

TOXIC EFFECTS OF SOME PYRETHROID INSECTICIDES AGAINST FIELD POPULATION OF THE COTTON APHID, *Aphis gossypii* GLOVER (HOMOPTERA: APHIDIDAE)

Khaled, M. S.; Hala M. Abou -Yousef and Amal A. Hassanein
Central Agricultural Pesticides Laboratory, Agricultural Research Center, Dokki, Egypt

ABSTRACT

Six pyrethroid insecticides were tested against adults of the cotton aphid *Aphis gossypii* Glover collected from eight Egyptian Governorates in early cotton season 2004. The results showed that Decis and Sumi alpha were the most toxic effective followed by Fastac and Karate, but Meothrin and Sumicidin were the least toxic effective on tested aphids in all Governorates.

Keywords. *Aphis gossypii*, insecticide resistance, pyrethroids.

INTRODUCTION

The cotton aphid, *Aphis gossypii* Glover (Homoptera: Aphididae) is an important pest of cotton throughout the world. The cotton plants are liable to attack by this sucking pest early and late growing season. It affects the cotton yield by direct feeding as well as the fiber quality by excreting honeydew (Leclant and Deguine 1994 ; Ahmed *et al.*, 2003).

Pyrethroid insecticides have been used extensively to control cotton pests. *A. gossypii* has developed resistance to insecticides in many parts of the world (Moore *et al.*, 1996).

The present work is an attempt to compare the toxicity effects of some pyrethroid insecticides against the cotton aphid, *A. gossypii* Glover collected from eight different Egyptian Governorates.

MATERIALS AND METHODS

Cotton leaves infested with cotton aphid, *Aphis gossypii* Glover were collected from cotton fields at Fayoum, Beni-Suef, Menia, Gharbia, Kafr El-Sheikh, Dakahlia, Menufia and Behera Governorates early in 2004 cotton season.

Slide-dip technique was used to evaluate the toxicity of the tested insecticides against the adult stage of *Aphis gossypii* Glover. By fine brush, ten adults were affixed to double faced scotch tap and stuck tightly to slide on their dorsal side. The slides were then dipped in the prepared insecticide water solutions for ten seconds, each insecticide was tested at five different concentrations, each concentration was replicated three times. Mortality count was recorded two hours after application and all insects responded to touching with the fine brush were considered alive.

Natural mortality was corrected according Abbot's formula (Abbott, 1925), and data were then subjected to statistical analysis by the method of Busvine (1957). The toxicity index (the relative toxicity factor) of each insecticide was determined according to Sun (1950) as follow:

$$\text{Toxicity index (TI)} = \frac{\text{LC}_{50} \text{ of the most effective insecticide}}{\text{LC}_{50} \text{ of the least effective insecticide}} \times 100$$

Pyrethroid insecticides used :

Decis (deltamethrin) 2.5% EC , Sumi alpha (esfenvalerate) 5%EC
Fastac (alpha-cypermethrin) 15% EC , Sumicidin (fenvalerate)5% EC
Karate (lambda-cyhalothrin) 8.33% EC, Meothrin (fenpropathrin)20 % EC

RESULTS AND DISCUSSION

In table (1), the results showed that, Decis was the most effective insecticide against *A.gossypii* Glover in five Governorates with LC₅₀ (ppm) values of 3.02 in Fayoum, 4.13 in Kafr-El-Sheikh, 9.11 in Gharbia, 17.38 in Dakahlia and 19.08 in Beni-Suef. Decis followed by Sumi alpha and Sumicidin in Kafr El-Sheikh, Gharbia and Dakahlia, but it followed by Fastac and Sumi alpha in Fayoum or Sumi alpha and fastac in Beni-Suef, the relative toxicity factors of Sumi alpha, Sumicidin and Fastac ranged between (18.59% - 98.06%), (9.86% - 39.42%) and (4.48% - 27.15%), respectively of the toxicity of Decis.

However, Sumi alpha was the most effective insecticide against *A.gossypii* with LC₅₀ (ppm) values of 5.03 in Menufia and 9.36 in Behera. It followed by Decis, Sumicidin, Fastac and Karate in Menufia or Decis, Fastac, Karate and Sumicidin in Behera, the relative toxicity factors of Decis Fastac, Karate and Sumicidin ranged between (28.2% - 75.97%), (22.45 % - 28.61%), (11.9% - 31.98%) and (6.84% - 24.79%), respectively of the toxicity of Sumi alpha.

Although Fastac was the most effective insecticide in only Menia with LC₅₀ values of 20.95 ppm, it followed by Sumi alpha, Decis, Karate and Sumicidin. As for Meothrin was tested in only four Governorates, the results indicated that Meothrin was the least effective insecticide in these Governorates.

In general, results showed that Decis and Sumi alpha were the most toxic effective on *A.gossypii* followed by Fastac and Karate. While Meothrin and Sumicidin were the least toxic effective on *A.gossypii*. Results are agree with Ayad *et al.*, (1991 - 1992) who found that, the pyrethroids deltamethrin , lambda cyhalothrin and cypermethrin were the most potent against *A.gossypii* . Ahmed *et al.*, (2003) decided that *A.gossypii* was generally very high resistance to seven pyrethroid insect-icides cypermethrin, alphacypermethrin, zetacypermethrin, cyfluthrin, fenpropathrin, bifenthrin and lambdacyhalothrin, but it showed lower resistance to deltamethrin than to other pyrethroids, They also added that deltamethrin might be less effected by the resistance mechanism. In contrast, Singab *et al.*, (2002) indicated that the pyrethroid Karate was the most toxic followed by Meothrin then Baythroid and Sumicidin against *A.gossypii*. Singab, (2002) found that Meothrin was the first most toxic followed by Karate, but Sumicidin and Baythroid came next in its toxicity against *A.gossypii*. Ghoneim, (2002) showed that Meothrin was the most toxic pesticides followed by Karate against *A.gossypii*

Pyrethroids have long been considered the most cost effective compounds against the cotton pests in Egypt. Fortunately our studies show that differences within a pyrethroid class with respect to the expression of

resistance exist, and that the pyrethroids Decis, Sumi alpha, Fastac, Karate and Sumicidin currently remain fully effective against *A.gossypii* when used according to manufacturers recommendations.

Table (1) : Toxicity index of pyrethroids against field strain of the cotton aphid *Aphis gossypii* Glover collected from different Governorates in the cotton season 2004

Fayoum				Kafr El - Sheikh			
Insecticide	Slope ± ES	LC ₅₀ ppm 5 % Fiducial limits	TI*	Insecticide	Slope ± ES	LC ₅₀ ppm 5 % Fiducial limits	TI*
Decis 2.5 % EC	1.36 ± 0.28	3.02 (1.60 - 4.48)	100	Decis 2.5 % EC	0.94 ± 0.40	4.73 (0.004 - 8.79)	100
Fastac 15 % EC	2.76 ± 0.56	12.08 (8.21 - 15.71)	25	Sumi alpha 5 % EC	2.33 ± 0.45	9.11 (6.11 - 11.88)	45.33
Sumi alpha 5 % EC	1.41 ± 0.36	16.27 (10.17 - 24.82)	18.56	Sumicidin 20 % EC	1.20 ± 0.29	41.87 (18.70 - 64.72)	9.86
Sumicidin 20 % EC	1.26 ± 0.32	41.83 (22.44 - 69.34)	7.22	Karate 20 % EC	1.83 ± 0.39	87.84 (55.45 - 119.58)	4.70
Karate 20 % EC	1.23 ± 0.28	90.84 (42.29 - 140.56)	3.32	Fastac 15 % EC	3.24 ± 0.71	92.21 (64.99 - 114.8)	4.48
Meothrin 20 % EC	-----	-----	-----	Meothrin 20 % EC	3.11 ± 0.66	290.41 (2153 - 360.9)	1.42
Gharbia				Dakaklia			
Insecticide	Slope ± ES	LC ₅₀ ppm 5 % Fiducial limits	TI*	Insecticide	Slope ± ES	LC ₅₀ ppm 5 % Fiducial limits	TI*
Decis 2.5 % EC	1.67 ± 0.31	9.11 (5.20 - 12.87)	100	Decis 2.5 % EC	2.08 ± 0.31	17.38 (13.29 - 71.19)	100
Sumi alpha 5 % EC	1.64 ± 0.28	9.29 (9.47 - 12.67)	98.06	Sumi alpha 5 % EC	0.74 ± 0.27	20.39 (6.68 - 55.29)	85.24
Sumicidin 20 % EC	1.50 ± 0.29	23.11 (13.59 - 32.82)	39.42	Sumicidin 20 % EC	1.31 ± 0.28	58.75 (32.47 - 88.42)	29.58
Fastac 15 % EC	2.77 ± 0.47	33.55 (24.99 - 42.50)	27.15	Fastac 15 % EC	1.19 ± 0.26	66.28 (40.27 - 102.86)	26.22
Karate 20 % EC	-----	-----	-----	Karate 20 % EC	2.37 ± 0.46	71.55 (48.01 - 93.09)	24.29
Meothrin 20 % EC	-----	-----	-----	Meothrin 20 % EC	1.32 ± 0.27	146.65 (92.09 - 213.4)	11.85
Beni-Suef				Menoufia			
Insecticide	Slope ± ES	LC ₅₀ ppm 5 % Fiducial limits	TI*	Insecticide	Slope ± ES	LC ₅₀ ppm 5 % Fiducial limits	TI*
Decis 2.5 % EC	3.03 ± 0.67	19.08 (15.08 - 27.09)	100	Sumi alpha 5 % EC	1.41 ± 0.29	5.03 (2.64 - 7.39)	100
Sumi alpha 5 % EC	1.99 ± 0.39	32.95 (24.76 - 46.24)	57.91	Decis 2.5 % EC	2.58 ± 0.38	17.84 (13.9 - 22.68)	28.20
Fastac 15 % EC	2.37 ± 0.43	85.27 (62.52 - 112.7)	22.38	Sumicidin 20 % EC	1.21 ± 0.28	20.30 (9.12 - 31.59)	24.79
Sumicidin 20 % EC	2.33 ± 0.41	146.4 (108.4 - 183.2)	13.03	Fastac 15 % EC	1.95 ± 0.34	22.41 (14.75 - 20.27)	22.45
Karate 20 % EC	-----	-----	-----	Karate 20 % EC	2.06 ± 0.45	43.03 (25.32 - 59.20)	11.90
Meothrin 20 % EC	-----	-----	-----	Meothrin 20 % EC	-----	-----	-----
Behera				Menia			
Insecticide	Slope ± ES	LC ₅₀ ppm 5 % Fiducial limits	TI*	Insecticide	Slope ± ES	LC ₅₀ ppm 5 % Fiducial limits	TI*
Sumi alpha 5 % EC	1.13 ± 0.29	9.36 (4.554 - 14.81)	100	Fastac 15 % EC	1.14 ± 0.26	20.95 (10.95 - 32.65)	100
Decis 2.5 % EC	1.44 ± 0.27	12.32 (7.88 - 17.41)	75.97	Sumi alpha 5 % EC	0.95 ± 0.26	36.85 (22.02 - 80.45)	56.85
Fastac 15 % EC	2.09 ± 0.34	32.72 (24.45 - 43.23)	28.61	Decis 2.5 % EC	1.45 ± 0.32	36.88 (24.77 - 7669)	56.81
Karate 20 % EC	2.13 ± 0.42	29.27 (19.33 - 41.35)	31.98	Karate 20 % EC	1.48 ± 0.28	64.37 (41.45 - 90.52)	32.55
Sumicidin 20 % EC	1.64 ± 0.31	136.75 (89.26 - 188.3)	6.84	Sumicidin 20 % EC	2.32 ± 0.36	130.98 (101.5 - 178.8)	15.99
Meothrin 20 % EC	1.56 ± 0.29	149.11 (101.6 - 209.3)	6.28	Meothrin 20 % EC	1.89 ± 0.47	209.63 (151.2 - 323.7)	10

Toxicity index (TI*) = (LC₅₀ of the most effective insecticide / LC₅₀ of the least effective insecticide) x 100

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التأثيرات السامة لبعض مبيدات البيرثرويد على سلالات حقلية لمن القطن
محمد سنجاب خالد ، هاله محمد أبو يوسف ، أمل أحمد حسنين
المعمل المركزي للمبيدات مركز البحوث الزراعية - الدقى

أختبرت ستة مبيدات بيرثرويد على الأطوار الكاملة لمن القطن والتي جمعت من ثمانية محافظات
مصرية في بداية موسم نمو القطن لعام ٢٠٠٤ وقد أظهرت النتائج أن مركب الديسيس والسومي ألفا كانا
الأعلى سمية يليهما مركبي الفاستاك والقيراط ، بينما كانا مركبي الميوثرين والسومبيدين هما الأقل سمية
على الأطوار المختبرة من جميع المحافظات.