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Latent effect of some acaricides on biological aspects of the false spider mite, *Brevipalpus phoenicis* Geijskes (Acari: Tenuipalpidae)

Brevipalpus phoenicis **(Geijskes)**

El-Khouly, N. M.

Plant Protection Dept., Fac. of Agric., Fayoum Univ.

ABSTRACT:

The present study were determined to evaluate the effect of three acaricides named; Ortus super (5%Ec), Vertimec (1.8%Ec) and Delmite (7.5% Sc) on the biological aspects of the false spider mite, *Bervipalpus phoenicis* Geijskes at laboratory condition (30±1°C) and (70±5% RH) at Fayoum Governorate. The percentage of hatchability, mortalities, the duration of larva, protonymph and deutonymph were recorded under using the three acaricdes. Duration of larvae were recorded 1.20, 1.20, 1.20 and 1.28 days at the applications of acaricides (Vertimec, Ortus, Delmite and control; respectively). At the respective application the duration of protonymph and deutonymph were 0.00, 1.10, 0.55& 0.87 days and 0.00, 1.11, 1.12 and 1.96 days). All the individuals were died during the larval stages and failed to reach the nymph, at application of Vertimec. Adults lived for a maximum of 33.14 days at control and a minimum of 4.21 days at Vertemic. Longevity of females were recorded 10.32 and 28.32 days at application of Ortus and Delmite; respectively. Generally, all acaricides were affected on the biological aspects of *B. phoenicis.* Vertimec (1.8% Ec) was the most effective on all the biological parameters compared with Delmite and Ortus super.

KEYWORDS: *Brevipalpus phonicis*, biological aspects, acaricides.

1.INTRODUCTION:

Family Tenuipalpidae presents a worldwide distribution with over 1100 valid species belonging to 38 genera. Most of the species described are from North America (33%) and Africa (13%), whereas little is known about the distribution of flat mites in the rest of the world. (Gerson 2003 and Moraes & Flechtmann, 2008).

*Corresponding author Email: ✉nma01@fayoum.edu.eg
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The flat-mite *Brevipalpus phoenicis* Geijskes, was infested various cultures of economical importance crop, such as coffee (*Coffea* spp.), citrus (*Citrus* spp.), Indian tea (*Camellia sinensis* L.), peach (*Prunus persica* L.), papaya (*Carica papaya* L.), coconut (*Coconuts nucifera* L.), apple (*Malus* spp.), pear (*Pyrus comunis* L.), guava (*Psidium guajava* L.), olive (*Olea europaea* L.), fig (*Ficus carica* L.), walnut (*Juglans* spp.) and grapevine (*Vitis* spp.) as some of the principal hosts (Della Vechia and Andrade, 2022).

The mite, *B. phoenicis*, is a composition tenuipalped mite that feeds on citrus species, it plays an important role in transmission of the Citrus Leprosis Virus (CiLV) on sweet orange and mandarin trees, which has been causing economics loses. (Vacante, 2010; Carvalho et al., 2014 and Della vechia et al., 2018)

Information on the biology and effect of acaricides on biological aspects of this mite species is scanty in many parts of the world, e.g, Argentina, Brazil, Venezuela, Costa Rica and Egypt. (Dosse, 1957, Zaher et al., 1971, Nagesh Chandra & Channa Basavanna, 1974, Lal, 1979 and Della vechia et al., 2022).

Therefore, this work reported to determine the effect of some recommended acaricides on the biological aspects of this mite and choses the best of acaricide for control the tenuipalpid mite, *B. phoenicis.*

2.MATERIALS AND METHODS:

The present study aimed to evaluate the effect of three recommended acaricides named; Ortus super, Vertime and Delmite, (Table 1) on the biological aspects of the mite, *B. phoenicis* under constant conditions, 30±1°C and 70±5%RH at Fayoum University (Faculty of Agric.).

Table 1. Acaricides were used in study

Trade name	Common name	Rate of field application
Ortus super 5% Ec	Fenpyroximate	50 cm^3/100 liter water
Vertimec 1.8% Ec	Abamectin	40 cm^3/ 100 liter water
Delmite 7.5% Sc	Sulfur	500 cm^3 /100 liter water

Stock cultures of *B. phoenicis*:

The stock culture of *B. phoenicis* was prepared in the lab. under the same conditions. The infested leaves and branches of lemon were collected from Fayoum province (Fedimeen, Sinawares, Fayoum).

The newly emerged adults of the mite, *B. phoenicis* were collected and introduced on seedling of lemon under wooden cages covered with muslin to avoid the contamination by the other pests. Immature individuals were used for preparing small cultures in petri dishes (10 cm) provided with lemon leaves, its ridges dipped in thin layer of Agar 0.6% to prevent escape the mites (Abd-Elgayed, 2004 and El-Khouly & Farag, 2022).

Twenty replicates of lemon leaf dishes were dipped in LC_{50}% of the three acaricides for around 1 min. Control leaf discs were immersed in distilled water and let to dry at room temperature. Leaf discs were put in petri dishes (10 cm diameter); the cotton bed was supplied with water when is needed to maintain the leaf discs fresh. Leaf discs were

replaced with fresh ones when needed. (Abd-Elgayed, 2004)

Twenty couple transferred to leaf discs put on petri dishes (5 cm diam.) and incubated for 24 h. until deposit eggs, then adults were transferred to another discs. The obtained eggs were incubated in the same conditions (30±1°C &70 % RH) until hatching. One newly hatched larva was transferred to lower surface of each lemon leaf discs. Kept separately on a disc for recording duration of different biological aspects. The same former steps were followed with untreated leaf discs as a control. The number of hatched eggs, the percentage of hatchability and mortalities was calculated. The duration of larva, protonymph and deutonymph were recorded under using the three acaricdes. The toxicity experiments from the same chosen acaricides, (Ortus super, Vertimec and Delmite) were used according to (El-khouly and Farag, 2022).

Percentages of mortality were corrected for natural mortality by using Abbott's formula (Abbott, 1925) and the dosage-mortality regression lines were drawn (Finney, 1971). The data was subjected to analysis of variance (ANOVA) and the means spared using New least significant difference (New L.S.D) according to the methods given by (Senedecor and Cochran, 1980).

3.RESULTS AND DISCUSSION:

1- Duration of immature stages of *B. phoenicis* treated with some acaricides.

The duration of immature stages of *B. phoenicis* reared on citrus leaves treated with some acaricides were reported in table (2). The duration from newly laid egg to adult requires minimum of 10.32 days at ortus application and a maximum of 16.27 days at control under laboratory conditions. The mite cannot complete its life cycle at application of the acaricide (Vertemic), while this value at delmite was 11.21 days. (Table, 2 and fig., 1)

Duration of larvae was recorded 1.20, 1.20, 1.20 and 1.28 days at the applications of acaricides (Vertimec, Ortus, Delmite and control, respectively). At the respective application the duration of protonymph and deutonymph were 0.00, 1.10, 0.55& 0.87 days and 0.00, 1.11, 1.12 and 1.96 days). All the individuals were died during the larval stages and failed to reach the nymph, at application of Vertimec.

In Hawaii, generations are continuous often overlapping. Based on laboratory studies there are at least 10 generations per year (Haramoto, 1969). On *Oroxylum indicum* the life cycle was completed in 20.02 days at 70˚F and 29.66 days at 79˚F, the life cycle duration on *Clerodendron siphonanthus* took 28.34 and 20.20 days at 70˚F and 79˚ F; respectively. (**Lal, 1979)**

2- Longevity of the adult of *B. phoenicis* treated with some acaricides.

On average, adults lived for a maximum of 33.14 days at control and a minimum of 4.21 days at Vertemic. Longevity of females was recorded 10.32 and 28.32 days at application of Ortus and Delmite; respectively.

The duration of the post-embryonic phases, as well as the preoviposition, oviposition and postoviposition periods varied in agreement with application of acaricides in which the mite developed. During the pre-oviposition period, females feed for 1 to 2 days (average 1.21 days) on application of acaricides (Ortus and Delmite) and 1 to 3 days (average 1.24 days) on control.

3- Fecundity of the adult of *B. phoenicis* treated with some acaricides.

The number of eggs laid by each female varies with application of acaricide and no eggs laid after 3 days from application of vertemic and the females lives for 2 to 4

days. Hatching occurs in minimum of 5.32 days at Ortus and a maximum of 8.43 days at Delmite under laboratory conditions.

At control and the applications each female laid from one to four eggs per day for (3.44 to 33.80 days). (Table. 2 and fig., 2). The number of egg laid by the applications of acaricides was recorded in fig.2. the number of egg affected significantly by application of acaricides, while the egg laid at Vertemic were 3.44 eggs and the same parameter were 10.32 and 28.32 day at Ortus and Delmite compared with control (33.14 days).

The intense spraying of acaricide applications has positively affected the management of the leprosis vector mite, *B. yothersi*, requiring additional acaricide. Additionally, the concentration of the active ingredient Vertimec was quantified in the spray solutions. The efficacy of Vertimec on the eggs and adults of *B. yothersi* was drastically reduced. There was no significant reduction in Delmite application. (**Andrade et al., 2013 and Amaral et al., 2018).**

Table 2. Duration in days of life cycle of *B. phoenicis* rearing on citrus leaves treated with some acaricides.

Parameters		Acaricides			
		Vertimec	Ortus	Delmite	Control
Incubation	Mean±SE	6.22± 0.30 **b**	5.32 ± 0.14 **b**	8.43 ± 0.14 **a**	8.23 ± 0.54 **a**
	Range	(4-7)	(4-6)	(5-9)	(6-15)
Larva	Mean±SE	1.20± 0.11 **a**	1.20 ± 0.11 **a**	1.20 ± 0.10 **a**	1.28 ± 0.16 **a**
	Range	(1-2)	(1-2)	(1-2)	(1-2)
Protonymph	Mean±SE	0	1.10 ± 0.10 **a**	0.55 ± 0.02 **b**	1.87 ± 0.12 **b**
	Range	(0)	(1-2)	(0-2)	(1-2)
Deutonymph	Mean±SE	0	1.11 ± 0.24 **a**	1.12 ± 0.13 **a**	1.96 ± 0.27 **a**
	Range	(0)	(1-2)	(1-2)	(1-2)
Egg-adult	Mean±SE	0	10.32 ± 0.10 **a**	11.21 ±0.11 **a**	16.27 ± 1.11 **b**
	Range	(0)	(9-11)	(6-12)	(12-19)
Longevity	Mean±SE	4.21± 0.21 **a**	10.32 ± 2.32 **b**	28.32 ± 2.22 **c**	33.14 ± 5.08 **c**
	Range	(2-5)	(8-11)	(20-30)	(20-36)
Preoviposition	Mean±SE	1.20±0.12 **a**	1.21 ± 0.11 **a**	1.21 ± 0.11 **a**	1.24 ± 0.21 **a**
	Range	(1-2)	(1-2)	(1-2)	(1-3)
Oviposition	Mean±SE	3.44± 0.11 **a**	6.98 ± 2.11 **b**	22.50 ± 2.32 **c**	33.80 ± 5.03 **c**
	Range	(2-4)	(5-7)	(16-25)	(22-36)
Postoviposition	Mean±SE	0	0.22 ± 0.17 **a**	0.22 ± 0.11 **a**	0.66 ± 0.59 **a**
	Range	(0)	(0-1)	(0-1)	(0-2)

N.B.1- Standard mean error (SE). The averages differed significantly among the utilized substrates citrus by the F test at 5% of significance.
2- Data with different letter in row significantly different.

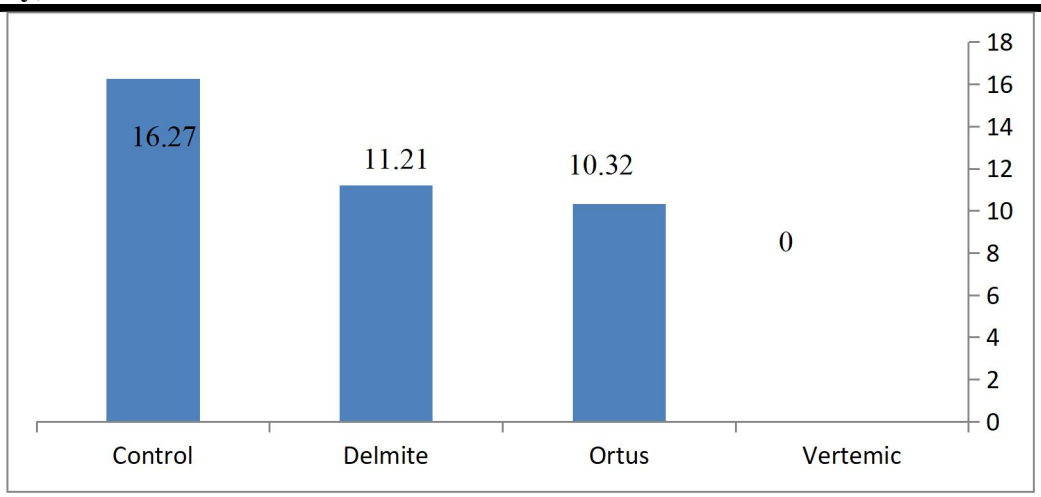

Fig 1. Duration, (in day), of immature stages of *B. phoenicis* treated with some acaricides.

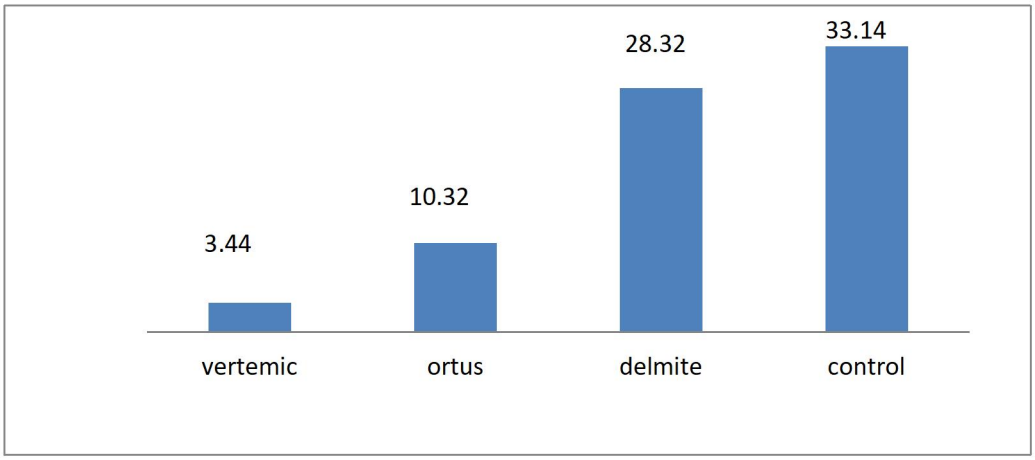

Fig . Longevity, (in days), of *B. phoenicis* adult treated with some acaricides

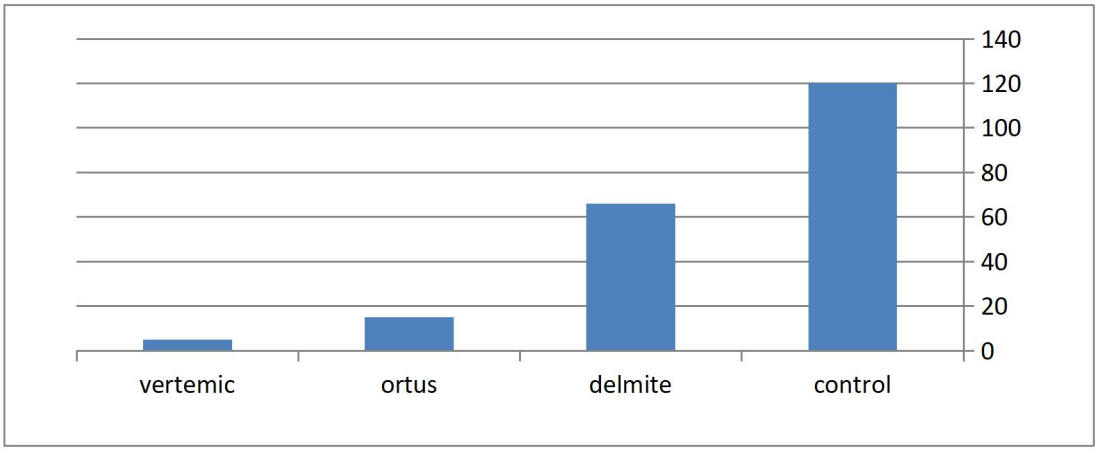

Fig 3. Fecundity of *B. phoenicis* female treated with some acaricides

Our results are agreement with the results which obtained by (**Nagesha Chandra and Channabasavanna 1974; Denmark, 1975 and Andrade et al., 2010),** reared the mite *B. phoenicis* in the laboratory on two different host plants viz. *Oyoxyrut indicum* and *Creyoaenayon siphonanthus* to study the biology and time taken to complete the life cycle. The life cycle completed in 20.02 and 29.66 days at an average temperature of 21.2˚C and 26.6˚C on *O. indicum* and 28.34 and 20.20 days on *C. siphonanthus* food plant; respectively. Approximately 9 generations were reared in a year. The average incubation period is 8.89 days and 6.37 days at an average temperature of 21.2˚C and 26.6˚C; respectively on *C. siphonanthus* and 9.04 days and 6.01 days on *O. indicum* food plant. The total period taken to complete the life cycle was 29.02 and 20.66 days at an average temperature of 21.2˚C and 26.6˚C on *O. indicum* and 28.34 and 20.20 days on *C. Siphonanthus* food plant; respectively. Similar observations have also recorded by **Zaher et al. (1971) Haramoto 1969 and Lo et al., 1968** had already observed average periods of incubation of 9.4 days in Papaya at 25 °C, and 9.5 days in Indian tea leaves at 26 °C.

Several acaricides registered to control the leprosis mite (abamectin, amitraz, acrinathrin, bifenthrin, fenpropathrin, etoxazole, hexythiazox, flufenoxuron, spirodiclofen, cyflumetofen, chlorfenapyr, fenbutatin oxide, propargite, fenpyroximate, pyridaben, and sulfur). The use of synthetic acaricides is a control option that generates short-term results for the citrus grower (**Sato et al., 1995 and Della Vechia et al., 2021).** Synthetic acaricides are the main management strategy used by citrus growers to reduce the vector population. This work aims to provide historical data on the use of acaricides to control the citrus leprosis mite and the main factors involved with the efficacy of these products. To get to know the main products that were and have been used to control the leprosis mite, we used scientific papers that studied the toxic effect caused by pesticides on these mites

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