J. Agric. Sci. Mansoura Univ., 32 (12), December, 2007

EFFECT OF LATE-SEASON TREATMENTS ON THE POPULATION OF DIAPAUSING PINK BOLLWORM LARVAE .

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ABSTRACT

The effect of late-season spraying by the conventional insecticide (chlorpyrifos) and the mineral oil (KZ oil), before and after harvest of seed cotton, on the population of pink bollworm larvae entering diapause was studied during 2004 and 2005 cotton seasons at the farm of Sakha Agricultural Research Station, Kafr El-Sheikh Governorate. The data revealed that the highest average reduction percentage in pink bollworm diapausing larvae during the two experimental seasons was 64.09% for the treatment of one insecticidal spray one week before harvest followed by another spray one week after harvest. The rest treatments could be arranged descendingly as follows: one spray of the insecticide before harvest followed by one spray of the oil after harvest (57.53%), one spray of the insecticide after harvest (47.32%). One spray of the insecticide before harvest (43.72%), and one spray of the oil after harvest (28.7%) average reduction on diapausing pink bollworm larval population.

INTRODUCTION

Cotton is considered one of the principal economic crops in Egypt. It represents the basis of the major textile industry. Successful cotton production depends on efficient pest management programme which reduces the risk crop losses caused by several pests.

The pink bollworm, *Pectinophora gossypiella* (Saund.), and the spiny bollworm, *Earias insulana* (Boisd), are major pests attacking cotton in Egypt. Such pests may cause severe loss of cotton yield quantity and quality.

Several investigations were carried out to reduce the population of the pink bollworm diapausing larvae in cotton fields by: completely plant residue distruction (Ingram, 1980 and Natwick *et al.,* 1990), tillage and burying the infested cotton bolls after ginning (Nassef, 1989; Hosny *et al.,* 1991 and Clark *et al.,* 1992), early irrigation cut-off and chemical fruiting termination using plant growth regulators (Bariola *et al.,* 1990 and Ibrahim, 1997) and late-season insecticidal applications (Bariola *et al.,* 1984).

Also, some oils are considered to be promising approach for suppression the population of certain pests: plant-derived oils on cotton aphids and whitefly (Broza *et al.,* 1988; Butler *et al.,* 1988; Butler *et al.,* 1991 and Nassef, 1995); and plant oils on bollworms (Azab *et al.,* 2005).

The present investigation was directed to study the effect of late-season treatments using insecticides and mineral oils on the population of pink bollworm diapausing larvae.

MATERIALS AND METHODS

The present study was conducted at the farm of Sakha Agricultural Research Station, Kafr El-Sheikh Governorate, during 2004 and 2005 cotton growing seasons, to determine the effect of late-season spraying by certain chemicals on the population of diapausing pink bollworm larvae .

Chemical insecticides:
Organophosphates: Chlorpyrifos (Pestban), EC, 48%; at 480g a.i./fed.
0,0 – diethyl 0- (3,5,6-trichloro-2-pyridyl) phosphorothioate .
Mineral oils: KZ oil, EC, 95%; at 1.75 liter/100 liter, was obtained from the plant Protection Research Institute , Agricultural Research Center , Dokki , Egypt .

Experimental design:
The experiments were carried out during 2004 and 2005 cotton seasons at the farm of Sakha Agricultural Research Station, Kafr El-Sheikh Governorate. The aim was to evaluate the efficiency of late-season spraying by a conventional insecticide (chlorpyrifos) and a mineral oil (KZ oil), before and after harvest of seed cotton, on the population of pink bollworm larvae entering diapause. The experimental area was cultivated with Giza 89 cotton variety on April 15, 2004 and Giza 86 on April 10, 2005. The area was divided into plots of 1/24 of a feddan each, and the treatments were arranged in randomized complete blocks with 4 replicates each. Cotton plants received the normal agricultural practices and they were subjected to the same pest control regime for all treatments. Six treatments including the untreated check were considered, as shown in Table (1). The first spray was conducted one week before harvest (October 16, 2004 and October 12, 2005) and the second one was conducted one week after harvest (October 30, 2004 and October 28, 2005). The volume of spray solution was 200 liters/feddan, using a knapsack sprayer with one nozzle (model CP_3) to spray the dilutions.

Criterion for evaluating the late-season spraying:
To evaluate the treatments, two weeks after the second spray, all the remainder bolls on the cotton plants were collected from plots of each treatment, dissected, number of larvae counted, and the numbers of diapausing pink bollworm larvae per plot were determined as all the living larvae at that time were considered in diapause (Kittock *et al*., 1975).

Statistical analysis of the data:
The absolute figures of the bollworms population were transformed by using ($\sqrt{x+1}$) to have a normal distribution of the populations.the effect of late-season spraying by insecticides and mineral oils on the population of diapausing pink bollworm larvae in cotton fields were analyzed by analysis of variance. When the resulted (F) was significant, Duncan's multiple range test was used to partition the means into significant ranges (Snedecor, 1956).

RESULTS AND DISCUSSION

Replicated, small-plot studies were conducted on the potential impact of certain late-season treatments using an insecticide and a mineral oil on the abundance of diapausing pink bollworm larvae during 2004 and 2005 cotton seasons.

Mean number of diapausing larvae and the percentages of reduction in larval population in the treated plots during two successive season are listed in Table (1) and graphically illustrated in Fig. (1 & 2). Analysis of variance of all treatments during the two cotton seasons were obtained in Table (2).

Approximately, the data in Table (1) and Fig. (1 & 2) take the same trend during the two seasons of the study. Numbers of diapausing larvae were significantly reduced by all treatments in both years. One spray of the insecticide (chlopyrifos) one week before harvest followed by another spray one week after harvest (T_1) gave the lowest mean numbers of diapausing larvae (130.5 and 122) causing the highest effect (60.69 and 67.49% reduction) in larval population during 2004 and 2005 seasons, respectively. The mean number of diapausing larvae in the untreated fields were 332 in 2004 and 375.25 larvae in 2005.

Table (1): Mean numbers of diapausing pink bollworm larvae in late-season treated and untreated cotton fields during 2004 and 2005 seasons

Treatment		Mean no. of diapausing larvae*		% reduction		
Before harvesting	After harvesting	2004	2005	2004	2005	Average
1. Chlorpyrifos	Chlorpyrifos	130.5 f	122.0 e	60.69	67.49	64.09
2. Chlorpyrifos	-	200.5 c	195.75 c	39.61	47.83	43.72
3. Chlorpyrifos	KZ oil	147.75 e	151.75 d	55.50	59.56	57.53
4. -	KZ oil	261.5 b	239.5 b	21.23	36.18	28.71
5. -	Chlorpyrifos	183.5 d	188.0 c	44.73	49.90	47.32
6. Untreated check		332.0 a	375.25 a	-	-	-

*** Average of 4 plots of 1/24 of a feddan each.**

By Duncan's multiple range test, means followed by the same letter are not significantly different at 5% level.

When the cotton plants received only one spray of the mineral oil (KZ oil) one week after harvest (T_4), 261.5 and 239.5 diapausing larvae were counted in 2004 and 2005 recording the lowest reduction in larval populations (21.23 and 36.18%, respectively).

The mean number of diapausing larvae in the rest treatments during the two seasons, 2004 and 2005, were (147.75 & 151.75), (183.5 & 188) and (200.5 & 195.75) for T_3 (on spay of the insecticide before harvest followed by one spray of KZ oil after harvest), T_5 (one spray of chlorpyrifos after harvest) and T_2 (one spray of the insecticide before harvest), respectively. The corresponding values of the percent reduction in diapausing larval populations were (55.5 & 59.56), (44.73 & 49.9) and(39.61 & 47.83%) during the 2004 and 2005 seasons for T_3, T_5 and T_2, respectively.

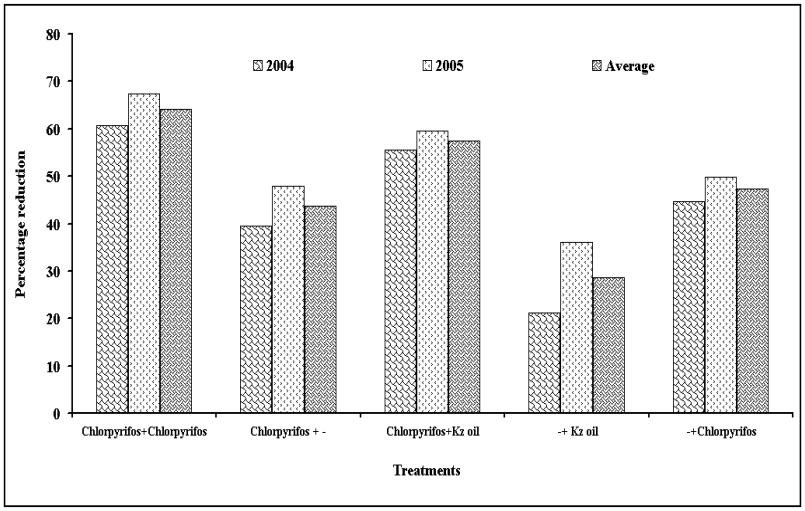

Fig. (1): Mean numbers of diapausing pink bollworm larvae in late-season treated and untreated cotton fields during 2004 and 2005 seasons.

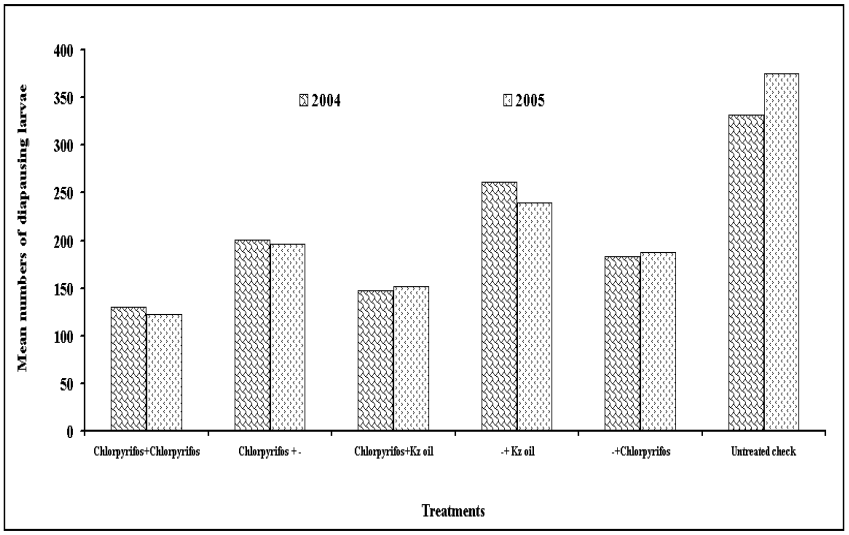

Fig. (2): Reduction percentage in the population of diapausing pink bollworm larvae following late-season treatments during 2004 and 2005 cotton seasons.

The data in Table (1) and Fig. (2) revealed that the highest average percentage of reduction in pink bollworms diapausing larval population during the two seasons of the study was 64.09% for T_1. The rest treatments induced 57.53 to 28.71% average reduction and could be arranged descendingly as follows: T_3 (57.53%), T_5 (47.32%), T_2 (43.72%) and T_4 (28.71% reduction).

The simple correlation coeffients between each of the six treatments and population diapausing pink bollwarm during 2004 and 2005 cotton season are presented in table (2) . In both season showed that the F values were highly significant between treatments (285.062**& 170.976**).

Table (2): Analysis of variance of late-season treatments on the population of diapausing pink bollworm larvae during 2004 and 2005 cotton seasons

Season	Source of variation	d.f	SS	MS	F
2004	**Total**	**23**	115318.958		
	Replicates	**3**	34.125	11.375	0.1421146
	Treatments	**5**	114084.208	22816.84	285.062**
	Error	**15**	1200.625	80.041	
2005	**Total**	**23**	162842.958		
	Replicates	**3**	129.458	43.153	0.2307
	Treatments	**5**	159907.708	31981.54	170.976**
	Error	**15**	2805.792	187.053	

Several investigations were conducted for the same goal of ours to reduce the population of the pink bollworm diapausing larvae by late-season treatments.

Bariola *et al.* (1984) found that numbers of pink bollworm diapausing larvae were significantly reduced by late-season insecticide treatments. They stated that percentage reduction in the larval population increased by increasing the number of insecticide applications.

Also, chemically fruiting termination of cotton plant using plant growth regulators in late-season, significantly reduced pink bollworm diapausing larvae with no significant reduction in cotton yield (Kittock *et al.,* 1973; Kittock *et al.,* 1975;k Bariola *et al.,* 1976; Watson *et al.,* 1978; Bariola *et al.,* 1990 and Ibrahim, 1997).

Moreover, in laboratory bioassays conducted by Azab *et al.* (2005), cotton seed oil and safflower oil caused insecticidal effects on *E. insulana* and *P. gossypiella*. Data indicated a great reduction in population growth and weight of the larvae and adults than the control. Consequently, it is an acceptable idea when used the oils as a control agent against the pink bollworm in the present study.

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دراسة تأثير الرش فى نهاية الموسم بمركبات مختلفة على تعداد دودة اللوز القرنفلية التى تدخل فى طور السكون:

محمد عبد المحسن سلامة[1] و صفوت عبدالسلام عارف[2]
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فى هذه التجربة التى أجريت فى المزرعة البحثية بمحطة البحوث الزراعية بسخا خلال موسمي 2004م ، 2005م كان هناك خمسة معاملات مختلفة بجانب القطع التجريبية الغير معاملة.
وأوضحت النتائج أن افضل المعاملات التى أعطت اكبر نسبة خفض فى تعداد يرقات دودة اللوز القرنفلية التى تدخل فى طور السكون هى التى تم رشها قبل الجنى بأسبوع بمبيد بستبان ثم رشة أخرى بعد الجنى بنفس المبيد. حيث سجلت متوسط عام فى نسبة الخفض خلال الموسمين 64.09٪.
ومن الممكن ترتيب باقى المعاملات من حيث تأثيرها فى هذا المجال تنازليا كما يلى:
1) رشه مبيدات قبل الجنى ثم أخرى بعد الجنى بزيت Kz oil أعطت نسبة خفض فى تعداد اليرقات 57.53٪.
2) رشه مبيدات واحدة فقط بعد الجنى بأسبوع أعطت نسبة خفض (47.32٪)
3) رشه مبيدات واحدة قبل الجنى بأسبوع أعطت نسبة خفض (43.72٪)
4) وأخيرا رشه زيت بعد الجنى بأسبوع أعطت نسبة خفض 28.71٪ فى تعداد يرقات ديدان اللوز القرنفلية التى تدخل طور السكون.