

مكافحة حلم الفاروا باستخدام مستخلصات الزيوت الطبيعية

حسنى شرف الدين^(١) ، عثمان عسل^(١) ، سعد السيد سالم^(١) ،

نعمت محمد فؤاد مهنا^(٢) ، خالد محمد احمد عبد الحميد^(٢)

١-قسم الحشرات الاقتصادية والحيوان الزراعى كلية الزراعة شبين الكوم جامعة المنوفية

٢-معهد بحوث وقاية النباتات -بالصباحية مركز البحوث الزراعية -الاسكندرية

الملخص العربى

تم دراسة امكانية استخدام بعض الزيوت الطبيعية فى مكافحة اكاروس الفاروا وذلك باختيار عشرون طائفة مصابه وتم تقسيمها الى خمسة معاملات وكل معاملة تم تكرارها أربع مرات. وكانت العلاجات على النحو التالي : زيت القرع ، زيت القرنفل ، زيت الحبهان ، وزيت القرفة والمقارنة. استخدم (٥) مل من كل مادة فى الطائفة وتغيير كل اسبوع خلال مدة التجربة التي استمرت لنحو ٣ أشهر ، احصيت اعداد الفاروا التي سقطت على ورقة الفازلين كل ٣ ايام ويتم تغيير الورق المدهون بالفازلين بورق جديد مدهون بعد كل عد ، وفى نهاية فترة التجربة تم معاملة كل خلية بواحد مل ميتاك لتحديد مدى فعالية المواد المستخدمة، حيث تم وضع ١ مل من الميتاك على قطعه صغيرة من القطن ووضعت لكل خلية لقتل ما تبقى من فاروا لم تسقط بالزيوت لتحديد كفاءة المواد المستعملة (فترة تقييم العلاج) وقد وجد ان فعالية زيت القرع وزيت القرنفل متساويتان تقريبا حيث كانت النسبة المئوية للموت متساوية تقريبا ٧٤.٩٣ و٧٢.٢٥ % يليها زيت القرفة الذى بلغ ٧٠.٣٧ % ثم زيت الحبهان الذى كان اقلهم فى نسبة الخفض ٦٦.٦٢ حيث بلغت اعداد الفاروا التي سقطت خلال فترة المعاملة ١٤٦٠ و ١٠٥٠ و ٨٣٨ و ٥٧٢ لكلا من زيت القرع وزيت الحبهان وزيت القرنفل وزيت القرفة على التوالي بينما كانت اعداد الفاروا الساقطة خلال فترة التقييم هى كالتالى ٤٥٨ و ٦٥٠ و ٢٧٣ و ١٩٦ فاروا اما بالنسبة لتاثير الزيوت المستخدمة على نسبة الخفض للفاروا الملتصقة بالشغالات فكان اعلاها تاثيرا هو زيت القرفة ٨٣% تلاه زيت القرع الذى بلغ ٨١.٥٨% ثم زيت الحبهان الذى حقق ٨٠.٠٤% خفض وكان اقلهم كفاءة زيت القرفة الذاعطى ٦٧.٦٥%، اما عن تاثير هذه الزيوت على نسبة الفاروا داخل الحضنة نجد ان زيت الحبهان كان اعلاها تاثيرا ثم زيت القرفة وزيت القرنفل واخيرا زيت القرع العسلى حيث كانت النسبة المئوية للخفض فى اعداد الفاروا داخل الحضنة للمواد السابقة هى ٩٤.٥٢ و ٨٤.٤ و ١٨ و ٨٤.٠٣ و ٧٤.٠٣ % على الترتيب.

CONTROLLING VARROA MITES USING NATURAL OIL EXTRACTS

H. A. Sharaf El-Din⁽¹⁾, O.M Assal⁽¹⁾ S. E. Salem⁽¹⁾,
Neemat M.F. Mehana⁽²⁾ and K.M.A. Abd –Elhamid⁽²⁾

⁽¹⁾ Economic Entomology Dept., Fac.of Agric Minoufiya University Egypt.

⁽²⁾ Plant protection research institute .El-sabaheia Agric. Res. Centre Alex. Egypt

(Received: Sep. 4, 2011)

ABSTRACT: *The efficacy percentages of both pumpkin oil and clove oil against varroa mites are equal recording 72.25 and 74.93 %, followed by cassia oil and cardamom oil resulting 70.37 and 66.62, respectively, compared with the control 40.47. The reduction percentages of mites attached to honey bee workers as affected by the application of pumpkin oil, cardamom oil and cassia oil are approximately the same recording 81.58, 80.04 and 83.01%, respectively, compared with the clove oil ,which reduced only 67.65 %. The reduction percentage of mite infestation levels inside worker brood for cardamom oil was the highest recording 94.52 %, followed by pumpkin oil, clove oil and cassia oil, which gave 74.03, 84.18 and 84.4 %, respectively, in comparison with the control, which increased more than 100%.*

Key words: *honeybee, Apis mellifera, Varroa destructor control, essential oils*

INTRODUCTION

The honey bee *Apis mellifera* is considered one of the most important beneficial insect for man. A parasitic mite , *Varroa destructor* ,has become a dangerous enemy of beekeeping in the world wide. Owing to the problems of the use of chemical materials resulted in the accumulation of residues in bee products it was urgent need for alternative control strategies that are sustainable and cost effective therefore, the following experiment was conducted as an attempt to use essential oils in the control of varroa mites infesting honey bee colonies.

MATERIALS AND METHODS

The present study was conducted on the reserch apiary of Apiculture Department at El Sabaheia Research Station, Alexandria, Egypt. The used honey bee strain was the Carniolan hybrid *Apis mellifera carnica*. The chosen colonies were similar in their strength, with approximately the same number

of brood combs two honey and two pollen combs and headed by one-year old queens.

1-Experimental colonies:

The chosen colonies were almost identical in strength and headed by prolific one year old queen. Each of which was provided with sticky board inserted over the bottom board. Sticky board was stabled under wooden frame (¼") fitted with galvanized wire screen (3 mm) that allow mites to fall through, protect bees from the sticky surface of cardboard and prevent them recovering the mites (*Fries et al., 1991*).

2-Diagnostic methods of varroa mite infestations:

To estimate the mite levels of infestation either before, after or through the treatments using the current widely diagnostic methods such as fallen mites on the sticky-board, the mites inside sealed worker brood and the mites attached to adult bee was done as follows:

2-1- Fallen mite on the sticky board:

Through out the treatments performed to control varroa the number of fallen mites on the sticky board was recorded every three days. The sticky board was replaced by new ones after each count of mites.

2-2- Inspection of the sealed worker brood:

Before and after each treatment samples of 100 cells from two sealed worker brood combs form were randomized each experimental colony examined. The worker brood cells were uncapped with a fine forceps and the varroa mite was easily recognized against the white surface of larvae or pupae and counted (*Ritter, 1991*). The percentage of infestation was calculated by dividing the number of the presented mites by the number of the examined cells (*Sostences et al., 1992*).

2-3- Inspection of varroa attached to adult bees:

Before and after the treatment, a number of 200 worker bees per colony were sampled by brushing them off paper into a special jar contained 10% detergent solution (*Shimanuki and Knox, 1991*). The jar was vigorously shaken for several minutes and the dislodged mites were collected by passing the bees and solution through a wire screen to remove the bees and then sieving the solution through a piece of cotton cloth. The cloth was examined and the mites were counted. The collected bees on the wire screen were also spread on a white surface to be examined for any attached mites to bee segments (varroa missing).

The percent of infestation was calculated by dividing the total of varroa (on the white cloth and varroa missing) by the counted number of worker in the solution.

3-Used essential oils:

3-1 Pumpkin oil: *Mammoth pumpkin*.

3-2 Cardamom oil: *Elettaria cardamom*.

3-3 Clove oil: *Eugenia caryophyllate*.

3-4 Cassia oil: *Cinnamomun zeylanicum*

This experiment was run for three months. Twenty infested colonies were chosen and divided into five treatments each treatment was replicated four times. The treatments were as follows: Pumpkin Oil, Cardamom Oil, Clove Oil, Cassia Oil and Control.

Five ml of each material were applied per colony by soaked at a cotton strip 30 x 2.5 cm and placed above the frames and changed every week through out the experiment time, which lasted for about 3 months.

In the above mentioned treatments, the fallen mites on the vaselined paper sheet were counted at 3 days intervals. The sheet was replaced by new ones after each count of mites. To determine the efficacy of the used materials, 1 ml of Mitac was put on a small cotton card and hanged between the combs and repeated every week for a period of four weeks and fallen varroa on the vaselined paper were counted (evaluation of the treatment period).

4- Estimation of varroa infestation reduction:

To study the efficacy of the used materials in reducing Varroa population percentage of the brood or the adult bees, the modified Abbott's formula (1925) described by Handerson and Tilton (1955) :

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

Where :

Ta= The number of mites collected after treatment.

Cb= The number of mites collected from the control before treatment

Cb= The number of mites collected per sampling unit before treatment

Ca= The number of mites collected from the control after treatment

Concerning the fallen mites due to the used varrocidal materials the remained varroa mites after treatments were killed by using mitac or formic

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acid fumigator (Korpela *et al.* ,1992 ;Calderon and Spivak ,1995 and Imdorf *et al* 1995). The preparation of mites collected during the treatment period was determined by dividing the number of collected mites during the treatment period by the total number of collcted mites during both the treatment and its evaluation period (Calderon and Spivak 1995, Feldlaufer *et al.* 1997).

5- Statistical analysis:

All obtained data were statistically analyzed according to ANOVA test Snedecor and Cochran (1973) and Costat 22 (1998).

RESULTS AND DISCUSSION

Data in Table (1) showed that the efficacy percentages against varroa mites of both pumpkin oil and clove oil are semi equal with 72.25 and 74.93, respectively, followed by cassia oil and cardamom oil with 70.37 and 66.62 , respectively , compared with the control 40.47.

Table (1): Effect of four essential oils on fallen varroa mite percentages .

Treatments	Replicates	No. of fallen mites during		Total TP + ETP	Efficacy %
		Treatment Period TP	Evaluation. of treatment period ETP		
Pumpkin oil	1	1144	870	2014	57
	2	1805	78	1883	96
	3	1012	354	1366	74
	Mean	1460a	458b	-	72.25 a
Cardamon oil	1	1014	372	1386	73.2
	2	1014	702	1716	69.7
	3	723	440	1163	62.2
	Mean	1050b	650a	-	66.62 c
Clove oil	1	764	225	969	77.25
	2	1132	219	1351	83.79
	3	818	375	1193	68.57
	Mean	838c	273d	-	74.93a
Cassia oil	1	388	223	611	63.5
	2	492	313	805	61.12
	3	408	157	565	72.21
	Mean	572d	196e	-	70.37 b
Control	1	502	537	1039	48.32
	18	358	661	1019	35.13

	19	540	638	1178	45.84
	Mean	399e	344c	-	40.47 d

Means of each column followed by different letter are different significantly 0.05 %

Data in Table (2) showed that reduction percentage of mites attached to honey bee workers of pumpkin oil, cardamom oil and cassia oil are equal recording 81.58, 80.04 and 83.01%, respectively, followed with clove oil, 67.65%. Compared with the control 24.84. Also, the mean numbers of attached mites per 100 bee workers before treatment were 19.5, 17.5, 19.5, 23.5 and 17 for pumpkin oil, cardamom oil, clove oil, cassia oil and control, respectively.

Data in Table (3) showed that reduction percentages of mites inside worker brood for cardamom oil was 94.52%, followed by cassia oil, clove oil, and pumpkin oil, which were 84.4, 84 and 74.03 respectively, compared with the control, which increased more than 100%. Also, the mean brood infestation per 100 cells of brood before treatment were 18.4, 16.6, 19.5, 28.5 and 18.75 for pumpkin oil, cardamom oil, clove oil, cassia oil and control, respectively which was decreased after treatment to 12, 2, 5.5, and 7.5, respectively. But the mean number increased to 31.25 mites per 100 cells for control treatment.

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Table (2): Effect of tested materials on the infestation reduction of varroa attached to honey bee workers.

Treatments	Rep.	Infestation%		Reduction %
		Before	After	
Pumpkin oil	1	32	0	100
	2	18	6	77.33
	3	12	6	66.0
	4	16	4	83.0
	Mean	19.5 a	3.5b	81.58 a
Cardamom oil	1	28	10	75.71
	2	4	2	66.0
	3	18	3	88.67
	4	20	3	89.80
	Mean	17.5 a	4.5b	80.04 a
Clove oil	1	24	14	60.33
	2	20	10	66.0
	3	18	8	69.78
	4	16	6	74.5
	Mean	19.5 a	9.5 b	67.65 b
Cassia oil	1	18	2.5	90.56
	2	24	2.5	92.92
	3	20	7	76.2
	4	32	13	72.38
	Mean	23.5 a	6.25 b	83.01 a
Control	1	14	18	12.27
	2	20	28	19.0

	3	12	24	36.0
	4	22	30	7.27
	Mean	17 b	25 a	24.84

Means of each column followed by different letter are different significantly 0.05 %

Table (3): Effect of the four tested materials on the varroa infestation level inside worker brood.

Treatment	Rep.	Infestation %		Reduction %
		Before treatment	After treatment	
Pumpkin oil	1	26	12	72.30
	2	24	10	75.00
	3	34	12	78.82
	4	28	14	70.00
	Mean	18.4 a	12 b	74.03 b
Cardamom oil	1	17	Zero	100.0
	2	28	4	91.43
	3	20	Zero	100.0
	4	18	4	86.67
	Mean	16.6 a	2 b	94.52 a
Clove oil	1	24	10	75.00
	2	14	2	91.43
	3	18	4	86.67
	4	22	6	83.64
	Mean	19.5 a	5.5 b	84.18 a b
Cassia oil	1	24	5	87.50
	2	32	10	81.25
	3	28	8	82.86
	4	30	7	86.00
	Mean	28.5 a	7.5 b	84.4 a b
Control	1	14	24	-
	2	16	36	-
	3	25	35	-
	4	20	30	-
	Mean	18.75 b	31.25 a	-

Means of each column followed by different letter are different significantly 0.05 %

REFERENCES

- Abbott, W.S. (1925). A method of counting the effectiveness of insecticide. *J.Econ.,Entomol.*, 18:265-267.
- Calderone, N.W. and M. Spivak (1995). Plant extracts for control of the parasitic mite *Varroa Jacobsoni* (Acari:Varroide)in colonies of the western honey bee (Hymenopetra:Apidae).*J. Econ.Entomol.* 88(5): 1211-1215.
- Costat 22 (1998). A computer program for statistical analysi
- Feldlaufer, M.F., Y.S. Pettis, J. Pkochansky and H. Shimanuki (1997). A gel formulation of formic acid for the control of parasitic mites of honey bees. *Amer. Bee J.* 137 (9) 661-663.
- Fries, I., A. Aarhus, H. Hansen and S. Korpela (1991). Development of early infestation by the mite varroa Jacob- Soni in honey bee (*Apis mellifera*) colonies incold climates. *Experimental and Applied Acarology*, 11: 205-214.
- Handerson, C.F. and W. Tilton (1955). Tests with Acaricides against the brown wheat mite . *Econ.Entomol.*, 48 (2):157-161.
- Imdorf, A., V. Kilchemmann, S. Bogdanov, B. Bachofen and C. Beretta (1995). Toxic effectsof thymol , camphor menthol and eucalyptol on *Varroa jacobsoni* Oud,and *Apis mellifera* L,in laboratory test .*Apidologie*,26(1):27-31.
- Korpela , S., A. Aarhus, I. Fries and H. Hansen (1992). *Varroa Jacobsoni*. Oud.in cold climates :population growth ,Winter mortality and influence on the honey bee colonies. *Journal of Apicultural Research* 31(3/4):157-164 .
- Ritter. W. (1991). What Biotechnical control . Bee pathologe Branch.Institute of Animal Health,PB 5140,b7800.Freiburg, Germany.
- Shimanuki, H. and D. A. Knox (1991). Diagnosis of honey bee disease U. S. Department of Agriculture, *Agriculture Hand book*, 39- 42.
- Snedecor, G.W. and G. Cochran (1973). *Statistical methods*. 6th ed.; Iowa State Univ. Press Iowa, USA, 560 pp.
- Sostenes, R.R.D., J.M. Mendez and G.O. Colina (1992). *Varroa* found in Mexico. *Amer . Bee .J.*, (11):718-729.

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