

EFFICIENCY OF ABAMECTIN ALONE AND ITS COMBINATIONS WITH NATURAL AND KZ OILS AGAINST THE LEAFMINER FLY (*Melanogromyza phaseoli*) ON BEAN PLANTS

El-Bessomy, M. A. E.

Etay El-Baroud Agric. Res. Station, Plant Protection Research Institute, A.R.C, Egypt.

ABSTRACT

Efficiency of Abamectin, 1.8 % EC (Romactin) at different rates (120, 100, 80, 40 and 20 ml/feddan) and its combination with Natural and KZ oils against the leafminer fly (*Melanogromyza phaseoli*) on bean plants (*Phaseolus vulgaris*) was evaluated in the Nili plantation, 2003. The experiment was carried out at Etay El-Baroud Agricultural Research Station, El-Behera Governorate, Egypt.

The results revealed slight significant difference between the tested rates 120, 100 and 80 ml/fed., the efficiencies were 79.6, 69.8 and 66.6% for the three rates, respectively. So, it can be recommended the natural product Romactin at the rate of 80 ml/fed. to control this pest.

Regarding the toxicity of tested mixtures, the results indicated that there is no need for adding any Natural oil or KZ oil, where they had no impact on the toxicity of such compound. This in turn minimizes both costs of spray and environmental pollution to protect man's health.

INTRODUCTION

Bean (*Phaseolus vulgaris* L.) is one of the major vegetable crops and is considered as one of the main sources of plant protein. The leafminer *Melanogromyza phaseoli* is an economic insect pest attacking bean plants, especially those cultivated in the Nili plantation. The leaves may be severely injured by high densities of the leafminer larvae which feed on the juices resulting wounds and depositing eggs in some of the punctures. The hatched larvae cause significant damage by tunneling between the upper and lower leaf surfaces. This creates white tunnels which interfere with the photosynthetic process, delaying crop development and decreasing yield. On the other hand, Wolfenbarger and Wolfenbarger (1966), Levins *et al.* (1975), Abdallah *et al.* (1996) and Abd El-Wahab *et al.* (1999) found that leafminers directly affected tomato yield. Romactin is a natural product derived from the soil microorganism *Streptomyces avermitilis*. Abamectin, the active ingredient of this compound is used for controlling leafminer pests on vegetables.

Hamed (1999) studied the effect of mineral oils on the efficiency of Baythroid against whitefly and bollworms on cotton plants. The objectives of the present work were to get information on the role of mineral oil (KZ) and natural oil on the efficiency of Romactin against the leafminer fly on bean plants.

MATERIALS AND METHODS

Tested insecticides

1. Romactin 1.8% EC

The active ingredient is abamectin [a mixture containing a minimum of 80% Avermectin B, a (5-0-demethyl avermectin A, a) and a maximum of 20% Avermectin, B, 6 (5-0-demethyl-25-de (1-methylethyl) Avermectin A, a]. It was applied at rates of 120, 100, 80, 40 and 20 ml per feddan and its mixtures with either plant or mineral oils (KZ).

2. Oils

- a) **KZ oil 95% EC:** It is a mineral oil (petroleum oil), applied at the rate of 2 l/feddan mixing with Romactin.
- b) **Natural oil 97% EC:** It is a blend of vegetable oils, emulsifiers and antioxidant. It contains 93% pure vegetable oil, applied at the rate of 2.5 l/feddan mixing with Romactin.

Techniques used

An area of half feddan at Etay El-Baroud Agricultural Research Station Farm was divided into 64 plots including control (each plot is about 21 m²) in randomized blocks design and planted with bean seeds (*P. vulgaris*) var. Giza 6 on 25/9/2003. The first spray against leafminer larvae started on November 10th and the spray was repeated on November 25th, 2003. A knapsack sprayer with one nozzle was used. Randomized samples of 10 leaves per replicate at 0, 2, 5, 7, 10 and 15 days after each spray were kept in to paper bags and sent to laboratory for counting the larvae inside the tunnels between the upper and lower leaf surface using a binocular microscope according to the Ministry of Agriculture recommendation programme. The reduction percentages were calculated according to the equation of Henderson and Telton (1955). The mean of reduction percentage of the two sprays was calculated and presented in Tables (1, 2 and 3).

RESULTS AND DISCUSSION

The initial and residual effects of Romactin (Abamectin) alone and in combinations with Natural and KZ oils against larval population of leafminers *Melanogromyza phaseoli* infested bean plants were presented in Tables (1, 2 and 3).

1. Efficiency of Romactin alone

Data in Table (1) show the initial and residual effect of Romactin applied alone. The reduction percentages of the initial effect were found to be low and significant differences between the first three rates (120, 100 and 80 ml/fed.) and the latest two rates (40 and 20 ml/fed.) were observed. On the other hand, there were only slight significant differences among the first three rates.

The same trend was obtained in the case of the residual effect after 15 days of spraying. A highest reduction percentage (79.6%) was obtained for the highest rate of Romactin (120 ml/fed.) as compared with that determined in the lowest rate (20 ml/fed.) which gave the lowest reduction percentage (49%).

Table (1): Effect of Romactin (Abamectin) at different rates against leafminer *Melanogromyza phaseoli* infested bean plants.

Romactin rate of application	Pre-Count	Initial effect (48 h)		Residual effect								Mean	
				After 5 days		After 7 days		After 10 days		After 15 days			
		A	B	A	B	A	B	A	B	A	B	A	B
120 ml/fed.	16	13	43.1 a	10	61.3	5	82.8	5	83.4	3	90.8	6.5	79.6 a
100 ml/fed.	14	13	35.0 a	12	46.9	6	76.4	7	73.5	5	82.5	7.5	69.8a
80 ml/fed.	18	17	33.9 a	16	44.9	8	75.6	11	67.6	8	78.2	10.8	66.6 a
40 ml/fed.	18	18	30.0 b	17	41.4	10	69.4	13	61.7	11	70.1	12.8	60.7 b
20 ml/fed.	15	15	30.0 b	15	38.0	12	56.6	15	47.0	14	54.3	14.0	49.6 c
Control	18	26	-	29	-	33	-	34	-	37	-	-	-

A: Number of larvae inside the tunnels of 40 leaves taken after 2, 5, 7, 10 and 15 days of spraying (10 leaves x 4 replicates).

B: % reduction (calculated according to the equation of Henderson and Telton, 1955).

Means followed by the same letter are not significantly different according to analysis of variance at 0.05 level.

2. Effect of Natural plant Oils on Romactin

Data in Table (2) show the effect of natural plant oil on the efficiency of Romactin at the same rates. The results showed that both Abamectin and (Abamectin + natural oil) had low initial effect. On the other hand, a slight increase in the mean values of reduction percentage, especially at the rates of 100, 80, 40 and 20 ml/fed., was observed.

3. Effect of KZ oil

Table (3) shows the effect of KZ oil on Romactin efficiency. The results showed that the addition of KZ oil did not affect the efficiency of the compound, where slight increase in the efficiency at the rates of 100, 80, 40 and 20 ml/fed.

The lower initial effect may be related to feeding periods on the treated bean leaves or delaying mortality due to the time of larval pupal molting. The same conclusion was noted by Ramesh Arora *et al.*(1996), who concluded that the high residual mortality may be due to delayed mortality at the time of larval moult to pupae.

Finally, spraying Romactin alone gave satisfactory efficiency with insignificant differences at three rates of 120, 100 and 80 ml/fed. Adding the oils led to slight increasing at the rates of 100, 80, 40 and 20 ml/fed. These results may be supported with those obtained by Hamed (1999), who found that addition of cotton seed oil to the lower rate of Baythroid caused insignificant decrease of the initial kill, while the residual activity was increased significantly when it was compared with the corresponding insecticide alone. Korke *et al.*(1996) found that adding any of mineral or

plant oils and acetic acid to half recommended rate of pyriproxyfen gave no effect on toxicity of such compound against the mature stage of whitefly.

Table (2): Effect of Natural oil of the rate of 2.5 L / Fed. on efficiency of Romactin (Abamectin) applied at different rates against leafminer *Melanogromyza phaseoli* infested bean plants.

Romactin rate of application	Pre-Count	Initial effect (48 h)		Residual effect								Mean	
				After 5 days		After 7 days		After 10 days		After 15 days			
		A	B	A	B	A	B	A	B	A	B	A	B
120 ml/fed. +Natural oil	16	13	43.1 a	9	65.1	6	79.3	5	83.4	3	90.8	5.8	79.7 a
100 ml/fed. +Natural oil	16	14	38.8 a	10	61.3	8	72.5	8	73.5	5	84.7	7.8	73.0 a
80 ml/fed. +Natural oil	16	15	34.4 a	11	57.4	10	65.6	9	70.2	7	78.6	9.3	68.0 a
40 ml/fed. +Natural oil	15	15	30.0 b	14	42.1	8	70.7	11	61.1	9	70.6	10.5	61.1 b
20 ml/fed. +Natural oil	17	17	30.0 b	17	38.0	14	54.7	13	59.5	13	62.5	14.3	53.7 b
Control	18	26	-	29	-	33	-	34	-	37	-	-	-

A: Number of larvae inside the tunnels of 40 leaves taken after 2, 5, 7, 10 and 15 days of spraying (10 leaves x 4 replicates).

B: % reduction (calculated according to the equation of Henderson and Telton, 1955).

Means followed by the same letter are not significantly different according to analysis of variance at 0.05 level.

Table (3): Effect of KZ oil on efficiency of Romactin (Abamectin) applied at different rates against leafminer *Melanogromyza phaseoli* infested bean plants.

Romactin rate of application	Pre-Count	Initial effect (48 h)		Residual effect								Mean	
				After 5 days		After 7 days		After 10 days		After 15 days			
		A	B	A	B	A	B	A	B	A	B	A	B
120 ml/fed. +KZ oil	13	11	40.8 a	7	66.6	4	83.1	4	83.7	4	84.9	4.8	79.6 a
100 ml/fed. +KZ oil	18	17	33.9 a	13	55.2	6	81.7	6	82.3	7	80.9	8.0	75.0 a
80 ml/fed. +KZ oil	18	17	33.9 a	15	48.3	6	81.7	7	79.4	8	78.2	9	71.9 a
40 ml/fed. +KZ oil	18	18	30.0 b	16	44.8	9	72.5	11	67.6	11	70.1	11.8	63.8 b
20 ml/fed. +KZ oil	15	15	30.0 b	14	42.1	8	70.7	12	57.6	13	57.5	11.8	57.0 b
Control	18	26	-	29	-	33	-	34	-	37	-	-	-

A: Number of larvae inside the tunnels of 40 leaves taken after 2, 5, 7, 10 and 15 days of spraying (10 leaves x 4 replicates).

B: % reduction (calculated according to the equation of Henderson and Telton, 1955).

Means followed by the same letter are not significantly different according to analysis of variance at 0.05 level.

In conclusion, no significant differences were found between the rates of 120, 100 and 80 ml/fed. when Romactin was applied alone, and Romactin can be used at the rate of 80 ml/fed. to control leafminer,

Melanogromyza phaseoli infested bean plants, *Phaseolus vulgaris*. Also, there is no need for adding any Natural oil or KZ oil because they had no significant effect on toxicity of such compounds.

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كفاءة مبيد الرومكتين (أبامكتين) منفرداً أو مخلوطاً مع الزيت الطبيعي والمعدني ضد صانعات الأنفاق على نباتات الفاصوليا مبروك عبد المنعم البسومي محطة البحوث الزراعية ببايتاى البارود - معهد بحوث وقاية النباتات - مركز البحوث الزراعية

أجرى هذا البحث في محطة البحوث الزراعية ببايتاى البارود - محافظة البحيرة في العروة النبيلة عام ٢٠٠٣ لتقييم كفاءة المبيد الطبيعي رومكتين منفرداً ١,٨ مركز قابل للاستحلاب أو مخلوطاً مع الزيت الطبيعي والمعدني ضد صانعات الأنفاق على نباتات الفاصوليا، وقد استخدم المبيد بتركيزات ١٢٠، ١٠٠، ٨٠، ٤٠، ٢٠ مل لكل فدان ثم مخلوطاً بالزيت الطبيعي ناتورال بمعدل ٢,٥ لتر/فدان والزيت المعدني كى زد بمعدل ٢ لتر/فدان. وقد أوضحت النتائج عدم وجود فروق معنوية بين التركيزات ١٢٠، ١٠٠، ٨٠ مل/فدان حيث كانت نسب الإبادة ٧٩,٦%، ٦٩,٨%، ٦٦,٦% للثلاث تركيزات على التوالي، وقد دلت النتائج أيضاً أن إضافة الزيوت أدت إلى زيادة طفيفة في الكفاءة مع التركيزات ١٠٠، ٨٠، ٤٠، ٢٠ مل/فدان. توضح هذه الدراسة أنه يمكن استخدام الرومكتين منفرداً بتركيز ٨٠ مل/فدان وأنه لا حاجة لإضافة الزيت الطبيعي أو المعدني إلى محلول المبيد في مكافحة هذه الحشرة وذلك لخفض تكاليف المكافحة والتلوث البيئي.