J. Plant Prot. and Path., Mansoura Univ., Vol. 4 (6): 571 - 580, 2013

EFFICIENCY OF SOME CONVENTIONAL AND NON-CONVENTIONAL INSECTICIDES ON THE MAIN INSECT PESTS ATTACKING FABA BEAN PLANTS

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ABSTRACT

The present study was carried out at the experimental farm of Sakha Agricultural Research Station, Kafr El-Sheikh Governorate during two successive seasons, 2011/12 and 2012/13 to evaluate the influence of some conventional (Malathion extra or Max Sped) and non-conventional insecticides on the main insect pests attacking faba bean plants.

The conventional insecticide Malathion-Extra exhibited a high efficiency against *Aphis craccivora* (Koch.) population with the highest average percentage of reduction (86.26 ±7.64 % and 94.34±2.85 %) followed by Capel 2 (72.13 ±6.20 % and 79.69±5.75 %) during the two seasons; 2011/12 and 2012/13, respectively.

The conventional insecticide Malathion-Extra exhibited a high efficiency against *Empoasca* spp. population with the highest average percentage of reduction (51.52±11.19 % and 58.83±5.45 %) followed by Capel 2 (40.88±10.14% and 54.09±7.50 %) during the two seasons, respectively.

The conventional insecticide Max Sped exhibited a high efficiency against *Liriomyza trifolii* (Burgess) larval population with the highest average percentage of reduction (75.97±10.52 % and 67.25±13.94 %) followed by Capel 2 in the first season (75.63± 4.19 %) and Bioguard in the second one (57.10±12.15%).

The statistical analysis revealed significant differences among average percentages of reduction of aforementioned insect pests and the used compounds during the two successive seasons.

INTRODUCTION

Faba bean (*Vicia faba* L.) is considered one of the most important economic crops in Egypt. It ranks the first leguminous food and considered the main source of plant protein. However, production of this crop has been constrained by the limitations imposed by insect pests and diseases (Metwally *et al.*, 1997).

Faba bean plants are attacked by several insect pests which cause a considerable damage, e.g. the serpentine American leaf miner, *Liriomyza trifolii* (Burgess) (Diptera : Agromizidae); cowpea aphid, *Aphis craccivora* (Koch.) (Homoptera:Aphididae) and leafhopper, *Emposaca* spp. (Homoptera : Cicadellidae) that affect on the quality and quantity of faba bean yield (Aly and Markadey, 1990; Abdallah, 2000 and Mohamed and Slman, 2001).

These pests are polyphagous and have a wide range of hosts. Some of the species are known to be of great economic importance. It causes direct damage by transmitting several microorganisms such viral and fungal

pathogens (Hegab, 2008 and El-Defrawi *et al.*, 2000). 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 pesticide residues in water and growing plants, troubles in human health so, it is needed to use safer compounds such the non-conventional insecticides.

The present work aimed to study the efficiency of some conventional and non-conventional insecticides on the main insect pests attacking faba bean plants.

MATERIALS AND METHODS

The present study was carried out at the experimental farm of Sakha Agricultural Research Station, Kafr El-Sheikh Governorate during two successive seasons, 2011/12 and 2012/13 to evaluate the effect of some conventional and non-conventional insecticides on the main insect pests attacking faba bean plants. Sakha2 variety was chosen as recommended variety in Kafr El-sheikh governorate. The area was planted on mid-November in two seasons.

1- The first experiment was applied on the first of January to estimate efficiency of some compounds (Table 1) on *A. craccivora* where, the area of the experiment was divided into 32 replicates (4 replicates × 8 treatments) and direct counts were done of *A. craccivora* in the replicates on random samples of 5 plants per replicate (20 plants for each treatment).
2- The second one was applied on the first of February to estimate these compounds on *L. trifolii* and *Emposca* spp.. Samples of 25 leaflets per replicate (four replicates per compound) were taken and number of survive larvae were recorded. Concerning of *Emposca* spp., direct counts were done in the replicates on random samples of 25 leaflets per replicate.

Inspection of plants was carried out before spraying and after 24 hours, 3, 5, 7, 10, 15 days from application. The tested compounds were applied using low volume spray ordinary knapsack sprayer (20 litre) with one atomizer ensuring full coverage to the plants. Seven compounds (Table 1) were used, in addition to the untreated plot (control).

Table (1): Trade name, common name and the rate of application for the different compounds.

Trade Name	Common Name	The rate
Biofly	*Beauveria bassiana*	200 ml. / 10 lit.
Bioguard	*Bacillus thuringiensis*	250 gm / 50 lit.
Safe oil 0.03% EC	Azadirachtin	500 ml. / 100 lit.
Capel 1 96.62% EC	Mineral oil	1.5%
Capel 2 96.62% EC	Mineral oil	1.5%
Malathion extra 57% EC	Malathion	150 ml. / 100 lit.
Max Sped 2.5% EC	Lambada	250 ml. / 100 lit.

All compounds were obtained from Field Crops Pests Department, Plant Protection Research Institute.

To calculate the percentage of reduction, Henderson and Tilton formula (**Henderson and Tilton, 1955**) was used:

$$\text{Reduction \%} = \left\{1 - \left(\frac{\text{Number in treatment after} \times \text{Number in control before}}{\text{Number in treatment before} \times \text{Number in control after}}\right)\right\} \times 100$$

Statistical analysis

Data were subjected to analysis of Variance (ANOVA), and means were compared using Duncan's Multiple Range Test (1955) and Least Significant Differences (LSD).

RESULTS AND DISCUSSION

1. The cowpea aphid, *Aphis craccivora* koch.

Data presented in Tables (2 and 3) and figure (1) show the influence of some conventional (Malathion-Extra) and non-conventional insecticides on *A. craccivora* individuals under field condition during 2011/12 and 2012/13 seasons.

In the first season(2011/12), the highest percentage of aphid reduction after 24 hrs from application was caused by the non-conventional insecticide, Capel 2 (52.87%) followed by Malathion-Extra (51.46%) while, there was no effect caused by Biofly and Bioguard after 24 hr, afterward the highest percentage of reduction resulted from the conventional insecticide Malathion-Extra (98.11%) after 15 days. In general, the highest average percentage of reduction was caused by the conventional insecticide Malathion-Extra (86.26 ±7.64 %) followed by Capel 2 (72.13±6.20 %) and the lowest average percentage of reduction was caused by Bioguard (31.65 ±11.50 %) (Table 2 and Fig 1).

In the second season (2012/13), the highest percentage of aphid reduction after 24 hrs from application was caused by the conventional insecticide, Malathion-Extra (80.91%) followed by Capel 2 (68.03%) while, there was no effect was caused by Biofly after 24 hr, afterward the highest percentage of reduction caused by Malathion-Extra (98.42%) after 15 days. The highest average percentage of reduction was caused by Malathion-Extra (94.34±2.85 %) followed by Capel 2 (79.69±5.75 %) and the lowest average percentage of reduction was caused by Bioguard (52.75±8.75%) (Table 3 and Fig.1).

As a conclusion, the conventional insecticide Malathion-Extra exhibited the highest efficiency against *A. craccivora* population with the highest average percentage of reduction (86.26 ±7.64 % and 94.34±2.85 %) followed by Capel 2 (72.13 ±6.20 % and 79.69±5.75 %). The least average percentage of reduction was caused by the non-conventional insecticide Bioguard (31.65 ±11.50 % and 52.75±8.75%) during the two seasons, respectively. The statistical analysis revealed significant differences among

average percentage of reduction of aphid population during the two successive seasons.

These results are in agreement with the findings of Abdallah *et al.* (2000) who showed that all tested oils gave a strong and clear effect against aphids. El-Khawas *et al.* (2004) found that the chemical insecticide (Confidor) induced the highest percentages of reduction in the population density of *A. ccracivora*. El-Samahy (2008) found that the highest average reduction percentage in aphid resulted from Malathion (99.76%).

Table (2): Influence of some conventional (Malathion-Extra) and non-conventional insecticides on the reduction of *Aphis craccivora* under field condition during 2011/12 season.

Compound	Reduction % after						Av.±SE
	24 hrs	3 days	5 days	7 days	10 days	15 days	
Biofly	0	5.50	56.28	29.26	70.80	78.12	39.99± 13.91 b
Bioguard	0	2.89	22.60	41.44	64.87	58.10	31.65 ±11.50 a
Safe oil	19.51	51.13	62.15	49.86	69.26	80.49	55.40 ±8.75 c
Capel1	4.09	57.10	55.47	78.36	79.32	81.75	59.35 ±12.27 c
Capel 2	52.87	53.29	77.86	82.46	83.64	82.66	72.13 ±6.20 d
Malathion-Extra	51.46	80.34	97.24	98.01	92.37	98.11	86.26 ±7.64 e
LSD at 5%							6.50

In a column, means followed by the same letter are not significantly different at the 5% level

Table (3): Influence of some conventional (Malathion-Extra) and non-conventional insecticides on the reduction of *Aphis craccivora* under field condition during 2012/13 season.

Compound	Reduction % after						Av.±SE
	24 hrs	3 days	5 days	7 days	10 days	15 days	
Biofly	0	46.00	54.97	62.79	79.10	84.06	54.49±12.62 a
Bioguard	28.62	28.00	50.23	71.33	61.50	76.84	52.75±8.75 a
Safe oil	40.24	74.80	88.15	76.21	70.72	76.81	71.16±6.76 bc
Capel1	10.06	62.31	63.45	83.83	86.00	90.14	65.97±12.43 b
Capel 2	68.03	57.29	84.96	87.63	88.26	91.96	79.69±5.75 c
Malathion-Extra	80.91	94.51	95.26	97.51	99.4	98.42	94.34±2.85 d
LSD at 5%							10.5

In a column, means followed by the same letter are not significantly different at the 5% level

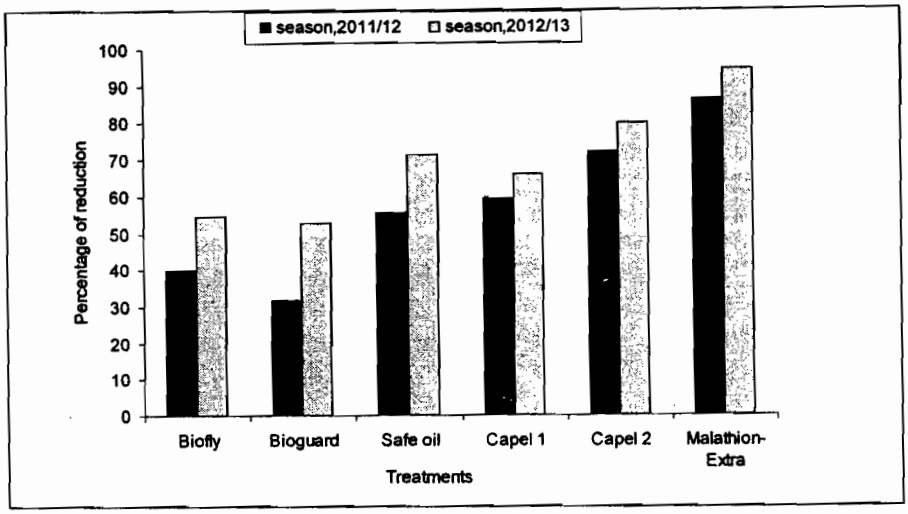

Fig (1): Influence of conventional (Malathion-Extra) and some non-conventional insecticides on the average percentage of reduction of *Aphis craccivora* under field condition during 2011/12 and 2012/13 seasons.

2. The leafhopper, *Empoasca* spp.

Data presented in Tables (4 and 5) and illustrated in Figure (2) show the influence of some conventional (Malathion-Extra) and non-conventional insecticides on the percentage of reduction of *Empoasca* spp. under field condition during 2011/12 and 2012/13 seasons.

The obtained results in the first season revealed that the highest percentage of leafhopper reduction after 24 hrs from application resulted from the conventional insecticide, Malathion-Extra (61.50%) and the lowest reduction caused by the non-conventional insecticide, Bioguard. Afterwards, the highest percentage of reduction was caused by Malathion-Extra (90%) followed by Capel2 (73.74%) after 10 and 15 days, respectively. The highest average percentage of reduction was caused by Malathion-Extra (51.52±11.19 %) followed by Capel 2 (40.88±10.14%) and the lowest average percentage of reduction resulted from Biofly (36.69±6.88 %) (Table 1 and Fig. 2).

The obtained results in the second season revealed that the highest percentage of leafhopper reduction after 24 hrs from application was caused by the conventional insecticide, Malathion-Extra (53.39%) while, there was no effect to Biofly and Safe oil after 24 hr. Afterwards, the highest percentage of reduction was caused by Capel2 (77.60%) followed by Malathion-Extra (76.43%) after 10 days. In general, the highest average percentage of reduction resulted from Malathion-Extra (58.83±5.45 %) followed by Capel 2 (54.09±7.50 %), and the lowest average percentage of reduction was caused by Biofly (21.38±8.73 %) (table 5 and Fig. 2).

As a conclusion, the conventional insecticide Malathion-Extra exhibited a high efficiency against Empoasca spp. population with the highest

average percentage of reduction (51.52±11.19 % and 58.83±5.45 %) followed by Capel 2 (40.88±10.14% and 54.09±7.50 %). The least average percentage of reduction caused by the non-conventional insecticide Biofly (36.69±6.88 % and 21.38±8.73 %) during the two seasons, respectively. The statistical analysis revealed significant differences among average percentage of reduction of leafhopper during the two successive seasons.

The obtained results are in agreement with those obtained by El-Khawas *et al.* (2004) who found that the chemical insecticide induced the highest percentages of reduction in the population density of *Empoasca* spp.. Awadalla *et al.* (2011) found that the conventional insecticide Sumithion exhibited a high efficiency against *Empoasca discipiens* population with the highest percentage of reduction 82.1% after two days from treatment for this insect.

Table (4): Influence of some conventional (Malathion-Extra) and non-conventional insecticides on the percentage of reduction of *Empoasca* spp. under field condition during 2011/12 season.

Compound	Reduction % after						Av.±SE
	24 hrs	3 days	5 days	7 days	10days	15 days	
Biofly	39.15	21.61	37.02	20.16	36.26	65.94	36.69±6.88 a
Bioguard	20.39	29.98	22.98	19.83	64.75	65.83	37.29±9.16 a
Safe oil	32.33	37.41	27.92	35.00	51.15	52.00	39.30±4.17ab
Capel1	31.56	44.50	29.00	8.33	61.48	55.56	38.41±8.13 a
Capel 2	36.08	28.17	19.62	19.06	68.60	73.74	40.88±10.14ab
Malathion-Extra	61.50	40.81	27.63	19.62	90.00	69.54	51.52±11.19 c
LSD $_{at\ 5\%}$							2.64

In a column, means followed by the same letter are not significantly different at the 5% level

Table (5): Influence of some conventional (Malathion-Extra) and non-conventional insecticides on the percentage of reduction of *Empoasca* spp. under field condition during 2012/13 season.

Compound	Reduction % after						Av.±SE
	24 hrs	3 days	5 days	7 days	10 days	15 days	
Biofly	0	56.19	26.79	27.02	18.30	0	21.38±8.73 a
Bioguard	15.63	46.75	20.08	24.97	62.50	21.63	31.93±7.72 c
Safe oil	0	15.05	28.59	21.25	57.14	31.64	25.61±7.96 b
Capel1	1.29	53.05	37.00	41.52	59.35	58.48	41.78±9.08 d
Capel 2	29.2	55.51	40.48	51.65	77.60	70.08	54.09±7.50 e
Malathion-Extra	53.39	54.36	38.55	63.25	76.43	67.00	58.83±5.45 f
LSD $_{at\ 5\%}$							3.24

In a column, means followed by the same letter are not significantly different at the 5% level

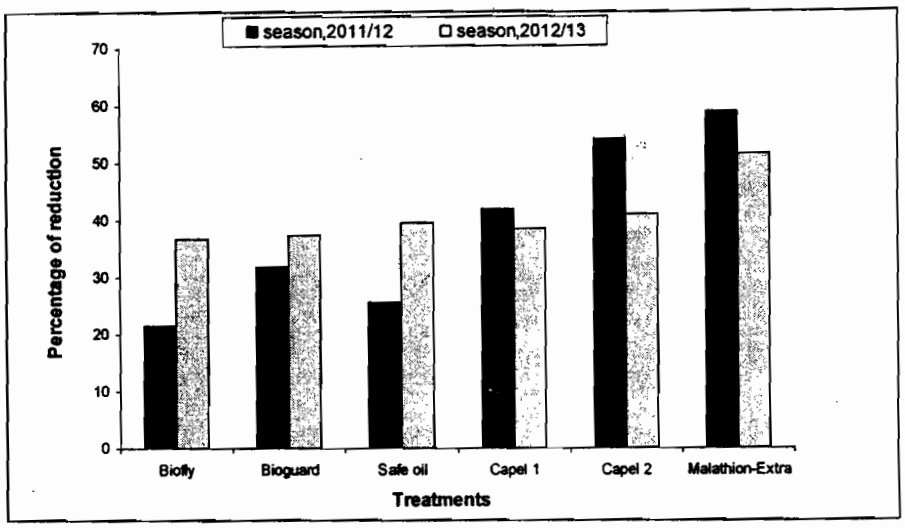

Fig.(2):Influence of some conventional (Malathion-Extra) and non-conventional insecticides on the average percentage of reduction of *Empoasca* spp. under field condition during 2011/12 and 2012/13 seasons.

3. The serpentine leaf miner, *Liriomyza trifolii* (Burgess)

Data presented in Tables (6 and 7) and Fig. (3) show the influence of some conventional (Max Sped) and non-conventional insecticides on the percentage of reduction of *L. trifolii* under field condition during 2011/12 and 2012/13 seasons.

The obtained results in the first season revealed that the highest percentage of reduction of leaf miner after 24 hrs from application was caused by the non-conventional insecticide, Capel 2 (68.34%) while, there was no effect was caused by the non-conventional insecticides; Bioguard, Safe oil and Capel 1 after 24 hr. Afterwards, the highest percentage of reduction was caused by Max Sped (98.61%) after 10 days. In general, the highest average percentage of reduction was caused by Max Sped (75.97±10.52 %) followed by Capel2 (75.63± 4.19 %) and the lowest average percentage of reduction was caused by Safe oil (47.75±10.17%) (Table 6 and Fig. 2).

In the second season, all treatments did not cause any reduction except the conventional insecticide Max Sped (8.59%) after 24 hr. Afterwards, the percentage of reduction increased to record the highest percentage of reduction by Max Sped (95.73%) after 10 days from spraying. In general, the highest average percentage of reduction was caused by Max Sped (67.25±13.94 %) followed by Bioguard (57.10±12.15 %) then Capel 2 (56.75±12.95 %) and the lowest average percentage of reduction was caused by Safe oil (47.42±13.83 %) (Table 7 and Fig.3).

As a conclusion, the conventional insecticide Max Sped exhibited a high efficiency against *L. trifolii* larval population with the highest average percentage of reduction (75.97±10.52 % and 67.25±13.94 %) followed by

Capel 2 in the first season (75.63± 4.19 %) and Bioguard in the second season (57.10±12.15%) during two seasons, respectively. The least average percentage of reduction was caused by the non-conventional insecticide Safe oil (47.75±10.17 % and 47.42±13.83 %) during the two seasons, respectively. The statistical analysis revealed significant differences among average percentage of reduction of leaf miner during the two successive seasons.

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) had a slight effect against *L. congesta* larvae in faba bean. El-Khawas *et al.* (2004) concluded that the chemical insecticide (Confidor) induced the highest percentages of reduction in the population density of *L. trifolii*. Abbassy *et al.* (2008) reported that spraying of common bean plants with bio insecticides significantly reduced number of leaf miner larvae. Spinosad (Tracer 24% WG) was the most effective bio insecticides, followed by B.T. (*Bacillus thuringiensis*) (Agerin) and botanical insecticides.

Table (6): Influence of some conventional (Max Sped) and non-conventional insecticides on the percentage of reduction of *L. trifolii* under field condition during 2011/12 season.

Compound	Reduction % after						Av.±SE
	24 hrs	3 days	5 days	7 days	10 days	15 days	
Biofly	3.90	76.44	58.12	66.97	77.99	61.01	57.41±11.42 b
Bioguard	0	77.64	52.80	68.41	68.00	75.65	57.08±12.21 b
Safe oil	0	53.28	53.07	69.49	50.10	60.55	47.75±10.17 a
Capel1	0	81.83	77.16	77.26	84.55	83.97	67.46± 13.83 c
Capel 2	68.34	60.28	73.50	82.22	86.26	83.20	75.63± 4.19 d
Max Sped	32.70	60.70	85.91	80.80	98.61	97.11	75.97±10.52 d
$LSD_{at\ 5\%}$							5.11

In a column, means followed by the same letter are not significantly different at the 5% level

Table (7): Influence of some conventional (Max Sped) and non-conventional insecticides on the percentage of reduction of *L. trifolii* under field condition during 2012/13 season.

Compound	Reduction % after						Av.,
	24 hrs	3 days	5 days	7 days	10 days	15 days	
Biofly	0	45.88	66.91	66.90	51.65	63.90	49.21±10.67 a
Bioguard	0	53.54	75.43	70.59	66.83	76.19	57.10±12.15 b
Safe oil	0	11.5	55.43	72.68	74.93	70.00	47.42±13.83 a
Capel 1	0	16.81	66.72	69.40	77.38	74.80	50.85±13.97 a
Capel 2	0	49.10	75.19	79.12	83.18	53.88	56.75±12.95 b
Max Sped	8.59	48.38	81.31	75.39	95.73	94.09	67.25±13.94 c
$LSD_{at\ 5\%}$							4.52

In a column, means followed by the same letter are not significantly different at the 5% level

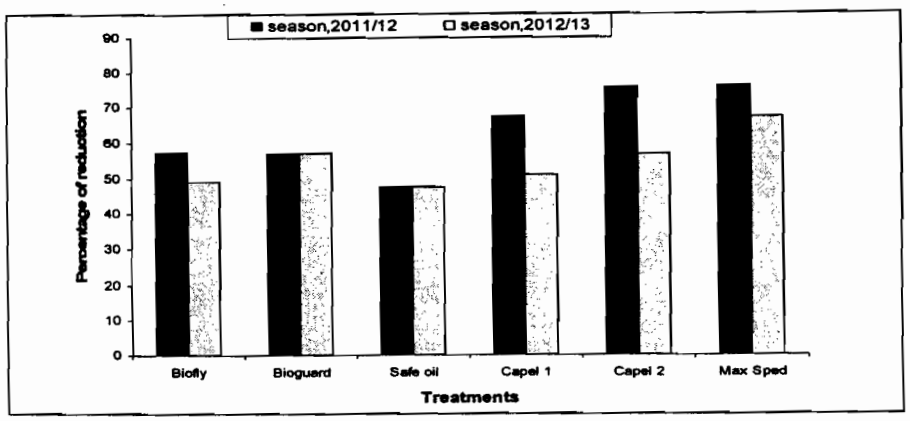

Fig.(3): Influence of some conventional (Max Sped) and non-conventional insecticides on the average percentage of reduction of *L. trifolii* under field condition during 2011/12 and 2012/13 seasons.

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تاثير بعض المبيدات التقليدية وغير التقليدية علي الآفات الرئيسية التـــي تهـــاجم الفول البلدي

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**** قسم بحوث افات محاصيل الحقل– محطة بحوث سخا – معهد بحوث وقاية النباتات – مركز البحوث الزراعية**

أجريت هذه الدراسة في المزرعة البحثية لمحطة بحوث سخا محافظة كفر الشيخ خلال موســمي ٢٠١١/٢٠١٢ و ٢٠١٢/٢٠١٣ لتقييم فاعلية بعض المبيدات التقليدية (ملاثيون اكسترا او مــاكس ســبيد) والمبيدات غير التقليدية علي أهم الآفات الحشرية التي تهاجم نباتات الفول البلدي.

أوضحت النتائج أن المبيد التقليدي ملاثيون اكسترا أحدث فاعلية كبيرة ضد تعداد مــن البقوليــات مسجلا أعلي متوسط لنسبة الخفض (٨٦.٢٦±٧.٦٤% و ٩٤.٣٤±٢.٨٥%) يليه كابل٢ (٧٢.١٣±٦.٢٠% و ٧٩.٦٩±٥.٧٥%) خلال موسمي الدراسة علي التوالي.

أحدث المبيد التقليدي ملاثيون اكسترا أعلي نسبة خفــض لتعــداد نطاطــات الأوراق بمتوســط (٥١.٥٢±١١.١٩% و ٥٨.٨٣±٥.٤٥%) يليه كابــل٢ (٤٠.٨٨±١٠.١٤% و ٥٤.٠٩±٧.٥٠%) خــلال موسمي الدراسة علي التوالي.

أحدث المبيد التقليدي ماكس سبيد أعلي نسبة خفض لتعداد صانعة أنفاق أوراق الفــول بمتوســط (٧٥.٩٧±١٠.٥٢% و ٦٧.٢٥±١٣.٩٤%) يليه كابل٢ في الموسم الاول(٧٥.٦٣±٤.١٩%) و بيو جــارد في الموسم الثاني (٥٧.١٠±١٢.١٥%).

أظهر التحليل الإحصائي وجود فروق معنوية في متوسط نــسبة الخفــض للحــشرات الــسابقة والمبيدات المستخدمه خلال موسمي الدراسة.

قام بتحكيم البحث

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