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EFFICIENCY OF CONVENTIONAL AND NON-CONVENTIONAL INSECTICIDE ON THE MAIN PESTS ATTACKING KIDNEY BEAN PLANTS AND THEIR EFFECTS ON SOME CROP PARAMETERS

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ABSTRACT

Experiments were carried out at Quesna, Menufyia governorate during season 2010 in summer plantation to evaluate the efficiency of conventional insecticide Sumithion (50 EC) or Fenitrothion and non-conventional insecticide against the main pests attacking kidney bean.

Regarding to the conventional insecticide Sumithion exhibited a high efficiency against *Aphis craccivora* (koch.) population with the highest percentage of reduction (83.4%) after two days from treatment, while the non- conventional insecticide liquid sulfur 30% caused the highest percentage of reduction 77.1 and 83.1% after 5 and 7 days from treatment.

With respect to the conventional insecticide Sumithion exhibited a high efficiency against *Bemisia tabaci* (Genn.) population with the highest percentage of reduction (93.7%) after two days from treatment, while the non- conventional insecticide Mineral oil and liquid sulfur 30% caused the highest percentage of reduction 85.0 and 84.5% after 5 and 7 days from treatment, respectively.

Results showed that, the conventional insecticide Sumithion exhibited a high efficiency against *Emposca discipiens* Poali population with the highest percentage of reduction (82.1%) after two days from treatment, while the conventional insecticide Sumithion and non- conventional Orange oil caused the highest percentage of reduction 53.8 and 60.5% after 5 days and 7 days from treatment, respectively.

In addition, the results revealed that, the conventional insecticide Sumithion exhibited a high efficiency against *Liriomyza trifolii* (Burgess) population with the highest percentage of reduction (75.5%) after two days from treatment, while the conventional insecticide Sumithion and non- conventional Liquid sulfur 30% caused the highest percentage of reduction 64.1 and 47.8% after 5 and 7 days from treatment, respectively.

The obtained results indicated that, the non- conventional insecticide Mineral oil exhibited a high efficiency against *Tetranychus urticae* (Koch.) population with the highest percentage of reduction 87.2% after two days from treatment, while the non-conventional insecticide Liquid sulfur 30% caused the highest percentage of reduction 76.8 and 81.8% after 5 and 7 days from treatment, respectively.

Regarding to the kidney bean crop parameters, the conventional insecticide Sumithion exhibited a high efficiency against the main pests on kidney bean, as a highest mean length of plants, the highest mean number of podes/ plant, the highest number of seeds/ pode and the highest mean weight of 100 seeds. On the other hand, the non-conventional pesticides Liquid Sulfur, Mineral oil, Orange oil and Bio-fly exhibited intermediate efficiency against the main pests on kidney bean with respect to the aforementioned parameters of the crop.

INTRODUCTION

Leguminous vegetable plants are very important in our agriculture map, which used as food in many countries of the world. Kidney bean (*Phaseolus vulgaris* L.) is considered one of the most important leguminous vegetable crops in Egypt. It has a great economic importance because of its local and global trading (Standsted, 1980; Karl and Maghogho , 1985; and Omar and Faris,2000).

It occupies the second grade in export among the legume crops. According to the report of The Department of Agricultural Economy, Ministry of Agriculture, (2003),the cultivated area of this crop was estimated at 15792 hectare for green pods and 11529 hectare for dry seed. Kidney bean contains 24.9% protein, 62% starch. In addition, it contains some minerals such as Fe, Ca, Mg and P and some vitamins such as vitamin A, B1, B2 and vitamin C (Standsted, 1980).

In Egypt, kidney bean usually infested by different pests causing considerable damage in both quantity and quality of the pods. The considerable pests that attack this crop are leafminer, white fly, aphid, leafhopper and tetranychid mite (Awadalla *et al*., 1991; Abd El-Gawwad, 2004; Abbassy *et al*., 2008; and Abd-Allah, 2010).

The leafminer, *Liriomyza trifolii* (Burgess) is considered a very important insect pest, which cause several infestations on the leaves as yellowish and dryness of leaves leading to the weakness of metabolism and consequently lack in crop. The white fly, *Bemisia tabaci* (Genn.), the leafhopper *Empoasca discipiens* (Paoli) and aphid, *Aphis craccivora* (Koch) are also, considered main insect pests infesting common bean and cause serious damage to the plant and yield (Shalaby, 2004; Shaalan, 2005 and Abd-Allah, 2010).

As a result to extensive, continued and unwise use of chemicals, several problems have been created in the environment among which environment pollution, unbalance between pests and their natural enemies, accumulation of pesticides residues in water and growing plants, damage to human health and his domestic animals, fish and honeybees. It is the time to consider that production of pesticide free vegetables and fruits as a main target to avoid human health problems. So, the new philosophy in pest control programs depends on the use of I.P.M. programs in which all possible and available methods can be applied to reach reasonable pests control and minimizing the environmental pollution (Mousa and Taha, 2001; Abou-Zaid, 2007; Soliman *et al*., 2007; Abbassy *et al*., 2009; Abd-Allah, 2010 and El-Naggar and Aref, 2010).

Therefore, the present work aimed to study the efficiency of some conventional and non-conventional pesticides on the main pests attacking kidney bean and their influence on the yield.

MATERIALS AND METHODS

The experiments were carried out at Quesna, Menufyia governorate during season 2010 in summer plantation to evaluate the efficiency of conventional insecticide Sumithion (50 EC) or Fenitrothion and non-conventional insecticide against the main pests attacking kidney bean.

The area of this experiment about 1200 m^2 was divided into 24 replications. All agricultural practices were carried out in this experiment without any spraying with pesticides. By using a knapsack sprayer (20 liter) the compounds were sprayed, the sprayer was filled the prepared concentration just before each treatment. Common bean plants were treated five times on April 23rd for one season 2010.

The compound tested :-

1- Liquid sulfur 30 % (K2) with concentration 5 ml/litre water.
2- Mineral oil (star oil 98%) with concentration 10 ml/litre water.
3- Orange oil (prev AM 6%) with concentration 5 ml/litre water.
4- Bio-fly (local)*Beauveria bassiana* with concentration 2 ml/litre water.
5- Sumithion 50 EC (fenitrothion) with concentration 2.5 ml/litre water.
6- Control, without using any compounds.

Inspection of plants was carried out before spraying and after 2, 5 and 7 days from application to calculate the effect of the different treatments on the number of pests under study. Then the second spray have been done and so on.

Direct count of the pests in the replicates on random samples of 30 leaflets replicate then these samples transferred to the laboratory to investigation with the aid of stereomicroscope.

The percentage of population reduction (% mortality) was calculated according the equation of Henderson and Tilton (1955) as following:-

$$\text{Reduction (\% mortality)} = [1- (\frac{Cb}{Ca} X \frac{Ta}{Tb})] X 100$$

Where,
T = Number of alive insect individual in treatment.
C = Number of alive insect individual in control.
a = Number of alive insect individual after treatment.
b = Number of alive insect individual before treatment.

Thereafter the mean length of the plant, mean number of podes, mean number of seeds per pode and the mean weight of 100 seed for each treatment were counted.

The statistical analysis (ANOVA and simple correlation) of the obtained data were performed by using SAS program (SAS Institute, 1988) which run under WIN. Also the difference between means was conducted by using Duncan's multiple range test in this program.

RESULTS AND DISCUSSION

A- Efficiency of conventional and non-conventional insecticide on the main pests of kidney bean:-

1- The leguminous aphid (*A. Craccivora*):-

Data illustrated in Table (1) represented the efficiency of some non-conventional insecticide and conventional insecticide (Sumithion) on the percentage of reduction of *A. craccivora* after 2, 5 and 7 days from treatments. The obtained data revealed that the highest percentage of reduction of *A. craccivora* nymphs noticed after 2 days 83.4% caused by Sumithion treatment and the lowest percentage of reduction was 41.1% caused by Bio-fly. While after 5 days the highest percentage of reduction was 77.1% caused by Liquid sulfur and the lowest percentages of reduction were 49.9, 53.9 and 54.1% caused by Bio-fly, Mineral oil and Sumithion, respectively. Meanwhile, after 7 days, the highest percentage of reduction 83.1% caused by Liquid Sulfur and the lowest percentage of reduction 32.2% caused by Sumithion.

Table (1): Efficiency of some non-conventional and conventional insecticide (Sumithion) on the percentage of reduction of the aphids *(A. craccivora*) infesting kidnay bean .

Treatment	Rate of application	The percentage of reduction %		
		After 2 days	After 5 days	After 7 days
Liquid Sulfur 30% (K2)	5 ml/L	61.1 c	77.1 a	83.1 a
Mineral oil (star oil 98%)	10 ml/L	67.8 b	53.9 c	51.5 c
Orange oil (Prev AM 6%)	5 ml/L	73.7 b	69.4 b	50.6 c
Bio-fly (Beauveria bassiana)	2 ml/L	41.1 d	49.9 c	57.6 b
Sumithion (50 EC) Fenitrothion	2.5 ml/L	83.4 a	54.1 c	32.2 d

Values labeled with the same letters in a column are not significantly different at the 1% level of probability (One way ANOVA).

As a conclusion, the conventional insecticide Sumithion exhibited a high efficiency against A. craccivora population with the highest percentage of reduction (83.4%) after two days from treatment, while the non-conventional insecticides, liquid sulfur 30% caused the highest percentage of reduction 77.1 and 83.1% after 5 days and 7 days from treatment, respectively. These results are in agreement with those reported by Mousa and Taha, 2001 who mentioned that, mineral oil exhibited a high efficiency against aphids on some vegetable crops. Omara *et al*., 1997 revealed that Anskpe at 4% (neem seed kernel powder) reduced the number of A. craccivora by 79.98%, while Neem Azal-F (5% Azadirachtin) reduced the population by 87.07% on faba bean. El-Naggar and Aref, 2010, mentioned that the mineral oil (Kz-oil) induced a moderate initial and residual effect, where exhibited (63.7-64.6%) and (65.1-65.3%) reduction on the aphid population during the two seasons 2007 and 2008, respectively.

As shown in Table (2) the highest percentage of reduction of *B. tabaci* after 2 days was 93.7 and 89.5 % caused by Sumithion and mineral oil, respectively, while the lowest percentage of reduction 11.0% caused by Bio-

fly. After 5 days the highest percentage of reduction caused by Mineral oil and Liquid Sulfur which represented by 85.0%, respectively and the lowest percentage of reduction 27.4% caused by Bio-fly. Meanwhile after 7 days the highest percentage of reduction caused by Liquid Sulfur and Mineral oil, which represented by 84.5% and 80.0, respectively, while, the lowest reduction rate was 31.0 % reduction rate was caused by Sumithion.

As a conclusion, the conventional insecticide Sumithion exhibited a high efficiency against *B. tabaci* population with the highest percentage of reduction (93.7%) after two days from treatment, while the non- conventional insecticide Mineral oil and liquid sulfur 30% caused the highest percentage of reduction 85.0 and 84.5% after 5 days and 7 days from treatment, respectively. These results are in agreement with those obtained by El-Naggar and Aref, 2010 who reported that the mineral oil (Kz-oil) gave a moderate initial and residual effect, where exhibited (72.2 and 74.9%) reduction against *B. tabaci* population, respectively.

Table (2): Efficiency of some non-conventional and conventional insecticide (Sumithion) on the percentage of reduction of the white fly (*B. tabaci*) infesting kidnay bean .

Treatment	Rate of application	The percentage of reduction %		
		After 2 days	After 5 days	After 7 days
Liquid Sulfur 30% (K2)	5 ml/L	73.6 b	83.3 a	84.5 a
Mineral oil (star oil 98%)	10 ml/L	89.5 a	85.0 a	80.0 a
Orange oil (Prev AM 6%)	5 ml/L	88.9 a	57.3 b	46.0 c
Bio-fly (*Beauveria bassiana*)	2 ml/L	11.0 c	27.4 c	72.1 b
Sumithion (50 EC) Fenitrothion	2.5 ml/L	93.7 a	55.7 b	31.0 d

Values labeled with the same letters in a column are not significantly different at the 1% level of probability (One way ANOVA).

Data represented in Table (3) indicated that the highest percentage of reduction of *E. discipiens* after two days 82.1% caused by Sumithion and the lowest average percentage of reduction 7.7% caused by Bio-fly, while after 5 days, the highest percentage of reduction 53.8% caused by Sumithion and the lowest percentage of reduction caused by Mineral oil and Bio-fly which represented by 9.4 and 11.0%, respectively. Meanwhile, after 7 days, the highest percentage of reduction 60.5% caused by Orange oil and the lowest percentage of reduction 4.2% caused by Mineral oil.

As a conclusion, the conventional insecticide Sumithion exhibited a high efficiency against *E. discipiens* population with the highest percentage of reduction (82.1%) after two days from treatment, while the conventional insecticide Sumithion and non- conventional Orange oil caused the highest percentage of reduction 53.8 and 60.5% after 5 days and 7 days from treatment, respectively.

Table (3): Efficiency of some non-conventional and conventional insecticide(Sumithion) on the percentage of reduction of the potato leafhopper (*E. discipiens*) infesting kidnay bean

Treatment	Rate of application	The percentage of reduction %		
		After 2 days	After 5 days	After 7 days
Liquid Sulfur 30% (K2)	5 ml/L	16.6 d	20.4 c	23.7 c
Mineral oil (star oil 98%)	10 ml/L	26.7 c	09.4 d	04.2 e
Orange oil (Prev AM 6%)	5 ml/L	38.9 b	41.7 b	60.5 a
Bio-fly (*Beauveria bassiana*)	2 ml/L	07.7 e	11.0 d	33.3 b
Sumithion (50 EC) Fenitrothion	2.5 ml/L	82.1 a	83.8 a	17.3 d

Values labeled with the same letters in a column are not significantly different at the 1% level of probability (One way ANOVA).

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Data arranged in Table (4) showed that the highest percentage of *L. trifolii* after 2 days 75.5% caused by Sumithion and the lowest percentage of reduction 7.8% caused by Bio-fly, while, after 5 days, the highest rate of reduction 64.1% caused by Sumithion and the lowest percentage of reduction 12.7% caused by Bio-fly. Meanwhile after 7days, the highest percentage of reduction 47.8% caused by Liquid Sulfur and the lowest percentage of reduction 33.3, 36.1, 37.1 and 37.9% caused by Orange oil, Bio-fly, Sumithion and Mineral oil, respectively.

Table (4): Efficiency of some non-conventional and conventional insecticide (Sumithion) on the percentage of reduction of the serepentine leaf miner (*L. trifolii*) infesting kidnay bean.

Treatment	Rate of application	The percentage of reduction %		
		After 2 days	After 5 days	After 7 days
Liquid Sulfur 30% (K2)	5 ml/L	29.7 c	37.1 b	47.8 a
Mineral oil (star oil 98%)	10 ml/L	40.0 b	39.2 b	47.9 b
Orange oil (Prev AM 6%)	5 ml/L	29.5 c	27.9 c	33.3 c
Bio-fly (*Beauveria bassiana*)	2 ml/L	07.8 d	12.7 d	36.1 b
Sumithion (50 EC) Fenitrothion	2.5 ml/L	75.5 a	64.1 a	37.1 b

Values labeled with the same letters in a column are not significantly different at the 1% level of probability (One way ANOVA).

As a conclusion, the conventional insecticide Sumithion exhibited a high efficiency against *L. trifolii* population with the highest percentage of reduction (75.5%) after two days from treatment, while the conventional insecticide Sumithion and non- conventional Liquid sulfur 30% caused the highest percentage of reduction 64.1 and 47.8% after 5 and 7 days from treatment, respectively. These results are in agreement with the findings of Omara *et al*., 1997 who found that Anskpe at 4% (Neem seed kernel powder) and Neem Azal-F (5% Azadirachtin) on L. trifolii infesting faba bean had a slight effect on the larval population. Abbassy *et al*., 2008 indicated that, spraying of common bean plants with bio-insecticide significantly reduced the number of leafminer *L. trifolii* larvae. They noticed also that Spinosad (24% WG) was the most effective bio-insecticide followed by Agerin.

The obtained data in Table (5) indicated that the highest percentage of reduction of *T. urticae* after 2 days caused by Mineral oil and orange oil which represented by 87.2 and83.7%, respectively, and the lowest percentage of reduction caused by Sumithion and Bio-fly which represented by 19.1 and 24.6%, while after 5 days the highest percentage of reduction caused by Liquid Sulfur and Mineral oil which represented by 76.8 and 75.2%, respectively and the lowest percentage of reduction 17.3% caused by Sumithion. Meanwhile, after 7 days the highest percentage of reduction 81.8% caused by Liquid Sulfur and the lowest percentage of reduction 15.2% caused by Sumithion.

Table (5): Efficiency of some non-conventional and conventional insecticide (Sumithion) on the percentage of reduction of the red spider mite (*T. urticae*) infesting kidnay bean .

Treatments	Rate of application	The percentage of reduction %		
		After 2 days	After 5 days	After 7 days
Liquid Sulfur 30% (K2)	5 ml/L	63.5 b	76.8 a	81.8 a
Mineral oil (star oil 98%)	10 ml/L	87.2 a	75.2 a	59.4 b
Orange oil (Prev AM 6%)	5 ml/L	83.7 a	58.5 b	44.3 c
Bio-fly (*Beauveria bassiana*)	2 ml/L	24.6 c	26.1 c	27.2 d
Sumithion (50 EC) Fenitrothion	2.5 ml/L	19.1 c	17.3 d	15.2 e

Values labeled with the same letters in a column are not significantly different at the 1% level of probability (One way ANOVA).

As a conclusion, the non- conventional insecticide, Mineral oil exhibited a high efficiency against *T. urticae* population with the highest percentage of reduction 87.2% after two days from treatment, while the non- conventional insecticide, Liquid sulfur 30% caused the highest percentage of reduction 76.8 and 81.8% after 5 and 7 days from treatment, respectively. These results are in agreement with those of Soliman *et al*., 2007 who mentioned that the environmental safe compounds mixture of Vertimec and Super Misrona Mineral oil exhibited the highest percentage of reduction of the population of two-spotted spider mite *T. urticae* on soybean plants. Abou-Zaid, 2007 who indicated that, Mineral oil caused more than 70% reduction on *T. urticae* population from the 3rd to the 7th day after treatment. Abbassey *et al*., 2009 found that Super Misrona oil, micronized sulfur and liquid sulfur gave approximately similar reduction on *T. urticae* population 75.10, 69.15 and 72.02%, respectively.

B- Influence of conventional and non-conventional insecticide on crop parameters:-

The object of this study was to find what is the non-conventional compound which would be safety applied in reducing the population of main pests on kidney bean crop. The results of this study revealed that, the highest mean length of plant was 47.4±2.4 cm caused by Sumithion followed by 45.8±2.2 cm by Mineral oil and 45.4±2.8 cm caused by Orange oil. On the other hand, the lowest mean length was 40.0±0.8 cm (Control) followed by 41.8±2.2 cm caused by Liquid Sulfur and 43.4±2.4 cm caused by Bio-fly with significant differences (Table 6).

Table (6): Efficiency of some non-conventional and conventional insecticide (Sumithion) on some parameters of crop.

Treatment	Mean length of plant/cm	Mean No. of podes/ plant	Mean No.of seeds /pode	Mean weight of 100 seeds /gm
Liquid Sulfur 30% (K2)	41.8±2.2 bc	23.6±2.8 a	4.7±0.1 a	46.7±0.6 c
Mineral oil (star oil 98%)	45.8±2.2 b	17.8±2.3 ab	4.8±0.1 a	51.4±0.7 a
Orange oil (Prev AM 6%)	45.4±2.8 b	15.9±4.7 ab	4.9±0.1 a	48.8±0.7 b
Bio-fly (*Beauveria bassiana*)	43.4±2.4 bc	15.4±3.7 ab	4.6±0.1 a	47.1±0.6bc
Sumithion (50 EC) Fenitrothion	47.4±2.4 a	25.2±6.3 a	5.1±0.1 a	52.2±0.7 a
Control	40.0±0.8 c	10.8±1.8 b	4.5±0.1 a	44.0±0.6 d

Values labeled with the same letters in a column are not significantly different at the 1% level of probability (One way ANOVA).

Data in Table (6) showed that the highest mean number of podes/plant 25.2±6.3 podes/plant caused by Sumithion followed by 23.6±2.8 caused by Liquid Sulfur and 17.8±2.8 caused by Mineral oil. On the other hand, the lowest mean number of podes/plant 10.8±1.8 (Control) followed by 15.4±3.7 caused by Bio-fly and 15.9±4.7 caused by Orange oil with significant differences.

Data illustrated in Table (6) showed that the highest mean number of seeds /pode was 5.1±0.1 caused by Sumithion, followed by 4.9±0.1, 4.8±0.1, 4.7±0.1, 4.6 and 4.5 caused by Orange oil, mineral oil, Liquid Sulfur, Bio-fly and control, respectively without any significant differences between them.

Data presented in table(6) indicated that the highest mean weight of 100 seeds (gm) was 52.2±0.7 gm caused by Sumithion, followed by 51.4 ±0.7, 48.8±0.7, 47.1±0.6, 46.7±0.6 and 44.0±0.6 (gm) caused by Mineral oil, Orange oil, Bio-fly, Liquid Sulfur and Control with significant differences between them.

As a conclusion, Data illustrated in Table(6) indicated that the conventional insecticide Sumithion exhibited a high efficiency against the main pests on kidney bean, as a highest mean length of plants, the highest mean number of podes/ plant, the highest number of seeds/ pode and the highest mean weight of 100 seeds. On the other hand, the non-conventional pesticides Liquid Sulfur, Mineral oil, Orange oil and Bio-fly exhibited intermediate efficiency against the main pests on kidney bean with respect to the previously mentioned parameters of the crop. These results are in agreement with Awadlla *et al*., 1991 who found that the effect of insecticides, Thiodicarb, Cypermethrin and Profenfos in their combinations with the two IGR's Chloroflauzura and Flufenoxuron were able to increase significantly the number of fruits per plant as well as the weight of 100 seeds and sequently, the crop yield of soybean increased. Omar and Faris, 2000 reported that the effect of bio-insecticide in controlling *L. trifolii* results in the highest quality and quantity of green yield of different varieties of common bean.

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فاعلية بعض المبيدات التقليدية و الغير تقليدية على الأفات الرئيسية التى تهاجم محصول الفاصوليا و أيضا تأثيرها على بعض خصائص المحصول.

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أجريت هذه الدراسات الحقلية بمركز قويسنا –محافظة المنوفية خلال العروة الصيفية بموسم 2010 وذلك لتقيم فاعلية المبيد التقليدى (السوميثيون) و بعض المبيدات الأخرى الغير تقليدية ضد الأفات الرئيسية التى تهاجم محصول الفاصوليا .

و أوضحت الدراسات أنه فى حالة مبيد السوميثيون سجلت أعلى نسبة خفض فى تعداد المن بنسبة 83.4% و ذلك بعد 2 يوم من المعاملة بينما كان الكبريت السائل 30% هو أعلى تأثير بعد 5 و 7 أيام بنسبة 77.1% و 83.1%من المعاملة على التوالى.

أحدث مبيد السوميثيون أعلى نسبة خفض على الذبابة البيضاء بعد 2 يوم من المعاملة بنسبة 93.7% بينما كان للزيت المعدنى أعلى نسبة بعد 5 أيام حيث سجل 85% وسبب الكبريت السائل أعلى نسبة بعد 7 أيام حيث سجل 84.5%.

كما أعطى ايضا للسوميثيون أعلى نسبة خفض بعد 2 يوم على تعداد نطاط أوراق البطاطس بنسبة 82.1% و أيضا أعلى نسبة خفض بعد 5 أيام بنسبة 53.8% بينما كان لزيت الموالح أعلى نسبة خفض بعد 7 أيام بنسبة 60.5%.

أما بالنسبة لصانعة أنفاق أوراق الفول فقد أحدث السوميثيون أعلى نسبة خفض بعد 2 يوم بنسبة 75.5% و أيضا بعد 5 أيام بنسبة 64.1%. و لكن بعد 7 أيام كان الكبريت السائل أعلى نسبة خفض بنسبة 47.8%.

كما لوحظ أن الزيت المعدنى قد تسبب فى أعلى نسبة خفض فى تعداد العنكبوت الأحمر بعد يومين بنسبة 87.2% وسبب الكبريت السائل خفض التعداد بنسبة 76.8% و 81.8% بعد 5و7 أيام على التوالى

و بصفة عامة فقد كان لمبيد السوميثيون أعلى فاعلية ضد معظم الحشرات التى تهاجم محصول الفاصوليا يليه الكبريت السائل , الزيت المعدنى ,زيت الموالح ثم البيوفلاى على التوالى . حيث كان لمبيد السوميثيون أفضل فاعلية على طول النبات ,متوسط عدد القرون فى النبات , عدد البذور فى النبات و أيضا متوسط وزن ال100 بذرة.

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