

Field Evaluation of Certain Control Agents Against Some Cotton Sucking Insects

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ABSTRACT

Two experiments were conducted during 2007 and 2008 cotton growing seasons, at Alexandria University Experimental Station, to evaluate the efficacy of Confidor 35% CS, Marshal 25% WP, Kemesol 95% EC and Achook 0.15% EC against some cotton sucking insects. These insects were aphid, *Aphis gossypii*, jassid, *Emboasca lybica*, and thrips, *Thrips tabaci*. The side effect of these control agents against the voracious predator aphid lion, *Chrysoperla carnea*, was also investigated. In both seasons Confidor was the most effective against aphid followed by Marshal, Achook and Kemesol. All tested control agents achieved a good control against thrips. Moreover, there were significant differences between them in 2007 and 2008 seasons. Confidor and Marshal had the highest reduction percentages against *E. lybica* population followed by Achook and Kemesol in both seasons. The side effects of the previous control agents against the predator *C. carnea* revealed that Marshal was the most harmful followed by Confidor in both seasons. In the same time, Achook and Kemesol had the least toxic effects.

INTRODUCTION

Cotton plants are attacked by a wide range of sucking insect pests from the seedling stage until near maturity (Khalafalla *et al.*, 1997). Heavy infestation of these pests results in extensive reduction in cotton yield (Nassef *et al.*, 1996). In addition to sucking the plant sap, virus disease transmitted by some of these insects may increase the severity of the injury and reduces the yield too (Butler *et al.*, 1986; Andrews and Kitten, 1989, and Harris *et al.*, 1992). The continuous and unwise uses of insecticides by farmers usually lead to adverse effects on naturally occurring biological control agents and the biotic environment as well. Therefore, the search about much safer alternatives to the synthetic insecticides is becoming so urgent. Many insecticide alternatives had been evaluated against these sucking insect pests (Guirguis *et al.*, 1991; Abou-Kahla *et al.*, 1992; Halawa *et al.*, 1992; Awad *et al.*, 1993; Salem, 1997 and El-Hariry *et al.*, 1998, El-Khodary *et al.*, 2007).

The main aim of this study was to evaluate the mineral oil Kemesol[®] and the botanical insecticide Achook[®] against thrips, aphids and jassid on

the seedling stage of cotton in comparison with the synthetic insecticides, Confidor® and Marshal®. The side effects of the previous control agents against the green lacewing predator *C. carnea* were also studied.

MATERIALS AND METHODS

Tested insecticides and oils:

Marshal 25% WP (carbosulfan), supplied by Delta Co., was used at a rate of 600 gm / fed. Confidor 35% CS (imidacloprid), provided by Bayer Comp., was used at a rate of 300 cm³/ fed. Mineral oil Kemesol 95% EC, supplied by Alexandria Chemical Co. (Kemex), was used at a rate of 1.5% V/V of the spraying solution. The neem seed kernel extract, Achook 0.15%EC (Azadirachtin), obtained by the Egyptian Agriculture Development Co., was used at a rate of 800 cm³/fed.

Field experiments:

Two experiments were conducted during 2007 and 2008 cotton growing seasons, at Alexandria University Experimental Station, Anees. Cotton variety Giza 70 was obtained from the Agronomy Department and cultivated at the first of April in the both seasons. Cultural practices were carried out as recommended for commercial production of cotton.

Treatments were arranged in a complete randomized block design. Each treatment was replicated four times (42 m² per each). The insecticides were sprayed by Knapsack sprayer equipment (CP3) at the rate of 200 liter per feddan on May 20, and May 27, at 2007 and 2008 seasons. respectively. Control was sprayed only by water.

The efficiency of the tested products against thrips, aphid, jassid and the predator aphid lion was determined by counting insects on ten plants per plot. Pre-treatment counts were done in the early morning just before application while post-treatment counts were made on days 1, 3, 5, 7 and 9 after treatment. Counts were done in the early morning when flight activity is minimal according to Bulter *et al.* (1988). Reduction percentages were calculated according to Henderson and Tilton equation (1955). The treatments were compared with each other using one way ANOVA with LSD_{0.05} (CoStat Statistical Software, 1990).

RESULTS AND DISCUSSION

Aphid:

Aphid, *A. gossypii*, is one of the most common insect pests attacking a wide spectrum of economic plants, causing a great losses in their yield. The problems of aphid are not only due to its direct damage to the infested

plants but also to its capability to transmit viruses (Blackman and Eastop, 1984). They reported that aphid species transmit more than 50 plant viruses. Impact of Kemesol[®], Achook[®], Confidor[®] and Marshal[®] against cotton aphid on the seedling stage of cotton is presented in Tables (1. A & B). At 2007 season, on days: 1, 3, 5, 7 and 9 post-treatment, reduction percentages in aphid population were 15.3, 77.4, 78.2, 84.0 and 78.8 %, respectively, when Kemesol[®] was used. These reduction percentages were 46.3, 83.1, 75.4, 67.8 and 61.4 %, respectively, when Achook[®] was used. The conventional insecticide Confidor[®] gave the highest aphid control with reduction percentages 69.2, 93.1, 97.3, 98.2 and 91.2 on the same days, respectively. Marshal[®] caused aphid reduction percentages 34.4, 86.2, 88.5, 74.4 and 65.4 at the same days, respectively (Table 1. A). Data from the 2008 season was partially concurred with those from the 2007 season. Confidor[®] revealed the highest aphid control with reduction percentages 83.4, 90.4, 96.4, 97.2 and 92.3 %, on days 1, 3, 5, 7 and 9 post-treatment, respectively. At the same time Kemesol[®] and Marshal[®] caused reduction percentages 25.6, 80.2, 79.3, 84.9 & 75.4 % and 30.0, 85.9, 88.3, 72.4 and 60.5 %, respectively. Achook[®] showed the least aphid control with reduction percentages 40.3, 80.9, 79.3, 60.8 and 55.4 %, respectively.

From these data the used control agents could be arranged at descending order as follow: Confidor[®] followed by Marshal[®] followed by Achook[®] and Kemesol[®]. The mean of reduction percentages were 89.8, 69.7, 66.8 and 65.9, respectively, in 2007 season (Table 1. A). In 2008 season, the used control agents could be arranged at a descending order as follows: Confidor[®] followed by Kemesol[®] and Marshal[®] followed by Achook[®]. The mean reduction percentages were 91.9, 69.1, 67.4 and 63.3 %, respectively (Table 1. B). From both studies, it is obvious that, the maximum reduction percentages were achieved at the 7th day for Kemesol[®] and Confidor[®], at the 5th day for Marshal[®] and at the 2nd day for Achook[®].

Table (1.A): Efficacy of certain treatments against aphids at the seedling stage of cotton

(season 2007):

Treatments	% Reduction					Mean
	1-day	3-days	5-days	7-days	9-days	
Kemesol	15.4	77.4	78.2	84.0	78.8	65.9 b
Achook	46.3	83.1	75.4	67.8	61.4	66.8 b
Confidor	69.2	93.1	97.3	98.2	91.2	89.8 a
Marshal	34.4	86.2	88.5	74.4	65.4	69.7 b

Means followed by the same letters are not significantly different according to the LSD_{0.05}.

Table (1.B): Efficacy of certain treatments against aphids at the seedling stage of cotton (season 2008):

Treatments	% Reduction					Mean
	1-day	3-days	5-days	7-days	9-days	
Kemesol	25.6	80.2	79.3	84.9	75.4	69.1 b
Achook	40.3	80.9	79.3	60.8	55.4	63.3 c
Confidor	83.4	90.4	96.4	97.2	92.3	91.9 a
Marshal	30.0	85.9	88.3	72.4	60.5	67.4 b

Means followed by the same letters are not significantly different according to the $LSD_{0.05}$.

Thrips:

Thrips, *T. tabaci*, are known to be serious pest on a wide range of fruit, vegetable, flower and agronomic crops. Thrips are members of the order Thysanoptera, which contains a number of genera and species (Coviello *et al.*, 1993). In this study, field evaluation of Kemesol[®], Achook[®], Confidor[®] and Marshal[®] against thrips on the seedling stage of cotton was carried out. Data is presented in Tables (2. A & B). It is clear that, in both 2007 and 2008 seasons, all the tested insect control agents reduced the mean percent population of thrips and there were no significant differences between these agents. In 2007 season, the mean reduction percentages of thrips were 90.7, 92.2, 92.8 and 91.9 for Kemesol[®], Achook[®], Confidor[®] and Marshal[®], respectively. These mean reduction percentages of thrips were 93.2, 93.1, 94.9 and 94.7 for Kemesol[®], Achook[®], Confidor[®] and Marshal[®], respectively, in 2008 season (Tables 2. A & B). Moreover, in both 2007 and 2008 seasons, Confidor[®], Marshal[®] and Achook[®] induced their highest reduction percentages along the 3 first days post-treatment while Kemesol[®] at the 7th day.

Table (2.A): Efficacy of certain treatments against thrips at the seedling stage of cotton (season 2007):

Treatments	% Reduction					Mean
	1-day	3-days	5-days	7-days	9-days	
Kemesol	86.4	93.7	95.0	87.7	90.8	90.7 a
Achook	93.3	97.0	82.1	97.8	90.8	92.2 a
Confidor	97.1	97.5	94.5	90.9	83.8	92.8 a
Marshal	96.2	94.9	91.8	93.7	82.7	91.9 a

Means followed by the same letters are not significantly different according to the $LSD_{0.05}$.

Table (2.B): Efficacy of certain treatments against thrips at the seedling stage of cotton (season 2008):

Treatments	% Reduction					Mean
	1-day	3-days	5-days	7-days	9-days	
Kemesol	83.5	97.9	95.5	98.0	91.2	93.2 a
Achook	97.5	98.7	89.2	92.4	87.6	93.1 a
Confidor	98.0	98.6	92.2	92.6	92.9	94.9 a
Marshal	97.1	98.5	95.1	92.9	90.0	94.7 a

Means followed by the same letters are not significantly different according to the $LSD_{0.05}$.

Jassid:

Jassid, *E. lybica*, is among the important sucking insects which attack cotton. Ahmed and Haq (1982) reported that, the retardation in plant growth, deterioration of lint quality as well as loss of cotton yield in non-hairy susceptible varieties is due to jassid infestation. The effect of Kemesol[®], Achook[®], Confidor[®] and Marshal[®] against jassid in 2007 and 2008 seasons is shown in Tables (3. A & B). In 2007 season, Confidor[®] and Marshal[®] had the highest reduction effects against jassid with mean reduction percentages 93.5 and 93.4 % followed by Achook[®] and Kemesol[®] with mean reduction percentages 70.9 and 67.7 %, respectively (Table 3. A). In 2008 season, Confidor[®] had the highest reduction effect followed by Achook[®] and Kemesol[®]. The mean reduction percentages of jassid which resulted from treatment by Confidor[®], Marshal[®], Achook[®] and Kemesol[®] were 93.2, 86.2, 72.6 and 72.1, respectively, (Table 3. B).

Table (3.A): Efficacy of certain treatments against jassid at the seedling stage of cotton

(season 2007):

Treatments	% Reduction					Mean
	1-day	3-days	5-days	7-days	9-days	
Kemesol	65.6	57.9	71.5	78.2	65.2	67.7 b
Achook	57.6	72.3	85.9	81.7	55.9	70.9 b
Confidor	90.6	95.1	93.2	95.6	93.2	93.5 a
Marshal	88.5	95.9	96.2	97.5	88.9	93.4 a

Means followed by the same letters are not significantly different according to the LSD_{0.05}.

Table (3.B): Efficacy of certain treatments against jassid at the seedling stage of cotton (season 2008):

Treatments	% Reduction					Mean
	1-day	3-days	5-days	7-days	9-days	
Kemesol	66.4	68.9	82.7	74.8	67.8	72.1 c
Achook	62.9	67.6	81.9	78.2	72.3	72.6 c
Confidor	85.8	96.2	95.1	96.6	92.3	93.2 a
Marshal	84.8	85.7	91.2	88.4	80.7	86.2 b

Means followed by the same letters are not significantly different according to the LSD_{0.05}.

Aphid lion:

Green lacewing, *C. carnea* Stephens also known as aphid lion belongs to family Chrysopidae, Order: Neuroptera. Larvae of aphid lion are a voracious predator of exposed eggs, small larvae of beetle and lepidopterous pests. It also feed on slow moving, soft-bodied arthropods such as aphids, jassids, thrips, whitefly, scales, mealy bugs and mites. It is a very important biological control agent due to its tolerance to the wide ranges of ecological factors. Aphid lion is found in different agricultural habitats in high relative frequency of occurrence (New, 1984 and Zelany, 1984). It has broad prey range and effective searching abilities (Ridgway and Murphey, 1984) and high resistance to many widely used pesticides (Bigler, 1984). Zaki *et al.* (1999) reported that double release of aphid lion achieved 100 % reduction in *A. gossypii* after 12 days. Therefore, when the integration between the natural enemies (such as aphid lion) and the chemical control is required, the impact of these chemical insecticides on the natural enemies must be studied.

In this study, the impact of Kemesol[®], Achook[®], Confidor[®] and Marshal[®] on the aphid lion population in 2007 and 2008 seasons is

presented in Tables (4. A & B). It is clear that, in both seasons, Marshal[®] proved to be the most toxic against the aphid lion followed by Confidor[®] which is followed by Achook[®] and/or Kemesol[®]. In 2007 season, the mean reduction percentages of aphid lion caused by Marshal[®], Confidor[®], Achook[®] and Kemesol[®] were 58.6, 33.0, 25.9 and 28.0 %, respectively. These mean reduction percentages were 55.7, 32.5, 30.8 and 28.4 %, respectively, in season 2008.

Table (4.A): Efficacy of certain treatments against aphid lion at the seedling stage of cotton (season 2007):

Treatments	% Reduction					Mean
	1-day	3-days	5-days	7-days	9-days	
Kemesol	31.6	43.7	25.6	21.2	17.7	28.0 c
Achook	31.3	35.4	25.5	19.5	17.8	25.9 c
Confidor	34.1	39.4	37.4	28.7	25.3	33.0 b
Marshal	52.5	67.4	63.1	55.3	54.9	58.6 a

Means followed by the same letters are not significantly different according to the LSD_{0.05}.

Table (4.B): Efficacy of certain treatments against aphid lion at the seedling stage of cotton (season 2008):

Treatments	% Reduction					Mean
	1-day	3-days	5-days	7-days	9-days	
Kemesol	33.1	35.9	28.3	23.3	21.4	28.4 c
Achook	31.7	38.9	32.2	27.6	23.4	30.8 bc
Confidor	34.3	42.8	31.7	29.2	24.7	32.5 b
Marshal	50.4	61.6	64.0	52.1	50.3	55.7 a

Means followed by the same letters are not significantly different according to the LSD_{0.05}.

According to the results obtained in this study, Confidor[®] proved to be effective in controlling aphid, thrips and jassid on the seedling stage of cotton. Marshal[®] was effective in controlling thrips and jassid. Kemesol[®] and Achook[®] proved to be effective in controlling thrips. These results were comparable with the results of many authors. Aslam *et al.* (2004) reported that, between seven insecticides tested against cotton sucking insects in Pakistan, Confidor[®] was the most effective in controlling jassid and thrips. Also, Wahla *et al.* (1997) and Hameed *et al.* (1997) investigated that Confidor[®] effectively controlled thrips and jassid in cotton. With respect to

the mineral oils Halawa *et al.* (1992) reported that, while the mineral oil Folk[®] oil induced a good initial and residual activity against thrips and can be used in IPM, it had a slight residual activity against aphids and jassids. The lower toxicity of the Achook[®] against aphid and jassid, compared with Confidor[®], in the present study was also observed by Aslam and Naqvi (2000) but in comparison with the insecticide Perfekthion[®].

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المخلص العربي

التقييم الحقلى لبعض مواد مكافحة ضد بعض الحشرات الثاقبة الماصة فى القطن

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**معهد بحوث وقاية النبات - محطة البحوث الزراعية - الصباحية - الإسكندرية

تم إجراء تجربتين خلال موسم نمو القطن ٢٠٠٧، ٢٠٠٨ فى محطة البحوث التابعة لجامعة الإسكندرية وذلك بهدف تقييم كفاءة الكونفيدور ٣٥% ، المارشال ٢٥% ، كيميسول ٩٥% والأشوك ١٥% على بعض الحشرات الثاقبة الماصة فى القطن. هذه الحشرات كانت المن ، الجاسيد والتربس. كذلك تم دراسة تأثير هذه المبيدات على الحشرة المفترسة أسد المن. أظهرت النتائج أنه فى كلا الموسمين كان الكونفيدور أكثر المبيدات خفضاً لأعداد المن متبوعاً بالمارشال ثم الأشوك وأخيراً الكيميسول. كل المواد المستخدمة فى المكافحة أعطت مكافحة عالية على حشرة التربس. الكونفيدور و المارشال كان لهما أعلى خفض فى أعداد حشرة الجاسيد ثم الأشوك ثم الكيميسول فى كلا الموسمين. أظهرت نتائج تأثير مواد المكافحة السابقة على أسد المن أن المارشال و الكونفيدور كانا أكثر المبيدات المستخدمة ضرراً على أسد المن. بينما كان للأشوك و الكيميسول تأثير صغير جداً على أسد المن مما يظهر قدرتهما الإختيارية.