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EFFECTIVENESS OF SOME INSECTICIDES AGAINST *Bemisia tabaci* (Genn) INFESTING SQUASH PLANTS

Shaimaa G. Lasheen[1*], R.M. Sherif[1], M.A.I. Youssif[1] and H.M. Sallem[2]

1. Plant Prot. Dept., Fac. Agric., Zagazig Univ., Egypt

2. Plant Prot. Inst., Argic. Res. Cent., Dokky, Giza, Egypt

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ABSTRACT: The aim of this study was to investigate the efficiency of four pesticides against the white fly, *Bemisia tabaci*, infesting squash plants during the two growing season, 2017 and 2018, under field conditions. Results showed that the reduction percentages of the white fly, *B. tabaci* populations on squash plant during season 2017 caused by Lambda cyhalothrin, Thiamethoxam, Azadirachtin and *Beauveria bassiana* were 86, 81.5, 72.25 and 86.66%, respectively, as mean residual effect. While, the initial reduction percentages for these pesticides were 98, 96, 93 and 0%, respectively. The general mean percentages of reduction caused by Lambda cyhalothrin, Thiamethoxam, Azadirachtin and *B. bassiana* were 92, 88.75, 82.63 and 90.33%, respectively. The efficiency of the tested pesticides on white fly could be arranged according to their percentages of reduction in infestation in the follows order: Lambda cyhalothrin > *B. bassiana* > Thiamethoxam > Azadirachtin, respectively. Results also showed that all the tested pesticides significantly decreased the number of the white fly*, B. tabaci* in an irregular way compared to the untreated control. Results also cleared that all the tested pesticides caused decrease in white fly populations till 11th day after treatment. The general mean numbers of the white fly, *B. tabaci* were 18.4, 27.6, 35.8 and 20 individuals/ sample for Lambda cyhalothrin, Thiamethoxam, Azadirachtin and *B. bassiana*, respectively, comparing with 211.6 individuals/sample in control group.

Key words: White fly, squash, Lambda cyhalothrin, Thiamethoxam, Azadirachtin, *B. bassiana*.

INTRODUCTION

Vegetables are grown extensively in Egypt, and essential for a healthy and balanced diet, as well as adding variety, interest and flavor to the menu. But vegetables also attract a wide range of pests and diseases, and require intensive pest management.

About 87% of the farmers who grow vegetables in Egypt use pesticides **(Dinham, 2003)**. Many of them spray the same wide range of pesticides on all vegetables and ignore pre-harvest intervals **(Ntow *et al.*, 2006).** Sometimes farmers spray pesticides one day before harvest to sell 'good-looking' vegetables. This practice, in particular, exposes consumers to pesticides. Pesticides applied to food crops in the field can leave potentially harmful residues. Organochlorine pesticides in particular can persist in foodstuffs for a considerable period. If crops are sprayed shortly prior to harvest without an appropriate waiting period, even organophosphate residues can persist up until the food is in the hands of the consumer.

The white fly, *Bemisia tabaci* (Gennadius Homoptera: Aleyrodidae) feeds on a wide range of vegetables and is an important pest of many crops including soybean and many types of ornamental plants **(Hirano *et al.*, 1993)**. The white fly also attack cucumber, okra, pumpkin, lablab bean and eggplant **(Kajita and Alam, 1996)**.

Sucking of plant sap by large populations of white fly nymphs and adults can greatly reduce

***Corresponding author: Tel. :** +201128102465
E-mail address: shaimaagamall@yahoo.com

the plant vigor. Chlorotic spots appear at feeding sites on the leaf surface, followed by wilting and resulting leaf shedding. Such damage to foliage at the early stages of plant growth, affects development of the reproductive structures and consequently the yield may be greatly reduced. However, direct damage due to feeding would not appear to have been a matter of much concern, as reflected by the general lack of attention to this aspect in the literature.

Heavy colonization of *B. tabaci* can cause serious indirect damage to this crop due to honeydew excreted by all insect stages, particularly the late nymphal instars. Accumulation of honeydew on leaf or on fruit surfaces encourages growth of sooty moulds, which affect yield both in quantitative and qualitative terms **(Basu, 1995)**.

The notoriety of *B. tabaci* as a pest obscured by its role as an efficient vector of a large number of important diseases of tomato in the tropical and subtropical parts of the world. The prevalence and distribution of *B. tabaci* viral maladies have increased during the past decade and the impact has often been devastating **(Basu, 1995)**.

Due to virus diseases enormous yield loss of tomato is recoded all over the world described yellow leaf curl symptom in tomato leaves caused by a virus transmitted by white fly (*B. tabaci*) in Israel which was extensively studied by **Cohen and Nitzany (1966)** and named the virus as Tomato yellow leaf curl virus (TYLCV).

The white fly population during growing period of tomato plants contributes to the spread of virus in the field. TYLCV is not mechanically transmitted and genetic resistance in cultivated varieties is absent. **Brunt *et al.* (1990)** suggested that control of *B. tabaci* could be possible to a good extent by growing tomato seedling in insect proof net house. For profitable cultivation of tomato in Bangladesh, management of white fly is urgently needed. Among the various control practices in tomato plant to suppress the prevalence of white fly insecticides are the mostly used.

The synthetic pyrethroids are powerful contact insecticides with a quick knockdown effect, a highly deserved quality to inactivate vector individuals within the period required for virus transmission. **Basu (1995)** found that foliar sprays of a synthetic pyrethroid reduced the number of nymphs and adults of *B. tabaci* as a chemical measure to restrain tomato leaf curl virus disease.

Occurrence of white fly is very common in summer squash. But in recent years the problem has increased manifold. To combat the disease problem disseminating by white fly there is no effective management package or resistant variety available at present. Therefore, developing a sound and effective management package for white fly is urgently needed. Under the existing circumstances combination of physical and chemical approaches seem to be a better option for the management of white fly as reported by **Basu (1995)** in Bangladesh.

So that, the aim of this work was investigating the efficiency of Lambda cyhalothrin, Thiamethoxam, Azadirachtin and Beauveria bassiana against white fly infesting squash plants. During the seasons of (2017, 2018).

MATERIALS AND METHODS

Tested Insecticides

Lambda cyhalothrin (Lambda 5% EC)

(obtained from Kafr El-Zayat Company for Pesticides and Chemicals 61 Al-Hussein Street, Mohandessin-Giza-Egypt)

Thiamethoxam (Actara25% wg)

(obtained from Syngenta Agro Company 4 Yanbu Street - Dokki - Giza – Egypt)

Azadirachtin (Neem 1% EC)

(obtained from Misr Agricultural Development Company (Hisham Abu Hussein), Kilo 89, Cairo Alexandria Desert Road - Sadat City)

Beauveria bassiana (Biovar)

Obtained from bio insecticides production unit (BPU). Plant protection institute (PPRI) 7st. Dokky, Giza

Field Studies

The field studies were done to investigate the efficiency of some pesticides against white fly infesting squash plants.

The experiment was carried out at El-Ibrahimiya city during seasons of 2017 and 2018. Experiments were set at a randomized block design.

An area of 5 Kirate (875m^2) was divided into 5 equal plots (4 treatments of pesticides and one as control). Motor sprayer was used to spray the tested pesticides with the recommended field rates. 30 leaves were taken at random from each plot. Counts of white fly were made just before treatment then after, 3, 7 and 14 days post treatment.

The reduction percentages of white fly population were calculated according to **Henderson and Tilton (1955)**.

$$\text{Reduction (\%)} = 1 - \frac{A \times C}{B \times D} \times 100$$

Where:

A= number of individuals in treatment after application.

B= number of individuals in treatment before application.

C= number of individuals in control before application.

D= number of individuals in control after application.

Statistical Analysis

Data obtained were statistically analyzed. Duncans Multiple Range-test was used to determine the significant differences between the mean values of treatments according to **Snedector and Cochran (1989).**

RESULTS

Efficacy of the Tested Inseticides Against White fly, *Bemisia tabaci* Under Field Conditions

First season (2017)

Results presented in Table 1 show that the mean number of *Bemisia tabaci* on squash plant decreased after treatment with all examined insecticides comparing with check control. The general mean numbers of *B. tabaci* individuals/ 30 leaves were 23.4, 35.2, 52.2 and 23.75 in cases of Lambda cyhalothrin, Thiamethoxam, Azadirachtin and *Beauveria bassiana*, respectively, compared to the untreated control which was higher (218.4 individuals/30 leaves) than that of the sprayed plots.

As shown in Table 2, reduction percentages of *B. tabaci* on squash plant during season 2017 caused by Lambda cyhalothrin, Thiamethoxam, Azadirachtin and *B.bassiana* reached 86, 81.5, 72,25 and 86.66 respectively, as mean residual reduction percentages. While, the initial reduction percentages for these treatments were 98, 96, 93 and 0%, respectively. The general mean percentages of reduction caused by Lambda cyhalothrin, Thiamethoxam, Azadirachtin and *B. bassiana* were 92, 88.75, 82.63 and 90.33%, respectively . The tested white fly could be arranged according to their percentages of reduction in infestation in the follows order: Lambda cyhalothrin > *B. bassiana* > Thiamethoxam > Azadirachtin, respectively (Table 2).

Second season (2018)

Results tabulated in Table 3 show that all the tested pesticides significantly decreased the number of *B. tabaci* in an irregular way compared to the untreated control. Results also cleared that all white fly caused decrease till 11th day after treatment. The general mean numbers of *B. tabaci* were 18.4, 27.6, 35.8 and 20 individuals/sample for Lambda cyhalothrin, Thiamethoxam, Azadirachtin and *B. bassiana*, respectively, comparing with 211.6 individuals/ 30 leaves in control.

Results presented in Table 4 indicate that the mean initial reduction percentages of *B. tabaci* population on squash plant after 24 hr., caused by Lambda cyhalothrin, Thiamethoxam, Azadirachtin and *B. bassiana* were 100, 99, 95 and 0.0%, respectively. On the other hand, the mean reduction percentages of residual effect were 90.5, 86.5, 81.75 and 90.33% for the same tested white fly, respectively. While, the mean reduction percentages of accumulation effect (general effect) were 95.25, 92.75, 88.38 and 92.67% for Lambda cyhalothrin, Thiamethoxam, Azadirachtin and *B. bassiana*, respectively.

Table 1. Effect of the tested compounds against white fly, *Bemisia tabaci,* on squash plant at El-Ibrahimiya, Sharkia Governorate during summer season of 2017

Tested compound	Population No. before treatment	Mean No. of *Bemisia tabaci* after treatment (in days) (30 leaves)					General mean
		1	3	7	11	14	
Lambda cyhalothrin 5% EC	254	4	3	11	44	55	23.4
Thiamethoxam 25% wg	267	11	21	24	56	64	35.2
Azadirachtin 1% EC	270	16	44	56	68	77	52.2
Beauveria bassiana	249	0.0	15	14	11	55	23.75
Control	256	233	245	207	202	205	218.4
LSD	1.49	1.48	0.64	1.84	1.14	1.49	

Table 2. Reduction percentages of *Bemisia tabaci* caused by the tested compounds on squash plant at El-Ibrahimiya, Sharkia Governorate during summer season of 2017

Tested compound	Initial effect (%)	Reduction (%) of *Bemisia tabaci* after different periods (in days) (30 leaves)				Mean residual effect (%)	General reduction effect (%)
		3	7	11	14		
Lambda cyhalothrin 5% EC	98	99	95	78	72	86	92
Thiamethoxam 25% WG	96	92	89	75	70	81.5	88.75
Azadirachtin 1% EC	93	83	74	68	64	72.25	82.63
Beauveria bassiana	0.0	94	93	95	72	86.66	90.33

Table 3. Effect of the tested compounds against white fly *Bemisia tabaci* on squash plant at El-Ibrahimiya, Sharkia Governorate during summer season of 2018

Tested compound	Population No. before treatment	Mean No. of *Bemisia tabaci* after treatment (in days) (30 leaves)					General mean
		1	3	7	11	14	
Lambda cyhalothrin 5% EC	217	0	3	12	35	42	18.4
Thiamethoxam 25% WG	227	2	8	18	42	68	27.6
Azadirachtin 1% EC	205	10	15	44	58	52	35.8
Beauveria bassiana	216	0.0	11	18	17	34	20
Control	197	206	195	217	229	211	211.6
LSD	1.19	1.26	2.57	1.40	1.68	1.39	

Table 4. Reduction percentages of *Bemisia tabaci* caused by the tested compounds on squash plant at El-Ibrahimiya, Sharkia Governorate during summer season of 2018

Tested compound	Initial effect (%)	Reduction (%) of *Bemisia tabaci* after different periods (in days) 30 leaves				Mean residual effect (%)	General reduction effect (%)
		3	7	11	14		
Lambda cyhalothrin 5% EC	100	99	95	86	82	90.5	95.25
Thiamethoxam 25% WG	99	96	93	84	73	86.5	92.75
Azadirachtin 1% EC	95	93	81	76	77	81.75	88.38
Beauveria bassiana	0.0	95	93	93	85	90.33	92.67

DISCUSSION

White fly has complex morphological traits depending on host biotypes, cultivars and environmental conditions **(Legg, 1999)**. On this respect, white fly has an ability to adapt new environment and damage new hosts at different geographic regions **(Basu, 1995)**. Heavy infestation leads to stunting and reducing vigor and growth of plants. There are different controlling strategies that have been adopted to control white fly on tomato since decades viz; biological control, cultural control, mechanical and chemical control (**Jesse *et al.*, 2007**). The current results were confirmed by those of **El-Naggar and Zidan (2013)** who showed the effect of imidacloprid and thiamethoxam against sucking insect pest like white fly, jassids and aphids and reported the maximum reduction percentage at 40 days. **Jamshid *et al.* (2015)** compared the effect of datura alba 5% and *B. hystophorous* 5% with Imidacloprid 250g/acre against white fly on tomato and cotton and repoted that datura alba and B. hystophorous were more effective against white fly. **Asi *et al.* (2008)** tested confidor and polo against white fly, jassids and thrips were found them very effective on cotton and tomato crop comparing with Cascade at the interval of 24, 48 and 72 and 168 hrs.

Das and Islam (2014) found that imidacloprid, fipronil and buprofezin were exibited high efficacy against white flies and jassids while, thiamethoxam + emamectin benzoate showed moderate efficacy.

Also, results of the current study are in conformity with those of **Horowitz *et al.* (1998)**, **Natwick (1999), Natwick and Deeter (2001), Parrish and Assial (2001) and Aslam *et al* (2003)** who observed significant mortality of white fly with the application of acetamiprid.

The tested insecticides showed variable effects on whiteflies and this may be due to the great variability in neonicotinoids characteristics influencing the movement in plant tissues such as water solubility which greatly affecting their toxicity especially on piercing sucking insect pests such as whiteflies **(Cloyd and Bethke, 2011)**. The tested neonicotinoid insecticide also variably reduced whiteflies populations on squash either during first or second season. Based on the results obtained, it was noticed that the percentage reduction of whiteflies populations were higher in first season than second season. This may be due to the high temperature during the first cropping season. As revealed by **Zheng and Liu (1999)** who stated that when the surrounding temperature increase, the hydrolysis of neonicotinoid insecticides will increase and subsequentely affect the toxicity levels.

Dey *et al.* (2005), Preetha *et al.* (2009), Yasmin *et al.* (2009), Raghuraman and Birah (2011) and Shinde *et al.* (2011) reported that imidacloprid is effective against whiteflies. Similarly **Muhammad *et al.* (2005)** also reported that imidacloprid and thiomethoxam are effective in controlling the white fly population. **Naik and Shekharappa (2009)**,

Meade and Bruce (1991) reported that *B. bassiana* and *Verticillium lecaniito* be effective in managing the white fly population in okra. Similar to the present study, **Muhammad *et al.* (2009)** also reported imidacloprid and diafenthiuron to be effective against whiteflies.

On the other hand, flubendiamide and chlorantraniliprole showed low effect against white fly. While **Liu (2004)** reported that the spiromesifen showed excellent promise as a foliar spray against white fly infesting melons and collards. According to **Nauen and Konanz (2005)**, the spiromesifen considered as an option for control management of white fly, *Bemisia* spp. in cotton. **Palumbo (2009)** revealed that the spray application of spiromesifen provided residual control of white fly, *B .tabaci* on spring cantaloupes. **Al-Kherb (2011)** showed the highest efficacy against white fly in cucumber and tomato with thiamethoxam which is partially agreed with the above results.

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فعـــاليـــــة بعـــض المبيـــــدات علـــــى الذبـــابـــــة البيضـــاء التـــي تصـيب الكـوســـــة

شيماء جمال لاشين[١] - رفعت مصطفي شريف[١] - محمد أحمد إبراهيم يوسف[١] - حسن محمد سالم[٢]

١- قسم وقاية النبات - كلية الزراعة - جامعة الزقازيق - مصر

٢- معهد بحوث وقاية النباتات - الدقي - الجيزة - مصر

تهدف هذه الدراسة إلى دراسة فعالية أربعة من مبيدات الآفات على الذبابة البيضاء التي تصيب نباتات الكوسة خلال موسمي الدراسة ٢٠١٧ و٢٠١٨ تحت ظروف الحقل، أظهرت النتائج أن نسب الخفض فى تعداد الذبابة البيضاء علي نباتات الكوسة خلال موسم ٢٠١٧ بواسطة مبيدات لمبادا واكتارا والنيم وبيوفار كانت ٨٦، ٨١,٥٠ ، ٧٢,٢٥ و ٨٦,٦٦ % علي التوالي كتأثير متبقي علي الذبابة البيضاء في حين كان التأثير الأولي لنسب الخفض هو ٩٨ ، ٩٦ ، ٩٣ و صفر% علي التوالي وكان المتوسط للتأثير بواسطة لمبادا واكتارا ونيم وبيوفار هي ٩٢ ، ٨٨,٧٥ ، ٨٢,٦٣ و ٩٠,٣٣% على التوالي، ولذلك يمكن ترتيب المبيدات المختبرة تنازليا طبقا لنسب الخفض في تعداد الذبابة البيضاء كالتالي لمبادا > بيوفار > اكتارا > ونيم، كما اظهرت النتائج ان المبيدات المختبرة أحدثت خفض معنوي في تعداد الذبابة البيضاء مقارنة بالكنترول، كما اظهرت النتائج ان المبيدات المختبرة احدثت خفض اعداد الذبابة البيضاء حتي اليوم الحادي عشر من المعاملة، وكان المتوسط العام لتعداد الذبابة البيضاء هو ١٨,٤ ، ٢٧,٦ ، ٣٥,٨ و٢٠ فرداً لكل عينة لمبيدات لمبادا، اكتارا، نيم و بيوفار علي التوالي مقارنة ب ٢١١,٦ فرد في تجربة المقارنة.

المحكمـــون:

١- د. علـي عبدالعزيز الشيخ رئيس بحوث متفرغ بمعهد بحوث وقاية النباتات- فرع الشرقية- مركز البحوث الزراعية بالجيزة.

٢- أ.د. علي أحمد علـي أيوب أستاذ المبيدات المتفرغ - كلية الزراعة- جامعة الزقازيق.