمكن أن نستخلص من هذه الدراسة أن معظم النسبة المئوية للخفض المتحصل عليها قد عكس التأثير المعتدل لهذه المبيدات لذلك يجب تحاشى الرش المتكرر لاى من المبيدات خلال نفس الموسم.