



# FIELD TRIALS TO CONTROL DATE PALM DUST MITE *OLIGONYCHUS AFRASIATICUS* (MCGREGOR) (ACTINIDIDA: TETRANYCHIDAE) INFESTING DATE PALM TREES WITH ENTOMOPATHOGENIC FUNGI IN SHARQ EL-OWAINAT, EGYPT

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## Abstract

Date palm dust mite *Oligonychus afrasiaticus* (McGregor) (Acari: Tetranychidae) is one of the injurious pests of date fruits specially in the New Valley Governorate, Egypt, causing severe damage especially to date palm Bartmoda cultivar (dry). This study was conducted in Sharq El-Owainat region, New Valley, Egypt to evaluate the efficacy of the two biocides Newfar and Metamite and the acaricides (Vertimec 1.8% EC) on this pest. Results indicated that all treatments reduced *O. afrasiaticus* populations compared to control. The highest reduction in mite population 83.02% was for Vertimec at rate 40 ml/100 liter of water followed by Newfar and Metamite at rate 200g/ 100 liter of water giving 59.10 and 56.0% reduction after two weeks, respectively. The study demonstrated the efficacy of biocides as safe and sustainable acaricides in control dust mites on date palm trees.

**Key words:** acaricides, biological control, Entomopathogenic fungi, date palm, Egypt.

## Introduction

Date palm (*Phoenix dactylifera* L.) of the family "Areaceae" the oldest domesticated plant with 5000-10000 years history in Middle East countries and is the God gifted heaven fruit to man with different byproducts, serves additional income sources for many date producers. It is considered the source of livelihood for many nations, especially the Arab world (Arbabi *et al.*, 2017). However, palm tree in Egypt is the tree of economic, environmental, food, medical, social and industrial value, whose role cannot be ignored for the life of the farmer and the ordinary citizen in any country.

FAOSTAT, 2012 demonstrated that Egypt is one of the main of the date- producer countries in the world. As it produce 1.7 million tons of date fruits from about 15 million palm trees. The Egyptian Government deeply concerned the date palm sector by planting 5 million palm trees in Toshka and the New Valley governorate, which will result in major changes in the global market over the next few years. The environmental role of date palms

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from purification of gases and heavy metals, salinity and drought, as well as non-competition of other crops in the area and the validity of cultivation in the poorest land and the lowest quality makes it a crop not competing by others (Bekheet and El-Sharabasy, 2015).

According to Central Administration for Agricultural Extension Services, Egypt 2001, diseases and pests are badly treating date palm plantations, causing severe economic loss to the growers in Egypt. The reduction reached about 52% of the total yield. Incidence of *O. afrasiaticus*, which known as the meadows of the ancient world, showed wide scatter in Middle East and Africa (Ben Chaaban *et al.*, 2011). Likewise, Al-Khayri *et al.*, 2015 demonstrated that *O. afrasiaticus* (McGregor) and *O. pratensis* (Banks) severe damage the early fruit developing stages, as it affects the fruits of during its growth and ripening stages. In sever infestation, it destroys the crop and leads to deformation of the fruits and stopping growth and immaturity.

However, if date palm trees are treated before flowering it will be highly protected from damage. The

efficacy of *Beauveria bassiana* and *Metarhizium anisopliae* on dust mite *O. afrasiaticus* infesting date palm fruits in the field resulted in a high potential of *M. anisopliae* to control *O. afrasiaticus* at Alhassa region in Saudi Arabia (Al-Jabr and Al-Shaqqaq, 2007). The efficiency of the botanical compound (Baico) compared with other acaricides (Amitraz, Vertimec, Perpol and Salocide) appeared to be effective, Aldosari, (2007). However, In Iraq, efficacy of nine different insecticides and miticides evaluated against dust mite nymphs' *O. afrasiaticus* infested date. The efficacies ranged between 83.3% and 99.6% after two days of treatment and increased to become 91.2% to 100% after seven days. (Alrubeai *et al.*, 2015).

Various devices studied the effect of different acaricides against phytophagous mites were carried out by Elhalawany and El-Sayed, 2013 and Abou El-Ela, 2014 in Egypt. In four different locations in Giza, Assiut, Matruh and the New Valley Governorates, in Egypt infected with dust mite recorded by Sanad *et al.*, 2017 and Elhalawany *et al.*, 2017, evaluated biochemical acaricides (Vertimec 1.8% EC), four chemical acaricides (Abroch 5% SC, Challenger Super 24% SC, Envidor 24% SC and Ortus Super 5% EC), one insecticide (Tafaban 48% EC), a mineral oil (K.Z. oil 95% EC), sulfur (Micronite 80% WP) and water for *O. afrasiaticus* in two date palm cultivars Barhi (soft) and Bartamoda (dry) under field conditions. The aim of this study to evaluate the efficacy of 2 different entomopathogenic fungi as safe and sustainable in control dust mites on date palm trees in Egypt.

## Materials and Methods

Experiments were conducted on date palm variety Bartmoda (dry) cultivar (15 year old) severely infected with palm dust mite at Al-Ain Village, Sharq El-Owainat province, New Valley Governorate, Egypt.

### Experimental design

The experimental area in the orchard was divided into four sections; 3 compared with the control. Each

treatment had four replicates; each had five trees distributed in complete random sectors. The spray was carried out using a 600 liter sprayer motor. Random samples were collected included, 4 fruits per tree at a rate of total 20 fruits per replicate (totally 80 fruits per each treatment). The mite number on fruits was counted immediately before treatment and on 3<sup>rd</sup>, 7<sup>th</sup> days and 14<sup>th</sup> days before application.

### Experimental compounds

The components used in treatments were conducted from Plant Protection Research Institute (PPRI) and its application rates are shown in table 1.

### Calculations and statistics analysis

Date palm dust mites' percent reduction was calculated using the Henderson and Tilton equation (1955) as followed:

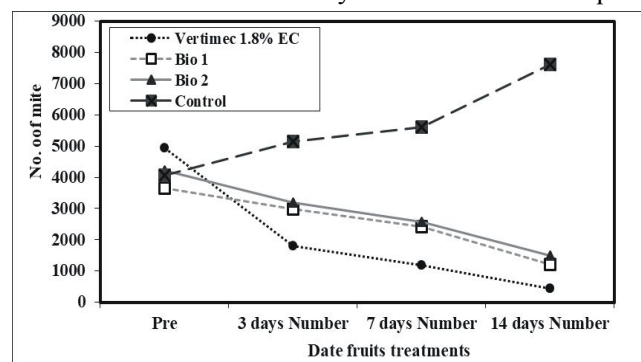
$$\text{Reduction \%} = \frac{(1 - (N \text{ in Co before treatment} \times N \text{ in T after treatment})}{(N \text{ in Co after treatment} \times N \text{ in T before treatment})} \times 100$$

Where: N = mite population, T = treated, Co = control

Statistics analyzed by means were compared by using Fisher's least significant difference. Significance level was  $P > 0.05$ . Analysis was conducted using SAS statistical software (SAS Institute, 2003).

## Results and Discussion

Treatments in this study have disclosed adequate



**Fig. 1:** Number of *Oligonychus afrasiaticus* individuals on Bartmoda cultivar after application under field condition.

**Table 1:** Treatments and its application rates.

Trade name	Product name and source	Formulation	Chemical name	Rate of application/ 100 liter of water
Vertimec 1.8% EC	Abamactin	Liquid	Mixture containing a minimum of 80% avermectin B1b (i) 5-O-demethylavermectin B1b mixture with(ii) 5-O-demethyl-25-de (1-methylpropyl) -25- (1-methylethyl) avermectin B1b	40cc
Metamet	<i>Metarhizium anisopliae</i>	Powder	-	200gm
Newfar	<i>Beauveria bassiana</i>	Powder	-	200gm

**Table 2:** Reduction percentage of *O. afrasiaticus* on date palm fruits treated with compounds on Bartmoda cultivar under field conditions.

Trade name	Reduction percentage of individuals / 80 fruits after treatment			
	3 days	7 days	14 days	Average %
Vertimec 1.8% EC	71.26 a	82.58 a	95.23 a	83.02 a
Metamet	35.48 b	52.32 b	82.31 b	56.70 b
Newfar	40.47 b	55.65 b	81.19 b	59.10 b
F-value	98.25	78.85	130.73	15.84
P-value	0.0001	0.0001	0.0001	0.0126
LSD at level 5%	6.94	6.4	2.35	14.46
Different letters in the same column denote significant difference (P < 0.05).				

control to the date palm dust mite, *O. afrasiaticus* on date palm fruits treated cultivars Bartmoda. Results indicated that no significant difference in mite's population when date palm treated with the biocides Metamet (1215 individuals) or Newfar (1490 individuals) compared with palm treated with Vertimec (442 individuals.) which gave lower population. Whereas the population in control was (7620 individuals) as showed in fig. 1. Individuals of *O. afrasiaticus* gradually decreased in number after application with compounds till end experiment. Results in table 2 showed that reduction percentage of population of *O. afrasiaticus* after application with biocides and acaricides treatments under field conditions after 3, 7 and 14 days. There were significant differences between acaricides and biocides exhibited reduction percentages. Vertimec 1.8% EC gave the highest reduction percentage by 83.02% while, Metamet gave the 56.70% and Newfar resulted in 59.10% after 14 days of treatments ( $F= 15.84$  &  $P= 0.0126$ ). Thus, it could be concluded that all acaricides were effective against *O. afrasiaticus*. These results are in agreement with findings by Al-Jabr and Al-Shaqqaq, 2007 in Saudi Arabia with high potential of *B. bassiana* and *M. anisopliae* to control *O. afrasiaticus* in Alhassa region, Saudi Arabia.

This study was conducted in Sharq El-Owainat region, New Valley Governorate, Egypt, in order to reduce the use of synthetic insecticide to provide successful pest management. Entomopathogenic fungi used in this study as microbial pesticide play an important role in sustainable food crops. Results recommended that there moderate potential and harmless to use Metamet (*Metarhizium anisopliae*) and Newfar (*Beauveria bassiana*) compared with using Vertimec as pesticides mentioned before to control palm dust mite *O. afrasiaticus* in the field.

According to the recommended concentration for each product results demonstrated the sustainable use of

the entomopathogenic fungi compared with Vertimec use. As these pesticides gave good protection for infested fruits through the experiment compared to control treatment. Future study recommended to measure the crop production.

## Conclusion

This study confirms that using both biocontrol agents *Metarhizium anisopliae* and *Beauveria bassiana* can help in control *O. afrasiaticus* as a harmless products compared with using synthetic products which environmentally harm.

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