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Bio-efficiency of some Aromatic Oils and Other Compounds on Some Biological Aspects of *Tetranychus urticae* as Alternative to Pesticides

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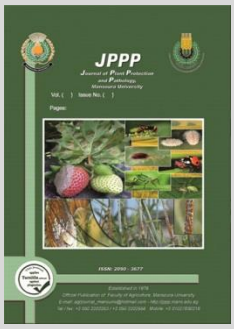

ABSTRACT

Extensive use of conventional pesticides and acaricides to control of the two spotted spider mite, *Tetranychus urticae* Koch caused undesirable side effects on environment, humans and animals so, it was necessary to look for alternative control methods including the use of aromatic oils and natural oils, as botanical acaricides . The present study was carried out to assessment bio-efficiency of some aromatic oils and other compounds on some biological aspects of *T. urticae* in laboratory at (25±2) ºC, and (65±5) %R.H. to finding safe a mean to human, environment , and animals as alternative to synthetic miticides used in the control this mite. Results indicated that Helbstar was the highest toxic compound to adult females of *T. urticae* followed byNat-1 with **Lc_{50}** values of 1686.5 and 2861.5 ppm, respectively while Basil was the least toxic one with Lc_{50} value of 5990.4 ppm . The population showed more homogeneity in its response to the aromatic oils (Basil and carnation). As a result to significant differences between different oils it was found that Carnation oil and natural oil (Nat-1) can be recommend in controlling mite through incubation stage of *T. urticae* . Also Carnation oil can be recommend in controlling active proto-nymph, total immature and life cycle stages of *T. urticea* . All oils were not preferred in controlling adult females of mite through pre- oviposition, oviposition, post-oviposition and longevity stages . The obtained results were important so they are taken in the consideration when planning programs of integrated pest management.

Key words: aromatic oils , pesticide , natural oil, toxicity and biology, *Tetranychus urticae*

INTRODUCTION

Continuous use of synthetic acaricides and pesticides to control of the two spotted spider mite, *Tetranychus urticae* Koch (Acari: Tetranychidae) may lead to a number of undesirable side effects including the development of pesticide resistance and appearance adverse effects on non-target organisms and contribute to environmental pollution , risks to humans and animals.. Thus, It was necessary to look for alternative control methods including the use of aromatic oils and botanical oils, as botanical acaricides for crop protection to increasing and to control mites with low risk to environment, humans and animals in alternative control methods including the use of botanical oils, aromatic oils and plant extracts as alternative to pesticides to control mites where *T. urticae* is serious pest and causes crop losses by direct feeding and reducing the photosynthetic rate in severe infestations. This pest has short life-cycle, high reproductive and reproduction, which resistance to acaricides very rapidly. Insect Pest Management (IPM) has to face up to the economic and ecological consequences of the use of pest control measures. Sixty years of sustained struggle synthetic insecticides against harmful insect , because these produced secondary effects as mammalian toxicity, insect resistance and ecological hazards. The diversification in IPM is necessary for better environmental protection. Among the alternative strategies, the use of plants insecticidal allelo-chemicals appears to be promising(Roger, 1997). Aromatic plants and their essential oils are among the most efficient botanicals, which obtained through stream distillation of herbs and medicinal plants (Yatagai, 1997). Most of these oils are environmentally non-resistant and non-toxic to humans and wildlife(with some exceptions)(Cockayne and Gawkrodger, 1997) , (Kumar *et al*., 2000), (Gorman *et al.* 2001) and (Van Leeuwen *et al.* 2010). They induce topical toxicity and fumigant as well as repellent or ovicidal effects. Also the use of some synthetic chemicals to control pest and these synthetic chemicals are carcinogenic, high and acute toxicity, long degradation periods and environmental pollution as a result to this led to increase in the search for efficient alternative to chemical pesticides management of *T. cinnabarinus*. Essential oils are obtained or isolated as a result of steam distillation from aerial plant parts. Plant essential oils may be an alternative source of materials for *Tetranychus* control because they constitute a rich source of bioactive chemicals. Because of this, much effort has been focused on plant essential oils or phyto-chemicals as potential sources of commercial insect control agents. Moreover, essential oils have a broad spectrum of insect and mite activity due to the presence of several modes of action, including repellent and anti-feedant activities, inhibition of molting and respiration, reduction in growth and fecundity, cuticle disruption, and effect on the invertebrate octopamine path way (Saxena, 1989; Arnason et al., 1993; Isman,2000; Enan, 2001; Akhtar and Isman,2004).

Therefore the present study was carried out to assessment the bio-efficiency of some aromatic oils and

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other compounds on some biological aspects of *Tetranychus urticae* in laboratory to find safe a mean to environment, human health and animals and an alternative to synthetic miticides currently used in the control of the devastating phytophagous mite pest,*T. rticae*

MATERIALS AND METHODS

Two aromatic oils (Basil and Carnation), one natural oil (Nat-1) were used as alternative pesticides and one traditional acaricide (Helbstar) were evaluated against some biological aspects of spider mite , *Tetranychus urticae* in laboratory

1.Aromatic oils as Alternative compounds :

Basil (*Ocimum basilicum* L.) 62% absolute oil , (parts used , Herb) . It was supplied by Hashem Brothers Company of Essential Oils and Aromatic Products, Giza , Egypt .

Carnation (*Diamthus caryophylceae*) 22% absolute oil (parts used flowers). It was supplied by Hashem Brothers Company of Essential Oils and Aromatic Products, Giza, Egypt.

Nat-1 (Jojoba oil , 96% Ec). It was supplied by Acarology Research Department, Plant Protection Research Institute, Giza , Egypt

2.The traditional acaricide: Pyridaben (Helbstar 20% EC) was supplied by Helb Company of Pesticides and Chemicals, Egypt.

3.Laboratory tests:

Leaf-disc dipping technique and assessment toxicity of the aromatic oils and natural oil as alternative compounds and the traditional acaricide to adult females of two spotted spider mite

Stock colonies of *T. urticae* mite which were reared under laboratory conditions on castor bean leaves away from any contamination of pesticides before starting the experiments. The susceptibility of adult females of *T. urticae* Koch to the abovementioned compounds was evaluated using leaf disc dipping method (Siegler 1947). Four discs of sweet potato leaves were dipped in each concentration for 5 seconds and left to dry. These used concentrations (Lc_{50}) were 1686.5, 2861.5, 4340.5, 5990.4 for Helbstar, Nat-1, Carnation and Basil. Then, 10 adult female mites were transferred by camel hair brush to each disc. The discs were placed on moist filter paper which rested on moist cotton wool pad in petri-dishes and kept in laboratory at (25±2)ºC, and (65±5) % R.H. Using leaf disc dipping method as the same previous method in control but the water was used for all treatments instead of concentrations of tested compounds to comparison (Lancaster, *et al.,* 2002) . Mortality percentage was recorded 24 hours after treatment for compounds, Helbstar and Nat-1,and seven days after treatments of Basil and carnation. Correction mortality in control was made by using Abbott's formula (1925) . The toxicity curves were drawn and the estimated Lc_{50} values and the 95 % confidence limits were calculated from probit regressions by using log-probit software program Ldp Line®model "Ehabsoft" (Bakr, 2000). based on Finney(1971) . The toxic index of each compound was determined according to Sun (1950).

I-A-Effect of Lc_{50} concentration of tested compounds on eggs hatchability and longevity time after adult females *T. urticae* treatment

Twenty newly emerged mature females of *T. urticae* Koch were obtained from spider mite stock colonies which were reared under laboratory conditions on castor bean leaves were used in this experiment. By using leaf disk dipping method(feeding after treated leaves) about twenty potato leaf discs (1.5 cm in diameter for each disc) were used as replicates for each concentration of tested compounds and each leaf disc immersing for five seconds in each concentration of tested compounds and these discs were left to dry and put upside down on a filter paper and over a wet cotton pad in petri-dish, 9cm in diameter after that twenty newly emerged mature females transferred by camel hair brush to treated twenty potato leaf discs for each concentration of tested compounds where these females feed on treated potato leaf discs and these discs kept in the incubator at (25±2) ºC, and (65±5) % R.H. Also twenty replicates as mentioned above were used in control and in control water was used for all treatments instead of concentrations of tested compounds in comparison (Lancaster, *et al.,* 2002) and according to the above dipping technique considered in control check. Using microscope to the examination . The examination each 12 hours to follow up the hatchability and reduction for the laid eggs and also longevity stage periods of adult females *T. urticae* Koch which consists of different development periods are pre-oviposition. , oviposition and post –oviposition periods and record it until death all adult females . After these females put eggs , these eggs were monitored twice daily until hatching and percentages mortality for adult females during any stage of development stages *T. urticae* were calculated . Correction for control mortality was made by using Abbott's formula (1925) .

I-B- Effect of Lc_{50} concentration of tested compounds on life cycle of adult females *T. urticae* after treatment of larvae, proto-nymph and deuto-nymph

After the previous females as mentioned above put eggs and they were monitored twice daily until hatching. After that were taken about twenty hatched larvae of *T. urticae* Koch and by using leaf disk dipping method(feeding after treatment) about twenty potato leaf discs (1.5 cm in diameter for each disc) were used as replicates for each concentration of tested compounds and each leaf disc immersing for five seconds in each concentration of tested compounds and these discs were left to dry and put upside down on a filter paper and over a wet cotton pad in petri-dish, 9cm in diameter after that twenty larvae transferred to treated twenty potato leaf discs for each Lc_{50} concentration of tested compounds where these larvae feed on treated potato leaf discs and these discs kept in the incubator at (25±2) ºC, and (65±5) % R.H. Also twenty replicates as mentioned above were used in control and water in control for all treatments instead of concentration of tested compounds in comparison (Lancaster, *et al.,* 2002) and according to the above dipping technique considered in control check. After developed larvae to proto-nymph and deuto-nymph .

As the same previous leaf disk dipping method was

used for each of proto-nymph and deuto-nymph and follow up development these stages until reach to adult stage by using microscope to the examination .The examination each 12hours to follow up twice daily all development stages time from active larva, quiescent larva , active proto- nymph, quiescent proto- nymph, active deuto-nymph, quiescent deuto-nymph, total immature stages and recorded them until reach to adult stage. Calculate mortality percentages of development stages *T. urticae*. The correction for mortality in control was obtained by using Abbott's formula (1925)

Statistical analysis:

The significance of treatments effect was determined by analysis of variance (ANOVA). The significance of various treatments was evaluated by Duncan's multiple range test (1955) at level 5% by MSTATC program **(**1990**)** Version 2-10 and by using SPSS Statistical Software packages (2007) version 16.0 and this program was used also to calculate stander error for mean (Mean ±SE) .

RESULTS AND DISCUSSION

1- Toxicity of tested compounds against adult females of *T. urticae* .

The data in Table (1) indicated that Helbstar was the highest toxic compound to adult females of *T. urticae* followed by Nat-1 with Lc_{50} values of 1686.5 and 2861.5ppm, respectively, while Basil was the least toxic one with Lc_{50} value of 5990.4 . Also , data in Table (1) showed that Carnation displayed the highest slope (5.58)over all compounds , followed by Basil with a slope value of 3.64 , while Nat-1 displayed the lowest one (1.66) . In other words, the highest slope value means more homogeneity in response of the organism towards the pesticide and in the same time the pesticide is acting as a selection factor producing an organism strain as pure genetically as possible , while the low slope value indicate heterogeneous mite population , in its response to the chemical. Concerning the toxicity index at Lc_{50} and Lc_{90} levels , the data in Table (1) confirmed that Helbstar was the most toxic compound to adult females of *T. urticae* with a toxicity index of 100 to both Lc_{50} and Lc_{90} followed byNat-1 with a toxicity index of 58.94 at Lc_{50} and 77-46 at Lc_{90} of Carnation . Basil and carnation were the poorest toxic compounds to adult females with toxicity index of 28-15 and 38.86 , respectively at Lc_{50} levels while Nat-1 and Basil were the poorest toxic compounds with toxicity index of 33-81 and 42-36, respectively at Lc_{90} levels . These results are in agreement with those of Hoskims and Gordon (1956) postulated the fact that one of the first sign in the development of a resistant strain is the decrease in the slope of the dosage mortality line , therefore one expect that compound with low slope value may lead to development of resistance if used successively . Also the obtained results are in agreement with the results of Park *et al* (1996) who found that the acaricide abamectin solution killed all *T. urticae* females 24 hours after dipping . Magouz (1997) who reported that the slope value of log concentration probit line is considered as a reaction indicator between the chemical and affected organism, Hosny *et al*(2003 a & b) ,they found that mineral oils came in the second category after specific acaricides in their toxicity to *T. urticae* under laboratory conditions , . Also, Magouz (2003) found that abamectin was more toxic to adult females of *T. urticae* than the other tested compounds .

Table 1. Toxicity of tested compounds to adult females of *Tetranychus urticae* Koch

Compound	Lc_{50} PPm	Confidence limits (c.L) lower	upper	Slope value	Toxicity index of Lc_{50}	Lc_{90} PPm	Confidence limits (c.L) lower	upper	Toxicity index of Lc_{90}
Basil	5990.4	5498.02	6540.5	3.64	28.15	13464.60	11511.19	16811.24	42.36
Carnation	4340.5	4087.13	4609.6	5.58	38.86	7363.54	6792.9	7982.03	77.46
Helbstar	1686.5	1319.63	2155.33	2.42	100	5703.97	3835.89	8481.08	100
Nat-1	2861.5	2357.0	3427.0	1.66	58.94	16890.54	11620.79	30692.81	33.81

2 - Influence Lc_{50} concentration of aromatic oils and some compounds on the percentage of un-hatchability eggs and mortality percentages of larvae, nymphs and total immature and longevity stages of adult female *Tetranychus urticae* Koch after adult females, larvae , proto-nymphs and deuto- nymphs treatment

Data in Table (2) demonstrated that (Lc_{50})conc. for pesticide Helbstar was the higher than other tested compounds in the reduction percentage of *T. urticae* eggs where it was 100% with compared to control . (Lc_{50}) conc. of (Nat-1) oil and Basil oil did not affect eggs hatchability with compared to control . Results in Table (2) indicated that (Lc_{50})conc. Carnation oil affected on reduction of *T. urticae* eggs where its percentage was about 5% higher than Basil oil and (Nat-1) oil with compared to control Results as in Table (2) also shown that (Lc_{50}) conc. of (Nat-1) oil affected on percentage (%) of the active larva of *T. urticae* and represented by (15%) high compared to control. Data in Table (2) demonstrated that the effect (Lc_{50}) conc. of Carnation on the percentage of mortality to the active larva of *T. urticae* was (31.58%) higher than (Lc_{50}) of Basil with compared to control. Also as shown in Table (2) (Lc_{50}) of (Nat-1) effect on the quiescent larva of *T. urticae* with high mortality percentage which represented by (21.57%) with compared to control and this percentage considered larger than two aromatic oils . It is obvious from Table (2) that the percentage of mortality of active proto-nymph, and quiescent proto-nymph of *T. urticae* affected with(Nat-1) with high percentages were (25%, and 5.88%) respectively than other tested compounds with compared to control. Also Basil oil was higher effected on percentages of mortality of active deuto-nymph and quiescent deuto- nymph of *T. urticae* where mortality percentage was (14.67 and41.67%) respectively as in Table (2). As shown in Table (2) it was found that(Nat-1) caused a high percentage of mortality for total immature stages of *T . urticae* about (79.75%) compared to control and followed by Carnation and Basil oils where percentages of mortality were (87.46% and 74.42%)respectively . As in Table (2) Carnation effected

on mortality percentage of total immature and longevity

T. urticae was high percentages with compared to control. Results in Table (2) demonstrated that natural oil (Nat-1) affected on mortality percentage of stages was high and the represented value was (33.33%) compared to control. These results in an agreement with Rock and Crbtree(1987) they reported that petroleum oil more effective on the adult female of *T. urticea* than cotton seed oil , Amer(2001) who mentioned that vegetable oil Natural 1 has toxic to the adult female. Also, many authors had reported that mineral and botanical oils had height efficiency against spider mites (Lancastes *et al.* (2002) and Lee *et al.* (2005), Magouz and Saadoon (2005) they reported that two mineral oils, Alkanz 2000 oil and Natcom (20/5) oil affected by different percentages of mortality on the quiescent larva, of *T. cucurbitacearum* ,active proto-nymph ,quiescent proto-nymph active and deuto-nymph of *T. cucurbitacearum* but by small percentage . and also Alkanz 2000 oil affected on mortality percentage of total immature of *T. cucurbitacearum* with a percentage about (73.33%)but Natcom (20/5) did not affect percentage of quiescent deuto-nymph of *T. cucurbitacearum*. ,Miresmailli and Isman (2006) ,Topuz and eler (2007), those mentioned that essential oils were used in the experiment had toxic effect to oviposition stage and adult females and caused a significant reduction to adult longevity of spider mite when spray method was used , Roh *et al.* (2011 and Mead ,2012) who mentioned that sandalwood oil (essential oil) caused mortality to adult females of *T. urticae* with percentage(87.2±2.9%) and also the previous results in agreement to Elsadany *et al.* (2020) who mentioned that Helbstar was higher in reduction percentage of egg *T. urticae* than other tested compounds. Also some of result in partial agreement with Elsadany (2020) who stated that (Lc_{50}) conc. of Carnation oil effect on reduction *T. urticae* by high percentage ranging between (96.73-100%). While Basil oil had no effect on eggs hatchability with compared to control . These results in contrast to (EL-Duweini and Sedrak (1997), Gamieh *et al.* (2000), Amer *et al.*(2001), Magouz and Saadoon (2005), (Sertkaya *et al.* (2010), Ismail and Abo Ghalia, 2011, Mead, 2012 and Elsadany ,2020) where those mentioned that mineral oils as jojoba oil, Super Masrona oil, Natcom oil (20/5) and (Nat-1) oil causes high reduction to *T. cucurbitacearum and T . urticae* eggs . , where those demonstrated that aromatic oils as Rosemary oil, Lemongrass oil and Basil oil affected on the percentage of reduction eggs *T. urticae* as result to using spray or dipping leaf method. Also the previous results in contrast with those mentioned that all essential oils were used in experiment caused (100%) adult mortality .

Table 2. Influence Lc_{50} concentration of aromatic oils and some compounds stages of adult female *Tetranychus urticae* Koch on percentage of un- hatchability eggs, mortality percentages of larvae, nymphs and total immature and longevity after adult females , larvae , proto-nymphs and deuto- nymphs treatment

Compound	Lc_{50} (ppm)	Un-hatchability (%) of eggs	Mortality percentage(%) of						Total immature	longevity
			Active larva	Quiescent larva	Active proto-nymph	Quiescent proto-nymph	Active deuto-nymph	Quiescent deuto - nymph		
Helbstar	1686.5	100	-	-	-	-	-	-	-	-
Nat-1	2861.5	0	15	21.57	25	5.88	12.50	0	79.75	33.33
Carnation	4340.5	5	31.58	5.98	9.09	4.70	11.11	25	87.46	61.11
Basil	5990.4	0	5	12.28	0	1.18	14.29	41.67	74.42	5.56
Control	-	0	0	-	0	-	0	0	0	-

3-Influence Lc_{50} concentration of aromatic oils and some compounds on percentages (%) of hatchability and reduction of *Tetranychus urticae* Koch eggs after adult females treatment .

Data in Table (3) demonstrated that (Lc_{50}) conc. for pesticide Helbstar's effect on hatchability was led to no hatching and an increasing percentage of reduction of eggs*T. urticea* until reached to (100%) compared to control . Results were obtained from Table(3) appeared that(Lc_{50}) conc. of (Nat-1) oil did not affect hatchability of eggs *T. urticea* where the percentage of hatchability was (100%) and led to no reduction for eggs *T. urticea* occurred with compared to control. It was obvious from Table (3) that affect (Lc_{50}) conc. of Carnation oil on the percentage of reduction eggs, *T. urticea* was slight effect where the percentage of reduction was (5%) with compared to control. These results in contrast with El – Duweini and Sedrak(1997) they found that jojoba oil (Nat-1) oil when sprayed on eggs *T. urticea* affected on hatchability of *T. urticea* and also with Amer *et al.* (2001) they found that Bio-duxoil and Kz oil were toxic to eggs of *T. urticea* when eggs treated with them. Also with Roh *et al*. (2004) and Mead (2012) they mentioned that (Lc_{50}) conc. of lemongrass oil and Sandalwood oil affected and caused significant reduction in hatchability percentages of *T. urticea* eggs. The previous results in agreement with Ismail *et al.* (2011) found aromatic oil (Rosemary oil) decreased the hatchability rate of eggs *T. urticea*.

Table 3. Influence Lc_{50} concentration of aromatic oils and some compounds on percentages (%) of hatchability and reduction of *Tetranychus urticae* Koch eggs after adult females treatment

Compound	Lc_{50} (ppm)	Egg stage	
		%Hatchability	%Reduction
Helbstar	1686.5	0.00	100
Nat-1	2861.5	100	0.00
Carnation	4340.5	95	5
Basil	5990.4	100	0.00
Control	-	100	0.00

4 - Comparison between influences of some aromatic oils and other compound on mean durations in days ± SE of different development stages of *Tetranychus urticae* Koch after adult females ,larvae, proto-nymphs and deuto-nymphs treatment

As in Figure (1) Data indicated that it was found

significant differences between Carnation and Basil and also between natural oil (Nat-1) and Basil in their effect on the duration of incubation *T. urticea* with compared to control. While Basil oil was the least effective but it had not significant difference between this oil and control hence mean durations was (3.5±0.289). Carnation oil had highest effective than other tested compounds and followed by (Nat-1) in the prolonged incubation period of *T. urticae*, where mean durations were(5.167 ± 0.441) (4.667±0.333) days, respectively and effect these tested compounds can be arranged descendingly as Follow: Carnation > Nat-1 > Basil > control .So these two types of oils preferred over the other type in controlling *T. urticae* especially this period because them in this way, they help to reducing the mite population. These result in partial similar with Magouz and Saadoon(2005) they found that Natcom20/5 and alkanz elongated incubation period.

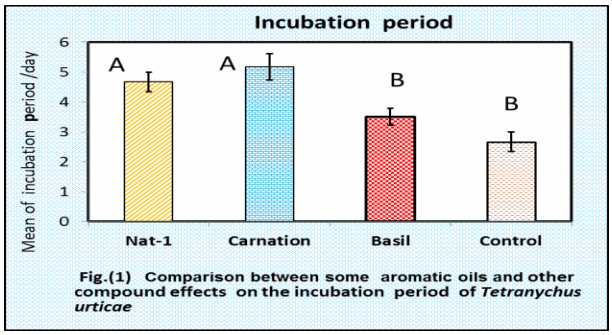

Fig.(1) Comparison between some aromatic oils and other compound effects on the incubation period of *Tetranychus urticae*

Results in Fig. (2) revealed that there was significant difference between Carnation and (Nat-1) and also it was found significant difference between Basil and natural oil (Nat-1) in their effect on the prolonged duration of active proto-nymph stage of *T. urticae* with compared to control while (Nat-1) did not affect this stage with compared to control. Also, it was found that Carnation and Basil more effective than (Nat-1) in the prolonged duration active proto-nymph stage of *T. urticae*. But aromatic oil, Carnation oil more effective than Basil oil in prolonged duration active proto- nymph. Where mean durations were (1.667±0.167,1.333±0.167) respectively. So the two aromatic oils were preferred in controlling this stage of *T. urticea* . This result in contrast to Magouz and Saadoon(2005) they found that Natcom20/5 and alkanz elongated duration of active proto- nymph . The following stages as, active larva, quiescent larva, quiescent proto-nymph, active deuto-nymph and quiescent deuto-nymph did not mention in results because it did not find significant differences in effect the aromatic oils or natural oil on them.

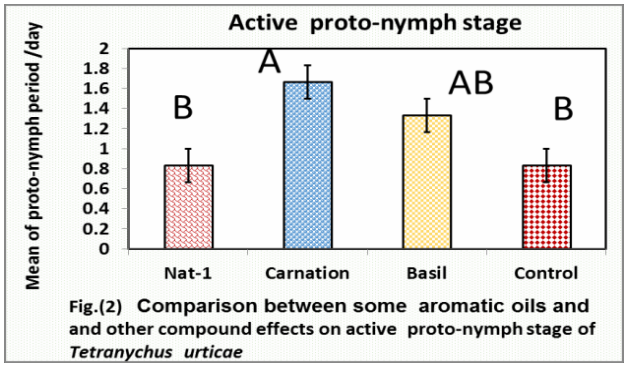

Fig.(2) Comparison between some aromatic oils and and other compound effects on active proto-nymph stage of *Tetranychus urticae*

Fig. (3) illustrated that the aromatic oil (Carnation oil) had significant difference between it and (Nat-1) with compared to control but effect Carnation oil was more effective on development duration total immature stages of *T. urticae* where prolonged duration to these stages. Otherwise nature oil (Nat-1) which was considered un effective because did not find difference significant between it and control where this oil shortened this period which will lead to increase the population of *T. urticea*. While no significant difference between Basil and other tested compounds where mean durations were (7.667±0.441, 6.833±0.333) respectively for Carnation oil and Basil .So Carnation oil and Basil oil can recommend them to controlling in these immature stages of *T. urticea* to reducing mite population . This result in contrast to Magouz and saadoon(2005) they reported that duration of total immature of *T. cucurbitacearum* prolonged when an adult female treated with mineral oils .While the previous results in these research findings after adult female , larva, proto-nymph, and deuto-nymph treatment .

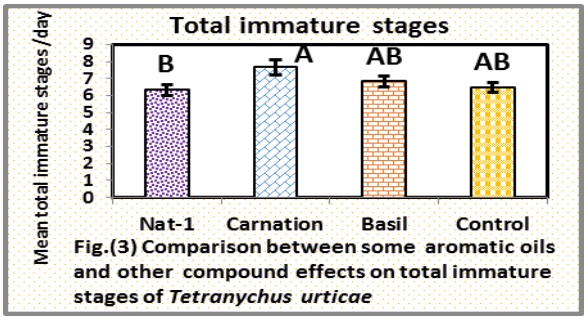

Fig.(3) Comparison between some aromatic oils and other compound effects on total immature stages of *Tetranychus urticae*

Data in Fig. (4) indicated that it was found significant difference between (Nat-1) and Carnation oils in effect on life cycle stages of *T. urticae* but no significant difference between Basil and(Nat-1) in the influence on the mean duration of life cycle *T. urticae* while between Basil and Carnation was found significant difference with compared to control. Carnation oil was more effective than (Nat-1) and Basil in influence on the prolonged duration of life cycle stages of *T. urticae* hence the mean durations were (12.833±0.441, 11.167± 0.441, 10.167 ±0.441) repectively. Also these results in resemblance with El-Duweini and Sedrak(1997) they reported that jojoba oil (Nat-1) prolonged life cycle of *T. urticae* when sprayed the adult female. Basil oil was considered least effect but no significant difference between it and control so Carnation oil more preference to controlling these stages of *T. urticae* and followed by natural oil because it more effective in prolonged duration life cycle stages hence will reduce number of generations for *T. urticae* and accordingly decreasing mite population.

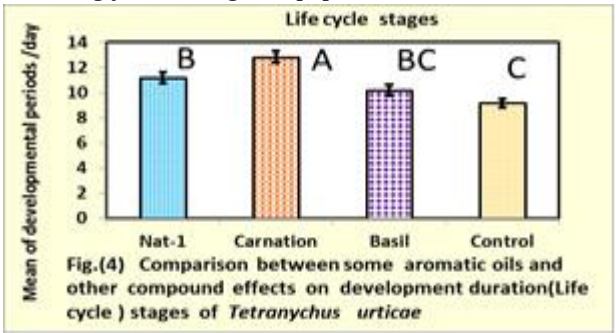

Fig.(4) Comparison between some aromatic oils and other compound effects on development duration(Life cycle) stages of *Tetranychus urticae*

Fig. (5) illustrated that found significant difference between(Nat- 1)and aromatic oil (Carnation oil) and also between Basil and control the mean of pre-oviposition period were(1.250 ± 0.214 , 0.5 ± 0.118, 1 ± 0.129 and2.917± 0.201)repectively but these oils not effective in controlling *T. urticae* through the pre-oviposition stage because these oils acted on shortened duration this stage than control and accordingly made adult female of *T. urticae* accelerated from entering female in laying eggs period and these oils caused in reducing generation period and increasing the *T. urticae* population.

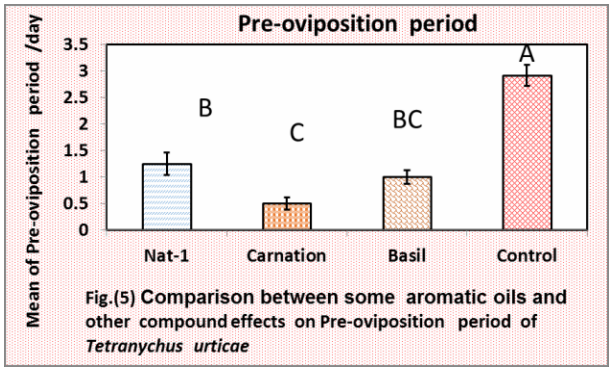

Fig.(5) Comparison between some aromatic oils and other compound effects on Pre-oviposition period of *Tetranychus urticae*

Results in Fig.(6)did not find any significant differences between aromatic oils or between aromatic oils and natural oil in the effect on the oviposition period but it was found significant differences between all the previous types of oils and control in impact on shortened duration of oviposition stage hence the mean durations were represented by (3.583 ± 0.454 ,3.667 ± 0.527 ,3.667± 0.494 and 7.167± 0.459)days respectively, but this influence was undesirable and not preferred in controlling *T. urticae* during this period. Because these oils whether Carnation or Basil or (Nat-1) less in influence than control and they acted on shortened duration oviposition than control and accelerated from entering in post-oviposition stage which after that gave us adult females which will increase *T. urticae* population .

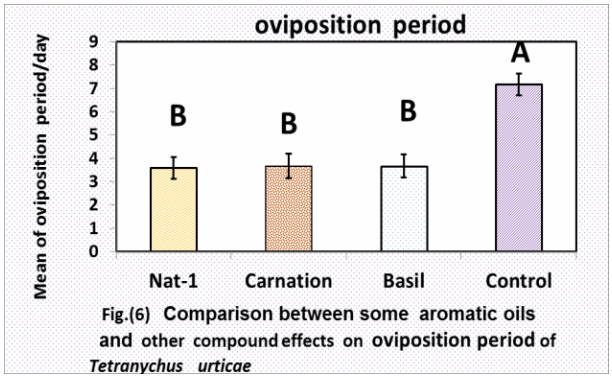

Fig.(6) Comparison between some aromatic oils and other compound effects on oviposition period of *Tetranychus urticae*

Fig.(7) revealed that did not find significant differences between aromatic oils and(Nat-1) oil but it was found between Carnation oil and control significant difference hence the mean durations represented by(1.667±0.401and 3.667± 0.494) respectively but influence this oil in shortened post-oviposition duration than control was undesirable because it accelerated from the reaching to adult stage and increasing *T. urticae* Population.

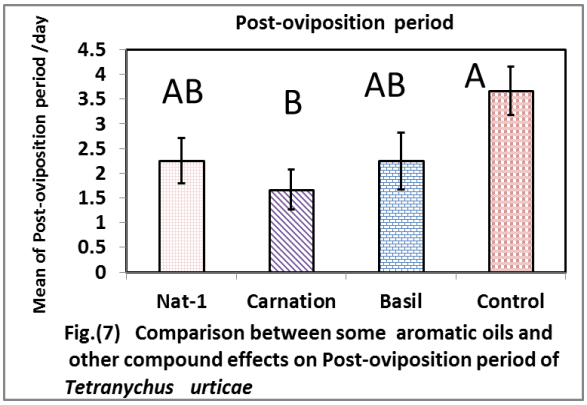

Fig.(7) Comparison between some aromatic oils and other compound effects on Post-oviposition period of *Tetranychus urticae*

Also as in Fig . (8),did not find significant differences between Basil, (Nat-l) and Carnation in their effects on the mean durations of longevity stages, while it was found significant difference between each oil of the tested oils and control in influence on durations these stages where the mean durations represented by(6.917 ± 0.689, 5.750 ± 0.574 , 7.083 ± 0.676 and 13.750 ± 0.544)respectively, but this influence was undesirable and not preferred because it shortened these periods than control. So these oils did not recommend them in controlling these stages of *T. urticae*. Because them accelerated from the reaching to adult stage of *T. urticae* which will increase of mite population by bringing adult *T. urticae* back to his life cycle again. The following development stages as, active larva, quiescent larva, quiescent proto-nymph, active deuto-nymph , and quiescent deuto-nymph which were not mentioned in the results and discussions, as a result, influence aromatic oils and natural oil on them because it did not find significant differences between each stage of these stages and aromatic oils or between them and between natural oil .So these oils did not influence on the durations of development for these stages of *T. urticae.*

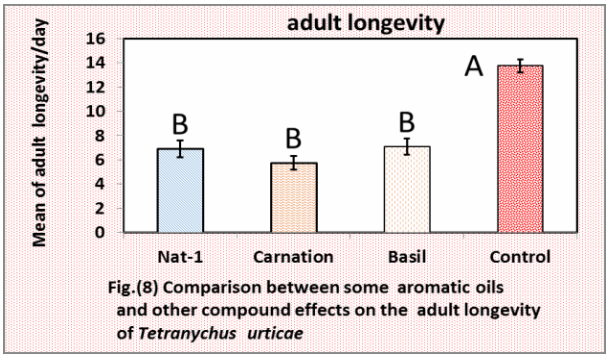

Fig.(8) Comparison between some aromatic oils and other compound effects on the adult longevity of *Tetranychus urticae*

As conclusions the present results revealed that Helbstar was the highest toxic compound to adult females of *T. urticae* followed byNat-1 with Lc_{50} values of 1686.5. Carnation oil and natural oil (Nat-1) can be recommend in controlling mite through incubation stage of *T. urticae* . Also Carnation oil was more effective in the effect on the following stages so can be recommend in controlling in active proto-nymph, total immature, life cycle stages of *T. urticea* . The obtained results were important so they are taken in the consideration when planning programs whether the use of these oils to controlling mites in a large scale in commercial greenhouses or in the open fields.

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الكفاءة الحيوية لبعض الزيوت العطرية والمركبات الأخرى على بعض الخصائص البيولوجية للعنكبوت ذو البقعتين *Tetranychus urticae* كبديل لمبيدات الآفات

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معهد بحوث وقاية النباتات – محطة البحوث الزراعية – سخا – محافظة كفر الشيخ

قد يؤدي الاستخدام المكثف لمبيدات الآفات عن طريق استخدام المبيدات التقليدية لمكافحة العنكبوت ذو البقعتين *Tetranychus urticae* Koch لآثار جانبية غيرمرغوب فيها على البيئة والإنسان والحيوان ، لذلك كان من الضروري البحث عن طرق مكافحة بديلة كاستخدام الزيوت العطرية والزيوت الطبيعية كمبيدات نباتية. لذلك أجريت الدراسة الحالية لتقييم الكفاءة الحيوية لبعض الزيوت العطرية والمركبات الأخرى على بعض الخصائص البيولوجية للعنكبوت ذو البقعتين في المعمل عند درجة حرارة (٢٥ ± ٢) درجة مئوية ،ورطوبة نسبية (٦٥ ± ٥)٪ ولإيجاد وسيلة آمنة للبيئة و الإنسان والحيوانات كبديل للمبيدات الأكاروسية المصنعة والمستخدمة حاليًا في مكافحة آفة العنكبوت النباتية المدمرة . أوضحت النتائج أن المبيد الأكاروسى Helbstar كان أعلى مركب سام للإناث البالغات من العنكبوت ذو البقعتين *T. urticae* يليه Nat-1 بقيم Lc_{50} حوالى١٦٨٦,٥ و ٢٨٦١,٥جزء في المليون على التوالي بينما كان الريحان أقل سمية بقيمة Lc_{50} حوالى٥٩٩٠,٤ جزء في المليون. أظهر تعداد الأكاروس تجانسًا أكبر في استجابته للزيوت العطرية (الريحان والقرنفل). نتيجة للاختلافات المعنوية بين الزيوت المختلفة وجد أن زيت القرنفل والزيت الطبيعي (Nat-1) يمكن التوصية بهما في مكافحة االعنكبوت خلال مرحلة حضانة البيض للأكاروس *T. urticae* . يمكن التوصية أيضاً بزيت القرنفل في مكافحة الحورية االأولى النشطة أوالمتحركة، ومجموع الأطوارالغير كاملة ومراحل دورة الحياة للأكاروس *T. urticae* . جميع الزيوت غير مفضلة في مكافحة الإناث البالغات لهذا الأكاروس خلال هذه المراحل : مرحلة ما قبل وضع البيض ، و مرحلة وضع البيض ، ومرحلة ما بعد وضع البيض ، ومراحل طول العمر . النتائج التي تم الحصول عليها كانت لها أهمية لذلك هذه النتائج تؤخذ فى الإعتبار عند تخطيط برامج الإدارة المتكاملة للآفات.