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IMPROVING THE EFFICIENCY OF SOME INSECTICIDES CONTROLLING *Aphis Craccivora* Koch. FOR INFESTING BROAD BEAN PLANTS

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ABSTRACT: The present study was conducted at Alzanqalon province, Sharkia governorate. Egypt during season 2016/2017 to throw light on the improving the effects of malathion, diazinon, acetamiprid and biovar with addition of sylgard 309 (silicone surfactant) and Npk to the spray solution of controlling Aphid (*Aphis craccivora*) insects. Data revealed that malathion was the superior compound reared general mean of reduction in infestation of 90.76% followed desendingly by acetamiprid (74.70%), diazinon (66.27%), biovar (53.07%), sylgard 309 (52.32%) and Npk (12.14%). The efficacy of malathion was increased by 1% with sylgard 309 of decreased with Npk by 1% sylgard 309 as well as Npk improved the effects of diazinon by 17% and 10% respectively. Efficacy of acetampred was decreased by 9% with sylgard 309 and 5% with Npk. While the effects of biovar was increased with sylgard 309 by 8% and decreased by 32% with Npk.

Key word: Insecticides controlling, *Aphis Craccivora* Koch., broad bean plants.

INTRODUCTION

Faba been (*Vicia faba* L.) is the most important food crop in Egypt, where most of the population depends up on the community because of the rise in its nutritional value containing a high proportion of vegetable protein up to about 30% and used for the consumption of both human and animals as well as it is highly efficient in the symbiotic fixation of atmospheric nitrogen (Mabrouk and Mohamed, 2017; Karkanis, et. al., 2018).

This crop infestation by numerous of pests such as the faba bean aphid (*Aphis craccivora*, Koch), leaf miner (*Liomyza trifolii*, Burgess), and Thrips (*Thrips tabaci*, Lindeman) (Abou - Elhagag and Salman, 2001). Piercing sucking pests are the most serious and destructive pests to invade Cowpea in Egypt (Moshera et al., 2017). The sucking pests act as vector for virus borne diseases (Munde et al., 2011; Rashmi Patel and Khare, 2013).

The cowpea aphid (*Aphis craccivora* Koch.) is one of the most common important sucking insect pests attacking certain legumes in Egypt, particularly faba bean cowpea and pea, from seedlings until harvest time (Fouad et al., 2016). *Aphis craccivora* causes direct damage by feeding, which may induce plant deformation and indirect damage caused either by honeydew or by transmission of viruses.

The control of these pests is considered an integral part of any strategy to increase the quality and quantity of the products. Chemical controls (insecticides) are used in a large scale through the world as the major effective method that is used by farmers and a major mean for pest management (Soumya et al., 2017).

Various adjuvants are being used to increase the penetration of pesticides into target plant foliage, and they strongly affect the interactions among pest, pesticide, and crop. They include surfactants, compatibility agents, anti-foaming

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agents, spray colorants (dyes) and drift control agents (Ferrell *et al.*, 2008).

Adjuvants are usually much cheaper than pesticides and can decrease the effective pesticide dosage as much as 10 fold, but their effects vary with chemicals and plant species. They may be added to the product at the time of formulation, or at treatment time (Green and Foy, 2003).

In addition, Fertilizers have a very profound effect on crop growth and yield especially nitrogen which is an essential element for plant growth and maintenance since it is considered a key nutrient in crop production (Abo Arab *et al.*, 2008). NPK fertilizer gives improvement in efficiency of insecticides (Carvalho *et al.*, 2009).

The present work aimed to study improving the efficiency of some insecticides (malathion, diazinon, acetamiprid and biovar (2.3×10^6 spore/gm) recommended against aphids infesting faba bean plants using organosilicon surfactant (sylgard 309) and Npk.

MATERIALS and METHODS

Chemicals

Malathion (Malson 57% EC)

Diethyl 2-[(dimethoxyphosphorothioyl)sulfanyl] butanedioate. or O, O, Dimethyl-S- (1,2-dicarbethoxy ethyl) phosphorodithioate.

Diazinon (Diazinox 60% EC)

O,O-diethyl O-[6-methyl-2-(1-methylethyl)-4-pyrimidinyl] phosphorothioate).

Acetamiprid (Mospilan 20% SP)

N - [(6 - chloro - 3 - pyridyl) methyl] - N'-cyano- N- methyl- acetamidine.

Beauveria bassiana. Bio-fly (2.3×10^6 spore/gm)

100% (W/W) Entomopathogenic fungus, *Beauveria bassiana*).

Silicone Surfactant

Sylgard 309:3- (3- Hydroxypropyl) eptamethyltrisiloxane, Ethoxylated Acetate/125997- 17- 3, Polyethylene Glycol Monallyl

Acetate/27252875, Polyethylene Glycol Diacetate/27252831.

NPK (Ekofert)

The NPK components are 15 N - 5 P - 30 K + 0.02% B + 0.02% Mo) + 10% citric acid.

Experimental Design

The field experiment was conducted during season (2016 - 2017) at Alzanqalon region, Sharkia governorate, Egypt to evaluate the efficiency of the mentioned chemicals for controlling the faba bean aphid (*Aphis craccivora*, Koch), infesting faba plants. The cultivated field with faba bean balady variety was divided into 45 plots each of 42m². The plots of each area were arranged in completely randomized blocks design with 15 treatments, each treatment was replicated three times.

Field Experiments

All divided plots were treated with the tested insecticide Malathion (Malson 57% EC (9 cm³/6L), (Diazinox 60% EC (30 cm/6L), Acetamiprid (Mospilan 20% SP (1.5 gm/6L), biocide (Bio-fly 2.3×10^6 spore/gm) and adjuvant (Sylgard 309) and Npk the mixtures between each of the tested insecticide and used adjuvant against aphid, during the growing season. Control plots were treated with water only. Spraying was carried out by using knapsack sprayer motor (Solo, 40 psi and 200 liters/feddan) at 2017. Mean numbers of the tested pests were recorded in to fellers for each replicate just before spraying and after post periods, namely 1, 3, 5, 7, 10 and 14 days.

Statistical Analysis

The data thus obtained were taken into consideration to calculate the percentage reduction in the population which was determined by applying a correction factor given by Henderson and Tilton's (1955)

All the obtained data were represented as mean \pm standard error (M \pm SE) and statistically analyzed according to complete randomized block design. The appropriate methods were used for the analysis of data according to (Little and Hills, 1975) and differences between parameters were analyzed using Costat-Program methods software version (2005) by

analysis of variance one - way (ANOVA). Least Significant Differences (LSD) test for comparison between groups and an overall significance level of $p \leq 0.05$ was used.

RESULTS AND DISCUSSIONS

The present results will be presented and discussed under the following four main heading:

Effect of Malathion (Malson 57% EC)

Results tabulated in Table 1 indicated that the lowest % percent reduction of population of aphid, *Aphis craccivora* recorded 76.07% at 14th day after treatment with malathion alone while, the highest value of % reduction was 99.13% after 3rd day post-treatment, in addition, the mean of residual effect and mean general effect were (89.57)% and (90.761) respectively. Also, the same trend was observed after treatment by the surfactant Sylgard 309, However the lowest % reduction was 30.42% after 14th day and the highest % reduction recorded 71.42% after 3rd day from spraying and the mean of residual effect and mean general effect were 50.23 % and 52.32%, respectively. In the case of mixture Malathion with Sylgard 309 the highest and lowest values of percent reduction of *Aphis craccivora* recorded 96.47% and 81.13% at 1st and 14th days post-treatment, then the mean of residual effect and general effect calculated 90.31 and 91.34% respectively. But in the case of mixture malathion plus NPK the percent reduction of individual of the pest infesting faba bean plants recorded 75.13% and 96.48% during 14th and 3rd day from treatment, while the mean residual effect was 89.43% and mean of general effect was 89.20% but in the case of NPK the lowest and highest of % reduction of aphid, *Aphis craccivora*, were (10.12%) and (15.97)% at 14th and 7th days with the % mean of residual effect and % means general effect (12.01 %) and (12.14 %), respectively.

Effect of Diazinon (Diazinox 60% EC)

The results represented in Table 2 showed the efficacy of diazinon alone and mixed with Sylgard 309. The lowest and highest% reduction of infestation, *Aphis craccivora*, recorded 36.51% and 90.1% at 14th day and 3rd day from application by diazinon alone during 2016/2017

season. The % mean of residual effect and % means general effect of diazinon alone was (53.81%) and (66.27%) respectively. In the same table the compound Sylgard 309 caused the lowest (30.42) and the highest % reduction (71.42%) for the same insect infesting faba bean plants at 14th and 3rd day respectively. But in the case of NPK spray alone reason the lowest and highest of% reduction of aphid, *A. craccivora* were 10.12% and 15.97% at 14th and 7th days with the % mean of residual effect and % means general effect 12.01% and 12.14% respectively.

On the other hand, in the case of diazinon mixed with Sylgard 309, the lowest and highest % reduction for *A. craccivora* were 66.5 and 95.59% at 14th and 3rd after spraying by Diazinox plus Sylgard 309, while % mean of residual effect and general effect recorded 82.1 and 83.38 %, respectively. While diazinon with NPK caused % reduction of individuals of aphid attacking faba bean plants ranged between 63.75% at 14th day and 90.16% at 3rd day after spraying with the mean residual effect and general effect recorded 75.74% and 76.803%, respectively.

Effect of Acetamiprid (Mospilan 20% SP)

During the experimental season (2016/2017), the lowest value of % reduction of population of aphid, *A. craccivora* recorded 46.28% at 14th day while, the highest value of % reduction was 91.06% after 3rd day from treatment with acetamiprid alone (Table 3). Moreover, the mean of residual effect recorded 77.828% and general effect mean was 74.70%. On the other hand, Sylgard 309 (surfactant) or NPK, data in Table 3 indicated that the lowest and highest % reduction was 10.12% and 15.97% at 14th and 7th day, respectively for NPK alone and 30.42% and 71.40% respectively for Sylgard 309 alone. The mean of residual effect recorded (12.01% and 50.23%) and general effect was (12.14%. and 52.32%) for NPK and Sylgard 309 alone, respectively. Moreover the lowest and highest % reduction for *Aphis craccivora* were 36.65 and 82.88% at 14th and 3rd after spraying with mospilan plus Sylgard 309. While % mean of residual effect and general effect recorded 63.82 and 65.34%, respectively. Additionally in case of mospilan with NPK% reduction of individuals of aphid

Table 1. Efficacy of malathion (Malson 57% EC), Sylgard 309 and their mixtures against faba aphid (*Aphis craccivora* Koch) attacking faba bean plants in field

Treatments	Recommended rates	Percent reduction of infestation at indicated days after application							Means of residual effect	Means of general effect
		Average number before spray	Initial effect 1 st	3 rd	5 th	7 th	10 th	14 th		
Control		51.6 ± 21.94	71.466 ^{ab} ± 35.660	84.5 ^a ± 40.149	72.816 ^{ab} ± 35.133	67.46 ^{abcd} ± 37.221	65.1 ^{abc} ± 37.687	61.43 ± 21.94	-	-
Sylgard 309	15 ml /6L	45.13 ± 18.594	21.6 ^b ± 11.380 (62.77)	19.9 ^b ± 9.007 (71.42)	25.53 ^b ± 12.538 (57.55)	27.07 ^b ± 18.079 (46.90)	29.23 ^b ± 19.3773 (44.83)	36.33 ^b ± 12.817 (30.42)	(50.23)	(52.32)
NPK	30g /6L	54.7 ± 28.645	75.9 ^c ± 7.515 (12.7)	81.47 ^c ± 9.330 (10.40)	66.73 ^c ± 10.706 (11.90)	64.23 ^c ± 11.105 (15.97)	57.33 ^c ± 15.230 (11.66)	55.2 ^c ± 14.242 (10.12)	(12.01)	(12.14)
Malathion	9cm ³ /6L	90.67 ± 17.444	3.77 ^a ± 1.4 (96.69)	1.3 ^a ± 0.331 (99.13)	5.77 ^a ± 2.657 (94.72)	1.546 ^a ± 3.456 (91.73)	14.33 ^a ± 3.842 (86.06)	23.57 ^a ± 4.493 (76.07)	(89.57)	(90.76)
Malathion+ Sylgard 309	9cm ³ +15mL	87.3 ± 35.275	4.5 ^a ± 1.0345 (96.47)	12.7 ^a ± 14.099 (91.43)	6.03 ^a ± 1.560 (95.36)	1.767 ^a ± 1.767 (93.27)	2.1793 ^a ± 1.034 (90.41)	17.5 ^a ± 5.876 (81.13)	(90.31)	(91.34)
Malathio+NPK	9cm ³ +30g	51.13 ± 10.178	3.63 ^a ± 1.729 (95.07)	2.83 ^{ab} ± 3.550 (96.48)	3.47 ^a ± 3.371 (94.72)	44.83 ^a ± 5.2819 (91.73)	5.93 ^a ± 7.7453 (89.06)	14.63 ^a ± .6424 (75.13)	(89.43)	(89.20)
L. S. D (5 %)			11.32	15.85	14.04	17.937	21.486	17.083	15.59	14.99
P.			***	***	***	***	***	***	***	***

*** Very highly significant. Initial effect 1st day of the application

Mean residual effect = the effect during the period from 3rd till 14 day after spray. Mean general effect = mean the effect during the period from 1st till 14 day after spray. The numbers in parentheses refer to % reduction.

Table 2. Efficacy of Diazinon (Diazinon 60% EC), Sylgard 309 and their mixtures against faba aphid (*Aphis craccivora* Koch) attacking faba bean plants in field

Treatments	Recommended rates	Percent reduction of infestation at indicated days after application							Means of Residual effect	Means of general effect
		Average number Before spray	Initial Effect 1 st	3 rd	5 th	7 th	10 th	14 th		
Control		51.6 ±21.94	72.81 ± 35.13	84.5 ± 35.66	72.816 ± 35.13	67.46 ^{abcd} ± 37.221	65.1 ± 37.687	61.43 ± 37.116	-	-
Sylgard 309	15 ml /6L	45.13 ± 18.59	21.6 ^b ±11.38 (62.77)	19.9 ^b ± 9.007 (71.42)	25.53 ^b ± 12.538 (57.55)	27.07 ^b ± 18.079 (46.0)	29.23 ^b ± 19.377 (44.83)	36.33 ^c ± 12.817 (30.42)	(50.44)	(52.32)
NPK	30g /6L	54.7 ± 28.65	75.9 ^c ±7.515 (12.70)	81.47 ^c ± 9.330 (10.40)	66.73 ^c ± 10.707 (11.90)	64.23 ^c ± 11.106 (15.97)	57.33 ^c ± 15.231 (11.66)	55.2 ^c ± 14.243 (10.12)	(12.01)	(12.14)
Diazinon	30cm/6L	52.87 ± 38.084	13.47 ^a ± 9.183 (77.54)	6.34 ^a ± 5.177 (90.1)	44.94 ^{ab} ± 9.7206 (73.35)	30.36 ^{ab} ± 12.810 (64.05)	23.43 ^{ab} ± 16.443 (56.06)	31.5 ^{bc} ± 25.364 (36.51)	(53.81)	(66.27)
Diazinon+ Sylgard 309	30cm +15 ml	64.5 ± 10.39	8.833 ^{ab} ± 6.609 (89.78)	4.7 ^a ± 3.397 (95.59)	11.6 ^{ac} ±7.952 (86.77)	14.03 ^a ± 8.120 (82.27)	15.67 ^a ± 8.951 (79.37)	24 ^{ab} ± 14.745 (66.5)	(82.1)	(83.38)
Diazinon+NPK	15 ml +30g	55.33 ± 5.80	12.433 ^a ± 1.622 (83.5)	8.65 ^a ± 0.790 (90.16)	17.33 ^a ± 5.107 (77.73)	16.9 ^a ± 4.329 (75.882)	19.2 ^{ab} ± 4.027 (69.86)	22.53 ^{ab} ± 5.928 (63.75)	(75.74)	(76.80)
	L. S. D (5 %)		14.47	11.710	17.37	21.510	25.39	28.915	5.783	18.816
	P.		***	***	***	***	**	**	**	***

*** Very highly significant

** highly significant

Initial effect 1st day of the applicationMean residual effect = the effect during the period from 3rd till 14 day after spray.Mean general effect = mean the effect during the period from 1st till 14 day after spray. The numbers in parentheses refer to % reduction.

Table 3. Efficacy of acetamiprid (Mospilan 20% SP), Sylgard 309 and their mixtures against faba aphid (*Aphis craccivora* Koch) attacking faba bean plants in field

Treatments	Recommended rates	Percent reduction of infestation n at indicated days after application							Means of Residual effect	Means of general effect
		Average number Before spray	Initial Effect 1 st	3 rd	5 th	7 th	10 th	14 th		
Control		51.6 ± 21.94	71.46 ± 35.66	84.5 ± 40.149	72.81 ± 35.13	67.46 ± 37.2	65.1 ± 37.687	61.43 ± 37.116	-	-
Sylgard 309	15 ml /6L	45.13 ± 18.59	21.6 ^b ± 11.38 (62.77)	19.9 ^b ± 9.007 (71.40)	25.53 ^b ± 12.538 (57.55)	27.07 ^{ab} ± 18.079 (46.9)	29.23 ^a ± 19.377 (44.83)	36.33 ^{ab} ± 12.817 (30.42)	(50.23)	(52.32)
NPK	30g /6L	54.7 ± 28.65	75.9 ^c ± 7.515 (12.70)	81.47 ^c ± 9.330 (10.40)	66.73 ^c ± 10.707 (11.90)	64.23 ^b ± 11.106 (15.97)	57.33 ^h ± 15.231 (11.66)	55.2 ^b ± 14.243 (10.12)	(12.01)	(12.14)
Acetamiprid	1.5gm	49.77 ± 8.95	9.066 ^a ± 11.378 (85.67)	7.5 ^a ± 5.336 (91.06)	12.3 ^a ± 13.812 (81.12)	14.67 ^a ± 19.626 (74.24)	16.53 ^a ± 21.460 (69.85)	28.5 ^a ± 27.584 (46.28)	(77.83)	(74.70)
Acetamiprid + Sylgard 309	1.5gm+15 ml	55.47 ± 24.80	20.6 ^{ab} ± 8.560 (72.93)	14.93 ^{ab} ± 5.087 (82.88)	19.8 ^{ab} ± 5.499 (73.87)	22.83 ^a ± 4.294 (67.11)	27.8 ^{cde} ± 8.997 (58.64)	24.9 ^{ab} ± 24.043 (36.65)	(63.83)	(65.34)
Acetamiprid +NPK	1.5gm+30g	45.37 ± 3.801	10.26 ^a ± 4.810 (83.30)	7.83 ^a ± 2.733 (89.42)	13.8 ^a ± 5.1816 (78.1)	16.13 ^a ± 27.788 (51.44)	14.03 ^{de} ± 9.166 66.48	25.43 ^a ± 12.385 (49.45)	(66.98)	(69.20)
	L. S. D 5 % P.		16.511 ***	12.33 ***	18.548 ***	32.807 *	28.568 **	35.08 <i>ns</i>	17.592 ***	20.346 ***

*** Very highly significant ** highly significant *significant ns: No significant Initial effect 1st day of the application

Mean residual effect = the effect during the period from 3rd till 14 day after spray.

Mean general effect = mean the effect during the period from 1st till 14 day after spray. The numbers in parentheses refer to % reduction.

attacking faba bean plants calculated 49.45% and 89.42 % at 14th and 3rd day, respectively. Whereas, the means of residual effect and mean general effect were recorded at 66.98, and 69.20% respectively.

Effect of *Beauveria bassiana* (Biovar, 2.3×10^6 cells/ml)

The result tabulated in Table 4 showed that the lowest and highest % reduction of numbers of aphid, *Aphis craccivora*, were 14.15 % and 62.63 % at 14th and 3rd day respectively after application with recommended rate of Biovar (2.3×10^6 cells *Beauveria bassiana*/ml), alone with the % mean of residual effect and general effect as 28.588% and 53.07%, respectively. In the same table date showed that lowest and highest % reduction for Sylgard 309 alone were (30.42% and 71.42%) at 14th and 3rd day, respectively at 50.224% for the % mean of residual effect and 52.32 % for general effect. On the other hand, in the case of both mixtures of *Beauveria bassiana* with Sylgard 309 or with NPK, data in Table 4 showed that the lowest and highest % reduction were 47.5% and 75.85 % at 14th and 3rd after spraying by *Beauveria bassiana* plus Sylgard 309 with the % mean of residual effect as 44.69 % and general effect as 61.86%. In case of NPK alone the lowest and highest of % reduction of aphid, *Aphis craccivora*, were 10.12% and 15.97% at 14th and 7th days after treatment with the % mean of residual effect and % means general effect recorded 12.010% and 12.14%, respectively. Moreover, the % reduction of aphid, *A. craccivora*, were 9.006 and 43.06% at 14th and 3rd day of spraying in case of *Beauveria bassiana* with NPK, with the mean residual effect and general effect of 19.45 % and 30.27%, respectively. Generally, the results obtained showed that adding of Sylgard 309 or NPK with Biovar (2.3×10^6 cells *Beauveria bassiana*/ml), apparently recorded decreasing of % reduction of aphid, (*A. craccivora*).

Finally concerning the efficiency of the four tested insecticides against broad bean aphids, it is obvious that malathion alone was the superior compound recorded general mean reduction infestation of 90.76% followed desending by acetamprid (74.70%), diazinon (66.27%), biovar (53.07%), while sylgard 309 and NPK give the lowest reduction percentages of infestation

recording 52.32 and 12.14 % could be noticed in tables (1-4). also, curiously enough to note that addition of sylgard309 or NPK with the tested four insecticides against aphids increased or decreased the general mean of reduction percentages of aphids infestation as follow :

- The efficacy of malathion was increased by % with sylgared 309 and decrecd by % with NPK
- Sylgared 309 as well as Npk caused increasing effect of diazinon by 17% and 10%, respectively.
- Sylgared 309 and npk decrecd the efficacy of acetamprid byn-9 and -5 %, respectively.
- The efficacy of biovar was increased by 8% with sylgard 309 deased by -32% with Npk.

These finding are in harmony with these recorded by some investigators working on the efficacy of different insecticides against aphids infested different crops. **Yu et al. (2009)** and **El-Sherif et al. (2009)** who showed that the adding surfactant into spray mixtures greatly increased droplet coverage area on the surfaces, while droplet evaporation time was greatly reduced. Therefore, droplet size, surface characteristics of the target (waxy or non-waxy), and chemical composition of the spray mixture (water alone, pesticide, additives) should be included as important factors that can affect the efficacy and efficiency of pesticide applications. Also, **El-Alfy et al. (2019)** cleared that malathion with Sylgard 309, resulted in a significant reduction in the number of the wheat aphid, also binary mixture of diazinon with NPK represent mixtures increasing efficiency as compared with diazinon alone. Malathion is the most effective insecticide in controlling this pest as it possesses a highly toxic effect against *A. craccivora*. The uptake rate of a compound cannot be predicted by either of them or even combination of them. For a specific chemical uptake varies greatly with plant species and there is no simple method at the moment to quickly evaluate the leaf surface permeability of a plant (**Nasser et al., 2000**). **Panwar and Singh (2007)**. **Abd-Ella (2014)** investigated that neonicotinoid insecticides (acetamprid, imidacloprid, thiamethoxam and dinotefuran) were highly effective against cowpea aphid (*Aphis craccivora* Koch.) under

Table 4. Efficacy of *Beauveria bassiana* (Biovar, 2.3×10^6 cells /ml), Sylgard 309 and their mixtures against faba aphid (*Aphis craccivora* Koch.) attacking faba bean plants in field

Treatments		Percent reduction infestation at indicated days after application						Means of residual effect	Means of general effect
		Average number before spray	3 rd	5 th	7 th	10 th	14 th		
Control	Recommended rates	51.6	71.46	84.5	72.81	67.46	65.1	-	-
		± 21.94	± 35.66	± 0.149	± 35.13	± 37.2	± 7.687		
Sylgard 309	15 ml /6L	45.13	21.6 ^a	19.9 ^a	25.53 ^{ab}	27.07 ^a	29.77 ^{ab}	(50.22)	(52.32)
		± 18.59	± 11.38	± 9.007	± 12.538	± 2.817	± 19.377		
NPK	30g /6L	54.7	76.07 ^c	81.47 ^b	66.73 ^c	64.23 ^b	57.23 ^b	(12.01)	(12.14)
		± 28.65	± 9.3301	± 9.330	± 11.106	± 15.231	± 13.744		
<i>Beauveria bassiana</i>	2.3×10 ⁶ spore/gm	78	51.5 ^{ab}	49.13 ^a	52.6 ^{ab}	57.57 ^{ab}	62.06 ^b	(28.59)	(53.07)
		± 29.06	± 3.4162	± 1.900	± 3.297	± 5.7360	± 12.485		
<i>B. b.</i> + Sylgard 309	2.3×10 ⁶ +15 ml	75.23	34.07 ^a	29.007 ^a	40.06 ^a	38.9 ^a	36.47 ^a	(44.69)	(61.86)
		± 12.37	± 4.187	± 9.722	± 15.752	± 9.284	± 13.744		
<i>B. b.</i> +NPK	2.3×10 ⁶ +30g	47.03	37.73 ^b	42.4 ^a	39.1 ^{bc}	43.9 ^b	46.93 ^b	(19.45)	(30.27)
		± 13.45	± 2.3497	± 0.622	± 15.1600	± 13.799	± 6.1242		
L. S. D (5 %)		21.4782	26.857	24.93	24.63	22.272	19.175	21.978	
P.			***	*	*	*	*	**	**

*** Very highly significant ** highly significant *significant Initial effect. 3rd day of the application

Mean residual effect = the effect during the period from 5th till 14day after spray

Mean general effect =mean the effect during the period from 3rd till 14day after spray.

The numbers in parentheses refer to % reduction.

field and laboratory conditions. Also **Gaber et al. (2015)** determined the efficiency of acetamiprid, imidacloprid, thiamethoxam, dinotefuran, pirimicarb and malathion on cotton aphid, *Aphis gossypii* Glover. They found that thiamethoxam, dinotefuran, acetamiprid and imidacloprid proved to be the most effective insecticides in reducing cotton aphid population up to 21 days after treatment. In additionally the efficacy of *Beauveria bassiana* against aphids was studied by many authors who agree with our study as following: **He ZHongGuo (2007)** they reported that a general consistency between infection mortality to aphids by *Beauveria bassiana* was found and effect on the reproduction and fecundity of the green peach aphids. Moreover **Devi et al. (2008)** showed that *Beauveria bassiana* (Balsamo-Crivelli) Vuillemin based mycoinsecticides are used against agricultural, veterinary and medical insect pests. Also, they reported that *B. bassiana* is thus a generalist with no strict host preference. *B. bassiana* based bio-pesticide can be used as a broad spectrum insecticide against a sucking of insect pests. Also, **Saranya et al. (2010)**, **Muhammad et al. (2013)**, **Guyen et al. (2014)** and **Selvaraj and Kaushik (2014)** they tested the field efficacy of different concentrations of *Beauveria bassiana* (Bals.) against the adults of *Aphis craccivora*. They demonstrated that, *B. b.* as potential bio-control agent could be used for the management of all aphid species such as *Aphis fabae*, *A. craccivora* and cowpea aphid. **Abboud et al. (2016)** reported that aphid's species are one of the main targets of *Beauveria bassiana* which is used as safe prospects for the biological control of this pest. Moreover, **Wafaa et al. (2017)** observed the positive effect of *B. bassiana* on mortality, reproduction (Neonate) in *A. craccivora* after four days of direct treatments, all fungal concentrations caused significant mortality ranged between 26.67 and 80% in (*Aphis craccivora*). They demonstrated that declared the enzymatic mechanisms concerned in insect immunity to entomopathogenic fungus and finally lead to death.

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تحسين فاعلية بعض المبيدات الحشرية لمكافحة من البقوليات التي تصيب نباتات الفول البلدى

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تمت هذه الدراسة فى قرية الذنكلون- الزقازيق- محافظة الشرقية بالحقول الزراعية بغرض إلقاء الضوء على تحسين فعالية الملاثيون والديازينون والاسيتامبيريد والبيوفار ضد حشرة المن التى تصيب نباتات الفول بالحقول خلال موسم الزراعة (2016-2017) بإضافة بعض المواد المساعدة لمحلول الرش (سليجار 309، Npk) وأوضحت النتائج ما يلى : يعتبر الملاثيون أكثر المبيدات المستخدمة فعالية ضد المن مسجلا 90.76% انخفاض فى التعداد متبوعا تنازليا بالاسيتامبيريد (74.70%) ثم الديازينون مسجلا 66.27% وأخيرا البيوفار (53.07%) بينما كان السليجار وNpk أقل المركبات فعالية مسجلين 52.32%، 12.14% على التوالى. أدى استخدام الملاثيون مخلوطا مع السليجار وزيادة قدرها 1% وانخفض التأثير 1% مع اضافة Npk كما أدى استخدام السليجار و Npk إلى زيادة فعالية الديازينون إلى 17، 10 % على التوالى كما أحدثت هذه المواد المضافة إلى إنخفاض فعالية كل من الاسيتامبيريد والبيوفار بنسبة تراوحت بين 5- 32%.

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