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EFFICIENCY OF SOME PESTICIDES ON COTTON WHITEFLY, *Bemisia tabaci* (Gennadius)(Homoptera:Aleyrodidae) INFESTING SOYBEAN PLANTS,*Glycine hispida* (Max).

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ABSTRACT

The present work was carried out to study the efficiency of seven pesticides namely, Agreenate , Diazinone, Boma, Major, Chlorosan, Agrezole and Nasractine on the egg hatchability percentage of the cotton whitefly, B. tabaci (Genn.) under laboratory conditions on soybean plants, and evaluate the efficiency of single and double applications of the tested pesticides against the nymphal stage of whitefly, B. tabaci infesting soybean plants under filed conditions.

Data showed that, the tested pesticides caused high reduction of egg hatchability percentages compared with control . The minimum hatchability percentages of egg caused by Major (4.35%), while the maximum egg hatchability percentages caused by Nasractine (54.03%) compared with control (95.52%). With respect to the efficiency of the tested pesticides against nymphal stage of B.tabaci, The results revealed that Chlorosan proved to be the highest effective compound in single and double applications, on the other hand, Agrezole was the lowest effective one in both applications. The other tested pesticides occupied in intermediate positions between the highest and the lowest compounds.

In addition, all treatments showed significant increase in the average weight of 100 seeds of the treated plots as compared with control.

***Conclusively,** it can be concluded that using the tested pesticides especially Chlorosan against whitefly, B. tabaci can reduce the crop losses in soybean plants under the Egyptian field conditions.*

Key words: Whitefly, *Bemisia tabaci*, soybean, pesticides.

INTRODUCTION

The cotton whitefly, *Bemisia tabaci* (Genn.) is one of the most intractable and worldwide damaging and injurious top hundred pest attacking a wide range of important corps, vegetables and ornamentals all over the world (Perring, 2001Carabali *et al*., 2005; Touhidal and Shunxiang, 2007; Abdel-Baky & Al-Deghairi, 2008).

High populations of *B. tabaci* induce losses in plant productivity by direct feeding, fungal growth associated with honeydew contamination, and plant physiological disorders. Losses also occur from *B. tabaci* due to the efficient transmission of leaf yellow mosaic and mottling, leaf distortion and stunting (Oliveir *et al*., 2001). However, management of *B. tabaci* is challenging because of its intercrop movement, high reproductive potential and it's under leaf habitat (Gerling *et al*., 2001; Al Deghairi, 2009 and Feuly *et al*., 2011). During the last decades, chemical control using insecticides was the most efficient method to minimize whitefly damages to crop production (Al-Kherb, 2011).

Therefore, the present investigation aimed to evaluate the efficiency of some pesticides against the egg and nymphal stages of the cotton whitefly, *B. tabaci* (Genn.) on soybean plants.

MATERIALS AND METHODS

The Laboratory tests was carried out at institute of plant protection research at Sharkia Governorate, while field experimental were carried out at Al-Kanayat City, Sharkia Governorate throughout the successive growing season, 2013 at Knayat district, Sharkia Governorate**,** Zagazig, Egypt.

1-*Pesticides used:*

The seven pesticides used in this study were:

1-The pyrathroid insecticide Chlorosan (Chlorpyrifos +cypermethrine) 29% E.C at the rate of 1 Liter- Fed .

2 -The pyrathroid insecticide Major (Lambada-cyhalothrine + deltamethrine) 5% E.C at the rate of 50 cm- 100 Liter water .

3 -The carbamate insecticide Agreenat (methomyl) 90% S.P at the rate of 300 g- Fed.

5 -The acaricide Nasractine (abamectine) 1.8% E.C at the rate of 30cm-100 Liter water.

6-The fungicide Boma (azoxystropin)25%S.C at the rate of 50cm-100 Liter water.

7-The fungicide Agrezole (Pencoanzole)10%S.C at the rate of 1 Liter- Fed.

2- ***Laboratory tests*****:**

Laboratory tests were undertaken to detect the efficiency of the seven following pesticides against the eggs of whitefly, *B. tabaci* (Genn.) as shown in Table 1. The eggs of *B. tabaci* were obtained by introducing the adults to fresh soybean plants in cages(50 cm. in diameter and 60 cm. in high) and allowed to lay eggs, after that the adults were removed. The eggs on the infested plants were left to develop to appropriate stage for the experiment. Each treatment, as well as, the untreated check (control) was replicated 3 times. After three days of adults' removing, the plant leaves with eggs were picked up and the eggs of each inspected leaf were counted before treatment, then the leaves were dipped in the prepared concentrations (with the recommended dose of the tested pesticides) of the studied pesticides for 5 seconds (Wang *et al*., 2003 and Zhang *et al*., 2004). For the control, leaves with eggs were dipped in water only for the same mentioned above time. After drying at ambient temperature, one leaf was placed in a Petri dish (10 cm diameter). The number of nymphs was counted 3 days after treating eggs with the tested pesticides. Unhatched eggs or individuals unable to come out of the egg shells were considered to be dead according to Yang *et al*. (2010).

3-*Field experiments*:

Field experimental were carried out at Al-Kanayat City, Sharkia governorate throughout the successive growing season, 2013. An experimental area of half feddan was divided into four sections of 8 plots. Each plot consisted of five rows of 6m. length and 120cm. width. Soybean seeds were cultivated in the experimental field using complete block randomized design with three replicates for each treatment. The normal agricultural practices were followed in due time during the experimental period.

4-*Application of the pesticides*:

The tested pesticides were distributed on the experimental sections as follows:

1- In the first 1st section, plants of soybean were grown without any pesticidal treatment to be used as control were sprayed with water only .
2- In the second 2nd section, plants of soybean were treated once with all pesticides as foliar spray.
3- In the third 3rd section, plants of soybean were treated twice (2 weeks between spray to another) with all pesticides as foliar spray.

The used pesticides were diluted with water and sprayed using a knapstack sprayer equipped with one nozzle.

5-*Sampling techniques*:

To evaluate the effectiveness of the tested pesticides, samples of 25 leaves were picked up by diagonal cross from each replicates (three replicates used) just before spraying and at 1 , 3 , 7, 11, and 14 days after single and double applications in all treatments. Samples (25 leaves/replicate) were placed in paper bags and transferred immediately to the laboratory for examination. Nymphs of *B. tabaci* were counted and recorded using a binocular microscope. The reduction percentage in the nymphs of *B. tabaci* resulted from the applications of the tested sprayed pesticides was calculated according to Henderson and Tilton equation (1955) as follows:

Reduction % = (1-[(Cb x Ta)/ (Ca x Tb)]) x 100

Where **:** Cb = no. of nymphs in control plots before spraying, Ca = no. of nymphs in control plots after spraying, Ta= no. of nymphs in treated plots after spraying, Tb= no. of nymphs in treated plots before spraying.

6-*Soybean yield*:

To study the effect of the seven tested pesticides on the yield of soybean at harvest time, the weight of 100 seeds (g / replicate) was recorded and weighted to compared the yield between treatments and untreated one (control) .

Data obtained were statistically analyzed . Duncans Multiple Range-test was used to determine the significance differences between the mean values of treatments according to Snedector and Coshran (1987).

RESULTS AND DISCUSSION

1- ***Laboratory tests:***

The effectiveness of the used pesticides against the egg stage of whitefly, *B. tabaci* is presented in Table 1. Data showed that all the tested pesticides (at the recommended dose) caused high reduction of egg hatchability percentage compare with the untreated one (control). The percentages of egg hatchability (No. of hatched egg \ No. of total lied egg) were 24.65, 42.19, 39.70, 20.00, 11.84, 4.35 and 54.03% for Agreenate, Diazinone, Agrozole, Boma, Chlorosan, Major and Nasractine , respectively, compare with egg hatchability percentage in control (treatment with water), which was 95.95%, data also cleared that Major caused the lowest

Table 1. Effect of the tested pesticides on the egg hatchability of whitefly, *B. tabaci* (Genn.) under laboratory conditions, during season 2013.

Tested Pesticides	Mean no. of eggs	Mean no of nymphs	Hatchability, %
Control	22.23	21.33	95.95
Agreenate	23.00	5.67	24.65
Diazinone	21.33	9.00	42.19
Agrazole	22.67	9.00	39.70
Boma	20.00	4.00	20.00
Chlorosan	25.33	3.00	11.84
Major	23.00	1.00	4.35
Nasractine	29.00	15.67	54.03

hatchability percentage, while Chlorosan came in the second position followed by Boma. On the other hand the highest hatchability percentage was given by Nasractine.

These results agreed with findings recorded by Al-Kherb (2011) who reported that chemical control using insecticides was the most efficient method to minimize whitefly damages to crop production.

2- ***Field Experiments***

2.1.Single application:

Data presented in Table (2) showed that the mean number of *B. tabaci* nymphs were decreased irregularly after treatment with all the examined pesticides. This decreasing lasted till the end of two weeks in case of Diazinone, Boma, Chlorosan, and Major, while in Agreenate, Agrazole and Nasractine this phenomenon observed till the 11^{th} day after spray.

The general mean numbers of whitefly nymphs were 47.40, 73.53 ,73.34, 38.80, 10.67, 17.80 and 96.73 (nymphs /sample) for Diazinone, Nasractine, Boma, Agreenate, Chlorosane, Major and Agrazole, respectively

as compared with the untreated one (control), which was 203.27 nymphs/sample.

Statistical analysis revealed that there were highly significant differences between all treatments and the control, while there was insignificant difference between Nasractine and Diazinone from one side, and between Chlorosane and Major from the other side in the 14th day after application.

The presents results are in agreement with those obtained by Horowitzt *et al*.(1998), Natwick (1999), Natwick and Deeter (2001), Parrish (2001), Aslam *et al*.(2003), Lin *et al.*(2007) and Amjad *et al*. (2009) who observed significant mortality of whitefly with the application of several pesticides.

As shown in Table (3) reduction percentages of *B.tabaci* nymphal stage population on soybean plants for the tested pesticides ; Agreenate, Daizinone, Agrazole, Boma, Choroson, Major and Nasractine reduced by 85.88 ,88.21 57.92,77.82 , 95.16 ,90.54 and 79.51% as initial reduction percentage , while the residual reduction percentages were 69.19, 66.88, -0.97, 31.42, 78.20, 80.44 and 24.44 for the previous tested pesticides, respectively . The general mean percentages recorded were 77.53, 77.55, 28.48, 54.62, 86.68, 85.49 and 51.97 for the same tested pesticides, respectively as shown Table 3.

The tested pesticides could be descendingly arranged at the percentages of reduction in infestation as follows: Chlorosan > Major > Agreenate > Diazinone > Boma > Nastactine > Agrazol.

In this respect the efficiency of the tested pesticides on whitefly *B.tabaci* (Genn.) were studied by several investigators *e.g*., Afzal *et al*.,(2001) and Saleem *et al.,* (2001) who compared the efficiency of different insecticides spray against sucking insect pests, Ahmed and Hussain (1993) studied the combination of insecticides against whitefly. Aamir *et al*., (2007) evaluated some chemical and biological control methods against the cotton whitefly, *B. tabaci* on squash plants and found that organophosphorus insecticide profenofos was the highest effective compound.

2.2. Double applications

Data tabulated in Table (4) showed that all the tested pesticides decreased the nymphal stage numbers of *B. tabaci* in an irregular way when compared with control. Data also cleared that Major was the only pesticide that caused decreasing lasted till the 14th day after treatment. The general mean numbers of *B. tabaci* nymphs were 20.80, 32.87, 29.13, 16.13, 15.00, 10.47 and 38.00 nymphs/sample for Diazinone, Boma, Nasractine, Agreenate, Major,

Table 3. Reduction Percentage of nymphal population of whitefly, *B. tabaci* (Genn.) infesting soybean plants as influenced by single application of tested pesticides under filed conditions during season 2013 at Al-Kanayat City, Sharkia Governorate.

Tested pesticides	Reduction percentage of *B.tabaci* nymphs after treatment(days)					Mean of Residual effect(%)	Mean of general effect (%)
	Initial Effect	3 days	7 days	11 days	14 days		
Diazinone	88.21	77.45	61.34	70.36	58.38	66.88	77.55
Nasractine	79.51	45.43	34.75	-20.28	37.85	24.44	51.97
Boma	77.82	64.73	27.87	11.40	21.69	31.42	54.62
Agreenate	85.88	81.60	79.64	44.30	71.20	69.19	77.53
Chlorosan	95.16	91.95	50.20	78.95	91.68	78.20	86.68
Major	90.54	82.08	89.61	66.43	83.64	80.44	85.49
Agrazole	57.92	32.08	29.82	-54.24	-11.53	-0.97	28.48

Chlorosan and Agrazole, respectively, compared with 145.40 nymphs/sample which recorded as a general mean number in the untreated one (control).

Statistical analysis showed significant differences between the treatments from one to each other, also between them and the control, with the exception of Diazinone, Nasractine and Major.

Data presented in Table (5) indicated that the mean reduction percentages of *B. tabaci* nymphal population on soybean plants after 24 hours of double sprays of the tested pesticides (Agreenate, Diazinone, Agrazole, Boma, Chlorosan, Major and Nasractine) were 88.73, 79.58, 47.71, 59.33, 92.09, 90.07 and 66.77, subsequently. On the other hand the mean reduction percentages of residual effect of the mentioned pesticides recording 86.71, 86.17, 71.23, 78.26, 90.50, 88.53 and 76.92%, respectively . While the mean percentages of accumulation effects (general effect) were 87.72, 82.88, 59.47, 68.88, 91.29, 89.05 and 71.84 for the aforementioned tested pesticides, successively.

Table 5. Reduction Percentage of nymphal population of whitefly, *B. tabaci* (Genn.) infesting soybean plants as influenced by double application of tested pesticides under filed conditions during season 2013 at Al-Kanayat City, Sharkia Governorate.

Tested pesticides	Reduction percentage of *B.tabaci* nymphs after treatment(days)					Mean of Residual effect(%)	Mean of general effect (%)
	Initial Effect	3 days	7 days	11 days	14 days		
Diazinone	79.58	82.32	85.70	93.36	83.31	86.17	82.88
Boma	59.33	72.65	85.20	75.53	79.67	78.26	68.80
Nasractine	66.77	76.74	77.24	74.21	79.48	76.92	71.84
Agreenate	88.73	89.84	86.74	85.20	85.05	86.71	87.72
Major	90.07	90.21	92.97	88.78	80.16	88.03	89.05
Chlorosan	92.09	88.72	94.68	87.37	91.21	90.50	91.29
Agrazole	47.71	77.18	70.60	68.76	68.38	71.23	59.47

The tested pesticides were arranged descendingly according to their percentages of reduction in infestation as follows : Chlorosan > Major > Agreenate > Diazinone > Nasractine > Boma > and Agrazole.

4-Soybean yield

Results in Table (6) indicated that all treatments showed significant differences in the average weight of 100 seeds of the treated plots as compared with that of untreated one (control). The mean weight of 100 seed after single applications with Chlorosan are 13.41g as compared with 15.12 g after double applications ,while in untreated one (control) was 8.60 g, so that the treatment with Chlorosan cause high in soybean yield equal 1.8 fold compared with control group. On the other hand, the treatment with Major cause high in soybean yield equal 1.7 fold compared with control. Whereas, the treatment with Agreenate caused high in soybean production about 1.67 fold compared with control. The treatment with Diazinone and Nasractine

Table 6. Effect of single and double applications of tested pesticides on the soybean yield under filed conditions during season 2013 at Al-Kanayat City, Sharkia Governorate.

Tested Pesticides	Weight of 100 seeds (g)	
	Single application	Double applications
Control	8.09	8.60
Agreenate	12.05	14.37
Diazinone	10.11	13.21
Agrazole	8.76	10.58
Boma	9.45	11.53
Chlorosan	13.41	15.12
Major	13.05	14.97
Nasractine	9.89	12.95

came in the second position with 1.5 fold in soybean production . The lasted position of soybean production were 1.3 and 1.2 fold compared with untreated one (control) caused by Boma and Agrazole after double applications. The single application caused high in soybean production compared with untreated one (control) but less than the double application.

Conclusively, it can be concluded that using the tested pesticides especially Chlorosan against whitefly, *B.tabaci* can reduce the crop losses in soybean plants under the Egyptian field conditions.

REFERENCES

Aamir, M.M.I; A.A.El-Feshawy; E.I.Mourad and M.F.El-Esawey (2007). Control of the cotton whitefly. *B.tabaci* (Genn.) on squash plants. *Zag . J. of Agric. Res.,* **34**(6):1145-1163.

Abdel-Baky, N.F. and M.A.Al-Deghairi, (2008). Role of host plants on the biological aspects and parasitism levels of *Eretmocerus mundus* Mercet (Hymenoptera: Aphelinidae), a parasitoids of *Bemisia* tabaci (Gennadius) (Hemiptera : Aleyrodidae *). J. Entomol*., **5**:356-368.

Afzal , M.; Z.Ahmed and T.Ahmed (2001). The comparative efficacy of different insecticide spray schedule against sucking insect pests on FS-628 cotton. *Pak. J. Agric.Sci*., **38:**23-24.

Ahmad, S. and M.Hussain (1993). Evaluation of some combination of insecticides against insect pest complex of cotton cultivar NIAB.78. *Pak. J. Agric. Sci.*, **30**:309-312.

Al-Deghairi, M.A.,(2009). Combining effect of Beauveria Bassaina(Bals.) and Ertemocerus Mundus Mercet (Hymenoptera :Alphelinidae) on sweet-potato whitefly, *Bemisia tabaci* (Gennadius) (Aleyrodidae: Hemiptera). *J. Entomol*., **6**:72-78.

Al-Kherb, W.A.(2011) . Field efficacy of some neonicotinoid insecticides on whitefly *Bemisia tabaci* (Homoptera: Aleyrodidae) and its natural enemies in cucumber and tomato plants in Al-qassim Region, K.SA. *J. Entomol.*, **10**:1-10.

Amjad , M.; M.H.Bashir; M.Afzal and M.A.Khan (2009). Efficacy of some insecticides against whitefly (*B.tabaci* Genn.) infesting cotton under field conditions. *Pak. J. Life Soc. Sci*., **7**(2):140-143.

Aslam, M.; M.Razzaq; S.A.Shah and M.Faheem (2003). Efficacy of different insecticides against sucking insect-pests on cotton. *Pak. Entomol.*, **25**:155-159.

Carabali, A.,A.C.Bellotti, J. Montoya-Lerma and M. E. Cuellar, (2005). Adaptation of *Bemisia* tabaci biotype B(Gennadius) to cassava, *Manihot esculenta* (Crantz), *Crop Prot*., **24**:643-649.

Fouly, A.H., M.A.Al-Deghairi and N.F.Abdel-Baky, (2011) . Biological aspects and life tables of *Typhlodromips swirskii* (Acari: Phytosiidae) fed *Bemisia tabaci* (Hemiptera: Aleyrodidae). *J. Entomol*.,**8**:52-62.

Gerling, D.,O.Alomar and J. Arno, (2001). Biological control of *Bemisia tabaci* using predators and parasitoids. *Corp Prot*. , **20**:779-799.

Henderson, C.F. and E.W.Tilton , (1955). Tests with acaricides against the brown wheat mite. *J. Econ. Entomol*., **48**:157-161.

Horowitz, A. R. ;Z. Mendelson, P. G. Weintramb and I. Ishaya (1998). Comparative toxicity of foliar and systemic application of acetamiprid and imidacloprid against the cotton whitefly *B.tabaci*. *Bull. Entomol. Res.,* 437-442.

Lin, K.,K.Wu, Y.Zhang and Y. Guo, (2007). Overwintering and population dynamics of *Bemisia tabaci* biotype B in Greenhouses during the spring in North China. *Corp Prot*., **26**:1831-1838.

Natwick , E.T.(1999). New insecticides for control of silver leaf whitefly an efficient evaluation. *Proc. Belt-wide Cotton Council Memphis TN*. USA., 2:910-920.

Natwick, E.T. and B.D.Deeter (2001). Comparison of neonictotinoid insecticides for control of whitefly in cotton. *Proc.Belt-wide Cotton Conferences National Cotton Council Memphis*, USA., 906-908.

Olivir, M.R.V., T.J.Henneberry and P.Anderrson.(2001). History , current status and collaborative research projects for *Bemisia* tabaci. *Crop Prot*., 20:709-723.

Parrish , M.D.(2001). A new tool for insect pest management in cotton . *Proc. Belt-wide Cotton Conferences. National Cotton Council*, Memphis T N. USA., 1: 46-47.

Perring , T.M.(2001).The *Bemisia tabaci* species complex. *Corp Prot*., **20**:725-737.

Saleem, M.A.;K.Mustafa and R.Hussain (2001). Comparative efficacy of some insecticides against some sucking insect-pests of CIM-443 cotton. *Pak . Entomol*., **23**:91-92.

Snedecor, G.W.and W.G.Cochran. (1987). *Statistical Methods*. 8th Ed. The Iowa State Univ. Press. Ames, Iowa, U.S.A

Touhidul, M. and R.Shunxiong . (2007). Development and reproduction of *Bemisia tabaci* on three tomato varieties. *J. Entomol*., **4**:231-236.

Wang, K.Y, X.B.Kong, X.Y.Jiang, M.Q.Yi and T.X. Liu., (2003). Susceptibility of immature and adult stages of *Trialeurodes vaporariorum* (Homoptera, Aleyrodidae) to selected insecticides. *J. Appl. Entomol.,* **127**:527:533.

Yang, N.W.,A.L.Li, F.H.Wan, W.X.Liu and D.Johnson.(2010). Effects of plant essential oils on immature and adult sweet potato whitefly, *Bemisia tabaci* biotype- B. *Crop Prot*., **29**:1200-1207.

Zhang, W.,H.J.Mc Auslane and D.J. Schuster.(2004). Repellency of ginger oil to *Bemisia argentifolii* (Homoptera, Aleyrodidae) on tomato. *J. Econ. Entomol*., **97**:1310-1318.

فعالية بعض مبيدات الآفات على ذبابة القطن البيضاء *Bemisia tabaci* (Gennadius) التي تصيب نباتات فول الصويا

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تم إجراء هذا البحث لدراسة فعالية سبعة من مبيدات الآفات هي : أجرينت ، ديازينون ، بوما ، ميجور ، كلورسان ، أجرزول ، نصر أكتين على النسب المئوية لفقس البيض للذبابة البيضاء معمليا وكذلك لتقييم كفاءة الرشة الواحدة والرشتين للسبعة مبيدات محل الدراسة ضد حوريات الذبابة البيضاء على نباتات فول الصويا حقليا.

وقد أوضحت النتائج أن المبيدات المختبرة أحدثت انخفاضا كبيرا في نسب فقس البيض مقارنة بالكنترول وأن أقل نسبة فقس للبيض حدثت باستخدام مبيد ميجور (٤.٣٥%) ، بينما كانت أعلى نسبة فقس للبيض في حالة استخدام مبيد نصرأكتين (٥٤.٠٣%) مقارنة بالكنترول (٩٥.٥٢%).

وفيما يتعلق بكفاءة المبيدات المختبرة ضد حوريات الذبابة البيضاء ، أوضحت النتائج أن مبيد الكلورسان كان أعلى المبيدات كفاءة في حالة الرشة الواحدة والرشتين ، على الجانب الآخر فقد كان مبيد اجرزول هو الأقل كفاءة في كلا المعاملتين ، أما المبيدات الأخرى فقد إحتلت مواقع وسطية بين المركبين الأعلى والأقل .

كما أظهرت المبيدات المختبرة زيادة معنوية فى متوسط وزن ١٠٠ بذرة من بذور فول الصويا مقارنة بالكنترول الغير معامل .

التوصية:

يمكننا التوصية باستخدام المبيدات موضع الدراسة للتقليل من الفقد في محصول فول الصويا تحت الظروف الحقلية المصرية.