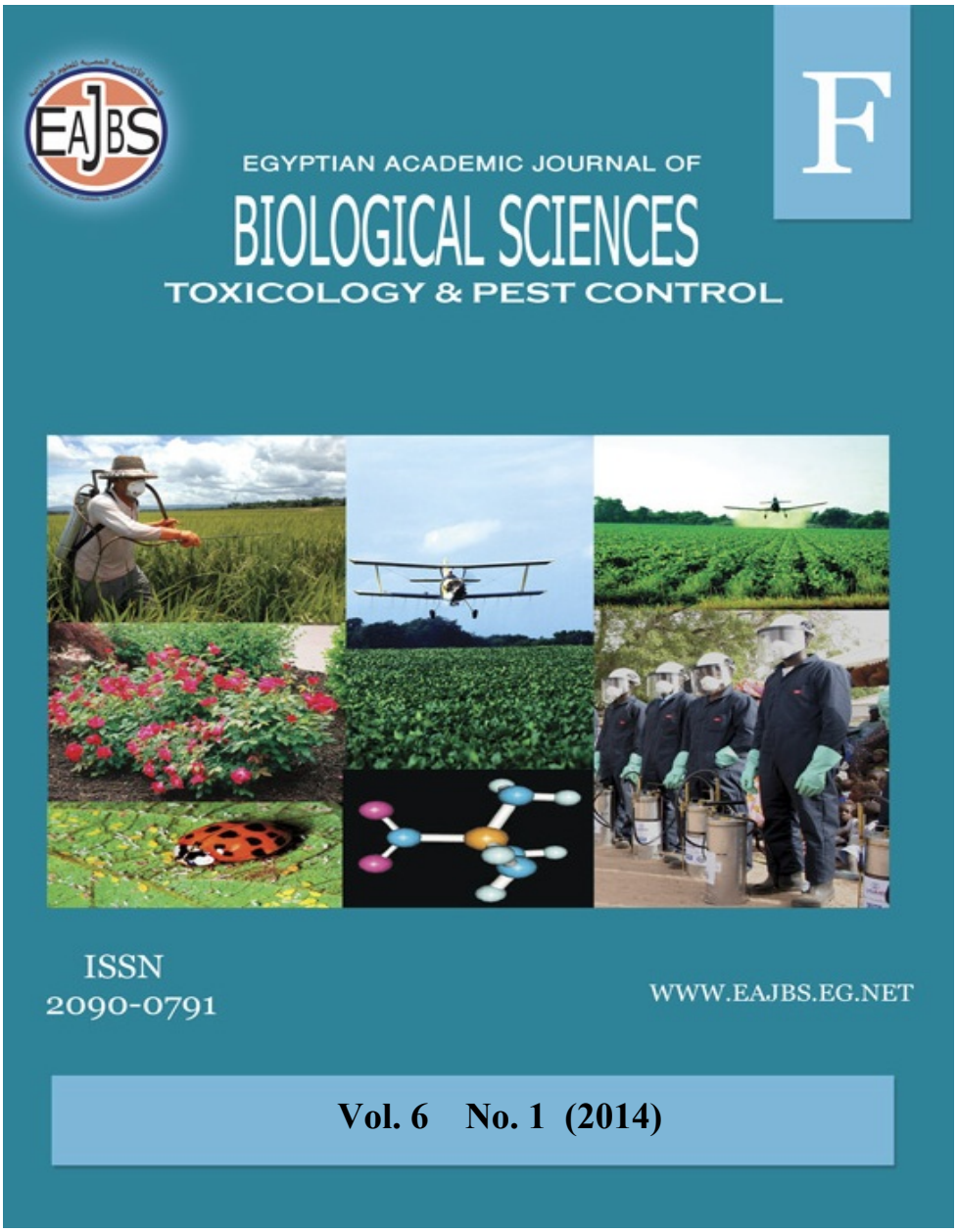

The journal of Toxicology and pest control is one of the series of Egyptian Academic Journal of Biological Sciences, issued twice by the Egyptian Society for Biological Sciences, Department of Entomology ,Faculty of Sciences Ain Shams University

The goal of the journal is to advance the scientific understanding of mechanisms of toxicity. Emphasis will be placed on toxic effects observed at relevant exposures, which have direct impact on safety evaluation and risk assessment. The journal therefore welcomes papers on biology ranging from molecular and cell biology, biochemistry and physiology to ecology and environment, also systematics, microbiology, toxicology, hydrobiology, radiobiology and biotechnology.

www.eajbs.eg.net

Egypt. Acad. J. Biolog. Sci., 6(1): 1 – 9 (2014)

Egyptian Academic Journal of Biological Sciences
F. Toxicology &Pest control

ISSN :2090 - 0791
www.eajbs.eg.net

Safety and proper use of pesticides on orange fruits

Nagwa A. Hassan and Sawsan G. Radwan
Plant Protection Res. Ins., Agric. Res. Center, Dokki, Giza

ARTICLE INFO
Article History
Received: 12/1/2014
Accepted: 23/2/2014

Key words:
Parlatoria ziziphi (Lucas)
Control, Residues
Quality orange fruits

ABSTRACT

The aim of this work is studying the correlation between applicable control of *Parlatoria ziziphi* (Lucas) and obtained healthy and high quality orange fruits. So, the objective of this research was organized through three parts, The first part was conducted in orange orchard at Qalubyia Governorate to evaluate the pesticidal efficiency of four compounds representing three insecticidal groups (Neonicotinoid, Avermectin and Organophosphrus) to struggle *P. ziziphi* on orange trees and protect the crop from the insect damage. The results published that Agriflex has the highest toxicity of the tested compound on *P. ziziphi* population and recorded 74.3% reduction, followed by Best (73% reduction), then Sunfidor (70.18% reduction) while Reldan came in the last order with 69.7% reduction. Also the statistical analysis elucidate the time uphold the efficiency of the four tested compound and the highest percentages reduction of *P. ziziphi* population after thirty days of application when compared by the other intervals. The second part: to determine the residues of the tested pesticides in orange fruits through initial time (zero time) and final time (at harvest). The results showed that the values of initial deposits of all tested insecticides were surpassed the maximum residue limits (MRL) while no residues of pesticides detected at harvest time (after 20 days of application).The third part: to examine the effect of the tested insecticides on quality orange fruit. Results obtained showed that all tested insecticides decreased the total soluble solids (TSS), total titratable acidity (Ta), Ascorbic acid and total sugar without significant differences except Best which increase the total sugar than untreated fruits while all tested insecticides exhibited non-significant increase on relative sweetness of orange fruits than untreated except Agriflex. The ratable data showed that all tested pesticides exhibited satisfied effect against *P. ziziphi* ranged from 69.73 to 74.31% reduction. They are safe at harvest interval 20 days after treatment. Also, they showed insignificant effect on orange fruits quality. It could be recommended Best 25% WP as it caused increase in total sugar in orange fruits, than un-treated; also fruits had the highest value of total soluble solids and acidity than other pesticides.

INTRODUCTION

Citrus is one of the most important fruit crops in Egypt for both local consumption and exportation, it contain large amounts of phytochemicals which offer health benefits such as ascorbic acid and carbohydrates (which consist of mostly sucrose, fructose and glucose) are the main component of that fruit (Latif *et al*. 2013). Also it contain proteins and salts.

Citrus trees are attacked by many destructive pests such as the black parlatoria, *Parlatoria ziziphi* (Lucas) (Hemiptera: Diaspididae). It injures citrus trees by feeding on the plant sap through leaves and fruits causing defoliation and drying up of young twigs, so affecting the commercial value of fruits and their export potential. Therefore chemical control is necessary to keep the population of insect pests below economic threshold level.

Systemic insecticides are being developed and used for insect control on the variety of crops around the world (Yue *et al*. 2003). Among these neonicotinoid groups, Imidacloprid has a broad spectrum activity and low mammalian toxicity, it has long a unique property of excellent tranclaminar activity (Chauhan *et al*. 2013). Also, Thiamethoxam, cames from a family of insecticides known as the second-generation neonicotinoids.

Imidacloprid and Thiamethoxam have definitely subversive effect on scale insects, but environmental and health problems and risk involved the use of chemicals especially pesticides in agriculture. Insecticides not only leads to chemical build up of residues in crops but also, disrupts the biochemical parameters of plants, so scientific assessments have considered only a few pathways where fore this study do:

1- To get the most effective insecticides against *P. ziziphi*.
2- To determine the interval between application and harvest as needed to obtain save fruits.
3- To investigate the effect of the tested insecticides on some quality parameters of orange fruits.

MATERIAL AND METHODS

The study was divided into three parts as follow:

Efficiency of tested insecticides against *P. ziziphi*:

Experimental design

Controlling experiment was carried out at El-Ghank, Qalubiya Governorate to evaluate the efficiency of four insecticides against *P. ziziphi* on orange trees (navel orange variety) under field conditions. Pesticides used were shown in Table (1).

Table 1: Active ingredient and applied rate of tested insecticides.

Trade name	Common name	Pesticide group	Recommended rate
Best 25% WP	Imidacloprid	Neonicotinoid	100gm/100L
Sunfidor 35% SC	Imidacloprid	Neonicotinoid	75cm/100L
Agriflex 18.6% SC	Abamectin 3.32% + Thiamethoxm 15.24%	Avermectin Neonicotinoid	40cm/100L
Reldan 22% EC	Chlorpyrifos methyl	Organophosphrus	300cm/100L

The selected orange trees received all the recommended agricultural practices, homogeneous in plant growth, severely attack with *P. ziziphi* and don't receive any control measures before and after treatment. The experimental area was arranged in Randomized complete Block design and each Pesticide treatment contains three replicates (9 trees / treatment) and other nine trees were left untreated as check.

Experimental work

The tested compounds were applied during September 2013 using motor sprayer with 600 liters tank. The samples were picked up at random with rate of 10 leaves/replicate (30 leaves / treatment) just before and after spraying immediately (zero time) and intervals time 10, 20 and 30 days after spraying. The collected samples were transferred to the laboratory in polyethylene bags to inspect by using stereoscopic microscope. The alive individuals (nymphs and adult females) were counted and recorded. Then, percent of reduction in insect populations was estimated using Henderson and Tilton equation (1955) to determine the initial effect after zero time and the residual effect after 10, 20, 30 days intervals. The statistical analysis of the present work was conducted using costat program.

Determination of residues of the tested pesticides in orange fruits:

Sampling of orange

Random fruit samples of about 1kg were taken at zero time after pesticide application from each replicate of treatment with all treatment. The collected samples were kept in an ice box and transferred to Central Agricultural Pesticides Laboratory,

Pesticide Residues & Environmental Pollution Dept. After words, the fruits were collected with the same procedure after 20 days of spraying (at harvest time).

Extraction and clean up of tested insecticides

The samples were comminuted using the laboratory blender and representative homogenized (15 g) of each was then placed into 50 ml polyethylene tube. Samples were extracted and cleaned up immediately after sampling. 15 ml of acetonitrile was added into each tube. The samples were well shaken using a vortex mixer at maximum speed (Anastassiades *et al*. 2003). Afterwards 6 g of anhydrous magnesium sulfate and 1.5g of sodium chloride were added, then extract by shaking vigorously on vortex for 5 min and centrifuged for 10 min at 4,000 rpm. An aliquot of 4 ml was transferred from the supernatant to a new clean 15-ml centrifuge tube containing 100 mg PSA and 600 mg anhydrous magnesium sulfate. The samples were again vortexed for 3 min and then centrifuged for 10 min at 4,000 rpm. An aliquot of 2mL was filtered through a 0.2 µm PTFE filter (Millipore, USA). The sample was then ready for the final analysis in LC system. HPLC analysis was performed with an Agilent 1100 HPLC system.

Determination of Best, Sunfidor and Agriflex Pesticide Residues

Residues of Best and Sunfidor as imidacloprid active ingredient, also for abamectin (present in Agriflex) were done on HPLC. The mobile phase of imidacloprid was acetonitrile: water (65:35 v/v) at a flow rate was 0.8 mL/minute. Wavelength was at 27nm. The retention time was about 2.2 min. while the mobile phase of abamectin was acetonitrile: Water (90:10 v/v) flow rate at 1 mL/min., retention time was about 5.06 min and the wavelength was at 254 nm.

Determination of Chloropyrifos Pesticide Residues

GLC Model 6890 equipped with a flame photometric detector (FPD) with phosphorus filter was used for this objective. A fused silica capillary (PAS-1701), column containing 14% cyanopropilsyloxane as stationary phase (30m length x 0.32 mm internal diameter (i.d) x 0.25µm film thickness), was used for the separation in the GC. Its operating conditions were the following:

Injector and detector temperatures were 240°C and 250°C; initial oven temperature, 170°C for 5 min, raised at 5°C/min. and then held at 235°C for 2 min. The carrier gas was nitrogen at 3 ml/min. and hydrogen and air were used for the combustion at 75 and 100 ml/min, respectively.

Determination of Thiamethoxam Pesticide Residues

Using Hewlett Packard GC Model 6890 equipped with an Ni^{63}- electron capture detector was used for determination of the Thiamethoxam residues. GC conditions: DB-17(J&W Scientific) capillary column (30m length x 0.32 mm internal diameter (i.d), x 0.25µm film thickness), carrier gas: N_2 at a flow rate of 4 ml/min ; injector and detector temperatures were 300°C and 320°C, respectively. The initial column temperature was initial oven temperature, 180°C for 3 min, raised at 10؛C/min. and then held at 280°C for 2 min., then raised at 10°C/min. to 260 °C and then held to 10 minutes, until a total time of 42 minutes had elapsed, PAS-5 methyl silicone (30m x 0.32 mm i.d x 0.25 µm film thickness) was used to confirm the detected pesticides.

Effect of the tested insecticides on orange fruits quality:

Sampling of orange

Random fruit samples of about 1 kg were taken at harvest time (after 20 days of application) from each replicate of treatment for all treated and untreated (control). The collected samples were kept in polyethylene bags and transferred to the laboratory.

Total Soluble Solids (TSS)

Soluble solids in juice can be measured by a hand refractometer (Model PR 32 Brix-readings 0-32 ranges Atago Palete Atago. Co.LTD-Japan) are calibrated to give °Brix or percent total soluble solids values directly.

Total Titratable Acidity (TA %)

It was determined according to A.O.A.C. (1980), phenolphthalein is generally used as a visual endpoint indicator; it gives a pink-colored endpoint. Total acidity can be determined by using 0.3125 N NaOH for a large number of samples. Total acidity of citrus juice and concentrates is determined as anhydrous citric acid and expressed as percent by weight. The endpoint can also be ascertained with a pH meter. Add a 5 ml pipette of filtered, single-strength orange juice into a 150 ml Ehrlenmeyer flask and carefully add 20 ml of distilled water. Take 5 ml from this in another flask and add 2 drops of a percent phenolphthalein solution (prepared in 50 percent isopropyl alcohol). Titrate with 0.1 N NaOH to the endpoint. Calculate the total titratable acidity by putting the values in the following formula (A.O.A.C., 2007).

$$\text{Ta \%} = \frac{\text{Volume of NaOH "ml"} \times \text{N of NaOH (0.1)} \times 0.064}{\text{Volume of sample "ml"}} \times 100$$

Relative sweetness

It is calculated by dividing TSS (Brix) with titratable acidity. Maturity index (MI) was evaluated by the ratio: °Brix / % Citric acid for each extracted juice (Porat *et al.,* 2000; Milind 2008; Nunes *et al.,* 2010).

$$\text{Relative sweetness} = \frac{\text{TSS}}{\text{TA}}$$

Total sugar and ascorbic acid:

They were determined according to A.O.A.C. (1980).

Analysis of variance:

The data were subjected to analysis of variance and Duncan's multiple rang test was used to differentiate means at 5% (Duncan, 1955).

RESULTS AND DISCUSSION

Efficiency of the tested pesticides against *Parlatoria ziziphi* population:

The residual effects of the tested insecticides on the insect populations after 30 days of application proved that Agriflex was the most efficient with nymph and adult stages giving 94, 88.6% mortality, respectively. The efficiency of other tested insecticides can be arranged according to their reduction percentages in a descending order as follows: Best, Sunfidor and Reldan in case of nymphs (87.8, 82.9 and 79.1%),

The initial effects of the tested insecticides on the nymphs and adult females after zero time of application as well as the residual effect after 10, 20, 30 days of application were shown in Table (2). The obtained results showed the initial effect of tested insecticides after zero time of application which was varied on both nymphs and adult females populations. Agriflex compound was the highest effective insecticide which reduced the population of nymphal and adult stages to 78.0% and 47.0% followed by Reldan to 75.1% and 43.3% and Best to 72.4 & 42.5%, respectively. Whereas Sunfidor was the lowest effective compound on both nymphs and adult females, it reduced the population to 69.4% and 30.0%, respectively.

The residual effect of all tested compounds on the nymphal populations was appeared after 10 days of application, the highest effective compound were obtained by Best where the percent of reduction increased to 87.0% followed by Agriflex (81.2%) and Sunfidor (79.6%) whereas, Reldan came in the last order (77.7%). Concerning the residual effect on adult females, it can be noticed that both Best and Sunfidor have conformable percent reductions (60.1 & 59.7%) and also Agriflex and Reldan (52.3 & 50.7%).

The results of statistical analysis are given in the same Table (2) after 20 days of spraying showed that Best was the highest toxic influence on nymhal stage which caused 85.7% reduction followed by Agriflex, Reldan and Sunfidor which inducing 81.4, 79.8 and 79.4% reduction, in respective order. While the range of toxicity of the tested insecticides with adult stage were closely related which attained 74.8, 72.3, 72.0 and 75.5% mortality in adult population with each of Best, Sunfidor, Agriflrx and Reldan, respectively.

respectively whereas with adult females they arranged: Sunfidor, Reldan and Best (80.1, 76.6 and 73.7%), respectively.

Statistically, the average percent of reduction (%) for the total population (Table 2) showed that, Agriflex and Best insecticides were most effective on *P. ziziphi* population which caused 74.3 and 73.0% respectively. Whereas Sunfidor and Reldan were less effective on the insect population, 70.18 and 69.73%, respectively.

From the previous result, it can be mentioned that the effect of insecticides on the total populations showed gradual decrease in density by the time elapsed from spraying.

It must be noticed that, the nymphal stage was highly susceptible to the tested insecticides compared with adult females. The tolerance of adult stage to tested insecticides may be attributed to the presence of protective scale which prevents the penetration of toxicants. These agree with Asfoor (1997) who proved that the adult stage of *Parlatoria oleae* (Cloveé) was least susceptible to tested insecticides than any other insect stage.

Table 2: Efficiency of some pesticides against the black Parlatoria, *Parlatoria ziziphi* (Lucas) infesting orange trees in Qalubyia Governorate.

Treatments	Pre-spraying alive no./ leaf			Post spraying counts and % of reduction																
				Initial effect			Residual effect at indicated time									Average percent of reduction			F value between intervals	L.S.D. at 0.05 level
				Zero Time			10 days			20 days			30 days							
	Nymph	Adult	Mean	Nym.	Ad.	Mean	Nym.	Ad.	Mean	Nym.	Ad.	Mean	Nym.	Ad.	Mean	Nym.	Ad.	Mean		
Best 25% wp	66.2	106.3	86.25	22.6 72.4 %	65.0 42.5 %	43.80 57.45 %	7.1 87.0 %	28.5 60.1 %	17.8 73.55 %	5.6 85.7 %	22.5 74.8 %	14.05 80.25 %	5.0 87.8 %	19.6 73.7 %	12.3 80.75 %	40.3 83.23 %	135.9 62.78 %	88.1 73.0 %	35473	1.8
Sunfidor 35% Sc	63.3	129.7	96.5	24.0 69.4 %	85.5 38.0 %	54.75 53.7 %	10.7 79.6 %	35.5 59.7 %	23.1 69.65 %	8.1 79.4 %	24.8 72.3 %	16.45 75.85 %	6.7 82.9 %	18.1 80.1 %	12.4 81.5 %	49.5 77.83 %	163.9 62.53 %	106.7 70.18 %	43216	1.8
Agriflex 18.0% Sc	68.0	138.8	103.4	18.5 78.0 %	78.2 47.0 %	48.35 62.5 %	10.6 81.2 %	45.0 52.3 %	27.8 66.75 %	7.5 81.4 %	32.7 72.0 %	20.1 76.7 %	2.5 94.0 %	11.1 88.6 %	6.8 91.3 %	39.1 83.65 %	167.0 64.98 %	103.05 74.31 %	49101	1.9
Reldan 22% Ec	56.8	101.5	79.15	17.5 75.1 %	61.1 43.3 %	39.3 59.2 %	10.5 77.7 %	34.0 50.7 %	22.25 64.2 %	6.8 79.8 %	20.9 75.5 %	13.85 77.65 %	6.5 79.1 %	16.7 76.6 %	11.6 77.85 %	41.3 77.93 %	132.7 61.53 %	87.0 69.73 %	27012	1.8
Control	74.3	149.7	112	92.0	159.1	125.55	61.5	101.8	81.65	44.1	126.0	85.05	45.9	105.1	75.5	243.5	492.0	367.75		
F value between treatments=				40.63	40.98		46.8	57.62		24.9	9.29		124.45	124.97		31.01	6.47	14.65		
L.S.D. at 0.05 level				1.9	1.8		1.9	2.15		1.8	1.8		1.9	1.8		1.8	1.85	1.9		

Nym., Ad.: Nymphs and Adult females
a,b,c,d : Significant differences between treatments.
A,B,C, D : Significant differences between intervals.

Also, Helmy, *et al.* (1991) found that the nymphal stage of *P. oleae* was more susceptible followed by adult females, while ovipositing females were less responsive.

Literature review showed that Best 25% WP at rate of 75 gm/100 L water gave 45.2, 99.2 and 77.1% reduction for each of the whitefly, *Bemisia tabaci*; aphid, *Aphis gossypii* and the jassid, *Empoasca lybica* on cotton plants (Abd El-Mageed, 2012) whereas, Shivanna *et al.,* (2011) found significant reduction of aphid population was noticed with imidacloprid (Best) to 54.5% seven days after treatment. Also, Helmy *et al.* (1989) evaluated five organophosphorus insecticides against *L. beckii* on orange trees; they found that Reldan gave excellent results after one month of application. These results are in agreement with Tayyib *et al.* (2005), they proved that Imidacloprid (Best) to be the most effective as it reduced the maximum population of jassid and whitefly on cotton at different time intervals.

Estimation of residues of the tested insecticides in orange fruits:-

The analysis of residual quantities of pesticides in raw of agricultural crops is at the forefront of measures to protect public

health and safety, so more studies on pesticide residue behavior are needed. This work provide guidance on proper and safe use of tested commercial insecticides on orange trees under field conditions, the evaluated residues through two important intervals, at zero time of application and at harvest were registrated in Table (3) and show that.

Initial residues (at zero time)

Agriflex had the highest initial residues when sprayed at recommended dosage (40 cm/100L water). Agriflex comprised two effected concomitant active ingredient, thiamethoxam which have the highest initial residues (2.81 ppm.) comparatively with other active ingridients and also contain Abamectin has the least initial presidues (0.099 ppm.) Reldan has the second range with (2.090 ppm.) after application; followed by Best (1.440 ppm.). The fourth tested insecticide was Sunfidor (1.001ppm.).

Table 3: Residues in orange samples.

Tested insecticides		Time intervals	
		Initial residue (at zero time) (conc. ppm)	Final residue (20 days after spray)
Best Imidacloprid 25% wp		1.440	ND*
Sunfidor Imidacloprid 35% Sc		1.001	ND
Agiflex	Abamectin 3.32%	0.099	ND
	Thiamethoxam 15.24%	2.810	ND
Reldan Chlorpyrifos methyl Ec 22%		2.090	ND

* ND: Non detectable

From the important remarkable that both Best and Sunfidor insecticide have the same active ingredient (Imidacloprid) but this active ingredient applied as WP in Best insecticide and applied as SC in Sunfidor insecticide but their initial residues varied this may be Imidacloprid has high molecular mobility in the xylem of treated plants due to of its high water solubility or may be attributed to the volatilization that occur during first day following application, so Best show higher initial deposit than Sunfidor.

Final residues (at harvest)

At harvest, residue limits consider from the important points must be appreciate through pest management strategies to establishment of the safe and the proper use of pesticides and avoid their prejudicial effect especially on orange fruits which consider from the most desirable fruits. So, at harvest residues for all tested insecticides (20 days of application) were evaluated. Data in Table (3) showed a rapid degradation of the tested insecticides in orange fruits and they subverted after 3 weeks and no residues were detected. This may be due to interfere of pesticide residues with biochemical and physiological processes in plants or the cortex of orange fruits make hindrance for the insecticides pentration. The results agree with Chauhan *et al.,* (2013), they indiciate residue of Imidacloprid in potato samples was 0.35 m/Kg at the time of harvest which is near to the MRL value.

Generally, residues of tested pesticides at harvest were comply with maximum residue limits (MRL) according to EU Pesticides for orange fruits as Imidacloprid (1 mg/kg), Thiamethoxam (0.5 mg/kg), Abamectin (0.01 mg/kg) and Chlorpyrifos (0.3 mg/kg) .

Effect of tested insecticides on some biochemical parameters in orange fruits:

Pesticides residues may interfere with biochemicals and physiological processes in plant and may retarding the growth of plant and yield. Also, they may lower its food quality and even prevent its uses as food by affecting its quality characteristics (Bartholomew *et al*., 1951).

Hence the residues effect of imidacloprid in formulation of crystals (Best), imidacloprid in form of SC (Sunfidor) Abamectin+Thiamothoxam (Agriflex) and Chlorpyrifos methyl (Reldan)

on some quality parameters as total sugar, TSS, Ascorbic acid and titratable acidity were estimated.

Results in Table (4) revealed that generally, all tested insecticides caused insignificant reduction in all studied parameters comparing with the control except Best which led to an increasing in total sugar; in addition to that all tested treatments showed increasing in relative sweetness than untreated samples.

It must be noticed that Best was the least effective insecticides on the total soluble solids (TSS) which gave the highest value recorded (9.67%) comparing with the effect of the other tested insecticides. Also, Best recorded the highest value with the total titratable acidity (1.24%) followed by Agriflex and Sunfidor which recorded 1.19 and 1.11% while Reldan was the lowest value (1.02%).

Table 4: Comparison between the tested insecticides and some quality parameters of orange fruits.

Treatments / Parameters	Control	Best	Sunfidor	Agriflex	Reldan
TSS	10.17 a	9.67 a	9.00 a	8.83 a	9.17 a
% changes related to control	-	-4.9	-11.5	-13.18	-9.8
Ta	1.31 a	1.24 a	1.11 a	1.19 a	1.02 a
% changes related to control	-	-13.0	-15.3	-9.2	-22.0
Relative sweetness	7.76 a	7.80 a	8.12 a	7.49 a	9.09 a
% changes related to control	-	+3.0	+2.8	-5.2	+15.1
Ascorbic acid	132.6 a	107.5 b	102.3 b	101.4 b	130.0 a
% changes related to control	-	-18.9	-22.9	-23.5	-2.0
Total sugar	17.52 a	19.11 a	14.52 a	13.86 a	14.75 a
% changes related to control	-	+9.1	17.12	-20.9	-15.8

As shown in the same table as for the internal quality of ascorbic acid untreated samples, Reldan has the highest content of ascorbic acid which recorded (130.0 mg/100ml.) relative to control (132.6 mg/100 ml.). This result agrees with Hassan (1985) who stated that organophousphrus compounds (Cidial K) caused increased ascorbic acids in orange fruits during one month before harvest time (From 56.6 to 60 mg/100ml. juice).

According to the total sugar the ratable data refer that Best has positive and increasing effect and uplift the value of total sugar (19.11mg/L) than untreated fruits (17.52 mg/L).

Generally**,** it can be concluded that all tested pesticides exhibited satisfied effect against *P. ziziphi* ranged from 69.73 to 74.31% reduction.

Also, its residues in oranges fruits comply the world organizations of WHO and EU Pesticides on orange fruits. The tested pesticides are safe at harvest interval 20 days after treatment.

Also, most of tested insecticides showed insignificant effect on fruit quality. Also, recommendation pointed to Best preferential because it cause increase in total sugar in orange fruits, highest value of total soluble solids (TSS) and acidity (Ta) than other pesticides with partnership of reduction of insect population followed by Reldan which has highest value of ascorbic acid in fruits.

REFERENCES

Abd El-Mageed, A. E. (2012): Efficacy of certain insecticides against some sucking insect pests of cotton. Egypt. J. Agric. Res., 90(2): 105-115.

Anastassiades, M.; Lehotay, S.; Stajnbaher, D.; and Schenck, F.; (2003): Fast and easy multiresidue method employing extraction/partitioning and "dispersive soild-phase extraction" for the determination of pesticide residues in produce. J AOAC Int 86(2):412-431.

Asfoor, M. A. M. (1997): Seasonal abundance and control of the plum

scale insect *Parlatoria oleae* (Cloveé) on some deciduous trees. Ph.D. Fac. Agric., Moshtohor, Benha branch, Zagazig Univ., 399 PP.

A. O. A. C. (1980): Official methods of analysis. Association of official Agricultural Chemists. Washington, D.C.

A. O. A. C. (2007): Official methods of analysis. Association of official Agricultural Chemists, Washington. D.C., USA.

Bartholomew, E. T.; Stewart W. S. and Carman G. E. (1951): Some phosiological effects of insecticides on citrus fruits and leaves. The Botanical Gazette 112(4): 501-511.

Chauhan, S. S.; Agrawal, S. and Srivastava, A. (2013): Effect of imidacloprid insecticide residue on biochemical parameters in potatoes and its estimation by HPLC. Asion J. Pharm Clin Res, Vol 6, Suppl 3, 114-117.

Duncan, D. B. (1955): Multiple range and multiple "F" tests. Biometrics, 11:1-4.

Hassan, N. A. (1985): Effect of spraying scalicides and folifertilizers on the purple scale insect *Lepidosaphes beckll* (Newman), and chemical constituent of orange fruit in Egypt. M.Sc. Thesis, Fac. Sci., Ain-Shams Univ., 114 pp.

Helmy, E. I.; Zidan, Z. H.; El-Hamaky, M. A.; El-Emery, S. M. and El-Deeb, W. (1991): Efficacy of certain scalicides against *Parlatoria oleae* (Cloveé), other scale insects and their parasites on navel orange trees in summer. 4th Arab Conf. Plant Protection, Cairo, 1-5 Dec., pp. 49-57.

Helmy, E. I. and Tawfik, M. H. (1989): Effectiveness of summer spraying on the scale insect *Lepidosaphes beckii* (Newm.) and its parasitoid *Aphytis lepidosaphes* Comp. Zagazig J. Agric. Res., 16(3):349-353.

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

Latif, I.; Ahmad, S.; Qayyoum, M. A. and Khan, B. S. (2013): Evaluation of infestation of *Phyllocnisyis citrella* Stamin (Lepidoptera: Gracillariidae) and its parasitism after the application of Betacyhalothrin and thiamethoxam on Quadrates of citrus trees. American Eurasian J. Agric. & Environ. Sci., 13 (7):996-1003.

Milind, L. (2008): Citrus fruit biology, technology and evaluation. First edition book copyright © Elsevier Inc. All rights reserved Acadmic Press is an imprint of Elsevier.

Nunes, C.; Duarte, A.; Manso, T.; Garcia, J.; Cayuela, J.; Yousfi, K.; Martinez, M.; Weiland, C. and Salazar, M. (2010): Relationship between post-harvest diseases resistance and mineral composition of citrus fruit. Acta Hort. 868.

Porat, R.; Daus, A.; Weiss, B.; Cohen, L.; Fallik, E. and Droby, S. (2000): Reduction of post-harvest decay in organic citrus fruit by a short hot water brushing treatment. Post-harvest Biology and Technology. 18: 151-157.

Radwan, M. A.; Shiboob, M. H.; Abu-Elamayem, M. M. and Abdel Aal, A. (2004): Residues of pirimiphos-methyl and profenofos on green pepper and eggplant fruits and their effect on some quality properties. Emir. J. Agric. Sci., 16(1):32-42.

Shivanna B. K.; Gongadhara, N. B; Nagaraja, R; Basavaraja, M. K; Kalleswara C.; Swamy M. and Karegowda. C. (2011): Bio efficacy of new insecticides against sucking insect pests of transgenic cotton. Inte. J. of Sci. and Nature Vol. 2(1) 79-83.

Tayyib M.; Sohail, A.; Murtaza, S. A. and Jamil, F. F. (2005): Efficacy of some new-chemistry insecticides for controlling the sucking insect pests and mites on cotton. Pak. Entomol., 27(1): 63-66.

Yue B.; Wilde, G. E. and Arthur, F. (2003): Evaluation of Thiamethoxam and Imidacloprid as seed treatments to control European corn borer and indianmeal moth (Lepidoptera: Pyralidae) larvae. J. Econ. Entomol., 96(2):503-509.

ARABIC SUMMARY

الإستخدام الأمثل والآمن للمبيدات على ثمار البرتقال

نجوى على حسن وسوسن جاب الله عطية رضوان
معهد بحوث وقاية النباتات – مركز البحوث الزراعية- الدقى- الجيزة

أجريت هذه الدراسة بهدف الربط بين تطبيق أنسب مكافحة لحشرة النبق القشرية *Parlatoria ziziphi* (Lucas)علي أشجار الموالح (برتقال أبوسرة) مع الحصول علي ثمار صحية عالية الجودة. ولذلك إتجهت الدراسة إلي ثلاثة نقاط أساسية : **1-** التقييم الحقلي لكفاءة أربعة مركبات تمثل ثلاثة مجموعات مختلفة من المبيدات الحشرية لمكافحة الحشرة علي أشجار البرتقال وحماية المحصول من أضرارها في بستان موالح بمحافظة القليوبية. وأتضح من النتائج أن مبيد أجريفلكس أكثر المبيدات فعالية في خفض أعداد الحشرة (حوريات وحشرات كاملة) حيث كان متوسط نسبة الخفض (74.3%) يليه البست (73%) ثم الصنفيدور (70.18%) وأخيرًا الريلدان (69.7%) . وقد تبين من نتائج التحليل الإحصائي أن الوقت له تأثير إيجابي علي كفاءة كل المركبات المختبرة حيث أعطت أعلي نسبة خفض بعد 30 يوم من المعاملة وأظهرت النتائج أيضا حساسية الأطوار الغير كاملة لجميع المبيدات مقارنة بالأطوار الكاملة للحشرة. **2-** تحديد متبقيات المبيدات المختبرة في ثمار البرتقال من خلال فترتين هما بعد الرش مباشرة وعند وقت الحصاد . وأتضح من النتائج أن قيم المتبقيات في الثمار بعد الرش مباشرة تجاوزت الحد الأقصى المسموح به، أما وقت الحصاد فلم يسجل أي قيمة للمتبقيات مع كل المبيدات المختبرة (بعد 20 يوم من المعاملة). **3-** تأثير المبيدات المختبرة علي بعض صفات الجودة للثمار المعاملة. أوضحت النتائج أن كل المبيدات أدت إلي نقص غير معنوي لمحتوي الثمار لكل من المواد الصلبة الذائبة الكلية والحموضة الكلية وحمض الأسكوربيك والسكريات الكلية عدا مبيد البست الذي أدي إلي زيادة غير معنوية مع السكريات الكلية مقارنة بالثمار الغير معاملة، بينما أدت كل المبيدات إلي زيادة غير معنوية في درجة الطعم (الحلاوة) لثمار البرتقال مقارنة بالثمار الغير معاملة عدا مبيد أجريفلكس الذي أدي إلي نقص غير معنوي