

EFFECT OF SOME NATURAL SUBSTANCES FOR CONTROLLING *VARROA DESTRUCTOR* AND HONEYBEE COLONIES ACTIVITY

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ABSTRACT: This work was conducted in the Apiary of Plant Protection Institute at Quantar, Qalubia to study the effect of some natural substances on *Varroa destructor* in honeybee colonies and their comparison with Formic acid 60% and Metac (Amitraz 12%) through the period of 1/12/2013 to 28/12/2013. Results revealed that the mean reduction of infection with *Varroa* mite could be arranged into the following descending orders as follows: 89.49%, 89.49%, 77.87% (in brood +on adult) when using plates Apiguard, Clove, Camphor at the rate of 1- plate/ 2weeks/colony for 4 weeks at high temperature 27 C°. In case of infestation of honeybee colonies with varroa mites, it is advisable to use Apiguard, Clove, and Camphor. While Metac and formic acid where 58.51% and 54.91%.

Key words: Honeybee, *Varroa* mites, Apiguard, Clove, Camphor, Formic acid, Metac.

INTRODUCTION

Varroa destructor has become the most dangerous pest of honeybee colonies in Egypt. This mite was recorded for the first time in Egypt in (1983). Migratory beekeeping, importation of colonies packages of bees and queens, are considered to be the possible ways of varroa spread. The spread of varroa within colonies is due to swarming, robbing and foraging. Varroa disease resulted in weakened bee colonies malformations in wings and abdomen (Dehibes *et al.*, 1992). Cupric organic salts therefore provide a safe way for preventing the infestation of colonies and the population development of the mite over long periods. Bounias, M., *et al.* (1994). Application of 6 ml/day of formic acid to control *Varroa jacobsoni* in a colony is recommended, and at this dosage adverse effects can be neglected. Chen YueWen, *et al.* (1995). Populations of *Varroa jacobsoni* in honeybee colonies showed seasonal high densities in the spring and autumn. Numbers of maternal mites and/or their progeny in drone cells were higher than in worker cells. Food suitability and amount of resources, e.g., food and space, were higher in drone cells than in worker cells. The fact that mites concentrated on the "brood nests" located in the mid-low portion of the comb

was consistent with the egg-laying pattern of the queen. Chen PaoLiang, and Shih Chainng T (1995). The varroa mite, *Varroa jacobsoni* Oud. (Acarina: Varroidae), is the most serious parasite of honey bees, *Apis mellifera* (Hymenoptera: Apidae) in the USA. *Varroa* immatures and adults feed on bee haemolymph, causing morphological abnormalities and transmitting debilitating viruses. Without control efforts by man, varroa eventually destroy the colony within ca. 2 years. Application of smoke from burning of grapefruit leaves over varroa-infested honey bees has been shown to cause biological activity on the varroa: Elzen, P. J., *et al.* (2001). Different dosages, ways and times of application have been tested on colonies in the post, often reporting highly satisfactory results (range of mean effectiveness 66-99.5%) Imdrof *et al.* (1999). The mean reduction of infestation when using natural compound as tablet against *Varroa* mite could be arranged descendingly as follows: clove, marjoram and ginger, respectively. When using of natural compounds as capsules, the marjoram and clove caused reduction of infestation reached 86.6% Abou El-Enain *et al.*, 2005 An experiment was conducted to evaluate the acute toxicity of crude neem seed extract and of neem-based commercial

product (0, 1, 2, 3 and 4%) on *Varroa destructor* and *Apis mellifera*, and to evaluate their repellence of varroa mites. There was no acute toxic effect of any of the neem extracts for varroa mites or bees. An important repellent effect was observed with neem extracts, which interfered with the ability of female varroa to locate bee pupae to feed on. The neem-based products had a persistent repellency effect that lasted approximately 48 h. Gonzalez-Gomez, R., et al (2006).

The present work aimed to study the effect of some natural substances on *Varroa destructor* in honeybee colonies and their effects on activity of honeybee colonies.

MATERIALS AND METHODS

Such groups were treated as materials and the experiment was carried out under the apiary conditions at the Institute of Plant Protection in Quantar, Qalubia governorate during the period of 1/12 to 28/12/2013 to study the effect of some natural substances on *Varroa destructor* in honeybee colonies and their comparison with Apiguard 25% thymol, formic acid 60% and Metac (Amitraz 12%) material import was recommended. Brood areas, honey area and pollen area were measured every 12 days, square inches were used. The first inspection of brood, honey and pollen were taken just before the beginning of the experiment in 1/12/ - 28/12/2013.

The strength colony contains at least five frames covering with bees (1st hybrid Carniolan). These colonies were headed with equal queen ages. Eighteen honey bee carniolan were selected. The colonies have been divided into 6 groups (each of 3 colonies). Colonies in each group were insignificant of infested with *Varroa* mite in adult.

A-Substances used:

Clove 25%, Apigard 25%thymol, Camphor 25%, Formic acid 60% and Metac (Ametraz 12%).

B-Preparing the natural substances: Such groups were treated as follows:

Group (1): Clove25% which was prepared on the shape plates from aluminum foil as follow: A mixture of 50g of (talc powder+Vaseline) containing 25% Clove (12.5 g.)and put in aluminum foil inside Petri dish as past form.

Group (2): Apiguard (25%thymol) on the shape plates of aluminum import was recommended (vita Europe limited), which contained 50 g gel, 25%thymol.

Group (3): Camphor 25% which was prepared on the shape plates from aluminum foil as follow: A mixture of 50g of (talc powder+Vaseline) containing 25% Clove (12.5 g.)and put in aluminum foil inside Petri dish as past form

Group (4): Formic acid 60% which was used by Nassenheider evaporator (*Varroa* form apparatus) with 120 ml and put on the floor of the experimental hive to evaporate 8 ml of the acid per day. The amount of acid in the apparatus completely evaporate d after 15 days

Group (5): Metac (Ametraz 12%) which was used by rat 0,5cm per colony per week.

Group (6): Untreated colonies (Control).

The plates were placed on the top of board facing the brood chamber after open cover the plate to allow the bees to enter the plate and remove the product. The colonies were treated with (2 plates/colony). The total treatment period was four weeks. The honeybee colonies were fed on sugar syrup (2 sugar : 1 water) one per week. The bottom board of the hive was covered with a plastic sheet coated with raw Vaseline to capture the fallen mites. The died *Varroa* were counted and removed at the end of each treatment.

C-Determination of *Varroa* infestation:

1-In brood cells :

The infestation percent of *Varroa* mites before and after treatments in brood cells was determined by using 40 worker cells that were opened and the *Varroa* mite occurring with these cells counted.

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2-On adult workers :

The percent infestations of Varroa mites on workers before and after treatments were determined according to Komeili (1988). Samples of hundred bees /colony were collected randomly in vial partially filled with water containing few drops of detergent. The samples were shaken and the bees were washed in a strainer, individual mites that fell off from worker bees were found at the bottom of the white container (Ritter, 1981). All worker bees and mites were counted for each sample, where the number of mites/100 workers was calculated. Reduction percentage in mite infestation was calculated according to Henderson and Tilton (1955).

D-Effects of tested materials:

Effect of tested materials on individual honeybee colonies (after treatment of the experimental colonies, the average daily of queen and adult bees were counted until the end of experimental and disturbance of honeybee colonies were observed compared with untreated colonies (control).

On brood rearing activity (the daily worker sealed brood cells was counts after treated honeybee colonies at 12 day intervals , on honey production and on pollen grains.

RESULTS AND DISCUSSION

1-Fallen Varroa mite in honeybee colonies :

Table (1) show that treating Varroa mites infesting honeybee colonies with the tested material caused significantly higher number of fallen Varroa mites as compared to that of untreated colonies. Mean total of fallen Varroa (693 mites) was recorded after using plate of Apiguard . Clove on the shape plates followed by (592 mites), Camphor on the shape plates (482 mites), Formic acid (379 mites)and Metac in package in plastic of rat 0,5cm per colony.per week (482 mites). The least number of fallen Varroa was recorded in untreated colony (78 mites). It can be concluded that, the number of dead fallen mites were increased gradually in case of using natural materials, this might be due to slow action against Varroa mite.

Table (1): Mean number of fallen Varroa mites after daily sequence from the treatments during winter, 2013 year.

Treatments Days	No. of varroa mites fall/colony after the following days from treatment							Total
	1	2	3	7	14	21	28	
Apiguard 25%thymol	183	124	150	159	43	27	7	693
Clove 25%	217	110	95	93	42	25	10	592
Camphor 25%	121	87	104	98	100	76	13	593
Metac (Amitraz 12%)	109	105	102	67	59	31	9	482
Formic acid 60%	85	71	55	59	62	35	12	379
Untreated (Control)	7	8	7	10	12	16	18	78
F value								6.50
L .S.D at 5%								35.54

2- Effect of the natural substances against Varroa mite :

Table (2) indicated that the Apiguard on the shape plates as pest form caused reduction of infestation being (87.76%) and (91.21%)for brood cells and adult , The mean reduction of infestation reached (89.49%) for both brood and adult, respectively . The Clove caused reduction of infestation being(87.63%) and (91.34%)for brood cells and adult, respectively. The mean reduction of infestation reached (89.49%)for both brood and adult . Camphor on the shape plates as pest form caused reduction of infestation being(73.88%)and (81.85%)for brood cells and adult, respectively. The mean reduction of infestation reached (77.87%) for both brood and adult Metac caused reduction of infestation being(59.23%) and (57.78%)for brood cells and adult, respectively. The mean reduction of infestation reached (58.51%) for both brood and adult. Formic acid 60% caused reduction of infestation being (57.74 %) and(52.38%)for brood cells and adult, respectively. The mean reduction

of infestation reached (54.91%) for both brood and adult.

The results obtained in Table (3) show that the reduction of infection could be arranged into the following descending orders as follows: Clove plates, Apiguard plates, Camphor plates, Metac in package in plastic of rat1/2 c/colony /week and Formic acid 60% for both brood and adult. Non significant between Clove and Apiguard on adult, but there were significant between Clove and Camphor ,Metac and Formic on adult. On brood there were non significant between Clove , Apiguard and camphor, but there were significant between Clove and Metac and Formic .

3- Effect of tested substances on odour and individual colony statues:

Table (3) cleared that, there was no effect of tested substances on odour and individual colony statues as compared to that of untreated colonies

Table (2): Mean reduction percentages of Varroa mites on brood and adult honeybee colonies treated with certain natural substances during winter, 2013 year.

Treatment	%infestation In brood cells		Reduction%	%infestation On adult bees		Reduction%	Mean %
	before	after		before	after		
Apigaurd 25% Thymol	25.97	3.70	87.76	19.30	1.99	91.21	89.49
Clove 25%	20.00	2.88	87.63	13.70	1.90	91.34	89.49
Camphor 25%	26.38	8.02	73.88	21.60	4.60	81.85	77.87
Metac(Amitraz 12%)	23.60	11.20	59.23	12.11	6.00	57.78	58.51
Formic acid 60%	18.50	9.10	57.74	10.20	5.70	52.38	54.91
Untreated (Control)	24.50	28.90	—	15.07	18.90	—	—
LSD at 5 %	Brood= 3.9 Adult= 4.19						

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Table (3): Effect of tested substances on colony status, accumulated worker sealed brood rearing activity, honey and pollen areas during winter, 3013 year

Treatments	daily av. dead worker bees after treatment/ colony	Mean.sealed brood cells after treatment (inch ²)/ colony	increase of sealed brood %	honey areas after treatment (inch ² / Colony)	increase of honey %	pollen area after treatment (inch ²)/ colony	increase of pollen grains %
Apiguard 25%thymol	3.42	112.89	44.93	228.80	23.23	98.65	48.12
Clove 25%	3.81	97.10	35.97	225.67	22.17	71.67	28.59
Camphor 25%	4.10	95.52	34.91	202.00	13.04	56.64	9.56
Metac Amitraz 12%	4.51	75.57	17.73	187.10	6.12	54.60	6.26
Formic acid 60%	3.93	69.84	10.98	178.20	1.43	52.50	4.34
Untreated Control	4.39	62.17	-	175.65	-	51.18	-

4-Accumulated of worker sealed brood cells:

As shown in Table (3), the highest average daily worker brood cells was (112.89) cells with increase of (44.93%) when using Apiguard followed by (97.10)cells with increase of (35.97%) when using Clove, (95.52) cells with increase of (34.91) when using Camphor,(75.57) cells with increase of (17.73)when using Metac and (69.84) cells with increase of (10.98%)when using Formic acid, respectively.

5-Accumulated of stored honey:

Table (3) indicated that the highest average of honey production area was (228.80) with increase of (23.23) as compared to that untreated colonies , when using Apiguard, followed by (225.67) with increase of (22.17%) when using Clove, (202) with increase of (13.04)when using Camphor, (187.10) with increase of (6.12)when using Metac and (178.20) with increase of (1.43%) when using formic as compared to that untreated colonies. There was no effect of natural tested substances on physical shape, color and odour of honey

6- Accumulated of stored pollen grains:

Table (3) indicated that the highest average of pollen production was (98.65) with increase of (48.12) as compared to that untreated colonies when using Apiguard, followed by (71.67) with increase of (28.59)when using Clove, , (56.64) with increase of (9.56)when using Camphor, (54.60) with increase of (6.26%)when using Metac and (52.50) with increase of (4.34) as compared to that untreated colonies when using Formic acid for controlling varroa mites .

It can be concluded that using natural tested substances for controlling Varroa mites in winter and after the honey harvest. These results coincided with Emara *et al.* (1994), Imdrof *et al.* (1995), Mattilla and Otis (2000) and Abou Elenain *et al.* (2007).

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تأثير بعض المواد الطبيعية لمكافحة طفيل الفاروا ونشاط طوائف نحل العسل

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المخلص العربي

أجرى هذا البحث في منحل قسم بحوث النحل بالفناطر الخيرية محافظة القلوبية بهدف دراسة تأثير بعض المواد الطبيعية المحلية ودراسة تأثيرها على أفراد طائفة نحل العسل وكذلك على أنشطة الطوائف (تربية الحضنة ، مساحة العسل ، مساحة حبوب اللقاح) ومقارنتها ببعض المنتجات الكيميائية الشائع إستخدامها بين النحالين (حامض الفورميك ٦٠% ومادة الميتاك (أميتراز ١٢%) وكانت المواد الطبيعية المستخدمة هي أطباق القرنفل والإبيجارد والكافور وهذه المواد تم تجهيزها في صورة أطباق بعد إضافة مواد حاملة مناسبة لتنظيم عملية تبخيرها داخل طوائف نحل العسل عند الإستخدام .وقد أوضحت النتائج ما يلي :

أعطت معاملات القرنفل والإبيجارد أعلى معدل خفض في الإصابة لطفيل الفاروا وبلغت (٨٩.٤٩%) يليها في المرتبة الثانية معاملات الكافور حيث بلغت النسبة المئوية للخفض (٧٧.٨٧%) .وحققت مادة الميتاك الشائع إستخدامها بين النحالين المرتبة الثالثة بنسبة خفض(58.51%) بينما حقق حامض الفورميك المرتبة الرابعة حيث بلغت النسبة المئوية للخفض(54.91%). وحققت طوائف نحل العسل التي تم معاملتها لمكافحة طفيل الفاروا زيادة ملحوظة في إنتاجيتها في معدل تربية الحضنة 35.97% , 34.91% , 17.73 , 10.98% , 44.39% , ومساحات العسل (٦.١٢، ١٣.٠٤، ٢٢.١٧، ٢٣.٢٣، ٢٤.٤٣) ومساحات حبوب اللقاح (٤٨.١٢ ، ٢٨.٥٩ ، ٩.٥٦ ، ٦.٢٦ ، ٤.٣٤) عند إستعمال كلا من معاملات الإبيجارد، القرنفل، والكافور، الميتاك و حامض الفورميك على التوالي . بالإضافة الى عدم تأثيرها بالمواد المستخدمة في مكافحة .

وتوصى النتائج بإستخدام المواد الطبيعية مثل الإبيجارد . القرنفل . الكافور على هيئة اطباق في علاج اكاروس الفاروا بمعدل طبق واحد لكل طائفة كل أسبوعين وتكرر المعاملة مرتين وتستمر فترة العلاج ٢٨ يوم مع مراعاة عدم زيادة درجة الحرارة عن ٢٧ م حتى لا تؤثر على أنشطة وأفراد طوائف نحل العسل.
