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Efficiency assessment of modified defined chemical compounds for controlling varroa mite , *Varroa destructor* (Parasitiformes : Varroidae) in Egyptian apiaries

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Abstract:

Varroa mites, *Varroa destructor* Anderson and True man (Parasitiformes : Varroidae) are external parasites that attack both honey bees and brood. They suck the blood from both the adults and developing brood, especially drone brood. This weakens and shortens the bee's life. Emerging brood may be deformed with missing legs or wings. Untreated infestations of varroa mites will increase and may kill colonies. If the colonies are not examined for mites, losses may be mistaken for winter mortality or queenlessness. The present work is to study, the efficacy of the two chemical compounds, Bayvarol and VarroKiller acaricides were tested separately against the varroa mite, within the honey bee colonies located in the stations of the Beekeeping Research Department in four Egyptian Governorates as a reevaluation of them after their development by the companies producing them. Both compounds showed their qualitative superiority in the treatment of the colonies under study and reduce the infection of parasite on the adult bees below the minimum levels compared with the untreated colonies, and Bayvarol was a more superior than VarroKiller compound.

Introduction

Varroa mite, *Varroa destructor* Anderson and Truman (Parasitiformes : Varroidae) , is external parasite attacks three casts of the honeybee colony, *Apis mellifera* L. (Hymenoptera: Apidae) , at their different ages preferred to the drone broods for its rich with nutritional substances due to its largest body sizes and the longer stage in contrast with the workers and the queen, and the parasite destroys the honeybee colony if mite was not noted and early controlled, since their individuals feed on the host haemolymph causing impotent and very weakness to the generated honeybee, furthermore, deformity in their wings and that makes the honeybees not able on the flying and not able on the performance with their various jobs and activities, and finally a lot of honeybee individuals die of what overall leads to acute decrease of the honeybee population and subsequently to negative or diminishing returns from the honeybee's economic result, so what was said by Anderson and Trueman (2000) and by Al-Abbadi and Nazer (2003) was a true or a fact that they agreed about the parasitic bee mite *V. destructor* is the most devastating pest of honeybee and causes high economic losses in beekeeping industry worldwide.

So, many experiments and investigates were performed by chemically controlling of this parasite using several materials and compounds by various manners inside the colonies in several countries due to eradication of varroa mites from the honeybee colonies or at least that to decreasing of its damages.

Since, over the last 15 years, the most noted synthetic acaricides against *V. destructor* are the organophosphate coumaphos (Checkmite, Asuntol and Perizin), the pyrethroids tau-fluvalinate (Apistan, Klartan and Mavrik) and Flumethrin (Bayvarol), as well as the formamidine amitraz (Ritter, 1988; Milani and Barbattini, 1988 and Milani and Lob, 1998).

Tau-fluvalinate acts at the voltagegated sodium channels while coumaphos, an acetylcholinesterase inhibitor, interferes with nerve signaling and function. Most of these pesticides are easy to apply, economically convenient, and do not require refined knowledge of the mites' biology. Furthermore, as lipophilic substances they are mainly absorbed by the bees' wax (Bogdanov *et al*., 1998; Wallner, 1999 and 2000), thus not directly jeopardizing the honey. However, they are persistent and accumulate after repeated treatments.

Therefore, these miticides also possess some disadvantages: They may harm bees when bees are simultaneously exposed to multiple compounds stored in wax (Wallner, 2005; Chauzat *et al*., 2009 and Johnson *et al*., 2009). They can sustainably pollute the honey and other bee products (Wallner, 1999; Nasr and Wallner, 2003; Schroeder *et al*., 2004; Martel *et al*., 2007 and Lodesani *et al*., 2008).

For Asuntol, residues in honey were found, that exceeded the EU Maximum Limit of Residue (MLR). Contamination of bee's wax even persists through commercial recycling. Because several types of wax residues also may have some effect on mites in the sealed cells (Fries *et al*., 1998), they are likely to create acaricide resistance, thus causing unrecognized failure of control in the field and serious damage to beekeeping. While in Egypt that many different chemical compounds as Mavrik acaricide (Abd El-Wahab and Ebada, 2006) were used as strips for controlling *Varroa destructor* mite.

In this present study, the chemical compounds, Bayvarol and VarroKiller were loneness used against Varroa mites inside the colonies at stations of the honeybee research department that belonged to four Egyptian Governoratesas returning back the evaluation after developing these two compounds by the own producer companies.

Materials and methods

These evaluating experiments were conducted for controlling varroa mites (***V. destructor***) in definite number of honeybee colonies by using two chemical cures according to the following plan;

1. Chemical treatments used:

1.1. Bayvarol strips; each strip contains 3.6 mg Flomethrin as an active ingredient, imported by Cairo Chemicals Company and used from October to December in the experimental colonies.

1.2. VarroKiller strips; each strip contains 3.6 mg Flomethrin as an active ingredient (Molecular formula is C28H22Cl.2FNO3), used from March to May the experimental colonies.

2.Honeybee colonies treated:

The present investigation was carried out through October to December, in four localities which were Dokki\ Giza, Gemmeza\ Gharbeiia, Manzala\ Daqahlia and Dakhla\ New Valley Governorates. Nine colonies of hybrid Carniolan honeybee (***A. mellifera Carnica***) infested with varroa mites were chosen in each locality and divided to three groups, three replicates each, the 1st and 2nd groups were

treated with Bayvarol strips for along 28 days by the following dosages;
One strip / replicates of 1st group
Two strips / replicates of 2nd group
Whereas the 3rd group used as a control (untreated colonies).

On the other side, the VarroKiller treatment was carried out through March to May in the same four localities which were previously mentioned. Nine colonies of hybrid Carniolan honeybee (***A. mellifera Carnica***) infested with varroa mites were chosen in each locality and divided to three groups, three replicates each, the 1st and 2nd groups were treated with VarroKiller strips for along 28 days by the following dosages;
One strip / replicates of 1st group
Two strips / replicates of 2nd group
Whereas the 3rd group used as a control (untreated colonies).

However, at every different place of both two presented experiments for along five weeks that estimated the means of vival varroa mites on adults' workers of honeybee before and after treating, then the reduction percentages of infesting with Varroa mites were calculated by using of Henderson and Tilton equation (1955) which is;

$$\% \text{ Reduction} = \left(1 - \frac{T_a \times C_b}{T_b \times C_a}\right) \times 100$$

T_a = after Treatment Tb = before Treatment
C_a = after control C_b = before control

Also, the fall Varroa mite numbers were estimated and represented over the five weeks, all data were statistical analyzed in a randomized complete block design (ANOVA) by MSTAT-C version 1.41 (Sendecor and Cochran, 1980). All means were compared by Duncan's multiple range test at level 0.05 (Duncan, 1955).

Results and discussion

Data in Table (1) it clear that the grand mean of reduction percentage (%reduction) in survival numbers of varroa mite was 71.2 % ± 5.9 inner the honeybee colonies which treated with Bayvarol strips in the end of experiment and that means the decrease of survival numbers of Varroa mite on the honeybee adults approximately to more than third of the counting before the experiment whereas;

At the Governorates level, the treating with number of two Bayvarol strips had significantly surpassed on the treating with number only one strip of the Bayvarol acaricides, since treating with two strips gave a general mean of %reduction in survival numbers of varroa mite on the honeybee adults equaled 78.0% ± 6.5, while the treating with one strip gave a general mean of %reduction in survival numbers of varroa mite on the honeybee adults equaled 64.5% ± 5.4.

In this connection, the station which was the exalt was Gemmeza/ Gharbeiia Governorate which significantly surpassed over the other three Governorates respect to both of the two treatments whether by one strip or by two strips, whereas that station gave against each of them the means of %reduction in survival numbers of varroa mite on the honeybee adults equaled 69.0% and 83.7% successively and what paralleled a total mean of %reduction was 76.3% ± 10.4.

But Dokki / Giza Governorate was the significantly lowest of all Governorates in %reduction, since it gave against each of the treating with one strip and two strips the following means values; 57.1% and 68.6% consecutively and what paralleled a total mean of %reduction was 2.9% ± 8.2.

The previous results were comparison with the untreated honeybee colonies as a negative control which resulted a very slight change of the excluded mites by a general mean of change percentage (% change) equaled 8.7% ± 2.4, and those resulted relationships were represented and showed on the following Figure (1).

Table (1) Effect of using Bayvarol strips on the mean survival number of varroa mites / 100 honeybee workers

Governorate		Giza (Dokki)			New Valley (Dakhla)			Gharbeiia (Gemmeza)			Daqahlia (Manzala)			Grand Mean of %Reduction ± S.D.	L.S.D. Value at 0.05
Number of Strips	Replicate / Varroa numbers	Before treatment	After treatment	% Reduction	Before treatment	After treatment	% Reduction	Before treatment	After treatment	% Reduction	Before treatment	After treatment	% Reduction		
One	1	13.5	7.5	40.2	16.0	7.0	50.5	12.0	2.0	81.6	15.0	4.5	68.0	**60.0 ± 18.4**	
	2	9.5	3.5	60.3	13.5	2.5	79.0	10.0	3.0	66.8	12.0	5.0	55.5	**65.4 ± 10.2**	
	3	18.5	5.5	68.0	10.2	3.0	66.7	10.0	4.0	55.7	15.0	3.0	78.6	**67.3 ± 9.4**	
	Mean	**13.8**	**5.5**	**57.1**	**13.2**	**4.2**	**64.0**	**10.7**	**3.0**	**69.0**	**14.0**	**4.2**	**68.0**	**64.5^{B} ± 5.4**	
Two	1	10.5	5.0	48.7	22.0	2.5	87.1	7.9	1.9	73.4	9.5	1.0	88.8	**74.5 ± 18.5**	**0.911**
	2	7.5	2.0	71.3	16.5	4.0	72.5	8.5	0.0	100.0	12.0	2.0	82.2	**81.5 ± 13.3**	
	3	13.0	2.0	83.4	15.5	3.0	78.1	10.0	2.0	77.9	10.0	3.0	68.0	**76.8 ± 6.5**	
	Mean	**10.3**	**3.0**	**68.6**	**18.0**	**3.2**	**79.9**	**8.8**	**1.3**	**83.7**	**10.5**	**2.0**	**79.7**	**78.0^{A} ± 6.5**	
Total Mean ± S.D.		**12.1 ± 2.5**	**4.3 ± 1.8**	**2.9^{c} ± 8.2**	**15.6 ± 3.4**	**3.7 ± 0.7**	**71.9^{b} ± 11.3**	**9.8 ± 1.3**	**2.2 ± 1.2**	**76.3^{a} ± 10.4**	**12.3 ± 2.5**	**3.1 ± 1.6**	**73.8^{b} ± 8.3**	**71.2 ± 5.9**	
-ve control	1	14.3	13.2	7.7	12.0	11.5	4.2	19.5	18.0	7.7	20.0	19.0	5.0	**6.1 ± 1.8**	
	2	12.0	10.9	9.2	9.7	8.1	16.5	14.0	11.7	16.4	13.8	12.6	8.7	**12.7 ± 4.4**	
	3	15.6	15.0	3.9	6.4	5.4	15.6	10.0	9.5	5.0	18.2	17.0	6.6	**7.8 ± 5.4**	
	Mean	**14.0**	**13.0**	**7.1**	**9.4**	**8.3**	**11.7**	**14.5**	**13.1**	**9.7**	**17.3**	**16.2**	**6.4**	**8.7 ± 2.4**	

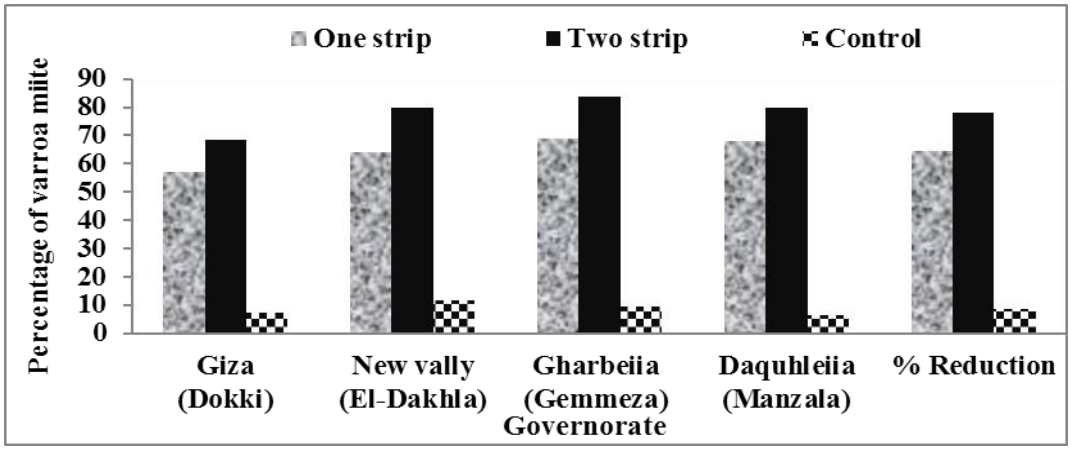

Figure (1): Percent reduction of varroa mite after treating the honeybee colonies with Bayvarol strips.

When taking up the readings which presented in Table (2) it was found that confirming the previous results, because table; 2 holds or makes a comparison between the numbers of used Bayvarol strips against varroa mite as the fallen numbers, since we generally find the using of two Bayvarol strips had exceeded on only one strip with respect to the fallen varroa numbers at every Governorates.

Generally, there were a gradually and a regular decreasing of the fallen mite numbers against one strip or two strips over the five weeks inner the experiment colonies at every Governorate, whereas the result of 1st week had significantly surpassed over the other weeks of this experiment in the fallen varroa mites and wined 154.1mites as a grand mean, while the last week wined 40.6mites.

In this connection, Gemmeza/ Gharbeiia Governorate was the highest and Dokki/ Giza Governorate was the lowest of the Governorates, whereas both of them gave a general mean of the fallen mites against using two Bayvarol strips equaled 170.9and 57.1 individuals successively. In obverse that Frilli (1989) evaluated the effect of coumaphos (Preizin), fluvalinate (Apistan), flumethrin (Bayvarol), powder of Thymol and Formic acid against *V. jacobsoni* in honey bee colonies in Italy and they found that mortality reached 95% for Bayvarol. As it is shown from the numerals in this Table (2), there were somewhat a small approaching to the results of both Manzala / Daqahlia and Gemmeza / Gharbeiia from each other, while it was observed that same approaching of both Dakhla / New Valley and Dokki / Giza with respect to results of the fallen mites against using one strip or two strips of Bayvarol each separately.

Table (2): Mean of the fallen varroa mites weekly after treating the honeybee colonies with Bayvarol strips

Governorate	Week / Number of Strips	1st	2nd	3rd	4th	5th	General mean ± Sd
Giza (Dokki)	**1**	83.3	66.6	51.4	23.0	6.7	**42.3±31.3**
	2	123.3	83.3	67.1	28.3	12.3	**57.1±44.3**
New Valley (Dakhla)	**1**	106.3	66.7	55.3	43.3	10.3	**54.2±35.0**
	2	180.0	99.0	75.8	55.0	26.0	**81.8±58.4**
Gharbeiia (Gemmeza)	**1**	129.0	118.0	78.0	77.3	66.0	**90.9±27.9**
	2	269.0	244.0	148.0	125.0	114.3	**170.9±71.4**
Daqahlia (Manzala)	**1**	120.0	98.0	66.3	45.0	29.0	**67.2±37.4**
	2	221.6	160.0	129.3	89.0	60.0	**124.8±63.0**
General mean	**1**	**109.7**	**87.3**	**62.8**	**47.2**	**28.0**	**63.7±32.3 b**
	2	**198.5**	**146.6**	**105.1**	**74.3**	**53.2**	**108.7±58.2 a**
Grand mean ± Sd		**154.1±62.8 A**	**117.0±41.9 B**	**83.9±29.9 C**	**60.7±19.2 D**	**40.6±17.8 E**	**86.2±31.8**

On the other hand, data in Table (3) clear that the grand mean of %reduction in survival numbers of varroa mite was 46.0% ± 8.7 inner the honeybee colonies which treated with VarroKiller strips in the end of experiment and that means the decrease of survival numbers of varroa mite on the honeybee adults for nearly half of the census before the experiment whereas;

At the Governorate level, the treatment was significantly higher with the number of 2 strips VarroKiller on the treatment with the number of single bar, since treating with two strips gave a general mean of %reduction in survival numbers of varroa mite on the honeybee adults equaled 50.8% ± 10.7, while the treatment with one tape gave a general mean of the reduction rate in the live census of varroa mites on the adult bees equaled 41.3% ± 8.4.

The highest in this regard was Dokki / Giza Governorate, which was significantly higher than the other three Governorates in both labs, with either one tape or two tapes, whereas that station gave against each of them the means of %reduction in the live census of varroa mite on the honeybee adults equaled 53.5% and 60.7%

successively as paralleled a total mean of %reduction was 57.1% ± 5.1.

While Manzala / Daqahlia station was the least significant Governorate in the reduction ratio, where the ratios mean against one strip and two strips were 35.0% and 38.5% respectively, which equivalent to a total mean of reduction rate equaled 36.7% ± 2.5.

The previous results compared with the untreated colonies as a control, which gave a very small change in the excluded varroa population by an average of %change as 11.5% ± 6.9. These relationships were represented in Figure (2).

Table (3): Effect of using VarroKiller strips on the mean survival number of varroa mites / 100 honeybee workers

Governorate		Giza (Dokki)			New Valley (Dakhla)			Gharbeiia (Gemmeza)			Daqahlia (Manzala)			Grand Mean of %Reduction ± S.D.	L.S.D. Value at 0.05
Number of Strips	Varroa numbers / Replicate	Before treatment	After treatment	% Reduction	Before treatment	After treatment	% Reduction	Before treatment	After treatment	% Reduction	Before treatment	After treatment	% Reduction		
One	1	9.6	5.7	52.8	10.2	5.8	35.6	10.4	5.9	41.3	10.4	5.9	36.6	**41.6 ± 7.9**	0.574
	2	8.1	4.6	54.9	6.3	3.8	31.7	9.0	5.4	37.9	9.0	5.4	32.9	**39.3 ± 10.7**	
	3	10.6	6.1	54.3	9.8	5.2	39.9	9.9	5.8	39.4	9.9	5.8	34.5	**42.0 ± 8.5**	
	Mean	**9.4**	**5.5**	**53.5**	**8.8**	**4.9**	**36.9**	**9.8**	**5.7**	**39.8**	**9.8**	**5.7**	**35.0**	**41.3^{B} ± 8.4**	
Two	1	8.2	4.3	58.3	9.7	4.0	53.3	10.3	4.7	52.8	10.3	4.7	48.9	**53.3 ± 3.8**	
	2	8.5	4.1	61.7	10.3	3.7	59.3	9.9	6.0	37.3	9.9	6.4	27.7	**46.5 ± 16.7**	
	3	10.7	5.1	62.1	8.7	2.9	62.2	9.9	5.3	44.6	9.9	5.3	40.1	**52.3 ± 11.6**	
	Mean	**9.1**	**4.5**	**60.7**	**9.6**	**3.5**	**58.7**	**10.0**	**5.3**	**45.2**	**10.0**	**5.5**	**38.5**	**50.8^{A} ± 10.7**	
Total Mean ± S.D.		**9.3 ± 0.2**	**5.0 ± 0.7**	**57.1^{a} ± 5.1**	**9.2 ± 0.6**	**4.2 ± 1.0**	**47.8^{ab} ± 15.4**	**9.9 ± 0.1**	**5.5 ± 0.3**	**42.5^{b} ± 3.8**	**9.9 ± 0.1**	**5.6 ± 0.1**	**36.7^{c} ± 2.5**	**46.0 ± 8.7**	
-ve control	1	15.6	11.4	26.9	12.0	10.4	13.3	8.8	8.0	9.1	11.8	10.1	14.4	**15.9 ± 7.7**	
	2	11.8	10.0	15.3	11.2	9.8	12.5	9.1	9.0	1.1	10.4	9.6	7.7	**9.1 ± 6.2**	
	3	9.3	7.8	16.1	10.0	9.3	7.0	8.8	8.7	1.1	9.1	8.3	8.8	**8.3 ± 6.2**	
	Mean	**12.2**	**9.7**	**20.4**	**11.1**	**9.8**	**11.1**	**8.9**	**8.6**	**3.8**	**10.4**	**9.3**	**10.6**	**11.5 ± 6.9**	

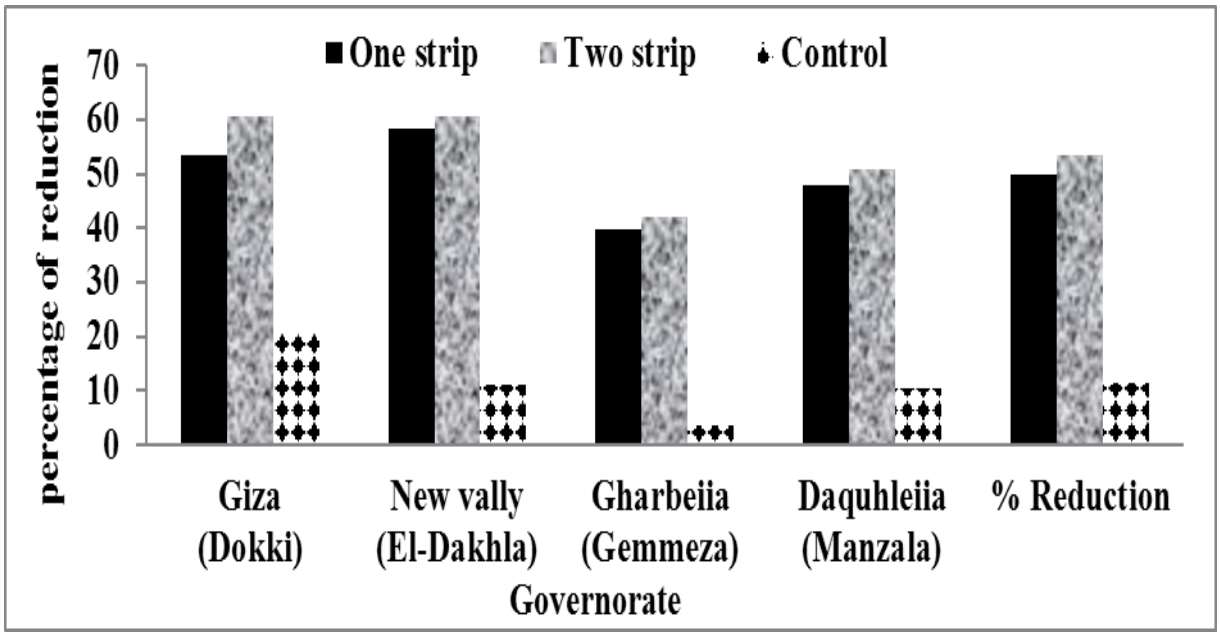

Figure (2): Percent reduction of varroa mites after treating the honeybee colonies with VarroKiller strips.

When taking up the readings which presented in Table (4), it was found that confirming the previous results, because Table (4) holds or makes a comparison between the numbers of used VarroKiller strips against their effect on varroa as the fallen numbers, since we generally find the using of two VarroKiller strips had exceeded on single tape with respect to the fallen varroa numbers at every governorate.

Generally there were a gradually and a regular decreasing of the fallen mites numbers against one strip or two strips over the five weeks inner the experiment colonies at every Governorate, whereas the result of 1st week had significantly surpassed over the other weeks of this experiment in the fallen varroa mites and wined 56.3mites as a grand mean, while the other four weeks primary from 2nd week to 5th week had wined 34.7, 26.9, 12.9 and 10.4 mites as grand means, respectevily.

In this connection, Dokki / Giza Governorate was the highest and Manzala / Daqahlia Governorate was the lowest of the Governorates, whereas both of them gave a general mean of the fallen mites against using two VarroKiller strips equaled 76.4 and 16.8 individuals successively.

As it is shown from the numerals in this Table (4), there were an approaching to the results of both Manzala / Daqahlia and Gemmeza / Gharbeiia from each other whether to using single tape or two strips, while it was observed a spacing or a high gap between Dakhla / New Valley and Dokki / Giza with respect to results of the fallen mites against using one strip or two strips of VarroKiller each separately, and generally there were a gradually and a regular decreasing of the fallen mites census against one strip or two strips over the five weeks inner the experiment colonies at every Governorate.

Data presented in Table (5) cleared that surpassed of Bayvarol compound on VarroKiller in the fallen varroa mites weekly, whereas Bayvarol attained 86.2 mites as a general mean, while VarroKiller achieved to 28.3 mites as a general mean.

Table (4): Mean of the fallen varroa mites weekly after treating the honeybee colonies with VarroKiller strips

Governorate	Week / Number of Strips	1st	2nd	3rd	4th	5th	General mean ± Sd
Giza (Dokki)	1	118	55.3	55	25	20	**54.7 ± 39.0**
	2	150	100	75.8	33	23	**76.4±51.7**
New Valley (Dakhla)	1	26.1	19.3	10.1	5.8	4.6	**13.2±9.2**
	2	44.5	26.6	18.8	7.9	7	**21.0±15.5**
Gharbeiia (Gemmeza)	1	23.8	16.4	9.7	5.4	5.1	**12.1±8.0**
	2	42.4	24	16.4	9.7	8.3	**20.2±13.9**
Daquhleiia (Manzala)	1	18.9	14.8	10.9	6.6	5.9	**11.4±5.5**
	2	26.3	20.9	18.6	9.8	8.7	**16.9±7.5**
General mean	1	**46.7**	**26.5**	**21.4**	**10.7**	**8.9**	**22.9±15.2 b**
	2	**65.8**	**42.9**	**32.4**	**15.1**	**11.8**	**33.6±22.0 a**
Grand mean ± Sd		**56.3±13.5 A**	**34.7±11.6 B**	**26.9±7.8 C**	**12.9±3.1 D**	**10.4±2.1 D**	**28.3**

Table (5): Comparison between Bayvarol and VarroKiller compounds in fallen varroa mite numbers over the experiment weeks

Compound	Number of strips	Weeks					General mean ± Sd
		1st	2nd	3rd	4th	5th	
Bayvarol	1	109.7	87.3	62.8	47.2	28.0	**63.7±32.3**
	2	198.5	146.6	105.1	74.3	53.2	**108.7±58.2**
General mean ± Sd		**154.1±62.8**	**117.0±41.9**	**83.9±29.9**	**60.7±19.2**	**40.6±17.8**	**86.2±31.8^{A}**
VarroKiller	1	46.7	26.5	21.4	10.7	8.9	**22.9±15.2**
	2	65.8	42.9	32.4	15.1	11.8	**33.6±22.0**
General mean ± Sd		**56.3±13.5**	**34.7±11.6**	**26.9±7.8**	**12.9±3.1**	**10.4±2.1**	**28.3±18.6^{B}**

In spite of the experiment periods, Grobov (1977) observed in temperate climates, where winter limits brood rearing, the female mites may remain on the adult bee for 5-8 months, during, which time they-are inactive. the infestation percentage by the *Varroa jacobsoni* is from about 5% of bees in spring to about 16% in August and 20% in September. Assuming only ten cycles of reproduction of varroa mites in one season and there is usually enough brood. informed that the climatic differences can affect varroa population. In Mediterranean climates mite populations have been observed to grow very rapidly (Frili, 1989). In Minia, Egypt, it was reported that the population density of varroa mite infested honeybee colonies varied considerably at localities in different months, the maximum number of mites was recorded in May as 1011 mites /colony, but Ashroba locality had the highest average number of mites (mites/100 bees) in general the mean mite density was 5.8 mite/100 bees (Eshbah, 1990). Allam found in 1999 that the levels of varroa infestation were high during October (autumn), reaching 60%, 75% and 41.8% worker, drone brood

and live bees, respectively, while in winter this level was decreased to 30,60 and 2.4% on worker, drone broods and live bees, respectively, and increased again during May (spring), especially on drone brood reaching 36.2%, 97.3% and 2.6%, respectively. However, the levels of varroa infestation decrease to the minimum level during July (summer) as averaged 23.89%, 37.5% and 3.91% on worker, drone brood and live bees, respectively. El-Shemy *et al.* (1995) mentioned that varroa infestation reached its peak in autumn and spring, but the lowest infestation was during summer, Drone-brood suffered high level of infestation and the same authors found that exposing the bee colonies to sunshine or destroying the drone brood during spring may decrease the infestation level with varroa.

The population dynamic of *V. jacobsoni* in worker and drone broods and honeybee adults was studied and recorded that October had the highest infestation (25-56%) and May had the lowest infestation (3.75%) in sealed worker brood Also, the infestation rates of nurse workers were high during autumn and winter (Serag El-Dien, 1999). While El-Hady (2001) recorded different infestation levels of varroa in three overnorates of Egypt, from April-September, his observations were: at Kafr El-Sheikh (86.66 and 70.00%), El-Qualubia (81.25 % 75.00%), and El-Gharbia (62.50 and 83.33%) in 1988 and 1999, respectively. Also Abd-Alhakam (2002) studied the varroa infestation percentage in worker brood and in adult bees and found that the highest infestation was recorded in winter (15.3% and 14.5%) at the five districts which were Fayoum, Etsa, Ibshawai, Tameia and Sannouris of Fayoum Governorate; while the lowest infestation (3.3 and 3.1%) was recorded in summer for the 1st and 2nd years, respectively, he showed that autumn and spring infestations were 11.2 and 14.1% and 7.4 and 6.9% for the same years, respectively and significant differences were found between all values in the 1st years, but autumn, summer and winter values differed significantly in the 2nd year, and the varroa infestation in adult bees was the highest infestation (13.2 and 16.1%) recorded in winter, while the lowest infestation (2.9 and 33%) was in summer in the 1st and 2nd years, respectively,

finally, autumn and spring infestations averaged 10.2 - 12.9% and 5.1 and 3.7% for the 1st and 2nd years, respectively. Also, Abada (2016) varroa mites have been considered a problem for beekeeping for about 40 years. Mint oil, Eucalyptus oil, lemon juice and to concentration from the extract of propolis alcohol prepared in carton strips saturated with aforementioned compounds with known concentrations hanged in the middle of Carnica bees at Aga county, Dakahlia Governorate for 12 weeks. The population dynamic of the varroa mite on the brood and the adults of honey bee was significantly differed in the inspected months. In addition, the peak of infestation with varroa mite was occurred during September, on brood and on adult bee then gradually decreased until November of both years. In addition, the average of the total count of varroa mite on brood and adult bee was greatly increased.

It was concluded from evaluation results of bayvarol and VarroKiller for controlling varroa mites at Egyptian apiaries that success of both two compounds in this trend with significantly surpassed of first chemical product kindly over the second in decreasing of the parasite enumeration or counts within the experiment's colonies, furthermore of increasing the controlling percentages in this present study than the previous which used same compounds that indicates to success of the added modification in these two mentioned compounds.

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