

Toxicity of some Acaricides Against *Oligonychus afrasiaticus* (McGregor) (Acari: Tetranychidae) under Laboratory Conditions in The New Valley, Egypt

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Abstract

The date palm, *Phoenix dactylifera* L. is an important fruit trees growing in the New Valley, Egypt. The old world date mite, *Oligonychus afrasiaticus* (McGregor, 1939) (Acari: Tetranychidae) is one of the most harmful pests of the date palms, due to the economic damage caused in the production of dates especially in the New Valley, Egypt. Thus, the efficiency of some recommended chemical compounds (i.e., abamectin (1.8% EC), chlorfenapyr (36% SC), fenopyroximate (5% EC), cyflumetofen (20% SC) and hexythiazox (10% WP) against the pest was evaluation under laboratory conditions. The experiments were carried out at the laboratory of the Plant Protection Department, Faculty of Agriculture, the New Valley University. The date fruits-dip bioassay method was used. The mortality percentages of the pest adult stages were recorded after 1, 6, 12 and 24-h exposure periods. Results of the LC₅₀ values of abamectin, chlorfenapyr, cyflumetofen, fenopyroximate and hexythiazox after 24-h were 0.05, 0.07, 0.13, 0.55 and 6.89 ppm, respectively. Abamectin was the most toxic one of all tested acaricides. The results showed that, the acaricides used are important tools in the control of the *O. afrasiaticus* on date palm trees.

Keywords: Date palm, Acaricides, *Oligonychus afrasiaticus*, The New Valley.

Introduction

The date palm, *Phoenix dactylifera* L. (Arecaceae) is an important fruit trees cultivated in the New Valley Governorate. It is the main source of income and a food source for oasis farmers. Often there are more than two million palm trees producing about 60, 000 tons of date fruits annually in the New Valley Governorate, Egypt.

There are also many secondary products in addition to fruits that are useful to oasis farmers. The date fruits can be eaten fresh, dried and any other processed forms. Date fruits are high-energy food source with 72 to 88% sugar content at ma-

turity stage. During the Khalal stage, about 80 to 85% of the sugar content is sucrose. While, during ripening progresses, the sucrose dissolves to reduce sugars such as glucose and/or fructose. Date fruit is a rich source of iron and potassium, a fair source of calcium, chlorine, copper, magnesium, and sulfur and a scarce source of phosphorus. In addition, it is a source of 16 amino acids and vitamins such as: A, B1, and B2 (Ahmed *et al.*, 1995 and Vandercook *et al.*, 1980).

The date palms are afflicted with many pest species, but the nature and severity of the problems vary with cultivar, location, weather, and

cultural practices (Carpenter and Elmer, 1978 and Zaid *et al.*, 2002) causing serious losses in yield and in some cases, when the injury increases, which causes death of palm trees. The climate change and the large scale movement of palm species for farming and ornamental gardening, may help in an increasing of the invasive species events compounding the problems of crop protection. El-Shafie *et al.*, (2017) reported 132 species of insect and mite pests associated with date palm grown worldwide. These species are distributed among eight insect orders and 30 families, besides a single order of mites pertaining to nine families. The *O. afrasiaticus* is a serious pest of date palms (El-halawany *et al.*, 2017; Ben Chaaban and Chermiti, 2009; Blumberg, 2008).

The mites suck the fruit sap through the skin, covering bunches with dense webbing that hinders photosynthesis. Heavy infestations can lead to partial or total yield loss.

Materials and Methods

The toxicity of certain acaricides against *O. afrasiaticus* adults was evaluated under laboratory conditions in El-Kharga city, the New Valley Governorate, Egypt.

Acaricides used: The formulations of abamectin (1.8% EC), chlorfenapyr (36% SC), fenopyroximate (5% EC), cyflumetofen (20% SC) and hexythiazox (10% WP) were used in the present bioassay. These acaricides were obtained from the Central Agricultural Pesticides Laboratory (CAPL) in Dokki, Giza, Egypt.

A pilot test was used in order to choose the range of concentrations of each acaricide for the bioassay ex-

periments. The concentrations of 0.1, 1, 10, 100 and 1000 ppm were used against the *O. afrasiaticus*. The date fruits-dip bioassay was used. The fruits of date palms were dipped for 10 seconds in each concentration and left to dry under laboratory conditions for one hour, then 30 healthy of mite adults were transferred on the treated fruits in plastic cans covered with sieved lid. Three replicates were used. For control treatments, the palm fruits were dipped in distilled water only and the mite individuals were transferred on the fruits. This technique was carried out for all acaricides used. The percentages of mortality in mite adults were recorded after 1, 6, 12, and 24 h (exposure periods). Mortality (%) was estimated and corrected according to Abbott's formula (Abbott, 1925).

Results and Discussion

Data in Table 1 showed the toxicity of acaricides against *O. afrasiaticus* using fruits-dip bioassay after 1h (exposure period). The LC₅₀ value of abamectin was 17.62 ppm, followed by chlorfenapyr (46.95 ppm). The LC₅₀ of cyflumetofen, fenopyroximate and hexythiazox were not applicable because the mortality percentage significantly below 50% after 1-h. While, the LC₅₀ values of abamectin, chlorfenapyr, cyflumetofen, fenopyroximate and hexythiazox after 6 h (exposure period) were 0.56, 1.86, 12.05, 36.94 and 85.31 ppm, respectively. abamectin was the most toxic acaricide of all tested ones when used mite adults-dip bioassay (Table 2). Further, the LC₅₀ values of abamectin, chlorfenapyr, cyflumetofen, fenopyroximate and hexythiazox after 6-h (exposure period) were 0.08, 0.21, 1.14, 3.44 and 21.20 ppm, respectively (Table 3). Furthermore, the LC₅₀ value of abamectin, chlorfenapyr, cyflumetofen,

fenopyroximate and hexythiazox after 24-h (exposure period) were 0.05, 0.07, 0.13, 0.55 and 6.89 ppm, respectively (Table 4). In general, abamectin was the most potent pesticide of all tested pesti-

cides followed by chlorfenapyr, cyflumetofen, fenopyroximate and hexythiazox. The toxicity of the tested pesticides increased with increasing of the exposure period from 1 to 24-h exposure.

Table 1. Toxicity of acaricides against *O. afrasiaticus*, using date fruits-dip bioassay after 1h (exposure period).

Pesticides	LC ₅₀ (ppm)	95% Confidence limits of LC ₅₀	Slope	±SE
Abamectin 1.8 %EC	17.62	1.29-587.09	0.21	0.07
Chlorfenapyr 24% SC	46.95	1.19-1.89E+13	0.15	0.07
Cyflumetofen 20% SC	NA*	-	-	-
Fenopyroximate 5% EC	NA	-	-	-
Hexythiazox 10% WP	NA	-	-	-

*NA= not applicant (the mortality percentage was very low 50% at the highest concentration)

Table 2. Toxicity of acaricides against *O. afrasiaticus*, using date fruits-dip bioassay after 6 h (exposure period).

Pesticides	LC ₅₀ (ppm)	95% Confidence limits of LC ₅₀	Slope	±SE
Abamectin 1.8 %EC	0.56	0.00-4.14	0.24	0.07
Chlorfenapyr 24% SC	1.86	0.1-17.13	0.21	0.07
Cyflumetofen 20% SC	12.05	0.70-281.68	0.21	0.07
Fenopyroximate 5% EC	36.94	3.70-2971.95	0.21	0.07
Hexythiazox 10% WP	85.31	10.73-11403.37	0.22	0.07

Table 3. Toxicity of acaricides against *O. afrasiaticus*, using date fruits-dip bioassay after 12 h (exposure period).

Pesticides	LC ₅₀ (ppm)	95% Confidence limits of LC ₅₀	Slope	±SE
Abamectin 1.8 %EC	0.08	0.00-0.52	0.34	0.08
Chlorfenapyr 24% SC	0.21	0.00-1.51	0.27	0.07
Cyflumetofen 20% SC	1.14	0.03-6.84	0.26	0.07
Fenopyroximate 5% EC	3.44	0.24-21.12	0.27	0.07
Hexythiazox 10% WP	21.20	1.72-866.66	0.21	0.07

Table 4. Toxicity of acaricides against *O. afrasiaticus*, date fruits-dip bioassay after 24 h (exposure period).

Pesticides	LC ₅₀ (ppm)	95% Confidence limits of LC ₅₀	Slope	±SE
Abamectin 1.8 %EC	0.05	0.00-0.19	0.65	0.14
Chlorfenapyr 24% SC	0.07	0.00-0.33	0.43	0.09
Cyflumetofen 20% SC	0.13	0.00-0.85	0.32	0.08
Fenopyroximate 5% EC	0.55	0.00-3.36	0.27	0.07
Hexythiazox 10% WP	6.89	0.24-104.36	0.21	0.07

The data obtained in the present study are generally in agreement with Vasquez and Ceballos (2009); Reddy *et al.* (2014) and Kumari *et al.* (2017) who found that Chlorfenapyr was the most toxic compound against *T. urticae* as compared with abamectin. Kumari *et al.* (2017) mention that, the Abamectin, fenpyroximate, spiromesifen, chlorfenapyr, propargite and dicofol against the *Tetranychus urticae* gave a satisfactory results. They also stated that abamectin was found to be the most toxic one to control the *T. urticae* adults (LC50 = 0.39 ppm), followed by fenpyroximate (5.67 ppm), spiromesifen (12.53 ppm), chlorfenapyr (32.24 ppm), propargite (77.05 ppm) and dicofol (146.65 ppm). Hexythiazox was the least toxic one. Reddy *et al.* (2014) found that fenazaquin and abamectin were high toxic among acaricides, followed by spiromesifen, fenproximate and hexythiazox in controlling of *T. urticae*. In conclusion, data of the present study recommend using abamectin in controlling *O. afrasiaticus* on date palm trees.

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سمية بعض المبيدات الأكاروسية ضد، *Oligonychus afrasiaticus* (McGregor) تحت ظروف المعمل في الوادي الجديد، مصر

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الملخص

في هذا البحث تم تقييم بعض المركبات الكيماوية ضد حلم الغبار معمليا في محافظة الوادي الجديد حيث تم استخدام طريقة عمر ثمار النخيل في تركيبات مختلفة للمركبات المستخدمة وتقدير النسبة المئوية للموت بعد ١، ٦، ١٢ و ٢٤ ساعة من التعرض للمبيدات حيث تم حساب قيم LC_{50} لكل من المبيدات chlorfenapyr، abamectin (1.8% EC)، cyflumetofen (20% SC) و fenopyroximate (5% EC)، (36% SC) و hexythiazox (10% WP) بعد ٢٤ ساعة وكانت ٠,٠٥ و ٠,٠٧ و ٠,١٣ و ٠,٥٥ و ٦,٨٩ جزء في المليون على التوالي، وأعطى مبيد abamectin (1.8% EC) سمية أعلى بين جميع المركبات التي تم اختبارها، وأظهرت النتائج أن المبيدات الأكاروسية تستخدم للسيطرة على *O. afrasiaticus* على أشجار النخيل.