

EVALUATION OF SOME CHEMICAL MATERIALS FOR CONTROLLING OF VARROA MITE, *Varroa jacobsoni* Oud. ON HONEYBEE

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ABSTRACT

The present investigation was achieved at the apiary of Sakha Agricultural Research Station, Kafr El-Sheikh Governorate during 2008 season to evaluate the efficiency of five materials, i.e., formic acid 60%, salcelate methyl 60%, Bayvarol strips, malathion powder 1% and Apitol for controlling varroa mite. All tested materials reduce mite population. Malathion powder 1% and formic acid 60% were the most effective material on varroa mite (93.75 & 89.57% reduction) on each of workers and drones after the fourth week of treatment during the first period from 1/2/2008 to 28/2/2008, respectively. Also, during the second period from 1/9/2008 until 28/9/2008, malathion powder 1% gave the highest reduction (93.15 & 94.00%) of varroa mite on each of workers and drones after the fourth week of treatment, respectively. On the other hand, the remaining materials, i.e., formic acid 60%, Apitol (2 gm), salcelate methyl 60% (2 cm³/colony) and Bayvarol strips gave a high reduction (88.19, 86.67, 84.08 & 82.0%) of varroa mite on workers after the four weeks of application during the first period, respectively. Also, during the second period formic acid 60%, salcelate methyl 60% (2 cm³/colony, Apitol (2 gm) and Bayvarol strips exhibited a high reduction (88.13, 88.11, 84.21 & 82.86%) of varroa mite on workers after the fourth week of application, respectively. At the same trend, formic acid 60%, salcelate methyl 60% (2 cm³/colony), Apitol (2 gm) and Bayvarol strips gave a high reduction (91.67, 91.11, 86.67 & 84.11%) of varroa mite on drones after four weeks of treatment during the second period, respectively. It could be concluded that bee keepers can use formic acid 60%, and salcelate methyl 60% (2 cm³/colony) safely during the above two tested periods for controlling varroa mite.

INTRODUCTION

Varroa disease causes a serious problem to *Apis mellifera* L. in many countries, it feeds on haemolymph of broods, drones and workers, causing severe damage to colonies, decreased brood and emerging bees (De Jong *et al.*, 1982) and (Keoniger *et al.*, 1981). It was detected in Egypt for the first time in 1983 (Wienands, 1988) and since then, it spread all over the country in areas where bees are kept, and caused great losses in many apiaries during this period.

Many chemical compounds have been developed and tested in recent years against varroa mites, as well known, none is 100% effective but a few give a partially satisfactory (Giordani and Leporati, 1989). The efficiency of these chemical compounds have been studied by several authors, among them Santas, 1983 and 1986; Luganskii *et al.*, 1987; Abd El-Fattah *et al.*, 1991; Marchetti *et al.*, 1984; Chahin, 1997; Okada and Nakane, 1998; Daniels *et al.*, 1999; Calderone, 2000; Poklukar, 2001; Mansour, 2003; Serag El-Dien and Eissa, 2003 and Abou El-Enain *et al.*, 2007.

The present investigation was conducted to evaluate the effectiveness of five chemical materials; formic acid, salcelate methyl, Bayfarol, malathion powder Apitol against varroa mite in Egypt.

MATERIALS AND METHODS

The present investigation was conducted at the apiary of Sakha, Agricultural Research Station, Kafr El-Sheikh during February and September, 2008. The colonies of honeybee of this study were of F₁-caraniolan hybrid headed by young sister queens, similar in strength, honey, brood and bees and heavily infested by the varroa mite, twenty five colonies (5 combs each) were divided into five groups (treatments), each of five colonies (replicates).

Treatments:

Each of the following treatments were applied on weekly for two months, the first from 1/2/2008 to 28/2/2008, the second from 1/9/2008 until 28/9/2008.

1. Formic acid (60%): Ten milliliters were sprayed on a thick sheet of pepper (20 x 20 cm) and placed on the top of the combs (at a rate of 2 ml/comb).
2. Salcelate methyl (60%): Two milliliters were applied on a cotton wool and place down the bottom of the hive.
3. Bayvarol strips: Two strips (3.6 mg of flumethrin) hanged in the mid of brood combs to four weeks.
4. Malathion powder (1%): Malathion 1% was mixed with taic powder in ratio one part malathion to five part powder taic. Each colony was dusted by 3.5 gm of the mixture in between the top of the combs.
5. Apitol (2-(2.4-dimethyl phenylamino)-3 methyl-4 thiazaline hydrochloride, Ciba Geigy). Two gm of Apitol mixed with 100 gm sugar and dissolved in ½ liter of water, then used in the feeding per fifty colony.
6. Control colonies: Five colonies used as control without any treatment.

Evaluate the efficiency of the different treatments:

In order to evaluate mite infestation, 100 adult each of workers and drones were collected as a sample from each hive before and after treatments and the occurring mites on different parts of body were counted. Treatment efficacy was expressed as percentage reduction on varroa infestation among adult bees according to Abbot (1925).

RESULTS AND DISCUSSION

As shown in Table (1) all tested materials reduced mite population. The highest varroa mortality 89.57% was observed with malathion powder 1% application on honeybee adults of workers followed by formic acid 60% (88.19%), Apitol (2 gm), (86.67%) salcelate methyl 60% (2 cm³/colony) (84.08%), and then Bayvarol strips (82.00%) after four weeks of application from 1/2/2008 to 28/2/2008, respectively. On the other hand, formic acid 60% gave the highest mortality 93.75% followed by salcelate methyl (2

cm³/colony) (90.0%), malathion powder 1% (90.0%), Apitol (2 gm) (88.37%) and Bayvarol strips (85.58%) on drones after four weeks of application, respectively. Generally, results indicated slightly reduction of varroa mite with all tested materials, malathion powder 1%, Bayvarol strips, Apitol (2 gm), formic acid 60% and salcelate methyl (2 cm²/colony) being 36.96, 20.72, 16.67, 16.30 and 14.43% on workers after the first week of treatment, respectively. Also, results showed slightly reduction percentage of varroa mite with malathion powder 1%, formic acid 60%, salcelate methyl 60% (2 cm³/colony), Bayvarol strips and epitol (2 gm) (44.81, 18.75, 17.58, 16.22 & 11.60%) on drones after the first week of treatment, respectively. A moderate reduction percentage of *V. jacobsoni* was detected with malathion powder 1%, Apitol (2 gm), Bayvarol strips, formic acid 60% and salcelate methyl 60% (2 cm³/colony) (69.48, 60.42, 57.66, 53.58 & 44.28%) on workers after the second week of treatment, respectively. As well as results exhibited a moderate reduction percentage of varroa mite on drones after the second week of treatment with malathion 1%, Apitol (2 gm), Bayvarol strips, formic acid 60% and salcelate methyl 60% (2 cm³/colony) (73.83, 62.83, 62.61, 57.50 & 45.05%), respectively.

The same trend was obtained during the second period from 1/9/2008 until 28/9/2008 (Table 2) where the highest varroa mortality 93.15% was detected with malathion powder 1% application followed by formic acid 60% (88.13%), salcelate methyl 60% (2 cm³/colony) (88.11%), Apitol (2 gm) (84.21%) and Bayvarol strips (82.86%) on workers after four weeks of application from 1/9/2008 until 28/9/2008, respectively. Similarity, malathion powder 1% application gave the highest varroa mortality 94.0% followed by formic acid 60% (91.67%), salcelate methyl 60% (2 cm³/colony) 91.11%, Apitol (2 gm) (86.67%) and Bayvarol strips (84.11%) on drones after four weeks of application, respectively. All tested materials gave slightly reduction percentage of varroa mite with malathion powder 1%, formic acid 60%, Apitol (2 gm), Bayvarol strips, and salcelate ethyl 60% (2 cm³/colony) being 36.49, 29.14, 28.42, 26.80 and 24.0% on workers after the first week of treatment, respectively. Again, all the previous tested materials exhibited a weak reduction percentage of varroa mite with malathion powder 1%, Bayvarol strips, Apitol (2 gm), formic acid 60%, salcelate methyl 60% (cm³/colony) (51.17, 46.32, 34.31, 30.94 & 25%) on drones after the first week of treatment, respectively. On the other hand, a moderate reduction percentage of *Varroa jacobsoni* was observed with malathion powder 1%, formic acid 60%, Apitol (2 gm), byvarol strips and salcelate methyl 60% (2 cm³/colony) being 65, 75, 58.87, 57.37, 54.29 and 50.27% on workers after the second week of treatment, respectively. Also, after the second week of treatment results showed a moderate reduction percentage of varroa mite with malathion powder 1% (75.0%), Bayvarol strips (68.42%), formic acid 60% (65.56%), Apitol (2 gm) (63.08%) and salcelate methyl 60% (2 cm²/colony) (50.0%) on drones, respectively. From the third week of treatment results indicated a high reduction percentage of varroa mite with malathion powder 1% and formic acid 60% being 84.43 and 88.88% on workers and drones, respectively.

Table (1): Reduction percentage (%R) of *V. jacobsoni* after each week of treatment of the tested materials on honeybee adults each of workers and drones during the first period from 1/2/2008 to 28/2/2008.

Tested materials	Infestation percentage before treatment		% R after 4 weeks							
			1 st week		2 nd week		3 rd week		4 th week	
			% infestation	% reduction	% infestation	% reduction	% infestation	% reduction	% infestation	% reduction
Formic acid 60%	Workers	22.02	18.43	16.30	10.20	53.68	6.10	72.30	2.60	88.19
	Drones	24.00	19.50	18.75	10.20	57.50	5.00	79.16	1.50	93.75
Salcelate methyl 60% 2 cm	Workers	20.10	17.20	14.43	11.20	44.28	5.20	74.13	3.20	84.08
	Drones	20.02	16.50	17.58	11.00	45.05	4.02	79.92	2.00	90.00
Bayvarol strips	Workers	22.2	17.60	20.72	9.40	57.66	6.20	72.02	4.00	82.00
	Drones	22.2	18.60	16.22	8.30	62.61	5.70	74.32	3.20	85.58
Malathion powder 1%	Workers	23.00	14.50	36.96	7.02	69.48	4.40	80.87	2.40	89.57
	Drones	21.02	11.60	44.81	5.50	73.83	3.50	83.35	2.10	90.0
Apitol 2 gm	Workers	24.00	20.0	16.67	9.50	60.42	5.00	79.17	3.20	86.67
	Drones	22.06	19.50	11.60	8.20	62.83	5.00	77.33	2.60	88.37

Table (2): Reduction percentage (%R) of *V. jacobsoni* after each week of treatment of the tested materials on honeybee adults each of workers and drones during the second period from 1/9/2008 to 28/9/2008.

Tested materials	Infestation percentage before treatment		% R after 4 weeks							
			1 st week		2 nd week		3 rd week		4 th week	
			% infestation	% reduction	% infestation	% reduction	% infestation	% reduction	% infestation	% reduction
Formic acid 60%	Workers	17.02	12.06	29.14	7.00	58.87	3.10	81.79	2.02	88.13
	Drones	18.00	12.43	30.94	6.20	65.56	2.00	88.88	1.50	91.67
Salcelate methyl 60% 2 cm	Workers	18.50	14.06	24.00	9.20	50.27	4.10	77.84	2.20	88.11
	Drones	18.00	13.50	25.00	9.00	50.00	3.02	83.22	1.60	91.11
Bayvarol strips	Workers	17.50	12.81	26.80	8.00	54.29	5.06	71.09	3.00	82.86
	Drones	19.00	10.20	46.32	6.00	68.42	4.06	78.65	3.02	84.11
Malathion powder 1%	Workers	16.06	10.20	36.49	5.50	65.75	2.50	84.43	1.10	93.15
	Drones	20.00	9.67	51.17	5.00	75.00	2.60	87.00	1.20	94.00
Apitol 2 gm	Workers	19.00	13.60	28.42	8.10	57.37	5.40	71.58	3.00	84.21
	Drones	19.50	12.81	34.31	7.20	63.08	4.00	79.49	2.60	86.67

Also, reduction percentage of varroa mite with the remaining materials as salcelate methyl (60 (2 cm³/colony-, Apitol (2 gm) and Bayvarol strips were (77.84 & 83.22%), (71.58 & 79.49%) and (71.09 & 78.65%) on workers and drones after the third week of treatment, respectively. The present results supported by Moosbeckhoger and Derakhshifa (1986) and Shaver *et al.* (1993) referred to formic acid and lactic acid as efficiency chemical for controlling *V. jacobsoni* mite in the brood. They found that formic and lactic acid have no direct or side adverse effect on honeybee worker, drone or brood. Similar results were also obtained by Daniels *et al.* (1999) and Calderone (2000) who reported that formic and vapours have been shown to an acceptable alternative and or as consistent as Apistain (Fluvalinate) in the control of *V. jacobsoni*. At the same trend, Abou El-Enain *et al.* (2007) who indicated that colonies treated with formic acid 60% were higher in the amount of broad rearing, stored pollen and honey than in untreated ones. On the other hand, Eissa *et al.* (2006) found that salcelate methyl 60% (2 cm³ /colony) was the highest varroa mortality (94.12 & 93.50%) after the four week of treatment during 2004 and 2005 seasons at El-Gharbia and Kafr El-Sheikh region, respectively. Mansour (2003) indicated that mitac 20% (acaricide) was the most effective compound on varroa mite; *V. jacobsoni* after a period of 8 days from treatment followed by malathion powder 1%, formic acid 60% while oxalic acid 0.4% had the least effect.

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تقييم بعض المواد الكيميائية لمكافحة طفيل الفاروا على نحل العسل

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أجرى هذا البحث بمنح محطة البحوث الزراعية بسخا - كفر الشيخ - مركز البحوث الزراعية خلال موسم ٢٠٠٨م وذلك لتقييم تأثير معاملة طوائف نحل العسل بخمسة مواد كيميائية وهى حمض الفورميك ٦٠% وسلسيلات الميثايل ٦٠% بمعدل ٢سم^٣ توضع على قطعة قطن على قاع الخلية أسفل أقراص الحضنة وشرائط البايفيرول بمعدل ٢ شريط تعلق وسط أقراص الحضنة فى الخلية والملاثيون بوندر ١% ثم الإيتنول بمعدل ٢جم يضاف مع محلول التغذية.

أوضحت النتائج المتحصل عليها أن الملاثيون ١% وحمض الفورميك ٦٠% كانت أكثر المركبات تأثيرا على طفيل الفاروا بنسبة ٨٩,٥٧% ، ٩٣,٧٥% على كل من الأفراد الكاملة للشغالات والذكور على الترتيب بعد الأسبوع الرابع من المعاملة وذلك خلال الفترة الأولى من ٢٠٠٨/٢/٢٨م إلى ٢٠٠٨/٢/٢٨م أما خلال الفترة الثانية من ٢٠٠٨/٩/١م إلى ٢٠٠٨/٩/٢٨م أوضحت النتائج أن الملاثيون ١% أعطى معدل خفض فى تعداد الطفيل بنسبة ٩٣,١٥% ، ٩٤,٠٠% على كل من الشغالات والذكور بعد الأسبوع الرابع من المعاملة على الترتيب ومن ناحية أخرى فإن باقى المواد مثل حمض الفورميك ٦٠% والإيتنول بمعدل ٢جم وسلسيلات الميثايل ٦٠% وشرائط البايفيرول أعطت معدل خفض فى تعداد الطفيل بنسبة ٨٨,١٩% ، ٨٦,٦٧% ، ٨٤,٠٨% ، ٨٢,٠٠% على الشغالات على الترتيب بعد الأسبوع الرابع من المعاملة خلال الفترة الأولى أما خلال الفترة الثانية فإن حامض الفورميك ٦٠% وسلسيلات الميثايل ٦٠% بمعدل ٢سم^٣/خلية والإيتنول بمعدل ٢جم وشرائط البايفيرول أعطت معدل خفض فى تعداد الطفيل بنسبة ٨٨,١٣% ، ٨٨,١١% ، ٨٤,٢١% ، ٨٢,٨٦% على الشغالات على الترتيب بعد الأسبوع الرابع من المعاملة وفى نفس الاتجاه أيضا فإن حامض الفورميك ٦٠% وسلسيلات الميثايل ٦٠% والإيتنول وشرائط البايفيرول أعطت انخفاض عالى فى تعداد الطفيل بنسبة ٩١,٦٧% ، ٩١,١١% ، ٨٦,٦٧% ، ٨٤,١١% على الترتيب وذلك على الذكور بعد الأسبوع الرابع من المعاملة خلال الفترة الثانية. يتضح من الدراسة أنه يمكن للنحالين استخدام حامض الفورميك ٦٠% وسلسيلات الميثايل ٦٠% بمعدل ٢سم^٣ لكل خلية حيث كانت أكثر أمانا على النحل وذلك خلال فترتى الدراسة لمكافحة طفيل الفاروا.