EVALUATION OF SULFOXAFLOR AS A NOVEL GROUP INSECTICIDE AGAINST WHITEFLY (*Bemisia tabaci* Genn.) (ALEYRODIDAE: HOMOPTERA) ON CUCUMBER AT NINEVEH GOVERNORATE/KWER DISTRICT.

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ABSTRACT

Three insecticides, viz. Sulfoxaflor 24% SC at following three doses (100, 200 and 300 ml/ha), Protues 11% OD and Mospilan 20% SP at their field recommended doses were evaluated for their efficacy against whitefly (*Bemisia tabaci* Genn) on cucumber at the farmer field in Kamesh Tapa village/Kwer/ Nineveh Governorate during autumn season of 2010.Sulfoxaflor @ 200 and 300 ml/ha and Proteus at its field recommended dose caused significant mortality of whitefly up to three days after first application. However, the most effective treatment for whitefly up to seven days after second application was Sulfoxaflor at 300 ml/ha while Sulfoxaflor at 100 ml/ha remained least effective while the others showed less than 73% mortality throughout the experiment.

Key words : *Bemisia tabaci* Genn**. ,** Sulfoxaflor**,** whitefly.

INTRODUCTION

The common cucumber *(Cucumis sativus* L.) is an important vegetable crop in Iraq and may be classified as one of the standard crops of the vegetable. The fruit is used as a table salad, eaten raw, with the usual salad seasonings, and is pickled in large quantities. The cucumber is pickled commercially on a large scale in both large and small sizes. There is no precise data available about the area cultivated with cucumber in Iraq for the period beyond 2003.Total area for both of

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open fields and greenhouses cultivated with this crop could estimate by 55000 ha based on total sales of crop commercial varieties seeds in the market (Personal communication with main cucumber seed distributers in Iraq: AMC-Debbane and ARD Unifert Companies). Data are not available about total production of cucumber but we can say that it is not sufficient for local need except yield during the period of April- July for every year as it is a seasonal peak of production for this crop in Iraq. Cucumber in both of its cultivation patterns is sensitive to wide range of insects and diseases. Whitefly (*Bemisia tabaci* Genn) debilitates cucumber by sucking the sap, Introducing toxins into the plant's vascular system, coating the leaf with honeydew, which facilitates the growth of soot mold fungi as well as reducing crop quality by their visible presence (Germano *et al*., 2006). Among different control measures recommended for whiteflies, chemical control is quick and rapid result one; so it intensively used for this purpose. Such Intensive use of insecticides has enhanced whiteflies to develop a type of resistant biotypes against these products (Amjad *et al.,* 2009). Historically, *Bemisia tabaci* Genn has been difficult to control with conventional insecticides in agronomic and horticultural production systems; for this reason it is imperative to search out some alternatives for highly toxic insecticides. Some soft insecticides as insect growth regulators and other new chemistry insecticides like those belong to Neonicotinoid and Sulfoximine chemical groups are getting more attention of scientists. In the past 10 years, new insecticide chemistries have been introduced that provide a diversity of novel modes of action and routes of activity to effectively control whiteflies. The chemistries that have had the most immediate impact on *B. tabaci* control include the neonicotinoids and insect growth regulators (IGRs). Khattak *et al*. (2004) reported that Mospilan 20SP, Actara 25WG, Polo 500 EC,Tamaron 60 SL and Confidor 200 SL reduced the mean percent population of whitefly on mungbean even at 240 hours after spray. Ali *et al*. (2005) proved that Buprofezin is effective against whitefly's nymphs and Acetamprid,Diafenthiuron and Imidacloprid are effective against whitefly's adults. The most effective insecticides against whitefly on Cotton are Mospilan and Actara (Aslam *et al*. ,2004).The most effective insecticides for controlling of whitefly on cotton up to 7 days after application are Megamos and Confidor, while Actara remain least effective (Amjad *et al.,* 2009) .

On the same target; Sulfoxaflor is a new insecticide developed and released by Dow AgroSciences in 2007. It is the first member of a new chemical class of insecticides called sulfoximines. Sulfoxaflor is characterized by broad-spectrum activity on sap-feeding insects such as plant bugs (*Lygus* spp.), aphids, whiteflies, plant hoppers, and scales. It is fast-acting and exhibits extended residual control

(Siebert *et al*., 2010). It has relatively low toxicity to non-target arthropods and both of its spectrum and toxicity properties suggest it will have an excellent fit in Integrated Pest Management programs (Thomas *et al.*, 2010).This research is attempting to test efficacy of this novel product against whitefly on cucumber. It presents a first trial to evaluate and introduce of this group of insecticides into Iraq.

MATERIALS AND METHODS

To evaluate the new product SULFAXAFLOR (Fig 1) against whitefly on cucumber; a field experiment was conducted in KAMESH TAPA village, which belongs to KWER district/Nineveh Governorate (with following geographical location of Latitude-N 36.0565-, Longitude-E 43.5698- Altitude 256 M).

Cucumber crop (var. Emperor) was sown in August 15, 2010 under Randomized Complete Block Design (RCBD) with 8 treatments including control and 4 replicates. Each experimental plot was 3 m long and 2 m wide. Insecticide treatments by common name are listed in Table 1. The field recommended doses of insecticides as present in above mentioned table were sprayed with help of Jakto knabsack hand sprayer (16 liters capacity fitted with control flow valve (CFV)).Nozzle with a discharge rate of 0.8 L/min at 2.4 bar pressure. Control plots were sprayed with water only. The crop was sprayed with an application rate of 400 L/ha. The sprayer was calibrated using simple water by calculating the amount of water required for spraying on a unit area prior to experiment. All agronomic practices were kept uniform throughout the experiment on all plots. Chemical application was done in early morning with temperature average of 25-30 °C at very quiet north east wind. The ambient conditions were selected to minimize the risk of spray solution evaporation and spray drift. To study the effect of various doses of Sulfaxaflor and other insecticides, whitefly population was recorded at 24 hours before and 24, 72,1treatments 168 hours after first chemical application and 72,168 hours after second chemical application by recording alive whitefly nymphs on the middle part of randomly selecting five central plants in each experimental plot .Twenty five leaves/ leaflets from those five central plants have assessed per treatment/replicate. Percent population mortality was calculated by using Henderson & Tilton formula (Flemings and Ratnakaran, 1985) as below:

$$\% \text{ corrected mortality} = 1 - \frac{Post-spray\ population\ in\ treatment}{Pre-spray\ population\ in\ treatment} \times \frac{Pre-spray\ population\ in\ control}{Past-spray\ population\ \ in\ control} \times 100$$

Data analysis was performed by analysis of variance and means were separated using LSD at 5% level of significance by using SAS 2004 for statistical analysis.

Table1: *Name of Insecticides and its doses used in the trial.*

Sq	Trade name	Common name	Dose/ha	Company
1	-	Sulfaxaflor	100 ml	DOW
2	-	Sulfaxaflor	200 ml	DOW
3	-	Sulfaxaflor	300 ml	DOW
4	Mospilan	Acetamprid	200 gm	Nippon Soda
5	Proteus	Thiacloprid + Deltamethrin	600 ml	Bayer

RESULTS AND DISCUSSION

Whitefly population level before spray and mortality percent after 1, 3, 7 days of first application and 3, 7 days after second application are present in table 2. Maximum decrease in the population on one day after first application was recorded in plots treated with Sulfaxaflor 300 ml/ha, Proteus, Sulfaxaflor 200 ml/ha, Mospilan, Sulfaxaflor 100 ml/ha treatments respectively with no significant differences among them. All treatments are achieved a significant decreasing in whitefly population compared with control. Three days after first application; Whitefly population in all treatments was lower than control but only Sulfaxaflor 300 ml/ha, Sulfaxaflor 200 ml/ha and proteus treatments have a significant value of difference. Same trend mentioned before was maintained among the various treatments. On seven days after first application, Sulfaxaflor 300 ml/ha treatment was realized highest mortality percent followed by all of proteus, sulfaxaflor 200 ml/ha,Mospilan, Sulfaxaflor 100 ml/ha treatments with no significant differences among various treatments included control.

Effect of second application was studied as well and shows that after three days maximum mortality percent was achieved by 300 ml/ha of Sulfaxaflor followed by Sulfaxaflor 200 ml/ha, Proteus, Mospilan, Sulfaxaflor 100 ml/ha treatments respectively. Same trend of variation among various treatments was maintained after seven days of second application with no significant variation among all treatments included control in both (Fig 2). It is clear from above mentioned results that higher dose of Sulfoxaflor (300 ml/ha) was maintained its superiority in higher mortality achieving of whitefly compared with all other treatments which could interrupted that Sulfoxaflor is a new product and has no cross resistance with the prior used conventional insecticides (Thomas *et al.*,2010) .Higher reduction in whitefly population done by Sulfaxaflor even after one day of application and lasting to 168 hours after both applications is confirming its fast knockdown action, and extended residual control effect(Siebert *et al.* ,2010). Relative efficacy

of each of Proteus and Mospilan found by this investigation is in conformity with those done by Horowitz *et al.* (1998); Natwick (1999);Natwick and Deeter(2001); Parrish (2001); Aslam *et al*. (2003); Khattak *et al*. (2004) ; Aslam *et al.* (2004) ; Ali *et al.* (2005) who observed good mortality of whitefly with the application of neonicotinoid insecticides like Acetamprid (Mospilan) and Thiocloprid+Deltamethrin(Proteus).

Table 2: *Population and percent corrected mortality of White fly on Cucumber at various periods after insecticides applications.*

Insecticide	Rate of Use	Mean Percent of reduction in whitefly population				
		1st Application			2nd Application	
		1 day After	3 day After	7 days After	3 days After	7 days After
Sulfaxaflor	100 ml/ha	1.59 (58.89)	1.49 (55.34)	1.50 (43.58)	1.44 (22.62)	1.50 (28.90)
Sulfaxaflor	200 ml/ha	1.30 (67.36)	1.22 (64.83)	1.25 (54.34)	1.17 (38.94)	1.18 (45.68)
Sulfaxaflor	300 ml/ha	1.22 (71.85)	1.13 (69.77)	1.18 (60.39)	1.10 (47.25)	1.14 (51.78)
Proteus	600ml/ha	1.23 (72.45)	1.18 (69.35)	1.25 (59.26)	1.22 (43.20)	1.29 (47.02)
Mospilan	200 gm/ha	1.42 (64.75)	1.29 (62.87)	1.36 (50.89)	1.31 (32.41)	1.39 (36.74)
Control	Water only 400 l/ha	4.26 (0.0)	3.89 (0.0)	3.1 (0.0)	2.17 (0.0)	2.46 (0.0)
LSD (0.05)= 2.65						

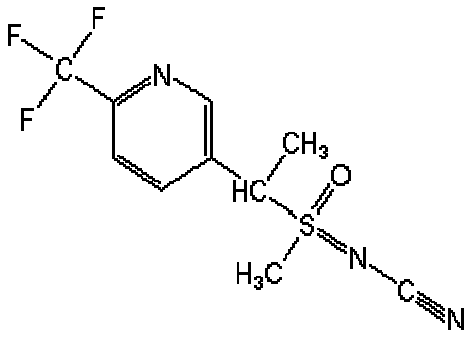

Fig.1 : *Sulfoxaflor structure* .

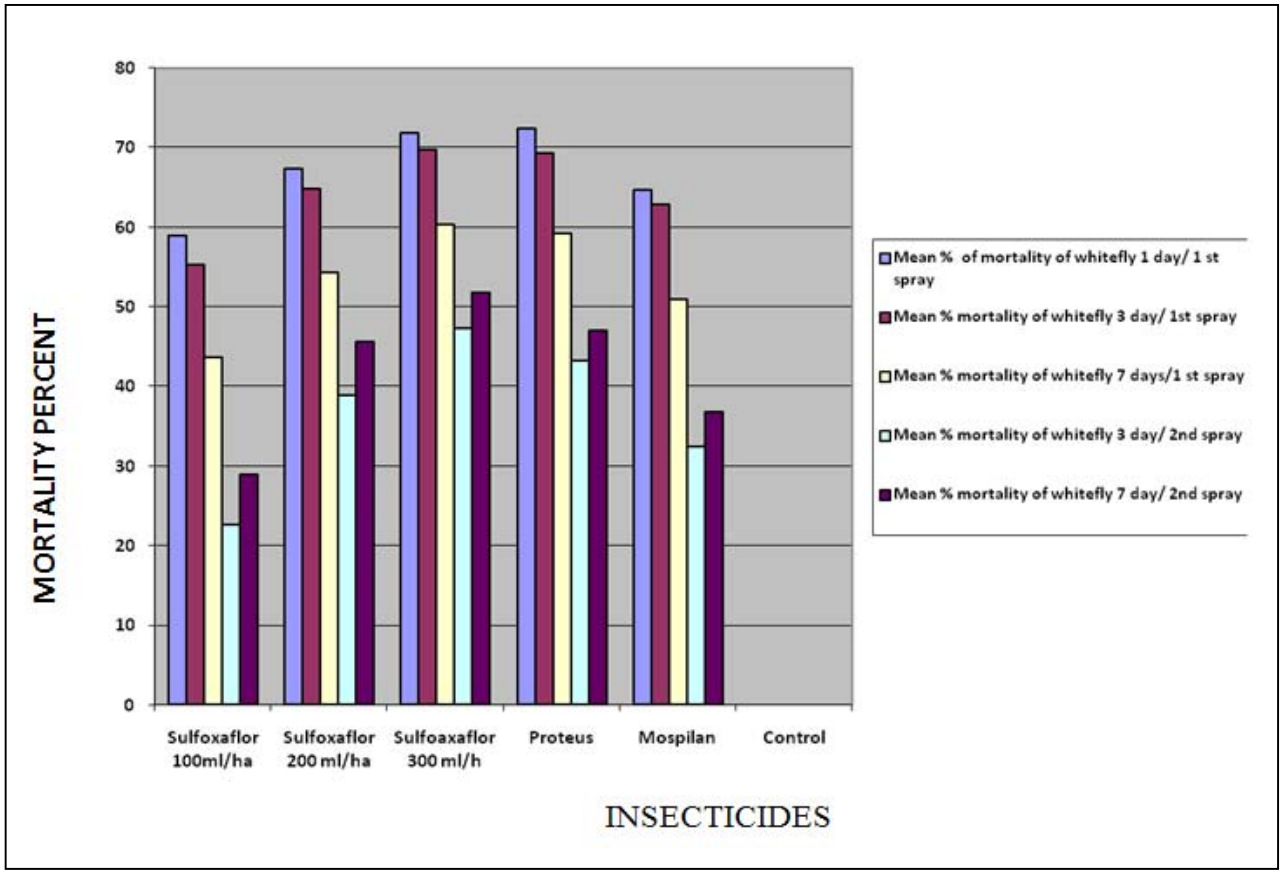

Fig.2 : *Mortality percent of whitefly by different treatments.*

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تقييم السلفوكسافلور كمبيد جديد ضد حشرة الذبابة البيضاء(*Bemisia tabaci* Genn.) على الخيار في محافظة نينوى/ناحية الكوير.

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المستخلص

تم أجراء التقييم الحقلي لكفاءة ثلاثة مبيدات كمياوية ضد حشرة الذبابة البيضاء *Bemisia tabaci* على محصول الخيار وهي كل من: مبيد سلفوكسافلور 24% أس سي بثلاثة جرعات أستخدام هي (200,100 و 300 مل/ هكتار) ، مبيد بروتيس 11% أو دي و مبيد موسبيلان 20% أس بي بالجرعتين الحقليتين الموصى بهما و ذلك في حقل أحد المزارعين الواقع في قرية كميش تبه/ناحية الكوير في محافظة نينوى خلال الموسم الخريفي 2010. لقد أوضحت النتائج أن كلا المبيدين سلفوكسافلور بالجرعتين 200 و 300 مل/ هكتار و بروتيس بجرعته الحقلية الموصى بها قد حققا نسبتي قتل معنوية لحوريات حشرة الذبابة البيضاء لمدة ثلاثة أيام بعد تأريخ أجراء المعاملة الأولى. وقد بينت التجربة أن الرش بالمبيد سلفوكسافلور بجرعة أستخدام 300 مل/هكتار كانت أكثر المعاملات فعالية ضد حوريات الحشرة لغاية سبعة أيام بعد تأريخ أجراء المعاملة الثانية و بقيت معاملة الرش بنفس المبيد بجرعة أستخدام 100 مل/هكتار هي الأقل فعالية بين المبيدات و الجرعات المستخدمة في حين كانت نسب القتل المتحققة من قبل جميع المعاملات الأخرى كل على حدة أقل من 73% طوال فترة التجربة.

الكلمات المفتاحية : *Bemisia tabac* ، مبيد سلفوكسافلور ، حشرة الذبابة البيضاء.