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BIOCIDES AS AN EFFECTIVE CONTROL AGENT OF *Spodoptera littoralis* (Boisd.) IN COTTON FIELDS AT EL GHARBEYA GOVERNORATE, EGYPT.

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ABSTRACT

Bacillus Thuringiensis sub species aizawi (Xentari 10.3% granul), *B.t.* sub species. Kurstaki (MVPII 20% FL) and microbial toxin (Abamectin 1.8% EC) as biological insecticides were tested against *Spodoptera littoralis* larvae infesting cotton plants in Gharbeya Governorate fields. The compounds applied spraying at the recommended dose, half and double dose. Results showed that Abamectin was the most potent bio-compound in reducing the population of *S. littoralis* followed by Xentari and the lowest results was obtained with MVPII.

Xentari at 240 gm/fed. and Abamectin at 60 ml/fed. gave significant high larval reduction in population (93% and 99%), respectively after 8 days of application. Data suggest that Abamectin caused a complete reduction in the cotton leafworm population (100%) when used at the double recommanded dose (120 ml/fed.) after 6 and 8 days of application.

INTRODUCTION

The demand for alternative insecticide products and pest management strategies for managing pest populations has grown by farmers, policy markers and the general puplic. In many countries more aware of the problems associated with the use of broad spectrum chemical insecticides in crop protection has grown. Environmental contamination, increasing pest resistance, worker safety concerns, the potential hazards associated with pesticide residues on crops are all problems that have become increasingly associated with the dependence upon broad spectrum chemical insecticides. In addition, the effect of these compounds on beneficial insect population frequently results in secondary pest out-breaks and pest resurgence, (Smith and Reynolds, 1966; Smith and Vanden Basch, 1967).

The Bacterial pesticide *B.t.* has been used for insect control because of its environmental safety and specificity to most of the target pests. Because *B.t* must be ingested to be effective, coverage of the food source plays an important role in its effectiveness. The development of biological pesticides is being encouraged in many countries, and various isolates of *B.t.* are in commercial use against a number of lepidopterous pests. This study examined the susceptibility of cotton leafworm *S. littoralis* (Boisd.) under field conditions to *B.t.* sub. Sp. aizawai, *B.t.* Sub. sp.. Kurstaki and Abamectin.

MATERIALS AND METHODS

Three different biocides tested were, as follows:

1) Abamectin (vertimec 1.8% EC): A mixture containing a minimum of 80% avermectin B1 a(5-o-demethyl avermectin A1a) and a maximum of 20% avermectin B1b(5-o-demethyl-25- de(1-methyl propyl-25-(1-methylethyl)

avermectin A1a). A nature product produced by the soil microorganisms *Streptomyces averemitillis.*

2) Xentari 10.3% (water dispersible granule) based on *Bacillus thuringiensis*Sub. sp.. Aizawai lepidoptera active toxin, produced by Abbott laboratories Nourth Chicago, USA.
3) MVPII 20% aqueous flowable, a genetically engineered bacterium that produces delta endotoxin derived from *B.t.* sub. sp.. Kurstaki. The active ingredient consists of endotoxin protein crystals which are encapsulated in dead *psedomonus fluorescens* cells, produced by Mycogen USA.

Field experiments were carried out in Manshiat-Ganzor, Gharbya Governorate during successive seasons starting 2003. An area of two feddans was divided into 40 plots and cultivated with cotton plants variety Giza89 on 15th of April 2003. The experiments included 3 different treatments with each tested compound (Xentari 120 gm/fed. 240 gm/fed. and 480 gm/fed., MVPII 500 ml/fed, 1000 ml/fed. and 2000 ml/fed. and Abamectin 30 ml/fed.,60 ml/fed. and 120 ml/fed.). The treatments including the control were used in four replicates. The bio-insecticides were applied using a small motor sprayer. A completely randomized design was applied for each treatment including the control. The average number of *S. littoralis* larvae present in 20 plants in each plot was recorded just before treatments, 1,4,6 and 8 days after treatments. Percentage of larval reduction were calculated according to Hendrson and Telton (1955).

The following physico-chemical properties of the field water used for dilution and the compounds diluted in this water were determined:

1- pH at 20 °C using orien pH meter.
2- Conductivity expressed as millsiemens meter (mS/m)
3- Percentage of salinity employing the conductimeter (YSI) as shown in Table (1).

Table(1): Physco-chemical properties of candidate compounds diluted with Manshiat ganzor water Gharbeya Governorate.

Compounds	pHat 20°C	Conductivity mS/m	Salinity %
Water	7.5	882	0.03
Abamectin(30ml/fed)	7.5	884	0.03
Abamectin(60ml/fed)	7.5	895	0.03
Abamectin(120ml/fed)	7.5	930	0.03
Xentari(120ml/fed)	7.7	920	0.04
Xentari(240ml/fed)	7.8	1200	0.06
Xentari(480ml/fed)	7.9	1680	0.08
MVPII (500ml/fed)	7.5	883	0.03
MVPII (1000ml/fed)	7.5	894	0.03
MVPII (2000ml/fed)	7.5	950	0.03

RESULTS AND DISCUSSION

The data of applications are presented in Tables 2,3 and 4. The field tests showed that Abamectin was the most potent bio-compound in reducing the population of *S. littoralis* larvae after 4 days of application, their reduction percentages were 55, 86 and 98% when using the half recommended dose (30 ml/fed.), recommended dose (60 ml/fed.) and the double dose (120 ml/fed.) respectively (Table 2). They were followed by Xentari which gave % reduction of *S. littoralis* larvae of 51% for the half recommended dose (120 gm/fed.), 70% for the recommended dose (240 gm/fed.) and 80% for the double dose (480gm/fed.) (Table 3). The lowest results was obtained with MVPII, where the percent reduction of larval population of *S. littoralis* were 26%, 44% and 64% after 4 days of application for the three different concentrations used (Table 4). Data in Table 2 proved that Abamectin caused a complete reduction (100%) when used it at the concentration of 120 ml/fed. after 6 and 8 days of application and it was 90% and 97% as effective as of Xentari (480 gm/fed.) (Table 3) Isaac Ishaaya *et al.* (2002) found that a spray concentration of Emamectin of 25 AI mg/L in cotton field resulted in over 90% suppression of *H.Armigera* larvae up to 28 days after treatment, while similar mortality of the *S. littoralis* under the same conditions, was maintained for 3 days only.

Table (2): Percentage of reduction of *Spodoptera littoralis* larvae on cotton plants treated with Abamectin in Gharbeya Governorate (2003).

Concentration per feddan	% reduction			
	One day	4 days	6 days	8 days
30 ml	31	55	70	77
60 ml	70	86	96	99
120 ml	89	98	100	100

Table (3): Percentage of reduction of *Spodoptera littoralis* larvae on cotton plants treated with Xentari in Gharbeya Governorate (2003).

Concentration per feddan	% reduction			
	One day	4 days	6 days	8 days
120 gm	27	51	61	72
240 gm	49	70	89	93
480 gm	57	80	90	97

Table (4): Percentage of reduction of *Spodoptera littoralis* larvae on cotton plants treated with MVPII in Gharbeya Governorate (2003).

Concentration per feddan	% reduction			
	One day	4 days	6 days	8 days
500 ml	13	26	41	46
1000 ml	23	44	67	70
2000 ml	34	64	76	79

The reduction in larval population after treatment with MVPII (2000 ml/fed.) were 76% and 79% after 6 and 8 days Table (4). This finding is in agreement, with the results obtained by Broza *et al.* (1984), for the control of the cotton leafworm *S. littoralis* in cotton fields treated with *B.t.* They found that *B.t.* successfully controlled larvae in large-scale by ground application. The microbial insecticide successsfully controlled first and second instars of *S. littoralis.*

The Kurstaki and aizawai serovars were shown to have high toxic activity against. *S. littoralis* larvae, but each strain showed different activity. The results indicate that Xentari (*B.t.* aizawai) was more effective than MVPII (*B.t.* Kurstaki). These results were in agreement with these obtained by Kalfon and De Barjac (1985) who pointed out that *S. littoralis* has been found to be susceptible to serovars aizawai.

While this may be true of many association of insect species and B.t. sub species.or strains, there have also been many reports where spores have been shown to synergist toxin activity or cause mortality directly activity of purified toxins of *Bt.* Sub. Species. Kurstaki was enhanced (146 X) by addition of toxin-free spores against larvae of *Plutella Xylosteua* (Miyasono *et al.* 1994). Similarly ,Johuson and MC Gaughey. (1996) reported that addition of spores synergised activity of delta-endotoxins against larvae of the Indianmeal moth *Plodia interpuncteua*.

The data in Table (1) show that pH, conductivity and salinity for the Xentari diluted in the Manshia Ganzor water were higher than those of MVPII.

The insecticidal activity as well as the latent effect of biocides were evaluated by spraying these compounds on castor-oil shrubs and cotton plants, (Ashmony) cultivated at Saft-El-Laban, Giza Governorate at the recommended rates using tap and Saft-El-Laban artesian well water for dilution. The results indicate that the biological activity of *B.t.* against *S. littoralis* was enhanced with increasing the water pH. This phenomenon can be a benefit since the great majority of water used for dilution in Egypt are alkaline Abdel Hai, (2001).

The previous results suggest that *B. thuringiensis* var. aizawai (Xentari) may be recommended as an effective component of the future IPM programs against . *S. littoralis,* on cotton fields. *B.t.* based products have been shown in some cases to enhance parasitism over levels seen in untreated area. Weseloh *et al.* (1983) reported higher levels of parasitism of gypsy moth larvae, *Lymantria dispar* by *Apntels melanoscdus* in Dipel treated wood land plots when compared to untreated plots.This may be attributed to the long larval span which is the preferable stage to parasitism.

It is appropriate, therefore, to recommend that biocides compounds tested in this experiment could be used in integrated pest management programs. Biological insecticides, particularly those based on the *B.t.,* are good candidates for inclusion on in IPM programs because they target specific classes of insects, do not have the broad spectrum knock-down and have less impact on beneficial and other nontarget invertebrates.

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المبيدات الحيوية كمركبات فعالة لمكافحة دودة ورق القطن على محصول القطن فى محافظة الغربية

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تم أختبار المركبات البكتيرية زينتارى ٣ر١٠% المحبب *B.t.* sub sp. aizawi وأم فى بىII ٢٠% القابل للتدفق *B.t.* sub sp. Kurstaki المهندس وراثيا وكذلك المركب الميكروبى أبامكتين (الفرتيمك) ٨ر١% القابل للأستحلاب على دودة ورق القطن التى تصيب نباتات القطن فى محافظة الغربية. و استخدام كل مركب بثلاث تركيزات التركيز الموصى به و نصف التركيز الموصى به وضعف التركيز الموصى به.

وقد بينت النتائج أن مركب الأبامكتين هو أكثر المركبات فعاليه فى خفض تعداد يرقات دودة ورق القطن على نباتات القطن يليه مركب الزنتارى و كان أقل المركبات فعاليه هو المركب المهندس وراثيا أم فى بىII .

سبب مركب الزنتارى عند الأستخدام بتركيز ٢٤٠جم/فدان (التركيز الموصى به) خفض معنوى فى مجتمع حشرة دودة ورق القطن بنسبة ٩٣% فى حين سبب مركب الأبامكتين عند أستخدامه بتركيز ٦٠سم٣ /فدان (التركيز الموصى به) خفض بنسبة ٩٩% بعد ثمانية أيام من المعاملة.

ولقد أعطى مركب الأبامكتين نسبة خفض وصلت الى ١٠٠% فى مجتمع دودة ورق القطن عند أستخدامه بضعف التركيز الموصى به (١٢٠سم٣ / فدان) و ذلك بعد ستة و ثمانية أيام من المعامله.