

EFFECTIVENESS OF SOME INSECTICIDES AGAINST LABORATORY  
AND FIELD STRAINS OF THE EGYPTIAN COTTON LEAFWORM  
SPODOPTERA LITTORALIS (BOISD.) DURING 1985 SEASON OF  
COTTON CULTIVATION

BY

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Received : 1.6.1988

ABSTRACT

The pattern of resistance to some of the commonly used insecticides in different field strains of the Egyptian cotton leafworm, Spodoptera littoralis (Boisd.) collected in 1985 cotton season was investigated. The results indicated that the population of Dakahlia, Gharbia and Sharkia strains acquired considerable resistance to cypermethrin. High levels of resistance to fenvalerate were detected in Qaliobia, Dakahlia, Sharkia and Menia. Resistance to majority of organophosphates was common in strains collected from Dakahlia, Gharbia and Sharkia Governorates. Resistance to methamidophos was evidently high; 10.12 fold in Dakahlia strain while it was only 4.62 fold in Fayoum strain. Triazophos and gardona were ineffective in all tested strains. The sole carbamate tested, methomyl produced 14.28, 15.58 and 10.33 fold resistance in Dakahlia, Fayoum and Beni-Suef respectively. Moderate levels of resistance were observed in the other Governorates.

### INTRODUCTION

Several new insecticides are continuously used against the cotton leafworm to encourage alternation of insecticides by changing before resistance development. Several investigations on the toxicity of used insecticides against this pest showed lights on the resistance appearance under field conditions to newly marketed insecticides [1,3] .

The present study deals with the pattern of resistance to several insecticides in different field strains of the cotton leafworm Spodoptera littoralis (Boisd.) during 1985 cotton season.

### MATERIALS AND METHODS

#### Strains:

Eight strains were used in this study. The susceptible strain was reared in the laboratory for 20 generations. Samples of egg masses were collected from cotton fields in seven governorates before the 1985 chemical control season, and were kept in the laboratory for hatching. The hatched larvae were reared in the laboratory on castor bean leaves at 25 °C and 70% R.H.

#### Insecticides:

The insecticides used were technical grades and

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represented different chemical groups namely, synthetic pyrethroids ( cypermethrin and fenvalerate ), organophosphorus compounds ( chlorpyrifos, methamidophos, triazophos and gardona ) and the carbamate compound methomyl.

Testing procedure :

The insecticidal solution was prepared by dissolving each grade in acetone on the basis of (w/v). One microliter of each solution was topically applied on the thoracic terga of the 4 th instar larvae. At least five concentrations were prepared in order to establish mortality regression lines. Four replicates of ten larvae each were used. Control larvae were treated with the solvent only. Mortality counts were made 24 hrs after treatment. Mortality data were statistically analysed using a common method [6]. The LD<sub>50</sub> values were expressed as ug/gr. of body weight. The rates of resistance were expressed as resistance ratios (R.R.) at the LD<sub>50</sub> levels of the field strains compared to those of the susceptible laboratory strain.

#### RESULTS AND DISCUSSION

The resistance ratios of the insecticides tested against field strains of S. littoralis during the cotton season 1985 are shown in Table (1). Response of the susceptible strain is also indicated for comparison. It is evident that cypermethrin was the most effective compound

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tested on the susceptible strain followed descendingly by fenvalerate and methomyl, chlorpyrifos came next in its toxicity followed by profenophos. Methamidophos and triazophos were comparatively less effective while gardona behaved as a poor insecticide.

It should be pointed out that a 10-fold level of resistance signifies the beginning of detectable control difficulties. However, a difference of 2 to 5 fold is considered to be within the limits of vigour tolerance and that of 6-fold or more as representing an acknowledged difference indicating significant resistance [3].

Pyrethroid insecticides :

The results in Table 1 clearly indicate that the population of Dakahlia, Gharbia and Sharkia strains acquired considerable resistance to cypermethrin in 1985 cotton season. The resistance ratios were 10.83, 10.00 and 11.66-fold, respectively. The other levels of resistance for the other governorates were either low or insignificant high levels of resistance were detected to fenvalerate in Qaliobia, Dakahlia, Sharkia and Menia. Low to moderate levels of resistance were indicated in the other governorates ( Table 1 ). Resistance to pyrethroids had already been observed in Spodoptera strains [4].

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Organophosphorus insecticides :

Chlorpyrifos was previously shown to be highly potent against Spodoptera field strains [3]. However, in the present work levels of 13.20, 10.90 and 10.90 fold resistance were detected in Dakahlia, Gharbia and Sharkia governorates, respectively ( Table i). This pattern of high levels of resistance detected in some governorates indicate that resistance to this chemical is accumulating in different field strains. The results of the present investigation are in full agreement with the findings of other workers [1,7,8]. The appearance of resistance to chlorpyrifos was only noticed after pyrethroids have been introduced on large scale since 1977 for the control of S. littoralis [3].

Dakahlia strain showed a high level of resistance to profenofos (16.36-fold) followed by Sharkia, (15.2-fold), Gharbia (14.72-fold) then Menia strain(10.90-fold). Moderate levels of resistance were detected for the other strains. The data obtained on the studied strains are somewhat similar to those reported by several authors [7].

Resistance to methamidophos was evidently high (10.12-fold) in Dakahlia strain, while it was only 4.62-fold in Fayoum strain (Table 1). Low to moderate levels of resistance were observed in the other strains.

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Triazophos, which has been used against cotton pests only since 1978, was ineffective in all governorates tested (Table 1). Similar pattern of resistance to this compound in different Spodoptera strains was also reported by several workers [3,7,8). Gardona generally produced a similar pattern of resistance.

Carbamate insecticides :

The sole carbamate tested, methomyl produced 14.28, 15.58 and 10.38-fold resistance in Dakahlia, Fayoum and Beni-Suef, respectively. Moderate levels of resistance were noticed in Qaliobia, Gharbia, Sharkia and Menia. During the last decade methomyl was considered highly potent against Spodoptera tolerant strains and it satisfactorily replaced several old insecticides that had previously produced resistance in the field strains [2]. However, resistance to this compound was first detected in 1979 [8] after the pyrethroids had been introduced. Since pyrethroids can induce various levels of tolerance to organophosphates, and since both organophosphates and carbamates are cholinesterase inhibitors and can be detoxified by similar defence mechanisms cross-resistance between pyrethroids and carbamates is likely to occur [3].

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Table (1) : Resistance ratios of different field strains of *S. littoralis* to insecticides during 1985 cotton season.

Insecticides	Susceptible strain		Galliohia		Dakahlia		Gharbia		Sharkia		Fayoum		Beni-suef		Menia	
	LD <sub>50</sub>	R.R	LD <sub>50</sub>	R.R	LD <sub>50</sub>	R.R	LD <sub>50</sub>	R.R	LD <sub>50</sub>	R.R	LD <sub>50</sub>	R.R	LD <sub>50</sub>	R.R	LD <sub>50</sub>	R.R
Cypermethrin	0.18	1.05	5.83	1.95	10.83	1.8	10.0	2.1	11.66	1.05	5.81	0.45	2.5	0.81	4.5	
Fenvalerate	0.57	7.05	12.36	8.1	14.21	4.2	7.36	6.0	10.52	4.5	7.89	3.0	5.62	6.0	10.52	
Chlorpyrifos	4.18	31.2	7.46	55.2	13.2	45.6	10.9	45.6	10.9	28.8	6.88	36.0	8.61	31.2	7.46	
Profenophos	4.4	36.0	8.18	72.0	16.36	84.8	14.72	67.2	15.2	28.8	6.54	31.2	7.09	48.0	10.9	
Methamidophos	8.3	52.8	6.36	84.0	10.12	52.8	6.36	64.8	7.8	38.4	4.62	48.0	5.78	50.4	6.07	
Triazophos	14.08	180.0	12.8	195.0	13.17	216.0	15.34	180.0	12.77	225.0	15.98	180.0	12.08	150.0	10.69	
Gardona	28.2	300.0	10.63	594.0	21.06	300.0	10.63	420.0	14.89	450.0	15.95	600.0	21.27	420.0	14.89	
Methomyl	1.54	12.96	8.41	22.0	14.28	11.2	7.27	15.36	9.97	24.0	15.58	16.0	10.38	10.8	7.01	

تأثير بعض المبيدات على سلالة معليه ، سلالات حقلية من دودة

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اشتملت هذه الدراسة على قياس مستويات مقاومة سلالات حقلية مختلفة من دودة ورق القطن لبعض المبيدات خلال موسم زراعة القطن عام ١٩٨٥ . وقد اوضحت النتائج ان سلالات محافظات الغربية ، الشرقية ، الدقهلية قد اكتسبت درجات عالية من المقاومة للسييرمثرين واطهرت سلالات محافظتى القليوبية والدقهلية درجات عالية من المقاومة للفينغاليريت وصلت الى ١٢,٣٦ ، ١٤,٢١ ضعف فى كل منهما على التوالى وبينت النتائج ان يرقات دودة ورق القطن من محافظات الدقهلية والغربية والشرقية اكتسبت درجات عالية جدا من المقاومة للمبيدات الفوسفورية المستخدمة وكان الميثاميدوفوس فعالا بدرجة كبيرة فى محافظة الفيوم ( ٤,٦٢ ضعف ) فى حين كانت مستويات المقاومة اعلى من ذلك فى باقى المحافظات . وكانت مركبات التراى ازوفوس ، الجاردونا قليلة الفاعلية وقد اظهرت يرقات دودة القطن مستويات عالية من المقاومة ضدها فى المحافظات السبعة المختبره وقد اعطت سلالات دودة ورق القطن من محافظات الدقهلية ، الفيوم ، بنى سويف درجات عالية من المقاومة لمركب الميثوميل .