RESULTS AND DISCUSSION

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I- Population fluctuation:-

I.1- Nili plantation:

I.1.A- The population abundance of broad bean leaf miner, *Liriomyza trifolii* (Burgess):

I.1.A.1- Season1999

The weekly average numbers of *Liriomyza trifolii* larvae and number of mines/20 leaves on different plant levels of common bean (i.e., upper, middle and lower part) during 1999 season were presented in **Table** (1) and illustrated in **Fig.** (1-A). The first count was begun on September 26th (after one month from planting). The data indicated that, the population of *L. trifolii* larvae varied from one plant level to another where, larval infestation appeared firstly on the upper level of the plant at the beginning of the season then disappeared again all over the season, except for November 21st (17.4 ± 1.6 larvae/20 leaves).The total average numbers of *L. trifolii* larvae during 1999 season were 4.6 ± 0.6, 45.3 ± 5.6 and 69.2 ± 5.9 larvae/20 leaves for upper, middle and lower plant level, respectively.

Statistical analysis of the data revealed that the population of *L. trifolii* larvae on upper, middle and lower plant level during 1999 season varied significantly from plant level to another. Thus, it could be arranged in descending order as follows; lower, middle and upper plant level, indicating that lower part received the highest infestation followed by middle level and upper part that was the least one.

In respect to the total *L. trifolii* larvae population estimated for the different plant levels (upper, middle and lower), data revealed that the total mean population began high at the first inspection and amounted 35.1 larvae/20 leaves on September 26th, after that the total mean population of larvae differed from one inspection to another by the time lapses and reached its maximum level on November 28th (62.5 Larvae/20 leaves), then the total mean population of larvae slowly decreased by the end of the season to reach 37.1 larvae/20 leaves on December 5th.

Concerning the number of mines/20 leaves in 1999 season results in **Table** (1) **and Fig.** (1-A) show the same trend as indicated with the larvae population. Whereas, the total average numbers of mines throughout the whole season of 1999 were 3.9 ± 0.7, 50.1 ± 4.3 and 88.9 ± 6.4 mines/20 leaves for upper, middle and lower level of common bean plants, respectively. Statistical analysis of data revealed significant differences between the three plant levels in the number of mines during 1999 season.

Accordingly, the three plant parts could be arranged in descending order regarding their total average numbers of mines as follows; lower, middle and upper part. Meanwhile, the total mean number of mines found on the different plant levels had the same line and trend as achieved with the total mean of larvae population during 1999 season, where it recorded 31.8 mines/20 leaves at the first inspection and differed from one inspection to another by the time lapses to reach its maximum values on November 14th (72.0 mines/20leaves) and on November 28th (71.1 mines/20 leaves); the total mean number of mines decreased at the end of the season to record 50.9 mines/20 leaves on December 5th.

I.1.A.2- Season2000:

Data in **Table** (2) and illustrated in **Fig.** (1-B) indicated that, the population of *L. trifolii* larvae and number of mines for upper, middle and lower plant level during 2000 season was obviously lower than those of 1999 season. This might attribute to the effect of some abiotic and biotic factors during the two seasons.

Generally, data revealed the same trend as achieved during 1999 season for larvae and mines on the three levels of the plant, the total average numbers were 2.9 ± 0.4, 16.4 ± 1.7 and 33.8 ± 2.2 larvae/20 leaves and 2.9 ± 0.3, 17.2 ± 1.7 and 36.9 ± 2.7 mines/20 leaves.

Statistically, during 2000 season there is a significant difference between the population of *Liriomyza* larvae and number of mines on the three common bean plant levels. Generally, the three levels could be arranged in descending order regarding to the population of larvae and number of mines as follows: lower, middle and upper part, indicating that lower part of common bean plants had the highest rate of infestation followed by the middle and the upper part that was the lowest one.

Regarding the total mean of larvae population found on the different plant levels (upper, middle and lower) during 2000 season, results showed that the total mean had the same trend as achieved with 1999 season, where it recorded 6.8 larvae/20 leaves at the first inspection and differed from one inspection to another by the time lapses to reach its maximum on November 20^{th} (24.8 larvae/20 leaves) then, decreased by the end of the season to record 14.3 larvae/20 leaves on December 4^{th}.

Also, the total mean number of mines found on the different plant levels had the same line and trend as achieved with the total mean of larvae population during 2000 season where, it recorded 8.6 mines/20 leaves at the first inspection and increased sharply to reach its maximum on October 9^{th} (25.1 mines/20 leaves) then, differed from inspection to another by the time lapses to decrease again at the end of the season and recorded 18.1 mines/20 leaves on December 4th.

These results are similar to the data obtained by **Shahein** and **El-Maghraby (1993)** and **Shahein *et al*. (1998)**. They found that, there were little or no mines induced by the agromyzid, *Liriomyza trifolii* on the upper parts of broad bean plants in the field in February-March, while the middle and lower parts were highly infested.

Table (1): Numbers of *Liriomyza trifolii* (Burg.) on common bean plants during 1999 season at Qalyubia Governorate.

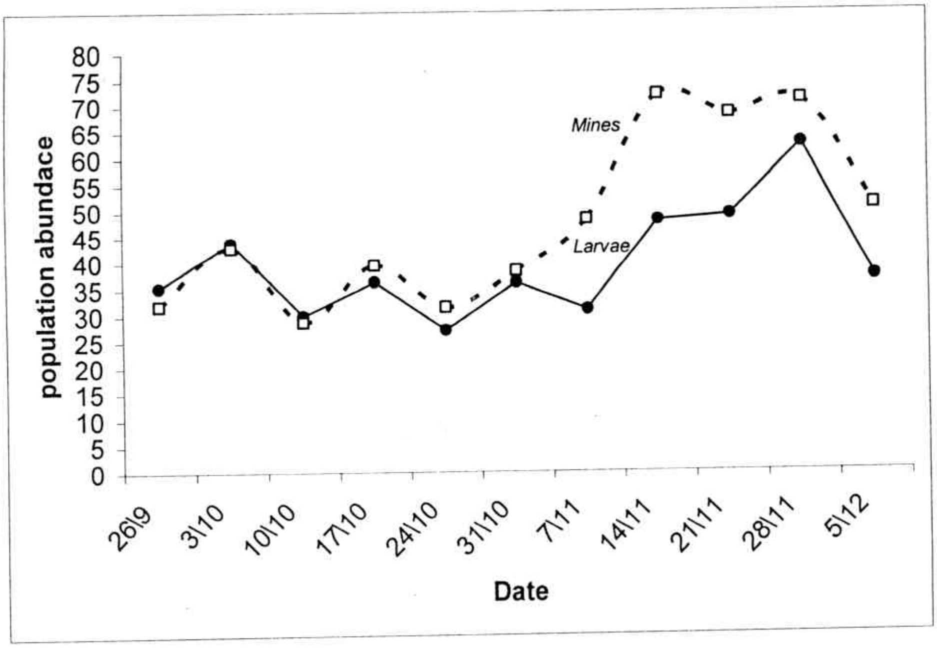
Date of inspection	Mean number of larvae and mines per 20 leaves at different plant levels							
	Upper part		Middle part		Lower part		Mean	
	Larvae	Mines	Larvae	Mines	Larvae	Mines	Larvae	Mines
26/9	21.0 ± 2.4	24.0± 3.8	33.4± 0.6	34.0± 4.0	51.4±1.0	37.4±2.2	35.1	31.8
3/10	12.4 ± 2.4	5.0 ± 1.2	63.4±9.6	58.4± 3.4	56.0±6.6	65.0±3.4	43.9	42.8
10/10	0.0 ± 0.0	0.0± 0.0	29.4± 3.2	23.0± 3.4	60.4±6.4	63.0±5.2	29.9	28.7
17/10	0.0 ± 0.0	0.0± 0.0	53.0±3.4	50.4± 1.4	56.0±2.8	68.0±5.0	36.3	39.5
24/10	0.0 ± 0.0	0.0± 0.0	29.0± 1.4	29.0±1.2	52.4±2.4	68.4±4.0	27.1	31.5
31/10	0.0 ± 0.0	0.0±0.0	30.0± 3.6	26.4±1.2	78.4±13.6	88.4±7.4	36.1	38.3
7/11	0.0 ± 0.0	0.0± 0.0	19.0±3.6	16.4±3.2	74.0±5.0	128.4±13.2	31.0	48.3
14/11	0.0 ± 0.0	0.0± 0.0	47.0±12.4	74.0±6.8	97.4±10.2	142.0± 11.8	48.1	72.0
21/11	17.4 ± 1.6	14.4± 2.6	55.0±4.2	73.4±8.0	75.0±4.2	117.0±5.8	49.1	68.3
28/11	0.0 ± 0.0	0.0± 0.0	72.0± 9.2	79.0±11.8	115.4±9.0	134.4±7.6	62.5	71.1
5/12	0.0 ± 0.0	0.0± 0.0	67.0± 4.8	87.4±3.4	44.4±3.2	65.4±5.0	37.1	50.9
Total	51.8 ± 6.4	43.4± 7.6	498.2±56.0	551.4± 47.8	760.8±64.4	977.4± 70.6	436.2	524.1
Average	4.6± 0.6*	3.9± 0.7*	45.3 ± 5.1*	50.1± 4.3*	69.2± 5.9*	88.9± 6.4*	39.6	47.6
L.S.D.	7.0	4.8						

*= Significant at 5% level.
± = SE.

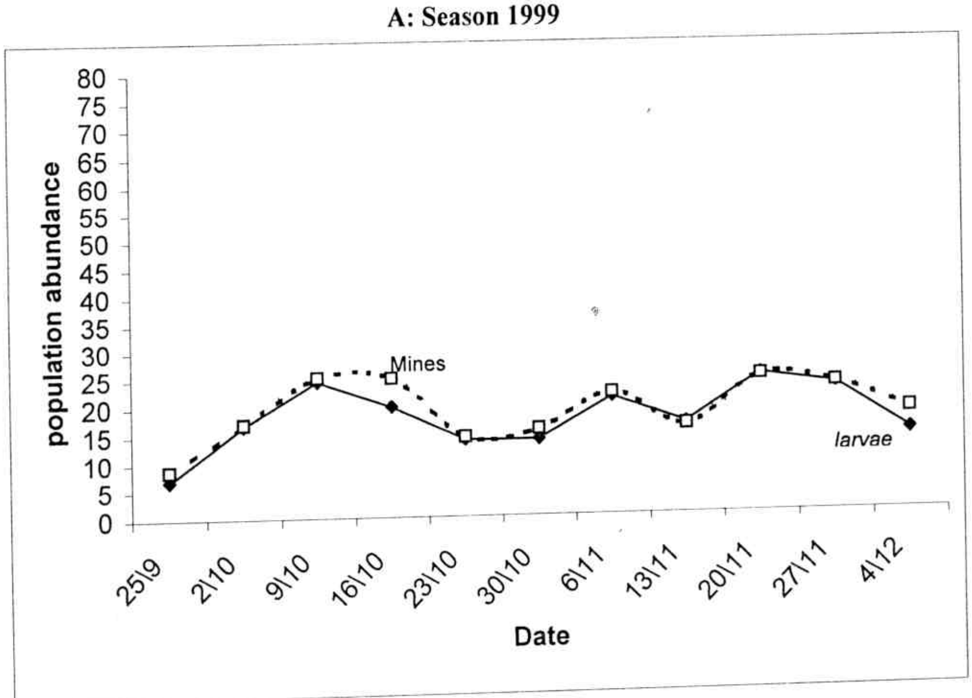
Table (2): Numbers of *Liriomyza trifolii* (Burg.) on common bean plants during 2000 season at Qalyubia Governorate.

Date of inspection	Mean number of larvae and mines per 20 leaves at different plant levels							
	Upper part		Middle part		Lower part		Mean	
	Larvae	Mines	Larvae	Mines	Larvae	Mines	Larvae	Mines
25/9	0.0± 0.0	0.0± 0.0	11.4± 1.6	13.4± 1.2	9.0± 1.8	12.4± 0.4	6.8	8.6
2/10	4.4± 1.2	4.0± 1.4	14.4± 0.8	19.4± 1.6	31.0± 1.6	27.4± 1.2	16.6	16.9
9/10	17.0 ±1.8	18.4± 0.8	22.0± 2.2	23.0± 2.2	34.0± 2.8	34.0± 2.0	24.3	25.1
16/10	0.0± 0.0	0.0± 0.0	19.4± 1.6	24.4± 2.6	40.0± 3.0	50.4± 3.4	19.8	24.9
23/10	0.0± 0.0	0.0± 0.0	12.0± 1.6	11.0± 3.0	29.4± 1.6	32.0± 2.0	13.8	14.3
30/10	0.0± 0.0	0.0± 0.0	12.0± 1.6	13.0± 1.6	29.0± 3.0	33.4± 2.2	13.7	15.5
6/11	0.0± 0.0	0.0± 0.0	0.0± 0.0	0.0± 0.0	63.0± 3.6	65.4± 7.4	21.2	21.8
13/11	0.0± 0.0	0.0± 0.0	17.4± 1.8	13.4± 1.2	31.4± 1.0	34.4± 1.6	16.3	15.9
20/11	4.0± 1.4	3.4± 1.4	27.4± 3.4	27.4± 2.2	43.0± 1.4	43.0± 3.0	24.8	24.6
27/11	6.0± 0.4	6.0± 0.0	24.4± 1.4	25.0± 1.2	38.4± 2.2	38.4± 2.0	22.9	23.1
4/12	0.0± 0.0	0.0 ± 0.0	19.4± 3.0	19.0± 1.6	23.4± 1.8	35.4± 4.0	14.3	18.1
Total	31.4± 4.8	31.8± 3.6	180.4± 19.0	189.0± 18.4	372.0± 23.8	406.2± 29.2	194.6	209.0
Average	2.9±0.4*	2.9± 0.3*	16.4± 1.7*	17.2± 1.7*	33.8± 2.2*	36.9± 2.7*	17.7	19.0
L.S.D.	2.0	2.0						

*= Significant at 5% level.
± = SE.



A: Season 1999



B: Season 2000

Fig. (1): Population fluctuation of *Liriomyza trifolii* (Burg.)on common bean plants at Qalyubia Governorate.

I.1.B -The population abundance of legume aphid, *Aphis craccivora* Koch.

I.1.B.1- Season 1999:

The total average numbers of aphid recorded throughout 1999 season were 410.3 ± 18.4, 281.3 ± 11.1 and 221.5 ± 9.5 individuals/20 leaves for upper, middle and lower part, respectively (**Table** 3 and **Fig.** 2-A).

Statistical analysis of the data indicated that there are significant differences between the populations on the three plant levels, *i.e.,* the upper part had the highest population followed by middle part and the lower part had the lowest population.

Regarding the total mean of aphid population estimated for the different levels (**Table** 3 and **Fig.** 2-A), results revealed that the aphid infestation occurred nearly, after two months from sowing on October 17th (51.5 individuals/20 leaves) then, increased sharply to reach the maximum level on November 14th (1168.5 individuals/20 leaves); after that the total mean population of aphid decreased sharply to reach 39.5 individuals/20 leaves on December 5th (at the end of the season).

I.1.B.2-Season 2000:

The values in **Table** (4) and **Fig**. (2-B) revealed that the population of aphid individuals on the three levels of common bean plants during 2000 season was clearly lower than 1999 season. This may be attributed to the effect of some ecological factors.

The recorded average mean numbers all over the season were 281.5 ± 16.8, 187.9 ± 8.3 and 170.7 ± 9.5 individuals/20 leaves for upper, middle and lower part, respectively Statistical analysis indicated significant differences between the population on upper part of the plant and the two others, but there were no significant differences in the aphid population between middle and lower plant level during season 2000.

Concerning the total mean of aphid population recorded on the three plant levels, it was noticed that aphid infestation had appeared late during season 2000 comparatively with 1999 season; where the total mean population estimated 59.5 individuals/20 leaves on October 23rd then, increased sharply to reach its maximum level on November 13th (781.5 individuals/20 leaves), then aphid population decreased sharply later, to reach 44.5 individuals/20 leaves on December 4th.

In this regard, **El-Defrawi *et al.* (2000)** observed that, the population density of the cowpea aphid, *Aphis craccivora* Koch. had 2 main periods of activity, with highest counts during the third week of December and February in 1995-96, and during the fourth week of December and third week of March in 1996-97.

The obtained data during the two seasons revealed that, the upper part of common bean plants had the highest population followed by middle, while the lower part had the lowest population. This may be due to the high vegetation growth of young leaves and thinner thickness of its palisade and spongy tissue - than the old leaves – and consequently young leaves become more preferred to the sucking piercing insects such as aphids and whiteflies.

The data achieved are in harmony with the finding of other investigators such as **Li *et al.* (1994)** in China, who indicated that the bionomics of *Aphis craccivora* Koch. in fields, were closely correlated with the mung bean [*Vigna radiata*] growth period, pointing out that the aphid migrated into the fields when the plants had produced 2-3 true leaves, showed the greatest population increase at the start of flowering, peak population density and damage at full flowering and a rapid population decrease at the full podding stage. Also, **Shalaby (1998)** mentioned that, common bean Giza variety that characterized with higher thickness of palisade and spongy tissue proved to be less susceptible to infestation with *B. tabaci* and aphids. While, the lower thickness of palisade and spongy tissue in Bronco variety may be explain the increase in *B. tabaci* and aphids populations.

In Hungary, **Kuroli *et al.* (1999)** the population density of Aphids [Aphidoidea] flying over faba bean fields (*Acyrthosiphon pisum*, *Aphis faba*, *A. craccivora*, *Macrosiphum euphorbiae* and *Myzus persicae)* differed yearly, depending on air temperature, relative humidity and rainfall.

Table (3): Numbers of *Aphis craccivora* Koch. on common bean plants during 1999 season at Qalyubia Governorate.

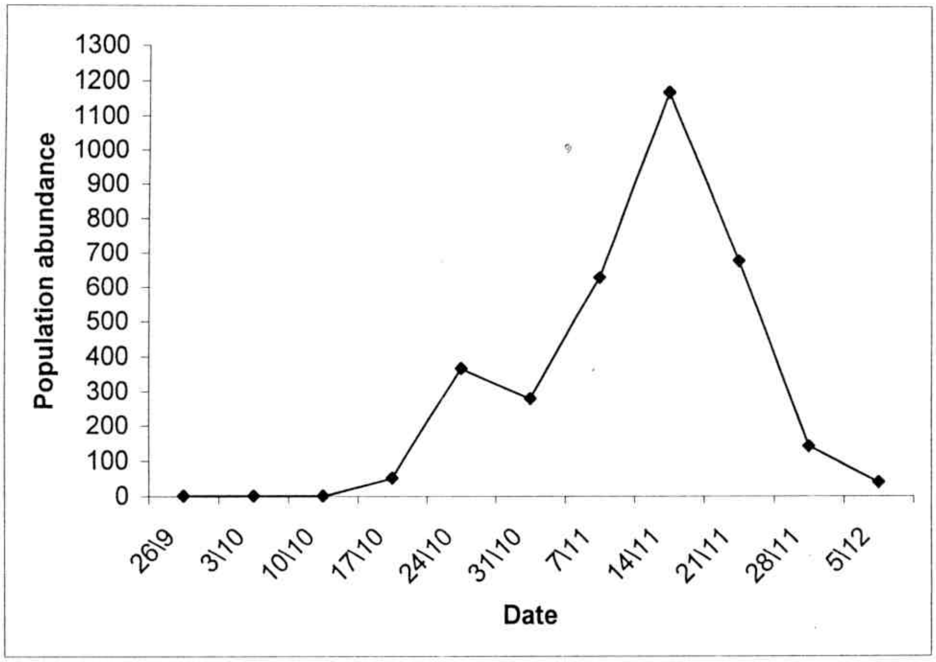
Date of inspection	Mean number of individuals per 20 leaves at different plant levels			
	Upper part	Middle part	Lower part	Mean
26/9	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0
3/10	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0
10/10	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0
17/10	78.0 ± 4.4	48.4± 3.6	28.0 ± 2.2	51.5
24/10	462.0± 20.4	387.0± 6.6	249.4± 13.8	366.1
31/10	384.0 ± 16.6	252.4± 11.8	200.0 ± 8.0	278.7
7/11	986.0± 38.2	502.4 ± 21.8	401.4 ± 13.4	629.9
14/11	1372.0 ± 53.6	1091.0 ± 23.0	1042.4 ± 32.6	1168.5
21/11	991.4± 52.2	619.4± 43.6	425.0± 25.0	678.6
28/11	189.4± 12.8	160.4 ± 9.2	73.0 ± 4.6	140.9
5/12	50.0± 4.6	32.4± 2.4	36.0± 5.2	39.5
Total	4513.0± 202.8	3094.0 ± 122.0	2454.8 ± 104.8	3353.7
Average	410.3± 18.4*	281.3± 11.1*	221.5 ± 9.5*	304.9
L.S.D.	36.8			

* =Significant at 5% level.
± = SE.

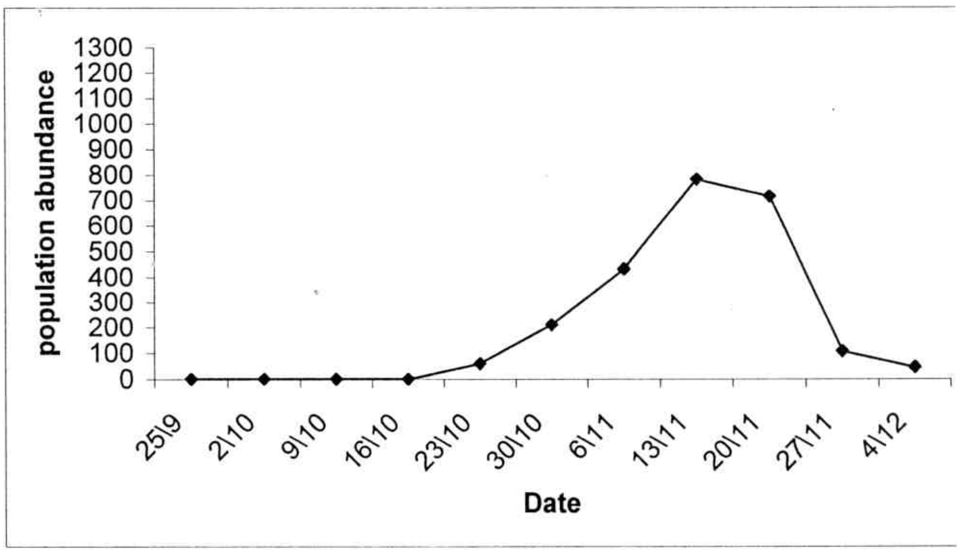
Table (4): Numbers of *Aphis craccivora* Koch. on common bean plants during 2000 season at Qalyubia Governorate.

Date of inspection	Mean number of individuals per 20 leaves at different plant levels			
	Upper part	Middle part	Lower part	Mean
25/9	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0
2/10	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0
9/10	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0
16/10	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0
23/10	70.0 ± 7.2	74.4 ± 6.7	34.0 ± 0.8	59.5
30/10	284.0 ± 15.4	191.4± 9.6	154.0± 14.6	209.8
6/11	720.0 ± 29.2	333.4± 28.6	237.0 ± 13.8	430.1
13/11	883.0± 66.6	704.4± 15.0	757.0± 37.6	781.5
20/11	949.4 ± 52.4	596.0 ± 18.0	599.4 ± 28.8	714.9
27/11	137.4± 8.8	129.4± 8.8	52.4± 6.2	106.4
4/12	51.4± 5.0	38.0± 4.0	44.0± 3.0	44.5
Total	3096.4 ± 184.6	2067.4± 91.6	1877.8 ± 104.8	2346.7
Average	281.5± 16.8*	187.9± 8.3	170.7 ± 9.5	213.3
L.S.D.	25.4			

* =Significant at 5% level.
± = SE.



A: Season 1999



B: Season 2000

Fig. (2): Population fluctuation of *Aphis craccivora* Koch. on common bean plants at Qalyubia Governorate.

I.1.C.1- The population abundance of the whitefly, *Bemisia tabaci* (Genn.) during season 1999:

I.1.C.1.A- Whitefly adults:

Data recorded in **Table** (5) and illustrated in **Fig.** (3-A) show the variation of the average numbers of the whitefly adults per 20 leaves from one inspection date to another during 1999 season. The total average numbers estimated all over the season for adults were 236.4 ± 19.5, 177.3 ± 18.1 and 105.6 ± 7.1 adults/20 leaves for upper, middle and lower common bean plants level.

Statistical analysis of the data revealed that adults' population of whitefly during 1999 season varied significantly from level to another. The three plant levels could be arranged ascendingly, according to the variation in population as follows: lower, middle and upper part, indicating that the upper part of common bean plants was the most preferred part by the adults followed by middle and lower part, which was the least preferred one.

Regarding the total mean of adult population that found on the different plant levels (upper, middle and lower), the results showed that the average adult numbers began low at the first inspection date and amounted 35.3 adults/20 leaves then increased slowly to reach its maximum level on November 14^{th} (320.5 adults/20 leaves); thereafter, the total mean of adult population decreased gradually to reach 26.7 adults/20 leaves on December 5^{th}.

I.1.C.1.B- Whitefly immature stages (eggs, larvae and pupae):

Results presented in **Table** (5) and **Fig**. (3-A) show that the immature stages trend differed obviously from adult stage concerning to the abundance on the three plant levels; on the other hand, the weekly population of immature stages showed the same trend during the whole season as achieved with adult stage. The total average numbers of immature stages throughout the whole season of 1999 were 331.3 ± 26.7, 695.8 ± 49.6 and 1148.0 ± 48.7 individuals/20 leaves for upper, middle and lower part, respectively

Statistically, the differences between the populations of the whitefly immature stages on the three levels were significant. Thus, it could be arranged ascendingly as follows: upper, middle and lower part, indicating that lower part received the greatest population of immature stages followed by the middle and upper part which received the lowest population.

Regarding the total mean population of the immature stages recorded on the different levels had shown the same trend during the whole season of 1999 as obtained with the total mean population of adult stage, where it recorded 43.9 individuals/20 leaves at the first inspection then increased gradually to reach its maximum level on November 28^{th} (1073.1 individuals/20 leaves), then decreased once more at the end of the season to record 850.1 individuals/20 leaves on December 5^{th}.

Meanwhile, the total mean population of both adult and immature stages recorded 79.3 individuals/20 leaves at the first inspection then increased by the time lapses to reach the maximum level on November 28^{th} amounted 1302.2 individuals/20 leaves after that decreased at the of the season recording 876.8 individuals/20 leaves on December 5^{th}.

I.1.C.2- The population abundance of the whitefly, *Bemisia tabaci* (Genn.) during 2000 season:

I.1C.2.A- Whitefly adults:

Data in **Table** (6) and **Fig.** (3-B) indicate that the population of adults and immature stages of *B. tabaci* on the three plant levels during 2000 season was clearly lower than 1999 season. This could be due to the effect of some ecological factors.

Generally, data revealed the same trend as achieved during 1999 season for the three plant levels, where the total average numbers were 218.5 ± 11.4, 171.1 ± 11.1 and 115.7 ± 6.6 adults/20 leaves for upper, middle and lower part, respectively

Statistical analysis of the data revealed that the differences were significant between the three plant levels in adult population. Accordingly, the three plant levels could be arranged ascendingly as follows: lower, middle and upper part.

Concerning, the total mean of adult population recorded on the different plant levels (upper, middle and lower), data showed that the average adult numbers began low at the first inspection and recorded 23.3 adults/20 leaves then, increased gradually to reach its maximum on October 30th (346.7 adults/20 leaves); by the time lapses the total mean of adult population decreased to reach 91.3 adults/20 leaves on December 5th at the of the season.

I.1.C.2.B- Whitefly immature stages (eggs, larvae and pupae):

Values of the average numbers of *B. tabaci* immature stages given in **Table** (6) and illustrated in **Fig.** (3-B) showed the same trend as indicated for those of 1999 season, where the total average numbers of the population were 266.7 ± 13.6, 292.5 ± 20.7 and 673.1 ± 43.1 individuals/20 leaves for upper, middle and lower part, respectively.

Statistical analysis revealed that, there are significant differences between the populations of immature stages during 2000 season for the three plant levels. Whereas, the lower part of the plant received the highest population followed by the middle and the upper part received the lowest immature stage population during 2000 season.

Also, the total mean population of immature stages amounted 31.3 individuals/20 leaves on September 25th at the first inspection then gradually increased to record its maximum on November 20th (741.3 individuals/20 leaves) after that the population slowly decreased to reach 254.7 individuals/20 leaves at the end of the season.

Meanwhile, the total mean population of both adult and immature stages recorded 54.7 individuals/20 leaves at the first inspection then gradually increased to achieve its two maximum levels on October 30th (1009.0 individuals/20 leaves) and on November 20th (993.3 individuals/20 leaves), then the population decreased slowly to reach 346.0 individuals/20 leaves on December 4th at the end of the season.

From the previous results recorded during the two seasons of 1999 and 2000 it revealed that, *B. tabaci* adults preferred upper common bean plant level for infestation on middle and lower part, on contrary of immature stages where the high population associated with lower plant part.

These results are coincidence with the finding of **Noldus *et al.*, (1986)** who stated that, adults of Green house whitefly (*Trialeurodes vaporariorum)* were more attracted to young leaves of tomato plants.

Also, data are in agreement with **El-Khayat *et al.* (1994)** who estimated the relative population density of *Bemisia tabaci*

(Genn.) stages on leaves of 5 summer and 5 winter vegetable crops at two locations in Qalyubia Governorate (Moshtohor and El-Kanater El-Khaireia). In winter crops, the heaviest infestation levels were detected during November followed by December, then the rates of infestation dropped sharply during January and February, due mainly to the sharp decrease in temperature. Concerning the whole average of infestation rate, it appeared much higher on leaves of winter crops than summer ones (about 7 and 12 times for the three stages altogether on tomato and bean, respectively).

The seasonal abundance of the castor whitefly *Trialeurodes ricini* (Misra) was studied by **Abd-Rabou *et al.* (2000)** on castor plants in addition to 8 species of wild plants (six winter and two summer) at Qalyubia Governorate. He added that, the highest population of these host plants occurred between September and December.

Table (5): Numbers of *Bemisia tabaci* (Gann.) on common bean plants during 1999 season at Qalyubia Governorate.

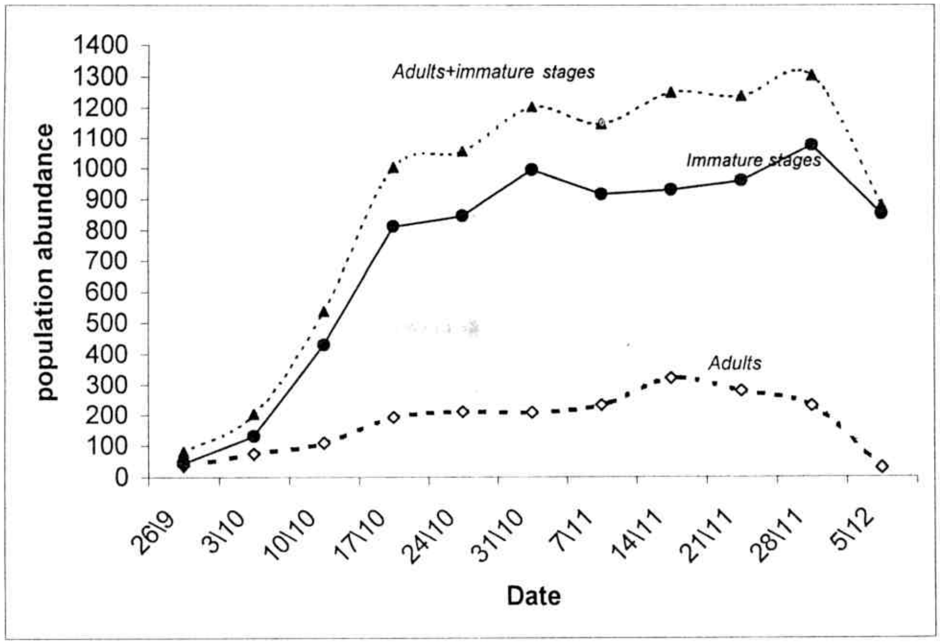
Date of inspection	Mean number of adults and immature stages per 20 leaves at different plant levels								
	Upper part		Middle part		Lower part		Mean		
	Adults	Immature stages	Adults	Immature stages	Adults	Immature stages	Adults	Immature stages	Adults+ Immature
26/9	50.0 ± 1.4	12.4±1.2	37.0±5.0	42.4±5.4	19.0±3.2	77.0±8.8	35.3	43.9	79.3
3/10	89.4± 9.2	101.4±10.6	63.4±4.2	103.0±10.2	64.4±10.4	183.4±10.4	72.4	129.3	201.7
10/10	113.0± 4.0	233.4±23.6	122.0±15.4	274.0±15.2	86.0±9.6	782.0±42.4	107.0	429.8	536.7
17/10	260.4± 36.0	245.0±24.6	180.0±17.4	831.0±78.0	133.0±9.6	1356.0±48.0	191.1	810.7	1001.8
24/10	280.4± 24.0	333.4±17.4	220.0±12.8	721.0±56.0	128.0±6.4	1479.0±20.0	209.5	844.5	1053.9
31/10	304.0 ± 13.4	429.0±32.2	194.4±19.4	954.0±32.0	122.0±4.8	1599.4±40.4	206.8	994.1	1200.9
7/11	268.0± 59.6	377.0±42.2	246.4±45.8	1052.0±29.4	169.4±5.6	1311.4±64.0	231.9	913.5	1145.4
14/11	426.0± 37.0	419.0±48.8	388.0±32.6	984.0±132.8	147.4±9.8	1380.0±119.0	320.5	927.7	1248.1
21/11	382.0± 27.4	816.0±49.4	261.0±36.0	832.0±88.0	192.4±12.4	1227.4±87.6	278.6	958.5	1236.9
28/11	386.0± 19.2	418.4±36.2	210.0±7.2	914.4±70.6	91.4±4.8	1886.4±56.4	229.1	1073.1	1302.2
5/12	44.0± 0.8	258.4±8.4	27.0±3.6	947.0±30.0	9.0±1.2	1345.0±39.8	26.7	850.1	876.8
Total	2603.2 ±237.0	3644.0±294.0	1950.0±199.4	7654.0±.547.6	1162.0±77.8	12628.0±536.0	1908.9	7975.3	9883.3
Average	236.6 ± 21.5*	331.3±26.7*	177.3±18.1*	695.8 ± 49.8*	105.6±7.1*	1148.0±48.7*	173.5	725.0	898.5
L.S.D.	17.2	56.0							

* =Significant at 5% level. ± = SE. Immature stages (eggs, larvae & pupae)

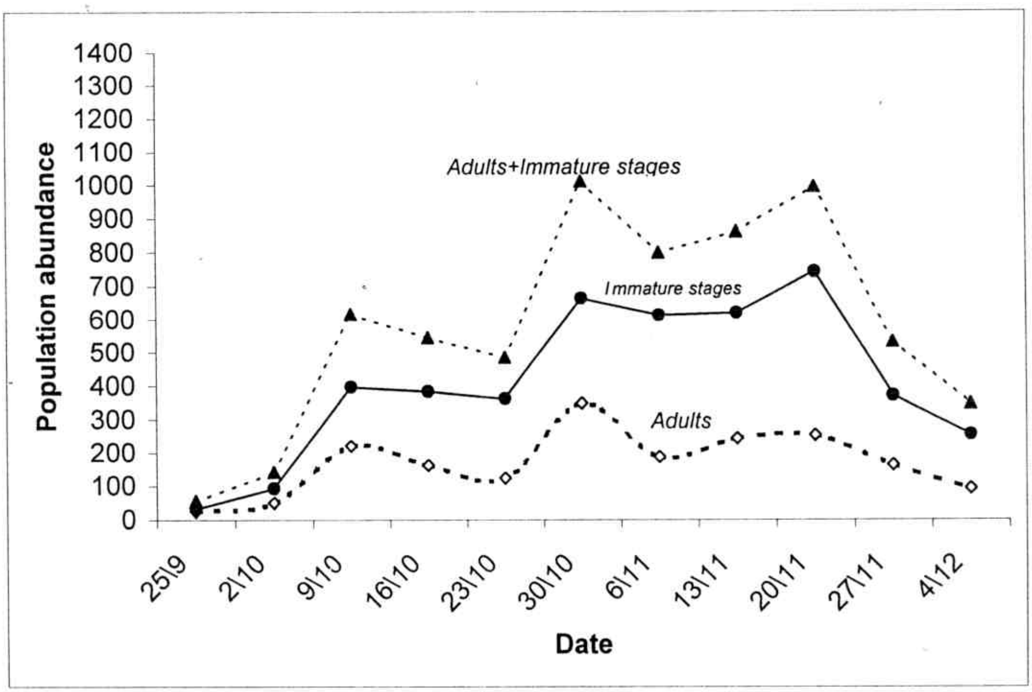
Table (6): Numbers of *Bemisia tabaci* (Gann.) on common bean plants during 2000 season at Qalyubia Governorate.

Date of inspection	Mean number of adults and immature stages per 20 leaves at different plant levels								
	Upper part		Middle part		Lower part		Mean		
	Adults	Immature stages	Adults	Immature stages	Adults	Immature stages	Adults	Immature stages	Adults+ Immature
25/9	29.0± 3.4	13.0±1.2	24.0±2.4	26.0±3.6	16.0±1.2	52.4±5.6	23.3	31.3	54.7
2/10	60.0± 9.8	71.4±5.0	44.0±5.6	65.0±6.2	42.4±6.0	140.4±3.4	48.7	92.0	140.7
9/10	268.0±14.2	262.4±24.6	249.4±10.2	283.4±19.6	141.4±14.2	641.4±137.4	219.3	396.0	615.3
16/10	234.0±31.4	273.4±13.2	157.4±11.8	368.4±43.2	91.0±3.2	506.0±45.2	160.7	382.7	543.3
23/10	137.0±4.4	299.0±9.2	133.0±19.2	312.4±9.2	95.0±4.0	471.0±36.2	122.0	360.7	482.7
30/10	464.0±14.8	314.4±10.0	339.4±11.2	337.0±12.4	237.0±11.4	1335.4±57.2	346.7	662.3	1009.0
6/11	242.4±15.0	283.4±13.0	185.4±16.0	305.4±22.8	131.0±5.0	1243.4±26.6	186.0	610.7	796.7
13/11	316.4±19.6	270.4±2.2	213.4±13.0	474.4±32.8	196.4±6.8	1108.4±88.6	242.1	618.0	860.1
20/11	366.4±8.4	539.4±22.8	251.4±8.4	550.0±21.4	138.0±6.2	1135.0±20.0	252.0	741.3	993.3
27/11	171.0±4.6	455.0±28.0	190.0±16.6	285.4±35.6	122.4±11.4	368.4±36.4	161.3	369.3	530.7
4/12	117.0±17.2	153.0±20.0	94.4±7.6	210.0±14.0	62.4±2.6	401.4±16.8	91.3	254.7	346.0
Total	2405.2 ±125.2	2934.0±149.2	1881.8±122.0	3217.4 ±228.0	1273.0±72.4	7403.2 ±474.0	1853.4	4518.7	6372.5
Average	218.7 ±11.4*	266.7±13.6*	171.1±11.1*	292.5 ±20.7*	115.7±6.6*	673.1 ±43.1*	168.4	410.8	579.3
L.S.D.	14.6	21.8							

* =Significant at 5% level.
± =SE.



A: Season 1999



B: Season 2000

Fig. (3): Population fluctuation of *Bemisia tabaci (Genn.)* on common bean plants at Qalyubia Governorate.

I.1.D- Population abundance of the parasitoid, *Diglyphus isaea* (Walker):

This study was carried out during 1999 and 2000 seasons as shown in **Tables** (7 and 8).

In **Table** (7) and **Fig.** (4-A) the mean number of parasitized *L. trifolii* larvae started during 1999 season by the second inspection on October 3rd (1.5 ± 0.5 larvae/20 leaves) with percentage of parasitism 3.0%. The parasitized larvae and the percent parasitism increased gradually with the time lapses to reach its maximum on November 21st (32.0 ± 5.9 larvae/20 leaves with the highest % parasitism of 21.8%) then decreased gradually by end of the season amounted 10.0 ± 2.8 larvae/20 leaves on December 5th with percent parasitism of 10.3 %.

Data in **Table** (8) and **Fig.** (4-B) showed the mean number of parasitized larvae during 2000 season that were lower than those of 1999 season, this due to the total host larvae of *L. trifolii* was lower in 2000 season than those of 1999 season. On the other hand the percent parasitism during 2000 season was higher than in 1999 season.

The parasitized larvae started also by the second inspection on October 2nd (1.5 ± 0.9 larvae/20 leaves and 7.5% parasitism) then increased slightly until November 13th to reach its maximum (8.0 ± 1.4 larvae/20 leaves with the highest % parasitism of 21.6%). After that, the parasitized larvae and percent parasitism decreased gradually by the end of the season on December 4th (4.0 ± 2.2 larvae/20 leaves and 15.4%, respectively). Regarding the seasonal parasitism by *D. isaea,* the previous results revealed that percent parasitism all over 1999 and 2000 season was varied (9.1 and 11.8 %, respectively), this could be due to the abundance of the host insect or the neighboring plantations of the host plant, also the dominant climatic factors could be affect the parasitoid efficiency.

The obtained results are coincidence with **Hannou (1992)** who studied the fluctuation percentage of parasitism in larvae and pupae obtained from faba bean fields located in Alexandria Governorate. The authoress found that parasitism had 3 peaks during the season 1989-1990 (Giza 2 cv.). The peaks occurred in the 1st week of December 1989, the third week of December 1989 and 3rd week of January 1990, respectively. Also, **Sharaf El-Din *et al.*, 1997** in Sudan, mentioned that percentage of parasitism of the pest larvae on broad bean was low in the beginning, but increased to 25% in January, in another season parasitism rates were even higher reaching 40 to 60% at the end of the season, showing that later in the season parasitoids might have a potential as biological control agents.

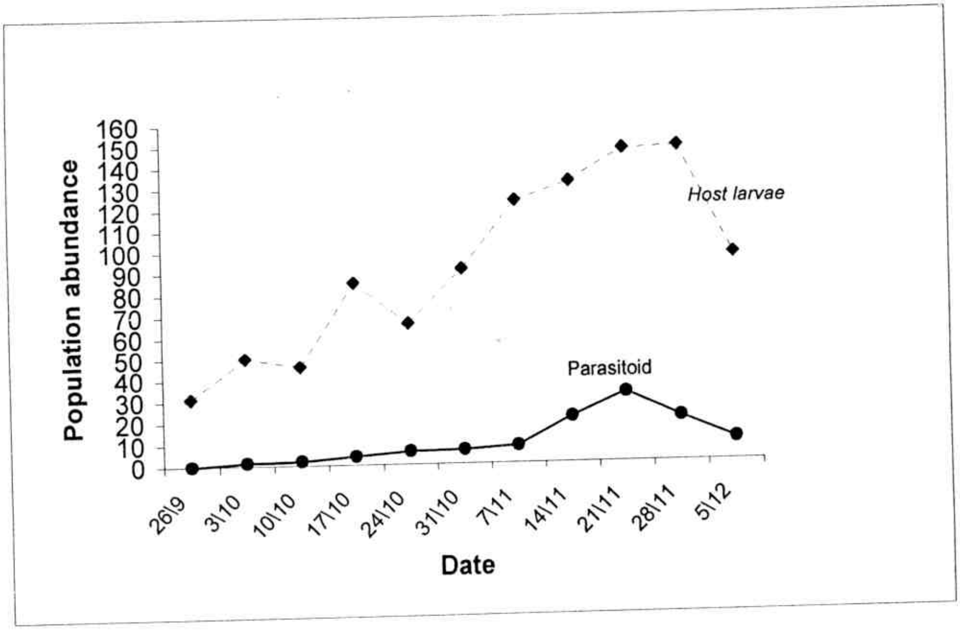
In this respect, **Trefas and Bujaki (1997)** in Hungary studied the searching capacity of *Diglyphus isaea* for *Liriomyza trifolii* (Burgess) and revealed that with high host densities, the time taken by female parasitoids to find hosts was significantly less and paralysation of host larvae was 100%. The number of eggs observed was 3 eggs on one larva.

Table (7): Percentage of parasitism by the ecto-larval parasitoid, *Diglyphus isaea* (Walker) on *Liriomyza trifolii* during 1999 season at Qalyubia Governorate.

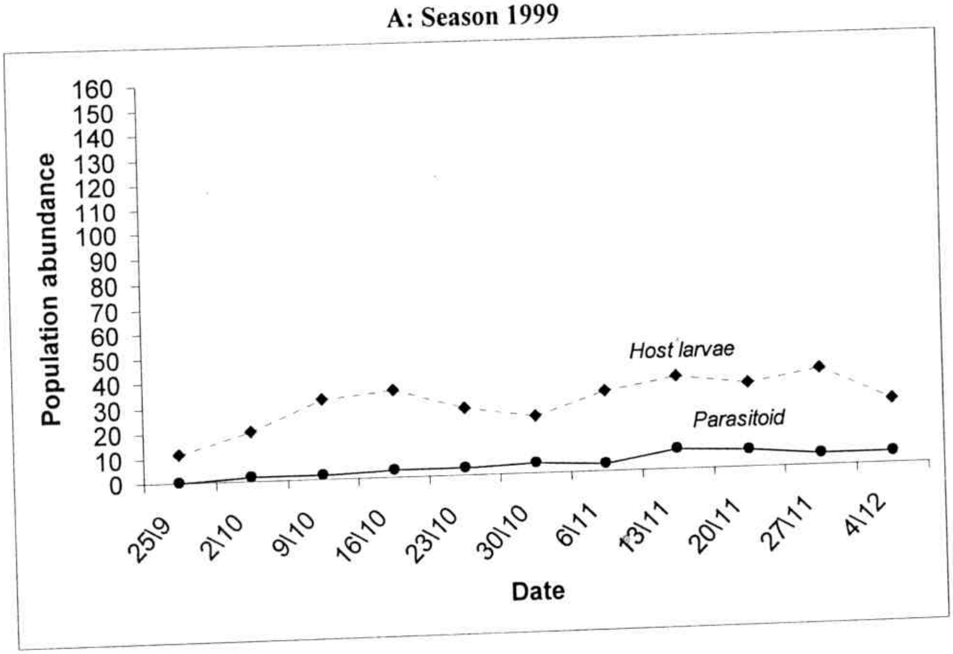
Date of inspection	Mean No. of host larvae	Parasitized larvae/20 leaves	
		Number	Parasitism %
26/ 9	31.0 ±1.9	0.0 ± 0.0	0.0
3/10	50.0 ± 4.9	1.5 ± 0.5	3.0
10/10	46.0 ± 5.3	2.0 ± 0.8	4.3
17/10	84.5 ± 5.0	4.0 ± 0.8	8.2
24/10	66.0 ± 11.8	6.0 ± 2.2	9.1
31/10	91.0 ± 5.2	6.5 ± 1.2	7.1
7/11	122.5 ± 15.5	8.0 ± 0.8	6.5
14/11	132.0 ± 10.4	21.0 ± 1.3	15.9
21/11	146.5 ± 20.3	32.0 ± 5.9	21.8
28/11	148.0 ± 11.4	20.5 ± 0.5	13.9
5/12	97.0 ± 17.3	10.0 ± 2.8	10.3
Total	898.5 ± 108.9	111.5 ± 16.8	100.2
Mean	**81.7 ± 9.9**	**10.1 ± 1.5**	**9.1**

Table (8): Percentage of parasitism by the ecto-larval parasitoid, *Diglyphus isaea* (Walker) on *Liriomyza trifolii* during 2000 season at Qalyubia Governorate.

Date of inspection	Mean No. of host larvae	Parasitized larvae/ 20 leaves	
		Number	Parasitism %
25/9	11.0 ± 1.3	0.0 ± 0.0	0.0
2/10	20.0 ± 2.9	1.5 ±0.9	7.5
9/10	32.0 ± 3.3	1.5 ± 0.9	4.7
16/10	34.5 ± 8.5	3.0 ± 1.3	8.7
23/10	26.5 ± 2.7	3.0 ± 1.3	11.3
30/10	23.0 ± 3.4	4.0 ± 1.6	17.4
6/11	32.0 ± 1.6	3.0 ± 0.6	9.4
13/11	37.0 ± 4.3	8.0 ± 1.4	21.6
20/11	34.0 ± 2.4	7.0 ± 4.5	20.6
27/11	39.0 ± 1.3	4.5 ± 0.9	11.5
4/12	26.0 ± 2.9	4.4 ± 2.2	15.4
Total	311.0 ± 34.9	39.5 ± 15.6	129.9
Mean	**28.3 ± 3.2**	**3.6 ± 1.4**	**11.8**



A: Season 1999



B: Season 2000

Fig. (4): Population fluctuation of *Liriomyza trifolii* (Burg.) infesting common bean plants and its ecto-larval parasitoid, *Diglyphus isaea* (Walker).

I.2- Summer plantation:

I.2.A- The population abundance of legume aphid, *Aphis craccivora* Koch. during 2004 season:

Results in **Table** (9) and **Fig**. (5) showed the numbers of aphid individuals on the three levels of common bean plants during summer plantation of 2004 season.

The recorded average mean numbers all over the season were 200.5 ± 16.6, 223.8 ± 16.8 and 135.1 ± 11.9 individuals/20 leaves for upper, middle and lower part, respectively Statistical analysis indicated significant differences between the population on the three levels of the plant during season 2004.

Concerning the total mean of aphid population recorded on the three plant levels, it was noticed that aphid infestation had appeared on April 19^{th} recorded 67.0 individuals/20 leaves then, increased sharply to reach its maximum level on May 10^{th} (624.5 individuals/20 leaves), after that aphid population declined sharply and disappeared at the end of May.

The obtained data during summer plantation revealed that, the middle part of common bean plants had the highest population followed by upper part, while the lower part showed the lowest population.

I.2.B- The population abundance of the whitefly, *Bemisia tabaci* (Genn.) during 2004 season:

I.2.B.1- Whitefly adults:

Data in **Table** (10) and illustrated in **Fig.** (6) showed the variation of the average numbers of the whitefly adults per 20 leaves from one inspection date to another during 2004 season. The total average numbers estimated all over the season for adults was 128.0 ± 15.6, 105.7 ± 13.1and 22.5 ± 2.2 adults/20 leaves for upper, middle and lower common bean plants level, respectively.

Statistical analysis of the data revealed that adults' population of whitefly during the season varied significantly from one level to another. The three plant levels could be arranged in ascending order, according to the population change as follows: lower, middle and upper part, indicating that the upper part of common bean plants was the most preferred part by the adults followed by middle and lower part, which was the least preferred one.

Concerning the total mean of adult population, data showed low average adult numbers at the first inspection date which amounted 64.5 adults/20 leaves then varied to reach its maximum on May 10^{th} (133.0 adults/20 leaves); thereafter, the total mean of adult population decreased gradually and tend to disappear at June 7^{th} to reach 12.5 adults/20 leaves.

Table (9): Numbers of *Aphis craccivora* Koch. on common bean plants during summer plantation of 2004 at Qalyubia Governorate.

Date of inspection	Mean number of individuals per 20 leaves at different plant levels			
	Upper part	Middle part	Lower part	Mean
05/04	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0
12/04	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0
19/04	57.5 ± 5.2	68.7 ± 6.5	75.0 ± 11.9	67.0
26/04	278.7 ± 51.4	412.5 ± 41.9	137.5 ± 17.5	276.2
03/05	561.2 ± 40.5	753.7 ± 24.0	235.0 ± 25.9	516.6
10/05	576.2 ± 31.8	713.7 ± 43.0	583.7 ± 24.2	624.5
17/05	360.0 ± 28.5	252.5 ± 46.6	320.0 ± 40.0	310.8
24/05/	151.2 ± 7.1	37.5 ± 5.9	0.0 ± 0.0	62.9
31/05	20.0 ± 2.0	0.0 ± 0.0	0.0 ± 0.0	6.6
07/06	0.0 ± 0.0	0.0 ± 0.0	0.0 ± 0.0	0.0
Total	2005.0 ± 166.8	2238.7 ± 168.2	1351.2 ± 119.7	1865.0
Average	200.5 ± 16.6*	223.8 ± 16.8*	135.1±11.9*	186.5
L.S.D.	18.93			

* =Significant at 5% level.
± = SE.

Table (10): Numbers of *Bemisia tabaci* (Gann.) on common bean plants during summer plantation of 2004 at Qalyubia Governorate.

Date of inspection	Mean number of adults and immature stages per 20 leaves at different plant levels								
	Upper part		Middle part		Lower part		Mean		
	Adults	Immature stages	Adults	Immature stages	Adults	Immature stages	Adults	Immature stages	Adults + Immature
05/04	71.2±4.7	0.0±0.0	87.5±5.9	113.7±9.6	35.0±4.5	373.7±30.0	64.5	162.5	227.0
12/04	197.5±8.5	0.0±0.0	105.0±8.6	127.5±17.9	42.5±3.2	485.0±95.6	115.0	204.1	319.1
19/04	155.0±21.0	0.0±0.0	97.5±5.2	146.2±16.2	42.5±3.2	527.5±45.7	98.3	224.5	322.8
26/04	106.2±15.1	16.2±2.3	105.0±8.6	363.7±64.5	42.5±3.2	755.0±85.8	84.5	378.3	462.5
03/05	115.0±20.1	30.7±4.7	187.5±42.6	662.5±68.8	27.5±2.5	1007.5±173.8	110.0	566.9	676.9
10/05	215.0±37.7	78.7±9.4	170.0±23.8	975.0±82.9	14.0±2.2	1512.5±206.5	133.0	855.4	988.4
17/05	155.0±20.7	185.0±13.2	170.0±15.1	1155.0±149.1	11.5±1.5	1275.0±77.7	112.1	871.6	983.7
24/05/	153.7±16.7	78.7±8.2	96.2±8.2	687.5±65.7	9.5±2.1	933.7±121.7	86.5	566.6	653.1
31/05	81.2±6.5	32.5±6.2	31.2±10.0	625.0±49.4	0.0±0.0	620.0±42.6	37.5	425.8	463.3
07/06	30.0±5.4	31.25±3.1	7.5±3.2	380.0±43.9	0.0±0.0	481.2±33.6	12.5	297.5	310.0
Total	1280.0±156.7	453.2±47.4	1057.5±131.6	5236.2±568.4	225.0±22.6	7971.2±913.4	854.1	4553.5	5407.6
Average	128.0±15.6*	45.3±4.7*	105.7±13.1*	523.6±56.8*	22.5±2.2*	797.1±91.3*	85.4	455.3	540.7
L.S.D.	13.16	84.33							

* =Significant at 5% level.
± = SE.
Immature stages (eggs, larvae & pupae)

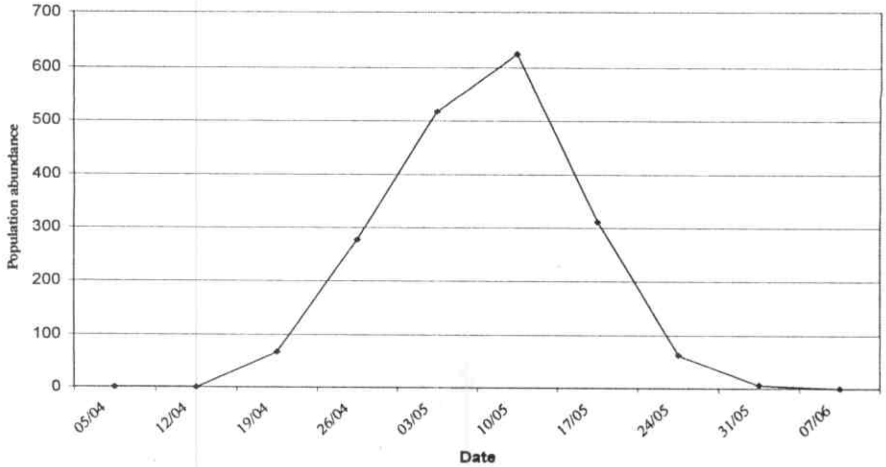


Fig. (5): Population fluctuation of *Aphis craccivora* Koch. on common bean plants during 2004 at Qalyubia Governorate.

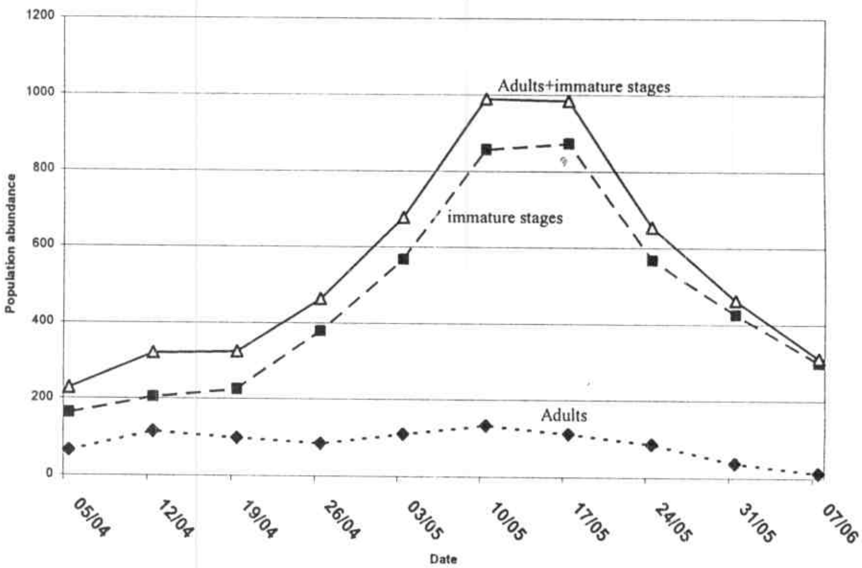


Fig. (6): Population fluctuation of *Bemisia tabaci* (Genn.) on common bean plants during 2004 at Qalyubia Governorate.

I.2.B.2- Whitefly immature stages (eggs, larvae and pupae):

Results presented in **Table** (10) and **Fig.** (6) showed that, the populations of immature stages averaged 45.3 ± 4.7, 523.6 ± 56.8 and 797.1 ± 91.3 individuals/20 leaves for upper, middle and lower part, respectively indicating that, the immature stages of the whitefly preferred obviously the lower and middle parts of the plants.

The populations of the whitefly immature stages differed statistically on the three plant levels. Thus, it could be arranged in ascending order as follows: upper, middle and lower part, indicating that the lower part harbored the highest immature stages populations followed by the middle and upper part, which showed the lowest one.

According to the total mean of immature stages populations found on the different plant levels, data showed that the average numbers recorded at the first inspection date was 162.5 adults/20 leaves then increased gradually to reach its maximum on May 17^{th} (871.6 adults/20 leaves); thereafter, the total mean decreased to reach 297.5 on June 7^{th}.

Meanwhile, the total mean populations of both adult and immature stages was 227.0 individuals/20 leaves at the first inspection then increased by the time lapses to reach its maximum on May 10^{th} amounted 988.4 individuals/20 leaves afterward decreased to 310.0 individuals/20 leaves on June 7^{th}.

I.2.C- The population abundance of *Tetranychus urticae* Koch during 2004 season:

Data in **Table** (11) and **Fig.** (7) showed the population of *T. urticae* individuals on the three levels of common bean plants during summer plantation of 2004 season.

Generally, the total numbers averaged 250.8 ± 221, 930.7 ± 83.3 and 946.6 ± 106.1 individuals/10 inches for upper, middle and lower plant part, respectively

Statistically, during 2004 season there is a significant difference in the population of *T. urticae* between the upper common bean plant level and the two other levels; whereas, the upper plant level harbored the lowest population. Thus, plant levels could be arranged in descending order regarding to the population as follows: upper, middle and lower part, indicating that the lower part of common bean plants had the highest infestation followed by the middle and the upper part, which showed the lowest one.

Regarding to the total mean of individuals found on the different plant levels (upper, middle and lower) during 2004 season, it was 127.5 individuals/10 inches at the first inspection and increased gradually by the time lapses to reach its maximum on May 31st (1325.0 individuals/10 inches) then, slightly decreased by the end of the season to record 932.2 individuals/10 inches on June 7th.

Kumar and Sharma (1993) revealed that, *Tetranychus ludeni* on okra in India appeared in the 1st week of April, the population peak was recorded in June, and sharp decline in mite density was observed in July. No mites were observed later in the year than September.

Table (11): **Numbers of *Tetranychus urticae* Koch on common bean plants during summer plantation of 2004 season at Qalyubia Governorate.**

Date of inspection	**Mean number of individuals per 10 inches at different plant levels**			
	Upper part	**Middle part**	**Lower part**	**Mean**
05/04	42.5 ± 3.2	65.0 ± 18.8	275.0 ± 32.2	127.5
12/04	45.0 ± 2.0	290.0 ± 50.1	435.0 ± 25.3	256.6
19/04	81.2 ± 9.6	567.5 ± 84.9	513.7 ± 33.5	387.5
26/04	97.5 ± 5.2	617.5 ± 67.8	527.5 ± 25.6	414.1
03/05	158.7 ± 18.7	885.0 ± 36.1	590.0 ± 67.2	544.5
10/05	312.5 ± 45.7	1750.0 ± 106.0	797.5 ± 446.1	953.3
17/05	533.7 ± 31.0	877.5 ± 287.5	1112.5 ± 65.7	841.2
24/05/	362.5 ± 23.9	1602.5 ± 53.2	1970.0 ± 86.9	1311.6
31/05	485.0 ± 30.1	1670.0± 77.1	1820.0 ± 69.4	1325.0
07/06	389.25 ± 51.5	982.5 ± 51.3	1425.0 ± 209.6	932.2
Total	2508.0 ± 221.2	9307.5 ± 833.4	9466.2 ± 1061.8	7093.9
Average	250.8 ± 221*	930.7 ± 83.3	946.6 ± 106.1	709.3
L.S.D.	104.22			

* =Significant at 5% level.
± = SE.

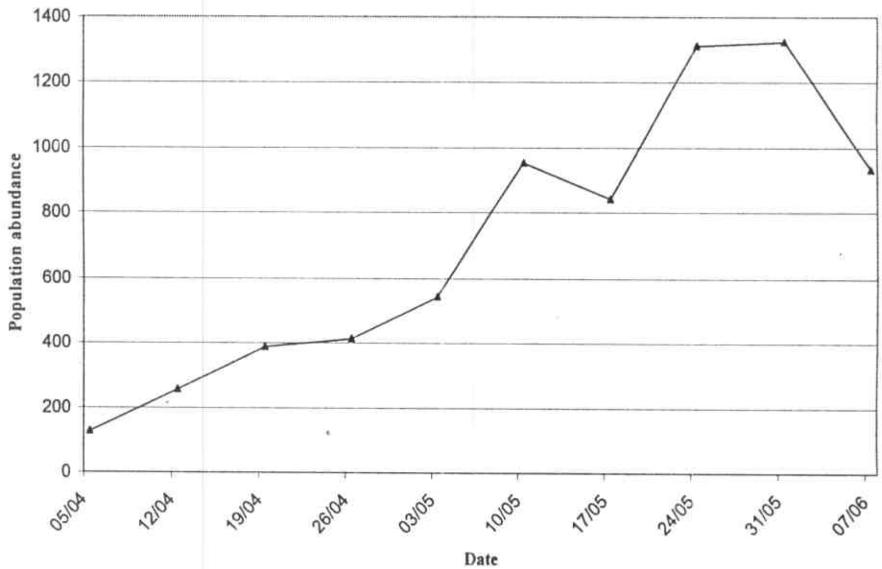


Fig. (7): Population fluctuation of *Tetranychus urticae* Koch on common bean plants during 2004 at Qalyubia Governorate.

This result indicated high infestation level for *T. urticae* on common bean plants during summer plantation in comparison to nili plantation.

When the results of the population of common bean pests during the two different plantations (nili & summer) were compared with each other, data showed the following:

A- *Liriomyza trifolii* (Burg.):

This insect pest was found only during nili plantation infesting common bean. The absence of this insect species at remarkable population level on common bean during the summer plantation could be due to the unfavorable climatic conditions especially high temperature and the low relative humidity dominate in Qalyubia region during the summer time.

A.1- Effect of maximum temperatures:

Table (12) and **Fig** (8) show the simple correlation value (r) for the numbers of *L. trifolii* larvae and numbers of mines and the weekly maximum temperature. This value revealed that, there was a negative correlation between maximum temperature and numbers of both larvae and mines; but this correlation was insignificant.

It could be concluded that, the average of this factor was around the optimum range for the activity of this pest at Qalyubia region.

A.2- Effect of minimum temperatures:

Value of simple correlation (r) for *L. trifolii* larvae and weekly minimum temperature expressed a negative and insignificant effect while, this value expressed a negative and significant relationship between minimum temperature and numbers of mines, **Table** (12) and **Fig** (8). Therefore, the average of this factor was around the optimum range for the activity of this pest.

A.3- Effect of relative humidity:

As shown in **Table** (12) and **Fig** (8) value of simple correlation (r) for *L. trifolii* larvae and mines and weekly relative humidity resulted in positive correlation, but this correlation was insignificant. Thus, this climatic factor was within the optimum range for the activity of this insect during nili plantation at Qalyubia region.

Webb (1969) in Maryland studied the effect of temperature on the mortality and time for larval developmental of the leafminer, *Liriomyza munder* Frick, on lima bean. Mortality on lima bean ranged from 8 to 16% at temperature between 15.6 to 35.4 °C, but the mortality was not consistent with the changes in temperature. Time for larval developmental on bean decreased as temperature increased from 15.6 to 26 °C, but little additional decrease occurred with higher temperature. Also, **Dimetry (1971)** in Egypt stated that, the immature stages of *Liriomyza congesta* was determined mainly by temperature, 20 °C appeared to be the optimum and at this temperature maximum numbers of eggs were laid.

B- *Aphis craccivora* Koch.:

Regarding the total mean of *A. craccivora* individuals found during the nili and summer plantations, **Table** (13) and **Fig.** (9&10) it was evident that, the legume aphid population varied from plantation to another (259.1 individuals/20 leaves during the nili plantation and 186.5 individuals/20 leaves during summer plantation.

Thus, common bean plants showed higher infestation of *A. craccivora* during the nili plantation than summer one. This result may be attributed mainly to the interaction of infestation between this insect and the two-spotted spider mite, *Tetranychus urticae* Koch; and/or some other factors as certain climatic factors dominated at Qalyubia region during the nili and summer plantation.

B.1- Effect of maximum temperatures:

Data in **Table** (13) and **Fig.** (9&10) indicated a negative correlation between weekly maximum temperature and *A. craccivora* throughout the two different plantations (nili & summer), but this correlation was insignificant indicating that, the average of this factor was around the optimum range for the activity of this pest.

B.2- Effect of minimum temperatures:

Value of simple correlation (r) for weekly minimum temperature and *A. craccivora* population expressed a negative effect and this relationship was insignificant during nili plantation while, it was positive and also, insignificant during summer plantation, **Table** (13) and **Fig.** (9&10).

Thus, the average of this factor was around the optimum range for the activity of this pest.

B.3- Effect of relative humidity:

Table (13) and **Fig** (9 & 10) showed the simple correlation value (r) for the numbers of *A. craccivora* and the weekly relative humidity. This value indicated a positive relationship and it was insignificant during the two different plantations.

Thus, the average of this factor was within the optimum range for the activity of this insect pest.

Hurej (1991) in Poland, studied the susceptibility of aphids to extreme temperatures and he suggested that, aphids of the spring and autumn generation can survive short periods at around 10 °C (depending on species, stage, gut content, feeding sites exposure time, acclimatization and the cold-hardiness of the food-plant) but temperatures above about 30 °C (depending on similar factors) are lethal in Poland only extremely high summer temperatures are able to cause high mortality in aphid populations.

C- *Bemisia tabaci* (Genn.):

The total mean of *B. tabaci* population during the nili and summer plantation, [**Table** (14) and **Fig** (11&12)] obviously varied, estimating 738.9 individuals/20 leaves during the nili plantation and 270.3 individuals/20 leaves during summer plantation.

Accordingly, common bean plants harbored higher infestation level of *B. tabaci* during the nili plantation than the summer one. This result may be attributed to the effect of climatic factors dominated at Qalyubia region during the growth of common bean plants during the two plantations.

C.1- Effect of maximum temperatures:

Value of simple correlation (r) for weekly maximum temperature and the total mean of both adult and immature stages of *B. tabaci* population expressed a negative relationship during nili plantation while, it was positive during summer plantation but these values were insignificant during the tow plantations.

C.2- Effect of minimum temperatures:

Data in **Table** (14) and **Fig** (11&12) indicated a negative correlation between weekly minimum temperature and the total mean of both adult and immature stages of *B. tabaci* populations throughout nili plantations, but this correlation was significant relationship. As a result, this climatic factor was below the optimum range for the activity of this insect during this plantation at Qalyubia region.

Whereas, during summer plantation value of simple correlation (r) expressed a positive and an insignificant relationship.

C.3- Effect of relative humidity:

Value of simple correlation (r) for weekly relative humidity and the total mean of both adult and immature stages of *B. tabaci* population expressed a positive and an insignificant relationship during nili plantation but during summer plantation a negative and an insignificant effect was shown. This result may explain the increasing the population during nili plantation.

Lal and Pillai (1982) In India mentioned that, *B. tabaci* population increases were found to be positively and significantly correlated with increases in maximum temperature. Also, **Vicente *et al.* (1988)** in Brazil, showed that observation of bean plants (*Phaseolus vulgaris*) sown in May and March, showed that population of *B. tabaci* were smaller in winter. This seemed to be related to low temperature rather than to other factors such as rain, wind and R. H.

D- *Tetranychus urticae* Koch

T. urticae was found at higher population on common bean plants during summer plantation. While, it was at lower population during nili one that was under the economic threshold level.

D.1- Effect of maximum temperatures:

Data in **Table** (15) and **Fig** (13) revealed a positive correlation between weekly maximum temperature and *T. urticae* population throughout the summer plantation but this correlation was insignificant.

D.2- Effect of minimum temperatures:

Value of simple correlation (r) for weekly minimum temperatures and *T. urticae* population expressed a positive and an insignificant relationship during summer plantation, **Table** (15) and **Fig** (13).

D.3- Effect of relative humidity:

Table (15) and **Fig** (13) showed the simple correlation value (r) for the numbers of *T. urticae* and the weekly relative humidity. This value indicated a negative and an insignificant effect during the summer plantation.

Generally, the results of *T. urticae* population assured that, the high incidence of this pest during summer plantation was due to the presence of high temperature during summer plantation indicating that, the daily average temperature and relative humidity during this plantation were within its optimum ranges for the activity of this pest.

In this respect, **Hassan *et al.* (1959)** reported that the population density of *T. cinnabarinus* (**Boisd.**) on cotton fields in Egypt was at a small peak in April; followed by a decrease in mid May, then increased again during July. This was due to high temperature and low relative humidity.

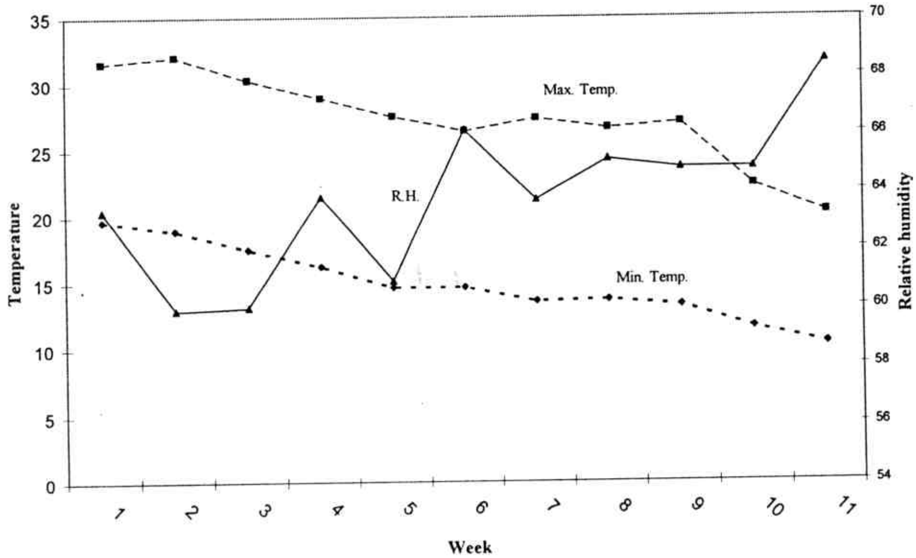
Atalla *et al.* (1972) showed that *T. arabicus* Attiah was the main phytophagous mite on bean, squash and eggplant. Population density of this mite was positively correlated with temperature while relative humidity had no significant effect. The increase in population occurred during warm and moderate humid months, with temperature average 26.5-28.0 °C and 60.5-64.5% relative humidity. In addition, **Lal (1984)** carried out field studies in India in 1976-78 on the influence of weather factors on populations of *Tetranychus neocaledonicus* Andre, *T.*

cinnabarinus (Boisd.) and *Eutetranychus orientalis* (Klein) on cassava. Populations of all species were very low or absent between June and December but increased markedly thereafter. Peak infestation occurred from January to April. Population size was significantly negatively related to humidity, but not significantly related to maximum temperature, minimum temperature or rainfall.

Table (12): Numbers of *Liriomyza trifolii* (Burg.) on common bean plants during the Nili plantation and the corresponding temperature and relative humidity at Qalyubia Governorate

Inspections (Week)	Mean number of larvae and mines per 20 leaves		Temperature		Average R.H.
	Larvae	Mines	Maximum Temp.	Minimum Temp.	
1	20.9	20.2	31.6	19.6	63.3
2	30.2	29.8	32.1	18.9	59.9
3	27.1	26.9	30.3	17.5	60.0
4	28.1	32.2	28.9	16.2	63.8
5	20.4	22.9	27.5	14.6	60.9
6	24.9	26.9	26.4	14.6	66.1
7	26.0	35.1	27.3	13.5	63.7
8	32.2	43.9	26.6	13.6	65.1
9	36.9	46.4	27.0	13.2	64.8
10	42.7	47.1	22.3	11.5	64.8
11	25.7	34.5	20.2	10.3	68.5
Total	315.4	366.5	--	--	--
Average	28.6	33.3	27.3	14.4	63.7
r": Larvae:			-0.350	-0.413	0.184
Mines:			-0.538	-0.662*	0.435

r" = Simple correlation coefficient value



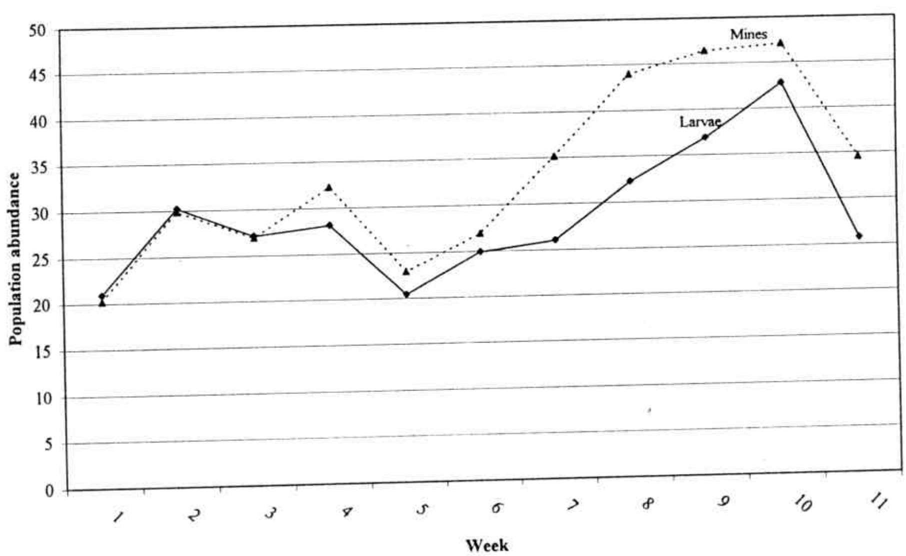


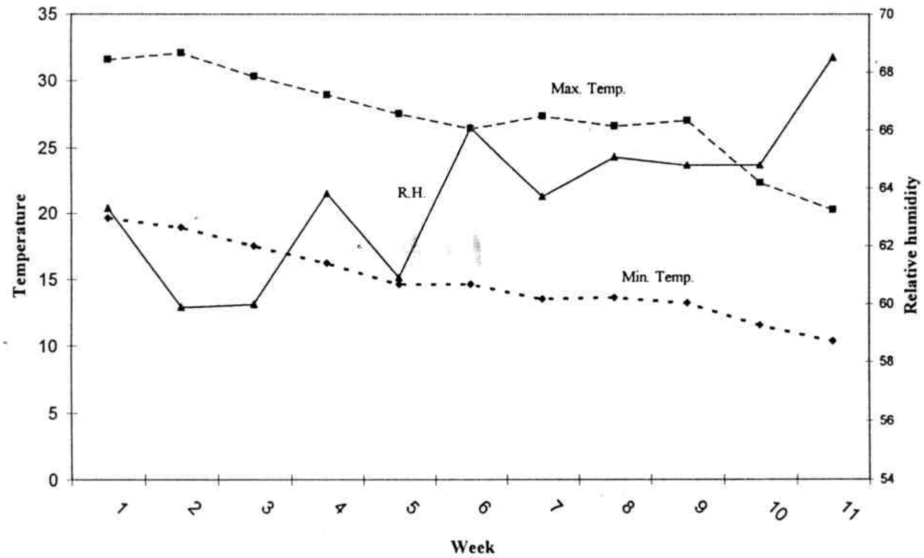
Fig. (8): Population fluctuation of *Liriomyza trifolii* (Burg.) on common bean plants during the nili plantation and the corresponding temperatures and relative humidity at Qalyubia Governorate.

Table (13): Numbers of *Aphis craccivora* Koch. on common bean plants during two different plantations and the corresponding temperature and relative humidity at Qalyubia Governorate.

Inspections	Mean number of individuals per 20 leaves							
	Nili plantation [Œ]				Summer plantation			
	No. of individuals	Temperature		Average R.H.	No. of individuals	Temperature		Average R.H.
		Maximum Temp.	Minimum Temp.			Maximum Temp.	Minimum Temp.	
1	0.0	31.6	19.6	63.3	0.0	26.6	13.5	61.5
2	0.0	32.1	18.9	59.9	0.0	29.5	13.1	58.7
3	0.0	30.3	17.5	60.0	67.0	27.4	15.5	60.6
4	25.7	28.9	16.2	63.8	276.2	29.4	15.2	55.3
5	212.8	27.5	14.6	60.9	516.6	28.1	16.0	60.7
6	244.2	26.4	14.6	66.1	624.5	29.2	14.6	55.4
7	530.0	27.3	13.5	63.7	310.8	38.0	21.7	49.4
8	975.0	26.6	13.6	65.1	62.9	30.8	14.8	65.5
9	696.7	27.0	13.2	64.8	6.6	31.9	14.4	45.6
10	123.6	22.3	11.5	64.8	0.0	34.5	19.1	45.0
11	42.0	20.2	10.3	68.5	--	--	--	--
Total	2850.2	--	--	--	1865	--	--	--
Average	259.1	--	--	--	186.5	--	--	--
r“		-0.160	-0.391	0.275		-0.038	0.170	0.072

Œ = Mean of 1999 & 2000 seasons

r“ = Simple correlation coefficient value



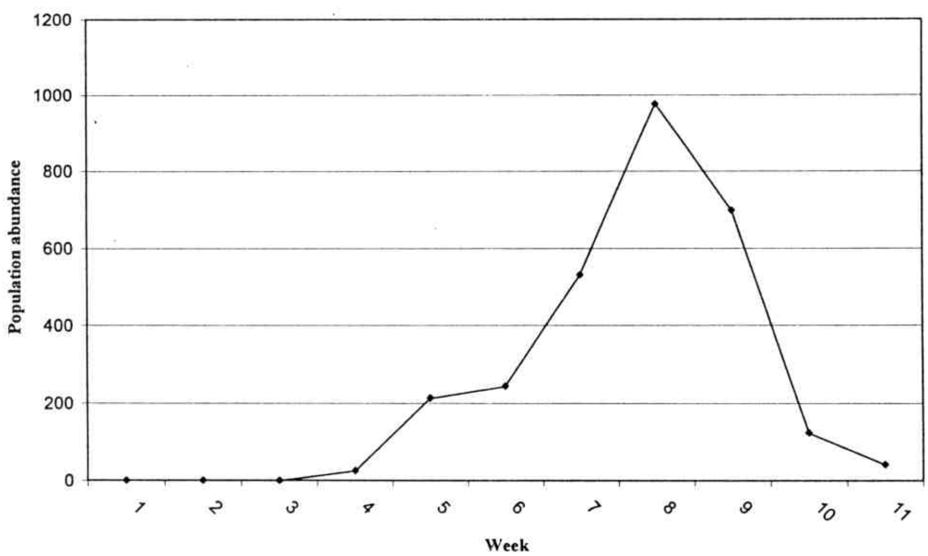


Fig. (9): Population fluctuation of *Aphis craccivora* Koch. on common bean plants during the nili plantation and the corresponding temperatures and relative humidity at Qalyubia Governorate.

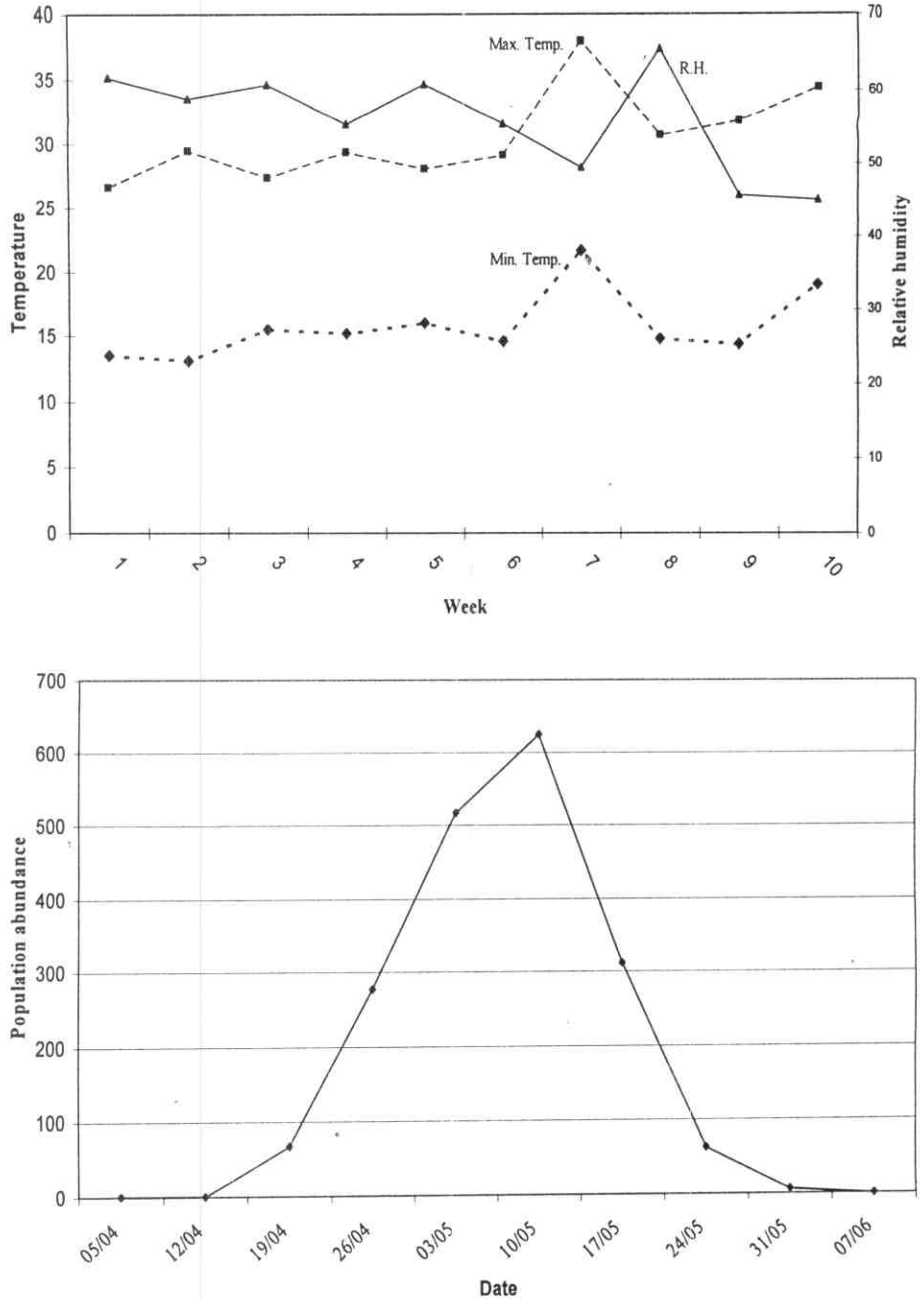


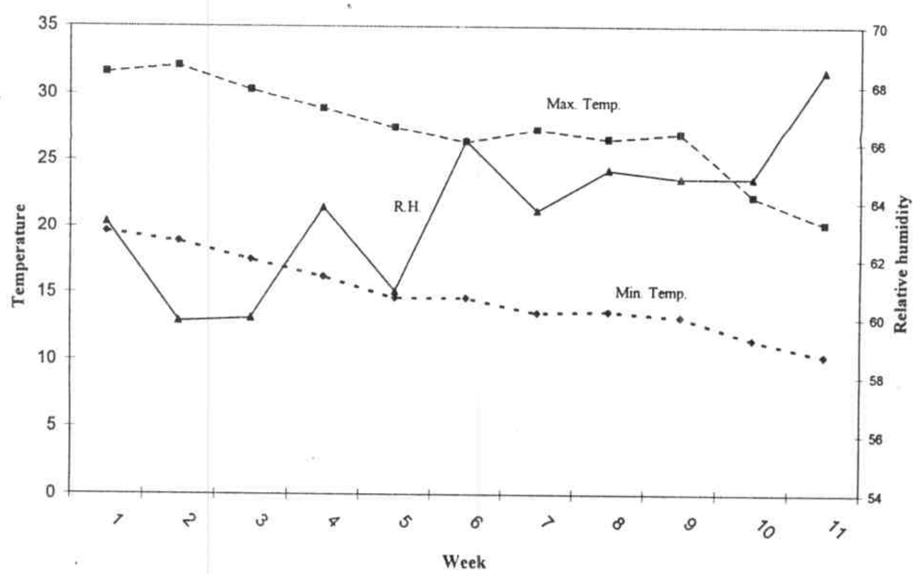
Fig. (10): Population fluctuation of *Aphis craccivora* Koch. on common bean plants during the summer plantation and the corresponding temperatures and relative humidity at Qalyubia Governorate.

Table (14): Numbers of *Bemisia tabaci* (Genn.) on common bean plants during two different plantations and the corresponding temperature and relative humidity at Qalyubia Governorate.

Inspections (Week)	Mean number of adults and immature stages per 20 leaves — Nili plantation [Œ]						Summer plantation					
	Adults	Immature stages	Adults + Immature	Temperature Maximum Temp.	Temperature Minimum Temp.	Average R.H.	Adults	Immature stages	Adults + Immature	Temperature Maximum Temp.	Temperature Minimum Temp.	Average R.H.
1	29.3	37.6	67.0	31.6	19.6	63.3	64.5	162.5	227.0	26.6	13.5	61.5
2	60.5	110.6	171.2	32.1	18.9	59.9	115.0	204.1	319.1	29.5	13.1	58.7
3	163.1	412.9	576.0	30.3	17.5	60.0	98.3	224.5	322.8	27.4	15.5	60.6
4	175.9	596.7	772.5	28.9	16.2	63.8	84.5	378.3	462.5	29.4	15.2	55.3
5	165.7	602.6	768.3	27.5	14.6	60.9	110.0	566.9	676.9	28.1	16.0	60.7
6	276.7	828.2	1104.9	26.4	14.6	66.1	133.0	855.4	988.4	29.2	14.6	55.4
7	208.9	762.1	971.1	27.3	13.5	63.7	112.1	871.6	983.7	38.0	21.7	49.4
8	281.3	772.8	1054.1	26.6	13.6	65.1	86.5	566.6	653.1	30.8	14.8	65.5
9	265.3	849.9	1115.1	27.0	13.2	64.8	37.5	425.8	463.3	31.9	14.4	45.6
10	195.2	721.2	916.4	22.3	11.5	64.8	12.5	297.5	310.0	34.5	19.1	45.0
11	59.0	552.4	611.4	20.2	10.3	68.5	--	--	--	--	--	--
Total	1881.1	6247.0	8128.1	--	--	--	854.1	4553.5	5407.6	--	--	--
Average	171.0	567.9	738.9	--	--	--	85.4	455.3	540.7	--	--	--
r[«] Adults:				-0.212	-0.412	0.222				-0.226	-0.116	0.525
r[«] Immature stages :				-0.601*	-0.768*	0.513				0.484	0.470	-0.163
r[«] Adults + immature:				-0.518	-0.698*	0.453				0.418	0.420	-0.080

Œ = Mean of 1999 & 2000 seasons

r« = Simple correlation coefficient value



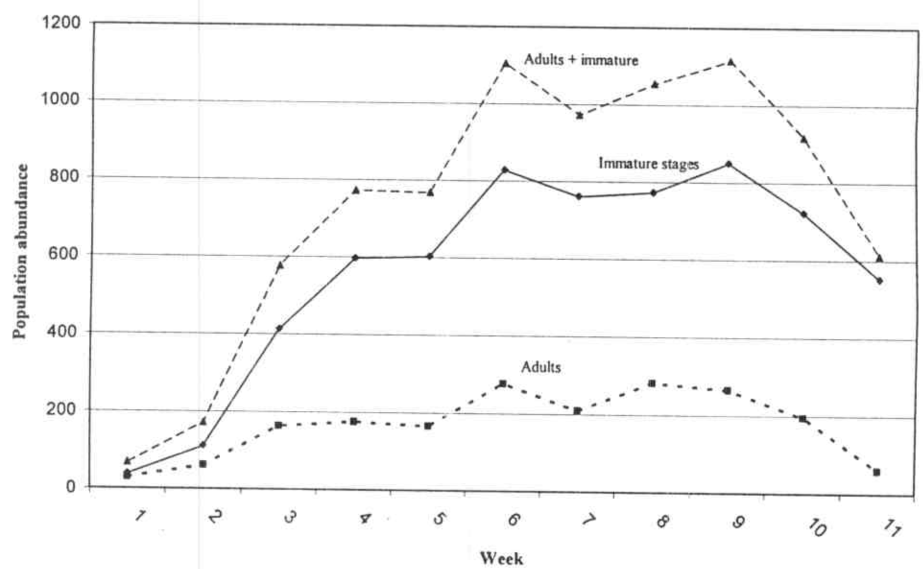


Fig. (11): Population fluctuation of *Bemisia tabaci* (Genn.) on common bean plants during the nili plantation and the corresponding temperatures and relative humidity at Qalyubia Governorate.

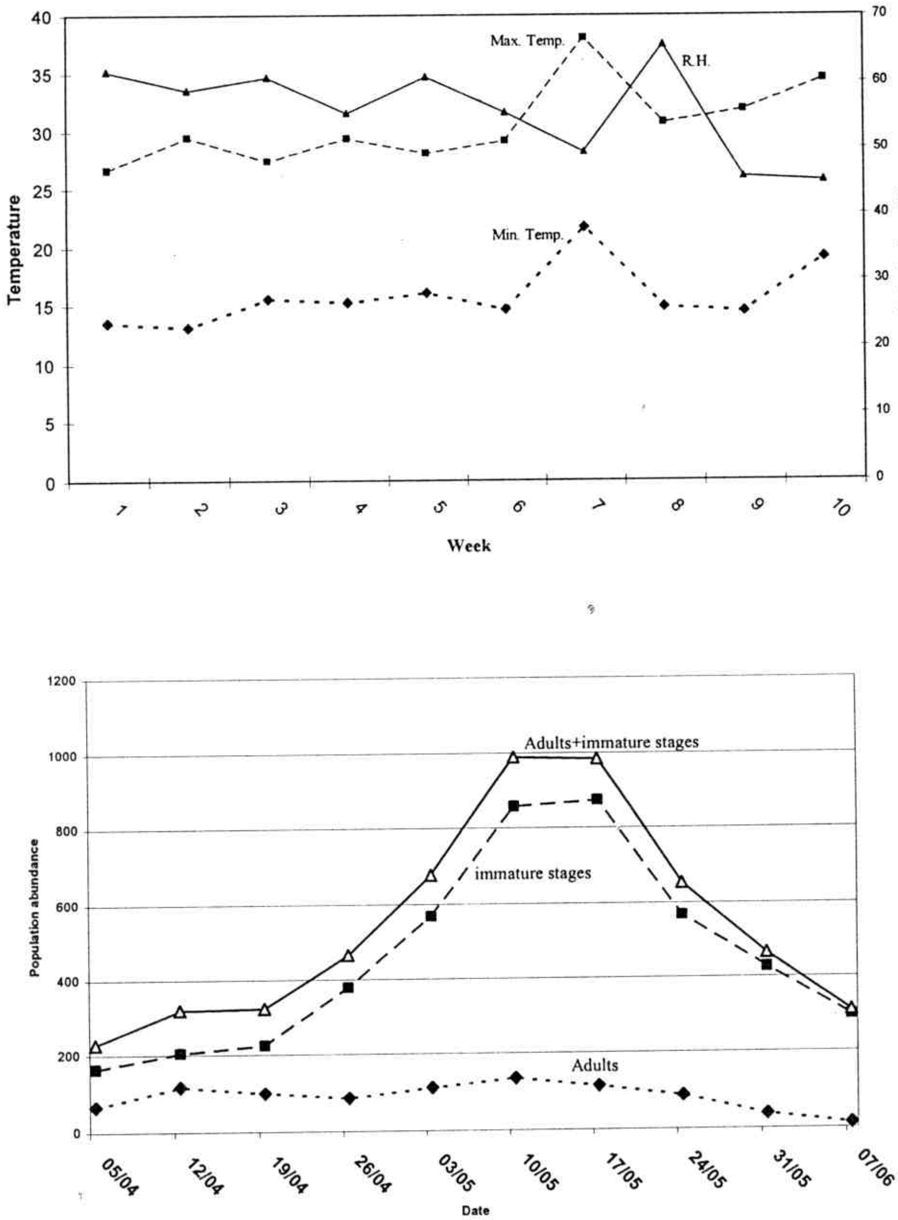
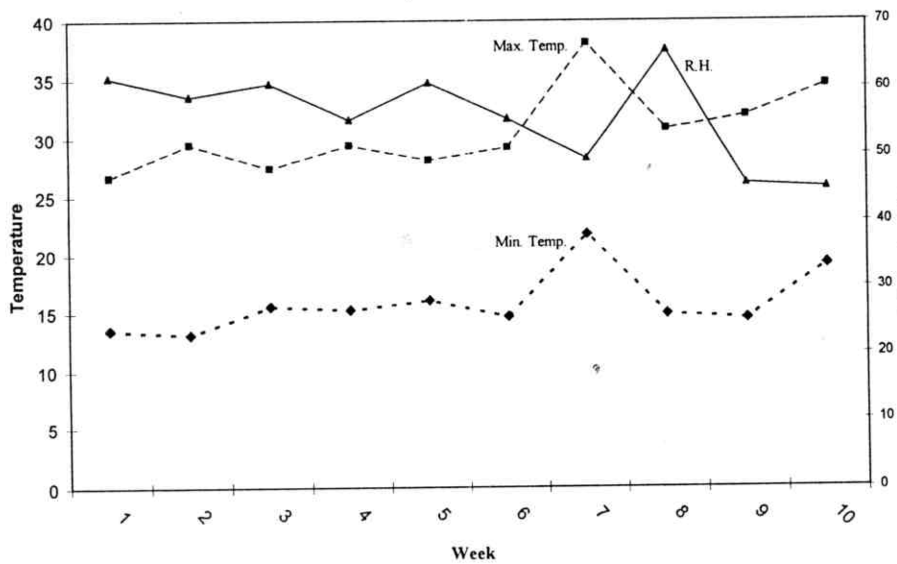


Fig. (12): Population fluctuation of *Bemisia tabaci* (Genn.) on common bean plants during the summer plantation and the corresponding temperatures and relative humidity at Qalyubia Governorate.

Table (15): Numbers of *Tetranychus urticae* Koch on common bean plants during summer plantation of 2004 season and the corresponding temperature and relative humidity at Qalyubia Governorate

Inspections	Mean number of individuals per 10 inches	Temperature		Average R.H.
		Maximum Temp.	Minimum Temp.	
05/04	127.5	26.6	13.5	61.5
12/04	256.6	29.5	13.1	58.7
19/04	387.5	27.4	15.5	60.6
26/04	414.1	29.4	15.2	55.3
03/05	544.5	28.1	16.0	60.7
10/05	953.3	29.2	14.6	55.4
17/05	841.2	38.0	21.7	49.4
24/05/	1311.6	30.8	14.8	65.5
31/05	1325	31.9	14.4	45.6
07/06	932.2	34.5	19.1	45.0
Total	7093.9	--	--	--
Average	709.3	--	--	--
r“:		0.529	0.252	-0.394

r“ = Simple correlation coefficient value



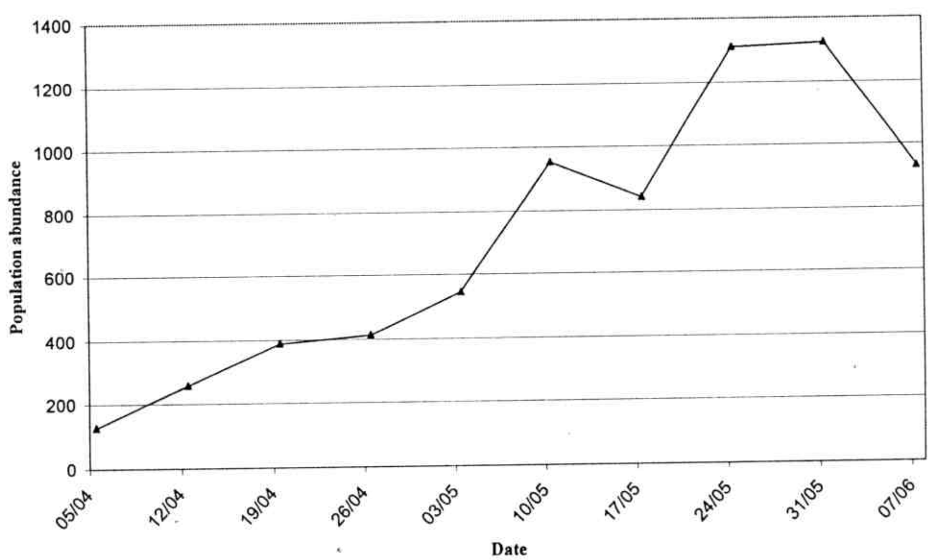


Fig. (13): Population fluctuation of *Tetranychus urticae* Koch on common bean plants during the summer plantation and the corresponding temperatures and relative humidity at Qalyubia Governorate.

II- Evaluation of certain treatments and their mixtures:

II.1- Nili plantation:

The present investigation was conducted during the Nili seasons of 1999 and 2000 to evaluate the efficiency of 5 treatments and their mixtures against the tested insects at the Experimental Station of Faculty of Agriculture, Moshtohor, Qalyubia Governorate.

II.1.1- Efficiency of the tested compounds alone:

II.1.1.A-The broad bean leafminer, *Liriomyza trifolii* (Burg.):

Results of the first spray of 1999 season in **Table** (16-A) revealed that the average number of *L. trifolii* larvae per 20 leaves was obviously reduced after 3 days from treatment and amounted (8.0, 28.0), (18.0, 28.6), (12.0, 22.6), (30.6, 40.0) and (32.0, 40.0) for Selecron (Profenofos) 72% EC. at (187.5, 93.7 cm^3/100L.), Achook (Azadirachtin) 0.15% EC. at (200, 100 cm^3/100 L.), Bemistop 21.1% EC. at (500, 250 cm^3/100L.), Biosect (*Beauveria bassiana*) 32 x 10^6 conidia/mg at (200, 100 g/100L) and Admiral (Pyriproxyfen) 10% EC. at (300, 150 cm^3/100L), respectively. The corresponding reduction rates were (87.3, 54.9%), (77.3, 58.7%), (81.8, 62.8), (62.1, 46.9%) and (59.7, 45.4%) for the 5 compounds, respectively

However, the number of larvae was slightly increased from the 7^{th} day after application to reach (18.6, 18.0), (36.0, 36.0), (41.2, 40.6), (50.6, 54.6) and (49.2, 50.6 larvae/20 leaves) at the 14^{th} day of spraying for various compounds, respectively. On contrary, reduction rates of larvae were decreased and amounted (72.3, 72.8%), (57.5, 51.2%), (41.5, 37.3%), (41.1, 32.0%) and (41.6, 35.1%) for various treatments, respectively.

The average reduction rates of *L. trifolii* larvae population reached to (87.8, 60.2%), (72.5, 54.8%), (70.4, 53.9%), (53.6, 41.8%) and (67.1, 43.9%) (rate, half application rate) for various treatments, respectively. Values of the general mean of larvae during the observation periods of two weeks from zero time indicated significant reduction for the various treatments at the two application rates as compared with the control.

Statistical analysis of the data detected no significant differences in the general mean of *L. trifolii* larvae between the application rate and half application rate of the various compounds with exception of Selecron and Admiral, where the half-recommended rate was less effective. Previous results proved that at the two application rates, Selecron (Profenofos) was the most effective one; followed by Achook (Azadirachtin), Bemistop, the I.G.R., Admiral (Pyriproxyfen) and Biosect (*Beauveria bassiana*) that was the least effective one.

Table (16-A): Efficiency of certain treatments against *Liriomyza trifolii* (Burg.) larvae on common bean plants during 1999 season at Qalyubia Governorate.

Treatments	Rate / 100L	Mean number of larvae per 20 leaves and reduction rates at indicated days from treatment								
		Pre-spray	First spray							
			1	2	3	5	7	10	14	Average
Selecron 72% EC.	187.5 cm^3	40.6	4.0 (91.8)	10.0 (82.2)	8.0 (87.3)	0.0 (100.0)	0.00 (100.0)	12.0 (81.6)	18.2 (72.3)	7.4* (87.8)
	93.7 cm^3	40.0	20.6 (57.5)	26.0 (52.9)	28.0 (54.9)	32.0 (50.7)	20.0 (61.4)	18.6 (71.1)	18.0 (72.8)	23.2* (60.2)
Achook 0.15% EC.	200 cm^3	51.2	12.0 (80.7)	18.0 (74.5)	18.0 (77.3)	20.0 (75.9)	20.0 (69.9)	23.4 (71.6)	36.0 (57.5)	21.0* (72.5)
	100 cm^3	44.6	40.6 (24.9)	25.4 (58.8)	28.6 (58.7)	22.2 (69.6)	18.6 (67.8)	34.0 (52.7)	36.0 (51.2)	29.2* (54.8)
Bemistop 21.1% EC.	500 cm^3	42.6	10.0 (80.6)	16.0 (72.8)	12.0 (81.8)	13.2 (80.9)	18.0 (67.4)	22.0 (67.9)	41.2 (41.5)	18.8* (70.4)
	250 cm^3	39.2	20.0 (57.9)	26.0 (51.9)	22.6 (62.8)	22.0 (65.4)	22.6 (55.5)	34.0 (46.1)	40.6 (37.3)	26.8* (53.9)
Biosect32x10^6 conidia/mg	200 gm.	52.0	18.0 (71.4)	32.0 (45.4)	30.6 (62.1)	34.6 (58.9)	36.0 (46.6)	42.0 (49.8)	50.6 (41.1)	34.8* (53.6)
	100 gm.	48.6	32.0 (45.7)	35.2 (47.6)	40.0 (46.9)	44.0 (44.2)	45.2 (28.3)	40.6 (48.1)	54.6 (32.0)	41.6* (41.8)
Admiral 10% EC.	300 cm^3	51.2	16.0 (74.2)	20.0 (71.7)	32.0 (59.7)	22.0 (73.5)	18.0 (72.9)	20.0 (75.7)	49.2 (41.6)	25.2* (67.1)
	150 cm^3	47.2	32.0 (44.0)	36.0 (44.8)	40.0 (45.4)	37.2 (51.4)	35.2 (42.58)	42.0 (44.7)	50.6 (35.1)	39.0* (43.9)
Control	--	47.2	57.2	65.2	73.2	76.6	61.2	76.0	78.0	69.6

L.S.D. =8.8

*= Significant at 5% level.

% Reduction rates are given in brackets.

Table (16-B): Continued.

Treatments	Rate / 100L	Mean number of larvae per 20 leaves and reduction rates at indicated days from treatment								
		Pre-spray	Second spray							
			1	2	3	5	7	10	14	Average
Selecron 72% EC.	187.5 cm^3	18.2	2.0 (88.9)	2.0 (89.5)	3.2 (84.85)	4.0 (78.5)	3.2 (84.0)	6.0 (72.0)	6.2 (71.7)	3.8* (81.4)
	93.7 cm^3	18.0	6.6 (62.4)	5.2 (71.8)	11.2 (44.8)	11.2 (37.8)	12.0 (38.1)	14.0 (32.6)	15.2 (28.4)	10.6* (45.1)
Achook 0.15% EC.	200 cm^3	36.0	12.6 (64.1)	12.0 (67.5)	14.0 (65.5)	12.2 (66.1)	10.0 (74.2)	8.6 (79.3)	10.6 (75.0)	11.4* (70.2)
	100 cm^3	36.0	20.0 (42.9)	18.0 (51.3)	20.0 (50.6)	18.4 (48.9)	18.0 (53.6)	17.2 (58.6)	20.0 (52.9)	18.8* (51.3)
Bemistop 21.1% EC.	500 cm^3	41.2	14.0 (65.1)	12.0 (71.6)	10.0 (78.5)	8.0 (80.6)	10.6 (76.1)	12.0 (74.6)	14.0 (71.2)	11.4* (73.9)
	250 cm^3	40.6	18.6 (52.9)	20.0 (51.9)	18.0 (60.7)	20.0 (50.7)	22.0 (49.7)	26.0 (44.5)	32.0 (33.2)	22.2* (49.1)
Biosect32x10^6 conidia/mg	200 gm.	50.6	18.0 (63.5)	20.0 (61.5)	26.0 (54.5)	24.0 (52.6)	20.0 (63.9)	26.0 (55.5)	26.6 (55.4)	22.8* (58.0)
	100 gm.	54.6	20.0 (62.10)	36.0 (35.71)	40.0 (35.06)	38.0 (30.40)	32.0 (45.57)	34.0 (46.03)	42.0 (34.78)	34.4* (41.42)
Admiral 10% EC.	300 cm^3	49.2	12.6 (73.7)	14.0 (72.3)	18.6 (66.5)	13.0 (71.9)	12.6 (76.2)	10.0 (82.4)	9.2 (84.1)	12.8* (75.3)
	150 cm^3	50.6	20.0 (59.4)	26.6 (48.7)	32.0 (43.9)	33.2 (34.4)	34.6 (36.5)	34.0 (41.8)	40.6 (31.9)	31.4* (42.4)
Control	--	78.0	76.0	80.0	88.0	78.0	84.0	90.0	92.0	84.0

L.S.D. =4.3
*= Significant at 5% level.
% Reduction rates are given in brackets.

Obtained data in **Table** (16-B) indicated that, the effect of the various treatments at the 2nd spray showed nearly the same trend as indicated with the 1st spray with some exception. However, all compounds caused a significant decrease in the general mean of larvae as compared with the control. Also, the I.G.R., Admiral came to the second grade of efficiency after Selecron followed by Bemistop, Achook and Biosect which was the least effective for depressing population of *L. trifolii* larvae.

Data obtained during 2000 season are presented in **Tables** (17-A) and (19-B), concerning the first spray results, **Table** (17-A) indicated that the average number of *L. trifolii* larvae per 20 leaves was significantly reduced after three days from application in comparison with control and amounted (4.6 at high application rate, 18.6 at low application rate), (10.0, 19.2),(4.0, 13.2), (16.0, 12.0) and (6.0, 20.0) for Selecron 72% EC., Achook 0.15% EC., Bemistop 21.1% EC., Biosect 32 x 10^6 conidia/mg and Admiral 10% EC. for the two application rates, respectively.

The corresponding reduction rates were (84.6, 57.5%), (73.3, 45.5%), (85.5, 66.8%), (52.4, 58.9%) and (80.8, 46.7%) for various compounds, respectively. From the 7th to the 14th day after spraying, the mean number of larvae was slightly increased for all treatments to reach (4.6, 7.2), (16.0, 16.0), (21.2, 20.0), (19.2, 20.0) and (24.6, 27.2 larvae/20 leaves) at the 14th day of spraying for various treatment, respectively. On contrary, the reduction rates of larvae were sharply decreased to (82.7, 81.5%), (52.0, 48.9%), (13.6, 43.5%), (35.7, 33.0%) and (11.6, 18.4%) for various compounds at the two application rates, respectively.

The average reduction rates of larvae were (83.7, 54.9%), (77.3, 52.2%), (70.2, 52.4%), (57.2, 49.5%) and (71.2, 34.5%) for various treatments, respectively. Values of the general mean of larvae during the observation periods of two weeks post-treatment indicated significant reduction for the various treatments at the two application rates used as compared with the control.

Statistical analysis of the data revealed significant differences in the general mean of larvae between the two application rates of the various compounds (except for the bioinsecticide, Biosect where the half application rate was less effective for controlling *L. trifolii* larvae). Accordingly, Selecron (Profenofos) was the most effective compound against *L. trifolii* larvae, followed by Achook, Bemistop, Admiral and Biosect that was the least effective one.

Regarding the second spray data in **Table** (17-B) showed the same line and trend as indicated with the first spray of 2000 season.

Also, all treatments caused a significant decrease in the general mean of larvae as compared with the control.

In general, Selecron (Profenofos) proved to be the most effective treatment for controlling *L. trifolii* larvae followed by the two botanical insecticides, Achook (Azadirachtin) and Bemistop and Admiral (Pyriproxyfen). In spite of Selecron was the most effective compound against *L. trifolii* larvae, botanical insecticide or I.G.R. /or the bioinsecticide could be used for controlling this insect pest due to the safety for the environment.

Concerning the effect of various compounds against *Liriomyza trifolii* (Burgess), **Richter and Tsegaye (1988)** in Germany, stated that Methamidophos, dimethoate and Deltamethrin were highly toxic to larvae, but Methidathion and Cypermethrin were not and could not be recommended as control agents on beans *Phaseolus vulgaris L.* Also, **Saito *et al.* (1992)** evaluated 54 insecticides by spraying 1-day-old larvae of

Liriomyza trifolii (Burgess), among these insecticides; the insect growth regulators (IGRs), Cyromazine and Flufenoxuron gave high mortality on *Phaseolus vulgaris*. Cyromazine and Flufenoxuron lacked adulticidal activity and the repellent effect on feeding and oviposition. When adult females were exposed for 2 days to the IGR-treated foliage, however, progeny egg and larval viability was reduced. Adult females that survived the IGR-treatment as larvae produced fewer progeny.

In addition, **Chang and Chen (1993)** in Taiwan evaluated some insecticides on kidney bean (*Phaseolus vulgaris* L.). Where they mentioned that, *Liriomyza bryoniae*, *Tetranychus urticae*, *Frankliniella intonsa*, *Edwardsiana flavescens* and some *Lepidoptera* were controlled effectively by 2 consecutive sprays of Bifenthrin, Cyhalothrin, Deltamethrin 2.8% EC., *Bacillus thuringiensis* 3% wp., malathion 50% EC or Cypermethrin (Cyromazine) 75% wp.

Also, in this regard, **Omara *et al.* (1997)** evaluated the aqueous neem seed kernel powder (ANSKPE) and Neem Azal-F (5% Azadirachtin) on *Liriomyza congesta* infesting faba bean in the field. They demonstrated that, spraying at high concentration (100 ppm of Neem Azal-F and 4% of ANSKPE) had a slight effect on mean numbers of mines and larvae of *Liriomyza congesta* where feeding and oviposition were not completely inhibited, but were effective as an antifeedant.

Table (17-A): Efficiency of certain treatments against *Liriomyza trifolii* (Burg.) larvae on common bean plants during 2000 season at Qalyubia Governorate.

Treatments	Rate / 100L	Mean number of larvae per 20 leaves and reduction rates at indicated days from treatment								
		Pre-spray	First spray							
			1	2	3	5	7	10	14	Average
Selecron 72% EC.	187.5 cm^3	26.0	8.6 (69.9)	4.6 (86.6)	4.6 (84.6)	0.6 (97.7)	0.0 (100.0)	8.0 (63.8)	4.6 (82.7)	4.4* (83.6)
	93.7 cm^3	38.0	16.0 (61.6)	17.2 (65.8)	18.3 (57.5)	20.0 (48.5)	26.0 (31.6)	20.0 (38.1)	7.2 (81.5)	17.8* (54.9)
Achook 0.15% EC.	200 cm^3	32.6	7.2 (79.9)	8.0 (81.5)	10.0 (73.3)	6.0 (82.0)	4.2 (87.1)	4.0 (85.6)	16.0 (52.0)	7.8* (77.3)
	100 cm^3	30.6	18.3 (44.6)	16.0 (60.5)	19.2 (45.5)	14.6 (53.3)	11.2 (63.4)	13.2 (49.2)	16.0 (48.9)	15.4* (52.2)
Bemistop 21.1% EC.	500 cm^3	24.0	4.0 (84.8)	4.4 (86.1)	4.0 (85.5)	2.0 (91.9)	5.2 (78.3)	10.0 (50.9)	21.2 (13.6)	7.2* (70.2)
	250 cm^3	34.6	19.2 (49.4)	20.0 (56.3)	13.2 (66.8)	13.2 (62.7)	14.6 (57.8)	20.6 (29.9)	20.0 (43.5)	17.2* (52.4)
Biosect 32x10^6 conidia/mg	200 gm.	29.2	14.0 (56.3)	16.0 (58.6)	16.0 (52.4)	12.0 (59.8)	8.0 (72.6)	8.6 (65.3)	19.2 (35.7)	13.4* (57.2)
	100 gm.	29.2	20.0 (37.6)	18.3 (51.9)	13.8 (58.9)	14.0 (53.1)	14.0 (52.2)	10.0 (59.7)	20.0 (33.0)	15.6* (49.5)
Admiral 10% EC.	300 cm^3	27.2	2.2 (92.63)	6.0 (83.3)	6.0 (80.8)	5.8 (79.1)	4.0 (85.3)	8.0 (65.4)	24.6 (11.6)	8.0* (71.2)
	150 cm^3	32.6	28.0 (21.8)	24.0 (44.4)	20.0 (46.7)	18.3 (44.2)	20.0 (38.7)	20.0 (27.8)	27.2 (18.4)	22.4* (34.5)
Control	--	26.6	29.2	34.2	30.6	27.2	26.6	22.6	27.2	28.2

L.S.D. = 4.8
*= Significant at 5% level.
% Reduction rates are given in brackets.

Table (17-B): Continued.

Treatments	Rate / 100L	Mean number of larvae per 20 leaves and reduction rates at indicated days from treatment								
		Pre-spray	Second spray							
			1	2	3	5	7	10	14	Average
Selecron 72% EC.	187.5 cm^3	4.6	2.0 (64.4)	0.6 (86.9)	1.2 (80.9)	0.8 (83.8)	0.0 (100.0)	0.0 (100.0)	0.4 (93.2)	0.6* (87.0)
	93.7 cm^3	7.2	4.6 (47.7)	4.0 (44.4)	4.2 (57.3)	3.8 (50.8)	2.6 (66.4)	3.8 (60.1)	4.2 (54.1)	3.8* (54.4)
Achook 0.15% EC.	200 cm^3	16.0	6.0 (69.3)	4.0 (75.0)	4.0 (81.7)	3.2 (81.4)	2.6 (84.9)	2.0 (90.6)	2.6 (87.2)	3.4* (81.4)
	100 cm^3	16.0	8.0 (59.03)	8.6 (46.3)	8.0 (63.4)	6.6 (61.6)	6.0 (65.1)	6.6 (68.8)	5.2 (74.5)	7.0* (62.7)
Bemistop 21.1% EC.	500 cm^3	21.2	8.6 (66.8)	8.0 (62.3)	7.2 (75.2)	6.0 (73.6)	2.6 (79.8)	7.2 (74.3)	8.0 (70.3)	7.0* (71.8)
	250 cm^3	20.0	10.0 (59.0)	9.2 (54.0)	8.6 (68.6)	10.0 (53.4)	8.6 (59.9)	8.0 (69.8)	10.0 (60.7)	9.2* (60.8)
Biosect $32x10^6$ conidia/mg	200 gm.	19.2	16.0 (31.7)	14.0 (27.1)	10.0 (61.9)	6.2 (69.9)	7.2 (65.1)	7.8 (69.3)	8.0 (67.2)	9.8* (56.0)
	100 gm.	20.0	16.6 (32.0)	12.0 (40.0)	14.0 (48.8)	11.2 (47.8)	8.6 (59.9)	13.2 (50.1)	16.0 (37.1)	13.0* (45.1)
Admiral 10% EC.	300 cm^3	24.6	10.0 (66.7)	6.0 (75.6)	.6.0 (82.2)	5.8 (78.0)	4.6 (82.6)	6.0 (81.6)	8.0 (74.4)	6.6* (77.3)
	150 cm^3	27.2	18.0 (45.8)	14.6 (46.3)	12.0 (67.7)	14.0 (52.1)	16.0 (45.2)	18.0 (50.0)	19.2 (44.5)	15.8* (50.2)
Control	--	27.2	33.2	27.2	37.2	29.2	29.2	36.0	34.6	32.2

L.S.D. = 2.1

*= Significant at 5% level.

% Reduction rates are given in brackets.

II.1.1.B- The legume aphid, *Aphis craccivora* Koch.

Results of the effects of Selecron (Profenofos), Achook (Azadirachtin), Bemistop, Biosect (*Beauveria bassiana*) and Admiral (Pyriproxyfen) on the aphid population and the reduction rates on common bean plants during 1999 season were presented in **Tables** (18-A & 18-B).

Results of the 1st spray in **Table** (18-A) revealed that the average number of aphid individuals/20 leaves was noticeably reduced after three days from spraying and amounted (0.0 at high, 13.2 at low application rate), (18.6, 164.0), (72.0, 170.0), (86.6, 200.0) and (75.4, 156.0 individuals/20 leaves) for Selecron (Profenofos), Achook (Azadirachtin), Bemistop, Biosect (*Beauveria bassiana*) and Admiral (Pyriproxyfen), respectively. However, the corresponding reduction rates were (100, 96.8%), (95.8, 62.6%), (84.0, 61.1%), (80.4, 55.7%) and (82.9, 66.9%) for the various compounds at the two application rates, respectively.

It was found that, the number of aphid individuals was decreased during the first 3 days from spraying then, increased slightly until reached the highest numbers on the 14th day from spraying showing (55.4, 174.0), (257.4, 199.4) and (216.6, 230.0 individuals/20 leaves) for both application rates of Selecron, Achook and Bemistop, respectively. On contrary, reduction rates were at the highest values during the 3 days post-treatment then, gradually decreased until the 14th day from spraying to reach (94.3, 82.7%), (61.6, 81.3%) and (71.0, 68.3%) for the two application rates of Selecron, Achook and Bemistop, respectively. The average of reduction rates was (98.2, 87.4%), (84.0, 65.7%) and (83.6, 61.5%) for Selecron, Achook and Bemistop, respectively.

Also, regarding to Biosect and Admiral, the number of aphid individuals was clearly decreased in the subsequent 3 days post-treatment, but reduction rates were increased (**Table**, 18-A). On the other hand, Biosect and Admiral increased gradually the number of aphid individuals from the 7th day after application to reach (109.4, 190.0) and (39.2, 114.0 individuals/20 leaves), respectively at the 14th day post-treatment. On contrary, the reduction rates were decreased gradually and amounted (85.1, 74.5%) and (94.5, 85.0%) for the two compounds, respectively. The average reduction rates of the two compounds reached (75.6, 60.3%) and (87.7, 67.9%) for the two application rates, respectively.

Values of the general mean of aphid during the observation period of two weeks from zero time indicated a significant reduction for the various materials at the two application rates as compared with the control.

Statistical analysis revealed no significant differences in the general mean of aphid population between recommended and half-recommended rate with Selecron only, but there were significant differences between the two application rates for the rest treatments, whereby, the lower application rate of these compounds was less effective.

Previous results proved that, the organophosphorus compound, Selecron was the most effective followed by the botanical compound, Achook, the insect growth regulator, Admiral, the botanical compound, Bemistop and the bioinsecticide, Biosect which was the least effective one.

Obtained data in **Table** (18-B) showed that, the average number of aphid individuals per 20 leaves during the second spray of 1999 season was reduced during the following three days post-treatment and amounted (0.0, 17.8), (0.0, 48.0), (20.0, 64.0), (18.6, 62.0) and (0.0, 26.6 individuals/20 leaves) on the 3rd day of treatment for the various compounds at high and low application rates, respectively. The corresponding reduction rates were (100, 90.9), (100, 78.6), (91.8, 75.2), (84.9, 70.9) and (100, 79.2%), for various compounds, respectively. The number of aphid individuals after that, increased slightly to reach (0.0, 24.0), (5.0, 27.0), (6.0, 31.0), (8.2, 53.2) and (1.2, 16.0 individuals/20 leaves) at the 14th day post-treatment for various materials at the two application rates, respectively. On contrary, the reduction rates were gradually decreased from the 7th day after spraying to reach (100, 63.3), (94.8, 63.9), (92.6, 64.1), (80.1, 53.5) and (91.9, 62.7%) for the various compounds, respectively at the 14th day from spraying.

The average reduction rates in aphid population of these compounds were (100, 85.6), (97.1, 74.6), (89.7, 70.4), (82.2, 63.2) and (95.4, 72.8%) for various treatments, respectively

Values of the general mean of aphid during the observation period of two weeks from zero time indicated significant reduction for the various treatments at the two application rates as compared with the control.

Statistical analysis of the data revealed no significant differences in the general mean of aphid population between the two application rates of various treatments. Accordingly used compounds could be arranged in descending order in relation to their efficiency as follows: Selecron followed by Achook, Admiral, Bemistop and Biosect that was the lowest effective one against the legume aphid during 1999 season.

Data achieved during 2000 season, **Tables** (19-A & 19-B) reflect the same trend for all tested materials during the two sprays, as compared with the results obtained from the first season. In addition, values of the general mean of aphid during 2000 season through the investigation period of two weeks from zero time indicated significant reduction for various compounds at the two application rates with the comparison of the control.

The obtained results during 1999 and 2000 seasons revealed that, all tested compounds could be used effectively for controlling *A. craccivora* on common bean indicating that, the organophosphorus compound was the most toxic treatment reducing aphid population followed by the botanical compound, Achook, Admiral, Bemistop and the bioinsecticide, Biosect that was the least one.

However, the biocide, Biosect and the I.G.R., Admiral considered the appropriate compounds for controlling *Aphis craccivora*, due to their safety for environment.

Data obtained are similar to the findings of **Gaffar *et al.*, (1990)** who mentioned that, eight insecticides were tested against *Aphis craccivora* **Koch.** on *Vigna radiata* in India, in 1988-89. Cypermethrin and Fenvalerate at 0.01%, and dichlorvos at 0.05%, gave the best results, causing 93.84-99.55% mortality, as compared with 73.13-86.45% for the other compounds. Also, **Lal (1992)** in India stated that application of either dimethoate, oxydemeton-methyl, Endosulfan, Malathion, phosphamidon, dichlorvos or monochrotophos during 2 successive years gave effective control of *Aphis craccivora* Koch. infesting French beans [*Phaseolus vulgaris]*. Two sprays at 2-weekly intervals gave full protection of the crop until the time of harvesting during both years.

Table (18-A): Efficiency of certain treatments against *Aphis craccivora* Koch. Individuals on common bean plants during 1999 season at Qalyubia Governorate.

Treatments	Rate / 100L	Mean number of individuals per 20 leaves and reduction rates at indicated days from treatment							
		Pre-spray	First spray						
			1	2	3	5	7	10	14	Average
Selecron 72% EC.	187.5 cm^3	310.0	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	5.2 (98.9)	32.0 (93.9)	55.4 (94.3)	13.2* (98.2)
	93.7 cm^3	322.6	0.0 (100.0)	0.0 (100.0)	13.2 (96.8)	78.6 (82.5)	113.2 (77.5)	152.0 (72.1)	174.0 (82.7)	75.9* (87.4)
Achook 0.15% EC.	200 cm^3	315.2	0.0 (100.0)	0.0 (100.0)	18.6 (95.8)	60.6 (86.9)	140.0 (72.2)	152.0 (71.5)	257.4 (61.6)	89.8* (84.0)
	100 cm^3	342.0	108.8 (65.0)	122.0 (65.4)	164.0 (62.6)	180.0 (62.1)	201.4 (61.9)	223.2 (61.4)	199.4 (81.3)	171.3* (65.7)
Bemistop 21.1% EC.	500 cm^3	351.4	31.0 (90.3)	31.0 (90.1)	72.0 (84.0)	72.0 (85.2)	82.0 (85.1)	120.0 (79.9)	216.6 (71.0)	89.9* (83.0)
	250 cm^3	341.2	146.0 (52.9)	160.0 (54.5)	170.0 (61.1)	170.0 (64.1)	186.0 (65.1)	207.4 (64.1)	230.0 (68.3)	181.3* (61.5)
Biosect 32x10^6 conidia/mg	200 gm.	344.6	152.2 (51.4)	152.0 (57.2)	86.6 (80.4)	73.2 (84.7)	68.0 (87.4)	99.4 (82.9)	109.4 (85.1)	105.8* (75.6)
	100 gm.	350.0	182.0 (42.8)	204.0 (43.5)	200.0 (55.7)	165.4 (65.8)	146.8 (72.8)	192.8 (67.4)	190.0 (74.5)	183.0* (60.3)
Admiral 10% EC.	300 cm^3	336.0	94.0 (69.2)	90.0 (74.0)	75.4 (82.9)	16.2 (96.6)	3.4 (99.4)	16.0 (97.2)	39.2 (94.5)	47.7* (87.7)
	150 cm^3	358.0	222.0 (31.8)	209.4 (42.6)	156.0 (66.9)	102.0 (79.5)	86.0 (84.6)	92.0 (84.8)	114.0 (85.0)	140.2* (67.9)
Control	--	379.8	343.4	388.6	486.8	526.0	590.0	641.4	800.0	539.5

L.S.D. = 73.6
*= Significant at 5% level.
% Reduction rates are given in brackets.

Table (18-B): Continued.

Treatments	Rate / 100L	Mean number of individuals per 20 leaves and reduction rates at indicated days from treatment								
		Pre-spray	Second spray							
			1	2	3	5	7	10	14	Average
Selecron 72% EC.	187.5 cm^3	55.4	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	0.0* (100.0)
	93.7 cm^3	174.0	0.0 (100.0)	0.0 (100.0)	17.8 (90.9)	18.0 (87.5)	20.0 (84.3)	22.0 (73.3)	24.0 (63.3)	14.5* (85.6)
Achook 0.15% EC.	200 cm^3	257.4	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	12.0 (94.4)	8.0 (95.7)	6.0 (95.1)	5.0 (94.8)	4.4* (97.1)
	100 cm^3	199.4	40.0 (86.5)	52.0 (79.7)	48.0 (78.6)	40.0 (75.7)	39.6 (72.8)	33.2 (64.9)	27.0 (63.9)	39.9* (74.6)
Bemistop 21.1%EC.	500 cm^3	216.6	38.0 (87.9)	32.2 (88.4)	20.0 (91.8)	19.2 (89.7)	16.0 (89.9)	12.0 (88.3)	6.0 (92.6)	20.5* (89.7)
	250 cm^3	230.0	78.0 (76.6)	66.6 (77.4)	64.0 (75.2)	60.0 (68.4)	54.0 (67.8)	40.0 (63.3)	31.0 (64.1)	56.2* (70.4)
Biosect 32x10^6 conidia/mg	200 gm.	109.4	24.0 (84.9)	22.0 (84.3)	18.6 (84.9)	17.2 (80.9)	15.4 (80.7)	10.6 (79.6)	8.2 (80.1)	16.6* (82.2)
	100 gm.	190.0	80.0 (70.9)	79.8 (67.2)	62.0 (70.9)	60.0 (61.8)	52.0 (62.5)	40.0 (55.6)	53.2 (53.5)	61.0* (63.2)
Admiral 10% EC.	300 cm^3	39.2	4.0 (92.9)	0.0 (100.0)	0.0 (100.0)	1.8 (94.4)	1.4 (95.1)	1.2 (93.5)	1.2 (91.9)	1.4* (95.4)
	150 cm^3	114.0	30.0 (81.8)	28.8 (80.3)	26.6 (79.2)	26.0 (72.4)	25.0 (69.9)	20.0 (62.9)	16.0 (62.7)	24.6* (72.8)
Control	--	800.0	1145.2	1014.0	896.0	660.0	580.0	378.0	300.0	710.5

L.S.D. = 103.2
*= Significant at 5% level.
% Reduction rates are given in brackets.

Table (19-A): Efficiency of certain treatments against *Aphis craccivora* Koch individuals on common bean plants during 2000 season at Qalyubia Governorate.

Treatments	Rate / 100L	Mean number of individuals per 20 leaves and reduction rates at indicated days from treatment								
			First spray							
		Pre-spray	1	2	3	5	7	10	14	Average
Selecron 72% EC.	187.5 cm^3	74.6	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	22.6 (95.97)	30.8 (92.31)	7.6* (98.32)
	93.7 cm^3	101.4	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	17.4 (95.9)	62.8 (91.8)	82.0 (84.9)	23.2* (96.1)
Achook 0.15% EC.	200 cm^3	97.4	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	13.4 (96.2)	71.2 (82.4)	90.6 (87.6)	153.2 (70.7)	46.9* (90.9)
	100 cm^3	90.6	62.0 (52.9)	54.0 (79.2)	54.6 (71.8)	76.6 (76.4)	57.4 (84.7)	59.2 (91.3)	68.0 (86.0)	61.2* (77.5)
Bemistop21.1%EC.	500 cm^3	98.0	60.6 (57.4)	53.4 (80.9)	41.4 (86.5)	34.0 (90.3)	42.0 (89.7)	54.0 (92.7)	60.6 (88.5)	49.4* (83.7)
	250 cm^3	90.0	64.6 (50.6)	62.6 (75.7)	73.4 (73.8)	69.4 (78.5)	68.0 (81.8)	58.6 (91.3)	66.8 (86.2)	66.2* (76.8)
Biosect32x10^6conidia/mg	200 gm.	95.4	72.6 (47.6)	62.6 (77.1)	31.2 (89.5)	26.6 (92.2)	30.0 (92.4)	33.4 (95.3)	38.0 (92.6)	42.1* (83.8)
	100 gm.	91.4	70.6 (46.8)	61.4 (76.6)	44.6 (84.3)	36.0 (89.0)	32.6 (91.4)	46.6 (93.2)	54.6 (88.9)	49.5* (81.5)
Admiral 10% EC.	300 cm^3	110.0	52.0 (67.4)	39.2 (87.6)	8.0 (97.7)	0.0 (100.0)	0.0 (100.0)	8.0 (99.0)	18.8 (96.8)	18.0* (92.6)
	150 cm^3	83.4	56.6 (53.3)	46.6 (80.5)	40.8 (84.3)	28.6 (90.4)	31.6 (90.9)	39.2 (93.7)	56.8 (87.3)	42.8* (82.9)
Control	--	71.2	103.4	204.0	222.0	255.4	295.2	535.4	382.6	285.4

L.S.D. = 55.0
*= Significant at 5% level.
% Reduction rates are given in brackets.

Table (19-B): Continued.

Treatments	Rate / 100L	Mean number of individuals per 20 leaves and reduction rates at indicated days from treatment								
		Pre-spray	Second spray							
			1	2	3	5	7	10	14	Average
Selecron 72% EC.	187.5 cm^3	30.8	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	9.4 (86.2)	6.6 (90.8)	2.3* (96.7)
	93.7 cm^3	82.0	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	20.6 (87.4)	35.2 (81.4)	64.0 (64.7)	60.0 (68.5)	25.7* (86.0)
Achook 0.15% EC.	200 cm^3	153.2	0.0 (100.0)	0.0 (100.0)	16.6 (93.2)	40.0 (86.9)	48.0 (86.5)	46.0 (86.4)	40.0 (88.8)	27.2* (91.7)
	100 cm^3	68.0	30.0 (68.2)	31.0 (70.8)	32.2 (70.6)	50.0 (63.2)	58.0 (63.1)	52.0 (65.4)	54.0 (65.9)	43.9* (66.8)
Bemistop 21.1% EC.	500 cm^3	60.6	20.0 (76.2)	18.0 (80.9)	16.0 (83.6)	12.0 (90.1)	15.4 (88.5)	12.4 (90.8)	11.2 (92.1)	15.0* (86.0)
	250 cm^3	66.8	18.2 (80.4)	32.6 (68.8)	40.0 (62.9)	44.0 (67.1)	40.0 (74.1)	46.0 (68.9)	46.0 (69.9)	38.1* (70.3)
Biosect $32x10^6$ conidia/mg	200 gm.	38.0	20.0 (62.1)	22.6 (61.4)	14.6 (75.9)	7.4 (90.3)	16.6 (81.1)	18.0 (78.6)	22.0 (75.1)	17.2* (74.9)
	100 gm.	54.6	54.0 (28.6)	41.2 (51.1)	39.4 (54.8)	30.6 (71.9)	30.0 (76.2)	48.0 (60.2)	56.0 (55.1)	42.6* (56.9)
Admiral 10% EC.	300 cm^3	18.8	2.0 (92.3)	0.0 (100.0)	0.0 (100.0)	4.0 (89.4)	6.0 (86.2)	7.2 (82.7)	8.0 (81.7)	3.9* (90.3)
	150 cm^3	56.8	30.0 (61.9)	24.0 (72.6)	30.0 (66.9)	38.0 (66.6)	40.0 (69.5)	47.2 (62.4)	48.0 (63.0)	36.7* (66.1)
Control	--	382.6	530.0	590.0	611.4	765.4	884.6	846.0	874.6	728.9

L.S.D. = 49.6

*= Significant at 5% level.

% Reduction rates are given in brackets.

II.1.1.C- The whitefly, *Bemisia tabaci* (Genn.):

II.1.1.C.1- The whitefly adults:

Results of the first spray of 1999 season presented in **Table (20-A)** showed that, the average number of the whitefly adults per 20 leaves was clearly reduced during the following 3 days after spraying to reach (32.0, 45.4), (36.6, 96.6), (58.0, 90.0), (60.0, 80.0) and (31.4, 80.6 adults/20. leaves) on the 3rd for the two application rates (high & low) of Selecron 72% EC. at (187.5, 93.7 cm^3/100L.), Achook 0.15% EC. at (200, 100 cm^3/100 L.), Bemistop 21.1% EC. at (500, 250 cm^3/100 L.), Biosect 32 x 10^6 conidia/mg at (200, 100 g/100 L.) and Admiral 10% EC. at (300, 150 cm^3/100 L.), respectively. The corresponding reduction rates of adults were (86.9, 79.8), (84.4, 57.1), (72.3, 58.3), (72.1, 65.6) and (86.5, 56.5%) for the various treatments, respectively. However, the number of adults was gradually increased from the 7th day after zero time and amounted (112.6, 142.6), (148.6, 148.0), (70.6, 106.6), (148.0, 176.6) and (34.0, 136.6 adults/20 leaves) at the 14th day from application for the two application rates of various compounds, respectively. At the same time, the percent reduction rates were gradually decreased and amounted (60.5, 45.4), (45.3, 43.3), (70.9, 57.4), (40.7, 34.4) and (87.4, 36.4%) at the 14th day after treatment for the various materials, respectively.

The average reduction rates of whitefly adults' population after the investigation periods of two weeks reached (82.1, 65.5), (70.8, 48.4), (77.7, 59.4), (60.9, 49.9) and (78.4, 44.8%) for various compounds, respectively. It was found that, values of the general mean of adults during the 1st spray detected significant reduction for the various treatments at the two application rates as compared with the control.

Statistical analysis of the data revealed no significant differences in the general means of adults between high and low application rate of Selecron and the bioinsecticide, Biosect. Whereas, there were significant differences between the two application rates for the botanical insecticides, Achook and Bemistop and insect growth regulator, Admiral, whereby the lower application rate was less effective.

Obtained data in **Table** (20-B) showed the mean number and reduction rates of adult whitefly of 2nd spray of 1999 season indicating noticeable decrease in the average number of adults per 20 leaves after 3 days of spraying recording (20.0, 64.6), (49.2, 109.2), (16.0, 76.0), (30.0, 80.0) and (14.0, 76.0) for various compounds, respectively. The corresponding reduction rates of adults were (86.5, 65.5), (74.8, 43.8), (82.7, 45.7), (84.6, 65.5) and (68.6, 57.6%) for various treatments, respectively. On the other hand, the numbers of adults were gradually decreased from the 7th day from treatment to reach (6.0, 22.0), (30.0, 40.0), (6.0, 20.0), (20.0, 30.0) and (4.0, 42.0 adults/20 leaves) at the 14th day after zero time for the two application rates, respectively.

The average reduction rates of the adults' population reached (88.3, 62.7), (73.5, 57.6), (78.2, 57.9), (71.4, 59.1) and (73.6, 47.9%) for various treatments, respectively.

Values of the general mean of adults during the 2nd spray indicated significant reduction for the various treatments at high and low application rates as compared with the control.

Statistical analysis of the data detected no significant differences in the general means of the whitefly adults between high and low application rates for the various treatments with the exception of Admiral, whereby the half-recommended rate was less effective.

The previous results of the first and second spray indicated that the efficiency of the tested compounds could be arranged in descending order as follows: the organophosphorus compound, Selecron followed by botanical compound, Bemistop, I.G.R., Admiral, botanical insecticide, Achook and lastly, bioinsecticide, Biosect that was the least effective one.

This result is in agreement with **Murguido, (1983)** in Cuba, who evaluated 7 organophosphorus insecticides for the control of *Bemisia tabaci* (Genn.) on beans (*Phaseolus vulgaris*). The only treatments that afforded good control of *B. tabaci* were Mevinphos at 0.2 liter/ha., Fenthion at 0.3 liter/ha and monochrotophos at 0.3 liter/ha. Also, **El-Sayed and El-Ghar (1993)** evaluated in field trials, the effectiveness of 10 insecticides belonging to different types of insecticides (organophosphates, carbamates and pyrethroids) against populations of *Bemisia tabaci* (Genn.) on *Phaseolus vulgaris* in Shibin El-Kom during 1992. The authors revealed that the organophosphate compounds Fenitrothrin, Chlorpyrifos, Cyanophos and Acephate (at 1.0, 2.4, 0.625 and 1.5 g.a.i. /liter, respectively) were the most effective compounds, resulting in 73% control 7 days after spraying.

Data obtained during 2000 season are presented in **Tables** (21-A & 21-B) and reflect the same trend for all tested compounds during the two sprays, as compared with the results of the first season of 1999. Besides, there were significant differences in the general mean of the whitefly adults between the two application rates for the various compounds whereby, the half application rate was less effective during the 1st spray, and this result was achieved during the 2nd spray as well with the exception, of the organophosphorus compound, Selecron where the two application rates were significantly effective.

Table (20-A): Efficiency of certain treatments against *Bemisia tabaci* (Genn.) adults on common bean plants during 1999 season at Qalyubia Governorate.

Treatments	Rate /100L	Mean number of adults per 20 leaves and reduction rates at indicated days from treatment							
		Pre-spray	First spray						
			1	2	3	5	7	10	14	Average
Selecron 72% EC.	187.5 cm^3	180.6	21.2 (90.3)	19.4 (92.2)	32.0 (86.9)	30.6 (91.9)	36.6 (80.5)	92.6 (72.4)	112.6 (60.5)	49.3* (82.1)
	93.7 cm^3.	165.4	78.0 (60.9)	56.6 (75.0)	45.4 (79.8)	60.6 (82.6)	73.4 (57.3)	130.0 (57.6)	142.6 (45.4)	83.8* (65.5)
Achook 0.15 % EC.	200 cm^3	172.0	46.6 (77.6)	50.6 (78.5)	36.6 (84.4)	53.4 (85.2)	66.0 (63.1)	122.6 (61.6)	148.6 (45.3)	74.9* (70.8)
	100 cm^3	165.4	126.0 (36.9)	115.4 (49.1)	96.6 (57.1)	125.4 (63.9)	100.0 (41.9)	164.0 (46.6)	148.0 (43.3)	125.1* (48.4)
Bemistop 21.1 %EC.	500 cm^3	154.0	36.6 (80.3)	60.0 (71.6)	58.0 (72.3)	40.0 (87.6)	32.0 (80.0)	54.6 (80.9)	70.6 (70.9)	50.3* (77.7)
	250 cm^3	158.6	86.6 (54.8)	100.0 (53.9)	90.0 (58.3)	88.0 (73.6)	80.0 (51.5)	99.4 (66.2)	106.6 (57.4)	92.9* (59.4)
Biosect32x10^6conidia/mg	200 gm.	158.0	126.6 (33.7)	68.6 (68.3)	60.0 (72.1)	46.0 (86.1)	63.4 (61.4)	106.0 (63.8)	148.0 (40.7)	88.4* (60.9)
	100 gm.	170.6	144.0 (30.2)	119.4 (48.9)	80.0 (65.6)	106.0 (70.4)	103.4 (41.7)	133.4 (57.9)	176.6 (34.4)	123.3* (49.9)
Admiral 10% EC	300 cm^3	170.6	104.0 (49.6)	68.0 (70.9)	31.4 (86.5)	47.4 (86.8)	40.0 (77.4)	30.0 (90.5)	34.0 (87.4)	50.7* (78.4)
	150 cm^3	136.0	142.0 (13.6)	93.4 (49.9)	80.6 (56.5)	76.0 (73.4)	104.6 (26.0)	106.6 (57.8)	136.6 (36.4)	105.7* (44.8)
Control	--	166.0	200.6	227.4	226.0	354.6	172.6	308.0	262.0	249.2

L.S.D = 36.8

*= Significant at 5% level

%Reduction rates are given in brackets.

Table (20-B): Continue.

Treatments	Rate /100L	Mean number of adults per 20 leaves and reduction rates at indicated days from treatment								
		Pre-spray	Second spray							
			1	2	3	5	7	10	14	Average
Selecron 72% EC.	187.5 cm^3	112.6	9.4 (95.1)	15.4 (91.1)	20.0 (86.5)	18.0 (91.2)	16.0 (81.4)	12.0 (82.6)	6.0 (89.8)	13.8* (88.3)
	93.7 cm^3.	142.6	64.0 (73.9)	62.0 (71.7)	64.6 (65.5)	100.0 (61.6)	56.0 (46.6)	46.0 (47.4)	22.0 (70.6)	59.2* (62.7)
Achook 0.15% EC.	200 cm^3	148.6	23.4 (90.8)	34.0 (85.1)	49.2 (74.8)	73.4 (72.9)	40.0 (64.7)	32.0 (64.9)	30.0 (61.5)	40.3* (73.5)
	100 cm^3	148.0	72.0 (71.7)	92.0 (59.5)	109.2 (43.8)	82.0 (69.7)	44.0 (61.1)	46.0 (49.3)	40.0 (48.5)	69.3* (57.6)
Bemistop21.1%EC	500 cm^3	70.6	19.4 (84.0)	19.6 (81.9)	16.0 (82.7)	15.0 (88.4)	12.0 (77.7)	10.0 (76.9)	6.0 (83.8)	14.0* (78.2)
	250 cm^3	106.6	37.4 (79.6)	45.4 (72.3)	66.0 (45.7)	60.0 (69.2)	60.0 (26.3)	34.0 (47.9)	20.0 (64.2)	47.5* (57.9)
Biosect32x10^6conidia/mg	200 gm.	148.0	64.0 (74.8)	60.0 (73.6)	30.0 (84.6)	58.0 (78.5)	60.0 (46.9)	30.0 (66.9)	20.0 (74.2)	46.0* (71.4)
	100 gm.	176.6	130.0 (57.1)	84.0 (69.0)	80.0 (65.5)	100.0 (69.0)	80.0 (40.7)	60.0 (44.5)	30.0 (67.6)	80.6* (59.1)
Admiral 10% EC.	300 cm^3	34.0	20.0 (65.8)	18.0 (65.5)	14.0 (68.6)	12.0 (80.7)	6.0 (76.9)	42.0 (79.8)	4.0 (77.6)	11.2* (73.6)
	150 cm^3	136.6	80.6 (65.6)	93.4 (55.5)	76.0 (57.6)	84.0 (66.3)	80.0 (23.3)	62.0 (25.9)	42.0 (41.4)	74.0* (47.9)
Control	--	262.0	456.6	402.6	344.0	478.6	200.0	160.6	137.4	311.4

L.S.D. = 48.9
*= Significant at 5% level
%Reduction rates are given in brackets.

Table (21-A): Efficiency of certain treatments against *Bemisia tabaci* (Genn.) adults on common bean plants during 2000 season at Qalyubia Governorate.

Treatments	Rate /100L	Mean number of adults per 20 leaves and reduction rates at indicated days from treatment								
		Pre-spray	First spray							
			1	2	3	5	7	10	14	Average
Selecron 72% EC.	187.5 cm^3	183.4	20.0 (91.8)	14.0 (91.9)	22.0 (89.5)	21.4 (91.8)	23.4 (94.0)	68.0 (83.5)	85.4 (80.5)	36.3* (89.0)
	93.7 cm^3.	206.0	118.0 (56.8)	86.0 (55.6)	66.0 (72.1)	84.0 (71.4)	132.0 (69.9)	140.0 (69.8)	104.0 (78.9)	104.3* (67.8)
Achook 0.15% EC	200 cm^3	254.0	34.0 (89.9)	41.4 (82.7)	27.4 (90.6)	34.0 (90.6)	44.6 (91.8)	76.0 (86.7)	104.0 (82.9)	51.6* (87.9)
	100 cm^3	222.0	83.4 (71.6)	82.0 (60.7)	86.0 (66.2)	98.0 (69.1)	118.6 (74.9)	166.6 (66.7)	120.0 (77.4)	107.8* (69.5)
Bemistop 21.1% EC.	500 cm^3	231.4	78.0 (74.6)	54.0 (75.2)	40.0 (84.9)	38.4 (88.4)	38.0 (92.3)	31.2 (94.0)	32.4 (94.1)	44.6* (86.2)
	250 cm^3	212.0	108.0 (61.6)	94.0 (52.8)	70.0 (71.2)	112.0 (62.9)	126.0 (72.1)	132.0 (72.4)	112.0 (77.9)	107.7* (67.3)
Biosect32x10^6conidia/mg	200 gm.	217.4	118.0 (59.0)	78.0 (61.2)	74.0 (70.3)	70.0 (77.4)	88.0 (80.9)	110.0 (77.5)	154.0 (70.4)	98.9* (70.9)
	100 gm.	230.0	196.0 (35.7)	160.0 (25.9)	140.0 (46.9)	140.0 (57.3)	166.0 (66.1)	192.0 (62.9)	218.0 (60.4)	173.1* (50.8)
Admiral 10% EC.	300 cm^3	255.4	76.0 (77.5)	50.6 (78.9)	23.4 (92.0)	34.0 (90.7)	82.0 (88.6)	45.4 (92.1)	65.4 (89.3)	50.9* (87.0)
	150 cm^3	214.2	124.2 (56.2)	144.0 (28.5)	124.0 (49.5)	130.0 (57.5)	146.0 (67.9)	160.0 (66.9)	170.0 (66.8)	142.6* (56.2)
Control	--	176.6	234.0	166.0	202.6	252.0	376.0	398.0	422.6	293.0

L.S.D = 42.0

*= Significant at 5% level

%Reduction rates are given in brackets.

Table (21-B): Continue.

Treatments	Rate /100L	Mean number of adults per 20 leaves and reduction rates at indicated days from treatment								
			Second spray							
		Pre-spray	1	2	3	5	7	10	14	Average
Selecron 72% EC.	187.5 cm^3	85.4	6.0 (91.5)	4.4 (89.4)	6.0 (85.3)	5.0 (88.9)	4.0 (93.5)	3.8 (92.5)	4.0 (92.6)	4.7* (90.5)
	93.7 cm^3.	104.0	18.0 (78.9)	16.0 (68.2)	18.6 (62.6)	20.0 (63.5)	24.0 (68.1)	28.0 (54.9)	26.0 (60.4)	21.5* (65.2)
Achook 0.15% EC.	200 cm^3	104.0	18.6 (78.2)	12.0 (76.2)	12.0 (75.9)	10.0 (81.7)	8.0 (89.4)	6.0 (90.3)	4.0 (93.9)	10.7* (83.7)
	100 cm^3	120.0	46.6 (52.8)	30.0 (48.4)	20.0 (65.1)	24.0 (62.0)	36.0 (58.6)	35.2 (50.8)	32.0 (57.7)	31.9* (56.5)
Bemistop 21.1%EC.	500 cm^3	32.4	5.2 (80.5)	6.0 (61.8)	4.2 (72.9)	3.2 (81.2)	2.6 (88.9)	2.0 (89.6)	2.0 (90.2)	3.6* (80.7)
	250 cm^3	112.0	24.0 (73.9)	26.0 (52.1)	18.0 (66.4)	24.0 (59.3)	34.0 (58.1)	22.0 (52.1)	30.0 (57.5)	26.9* (59.9)
Biosect32x10^6conidia/mg	200 gm.	154.0	60.0 (52.6)	11.4 (84.7)	17.4 (76.4)	30.0 (63.0)	28.0 (74.9)	26.0 (71.7)	32.0 (67.1)	29.3* (70.0)
	100 gm.	218.0	104.0 (41.9)	70.0 (33.7)	72.0 (30.9)	70.0 (39.0)	87.4 (44.6)	80.0 (38.5)	78.0 (43.3)	80.2* (38.8)
Admiral 10% EC.	300 cm^3	65.4	14.0 (73.9)	10.0 (68.4)	8.0 (74.4)	7.8 (77.4)	6.0 (87.3)	4.0 (89.7)	2.0 (95.2)	7.4* (80.9)
	150 cm^3	170.0	50.0 (64.2)	52.0 (36.8)	46.0 (43.4)	40.0 (55.3)	52.0 (57.8)	48.0 (52.6)	46.0 (57.1)	47.7* (52.5)
Control	--	422.6	437.4	204.6	202.0	222.6	306.0	252.0	266.6	257.4

L.S.D =18.9

*= Significant at 5% level

% Reduction rates are given in brackets.

II.1.1.C.2- The whitefly immature stages:

The obtained data for immature stages, **Tables** (22-A & 22-B) for the 1st and 2nd spray during 1999 season had the same trend for the various treatments as compared with the obtained results of adults during 1999 season. Additionally, the tested compounds were more effective and have long persistence on the whitefly immature stages than adults.

The achieved data during 2000 season for 1st and 2nd spray presented in **Tables** (23-A & 23-B), indicated the same trend of 1999 season with some exception.

Data in **Table** (23-A) revealed that, the average numbers of immature stages per 20 leaves were obviously reduced during the following 3 days after treatment for Selecron, Achook, Bemistop, Biosect and Admiral, respectively. However, the numbers of immature stages were gradually increased from the 7th day after zero time. On contrary, the reduction rates were slightly decreased.

The average reduction rates of the immature stages population during the 1st spray recorded (90.9, 66.7), (79.6, 66.2), (83.9, 59.9), (65.6, 50.5) and (90.4, 58.6%) for the two application rates of various compounds, respectively. Values of the general mean of immature stages were significantly lower for all treatments than control.

During the 2nd spray of 2000 season the obtained data, **Table** (23-B) were in the same trend for the different compounds as compared with the 1st spray with some exception in the general mean of immature stages. In addition, the efficiency of used compounds was clearly, higher on immature stages than adults.

Finally, it could be concluded that, the organophosphorus compound, Selecron (Profenofos) was the most effective against the whitefly, *B. tabaci* stages followed by the botanical compounds, Bemistop and Achook and the I.G.R., Admiral. However, the bioinsecticide, Biosect resulted in an intermediate effect; it can be used beside the I.G.R., Admiral and the botanical compounds.

Data obtained are in agreement with other investigators, where, **Laska (1986)** In Czechoslovakia determined the effectiveness of the insect growth regulator, Buprofezin against various life stages of *Trialeurodes vaporariorum* on bean plants. He stated that, Buprofezin consistently controlled larvae and young pupae, even though it did not kill them immediately and was effective against eggs.

Ismail *et al.* (1999) studied the effect of certain chemical insecticides on the whitefly, *Bemisia tabaci* (Genn.) and their side effects on natural enemies, *Coccinella undecimpunctata* and *Eretmocerus mundus* in the laboratory and field. They stated that, Pirimiphos-methyl and Profenofos were toxic to whitefly, but they demonstrated high toxicity to the natural enemies.

Dissimilarity, results achieved by **Mohamed *et al.* (1999)** who evaluated the effect of Bemistop (a product of NM Agro Egypt Company Coded 98402 is a combination of SDSS with Geraniol) applied at 0.3 and 0.5% concentrations against whitefly infesting tomato plants at Fayoum Governorate, and compared with four recommended chemical insecticides namely Nexter, Profecron (Profenofos), Reldan and Vertemic, indicated that Bemistop at 0.5% (500 ml/100 liter water) was more effective than the different insecticides.

Table (22-A): Efficiency of certain treatments against *Bemisia tabaci* (Genn.) immature stages on common bean plants during 1999 season at Qalyubia Governorate.

Treatment	Rate /100L	Mean number of immature stages per 20 leaves and reduction rates at indicated days from treatment								
		Pre-spray	First spray							
			1	2	3	5	7	10	14	Average
Selecron 72% EC.	187.5 cm^3	660.6	80.0 (91.5)	26.6 (97.6)	28.0 (96.9)	24.0 (97.8)	64.0 (94.4)	139.4 (89.0)	276.6 (76.9)	91.2* (92.1)
	93.7 cm^3	612.6	218.0 (75.5)	194.0 (81.4)	178.0 (79.1)	240.0 (76.6)	260.0 (75.4)	378.0 (67.9)	370.0 (66.8)	262.6* (74.7)
Achook 0.15 % EC.	200 cm^3	570.6	162.0 (80.4)	148.6 (84.7)	156.0 (80.3)	170.0 (82.2)	186.0 (81.1)	258.0 (76.5)	374.0 (63.9)	207.8* (78.5)
	100 cm^3	590.6	374.0 (56.4)	310.0 (69.2)	254.0 (69.1)	276.0 (72.1)	306.0 (70.0)	372.0 (67.3)	338.0 (68.5)	318.6* (67.5)
Bemistop 21.1 %EC.	500 cm^3	596.6	296.0 (65.8)	252.0 (75.2)	214.0 (74.2)	174.0 (82.6)	138.0 (86.6)	116.0 (89.9)	134.0 (87.6)	189.1* (80.3)
	250 cm^3	610.0	377.4 (57.4)	364.0 (65.0)	306.0 (63.9)	280.0 (72.5)	306.0 (70.9)	360.0 (69.4)	208.0 (81.2)	314.5* (68.6)
Biosect32x10^6 conidia/mg	200 gm.	558.0	264.0 (67.4)	310.0 (67.4)	240.0 (69.1)	234.0 (74.9)	224.0 (76.8)	270.0 (74.9)	250.0 (75.4)	256.0* (72.3)
	100 gm.	602.0	284.0 (67.5)	290.0 (71.8)	270.0 (67.7)	312.0 (69.0)	352.0 (66.2)	378.0 (67.4)	318.0 (70.9)	314.9* (68.6)
Admiral 10% EC	300 cm^3	616.0	131.4 (85.3)	104.0 (90.1)	78.0 (90.9)	64.0 (93.8)	84.0 (92.1)	90.0 (92.4)	104.0 (90.7)	93.6* (90.8)
	150 cm^3	586.6	280.0 (67.1)	274.0 (72.6)	274.0 (66.4)	290.0 (70.4)	346.0 (65.9)	308.0 (66.4)	274.0 (74.3)	302.6* (69.0)
Control	-	678.6	985.4	1157.4	943.4	1134.6	1172.6	1307.4	1234.0	1133.4

L.S.D. = 74.2
*= Significant at 5% level
% Reduction rates are given in brackets.

Table (22-B): Continue.

Treatment	Rate /100L	Mean number of immature stages per 20 leaves and reduction rates at indicated days from treatment								
		Pre-spray	Second spray							
			1	2	3	5	7	10	14	Average
Selecron 72% EC.	187.5 cm^3	276.6	32.0 (88.1)	14.0 (93.8)	16.0 (94.2)	18.0 (93.4)	14.0 (93.5)	6.0 (96.3)	4.0 (96.4)	14.9* (93.7)
	93.7 cm^3	370.0	186.0 (53.7)	89.4 (70.6)	128.6 (65.1)	188.6 (48.7)	144.0 (49.9)	124.0 (42.8)	84.0 (43.7)	132.1* (53.5)
Achook 0.15% EC.	200 cm^3	374.0	108.0 (70.2)	84.0 (72.7)	80.0 (78.5)	82.0 (77.9)	62.0 (78.7)	30.0 (86.3)	20.0 (86.7)	66.1* (78.7)
	100 cm^3	338.0	145.4 (55.6	130.0 (53.2)	120.0 (64.3)	122.0 (63.7)	100.0 (61.9)	80.0 (59.6)	60.0 (56.0)	108.2* (59.2)
Bemistop 21.1% EC.	500 cm^3	134.0	48.0 (63.1)	40.0 (63.7)	30.0 (77.5)	20.0 (84.9)	16.0 (84.6)	12.0 (84.7)	6.0 (88.9)	24.6* (82.2)
	250 cm^3	280.0	86.0 (57.4)	60.0 (64.9)	62.0 (65.2)	82.0 (60.3)	70.0 (56.7)	38.0 (68.8)	46.0 (45.2)	64.9* (59.8)
Biosect32x10^6conidia/mg	200 gm.	250.0	102.0 (57.9)	80.0 (61.0)	66.6 (73.2)	73.4 (70.4)	76.0 (60.9)	60.0 (59.1)	40.0 (60.4)	71.1* (63.3)
	100 gm.	318.0	145.4 (39.9)	126.6 (51.5)	130.0 (58.9)	104.6 (66.9)	118.0 (52.3)	100.0 (46.4)	64.0 (50.1)	118.4* (52.3)
Admiral 10% EC.	300 cm^3	104.0	60.0 (40.5)	30.0 (64.9)	20.0 (80.7)	16.0 (84.5)	12.0 (85.2)	6.0 (90.2)	4.0 (90.5)	21.1* (76.6)
	150 cm^3	27.4	91.4 (65.6)	90.0 (60.0)	86.0 (68.4)	106.6 (60.8)	82.0 (61.5)	78.0 (51.4)	70.0 (36.7)	86.3* (57.8)
Control	--	1234.0	1196.6	1013.4	1227.4	1226.0	959.4	725.4	498.0	977.6

L.S.D = 93.4

*= Significant at 5% level

% Reduction rates are given in brackets.

Table (23-A): Efficiency of certain treatments against *Bemisia tabaci* (Genn.) immature stages on common bean plants during 2000 season at Qalyubia Governorate

Treatment	Rate /100L	Mean number of immature stages per 20 leaves and reduction rates at indicated days from treatment								
		Pre-spray	First spray							
			1	2	3	5	7	10	14	Average
Selecron 72% EC.	187.5 cm^3	426.0	57.4 (86.8)	20.0 (93.9)	30.6 (91.6)	16.0 (96.0)	42.0 (95.5)	111.4 (88.7)	123.4 (84.1)	57.3* (90.9)
	93.7 cm^3.	360.0	144.0 (60.9)	132.0 (53.0)	118.0 (61.9)	120.0 (64.6)	186.0 (76.2)	198.0 (76.3)	170.0 (74.1)	152.6* (66.7)
Achook 0.15% EC	200 cm^3	394.0	92.0 (77.2)	86.0 (72.0)	76.0 (77.6)	64.6 (82.6)	914.0 (89.3)	130.6 (85.7)	196.0 (72.8)	105.2* (79.6)
	100 cm^3	356.0	158.0 (56.7)	116.0 (58.3)	110.0 (64.1)	132.6 (60.4)	210.0 (72.8)	182.0 (77.9)	176.0 (72.9)	154.9* (66.2)
Bemistop 21.1%EC.	500 cm^3	404.0	145.4 (64.9)	107.4 (65.9)	40.0 (88.5)	36.6 (90.4)	62.0 (92.9)	59.4 (93.7)	64.0 (91.3)	73.5* (83.9)
	250 cm^3	341.4	198.0 (43.4)	177.4 (33.5)	138.0 (52.9)	120.0 (62.6)	156.0 (78.9)	160.0 (79.8)	124.0 (67.9)	153.3* (59.9)
Biosect32x10^6conidia/mg	200 gm.	357.4	142.6 (61.0)	118.0 (57.7)	100.0 (67.5)	138.0 (58.9)	154.0 (80.1)	218.0 (73.7)	262.0 (59.9)	161.8* (65.6)
	100 gm.	414.6	264.0 (37.8)	250.0 (22.8)	214.0 (39.9)	164.0 (57.9)	274.0 (69.5)	304.0 (68.4)	324.0 (57.2)	256.3* (50.5)
Admiral 10% EC.	300 cm^3	444.6	77.4 (83.0)	66.6 (80.9)	26.6 (93.0)	33.4 (92.0)	64.0 (93.4)	38.6 (96.3)	50.0 (93.9)	50.9* (90.4)
	150 cm^3	304.0	166.0 (46.7)	144.0 (39.3)	130.0 (50.3)	134.0 (53.1)	146.0 (77.9)	170.0 (75.9)	184.0 (66.9)	153.4* (58.6)
Control	--	438.0	448.6	342.0	376.6	412.0	950.6	1017.4	800.0	621.0

L.S.D. =102.0
*= Significant at 5% level
%Reduction rates are given in brackets.

Table (23-B): Continue.

Treatment	Rate /100L	Mean number of immature stages per 20 leaves and reduction rates at indicated days from treatment								
		Pre-spray	Second spray							
			1	2	3	5	7	10	14	Average
Selecron 72% EC.	187.5 cm^3	123.4	20.0 (83.1)	8.6 (92.3)	8.0 (94.5)	10.0 (91.6)	12.0 (88.7)	8.0 (93.1)	4.0 (96.9)	10.1* (91.4)
	93.7 cm^3	170.0	86.0 (47.1)	80.0 (47.9)	70.0 (64.9)	72.0 (55.8)	80.0 (45.5)	86.0 (45.9)	86.0 (51.8)	80.0* (51.3)
Achook 0.15% EC.	200 cm^3	156.0	40.0 (78.7)	42.0 (76.3)	54.6 (76.3)	34.0 (81.9)	30.0 (82.3)	20.0 (89.1)	18.6 (90.9)	34.2* (82.2)
	100 cm^3	176.0	106.0 (37.1)	85.4 (46.3)	108.6 (47.5)	84.0 (50.2)	64.0 (57.9)	74.0 (54.9)	78.0 (57.8)	85.7* (50.3)
Bemistop 21.1% EC.	500 cm^3	64.0	16.0 (73.9)	14.0 (75.8)	16.0 (78.7)	12.0 (80.5)	10.0 (81.9)	6.0 (89.9)	4.0 (94.0)	11.1* (82.1)
	250 cm^3	124.0	40.0 (66.3)	38.0 (66.1)	52.0 (64.3)	16.0 (49.6)	64.0 (40.3)	74.0 (36.1)	68.0 (47.8)	56.6* (52.9)
Biosect32x10^6 conidia/mg	200 gm.	262.0	117.4 (53.2)	86.0 (63.7)	84.2 (72.6)	86.0 (65.8)	92.0 (59.4)	90.0 (63.2)	94.0 (65.8)	92.8* (63.4)
	100 gm.	324.0	138.0 (55.5)	116.0 (60.4)	138.0 (63.8)	140.0 (54.9)	157.4 (43.8)	153.2 (49.4)	174.6 (48.7)	145.3* (53.8)
Admiral 10% EC.	300 cm^3	50.0	16.0 (66.6)	14.0 (69.0)	12.0 (79.6)	10.0 (79.2)	8.2 (81.0)	6.4 (86.3)	4.4 (91.6)	10.1* (79.0)
	150 cm^3	184.0	60.0 (65.9)	66.0 (60.3)	72.0 (66.7)	80.0 (54.7)	86.0 (45.6)	94.0 (45.3)	90.0 (53.4)	78.3* (55.9)
Control	--	600.0	765.4	723.4	940.0	767.4	691.4	747.4	840.0	782.1

L.S.D = 29.3

*= Significant at 5% level

% Reduction rates are given in brackets.

II.1.1.D- Leaf miner parasitoid, *Diglyphus isaea* (Walker):

Data presented in **Table** (24-A) showed the effect of some compounds on larval and pupal stages of the parasitoid, *D. isaea* during the 1st spray of 1999 season.

The average reduction rates in larvae and pupae population of *D. isaea* during the observation periods of the two weeks reached (93.1, 72.4), (30.6, 14.1), (56.1, 13.7), (24.5, 1.8) and (22.8, 7.8%) for Selecron, Achook, Bemistop, Biosect and Admiral, respectively. However, values of the general mean of larvae and pupae per 20 leaves during the observation period of two weeks after treatment indicated significant reduction for high application rate of Selecron, Achook, Bemistop, Admiral and low application rate of Selecron and insignificant reduction at high application rate of Biosect and low application rate of Achook, Bemistop, Biosect and Admiral.

Statistical analysis of data revealed significant differences in the general mean of *D. isaea* larval and pupal stages between the two application rates of various compounds (with the exception of Selecron and Admiral) whereas, the low application rate was less toxic. Accordingly, Selecron was the highly toxic compound and Bemistop was less toxic one. While, Achook, Biosect and Admiral were approximately, nontoxic as compared with control.

Results of the 2nd spray, **Table** (24-B) indicated that, all tested compounds caused a significant decrease in the general mean of *D. isaea* larval and pupal stages as compared with the control.

Concerning 2000 season, the toxicity of the tested compounds took the same trend as achieved during 1999 season.

Results of the 1st spray, **Table** (25-A) showed that, values of the general mean of larval and pupal stages per 20 leaves indicated significant reduction for Selecron at high and low application rates, Achook and Bemistop at high application rate Meanwhile, there was no significant reduction for Achook and Bemistop at low application rate, Biosect at high and low application rate and Admiral at high and low application rates as compared with control.

Statistical analysis declared significant differences in the general mean of *D. isaea* individuals between the two application rates of various compounds (except for Biosect and Admiral) where, the low application rate was less toxic.

Data of the 2nd spray of 2000 season, **Table** (25-B) indicated that, values of the general mean of larval and pupal stages per 20 leaves indicated significant reduction for Selecron at high and low application rate, Achook and Bemistop at high application rate Meanwhile, there was no significant reduction for Achook and Bemistop at low application rate and Biosect and Admiral at high and low application rate as compared with control. In addition, there were significant differences in the general mean of *D. isaea* individuals between the two application rates of various compounds (except for Biosect) where, the low application rate was less toxic.

Generally, the organophosphorus compound was the highly toxic compound. While, the botanical insecticide, Bemistop was less toxic. Whereas, the bioinsecticide, Biosect was non-toxic followed by Admiral and the botanical insecticide, Achook.

Relating to the non-toxic tested compounds on *D. isaea*, Admiral and the botanical compound, Achook could be used effectively to be combined with *D. isaea* in *Liriomyza trifolii* integrated pest management programs.

The obtained results are in harmony with the finding of the following investigators such as **Beitia *et al.* (1994)** In Spain, who revealed that *Diglyphus isaea* (Walker) is an effective biological control agent of *Liriomyza trifolii* (Burgess). *L. trifolii* was reared on *Phaseolus vulgaris* and females of *D. isaea* were allowed to lay eggs in the 3rd instar larvae. The plants and insects were sprayed with Acephate, Cypermethrin, *Bacillus thuringiensis* suspension, Buprofezin, Cyromazine, Dicofol + Tetradifon, dimethoate, endosulfan, Fenbutatin oxide, Fenitrothrin, Fenoxycarb, Hexythiazox, Methomyl and Pirimicarb. Of these treatments, only dimethoate was noxious to *D. isaea* eggs.

Adults, larvae and pupae of *Diglyphus intermedius* and *Neochrysocharis puntiventris*, parasitoids of *Liriomyza trifolii* (Burgess) were exposed to Methomyl, Permethrin, Methamidophos, Thiodicarb, Endosulfan, Fenvalerate, Abamectin, *Bacillus thuringiensis* subsp. *Kurstaki* and Cyromazine in the laboratory. The results showed that Permethrin and Methomyl were highly toxic to all life stages of both parasitoids, while Methamidophos was highly toxic to adults but was less toxic to larvae and pupae. Endosulfan tended to be highly toxic to *Neochrysocharis puntiventris* but less toxic to *Diglyphus intermedius*.

Thiodicarb, Fenvalerate and Abamectin tended to be less harmful to at least some life stages of both parasitoids compared with Methomyl, Permethrin, Methamidophos or endosulfan. *Bacillus thuringiensis* and Cyromazine were generally the least toxic to all life stages, especially of *Diglyphus intermedius* (**Schuster, 1994** in USA).

Ozawa *et al.* (1998) in Japan, conducted laboratory experiments on the toxicity effects of 28 insecticides, 8 acaricides and 18 fungicides to adults and larvae of *Diglyphus isaea* (Walker), *Dacnusa sibirica* and parasitism of *Liriomyza trifolii* (Burgess) larvae. Pesticides were investigated in preparations ranging from wettable powders to soil applied granules. Effects on emergence of mature larvae, adult mortality, proportions of killed hosts and percentage of parasitism were assessed. Contact toxicity and residual contact toxicity were also measured. The authors concluded that insect growth regulators (Buprofezin, Flufenoxuron, Pyriproxyfen and Teflubenzuron), *Bacillus thuringiensis*, sodium Oleate, Pymetrozine, some acaricides and most fungicides could be combined with *D. isaea* and *Dacnusa sibirica* in *L. trifolii* integrated pest management programs.

Table (24-A): Efficiency of certain treatments against larvae and pupae of the parasitoid, *Diglyphus isaea* (Walker) on common bean plants during 1999 season at Qalyubia Governorate.

Treatments	Rate / 100L	Mean number of larvae and pupae per 20 leaves and its reduction rates at indicated days from treatment								
		Pre-spray	First spray							
			1	2	3	5	7	10	14	Average
Selecron 72% EC.	187.5 cm^3	5.3	0.7 (87.6)	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	1.3 (78.2)	0.7 (85.7)	0.3* (93.1)
	93.7 cm^3	4.0	1.3 (67.0)	1.3 (74.9)	0.7 (89.6)	2.0 (71.5)	1.3 (77.2)	1.3 (70.9)	0.7 (90.5)	1.2* (72.4)
Achook 0.15% EC.	200 cm^3	4.2	2.6 (38.1)	2.6 (52.9)	4.6 (31.0)	4.0 (45.7)	4.6 (24.4)	4.6 (3.1)	6.0 (18.6)	4.1* (30.6)
	100 cm^3	4.6	4.6 (0.0)	4.0 (33.9)	5.2 (28.8)	6.6 (18.2)	8.6 (0.0)	8.6 (0.0)	6.6 (17.5)	6.3 (14.1)
Bemistop 21.1%EC.	500 cm^3	3.6	2.0 (44.4)	1.3 (72.1)	1.3 (76.9)	2.0 (68.3)	1.3 (74.7)	2.0 (51.1)	6.0 (5.0)	2.3* (56.1)
	250 cm^3	4.0	4.0 (0.0)	4.0 (24.0)	3.3 (47.7)	5.3 (24.2)	6.0 (0.0)	7.3 (0.0)	7.3 (0.0)	5.3 (13.7)
Biosect 32x10^6 conidia/mg	200 gm.	4.7	4.0 (14.2)	3.3 (45.9)	4.7 (37.0)	4.0 (51.1)	5.3 (21.2)	7.3 (0.0)	8.0 (2.1)	5.2 (24.5)
	100 gm.	4.0	4.6 (0.0)	4.6 (12.6)	7.3 (0.0)	8.0 (0.0)	7.3 (0.0)	7.3 (0.0)	8.0 (0.0)	6.7 (1.8)
Admiral 10% EC.	300 cm^3	4.2	3.2 (23.8)	3.2 (42.1)	4.0 (40.0)	5.2 (29.4)	4.6 (24.4)	6.0 (0.0)	8.0 (0.0)	4.9* (22.8)
	150 cm^3	3.6	3.2 (11.1)	4.6 (2.9)	4.6 (19.5)	4.6 (27.2)	7.2 (0.0)	8.0 (0.0)	8.6 (0.0)	5.8 (7.8)
Control	--	4.6	4.6	6.0	7.2	8.0	6.6	5.2	8.0	6.5

L.S.D. = 1.5

*= Significant at 5% level.

% Reduction rates are given in brackets.

Table (24-B): Continued.

Treatments	Rate / 100L	Mean number of larvae and pupae per 20 leaves and its reduction rates at indicated days from treatment								
		Pre-spray	Second spray							
			1	2	3	5	7	10	14	Average
Selecron 72% EC.	187.5 cm^3	0.7	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	0.6 (48.2)	0.0 (100.0)	0.1* (92.6)
	93.7 cm^3	0.7	0.7 (37.0)	0.6 (50.9)	0.4 (61.8)	0.4 (61.8)	0.6 (45.2)	0.6 (48.2)	0.7 (46.0)	0.6* (50.1)
Achook 0.15% EC.	200 cm^3	6.0	6.0 (37.0)	6.0 (46.0)	6.6 (30.7)	6.0 (37.0)	6.6 (34.0)	7.2 (31.6)	7.2 (35.2)	6.5* (35.9)
	100 cm^3	6.6	8.6 (17.9)	11.2 (8.4)	11.2 (0.0)	10.0 (4.5)	8.6 (21.8)	8.6 (25.2)	8.0 (34.5)	9.5* (16.0)
Bemistop 21.1% EC.	500 cm^3	6.0	6.0 (37.0)	2.7 (76.1)	2.7 (72.7)	2.0 (79.0)	4.0 (60.0)	7.2 (31.6)	7.2 (35.2)	4.5* (55.9)
	250 cm^3	7.3	6.0 (48.4)	7.2 (46.9)	8.6 (25.9)	9.3 (19.9)	11.3 (7.2)	11.3 (11.9)	14.0 (0.0)	9.7* (22.9)
Biosect32x10^6 conidia/mg	200 gm.	8.0	8.0 (37.0)	7.3 (50.6)	9.3 (26.6)	10.0 (21.3)	11.3 (15.1)	12.0 (14.5)	13.3 (10.1)	10.2* (25.0)
	100 gm.	8.0	9.3 (0.0)	11.3 (23.6)	12.0 (5.5)	11.3 (10.9)	12.3 (7.6)	14.3 (2.0)	15.3 (0.0)	12.3 (7.1)
Admiral 10% EC.	300 cm^3	8.0	8.0 (37.0)	9.2 (37.9)	8.0 (37.0)	7.3 (42.3)	7.3 (45.1)	9.3 (33.6)	11.3 (25.6)	8.6* (36.9)
	150 cm^3	8.6	11.2 (17.5)	11.2 (29.7)	10.0 (26.7)	10.7 (21.9)	12.0 (16.3)	12.6 (16.5)	14.0 (12.1)	11.7* (20.1)
Control	--	8.0	12.6	14.6	12.6	12.6	13.2	14.0	14.6	13.5

L.S.D. = 1.6
*= Significant at 5% level.
% Reduction rates are given in brackets.

Table (25-A): Efficiency of certain treatments against larvae and pupae of the parasitoid, *Diglyphus isaea* (Walker) on common bean plants during 2000 season at Qalyubia Governorate.

Treatments	Rate / 100L	Mean number of larvae and pupae per 20 leaves and its reduction rates at indicated days from treatment								
		Pre-spray	First spray							
			1	2	3	5	7	10	14	Average
Selecron72%EC.	187.5 cm^3	2.4	0.4 (81.7)	0.2 (95.4)	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	0.4 (87.3)	0.7 (79.1)	0.2* (91.9)
	93.7 cm^3	2.6	2.0 (53.8)	1.3 (72.1)	0.7 (81.9)	1.2 (72.3)	1.2 (71.4)	1.2 (64.9)	1.2 (64.9)	1.3* (69.6)
Achook0.15%EC.	200 cm^3	2.0	1.6 (20.0)	0.2 (45.0)	2.0 (29.0)	2.0 (40.0)	2.2 (31.8)	2.0 (24.0)	2.0 (24.0)	1.9* (30.5)
	100 cm^3	2.6	2.4 (7.7)	4.4 (6.9)	3.3 (9.3)	3.4 (21.5)	3.6 (14.2)	2.6 (24.0)	2.7 (22.2)	3.2 (15.1)
Bemistop21.1%EC.	500 cm^3	1.4	1.2 (14.3)	1.2 (52.9)	0.7 (66.5)	0.7 (69.1)	1.0 (55.7)	0.9 (51.1)	0.8 (56.6)	0.9* (52.3)
	250 cm^3	2.6	2.4 (7.7)	2.3 (50.9)	2.2 (39.9)	2.7 (23.4)	3.9 (7.0)	4.8 (0.0)	4.8 (0.0)	3.4 (18.4)
Biosect32x10^6conidia/mg	200 gm.	2.7	2.4 (11.8)	2.6 (47.4)	2.6 (32.1)	2.4 (47.1)	2.9 (33.9)	3.6 (0.0)	4.0 (0.0)	2.9 (24.6)
	100 gm.	1.8	2.0 (0.0)	2.0 (26.7)	3.4 (0.0)	3.6 (0.0)	3.4 (0.0)	3.4 (0.0)	3.6 (0.0)	3.1 (3.8)
Admiral 10% EC.	300 cm^3	2.7	2.0 (24.8)	2.0 (58.6)	2.6 (30.6)	3.4 (23.3)	2.8 (34.7)	4.0 (0.0)	5.0 (0.0)	3.1 (24.6)
	150 cm^3	2.2	2.0 (9.1)	3.4 (15.0)	3.5 (0.0)	3.5 (4.5)	4.6 (0.0)	5.0 (0.0)	5.2 (0.0)	3.9 (4.1)
Control	--	2.0	2.0	3.6	2.8	3.3	3.2	2.6	2.6	2.9

L.S.D. = 0.8

*= Significant at 5% level.

% Reduction rates are given in brackets.

Table (25-B): Continued.

Treatments	Rate / 100L	Mean number of larvae and pupae per 20 leaves and its reduction rates at indicated days from treatment								
		Pre-spray	Second spray							
			1	2	3	5	7	10	14	Average
Selecron 72% EC.	187.5 cm^3	0.7	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	0.0* (100.0)
	93.7 cm^3	1.2	1.2 (35.0)	1.0 (53.3)	0.8 (56.7)	0.8 (56.7)	1.0 (49.2)	1.0 (54.2)	1.2 (44.0)	1.0* (49.85)
Achook 0.15% EC.	200 cm^3	2.0	2.0 (35.0)	2.0 (44.0)	2.2 (27.2)	2.0 (35.0)	2.3 (31.1)	2.4 (34.0)	2.4 (32.8)	2.2* (34.2)
	100 cm^3	2.7	3.5 (13.9)	4.4 (7.9)	4.4 (0.0)	4.0 (2.3)	3.5 (19.3)	3.5 (27.6)	3.2 (32.6)	3.8 (14.7)
Bemistop 21.1% EC.	500 cm^3	0.8	0.8 (35.0)	0.4 (74.8)	0.3 (72.4)	0.3 (78.9)	0.5 (60.4)	0.9 (34.0)	1.0 (30.0)	0.6* (55.05)
	250 cm^3	4.8	4.0 (45.8)	4.6 (46.3)	5.6 (24.2)	6.0 (18.8)	7.2 (8.5)	7.2 (17.5)	8.6 (0.0)	6.2 (23.01)
Biosect 32x10^6 conidia/mg	200 gm.	4.0	4.0 (35.0)	3.6 (49.6)	4.6 (25.3)	5.0 (18.8)	5.6 (14.6)	6.0 (17.5)	6.7 (6.8)	5.1 (23.9)
	100 gm.	3.6	4.2 (24.2)	5.2 (19.1)	5.4 (2.5)	5.1 (7.9)	5.6 (5.1)	6.5 (0.1)	7.0 (0.0)	5.6 (8.6)
Admiral 10% EC.	300 cm^3	5.0	5.0 (35.0)	5.7 (36.6)	5.0 (35.0)	4.6 (40.2)	4.6 (43.9)	5.2 (42.8)	6.0 (32.8)	5.2 (38.0)
	150 cm^3	5.2	7.0 (12.5)	6.8 (26.8)	6.0 (25.0)	6.4 (20.0)	7.0 (17.9)	7.2 (23.8)	8.6 (7.4)	7.0 (19.1)
Control	--	2.6	4.0	4.6	4.0	4.0	4.2	4.7	4.6	4.3

L.S.D. = 0.7
*= Significant at 5% level.
% Reduction rates are given in brackets.

II. 1.2– Effect of various Combinations:

II.1.2.A- The leaf miner, *Liriomyza trifolii* (Burg.):

The effects of mixtures of the botanical insecticide, Achook 0.15% at (high, 200 and low application rate, 100 cm^3/100 L.) and/or Bemistop 21.1% at (high, 500 and low application rate, 250 cm^3/100L.) plus Selecron (Profenofos) 72% at its half recommended rate (93.7 cm^3/100L.), also mixtures of the insect growth regulator, Admiral 10% at (high, 300 and low application rate, 150 cm^3/100L.) plus Achook 0.15% against the larvae of *L. trifolii* during 1999 season are presented in **Tables** (26-A & 26-B).

Data of the first spray in **Table** (26-A) showed that, the averages number of the larvae were reduced evidently after the following 3 days from spraying as compared with the control to reach (10.0, 22.6), (12.6, 20.0) and (12.0, 14.6 and 24.6 larvae/20 leaves) on the 3^{rd} day post-treatment for the mixture of Selecron plus Achook at (200, 100 cm^3/100 L.), mixture of Selecron plus Bemistop at (500, 250 cm^3/ 100 L.) and mixture of Achook at (200, 100 cm^3/100 L.) plus Admiral at (300, 300 and 150 cm^3/100 L.), respectively. The corresponding reduction rates were (85.5, 68.7), (81.8, 59.7) and (84.5, 78.2 and 64.4%) for various combinations, respectively.

The averages reduction rates of *L. trifolii* population of various combinations during the 1^{st} spray reached (85.3, 63.5), (81.2, 64.2) and (81.0, 73.8 and 60.4%) for various treatments, respectively. Values of the general means of larvae population showed a significant decrease in all treatments as compared with the control.

On the other hand, the 2^{nd} spray of 1999 season **Table** (26-B) showed the same trend as indicated in the 1^{st} spray.

Regarding the results of the second season 2000, the data had shown the same line and trend as obtained during 1999 season, **Tables** (27-A & 27-B).

Co-toxicity resulted from addition of the organophosphorus compound, Selecron to the two botanical insecticides (Achook and Bemistop) against *L. trifolii* larvae during the two seasons of 1999 and 2000 were presented in **Table** (28), also co-toxicity resulted from addition of the botanical compound, Achook to Admiral were summarized in **Table** (29).

Results indicated that, addition of the insecticide, Selecron at its half recommended rate to Achook and/or Bemistop at their high application rates induced an additive effect while, at their low application rates induced an antagonistic effect where, the high application rate of both Achook and/or Bemistop plus Selecron increased the toxicity of the combination against *L. trifolii* larvae than separately at two sprays during two seasons.

Also, results obtained from addition of botanical compound, Achook at its high application rate, (200 cm^3) to Admiral at its recommended rate at two sprays during 1999 and 2000 seasons, **Table** (29) induced an additive effect in which the total mortality of the combination is higher than the mortality of summation of each compound separately. Thus, the joint action of the two compounds in the mixtures was more effective against the tested insect than the compound alone. While, an antagonistic effect was obtained from the same combination at the low application rate of Achook and both application rates of Admiral (with some exception).

Table (26-A): Effect of various combinations on *Liriomyza trifolii* (Burg.) larvae infesting common bean plants during 1999 season at Qalyubia Governorate.

Treatments	Rate / 100L	Mean number of larvae per 20 leaves and reduction rates at indicated days from treatment								
		Pre-spray	First spray							
			1	2	3	5	7	10	14	Average
Achook 0.15% EC. + Selecron 72% EC.	200 cm^3+93.7 cm^3	44.6	2.0 (96.3)	8.0 (87.0)	10.0 (85.5)	12.6 (82.6)	10.0 (82.7)	10.4 (85.5)	16.6 (77.5)	9.9* (85.3)
	100 cm^3+93.7 cm^3	46.6	24.0 (57.5)	28.0 (56.5)	22.6 (68.7)	24.0 (68.3)	24.0 (60.3)	28.0 (62.7)	22.6 (70.7)	24.7* (63.5)
Bemistop 21.1%EC. + Selecron 72% EC.	500 cm^3+93.7 cm^3	44.6	12.0 (77.8)	10.0 (83.8)	12.6 (81.8)	12.0 (83.4)	11.2 (80.6)	10.0 (86.1)	18.6 (74.8)	12.2* (81.2)
	250 cm^3+93.7 cm^3	42.6	28.0 (45.8)	19.2 (67.4)	20.0 (69.7)	24.0 (65.3)	26.0 (52.9)	16.6 (75.8)	19.2 (72.7)	21.8* (64.2)
Achook 0.15% EC. + Admiral 10% EC.	200 cm^3+300 cm^3	50.0	12.0 (80.2)	12.6 (81.8)	12.0 (84.5)	14.0 (82.7)	14.0 (78.4)	12.0 (85.1)	21.2 (74.3)	13.8* (81.0)
	100 cm^3+300 cm^3	43.2	12.0 (77.1)	14.0 (76.5)	14.6 (78.2)	16.0 (77.2)	18.0 (67.9)	18.0 (74.1)	24.6 (65.5)	16.6* (73.8)
	100 cm^3+150 cm^3	44.6	23.2 (57.1)	24.0 (61.0)	24.6 (64.4)	28.0 (61.3)	26.0 (55.0)	28.6 (60.2)	26.6 (63.9)	25.9* (60.4)
Control	--	47.2	57.2	65.2	73.2	76.6	61.2	76.0	78.0	69.6

L.S.D. = 4.3
*= Significant at 5% level
% Reduction rates are given in brackets.

Table (26-B): Continued.

Treatments	Rate / 100L	Mean number of larvae per 20 leaves and reduction rates at indicated days from treatment								
		Pre-spray	Second spray							
			1	2	3	5	7	10	14	Average
Achook 0.15% EC. + Selecron 72% EC.	200 cm^3+93.7 cm^3	16.6	4.0 (75.3)	2.0 (88.3)	2.2 (88.3)	1.0 (93.9)	0.0 (100.0)	0.8 (95.8)	1.2 (93.9)	1.6* (90.8)
	100 cm^3+93.7 cm^3	22.6	10.0 (54.6)	12.0 (48.2)	10.0 (60.8)	8.0 (64.6)	6.0 (75.3)	8.0 (69.3)	10.0 (62.5)	8.6* (62.2)
Bemistop 21.1%EC. + Selecron 72% EC.	500 cm^3+93.7 cm^3	18.6	4.0 (77.9)	4.6 (75.9)	6.0 (71.4)	4.6 (75.3)	4.0 (80.0)	6.0 (72.0)	6.6 (69.9)	5.1* (74.6)
	250 cm^3+93.7 cm^3	19.2	8.0 (57.2)	6.0 (69.5)	8.6 (60.3)	6.0 (68.8)	6.0 (70.9)	8.0 (63.9)	10.0 (55.8)	7.5* (63.8)
Achook 0.15% EC. + Admiral 10% EC.	200 cm^3+300 cm^3	21.2	6.0 (70.9)	4.0 (81.6)	2.6 (89.1)	2.0 (90.6)	2.0 (91.2)	3.2 (86.9)	3.4 (86.4)	3.3* (85.3)
	100 cm^3+300 cm^3	24.6	8.0 (66.6)	6.0 (76.2)	4.2 (84.9)	6.2 (74.8)	6.4 (75.8)	6.6 (76.7)	8.0 (72.4)	6.5* (75.4)
	100 cm^3+150 cm^3	26.6	10.0 (61.4)	8.0 (70.7)	6.0 (80.0)	8.0 (69.9)	8.2 (67.9)	10.0 (67.4)	12.0 (61.8)	9.0* (68.4)
Control	--	78.0	76.0	80.0	88.0	78.0	84.0	90.0	92.0	84.0

L.S.D. =2.1
*= Significant at 5% level
% Reduction rates are given in brackets.

Table (27-A): Effect of various combinations on *Liriomyza trifolii* (Burg.) larvae infesting common bean plants during 2000 season at Qalyubia Governorate.

Treatments	Rate / 100L	Mean number of larvae per 20 leaves and reduction rates at indicated days from treatment								
		Pre-spray	First spray							
			1	2	3	5	7	10	14	Average
Achook 0.15% EC. + Selecron 72% EC.	200 cm^3+93.7 cm^3	32.6	2.0 (94.4)	6.0 (86.1)	6.0 (84.0)	5.2 (84.4)	5.2 (84.0)	8.0 (71.1)	13.2 (60.4)	6.5* (80.6)
	100 cm^3+93.7 cm^3	27.2	8.0 (73.2)	10.0 (72.2)	11.2 (64.2)	12.6 (54.7)	14.0 (48.5)	14.0 (39.4)	14.0 (49.7)	11.9* (57.4)
Bemistop 21.1% EC. + Selecron 72% EC.	500 cm^3+93.7 cm^3	29.2	2.0 (93.8)	4.0 (89.6)	4.0 (88.1)	4.6 (84.6)	6.0 (79.5)	6.0 (75.8)	13.2 (55.8)	5.7* (81.0)
	250 cm^3+93.7 cm^3	32.0	17.2 (51.0)	14.0 (66.9)	11.2 (69.6)	10.6 (67.6)	10.6 (66.9)	10.6 (61.0)	10.6 (67.6)	12.1* (64.4)
Achook 0.15% EC. + Admiral 10% EC.	200 cm^3+300 cm^3	32.6	2.0 (94.4)	6.0 (86.1)	6.6 (82.4)	8.0 (76.0)	6.0 (81.6)	4.6 (83.4)	13.2 (60.4)	6.6* (80.6)
	100 cm^3+300 cm^3	33.2	10.6 (70.9)	12.0 (72.7)	10.0 (73.8)	8.0 (76.4)	10.0 (69.9)	11.8 (58.2)	17.2 (49.3)	11.4* (67.3)
	100 cm^3+150 cm^3	33.2	14.0 (61.6)	15.2 (65.4)	15.2 (60.2)	12.0 (64.7)	10.0 (69.9)	12.0 (57.5)	15.2 (55.2)	13.4* (62.1)
Control	--	26.6	29.2	34.2	30.6	27.2	26.6	22.6	27.2	28.2

L.S.D. = 3.0

*= Significant at 5% level

% Reduction rates are given in brackets.

Table (27-B): Continued.

Treatments	Rate / 100L	Mean number of larvae per 20 leaves and reduction rates at indicated days from treatment								
		Pre-spray	Second spray							
			1	2	3	5	7	10	14	Average
Achook 0.15% EC. + Selecron 72% EC.	200 cm^3+93.7 cm^3	13.2	3.6 (77.7)	3.2 (75.8)	2.0 (88.9)	1.0 (92.9)	0.0 (100.0)	0.0 (100.0)	1.2 (92.9)	1.8* (89.7)
	100 cm^3+93.7 cm^3	14.0	5.2 (69.6)	4.0 (71.4)	8.0 (58.2)	8.2 (45.4)	10.0 (33.5)	8.0 (56.8)	6.0 (66.3)	7.1* (57.3)
Bemistop 21.1% EC. + Selecron 72% EC.	500 cm^3+93.7 cm^3	13.2	2.0 (87.6)	2.6 (80.3)	2.2 (87.8)	1.8 (87.3)	3.2 (77.4)	3.8 (78.2)	4.0 (76.2)	2.8* (82.1)
	250 cm^3+93.7 cm^3	10.6	2.4 (81.5)	4.0 (62.3)	5.2 (64.1)	6.0 (47.3)	4.6 (59.6)	4.0 (71.5)	5.2 (61.4)	4.5* (63.9)
Achook 0.15% EC. + Admiral 10% EC.	200 cm^3+300 cm^3	13.2	2.0 (87.6)	2.2 (83.3)	1.2 (93.4)	1.8 (87.3)	2.0 (85.9)	2.6 (85.1)	2.8 (83.3)	2.1* (86.6)
	100 cm^3+300 cm^3	17.2	4.0 (80.9)	3.8 (77.9)	2.4 (89.8)	2.0 (89.2)	4.0 (78.3)	6.0 (73.6)	6.6 (69.8)	4.1* (79.9)
	100 cm^3+150 cm^3	15.2	10.0 (46.1)	8.0 (47.4)	6.6 (68.3)	5.8 (64.5)	5.2 (68.1)	4.0 (80.1)	6.0 (68.9)	6.5* (63.3)
Control	--	27.2	33.2	27.2	37.2	29.2	29.2	36.0	34.6	32.2

L.S.D. = 2.0
*= Significant at 5% level
% Reduction rates are given in brackets.

Table (28): Co-toxicity resulted from addition of Selecron at its half-recommended rate to the botanical insecticides (Achook/or Bemistop) for *Liriomyza trifolii* (Burgess) during nili plantation.

Application rate (cm^3/100 L.)		% Mortality after 3 days from treatment			Co-toxicity factor	Type of joint action
		Selecron alone	Botanical insecticide alone	Botanical insecticide + Selecron		
		Expected mortality		*Observed mortality*		
Season 1999						
Achook 0.15 % EC.						
1st spray	200	54.9	77.3	85.5	-14.5	d
	100		58.7	68.7	-31.3	a
2nd spray	200	44.8	65.5	88.3	-11.8	d
	100		50.8	60.8	-36.4	a
Bemistop 21.1% EC.						
1st spray	500	54.9	81.8	81.8	-18.2	d
	250		62.8	69.7	-30.3	a
2nd spray	500	44.8	78.5	71.4	-28.6	a
	250		60.7	60.3	-39.7	a
Season 2000						
Achook 0.15 % EC.						
1st spray	200	57.5	73.3	84.0	-16.0	d
	100		45.5	64.2	-35.8	a
2nd spray	200	57.3	81.7	88.9	-11.1	d
	100		63.4	58.2	-41.8	a
Bemistop 21.1% EC.						
1st spray	500	57.5	85.5	88.1	-11.9	d
	250		66.8	69.6	-30.4	a
2nd spray	500	57.3	75.2	87.8	-12.2	d
	250		68.6	64.1	-35.9	a

a: antagonistic effect (-20 or more)
d: additive effect (between –20 & +20)

Table (29): Co-toxicity resulted from addition of Achook at 200 and 100cm³/100L to Admiral at two rates for *Liriomyza trifolii* (Burgess) during nili plantation.

Application rate (cm³/100 L.)		Achook alone	Admiral alone	Admiral + Achook	Co-toxicity factor	Type of joint action
		% Mortality after 3 days from treatment				
		Expected mortality		*Observed mortality*		
Season 1999						
At 200cm³/100L.						
1st spray	300	77.3	59.7	84.5	-15.5	d
2nd spray	300	65.5	66.5	89.1	-10.9	d
At 100cm³ /100/L.						
1st spray	300	58.7	59.7	78.20	-21.8	a
	150		45.4	64.4	-35.6	a
2nd spray	300	50.8	66.5	84.7	-15.1	d
	150		43.9	80.0	-15.5	d
Season 2000						
At 200cm³/100L.						
1st spray	300	73.3	80.8	82.4	-17.6	d
2nd spray	300	81.7	82.2	93.4	-6.6	d
At 100cm³/100L.						
1st spray	300	45.5	80.8	73.8	-26.2	a
	150		46.7	60.2	-34.7	a
2nd spray	300	63.4	82.2	89.8	-10.2	d
	150		67.7	68.3	-31.7	a

a: antagonistic effect (-20 or more)
d: additive effect (between –20 & +20)

II.1.2.B- The legume aphid, *Aphis craccivora* Koch.

Data presented in **Tables** (30-A & 30-B) showed the effects of mixtures of botanical insecticide, Achook 0.15% and/or Bemistop 21.1% plus the insecticide, Selecron 72% at its half recommended rate (93.7 cm^3/100L.), also mixtures of Admiral 10% plus Achook 0.15% at high and low application rates against *Aphis craccivora* individuals during 1999 season.

Concerning the results of the 1st spray **Table** (30-A) the averages number of *Aphis craccivora* individuals per 20 leaves was reduced noticeably during the following 3 days after spraying as compared with the control and reached (0.0, 35.8), (0.0, 25.2) and (10.6, 4.4 and 18.6) on the 3rd day post-treatment for mixtures of Selecron plus Achook (at 200, 100 cm^3/100 L.), mixtures of Selecron plus Bemistop at (500, 250 cm^3/100 L.) and mixtures of Achook (at 200,100 cm^3/100L.) plus Admiral at (300, 300 and 150 cm^3/100 L.), respectively. Thereafter, the values of the averages number of aphid individuals increased gradually recording (45.2, 136.0), (33.8, 83.8) and (30.6 and 26.6, 60.4 individuals/20 leaves) at the 14th day after spraying for different treatments, respectively.

The corresponding reduction rates were (100, 95.9), (100, 94.3) and (97.6 and 98.9, 95.2%) at the 3rd day post-treatment and (93.7, 80.4), (95.6, 88.54) and (95.7, 92.1 and 90.5%) at the 14th day from spraying for various combinations, respectively. The averages reduction rates of *A. craccivora* population of various combinations during the 1st spray reached (98.3, 91.5), (97.6, 93.3) and (97.8, 93.4 and 94.4%), respectively. Values of the general mean of aphid showed a significant decrease in all combinations as compared with the control. Regarding the 2nd spray of 1999 season **Table** (30-B), the same trend was achieved as indicated in the 1st spray. Also, the results of the second season of 2000, showed the same line and trend as obtained during 1999 season as indicated in **Tables** (31-A & 31-B).

Co-toxicity resulted from addition of the organophosphorus compound, Selecron to the two botanical compounds (Achook and Bemistop) against *Aphis craccivora* during two seasons of 1999 and 2000 were presented in **Table** (32), also, co-toxicity resulted from addition of the botanical compound, Achook to Admiral were summarized in **Table** (33). Results pointed out that, addition of Selecron at its half-recommended rate to Achook and/or Bemistop at two application rate **Table** (32), had increased obviously their toxicity against *A. craccivora* than separately, and exhibited an additive effect at two sprays. Also, results obtained from addition of botanical compound, Achook at 200 and 100 cm^3/100L. to Admiral at its recommended and half-recommended rates at two sprays during 1999 and 2000 seasons, **Table** (33) increased its effectiveness than separately and induced an additive effect at two sprays with the two application rates. This increase was determined and termed as additive effect in which the total mortality of the combination is higher than the mortality of summation of each compound separately.

Table (30-A): Effect of various combinations on *Aphis craccivora* Koch. individuals infesting common bean plants during 1999 season at Qalyubia Governorate.

Treatments	Rate / 100L	Mean number of individuals per 20 leaves and reduction rates at indicated days from treatment								
		Pre-spray	First spray							
			1	2	3	5	7	10	14	Average
Achook 0.15% EC. + Selecron 72% EC.	200 cm^3+93.7 cm^3	339.8	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	12.0 (97.7)	19.2 (96.7)	45.2 (93.7)	10.9* (98.3)
	100 cm^3+93.7 cm^3	328.6	0.0 (100.0)	0.0 (100.0)	17.2 (95.9)	35.8 (92.1)	60.6 (88.1)	90.6 (83.7)	136.0 (80.5)	48.6* (91.5)
Bemistop 21.1% EC. + Selecron 72% EC.	500 cm^3+93.7 cm^3	360.6	0.0 (100.0)	0.0 (100.0)	0.00 (100.0)	13.8 (97.2)	23.2 (95.9)	34.6 (94.3)	33.8 (95.6)	15.0* (97.6)
	250 cm^3+93.7 cm^3	347.2	0.0 (100.0)	0.0 (100.0)	25.2 (94.3)	30.4 (93.7)	45.8 (91.5)	86.6 (85.2)	83.8 (88.5)	38.8* (93.3)
Achook 0.15% EC. + Admiral 10% EC.	200 cm^3+300 cm^3	340.4	0.0 (100.0)	0.0 (100.0)	10.6 (97.6)	5.8 (98.8)	10.0 (98.1)	32.6 (94.3)	30.6 (95.7)	12.8* (97.8)
	100 cm^3+300 cm^3	337.2	89.2 (70.7)	11.2 (96.8)	4.4 (98.9)	3.8 (99.2)	0.0 (100.0)	22.0 (96.1)	26.6 (92.1)	22.6* (93.4)
	100 cm^3+150 cm^3	301.2	9.2 (96.6)	16.0 (94.8)	18.6 (95.2)	14.6 (96.5)	19.8 (95.8)	44.6 (91.2)	60.4 (90.5)	26.2* (94.4)
Control	--	379.8	343.4	388.6	486.8	526.0	590.0	641.4	800.0	539.5

L.S.D. =65.8

*= Significant at 5% level

% Reduction rates are given in brackets.

Table (30-B): Continued.

Treatments	Rate / 100L	Pre-spray	Mean number of individuals per 20 leaves and reduction rates at indicated days from treatment							
			Second spray							
			1	2	3	5	7	10	14	Average
Achook 0.15% EC. + Selecron 72% EC.	200 cm^3+93.7 cm^3	45.2	0.0 (100.0#	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	2.0 (90.6)	4.0 (76.4)	0.9* (95.4)
	100 cm^3+93.7 cm^3	136.0	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	6.0 (94.7)	20.0 (79.7)	24.0 (62.6)	24.6 (51.8)	10.6* (84.1)
Bemistop 21.1% EC. + Selecron 72% EC.	500 cm^3+93.7 cm^3	33.8	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	0.00 (100.0)	2.6 (89.4)	2.8 (82.5)	4.0 (68.4)	1.3* (96.1)
	250 cm^3+93.7 cm^3	83.3	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	6.6 (90.5)	10.4 (82.9)	15.6 (60.6)	15.4 (51.0)	6.9* (83.6)
Achook 0.15% EC. + Admiral 10% EC.	200 cm^3+300 cm^3	30.6	0.0 (100.0)	2.2 (94.3)	0.0 (100.0)	2.6 (89.7)	2.4 (89.2)	2.6 (82.0)	2.4 (79.1)	2.5* (84.9)
	100 cm^3+300 cm^3	26.6	2.2 (94.2)	4.0 (88.2)	0.0 (100.0)	0.0 (100.0)	4.2 (78.2)	4.0 (68.2)	3.4 (65.9)	2.4* (84.9)
	100 cm^3+150 cm^3	60.4	10.2 (88.2)	12.4 (83.8)	18.0 (73.4)	19.0 (61.9)	16.2 (63.0)	12.0 (57.9)	9.2 (59.4)	13.9* (69.7)
Control	--	800.0	1145.2	1014.0	896.0	660.0	580.0	378.0	300.0	710.5

L.S.D. = 121.6
*= Significant at 5% level
% Reduction rates are given in brackets.

Table (31-A): **Effect of various combinations on *Aphis craccivora* Koch. individuals infesting common bean plants during 2000 season at Qalyubia Governorate.**

Treatments	Rate / 100L	Mean number of individuals per 20 leaves and reduction rates at indicated days from treatment								
		Pre-spray	First spray							
			1	2	3	5	7	10	14	Average
Achook 0.15% EC. + Selecron 72% EC.	200 cm^3+93.7 cm^3	108.4	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	8.0 (99.0)	20.4 (96.5)	4.1* (99.4)
	100 cm^3+93.7 cm^3	76.0	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	14.4 (95.4)	35.2 (93.8)	43.2 (89.4)	13.3* (96.9)
Bemistop 21.1% EC. + Selecron 72% EC.	500 cm^3+93.7 cm^3	96.0	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	12.0 (96.9)	24.0 (96.7)	22.6 (95.6)	8.4* (98.5)
	250 cm^3+93.7 cm^3	83.2	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	9.2 (96.9)	25.2 (92.7)	36.4 (94.2)	48.0 (89.3)	16.9* (96.1)
Achook 0.15% EC. + Admiral 10% EC.	200 cm^3+300 cm^3	77.8	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	9.2 (97.1)	11.8 (97.9)	22.0 (94.7)	6.1* (98.6)
	100 cm^3+300 cm^3	72.6	30.0 (71.5)	7.2 (96.5)	4.0 (98.2)	0.0 (100.0)	0.0 (100.0)	9.2 (98.3)	17.2 (95.6)	9.7* (94.3)
	100 cm^3+150 cm^3	95.2	7.2 (94.8)	14.4 (94.7)	11.8 (96.0)	12.0 (96.5)	13.8 (96.5)	23.2 (96.8)	37.2 (92.7)	17.1* (95.4)
Control	--	71.2	103.4	204.0	222.0	225.4	285.2	535.4	382.6	285.4

L.S.D. = 54.6
*= Significant at 5% level
% Reduction rates are given in brackets.

Table (31-B): Continued.

Treatments	Rate / 100L	Pre-spray	Mean number of individuals per 20 leaves and reduction rates at indicated days from treatment							
			Second spray							
			1	2	3	5	7	10	14	Average
Achook 0.15% EC. + Selecron 72% EC.	200 cm^3+93.7 cm^3	20.4	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	8.0 (80.4)	11.2 (76.3)	18.0 (60.1)	22.0 (52.8)	8.5* (81.4)
	100 cm^3+93.7 cm^3	43.2	0.0 (100.0)	0.0 (100.0)	14.6 (78.9)	24.0 (72.2)	30.0 (69.9)	40.0 (58.1)	42.0 (57.5)	21.5* (76.7)
Bemistop 21.1% EC. + Selecron 72% EC.	500 cm^3+93.7 cm^3	22.6	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	6.0 (98.7)	1.0 (98.1)	24.0 (51.9)	36.0 (30.3)	8.8* (82.7)
	250 cm^3+93.7 cm^3	48.0	0.0 (100.0)	0.0 (100.0)	16.6 (78.4)	26.0 (72.9)	38.0 (65.8)	40.0 (62.3)	44.0 (59.9)	23.5* (77.0)
Achook 0.15% EC. + Admiral 10% EC.	200 cm^3+300 cm^3	22.0	0.0 (100.0)	0.0 (100.0)	0.0 (100.0)	6.0 (86.4)	10.0 (80.3)	11.6 (76.2)	30.0 (40.3)	8.2* (83.3)
	100 cm^3+300 cm^3	14.2	7.2 (69.8)	13.2 (50.2)	0.0 (100.0)	0.0 (100.0)	6.0 (84.9)	10.0 (73.7)	20.0 (49.1)	8.1* (75.4)
	100 cm^3+150 cm^3	37.2	9.2 (82.1)	14.6 (74.5)	13.8 (76.8)	14.0 (81.2)	16.0 (81.4)	40.0 (51.4)	44.0 (48.3)	21.7* (70.8)
Control	--	382.6	530.0	590.0	611.4	765.4	884.6	846.0	874.6	728.9

L.S.D. =58.2
*= Significant at 5% level
% Reduction rates are given in brackets.

Table (32): Co-toxicity resulted from addition of Selecron at its half-recommended rate to the botanical insecticides (Achook/or Bemistop) for *Aphis craccivora* Koch. during nili plantation.

Application rate (cm^3/100 L.)		% Mortality after 3 days from treatment			Co-toxicity factor	Type of joint action
		Selecron alone	Botanical insecticide alone	Botanical insecticide + Selecron		
		Expected mortality		*Observed mortality*		
Season 1999						
Achook 0.15 % EC.						
1[st] spray	200	96.8	95.8	100.0	0.0	d
	100		62.6	95.9	-4.1	d
2[nd] spray	200	90.9	100.0	100.0	0.0	d
	100		78.6	100.0	0.0	d
Bemistop 21.1% EC.						
1[st] spray	500	96.8	84.0	100.0	0.0	d
	250		61.1	94.3	-5.7	d
2[nd] spray	500	90.9	91.8	100.0	0.0	d
	250		75.2	100.0	0.0	d
Season 2000						
Achook 0.15 % EC.						
1[st] spray	200	100	100.0	100.0	0.0	d
	100		71.8	100.0	0.0	d
2[nd] spray	200	100	93.2	100.0	0.0	d
	100		70.6	78.9	-21.1	a
Bemistop 21.1% EC.						
1[st] spray	500	100	86.5	100.0	0.0	d
	250		73.8	100.0	0.0	d
2[nd] spray	500	100	83.6	100.0	0.0	d
	250		62.9	78.4	-21.6	a

a: antagonistic effect (-20 or more)
d: additive effect (between –20 & +20)

Table (33): Co-toxicity resulted from addition of Achook at 200 and 100cm³/100L to Admiral at two rates for *Aphis craccivora* Koch. during nili plantation.

Application rate (cm³/100 L.)		% Mortality after 3 days from treatment: Achook alone	Admiral alone	Admiral + Achook	Co-toxicity factor	Type of joint action
		Expected mortality		*Observed mortality*		
Season 1999						
At 200cm³/100L.						
1st spray	300	95.8	82.9	97.6	-2.4	d
2nd spray	300	100	100.0	100.0	0.0	d
At 100cm³/100L.						
1st spray	300	62.6	82.9	98.9	-1.1	d
	150		66.9	95.2	-4.8	d
2nd spray	300	78.6	100.0	100.0	0.0	d
	150		79.2	73.4	-26.6	a
Season 2000						
At 200cm³/100L.						
1st spray	300	100	97.7	100.0	0.0	d
2nd spray	300	93.2	100.0	100.0	0.0	d
At 100cm³/100L.						
1st spray	300	71.8	97.7	98.2	-1.8	d
	150		84.3	96.0	-4.0	d
2nd spray	300	70.6	100.0	100.0	0.0	d
	150		66.9	76.8	-23.2	a

a: antagonistic effect (-20 or more)
d: additive effect (between –20 & +20)

II.2.C- The whitefly, *Bemisia tabaci* (Genn.):

Data presented in **Tables** (34-A, 34-B, 35-A & 35-B) showed the effect of mixtures of botanical insecticide, Achook and/or Bemistop plus the chemical insecticide, Selecron at its half recommended rate (93.7 cm^3/100L.), as well mixtures of Admiral plus Achook at their high and low application rates against the whitefly adults and immature stages during 1999 season.

Results of the 1^{st} spray **Table** (34-A & 35-A), revealed that the averages number of *Bemisia tabaci* was decreased clearly during the following 3 days after spraying as compared with control and amounted (18.0, 44.0), (18.0, 50.0) and (30.0, 68.6 and 94.0 adults/20 leaves) for adults and (66.6, 164.0), (100.0, 182.0) and (90.0, 100.0 and 178.0 individuals/20 leaves) for immature stages on the 3^{rd} day for mixtures of Selecron plus Achook at (200, 100 cm^3/100 L.), mixtures of Selecron plus Bemistop at (500, 250 cm^3/100 L.) and mixtures of Achook at (200,100 cm^3/100 L.) plus Admiral at (300, 300 and 150 cm3/100 L), respectively.

Thereafter, the values of the averages number of *Bemisia tabaci* adults and immature stages increased gradually from the 5^{th} days after spraying for various combinations, respectively.

The corresponding reduction rates were (91.7, 80.5), (90.7, 77.8) and (85.1, 68.9 and 58.1%) for adults and (91.6, 80.9), (87.9, 77.8) and (88.8, 87.3 and 77.1%) for immature stages at the 3^{rd} day from spraying and (54.1, 52.7), (84.9, 76.9) and (80.1, 55.9 and 38.9%) at the 14^{th} day post-treatment for different combinations, respectively.

The averages reduction rates of *B. tabaci* population during the two weeks of investigation reached (82.1, 72.7), (88.5, 57.9) and (88.2, 69.8 and 54.3%) for adults and (90.9, 82.9), (88.5, 79.8) and (89.2, 87.6 and 80.5%) for immature stages for various combinations, respectively.

Values of the general mean of *B. tabaci* showed a significant decreased in all combinations as compared with the control.

In addition, results of the 2nd spray, **Table** (34-B & 35-B) showed that, the average number of *B. tabaci* adults and immature stages was reduced obviously during the following 3 days after application as compared with the control for all treatments. Then, the average number of *B. tabaci* decreased gradually to reach (14.0, 40.0), (2.0, 12.0) and (2.2, 20.0 and 32.0 adults/20 leaves) for adults and (10.0, 20.0), (4.2, 18.6) and (10.0, 16.0 and 20.0 individual/20 leaves) for immature stages at the 14th day after treatment for different mixtures, respectively.

Table (34-A): Effect of various combinations on *Bemisia tabaci* (Genn.) adults infesting common bean plants during 1999 season at Qalyubia Governorate.

Treatments	Rate /100L	Mean number of adults per 20 leaves and reduction rates at indicated days from treatments								
		Pre-spray	First spray							
			1	2	3	5	7	10	14	Average
Achook 0.15%EC. + Selecron 72% EC	$200 cm^3+93.7 cm^3$	160.0	16.0 (91.7)	16.6 (92.4)	18.0 (91.7)	20.0 (94.0)	38.0 (77.2)	78.0 (73.7)	116.0 (54.1)	43.2* (82.1)
	$100 cm^3+93.7 cm^3$	166.0	40.0 (80.1)	42.0 (81.5)	44.0 (80.5)	60.0 (82.8)	60.6 (64.9)	104.0 (66.2)	124.0 (52.7)	67.8* (72.7)
Bemistop 21.1EC. + Selecron 72% EC.	$500 cm^3+93.7 cm^3$	142.6	26.6 (84.6)	17.2 (91.2)	18.0 (90.7)	29.2 (90.2)	20.0 (86.5)	22.0 (91.7)	34.0 (84.9)	23.9* (88.5)
	$250 cm^3+93.7 cm^3$	165.2	46.6 (76.7)	48.0 (78.8)	50.0 (77.8)	72.0 (79.2)	62.0 (63.9)	68.0 (77.8)	60.0 (76.9)	58.1* (75.9)
Achook 0.15%EC. + Admiral 10% EC.	$200 cm^3+300 cm^3$	148.0	13.2 (92.6)	18.6 (90.8)	30.0 (85.1)	34.0 (89.1)	18.0 (88.3)	24.0 (91.3)	46.6 (80.1)	26.3* (88.2)
	$100 cm^3+300 cm^3$	162.0	22.0 (88.8)	46.0 (79.3)	68.6 (68.9)	75.2 (77.9)	78.6 (53.3)	106.6 (64.5)	112.6 (55.9)	72.8* (69.8)
	$100 cm^3+150 cm^3$	164.6	60.0 (69.8)	80.0 (64.5)	94.0 (58.1)	132.6 (61.6)	120.0 (29.9)	130.6 (57.2)	158.6 (38.9)	110.8* (54.3)
Control	--	166.0	200.6	227.4	226.0	354.6	172.6	308.0	262.0	249.2

L.S.D. =35.8
*= Significant at 5% level.
% Reduction rates are given in brackets.

Table (34-B): Continued.

Treatments	Rate /100L	Mean number of adults per 20 leaves and reduction rates at indicated days from treatments								
		Pre-spray	Second spray							
			1	2	3	5	7	10	14	Average
Achook 0.15% EC. + Selecron 72% EC	200cm^3+93.7 cm^3	116.0	12.6 (93.8)	16.6 (90.7)	30.6 (79.9)	35.0 (85.8)	20.0 (77.4)	18.0 (74.7)	14.0 (76.9)	20.3* (82.8)
	100cm^3+93.7 cm^3	124.0	21.2 (90.2)	30.6 (83.94)	36.6 (77.5)	63.2 (72.1)	70.0 (26.0)	42.0 (44.7)	40.0 (38.5)	43.4* (61.9)
Bemistop 21.1% EC. + Selecron 72% EC.	500cm^3+93.7 cm^3	34.0	13.2 (77.7)	12.0 (77.0)	10.0 (77.6)	8.0 (87.1)	4.0 (84.6)	2.2 (89.4)	2.0 (88.8)	7.3* (83.2)
	250cm^3+93.7 cm^3	60.0	35.2 (66.3)	26.0 (71.8)	20.2 (72.1)	18.6 (83.02)	18.0 (60.7)	12.0 (67.4)	12.0 (61.9)	20.5* (69.0)
Achook 0.15% EC. + Admiral 10% EC.	200 cm^3+300 cm^3	46.6	8.6 (89.4)	10.0 (86.0)	9.2 (84.9)	6.2 (92.71)	4.0 (88.8)	4.0 (85.9)	2.2 (90.9)	6.3* (88.4)
	100 cm^3+300 cm^3	112.6	13.2 (93.3)	28.6 (83.5)	39.2 (73.5)	62.0 (69.9)	60.0 (30.2)	42.0 (39.1)	20.0 (66.1)	37.9* (65.1)
	100 cm^3+150 cm^3	158.6	85.2 (69.9)	84.0 (65.5)	82.0 (60.6)	80.0 (72.4)	62.0 (48.8)	40.0 (58.9)	36.0 (61.5)	66.5* (62.5)
Control	--	262.0	456.6	402.6	344.0	478.6 1226.0	200.0	160.6	1374.0	311.4

L.S.D. = 56.3
*= Significant at 5% level.
% Reduction rates are given in brackets.

Table (35-A): Effect of various combinations on *Bemisia tabaci* (Genn.) immature stages infesting common bean plants during 1999 season at Qalyubia Governorate.

Treatments	Rate /100L	Mean number of immature stages per 20 leaves and reduction rates at indicated days from treatments								
		Pre-spray	First spray							
			1	2	3	5	7	10	14	Average
Achook 0.15%EC. + Selecron 72% EC.	200cm^3+93.7cm^3	570.0	62.0 (92.5)	42.0 (95.7)	66.6 (91.6)	60.0 (93.7)	85.2 (91.3)	140.0 (87.3)	161.2 (84.4)	88.1* (90.9)
	100cm^3+93.7cm^3	616.6	204.0 (77.2)	186.0 (82.3)	164.0 (80.9)	154.0 (85.1)	160.0 (84.9)	164.0 (86.2)	184.6 (83.5)	173.8* (82.9)
Bemistop 21.1EC. + Selecron 72% EC.	500cm^3+93.7cm^3	595.2	106.0 (87.7)	124.0 (87.8)	100.0 (87.9)	125.2 (87.4)	118.6 (88.5)	108.6 (90.5)	112.0 (89.7)	113.5* (88.5)
	250cm^3+93.7cm^3	588.6	234.0 (72.6)	204.0 (79.7)	182.0 (77.8)	170.0 (82.7)	194.0 (80.9)	236.0 (79.2)	155.2 (85.5)	196.5* (79.8)
Achook 0.15%EC. + Admiral 10% EC.	200cm^3+300 cm^3	578.0	58.0 (93.1)	69.2 (92.9)	90.0 (88.8)	110.0 (88.6)	108.6 (89.1)	142.6 (87.2)	163.2 (84.5)	105.9* (89.2)
	100cm^3+300 cm^3	566.6	96.0 (88.3)	98.0 (89.9)	100.0 (87.3)	110.0 (88.4)	122.0 (87.5)	146.0 (86.6)	154.6 (84.9)	118.1* (87.6)
	100cm^3+150 cm^3	558.0	202.0 (75.1)	184.0 (80.7)	178.0 (77.1)	164.0 (82.4)	160.0 (83.4)	180.0 (83.3)	183.2 (81.9)	178.7* (80.5)
Control	--	678.6	985.4	1157.4	943.4	1134.6	1172.6	1307.4	1234.0	1133.4

L.S.D. = 56.7
*= Significant at 5% level.
% Reduction rates are given in brackets.

Table (35-B): Continued.

Treatments	Rate /100L	Mean number of immature stages per 20 leaves and reduction rates at indicated days from treatments								
		Pre-spray	Second spray							
			1	2	3	5	7	10	14	Average
Achook 0.15% EC. + Selecron 72% EC.	200cm^3+93.7 cm^3	161.2	31.2 (80.0)	37.2 (71.9)	26.0 (83.8)	24.0 (84.9)	20.0 (84.0)	16.0 (83.1)	10.0 (84.6)	23.5* (81.8)
	100cm^3+93.7 cm^3	184.6	96.6 (46.0)	80.0 (47.2)	95.2 (48.2)	78.0 (57.5)	50.0 (65.2)	38.0 (64.9)	20.0 (73.2)	65.4* (57.4)
Bemistop 21.1% EC. + Selecron 72% EC.	500cm^3+93.7 cm^3	112.0	42.0 (61.3)	40.0 (56.5)	38.0 (65.9)	20.0 (82.0)	16.0 (81.6)	6.0 (90.9)	4.2 (90.7)	23.7* (75.6)
	250cm^3+93.7 cm^3	155.2	55.2 (63.3)	40.0 (68.61)	38.0 (75.4)	40.0 (74.1)	42.0 (65.2)	28.0 (69.2)	18.6 (70.3)	37.4* (69.4)
Achook 0.15% EC. + Admiral 10% EC.	200 cm^3+300 cm^3	163.2	35.2 (77.8)	32.0 (76.1)	26.0 (83.9)	24.0 (85.2)	20.0 (84.2)	18.0 (81.2)	10.0 (84.8)	23.6* (81.9)
	100 cm^3+300 cm^3	154.6	42.0 (71.9)	40.0 (68.5)	40.0 (73.9)	30.0 (80.5)	26.0 (78.4)	20.0 (77.9)	16.0 (74.4)	30.6* (75.1)
	100 cm^3+150 cm^3	183.2	72.0 (59.5)	62.0 (58.8)	60.0 (67.1)	56.0 (69.2)	40.0 (71.9)	36.0 (70.3)	20.0 (72.9)	48.9* (67.1)
Control	--	1234.0	1196.6	1013.4	1227.4	1226.0	959.4	725.4	498.0	977.6

L.S.D.= 107.4
*= Significant at 5% level.
% Reduction rates are given in brackets.

The averages reduction rates of *B. tabaci* population for the various mixtures during the 2nd spray recorded (82.8, 61.9), (83.2, 69.0) and (88.4, 65.1 and 62.5%) for adults and (81.8, 57.4), (75.6, 69.4) and (81.9, 75.1 and 67.1%) for immature stages for various treatments. Values of the general mean of *B. tabaci* adults and immature stages showed a significant reduction in all mixtures as compared with the control.

Results of the second season of 2000 revealed the same trend as achieved with the first season of 1999 as indicated in **Tables** (36-A, 36-B, 37-A & 37-B) for two sprays.

Results obtained from the two seasons of 1999 and 2000, detected that, the combination of Selecron plus botanical compound, Achook was the most effective mixture against *Bemisia tabaci* population followed by the combination of Selecron plus the botanical compound, Bemistop and the combination of Achook plus Admiral.

Finally, it could be concluded that combinations of certain compounds provided long persistence on *Bemisia tabaci* immature stages than adult stage.

Co-toxicity resulted from addition of Selecron to the two botanical insecticides (Achook and Bemistop) against *Bemisia tabaci* adults and immature stages during two seasons of 1999 and 2000 were presented in **Table** (38), also, co-toxicity resulted from addition of botanical compound, Achook to Admiral were recorded in **Table** (39).

Results in **Table** (38) stated that, the type of joint action obtained from the addition of the insecticide at its half recommended rate to Achook and/or Bemistop at two application rates varied and induced an irregular joint action against *B. tabaci*, indicating a dominated antagonistic effect at two sprays during two seasons. At the same time, results obtained from addition of botanical compound, Achook at (200 and 100 cm^3/100L.) to Admiral at its two application rates during 1^{st} and 2^{nd} spray of 1999 and 2000 seasons, **Table** (39), showed as well an irregular joint action where, induced an additive effect only with Achook at high application rate during the season of 1999.

In this respect, **Mansour *et al.* (1966)** found that, the toxicity of 11 organophosphorus and 2 carbamate insecticides were determined by topical application to 3^{rd} instar larvae of the Egyptian cotton leaf worm, *Prodenia litura* F. Several organophosphorus insecticides were potentiated when pairs were applied jointly. Most of the potentiated pairs contained 1 strong and another weak insecticide. There were also antagonistic pairs as well as other pairs producing only additive effect when jointly applied.

In addition, co-toxicity resulted from addition of the LC_{50} of Malathion (145 ppm) to Neemazal at (50 – 4000 ppm) for *Rhizopertha dominica* showed an additive effect at all tested concentrations. In case of mixtures of Sumithion plus Neemazal, an additive effect was obtained at higher concentrations (500, 1000 ppm) but at 50, 100 and 250 ppm an antagonistic effect was obtained, **El-Lakwah (1997).**

Table (36-A): Effect of various combinations on *Bemisia tabaci* (Genn.) adults infesting common bean plants during 2000 season at Qalyubia Governorate.

Treatments	Rate /100L	Mean number of adults per 20 leaves and reduction rates at indicated days from treatments								
		Pre-spray	First spray							
			1	2	3	5	7	10	14	Average
Achook 0.15% EC + Selecron 72% EC	200cm^3+93.7 cm^3	278.0	10.6 (97.1)	12.0 (95.4)	30.0 (90.6)	30.6 (92.3)	28.6 (95.2)	63.2 (89.9)	87.2 (86.9)	37.5* (92.5)
	100cm^3+93.7 cm^3	276.0	72.0 (80.3)	94.0 (63.8)	120.0 (62.1)	60.0 (72.1)	134.0 (77.2)	136.6 (78.0)	83.2 (87.4)	107.1* (74.4)
Bemistop 21.1% EC. + Selecron 72% EC.	500cm^3+93.7 cm^3	262.0	84.0 (75.8)	82.0 (66.7)	80.0 (73.4)	86.0 (76.9)	102.0 (81.7)	72.0 (87.8)	120.0 (80.9)	89.4* (77.6)
	250cm^3+93.7 cm^3	252.6	124.0 (62.9)	120.0 (49.5)	108.0 (62.7)	124.0 (65.6)	140.0 (73.9)	186.0 (67.3)	206.2 (65.9)	144.0* (63.9)
Achook 0.15% EC. + Admiral 10% EC.	200 cm^3+300 cm^3	243.2	62.0 (80.8)	60.0 (73.8)	56.0 (79.9)	60.0 (82.7)	62.0 (88.0)	84.0 (84.7)	80.0 (86.3)	66.3* (82.3)
	100 cm^3+300 cm^3	262.6	62.0 (82.2)	84.0 (65.9)	86.0 (71.5)	80.0 (78.7)	86.0 (84.6)	90.0 (84.8)	84.0 (86.6)	81.7* (79.2)
	100 cm^3+150 cm^3	223.2	59.2 (79.9)	50.6 (75.9)	78.6 (69.3)	100.0 (68.6)	104.0 (78.1)	126.0 (74.9)	128.0 (76.0)	92.3* (74.7)
Control	--	176.6	234.0	166.0	202.6	252.0	376.0	398.0	422.6	293.0

L.S.D. = 46.3
*= Significant at 5% level.
% Reduction rates are given in brackets.

Table (36-B): Continued.

Treatments	Rate /100L	Mean number of adults per 20 leaves and reduction rates at indicated days from treatments								
		Pre-spray	Second spray							
			1	2	3	5	7	10	14	Average
Achook 0.15% EC. + Selecron 72% EC	200 cm^3+93.7cm^3	87.2	10.0 (86.0)	8.4 (80.1)	6.6 (84.2)	6.0 (86.9)	4.6 (92.7)	4.0 (92.3)	2.0 (96.4)	5.9* (88.4)
	100 cm^3+93.7cm^3	83.2	14.0 (79.5)	18.0 (55.3)	16.0 (59.8)	12.0 (72.6)	10.6 (82.4)	8.0 (83.9)	8.2 (84.4)	12.4* (73.9)
Bemistop 21.1% EC. + Selecron 72% EC.	100 cm^3+93.7cm^3	120.0	10.6 (89.3)	8.6 (85.2)	8.0 (86.1)	6.0 (90.5)	6.6 (92.4)	7.2 (89.9)	6.0 (92.1)	7.6* (89.3)
	250 cm^3+93.7cm^3	206.0	23.2 (86.3)	32.0 (67.9)	34.0 (65.5)	29.2 (73.1)	40.6 (72.8)	34.6 (71.9)	65.2 (49.9)	36.9* (69.6)
Achook 0.15% EC. + Admiral 10% EC.	200 cm^3+300 cm^3	80.0	6.0 (90.9)	12.0 (69.0)	10.0 (73.9)	6.0 (85.8)	10.0 (82.7)	8.6 (81.9)	10.0 (80.2)	8.9* (80.6)
	100 cm^3+300 cm^3	84.0	10.6 (84.6)	18.0 (55.7)	20.0 (50.2)	18.0 (59.3)	16.0 (73.7)	12.0 (76.0)	10.0 (81.1)	14.9* (68.7)
	100 cm^3+150 cm^3	128.0	60.0 (43.0)	40.0 (35.5)	40.0 (34.6)	38.0 (43.6)	32.0 (65.5)	20.0 (73.8)	40.0 (50.5)	38.6* (49.5)
Control	--	422.6	347.4	204.6	202.0	222.6	306.0	252.0	266.6	257.3

L.S.D. =21.7

*= Significant at 5% level.

% Reduction rates are given in brackets.

Table (37-A): Effect of various combinations on *Bemisia tabaci* (Genn.) immature stages infesting common bean plants during 2000 season at Qalyubia Governorate.

Treatments	Rate /100L	Mean number of immature stages per 20 leaves and reduction rates at indicated days from treatments								
		Pre-spray	First spray							
			1	2	3	5	7	10	14	Average
Achook 0.15% EC. + Selecron 72% EC.	200cm^3+93.7 cm^3	409.2	36.0 (91.4)	26.0 (91.9)	39.2 (88.9)	33.2 (91.4)	49.2 (94.5)	103.2 (89.1)	93.2 (87.5)	54.3* (90.7)
	100cm^3+93.7 cm^3	442.0	80.0 (77.2)	98.0 (63.3)	103.2 (64.9)	132.2 (58.9)	158.0 (78.7)	144.0 (81.9)	85.2 (86.4)	114.3* (73.0)
Bemistop 21.1% EC. + Selecron 72% EC.	500cm^3+93.7 cm^3	324.6	90.0 (72.9)	88.0 (65.3)	63.2 (77.4)	71.2 (76.7)	72.6 (89.7)	57.2 (92.4)	60.6 (89.8)	71.8* (80.6)
	250cm^3+93.7 cm^3	307.2	122.0 (61.2)	126.0 (47.5)	144.0 (45.5)	168.0 (41.9)	186.0 (72.1)	202.0 (71.7)	200.0 (64.4)	164.0* (57.7)
Achook 0.15% EC. + Admiral 10% EC.	200cm^3+300 cm^3	300.0	28.6 (90.7)	34.0 (85.5)	59.2 (77.0)	94.0 (66.7)	80.0 (87.7)	82.0 (88.2)	98.0 (82.1)	67.9* (82.6)
	100cm^3+300 cm^3	296.6	78.0 (74.9)	60.0 (74.1)	54.6 (78.6)	57.2 (79.5)	96.0 (85.1)	100.0 (85.5)	94.6 (82.5)	76.9* (80.0)
	100 cm^3+150 cm^3	305.2	86.0 (72.5)	58.0 (75.7)	76.6 (70.8)	106.0 (63.1)	124.0 (81.3)	112.0 (84.2)	100.6 (81.9)	94.7* (75.6)
Control	--	438.0	448.6	342.0	376.6	412.0	950.6	1017.4	800.0	621.0

L.S.D. = 113.8
*= Significant at 5% level.
% Reduction rates are given in brackets.

Table (37-B): Continued.

Treatments	Rate /100L	Mean number of immature stages per 20 leaves and reduction rates at indicated days from treatments								
		Pre-spray	Second spray							
			1	2	3	5	7	10	14	Average
Achook 0.15% EC. + Selecron 72% EC	200cm^3+93.7 cm^3	93.2	16.0 (82.1)	14.0 (83.4)	12.0 (89.0)	10.6 (88.1)	8.0 (90.1)	6.0 (93.1)	4.0 (95.9)	10.1* (88.8)
	100cm^3+93.7 cm^3	85.2	46.0 (43.6)	40.0 (48.1)	46.6 (53.4)	38.0 (53.5)	32.0 (56.5)	20.0 (74.9)	18.2 (79.7)	34.4* (58.5)
Bemistop 21.1% EC. + Selecron 72% EC.	100cm^3+93.7 cm^3	60.6	40.0 (31.0)	30.0 (45.3)	20.0 (71.9)	18.0 (69.0)	12.0 (77.1)	8.0 (85.9)	6.0 (90.6)	19.1* (67.2)
	250cm^3+93.7 cm^3	200.0	64.0 (66.6)	60.0 (66.8)	59.8 (74.6)	118.0 (38.5)	80.0 (53.7)	96.6 (48.3)	127.2 (39.4)	86.5* (55.4)
Achook 0.15% EC. + Admiral 10% EC.	200 cm^3+300 cm^3	98.0	20.6 (78.0)	20.0 (77.4)	26.0 (77.4)	20.0 (78.7)	18.0 (78.7)	12.0 (86.9)	6.0 (94.2)	17.5* (81.6)
	100 cm^3+300 cm^3	94.6	40.0 (55.8)	36.2 (56.5)	36.0 (67.6)	26.0 (71.3)	20.0 (75.5)	18.0 (79.6)	12.0 (87.9)	26.9* (70.6)
	100 cm^3+150 cm^3	100.6	46.0 (52.2)	51.2 (43.7)	54.0 (54.3)	53.2 (44.9)	40.0 (53.9)	38.0 (59.6)	26.0 (75.4)	44.1* (54.9)
Control	--	600.0	765.4	723.4	940.0	767.4	691.4	747.4	840.0	782.1

L.S.D. = 34.6
*= Significant at 5% level.
% Reduction rates are given in brackets.

Table (38): Co-toxicity resulted from addition of Selecron at its half-recommended rate to the botanical insecticides (Achook/or Bemistop) for *Bemisia tabaci* (Genn.) during nili plantation.

Application rate (cm3/100 L.)		% Mortality after 3 days from treatment						Co-toxicity factor		Type of joint action	
		Selecron alone		Botanical insecticide alone		Botanical Insecticide+ Selecron					
		Expected mortality				*Observed mortality*					
		A	I	A	I	A	I	A	I	A	I
Season 1999											
Achook 0.15 % EC.											
1st spray	200	79.8	79.1	84.4	80.3	91.7	91.6	-8.3	-8.4	d	d
	100			57.1	69.1	80.5	80.9	-19.5	-19.1	d	d
2nd spray	200	65.5	65.1	74.8	78.5	79.9	83.8	-20.1	-16.2	a	d
	100			43.8	64.3	77.5	48.2	-22.5	-51.8	a	a
Bemistop 21.1% EC.											
1st spray	500	79.8	79.1	72.3	74.2	90.7	87.9	-9.3	-12.1	d	d
	250			63.9	73.6	77.8	77.8	-22.2	-22.2	a	a
2nd spray	500	65.5	65.1	82.7	77.5	77.6	65.9	-22.4	-34.1	a	a
	250			45.7	65.2	72.1	75.4	-27.9	-24.6	a	a
Season 2000											
Achook 0.15 % EC.											
1st spray	200	72.1	61.9	90.6	77.6	90.6	88.9	-9.4	-11.1	d	d
	100			66.2	74.1	62.1	64.9	-37.9	-35.1	a	a
2nd spray	200	62.6	64.9	75.9	76.3	84.2	89.0	-15.8	-11.0	d	d
	100			65.1	47.5	59.8	53.5	-40.1	-49.5	a	a
Bemistop 21.1% EC.											
1st spray	500	72.1	61.9	84.9	88.5	73.4	77.4	-26.6	-22.6	a	a
	250			71.2	52.9	62.7	45.5	-37.3	-54.5	a	a
2nd spray	500	62.6	64.9	72.9	78.7	86.1	71.9	-13.9	-28.1	d	a
	250			66.4	64.3	65.5	74.6	-34.5	-25.4	a	a

a: antagonistic effect (-20 or more)
d: additive effect (between –20 & +20)

Table (39): Co-toxicity resulted from addition of Achook at 200 and $100cm^3/100L$ to Admiral at two rates for *Bemisia tabaci* (Genn.) during nili plantation.

Application rate ($cm^3/100$ L.)		% Mortality after 3 days from treatment						Co-toxicity factor		Type of joint action	
		Achook alone		Admiral alone		Admiral + Achook					
		Expected mortality				*Observed mortality*					
		A	I	A	I	A	I	A	I	A	I
Season 1999											
At 200cm/100L.											
1st spray	300	84.4	80.3	86.5	90.9	85.1	88.8	-14.9	-11.2	d	d
2nd spray	300	74.8	78.5	86.6	80.7	84.9	83.9	-15.1	-16.1	d	d
At 100cm/100L.											
1st spray	300	57.1	69.1	86.5	90.9	68.9	87.3	-31.1	-12.7	a	d
	150			56.5	66.4	58.1	77.1	-41.9	-22.9	a	a
2nd spray	300	43.8	64.3	86.6	80.7	73.5	73.9	-26.5	-26.1	a	a
	150			57.6	66.3	60.6	67.1	-39.4	-32.9	a	a
Season 2000											
At 200cm/100L.											
1st spray	300	90.6	77.6	92.0	93.0	79.9	77.0	-20.1	-23.0	a	a
2nd spray	300	75.9	76.3	74.4	79.6	73.8	77.4	-26.2	-22.6	a	a
At 100cm/100L.											
1st spray	300	66.2	64.1	92.0	93.0	71.5	78.6	-28.5	-21.4	a	a
	150			49.5	50.3	69.3	70.8	-30.7	-29.2	a	a
2nd spray	300	65.1	47.5	74.4	79.6	50.2	67.6	-49.8	-32.4	a	a
	150			43.4	66.7	34.6	54.3	-65.4	-45.7	a	a

a: antagonistic effect (-20 or more)
d: additive effect (between –20 & +20)

II.1.2.D- The parasitoid, *Diglyphus isaea* (Walker):

Effects of mixtures of the botanical compounds, Achook 0.15% at (200, 100 cm^3/100 L.) and/or Bemistop 21.1% at (500 , 250 cm^3/100L.) plus Selecron 72% at its half recommended rate of application (93.7 cm^3/100L.), also mixture of Admiral 10% at (300 , 150 cm^3/100L.) plus Achook at its high and low application rate against the larval and pupal stages of *D. isaea* during 1999 season were presented in **Tables** (40-A & 40-B).

Results of the first spray in **Table** (40-A) showed that, the averages number of the larvae and pupae of *D. isaea* were obviously declined during the following 3 days post-treatment to reach (0.0, 1.2), (0.6, 1.3) and (0.6, 1.2 and 2.0 individuals/20 leaves) on the 3rd day for the mixture of Selecron plus Achook (at 200, 100 cm^3/ 100 L), mixture of Selecron plus Bemistop at (500, 250 cm^3/ 100 L.) and mixture of Achook (at high and low rate) plus Admiral at (300, 300 and 150 cm^3/ 100 L.), respectively.

The corresponding reduction rates were (100, 81.1), (92.9, 81.9) and (91.8, 79.0 and 68.5%) for various combinations, respectively. The averages number of larvae and pupae were increased slightly from the 7th day after spraying to reach (2.0, 3.2), (2.0, 3.2) and (3.2, 3.2 and 4.0 individuals/20 leaves) at the 14th day from spraying for different treatments, respectively.

The corresponding reduction rates were (77.9, 54.0), (78.6, 60.3) and (60.3, 48.9 and 42.5%) at the 14th day post-treatment for different combinations, respectively. However, the averages reduction rates of larvae and pupae during the first spray reached (91.1, 58.3), (84.0, 62.8) and (77.9, 51.5 and 37.9%) for various combinations, respectively. Values of the general mean of larvae and pupae showed a significant reduction in all treatments as compared with the control. Regarding the 2nd spray of 1999 season **Table** (40-B), results stated the same consequence as achieved with the 1st spray. Also, the results of the second season of 2000 had the same line and trend as achieved during 1999 season, **Tables** (41-A & 41-B).

Co-toxicity resulted from addition of Selecron to the two botanical insecticides (Achook and Bemistop) against larvae and pupae of *D. isaea* during two seasons of 1999 and 2000 were presented in **Table** (42). Results showed that, addition of Selecron at its half recommended rate to Achook and/or Bemistop increased its effectiveness and induced an additive effect at the higher and lower application rates at the two sprays. In addition, combined of Achook and Admiral at two application rates, **Table** (43) increased its toxicity and induced potentiated and additive effects against larvae and pupae of *D. isaea* at the two sprays during two seasons of 1999 and 2000.

It could be concluded that, the combinations of the botanical insecticides (Achook and Admiral) increased clearly their toxicity against larvae and pupae of *D. isaea* than separately. In addition, addition of Selecron to the botanical compound, Achook and/or Bemistop increased obviously their toxicity than two botanical compounds alone.

Table (40-A): **Effect of various combinations on larvae and pupae of *Diglyphus isaea* (Walker) on common bean plants during 1999 season at Qalyubia Governorate.**

Treatments	Rate / 100L	Mean number of larvae and pupae per 20 leaves and reduction rates at indicated days from treatment							
		Pre-spray	First spray						
			1	2	3	5	7	10	14	Average
Achook 0.15% EC. + Selecron 72% EC.	200 cm^3+93.7 cm^3	5.2	0.0 (100.0)	0.6 (91.2)	0.0 (100.0)	1.2 (86.8)	0.6 (92.0)	0.6 (89.8)	2.0 (77.9)	0.7* (91.1)
	100 cm^3+93.7 cm^3	4.0	2.6 (35.0)	2.0 (62.0)	1.2 (81.1)	3.2 (54.4)	2.0 (65.5)	2.0 (56.0)	3.2 (54.0)	2.3* (58.3)
Bemistop 21.1% EC. + Selecron 72% EC.	500 cm^3+93.7 cm^3	5.3	0.7 (87.6)	0.7 (90.6)	0.6 (92.9)	1.2 (87.1)	1.2 (84.4)	2.0 (66.9)	2.0 (78.6)	1.2* (84.0)
	250 cm^3+93.7 cm^3	4.6	2.0 (56.5)	2.0 (66.9)	1.3 (81.9)	2.0 (75.2)	2.7 (60.1)	3.2 (38.8)	3.2 (60.3)	2.3* (62.8)
Achook 0.15% EC. + Admiral 10% EC.	200 cm^3+300 cm^3	4.6	0.6 (68.9)	1.2 (80.2)	0.6 (91.8)	2.6 (67.8)	1.2 (82.0)	1.2 (77.0)	3.2 (0.0)	1.5* (77.9)
	100 cm^3+300 cm^3	3.6	2.0 (44.4)	1.2 (74.7)	1.2 (79.0)	4.6 (27.2)	2.6 (50.2)	2.6 (36.4)	3.2 (48.9)	2.5* (51.5)
	100 cm^3+150 cm^3	4.0	2.6 (35.0)	2.6 (50.0)	2.0 (68.5)	5.2 (25.9)	4.0 (31.0)	4.0 (10.1)	4.0 (42.5)	3.5* (37.9)
Control	--	4.6	4.6	6.0	7.2	8.0	6.6	5.2	8.0	6.5

L.S.D. = 0.9

*= Significant at 5% level.

% Reduction rates are given in brackets.

Table (40-B): Continued.

Treatments	Rate / 100L	Mean number of larvae and pupae per 20 leaves and reduction rates at indicated days from treatment								
		Pre-spray	Second spray							
			1	2	3	5	7	10	14	Average
Achook 0.15% EC. + Selecron 72% EC.	200 cm^3+93.7 cm^3	2.0	1.3 (83.8)	0.6 (83.8)	0.0 (100.0)	0.2 (93.7)	0.0 (100.0)	1.2 (65.8)	1.3 (64.4)	0.7* (80.9)
	100 cm^3+93.7 cm^3	3.2	2.6 (46.0)	3.2 (46.0)	2.6 (48.8)	2.0 (60.6)	2.6 (51.3)	3.2 (43.0)	3.3 (43.9)	2.8* (48.9)
Bemistop 21.1% EC. + Selecron 72% EC.	500 cm^3+93.7 cm^3	2.0	0.7 (64.4)	1.3 (64.4)	0.6 (81.1)	0.0 (100.0)	0.6 (82.0)	1.3 (62.4)	1.3 (64.4)	0.8* (76.2)
	250 cm^3+93.7 cm^3	3.2	2.0 (56.1)	2.6 (56.1)	2.0 (60.6)	2.0 (60.6)	2.6 (51.3)	2.6 (53.7)	3.3 (43.9)	2.6* (55.3)
Achook 0.15% EC. + Admiral 10% EC.	200 cm^3+300 cm^3	3.2	2.0 (89.9)	0.6 (89.9)	1.3 (71.0)	0.6 (88.2)	1.2 (77.5)	2.0 (64.4)	2.6 (56.1)	1.5* (72.5)
	100 cm^3+300 cm^3	3.2	2.0 (79.8)	1.2 (79.8)	1.2 (60.6)	1.2 (60.6)	2.6 (51.3)	3.2 (43.5)	4.0 (32.5)	2.4* (55.5)
	100 cm^3+150 cm^3	4.0	3.3 (37.9)	4.6 (37.9)	3.3 (47.7)	3.3 (47.4)	4.0 (40.0)	5.2 (25.9)	6.0 (19.0)	4.3* (37.9)
Control	--	8.0	12.6	14.6	12.6	12.6	13.2	14.0	14.6	13.5

L.S.D. = 0.7
*= Significant at 5% level
% Reduction rates are given in brackets.

Table (41-A): Effect of various combinations on larvae and pupae of *Diglyphus isaea* (Walker) on common bean plants during 2000 season at Qalyubia Governorate.

Treatments	Rate / 100L	Mean number of larvae and pupae per 20 leaves and reduction rates at indicated days from treatment								
		Pre-spray	First spray							
			1	2	3	5	7	10	14	Average
Achook 0.15% EC. + Selecron 72% EC.	200 cm^3+93.7 cm^3	3.0	0.0 (100.0)	0.3 (93.8)	0.2 (95.3)	0.7 (86.0)	0.3 (92.9)	0.3 (91.9)	1.2 (70.6)	0.4* (90.1)
	100 cm^3+93.7 cm^3	2.6	1.7 (34.6)	1.2 (73.8)	0.8 (78.2)	2.0 (53.8)	1.2 (71.4)	1.2 (64.9)	2.0 (41.5)	1.4* (59.7)
Bemistop 21.1% EC. + Selecron 72% EC.	500 cm^3+93.7 cm^3	2.6	0.3 (88.5)	0.3 (93.7)	0.2 (93.9)	0.4 (89.8)	0.4 (89.5)	0.7 (78.9)	0.7 (78.9)	0.4* (87.6)
	250 cm^3+93.7 cm^3	2.4	1.0 (56.7)	1.0 (77.1)	0.7 (80.5)	1.0 (75.0)	1.4 (63.8)	1.6 (48.1)	1.7 (47.4)	1.2* (64.1)
Achook 0.15% EC. + Admiral 10% EC.	200 cm^3+300 cm^3	2.4	0.3 (87.5)	0.6 (86.3)	0.3 (91.1)	1.3 (68.5)	0.7 (82.9)	0.6 (81.0)	1.8 (43.0)	0.8* (77.2)
	100 cm^3+300 cm^3	2.0	1.1 (45.0)	0.7 (81.9)	0.7 (76.6)	2.2 (33.4)	1.5 (53.5)	2.0 (24.0)	1.6 (39.2)	1.4* (50.5)
	100 cm^3+150 cm^3	2.6	1.7 (23.1)	1.7 (64.0)	1.3 (63.9)	3.4 (21.5)	2.6 (38.0)	2.6 (24.0)	2.7 (22.2)	2.3* (36.7)
Control	--	2.0	2.0	3.6	2.8	3.3	3.2	2.6	2.6	2.9

L.S.D. =0.5

*= Significant at 5% level

% Reduction rates are given in brackets.

Table (41-B): Continued.

Treatments	Rate / 100L	Pre-spray	Second spray: 1	2	3	5	7	10	14	Average
			Mean number of larvae and pupae per 20 leaves and reduction rates at indicated days from treatment							
Achook 0.15% EC. + Selecron 72% EC.	200 cm^3+93.7 cm^3	1.2	0.8 (58.7)	0.4 (81.4)	0.0 (100.0)	0.1 (92.4)	0.0 (100.0)	0.0 (100.0)	0.9 (56.1)	0.3* (84.1)
	100 cm^3+93.7 cm^3	2.0	1.6 (49.6)	2.0 (46.0)	1.6 (48.3)	1.2 (62.2)	1.6 (52.0)	2.0 (44.0)	2.0 (47.0)	1.7* (49.9)
Bemistop 21.1% EC. + Selecron 72% EC.	500 cm^3+93.7 cm^3	0.7	0.2 (79.00)	0.5 (62.5)	0.2 (82.5)	0.0 (100.0)	0.2 (80.0)	0.5 (62.7)	0.5 (63.2)	0.3* (75.7)
	250 cm^3+93.7 cm^3	1.7	1.1 (59.8)	1.3 (57.1)	1.1 (59.8)	1.1 (58.3)	1.3 (54.5)	1.3 (57.5)	1.7 (45.1)	1.3* (55.9)
Achook 0.15% EC. + Admiral 10% EC.	200 cm^3+300 cm^3	1.8	1.1 (61.5)	0.4 (88.0)	0.9 (69.2)	0.4 (86.0)	1.0 (66.7)	1.0 (68.9)	1.3 (61.1)	0.9* (71.6)
	100 cm^3+300 cm^3	1.6	1.0 (60.6)	7.2 (75.8)	1.1 (58.3)	1.1 (58.3)	1.4 (47.5)	1.6 (44.0)	2.0 (33.8)	1.3* (54.0)
	100 cm^3+150 cm^3	2.7	2.2 (47.9)	3.0 (39.2)	2.4 (43.2)	2.4 (43.2)	2.7 (38.6)	3.6 (24.2)	4.0 (20.3)	2.9* (36.6)
Control	--	2.6	4.0	4.6	4.0	4.0	4.2	4.7	4.6	4.3

L.S.D. =0.4
*= Significant at 5% level
% Reduction rates are given in brackets.

Table (42): Co-toxicity resulted from addition of Selecron at its half-recommended rate to the botanical insecticides (Achook/or Bemistop) for the parasitoid, *Diglyphus isaea* (Walker) during nili plantation.

Application rate (cm^3/100 L.)		% Mortality after 3 days from treatment: Selecron alone	Botanical insecticide alone	Botanical insecticide + insecticide	Co-toxicity factor	Type of joint action
		Expected mortality		*Observed mortality*		
Season 1999						
Achook 0.15 % EC.						
1st spray	200	89.6	31.0	100.0	0.0	d
	100		28.8	81.1	-18.9	d
2nd spray	200	61.8	30.7	100.0	8.1	d
	100		0.0	48.8	-21.0	a
Bemistop 21.1% EC.						
1st spray	500	89.6	76.9	92.9	-7.1	d
	250		47.7	81.9	-18.1	d
2nd spray	500	61.8	72.7	81.10	-18.9	d
	250		25.9	60.6	-30.9	a
Season 2000						
Achook 0.15 % EC.						
1st spray	200	81.9	29.0	95.3	-4.7	d
	100		9.3	78.2	-14.3	d
2nd spray	200	56.7	27.2	100.0	+19.2	d
	100		0.0	48.3	-14.8	d
Bemistop 21.1% EC.						
1st spray	500	81.9	66.5	93.9	-6.1	d
	250		39.9	80.5	-19.5	d
2nd spray	500	56.7	72.4	82.5	-17.5	d
	250		24.2	59.8	-26.1	a

a: antagonistic effect (-20 or more)
d: additive effect (between –20 & +20)

Table (43): Co-toxicity resulted from addition of Achook at 200 and 100cm^3/100L to Admiral at two rates for the parasitoid, *Diglyphus isaea* (Walker) during nili plantation.

Application rate (cm^3/100 L.)		% Mortality after 3 days from treatment			Co-toxicity factor	Type of joint action
		Achook alone	Admiral alone	Admiral + Achook		
		Expected mortality		*Observed mortality*		
Season 1999						
At 200cm^3/100L.						
1st spray	300	31.0	40.0	91.8	+29.3	p
2nd spray	300	30.7	37.0	71.0	+4.9	d
At 100cm^3/100L.						
1st spray	300	28.8	40.0	79.0	+14.8	d
	150		19.50	68.5	+41.8	p
2nd spray	300	0.0	37.0	60.6	+63.8	p
	150		26.7	47.7	+78.7	p
Season 2000						
At 200cm^3/100L.						
1st spray	300	29.0	30.6	91.1	+52.9	p
2nd spray	300	27.2	35.0	69.2	+11.3	d
At 100cm^3/100L.						
1st spray	300	9.3	30.6	76.6	+91.9	p
	150		0.0	63.9	+587.1	p
2nd spray	300	0.0	35.0	58.3	+66.6	p
	150		25.0	43.2	+72.8	p

p: potentiated effect (+20 or more)
d: additive effect (between –20 & +20)

II.2.E- Effect of tested treatments on yield components:

Data tabulated in **Tables** (44&45) showed the effect of different treatments on yield components during 1999 and 2000 seasons. The effect of Selecron, Achook, Bemistop, Biosect and Admiral separately or mixtures of Achook and/or Bemistop plus Selecron and mixtures of Achook plus Admiral on number of pods/plant showed seasonal variation. Only in the first season of 1999, the different treatments showed significant increase in no. of pods/plant. While, in the second season of 2000, the differences in number of pods/plant failed to reach the level of significance. However, during 1999 season, Selecron and mixtures of Achook plus Selecron gave the highest no. of pods/plant whereas the bioinsecticide, Biosect gave the lowest ones.

Regarding the weight of 100-seeds (g), there were significant differences between all treatments at two seasons as compared with the control except for Achook, Bemistop, Biosect and Admiral during 2000 season that produced lightest seeds (22.00 ± 0.86, 21.33 ± 0.44), (21.07 ± 0.52, 21.17 ± 0.93), (20.83 ± 0.92, 20.83 ± 0.44) and (21.83 ± 0.60, 21.27 ± 0.64 g). at two application rates, respectively. In this respect, the organophosphorus compound produced the heaviest seeds (24.33 ± 0.60, 23.33 ± 1.45 g for 1999 season) and (25.17 ± 1.01, 23.55 ± 1.61 g for 2000 season) followed by mixture of the botanical compound, Achook plus Selecron and mixture of Achook plus Admiral. The biocide, Biosect gave the lightest seeds during two seasons.

Concerning seed weight per plant, there were significant increase in seed weight/plant for all treatments as compared with the control with the exception of the biocide, Biosect that produced lightest seeds/plant during 1999 and 2000 season. Also, Selecron gave the highest seed weight/plant (55.1% and 58.0% increase than control) followed by mixture of Achook plus Selecron (51.3% and 49.4% increase than control) and Achook plus Admiral (52.1% and 49.4% increase than control). Biosect as well took the last grade concerning the seed weight/plant (15.5% and 17.3% increase than control) at high application rate during two seasons, respectively.

In Conclusion, the organophosphorus compound, Selecron gave higher seed yield followed by mixtures of Achook plus Selecron and Achook plus Admiral and botanical compound Bemistop. Also, bioinsecticide gave lower seed yield. This could be due to the efficiency of these treatments to control the insect pests infesting common bean plants while, the bioinsecticide had less efficacy to control insect pests infesting the plants. In spite of this result, botanical and bioinsecticides could be used successfully for controlling the insect pests under study especially, in combinations as they gave a satisfactory reduction in pests' population, increased the yield and more safe to mammals and environment.

Results achieved are similar to the finding of **Lal (1992)** who found that, in field studies on Dimethoate, Oxydemeton-methyl, Endosulfan, Malathion, Phosphamidon, Dichlorvos and Monochrotophos which gave effective control of *Aphis craccivora* infesting French beans (*Phaseolus vulgaris*), seed yield increased from 12 to 42% after treatment had started. Plots treated with Dimethoate gave the highest seed yield.

Table (44): Effect of different treatments on some yield components of common bean during 1999 season at Qalyubia Governorate.

Treatments	Rate/100L	No. of pods/plant	Weight of 100-seeds (g)	Seed weight per plant (g)	
				Seed weight	% increase
Selecron 72% EC.	187.5 cm^3	$17.8 \pm 0.7^*$	$24.3 \pm 0.6^*$	$12.3 \pm 0.2^*$	55.1
	93.7 cm^3	$17.6 \pm 0.7^*$	$23.3 \pm 1.5^*$	$11.3 \pm 0.7^*$	42.9
Achook 0.15% EC.	200 cm^3	$16.2 \pm 0.3^*$	$20.7 \pm 0.4^*$	$10.8 \pm 0.5^*$	36.2
	100 cm^3	$15.3 \pm 1.2^*$	$19.9 \pm 0.2^*$	$10.1 \pm 0.3^*$	26.9
Bemistop21.1% EC.	500 cm^3	$16.3 \pm 1.2^*$	$20.5 \pm 0.5^*$	$10.8 \pm 0.4^*$	36.6
	250 cm^3	$15.6 \pm 1.2^*$	$19.8 \pm 0.4^*$	9.4 ± 0.3	18.9
Biosect 32x10^6 conidia/mg	200 gm.	$15.3 \pm 0.8^*$	$20.1 \pm 0.7^*$	9.2 ± 0.6	15.5
	100 gm.	$14.9 \pm 0.3^*$	$18.9 \pm 0.6^*$	8.8 ± 0.6	11.3
Admiral 10% EC.	300 cm^3	$16.3 \pm 0.9^*$	$21.6 \pm 1.2^*$	$11.4 \pm 0.9^*$	43.3
	150 cm^3	$15.2 \pm 0.9^*$	$20.7 \pm 0.4^*$	$10.6 \pm 0.4^*$	33.7
Achook 0.15% EC + Selecron 72% EC	200 cm^3 +93.7 cm^3	$17.2 \pm 0.9^*$	$22.8 \pm 0.7^*$	$12.0 \pm 0.1^*$	51.3
	100 cm^3 +93.7 cm^3	$16.6 \pm 1.1^*$	$21.4 \pm 0.3^*$	$10.7 \pm 0.4^*$	34.6
Bemistop 21.1% EC. + Selecron 72% EC.	500 cm^3 +93.7 cm^3	$16.9 \pm 0.9^*$	$21.2 \pm 0.9^*$	$11.1 \pm 0.2^*$	40.4
	250 cm^3 +93.7 cm^3	$15.9 \pm 1.2^*$	$21.2 \pm 0.4^*$	$10.0 \pm 0.3^*$	26.1
Achook 0.15% EC. + Admiral 10% EC.	200 cm^3 +300 cm^3	$15.9 \pm 0.9^*$	$21.6 \pm 0.6^*$	$11.7 \pm 0.6^*$	47.2
	100 cm^3 +300 cm^3	$15.7 \pm 1.4^*$	$23.3 \pm 0.6^*$	$12.1 \pm 1.0^*$	52.1
	100 cm^3 +150 cm^3	$15.0 \pm 0.9^*$	$20.8 \pm 0.3^*$	$10.3 \pm 0.6^*$	30.3
Control	--	12.7 ± 0.4	16.6 ± 0.2	7.9 ± 0.2	--
L.S.D.		1.7	2.2	1.7	

*: Significant at 5% level.

Table (45): Effect of different treatments on some yield components of common bean during 2000 season at Qalyubia Governorate.

Treatments	Rate/100L	No. of pods/plant	Weight of 100-seeds (g)	Seed weight per plant (g)	
				Seed weight	% increase
Selecron 72% EC.	187.5 cm3	16.7 ± 0.9	25.2 ± 1.0*	12.8 ± 0.2*	58.0
	93.7 cm3	15.8 ± 1.1	23.6 ± 1.6*	11.7 ± 0.6*	44.1
Achook 0.15% EC.	200 cm3	15.7 ± 0.9	22.0 ± 0.9	11.0 ± 0.5*	36.2
	100 cm3	14.2 ± 1.2	21.3 ± 0.4	10.2 ± 0.2*	33.3
Bemistop21.1% EC.	500 cm3	14.5 ± 1.1	21.1 ± 0.5	10.3 ± 0.9*	27.5
	250 cm3	14.5 ± 0.5	21.2 ± 0.9	9.8 ± 0.9	20.9
Biosect 32x106 conidia/mg	200 gm.	14.1 ± 0.3	20.8 ± 0.9	9.5 ± 0.3	17.3
	100 gm.	12.6 ± 0.6	20.8 ± 0.4	9.4 ± 0.7	15.6
Admiral 10% EC.	300 cm3	14.0 ± 0.7	21.8 ± 0.6	11.9 ± 0.3*	47.7
	150 cm3	13.8 ± 1.5	21.3 ± 0.6	10.9 ± 0.8*	34.9
Achook 0.15% EC. + Selecron 72% EC	200 cm3 + 93.7 cm3	15.4 ± 0.9	25.2 ± 0.4*	12.1 ± 0.4*	49.4
	100 cm3 + 93.7 cm3	14.9 ± 2.0	23.7 ± 1.5*	11.1 ± 0.6*	36.5
Bemistop 21.1% EC. + Selecron 72% EC.	500 cm3 + 93.7 cm3	14.9 ± 0.9	24.2 ± 1.5*	11.5 ± 0.9*	42.3
	250 cm3 + 93.7 cm3	14.4 ± 0.3	23.7 ± 1.0*	10.6 ± 0.3*	30.4
Achook 0.15% EC. + Admiral 10% EC.	200 cm3 + 300 cm3	16.5 ± 0.7	23.2 ± 1.0*	11.3 ± 0.4*	39.5
	100 cm3 + 300 cm3	15.6 ± 0.7	22.6 ± 0.9	12.1 ± 0.2*	49.4
	100 cm3 + 150 cm3	15.4 ± 0.3	22.3 ± 1.2	10.9 ± 0.5*	34.6
Control	--	13.1 ± 0.7	19.6 ± 0.8	8.1 ± 0.7	--
L.S.D.		N.S	3.3	1.8	

*: Significant at 5% level

II.2- Summer plantation:

II.2.1- Efficiency of the tested compounds alone:

This investigation was conducted throughout the summer season of 2004 to evaluate the efficiency of aforementioned treatments alone and in combinations against the tested pests infesting common bean at the Experimental Station of Faculty of Agriculture, Moshtohor, Qalyubia Governorate.

II. 2.1.A- *A. craccivora* Koch.:

Results of the effects of Selecron (Profenofos), Achook (Azadirachtin), Bemistop, Biosect (*Beauveria bassiana*) and Admiral (Pyriproxyfen) on the aphid population and percent of reduction on common bean plants during 2004 season are presented in **Tables** (46-A & 46-B).

Results of the first spray of 2004 season in **Table** (46-A) revealed that the average number of *A. craccivora* individuals/20 leaves was obviously reduced after 3 days from treatment as compared with the control and amounted (15.0, 61.0), (20.0, 41.0), (15.0, 50.0), (20.0, 95.0) and (30.0, 71.0) for Selecron (Profenofos) 72% EC. at (187.5, 93.7 cm^3/100L.), Achook (Azadirachtin) 0.15% EC at (200, 100 cm^3/100 L.), Bemistop 21.1% EC. at (500, 250 cm^3/100L.), Biosect (*Beauveria bassiana*) 32 x 10^6 conidia/mg at (200, 100 g/100L) and Admiral (Pyriproxyfen) 10% EC. at (300, 150 cm^3/100L), respectively. While, the corresponding percent reductions were (95.6, 84.7%), (94.9, 89.7%), (96.0, 86.3), (95.0, 75.8%) and (91.8, 81.3%) for the 5 compounds, respectively.

However, the number of *A. craccivora* individuals was increased from the 7th day after application to reach (68.0, 210.0), (195.0, 200.0), (210.0, 240.0), (188.0, 276.0) and (120.0, 280.0 individuals/20 leaves) at the 14th day of spraying for various compounds, respectively. Reduction rates were (87.7, 67.6%), (69.4, 69.2%), (65.9, 59.7%), (71.0, 56.8%) and (79.8, 54.6%) for various treatments, respectively.

The average reduction of *A. craccivora* population reached to (93.0, 76.5%), (82.7, 76.3%), (85.2, 73.4%), (84.6, 63.9%) and (82.8, 66.9%) (rate, half rate) for various treatments, respectively. Values of the general mean of individuals during the observation periods of the two weeks from zero time indicated significant reduction for the various treatments at the two concentrations used as compared with the control.

Statistical analysis of the data detected that there were no significant differences in the general mean of *A. craccivora* population between the rate and the half rate of the various compounds with exception of Selecron and Bemistop, where the half-recommended rate was less effective.

Previous results proved that at the two application rates, Selecron (Profenofos) was the most effective treatment; followed by Bemistop, Achook (Azadirachtin), the I.G.R., Admiral (Pyriproxyfen) and Biosect (*Beauveria bassiana*) that was the least effective one.

Obtained data in **Table** (46-B) indicated that the effect of the various treatments at the 2nd spray showed dissimilar trend as indicated with the first spray. Where, the average number of *A. craccivora* individuals/20 leaves was obviously reduced after 3 days from treatment as compared with the control and amounted (0.0, 31.0), (0.0, 20.0), (0.0, 0.0), (0.0, 36.0) and (0.0, 55.0) for Selecron (Profenofos) 72% EC. Achook (Azadirachtin) 0.15% EC, Bemistop 21.1% EC., Biosect (*Beauveria bassiana*) 32 x 10^6 conidia/mg and Admiral (Pyriproxyfen) 10% EC. respectively. While, the corresponding percent reductions were (100, 78.1%), (100, 85.2%), (100, 100), (100, 80.7%) and (100, 70.9%) for the two application rates of the 5 compounds, respectively.

On the other hand, the average number of *A. craccivora* was increased at the 5th day after treatment then, declined from the 7th day to reach zero at the 14th day for all compounds (except for the low concentration of Achook, Biosect and Admiral) this, could be due to the drop of the insect population in control treatment.

However, all treatments caused a significant decrease in the general mean of aphid individuals as compared with the control. In addition, Bemistop came to the second grade of efficiency after Selecron followed by, the I.G.R., Admiral, Biosect and Achook, which was the least effective for depressing *A. craccivora* individuals.

In general, Selecron (Profenofos) proved to be the most effective one for controlling *A. craccivora* followed by the two botanical insecticides, Bemistop and Achook (Azadirachtin), Admiral (Pyriproxyfen) and Biosect. In spite of Selecron was the most effective compound against *A. craccivora*, the botanical insecticide or I.G.R. /or the bioinsecticide could be used for controlling this pest due to, their safety for the environment.

II. 2.1.B- The whitefly, *Bemisia tabaci* (Genn.):

II. 2.1.B.1- The whitefly adults:

Results of the first spray of 2004 season presented in **Table** (47-A) showed that, the average number of the whitefly adults per 20 leaves was clearly reduced during the following 3 days after spraying as compared with the control to reach (15.0, 38.0), (22.0, 41.0), (15.0, 32.0), (24.0, 46.0) and (21.0, 35.0 adults/20. leaves) on the 3rd day for the two application rates (high & low rate) of Selecron 72% EC. at (187.5, 93.7 cm^3/100L.), Achook 0.15% EC.

at (200, 100 cm^3/100 L.), Bemistop 21.1% EC. at (500, 250 cm^3/100 L.), Biosect 32 x 10^6 conidia/mg at (200, 100 g/100 L.) and Admiral 10% EC. at (300, 150 cm^3/100 L.), respectively. The corresponding percent reduction of adults were (86.5, 64.0), (78.0, 66.4), (85.7, 68.0), (787.4, 56.4) and (77.7, 62.9%) for the various treatments, respectively.

However, the number of adults was gradually increased from the 7^{th} day after zero time recording (45.0, 71.0), (50.0, 100.0), (62.0, 76.0), (50.0, 86.0) and (45.0, 78.0 adults/20 leaves) at the 14^{th} day from application for the two application rates of aforementioned treatments respectively.

At the same time, the percent reduction values of adults were slowly decreased and amounted (70.0, 50.0), (62.9, 39.3), (56.4, 43.7), (66.6, 39.6) and (64.7, 38.8%) at the 14^{th} day after treatment for the various materials, respectively.

The average reduction of whitefly adults' population after the investigation periods of the two weeks reached (78.1, 59.3), (71.1, 54.3), (76.2, 57.1), (64.1, 42.3) and (75.1, 52.3%) for various compounds, respectively. It was found that, values of the general mean of adults during the 1^{st} spray detected significant reduction for the various treatments at the two application rates as compared with the control.

Statistical analysis of the data revealed significant differences in the general means of adults between high and low application rates of all tested compounds whereby, the lower rate was less effective.

Table (47-B) showed the mean number and percent reduction of adult whitefly of 2^{nd} spray of 2004 season indicating obviously high decrease in the average number of adults per 20 leaves after 3 days of spraying which amounted (3.0, 21.0), (5.0, 30.0), (9.0, 19.5), (11.0, 31.0) and (5.0, 20.0) and their percent reductions were (93.3, 70.4), (90.0, 70.0), (85.4, 74.3), (78.0, 63.9) and (88.8, 74.3%) for various treatments, respectively. On the other hand, the numbers of adults were gradually increased from the 7th day from treatment to reach (12.0, 30.0), (14.0, 50.0), (13.5, 30.0), (17.5, 41.0) and (15.5, 30.0 adults/20 leaves) at the 14th day after zero time for the two application rates, respectively; meanwhile, values of percent reduction were (57.6, 32.8), (55.5, 20.5), (65.4, 37.3), (44.4, 24.2) and (45.2, 38.9%) for various treatments, respectively.

The average reduction of the adults' population reached (80.8, 58.9), (74.1, 51.5), (75.1, 60.5), (64.1, 49.3) and (76.4, 58.5%) for various treatments, respectively.

Values of the general mean of adults during the 2nd spray indicated significant reduction for the various treatments at high and low application rates used as compared with the control.

Statistical analysis of the data indicated significant differences in the general means of the whitefly adults between high and low application rates for the various treatments whereby, the half-recommended rate was less effective.

The previous results of the first and second spray indicated that the efficiency of the tested compounds could be arranged in descending order as follows: the organophosphorus compound, Selecron followed by the botanical compound, Bemistop, I.G.R., Admiral, the botanical insecticide, Achook and lastly, the bioinsecticide, Biosect that was the least effective one.

II. 2.1.B.2- The whitefly immature stages:

The achieved data for immature stages, **Tables** (48-A & 48-B) for the 1st and 2nd spray during 2004 season had the same line and trend for the different treatments as compared with the obtained results of adults. Furthermore, it was noticed that, compounds used were more effective and showed long persistence on the whitefly immature stages.

Data in **Table** (48-A) revealed that the average numbers of immature stages per 20 leaves were obviously reduced during the following 3 days after treatment as compared with the control for Selecron, Achook, Bemistop, Biosect and Admiral, respectively. However, the numbers of immature stages were gradually increased from the 7th day after zero time. Contrary, values of percent reduction were decreased.

The average reduction of the immature stages population during the 1st spray recorded (88.9, 71.2), (74.1, 62.6), (84.4, 65.0), (70.4, 46.5) and (80.3, 60.7%) for the two application rates of various compounds, respectively. Values of the general mean of immature stages were significantly lower for all treatments than control.

During the 2nd spray of 2004 season the obtained data, **Table** (48-B) showed the same trend for the different compounds as compared with the 1st spray with some exception in the general mean of immature stages. In addition, the efficiency of various treatments was clearly, higher on immature stages than adults.

Finally, it could be concluded that, the organophosphorus compound, Selecron (Profenofos) was the most effective against the whitefly, *B. tabaci* stages followed by the two botanical compounds, Bemistop and Achook and the I.G.R., Admiral. However, the bioinsecticide, Biosect resulted in an intermediate effect. But, these compounds are more save.

II. 2.1.C- The two-spotted spider mite, *Tetranychus urticae* Koch:

Data obtained during summer plantation of 2004 are presented in **Tables** (49-A & 49-B). Concerning the first spray results, **Table** (49-A) indicated that the average number of *Tetranychus urticae* individuals/10 inches was significantly reduced after three days from application in comparison with the control and amounted (33.0 at high application rate, 155.0 at low application rate), (51.0, 155.0), (55.0, 141.0), (49.0, 175.0) and (17.5, 140.0) for Selecron 72% EC., Achook 0.15% EC., Bemistop 21.1% EC., Biosect 32 x 10^6 conidia/mg and Admiral 10% EC. for the two application rates, respectively.

The corresponding reduction rates of *T. urticae* were (93.3, 69.1%), (89.5, 72.1%), (88.6, 69.7%), (90.0, 60.8%) and (96.4, 72.1%) for the various compounds, respectively. From the 7^{th} to the 14^{th} day after spraying, the mean number of individuals was considerably increased for all treatments to reach (541.0, 755.0), (700.0, 890.0), (500.0, 644.0), (585.0, 650.0) and (855.0, 870.0 individuals/10 inches) at the 14^{th} day of spraying for various treatments, respectively. On contrary, the reduction rates were obviously decreased to (40.8, 26.3%), (30.0, 21.7%), (49.3, 32.2%), (41.5, 28.7%) and (14.5, 15.1%) for various compounds at the tested application rates, respectively.

The average reduction of *T. urticae* population amounted (77.9, 50.2%), (63.2, 47.2%), (69.9, 55.2%), (70.0, 42.1%) and (60.0, 46.3%) for various treatments, respectively. Values of the general mean of individuals during the observation period of the two weeks post-treatment indicated significant reduction for the various treatments at the two concentrations used as compared with the control.

Statistical analysis of the data revealed no significant differences in the general mean of individuals between the two application rates of the various compounds. Accordingly, Selecron (Profenofos) was the most effective compound against *T. urticae*, followed by Bemistop, Biosect, Achook and Admiral that was the least effective one.

Regarding the second spray data in **Table** (49-B) showed the same trend as indicated with the first spray.

Also, all treatments caused a significant decrease in the general mean of larvae as compared with the control.

In general, Selecron (Profenofos) proved to be the most effective for controlling *T. urticae* followed by the botanical insecticide, Bemistop, Biosect, Achook (Azadirachtin) and Admiral (Pyriproxyfen). In spite of Selecron was the most effective compound against *T. urticae*, the botanical insecticide or I.G.R. /or the bioinsecticide could be used for controlling this pest this due to, their safety for environment.

Table (46-A): Efficiency of certain treatments against *Aphis craccivora* Koch. individuals on common bean plants during summer plantation of 2004 at Qalyubia Governorate.

Treatments	Rate / 100L	Mean number of individuals per 20 leaves and reduction rates at indicated days from treatment								
		Pre-spray	First spray							
			1	2	3	5	7	10	14	Average
Selecron 72% EC.	187.5 cm^3	256.0	10.0 (96.2) #	15.0 (95.0)	15.0 (95.6)	0.0 (100)	31.0 (93.3)	45.0 (90.2)	68.0 (87.7)	26.2* (93.0)
	93.7 cm^3	300.0	62.5 (79.8)	60.0 (80.0)	61.0 (84.7)	78.0 (83.5)	110.0 (79.8)	195.0 (63.8)	210.0 (67.6)	110.9* (76.5)
Achook 0.15% EC.	200 cm^3	295.0	55.0 (81.9)	40.0 (88.5)	20.0 (94.9)	58.0 (87.5)	60.0 (88.8)	145.0 (72.6)	195.0 (69.4)	81.8* (82.7)
	100 cm^3	300.0	80.0 (74.1)	50.0 (85.9)	41.0 (89.7)	95.0 (80.0)	145.0 (73.3)	185.0 (65.7)	200.0 (69.2)	113.7* (76.3)
Bemistop 21.1% EC.	500 cm^3	285.0	45.0 (84.7)	30.0 (91.1)	15.0 (96.0)	17.0 (96.2)	36.0 (93.0)	100.0 (80.5)	210.0 (65.9)	64.7* (85.2)
	250 cm^3	275.0	80.0 (71.8)	55.0 (83.0)	50.0 (86.3)	55.0 (87.3)	115.0 (76.9)	185.0 (62.6)	240.0 (59.7)	111.4* (73.4)
Biosect 32x10^6 conidia/mg	200 gm.	300.0	80.0 (74.1)	25.0 (92.9)	20.0 (95.0)	28.0 (94.1)	35.0 (93.5)	100.5 (81.3)	188.0 (71.0)	68.0* (84.6)
	100 gm.	295.0	155.0 (49.1)	136.0 (61.0)	95.0 (75.8)	90.0 (80.7)	115.0 (78.5)	200.0 (62.3)	276.0 (56.8)	152.4* (63.9)
Admiral 10% EC.	300 cm^3	275.0	78.0 (72.5)	65.0 (80.0)	30.0 (91.8)	34.0 (92.1)	55.0 (88.9)	80.0 (83.8)	120.0 (79.8)	66.0* (82.8)
	150 cm^3	285.0	95.0 (67.7)	84.0 (75.0)	71.0 (81.3)	98.0 (78.2)	175.0 (66.1)	222.0 (56.7)	280.0 (54.6)	146.4* (66.9)
Control	--	300.0	310.0	355.0	400.0	475.0	545.0	540.0	650.0	467.8

L.S.D. = 76.55

*= Significant at 5% level

% Reduction rates are given in brackets

Table (46-B): continued.

Treatments	Rate / 100L	Mean number of individuals per 20 leaves and reduction rates at indicated days from treatment								
		Pre-spray	Second spray							
			1	2	3	5	7	10	14	Average
Selecron 72% EC.	187.5 cm^3	68.0	5.0 (92.5)#	0.0 (100)	0.0 (100)	10.0 (76.1)	5.0 (84.0)	0.0 (100.0)	0.0 (100)	2.8* (93.2)
	93.7 cm^3	210.0	80 (61.3)	40.0 (77.4)	31.0 (78.1)	34.0.0 (73.0)	34.0 (64.9)	0.0 (100)	0.0 (100)	31.2* (79.3)
Achook 0.15% EC.	200 cm^3	195.0	55.0 (71.3)	25.0 (84.8)	0.0 (100)	30.0 (75.0)	46.0 (48.8)	0.0 (100)	0.0 (100)	22.2* (82.8)
	100 cm^3	200.0	88.0 (55.3)	30.0 (82.2)	20.0 (85.2)	11.0 (91.0)	11.0 (88.0)	0.0 (100)	0.0 (100)	22.8* (85.9)
Bemistop 21.1% EC.	500 cm^3	210.0	10.0 (95.1)	0.0 (100)	0 (100)	5.0 (96.1)	0.0 (100)	0.0 (100)	0.0 (100)	2.1* (98.7)
	250 cm^3	240.0	33.0 (86.0)	30.0 (85.2)	0.0 (100)	14.0 (90.5)	45.0 (59.3)	0.0 (100)	0.0 (100)	17.4* (88.7)
Biosect $32x10^6$ conidia/mg	200 gm.	188.0	56.0 (69.7)	21.0 (86.7)	0.0 (100)	5.0 (95.6)	48.0 (44.6)	0.0 (100)	0.0 (100)	18.5* (85.2)
	100 gm.	276.0	110.0 (59.5)	58.0 (75.1)	36.0 (80.7)	15.0 (91.1)	35.0 (72.5)	0.0 (100)	0.0 (100)	36.2* (82.7)
Admiral 10% EC.	300 cm^3	120.0	20.0 (83.0)	0.0 (100)	0.0 (100)	10.0 (86.4)	0.0 (100)	0.0 (100)	0.0 (100)	4.2* (95.6)
	150 cm^3	280.0	80.0 (70.9)	25.0 (89.4)	55.0 (70.9)	45.0 (73.8)	40.0 (69.0)	0.0 (100)	0.0 (100)	35.0* (82.0)
Control	--	650.0	640.0	550.0	440.0	400.0	300.0	145.0	60.0	362.1

L.S.D. =71.29

*= Significant at 5% level

% Reduction rates are given in brackets

Table (47-A): Efficiency of certain treatments against *Bemisia tabaci* (Genn.) adults on common bean plants during summer plantation of 2004 at Qalyubia Governorates.

Treatments	Rate /100L	Mean number of adults per 20 leaves and reduction rates at indicated days from treatment								
		Pre-spray	First spray							
			1	2	3	5	7	10	14	Average
Selecron 72% EC.	187.5 cm^3	100.0	25.0 (76.3)#	20.0 (81.0)	15.0 (86.5)	20.0 (81.0)	22.0 (82.0)	40.0 (70.0)	45.0 (70.0)	26.7* (78.1)
	93.7 cm^3.	95.0	32.0 (68.0)	36.0 (64.0)	38.0 (64.0)	45.0 (55.1)	50.0 (56.9)	54.0 (57.3)	71.0 (50.1)	46.5* (59.3)
Achook 0.15 % EC.	200 cm^3	90.0	41.0 (56.8)	23.0 (75.7)	22.0 (78.0)	19.0 (80.0)	26.0 (76.3)	38.5 (67.9)	50.0 (62.9)	31.3* (71.1)
	100 cm^3	110.0	56.0 (51.7)	54.0 (53.4)	41.0 (66.4)	42.0 (63.8)	59.0 (56.1)	74.0 (49.5)	100.0 (39.3)	60.8* (54.3)
Bemistop 21.1 %EC.	500 cm^3	95.0	22.0 (78.0)	9.0 (91.0)	15.0 (85.7)	25.0 (75.0)	21.0 (81.9)	44.0 (65.2)	62.0 (56.4)	28.2* (76.2)
	250 cm^3	90.0	44.0 (53.6)	40.0 (57.8)	32.0 (68.0)	37.0 (61.0)	37.0 (66.3)	61.0 (49.1)	76.0 (43.7)	46.7* (57.1)
Biosect32x10^6conidia/mg	200 gm.	100.0	55.0 (47.8)	35.0 (66.8)	24.0 (78.4)	39.0 (63.0)	46.0 (62.3)	48.0 (64.0)	50.0 (66.6)	42.4* (64.1)
	100 gm.	95.0	67.0 (33.1)	51.0 (49.1)	46.0 (56.4)	49.0 (51.1)	81.0 (30.2)	80.0 (36.8)	86.0 (39.6)	65.7* (42.3)
Admiral 10% EC	300 cm^3	85.0	30.0 (66.5)	31.0 (65.4)	21.0 (77.7)	14.0 (84.3)	15.5 (85.0)	20.0 (82.3)	45.0 (64.7)	25.2* (75.1)
	150 cm^3	85.0	44.0 (50.9)	41.0 (54.3)	35.0 (62.9)	36.0 (59.8)	45.0 (56.6)	65.0 (42.6)	78.0 (38.8)	49.1* (52.3)
Control	--	90.0	95.0	95.0	100.0	95.0	110.0	120.0	135.0	107.1

L.S.D. =15.96
*= Significant at 5% level
% Reduction rates are given in brackets

Table (47-B): continued.

Treatments	Rate /100L	Mean number of adults per 20 leaves and reduction rates at indicated days from treatment								
		Pre-spray	Second spray							
			1	2	3	5	7	10	14	Average
Selecron 72% EC.	187.5 cm^3	45.0	6.0 (87.1)#	4.5 (90.3)	3.0 (93.3)	4.5 (89.6)	7.0 (80.9)	11.0 (67.0)	12.0 (57.6)	6.8* (80.8)
	93.7 cm^3.	71.0	28.0 (61.9)	21.0 (71.4)	21.0 (70.4)	24.0 (64.8)	25.0 (56.7)	24.0 (54.3)	30.0 (32.8)	24.7* (58.9)
Achook 0.15 % EC.	200 cm^3	50.0	16.0 (69.1)	11.5.0 (77.8)	5.0 (90.0)	6.0 (87.5)	11.0 (73.0)	12.5 (66.2)	14.0 (55.5)	10.8* (74.1)
	100 cm^3	100.0	41.0 (60.4)	31.0 (70.1)	30.0 (70.0)	46.0 (52.2)	41.0 (49.6)	46.0 (37.9)	50.0 (20.5)	40.7* (51.5)
Bemistop 21.1 %EC.	500 cm^3	62.0	25.0 (61.1)	18.0 (72.0)	9.0 (85.4)	9.0 (84.9)	9.5.0 (81.1)	11.0 (76.0)	13.5 (65.4)	13.5* (75.1)
	250 cm^3	76.0	30.0 (61.9)	21.0 (73.3)	19.5 (74.3)	20.0 (72.6)	28.0 (54.7)	28.5 (49.3)	30.0 (37.3)	25.2* (60.5)
Biosect32x10^6conidia/mg	200 gm.	50.0	20.0 (61.4)	18.5 (64.3)	11.0 (78.0)	14.0 (70.9)	12.0 (70.5)	15.0 (59.5)	17.5 (44.4)	15.4* (64.1)
	100 gm.	86.0	45.0 (49.5)	31.0 (65.2)	31.0 (63.9)	31.0 (62.5)	40.0 (42.9)	40.0 (37.2)	41.0 (24.2)	37.0* (49.3)
Admiral 10% EC	300 cm^3	45.0	11.0 (76.4)	8.0 (82.8)	5.0 (88.8)	6.5 (85.0)	5.0 (86.3)	10.0 (70.0)	15.5 (45.2	8.7* (76.4)
	150 cm^3	78.0	34.0 (57.9)	28.0 (65.3)	20.0 (74.3)	20.0 (73.3)	29.5 (53.5)	31.0 (46.3)	30.0 (38.9)	27.5* (58.5)
Control	--	135.0	140.0	140.0	135.0	130.0	110.0	100.0	85.0	120.0

L.S.D. = 8.61
*= Significant at 5% level
% Reduction rates are given in brackets

Table (48-A): Efficiency of certain treatments against *Bemisia tabaci* (Genn.) immature stages on common bean plants during summer plantation of 2004 at Qalyubia Governorates.

Treatments	Rate /100L	Mean number of immature stages per 20 leaves and reduction rates at indicated days from treatment								
		Pre-spray	First spray							
			1	2	3	5	7	10	14	Average
Selecron 72% EC.	187.5 cm^3	410.0	40.0 (90.5)#	25.5 (93.9)	31.0 (92.8)	45.5 (91.1)	60.5 (89.1)	100.0 (87.8)	205.0 (63.4)	72.5* (88.9)
	93.7 cm^3.	390.0	78.0 (80.7)	69.0 (82.7)	110.0 (73.4)	175.5 (64)	195.0 (63.3)	224.0 (71.2)	310.0 (68.0)	165.9* (71.2)
Achook 0.15 % EC.	200 cm^3	400.0	100.0 (75.9)	79.0 (80.7)	87.0 (79.5)	94.0 (81.2)	184.0 (66.2)	258.0 (67.7)	278.0 (61.1)	154.2* (74.1)
	100 cm^3	410.0	210.0 (50.6)	185.0 (55.9)	129.0 (70.3)	155.0 (69.7)	168.0 (69.9)	321.0 (60.8)	346.0 (76.9)	216.2* (62.6)
Bemistop 21.1 %EC.	500 cm^3	395.0	98.0 (76.0)	56.0 (86.1)	31.0 (92.6)	54.0 (89.0)	54.0 (89.9)	155.0 (80.3)	198.0 (56.3)	92.2* (84.4)
	250 cm^3	375.0	145.0 (62.7)	145.0 (62.2)	125.0 (68.6)	133.0 (71.6)	158.0 (69.0)	265.0 (64.6)	356.0 (82.7)	189.5* (65.0)
Biosect32x10^6conidia/mg	200 gm.	400.0	195.0 (53.0)	200.0 (51.2)	125.0 (70.5)	103.0 (79.4)	142.0 (73.9)	144.0 (82.0)	150.0 (46.8)	151.2* (70.4)
	100 gm.	355.0	233.0 (36.7)	215.0 (40.9)	188.0 (50.1)	210.0 (52.6)	254.0 (47.4)	346.0 (51.2)	410.0 (82.4)	265.1* (46.5)
Admiral 10% EC	300 cm^3	415.0	215.0 (50.0)	98.0 (76.9)	36.0 (91.8)	46.0 (91.1)	98.0 (82.6)	105.0 (87.3)	158.0 (62.1)	108.0* (80.3)
	150 cm^3	390.0	250.0 (38.2)	181.0 (54.7)	145.0 (65.0)	187.0 (61.6)	155.0 (70.8)	215.0 (72.4)	321.0 (63.4)	207.7* (60.7)
Control	--	400.0	415.0	410.0	425.0	500.0	545.0	800.0	870.0	566.4

L.S.D. =95.94

*= Significant at 5% level

% Reduction rates are given in brackets

Table (48-B): continued.

Treatments	Rate /100L	Mean number of immature stages per 20 leaves and reduction rates at indicated days from treatment								
		Pre-spray	Second spray							
			1	2	3	5	7	10	14	Average
Selecron 72% EC.	187.5 cm^3	205.0	23.0 (88.8)#	15.5 (92.2)	8.0 (95.9)	11.0 (94.4)	14.0 (92.5)	24.0 (82.4)	30.5 (77.4)	18.0* (89.1)
	93.7 cm^3.	310.0	42.0 (86.5)	40.0 (86.7)	39.0 (86.8)	74.0 (75.2)	94.0 (67.0)	99.0 (52.0)	100.0 (51.16)	69.7* (72.2)
Achook 0.15 % EC.	200 cm^3	278.0	68.0 (75.6)	60.0 (77.7)	51.0 (80.8)	55.0 (79.5)	65.0 (74.5)	60.0 (67.6)	71.0 (61.3)	61.4* (73.9)
	100 cm^3	346.0	80.0 (77.0)	65.0 (80.6)	70.0 (78.9)	105.0 (68.5)	112.0 (64.7)	125.0 (45.8)	125.0 (45.3)	97.4* (65.8)
Bemistop 21.1 %EC.	500 cm^3	198.0	55.0 (72.3)	31.0 (83.8)	11.5 (93.9)	18.0 (90.5)	11.0 (93.9)	17.5 (86.7)	31.0 (76.3)	25.0* (85.4)
	250 cm^3	356.0	100.0 (72.0)	81.0 (76.5)	71.0 (79.2)	69.0 (79.9)	85.0 (74.0)	112.0 (52.8)	125.0 (46.8)	91.8* (68.7)
Biosect32x10^6conidia/mg	200 gm.	150.0	58.0 (61.5)	35.0 (75.9)	19.0 (86.8)	19.0 (86.8)	21.0 (84.7)	41.0 (59.0)	46.0 (53.6)	34.1* (72.6)
	100 gm.	410.0	198.0 (51.9)	155.0 (61.0)	145.0 (63.1)	188.0 (52.5)	191.0 (49.3)	195.0 (28.6)	200.0 (26.1)	181.7* (47.5)
Admiral 10% EC	300 cm^3	158.0	20.0 (87.4)	14.0 (90.8)	10.5 (93.0)	10.0 (93.4)	18.0 (87.6)	28.0 (73.4)	41.0 (60.7)	20.2* (83.7)
	150 cm^3	321.0	117.0 (63.7)	91.0 (70.8)	58.0 (81.1)	60.0 (80.6)	89.0 (69.8)	119.0 (44.3)	136.0 (35.8)	95.7* (63.7)
Control	--	870.0	875.0	845.0	835.0	840.0	800.0	580.0	575.0	764.2

L.S.D. =46.24
*= Significant at 5% level
% Reduction rates are given in brackets

Table (49-A): Efficiency of certain treatments against *Tetranychus urticae* Koch. individuals on common bean plants during summer plantation of 2004 at Qalyubia Governorates.

Treatments	Rate / 100L	Mean number of individuals per 10 inches and reduction rates at indicated days from treatment								
		Pre-spray	First spray							
			1	2	3	5	7	10	14	Average
Selecron 72% EC.	187.5 cm^3	366.0	74.0 (82.4)#	54.0 (87.9)	33.0 (93.3	38.0 (92.9)	81.0 (87.3)	355.0 (60.4)	541.0 (40.8)	168.0* (77.9)
	93.7 cm^3	410.0	214.0 (51.6)	165.0 (62.1)	155.0 (69.1)	200.0 (60.9)	278.0 (51.0)	622.0 (30.6)	755.0 (26.3)	341.2* (50.2)
Achook 0.15% EC.	200 cm^3	400.0	161.0 (62.7)	98.0 (76.9)	51.0 (89.5)	85.0 (83.0)	164.0 (70.3)	610.0 (30.2)	700.0 (30.0)	267.0* (63.2)
	100 cm^3	455.0	244.0 (50.3)	195.0 (59.6)	155.0 (72.1)	255.0 (55.1)	364.0 (42.2)	700.0 (29.6)	890.0 (21.7)	400.4* (47.2)
Bemistop 21.1% EC.	500 cm^3	395.0	112.0 (73.7)	100.0 (76.1)	55.0 (88.6)	78.0 (84.2)	190.0 (65.2)	412.0 (52.3)	500.0 (49.3)	206.7* (69.9)
	250 cm^3	380.0	240.0 (41.5)	122.0 (69.7)	141.0 (69.7)	155.0 (67.3)	187.0 (64.4)	485.0 (41.6)	644.0 (32.2)	282.0* (55.2)
Biosect 32x10^6conidia/mg	200 gm.	400.0	210.0 (51.3)	60.0 (85.8)	49.0 (90.0)	62.0 (87.6)	121.0 (78.1)	385.0 (56.0)	585.0 (41.5)	210.2* (70.0)
	100 gm.	365.0	280.0 (28.9)	200.0 (48.4)	175.0 (60.8)	185.0 (59.4)	310.0 (38.6)	561.0 (29.7)	650.0 (28.7)	337.2* (42.1)
Admiral 10% EC.	300 cm^3	400.0	333.0 (22.9)	80.0 (81.1)	17.5 (96.4)	20.0 (96.0)	181.0 (67.3)	510.0 (41.7)	855.0 (14.5)	285.2* (60.0)
	150 cm^3	410.0	385.0 (13.0)	142.0 (67.4)	140.0 (72.1)	145.0 (71.7)	295.0 (48.0)	565.0 (37.0)	870.0 (15.1)	363.1* (46.3)
Control	--	400.0	462.0	490.0	540.0	590.0	700.0	980.0	1000.0	680.2

L.S.D. = 253.1
*= Significant at 5% level
% Reduction rates are given in brackets

Table (49-B): continued.

Treatments	Rate / 100L	Mean number of individuals per 10 inches and reduction rates at indicated days from treatment								
		Pre-spray	Second spray							
			1	2	3	5	7	10	14	Average
Selecron 72% EC.	187.5 cm^3	541.0	135.0 (76.1)*	71.0 (86.1)	46.0 (91.9)	55.0 (90.7)	136.0 (79.7)	300.0 (58.7)	400.0 (47.1)	163.2* (75.8)
	93.7 cm^3	755.0	300.0 (61.9)	245.0 (65.8)	188.0 (76.2)	300.0 (63.8)	436.0 (53.5)	610.0 (39.9)	740.0 (29.9)	402.7* (55.9)
Achook 0.15% EC.	200 cm^3	700.0	275.0 (62.4)	195.0 (70.6)	135.0 (81.6)	144.0 (81.2)	200.0 (77.0)	452.0 (51.9)	474.0 (51.6)	267.8* (68.0)
	100 cm^3	890.0	452.0 (51.4)	280.0 (66.8)	214.0 (77.1)	371.0 (62.1)	540.0 (51.2)	700.0 (41.5)	850.0 (31.7)	486.7* (54.5)
Bemistop 21.1% EC.	500 cm^3	500.0	158.0 (69.7)	90.0 (81.0)	88.0 (83.2)	122.0 (77.8)	155.0 (75.0)	266.0 (60.4)	410.0 (41.4)	184.1* (69.8)
	250 cm^3	644.0	233.0 (65.3)	200.0 (67.3)	155.0 (77.0)	210.0 (70.3)	366.0 (54.3)	498.0 (42.5)	630.0 (30.1)	327.4* (58.1)
Biosect $32x10^6$ conidia/mg	200 gm.	585.0	280.0 (54.1)	136.0 (75.5)	48.0 (92.1)	60.0 (90.6)	138.0 (81.0)	290.0 (63.1)	545.0 (33.4)	213.8* (70.0)
	100 gm.	650.0	412.0 (39.3)	300.0 (51.4)	170.0 (75.0)	235.0 (67.1)	425.0 (47.4)	540.0 (38.2)	645.0 (29.1)	389.5* (49.6)
Admiral 10% EC.	300 cm^3	855.0	455.0 (49.0)	210.0 (74.1)	88.0 (90.1)	253.0 (73.0)	300.0 (71.7)	580.0 (49.5)	845.0 (29.4)	390.1* (62.4)
	150 cm^3	870.0	500.0 (45.0)	436.0 (47.2)	300.0 (67.1)	380.0 (60.2)	468.0 (56.7)	600.0 (48.7)	980.0 (19.5)	523.4* (49.2)
Control	--	1000.0	1045.0	950.0	1050.0	1100.0	1244.0	1345.0	1400.0	1162.0

L.S.D. = 197.7
*= Significant at 5% level
% Reduction rates are given in brackets

II.2.2- Effect of various combinations:

II.2.2.A- The legume aphid, *Aphis craccivora* Koch.

Data presented in **Tables** (50-A & 50-B) showed the effects of mixtures of the botanical insecticide, Achook 0.15% EC. and/or Bemistop 21.1% EC. plus the insecticide, Selecron 72% EC. at its half-recommended rate (93.7 cm^3/100L.), also mixtures of Admiral 10% EC. plus Achook 0.15% EC. at high and low application rates against *Aphis craccivora* individuals during summer plantation of 2004.

In relation to the results of the 1st spray **Table** (50-A) the averages number of *Aphis craccivora* individuals per 20 leaves was reduced evidently during the following 3 days after spraying as compared with the control where, reached (0.0, 5.0), (0.0, 20.0) and (0.0, 0.0 and 10.0 individuals/20 leaves) on the 3rd day post-treatment for mixtures of Selecron plus Achook (at 200, 100 cm3/100 L.), mixtures of Selecron plus Bemistop at (500, 250 cm^3/100 L.) and mixtures of Achook (at 200, 100 cm^3/100L.) plus Admiral at (300, 300 and 150 cm^3/100 L.), respectively. Thereafter, the values of the averages numbers of aphid individuals increased gradually to reach (30.0, 214.0), (20.0, 100.0) and (11.5, 92.0 and 80.0 individuals/20 leaves) at the 14th day after spraying for different treatments, respectively.

The corresponding reduction rates were (100, 98.7), (100, 94.4) and (100, 100 and 97.3%) at the 3rd day post-treatment and (94.7, 67.0), (97.0, 82.9) and (98.1, 85.3 and 87.0%) at the 14th day from spraying for various treatments, respectively.

The averages reduction rates of *Aphis craccivora* population of the various mixtures during the 1st spray reached (96.3, 83.8), (98.3, 87.6) and (98.3, 99.4 and 92.7%) for various treatments, respectively. Values of the general mean of aphid showed a significant decrease for various combinations as compared with the control.

Regarding the 2nd spray **Table** (50-B), results declared that, the averages number of *A. craccivora* individuals per 20 leaves was reduced obviously during the following 3 days after spraying as compared with the control to record zero on the 3rd day for all treatments; after that, aphid population was zero individuals until the 14th day for the high application rate. While, with the lower application rate the aphid population increased on the 5th and 7th day then, recorded zero values until the end of inspection period. This decline in *A. craccivora* population could be due to the drop of aphid population in control during the 2nd spray.

The averages reduction rates of *A. craccivora* population of various combinations during the 2nd spray reached (93.2, 83.4), (82.8, 85.9) and (98.7, 88.7 and 85.2%) for various treatments, respectively. Values of the general means of *A. craccivora* population showed a significant decrease in all treatments as compared with the control.

Co-toxicity resulted from addition of the organophosphorus compound, Selecron to the two botanical compounds, Achook and Bemistop against *Aphis craccivora* during 2004 season were presented in **Table** (51), also, co-toxicity resulted from addition of the botanical compound, Achook to Admiral were summarized in **Table** (52).

Results revealed that, the addition of Selecron at its half-recommended rate to Achook and/or Bemistop at the two application rates **Table** (51), had increased obviously their toxicity against *Aphis craccivora* than separately, and exhibited an additive effect at the two sprays. Also, results obtained from addition of the botanical compound, Achook at 200 and 100

cm^3/100L. to Admiral at its recommended and half-recommended rate at the two sprays during 2004 season, **Table** (52) increased its effectiveness than separately and induced an additive effect at the two sprays with the two application rates.

This increase was determined and termed as additive effect in which the total mortality of the combination is higher than the mortality of summation of each compound separately.

II.2.2.B- The whitefly, *Bemisia tabaci* (Genn.):

Data presented in **Tables** (53-A, 53-B & 54-A, 54-B) showed the effect of mixtures of the botanical insecticide, Achook and/or Bemistop plus the chemical insecticide, Selecron at its half-recommended rate (93.7 cm^3/100L.), as well mixtures of Admiral plus Achook at their high and low application rates against the whitefly adults and immature stages during 2004.

Results of the 1^{st} spray **Tables** (53-A & 54-A), revealed that the averages number of *Bemisia tabaci* was decreased clearly during the following 5 days after spraying as compared with the control and amounted (5.0, 21.0), (4.5, 18.5) and (2.0, 8.0 and 12.0 adults/20 leaves) for adults and (18.0, 66.0), (21.0, 84.0) and (9.0, 35.0 and 61.0 individuals/20 leaves) for immature stages on the 5^{th} day for mixtures of Selecron plus Achook at (200, 100 cm^3/100 L.), mixtures of Selecron plus Bemistop at (500, 250 cm^3/100 L.) and mixtures of Achook at (200, 100 cm^3/100 L.) plus Admiral at (300, 300 and 150 cm3/100 L.), respectively.

Afterward, the values of the averages number of *Bemisia tabaci* adults and immature stages increased gradually from the 7^{th} day after spraying for different combinations, respectively.

The corresponding reduction rates were (95.2, 81.0), (95.5, 80.5) and (98.0, 92.4 and 86.6%) for adults and (96.2, 87.1), (95.6, 83.4) and (98.1, 93.0 and 86.9%) for immature stages at the 5^{th}

day from spraying and (76.6, 58.7), (81.7, 66.2) and (89.4, 86.3 and 64.7%) for adults and (88.4, 70.3), (87.8, 77.9) and (86.2, 83.3 and 68.7%) for immature stages at the 14th day post-treatment for different combinations, respectively.

The averages reduction of *B. tabaci* population during the two weeks of investigation reached to (87.9, 75.8), (91.4, 75.3) and (92.9, 88.3 and 70.6%) for adults and (91.2, 79.8), (93.0, 78.9) and (94.7, 91.2 and 78.9%) for immature stages for various mixtures, respectively.

Values of the general mean of *Bemisia tabaci* showed a significant decreased in all treatments as compared with the control.

Furthermore, results of the 2nd spray **Tables** (53-B & 54-B) showed that, the average number of *B. tabaci* adults and immature stages was reduced clearly during the following 3 days after application as compared with the control for all treatments. After that, the average number of *B. tabaci* increased gradually to reach (7.0, 15.0), (3.5, 10.0) and (1.0, 2.5 and 9.0 adults/20 leaves) for adults and (10.0, 61.0), (4.0, 39.0) and (7.0, 12.0 and 65.0 individual/20 leaves) for immature stages at the 14th day after treatment for different mixtures, respectively.

The averages reduction rates of *B. tabaci* populations for the various mixtures during the 2nd spray recorded (87.8, 75.7), (92.1, 76.5) and (93.7, 89.1 and 75.6%) for adults and (91.8, 80.2), (95.1, 82.9) and (94.1, 92.9 and 81.3%) for immature stages for various treatments. Values of the general mean of *B. tabaci* adults and immature stages showed a significant reduction in all mixtures as compared with the control.

Results showed that, combination of Achook plus Admiral was the most effective mixture against *Bemisia tabaci* population followed by the combination of Selecron plus the botanical compound, Bemistop and the combination of Selecron plus the botanical compound, Achook.

Finally, it could be concluded that combinations of certain compounds provided showed higher effect on *Bemisia tabaci* immature stages than adult stage.

Co-toxicity resulted from addition of Selecron to the two botanical insecticides, Achook and Bemistop against *B. tabaci* adults and immature stages during 2004 season were presented in **Table** (55), also, co-toxicity resulted from addition of the botanical compound, Achook to the Admiral were recorded in **Table** (56).

Results (**Table,** 55) of addition of the insecticide at its half-recommended rate to Achook and/or Bemistop at the two application rates exhibited an additive effect at the two sprays against *Bemisia tabaci*. Also, addition of the botanical compound, Achook at 200 cm^3 and 100 cm^3/100L. to Admiral at its recommended and half-recommended rate at the two sprays during 2004 season, **Table** (56), increased its effectiveness than separately and induced an additive effect at the two sprays with the two application rates.

Table (50-A): Effect of various combinations on *Aphis craccivora* Koch individuals infesting common bean plants during summer plantation of 2004 at Qalyubia Governorates.

Treatments	Rate / 100L	Mean number of individuals per 20 leaves and reduction rates at indicated days from treatment								
		Pre-spray	First spray							
			1	2	3	5	7	10	14	Average
Achook 0.15% EC. + Selecron 72% EC.	200 cm^3+93.7 cm^3	265.0	15.0 (94.5)#	18.0 (94.2)	0.0 (100)	0.0 (100)	5.0 (98.9)	21.0 (95.5)	30.0 (94.7)	12.7* (96.3)
	100 cm^3+93.7 cm^3	300.0	35.0 (88.7)	20.0 (94.3)	5.0 (98.7)	7.0 (98.5)	85.0 (84.4)	164.0 (69.6)	214.0 (67.0)	75.7* (83.8)
Bemistop 21.1% EC. + Selecron 72% EC.	500 cm^3+93.7 cm^3	310.0	8.0 (97.5)	0.0 (100)	0.0 (100)	0.0 (100)	10.0 (98.2)	14.0 (97.4)	20.0 (97.0)	7.4* (98.3)
	250 cm^3+93.7 cm^3	270.0	35.0 (87.4)	20.0 (93.7)	20.0 (94.4)	50.5 (88.1)	78.0 (84.0)	80.0 (83.5)	100.0 (82.9)	54.7* (87.6)
Achook 0.15% EC. + Admiral 10% EC.	200 cm^3+300 cm^3	280.0	20.0 (93.0)	0.0 (100)	0.0 (100)	0.0 (100)	0.0 (100)	5.0 (99.0)	11.5 (98.1)	5.2* (98.3)
	100 cm^3+300 cm^3	290.0	25.0 (91.6)	10.0 (97.0)	0.0 (100)	0.0 (100)	15.0 (97.1)	40.0 (92.3)	92.0 (85.3)	26.0* (93.9)
	100 cm^3+150 cm^3	285.0	34.0 (88.4)	12.0 (96.4)	10.0 (97.3)	20.0 (95.5)	20.0 (96.1)	45.0 (91.2)	80.0 (87.0)	31.5* (92.7)
Control	--	300.0	310.0	355.0	400.0	475.0	545.0	540.0	650.0	467.8

L.S.D. = 60.94
*= Significant at 5% level
% Reduction rates are given in brackets

Table (50-B): continued.

Treatments	Rate / 100L	Mean number of individuals per 20 leaves and reduction rates at indicated days from treatment								
		Pre-spray	Second spray							
			1	2	3	5	7	10	14	Average
Achook 0.15% EC. + Selecron 72% EC.	200 cm^3+93.7 cm^3	30.0	5.0 (83.0)#	0.0 (100)	0.0 (100)	0.0 (100)	0.0 (100)	0.0 (100)	0.0 (100)	2.8* (93.2)
	100 cm^3+93.7 cm^3	214.0	55.0 (73.8)	41.0 (77.3)	15.0 (89.6)	18.0 (86.3)	0.0 (100)	0.0 (100)	0.0 (100)	25.5* (83.4)
Bemistop 21.1% C. + Selecron 72% EC.	500 cm^3+93.7 cm^3	20.0	0.0 (100)	0.0 (100)	0.0 (100)	0.0 (100)	0.0 (100)	0.0 (100)	0.0 (100)	22.2* (82.8)
	250 cm^3+93.7 cm^3	100.0	8.0 (91.8)	4.0 (95.2)	0.0 (100)	11.0 (82.1)	15.0 (67.5)	0.0 (100)	0.0 (100)	22.8* (85.9)
Achook 0.15% EC. + Admiral 10% EC.	200 cm^3+300 cm^3	11.5.0	0.0 (100)	0.0 (100)	0.0 (100)	0.0 (100)	0.0 (100)	0.0 (100)	0.0 (100)	2.1* (98.7)
	100 cm^3+300 cm^3	92.0	5.0 (94.4)	5.0 (93.5)	0.0 (100)	0.0 (100)	0.0 (100)	0.0 (100)	0.0 (100)	17.4* (88.7)
	100 cm^3+150 cm^3	80.0	10.0 (87.3)	8.0 (88.1)	0.0 (100)	8.0 (83.7)	15.0 (59.3)	0.0 (100)	0.0 (100)	18.5* (85.2)
Control	--	650.0	640.0	550.0	440.0	400.0	300.0	145.0	60.0	362.1

L.S.D. = 82.31
*= Significant at 5% level
% Reduction rates are given in brackets

Table (51): Co-toxicity resulted from addition of Selecron at its half-recommended rate to the botanical insecticides (Achook/or Bemistop) for *Aphis craccivora* Koch. during summer plantation.

Application rate (cm^3/100 L.)		% Mortality after 3 days from treatment			Co-toxicity factor	Type of joint action
		Selecron alone	Botanical insecticide alone	Botanical insecticide + Selecron		
		Expected mortality		*Observed mortality*		
Achook 0.15 % EC.						
1st spray	200	84.7	94.9	100	0.0	d
	100		89.7	98.7	- 1.3	d
2nd spray	200	78.1	100	100	0.0	d
	100		85.2	89.6	-10.4	d
Bemistop 21.1% EC.						
1st spray	500	84.7	96.0	100	0.0	d
	250		86.3	94.4	-5.6	d
2nd spray	500	78.1	100	100	0.0	d
	250		100	100	0.0	d

d: additive effect (between –20 & +20)

Table (52): Co-toxicity resulted from addition of Achook at 200 and 100cm³/100L to Admiral at two rates for *Aphis craccivora* Koch. during summer plantation.

Application rate (cm^3/100 L.)		% Mortality after 3 days from treatment			Co-toxicity factor	Type of joint action
		Achook alone	Admiral alone	Admiral + Achook		
		Expected mortality		*Observed mortality*		
At 200cm^3/100L						
1st spray	300	94.9	91.8	100	0.0	d
2nd spray	300	100	100	100	0.0	d
At 100cm3/100L.						
1st spray	300	89.7	91.8	100	0.0	d
	150		81.3	97.3	-2.7	d
2nd spray	300	85.2	100	100	0.0	d
	150		70.9	100	0.0	d

d: additive effect (between –20 & +20)

Table (53-A): Effect of various combinations on *Bemisia tabaci* (Genn.) adults infesting common bean plants during summer plantation of 2004 at Qalyubia Governorates.

Treatments	Rate / 100L	Mean number of adults per 20 leaves and reduction rates at indicated days from treatment								
		Pre-spray	First spray							
			1	2	3	5	7	10	14	Average
Achook 0.15% EC. + Selecron 72% EC.	200 cm^3+93.7 cm^3	100.0	19.0 (82.0)#	9.5 (91.0)	11.5 (89.6)	5.0 (95.2)	9.5 (92.2)	15.0 (88.7)	35.0 (76.6)	14.9* (87.9)
	100 cm^3+93.7 cm^3	105.0	35.0 (68.4)	26.0 (76.5)	20.0 (82.8)	21.0 (81.0)	19.0 (85.1)	31.0 (77.8)	65.0 (58.7)	31.0* (75.8)
Bemistop 21.1% EC. + Selecron 72% EC.	500 cm^3+93.7 cm^3	95.0	11.5 (88.5)	7.5 (92.5)	5.5 (94.7)	4.5 (95.5)	7.5 (93.5)	8.5 (93.2)	26.0 (81.7)	10.1* (91.4)
	250 cm^3+93.7 cm^3	90.0	21.0 (77.8)	20.0 (78.9)	18.5 (81.5)	18.5 (80.5)	22.0 (80)	45.0 (62.5)	45.5 (66.2)	27.2* (75.3)
Achook 0.15% EC. + Admiral 10% EC.	200 cm^3+300 cm^3	95.0	14.0 (86.0)	8.0 (92.0)	3.0 (97.1)	2.0 (98.0)	5.0 (95.6)	10.0 (92.1)	15.0 (89.4)	8.1* (92.9)
	100 cm^3+300 cm^3	100.0	24.0 (77.2)	14.0 (86.7)	6.0 (94.6)	8.0 (92.4)	12.0 (90.1)	12.0 (91.0)	20.5 (86.3)	13.7* (88.3)
	100 cm^3+150 cm^3	85.0	33.0 (63.2)	22.0 (75.4)	20.0 (78.8)	12.0 (86.6)	40.0 (61.4)	40.5 (64.2)	45.0 (64.7)	30.3* (70.6)
Control	--	90.0	95.0	95.0	100.0	95.0	11. 0.0	120.0	135.0	107.1

L.S.D. = 12.55
*= Significant at 5% level
% Reduction rates are given in brackets

Table (53-B): continued.

Treatments	Rate / 100L	Mean number of adults per 20 leaves and reduction rates at indicated days from treatment								
		Pre-spray	Second spray							
			1	2	3	5	7	10	14	Average
Achook 0.15% EC. + Selecron 72% EC.	200 cm^3+93.7 cm^3	35.0	4.0 (88.9)#	3.0 (91.7)	1.5 (95.7)	2.0 (94.0)	3.5 (87.7)	3.0 (88.4)	7.0 (68.2)	3.4* (87.8)
	100 cm^3+93.7 cm^3	65.0	20.0 (70.3)	14.0 (79.2)	9.5 (85.3)	10.0 (84.0)	11.0 (79.2)	15.0 (68.8)	15.0 (63.3)	13.5* (75.7)
Bemistop 21.1% EC. + Selecron 72% EC.	500 cm^3+93.7 cm^3	26.0	2.0 (92.5)	1.0 (96.2)	1.0 (96.1)	1.5 (94.0)	1.0 (95.0)	1.5 (92.2)	3.5 (78.6)	1.6* (92.1)
	250 cm^3+93.7 cm^3	45.5.0	9.0 (80.9)	11.0 (76.6)	7.0 (84.6)	7.0 (84.0)	9.5 (74.3)	10.0 (70.3)	10.0 (65.0)	9.0* (76.5)
Achook 0.15% EC. + Admiral 10% EC.	200 cm^3+300 cm^3	15.0	1.0 (93.5)	0.0 (100)	0.5 (96.6)	1.5 (89.6)	0.5 (95.9)	1.0 (91.0)	1.0 (89.4)	0.7* (93.7)
	100 cm^3+300 cm^3	20.5.0	2.0 (90.5)	1.5 (92.9)	1.0 (95.1)	2.0 (89.8)	1.5 (91.0)	2.5 (83.5)	2.5 (80.6)	1.8* (89.1)
	100 cm^3+150 cm^3	45.0	15.0 (67.8)	7.0 (85.0)	7.0 (84.4)	8.0 (81.5)	10.0 (72.7)	10.0 (70.0)	9.0 (68.2)	9.4* (75.6)
Control	--	135.0	140.0	140.0	135.0	130.0	110.0	100.0	85.0	120.0

L.S.D. = 8.77
*= Significant at 5% level
% Reduction rates are given in brackets

Table (54-A): Effect of various combinations on *Bemisia tabaci* (Genn.) immature stages infesting common bean plants during summer plantation of 2004 at Qalyubia Governorates.

Treatments	Rate / 100L	Mean number of immature stages per 20 leaves and reduction rates at indicated days from treatment								
		Pre-spray	First spray							
			1	2	3	5	7	10	14	Average
Achook 0.15% EC. + Selecron 72% EC.	200 cm^3+93.7 cm^3	385.0	84.0 (78.9)#	31.0 (92.1)	21.0 (94.8)	18.0 (96.2)	25.0 (95.2)	55.0 (92.8)	97.0 (88.4	47.2* (91.2)
	100 cm^3+93.7 cm^3	410.0	155.0 (63.5)	84.0 (80.0)	55.0 (87.3)	66.0 (87.12)	60.0 (89.2)	156.0 (80.9)	264.0 (70.3)	120.0* (79.8)
Bemistop 21.1% EC. + Selecron 72% EC.	500 cm^3+93.7 cm^3	385.0	41.5.0 (89.6)	35.5 (91.0)	18.5 (95.4)	21.0 (95.6)	13.5 (97.4)	41.0 (94.6)	102.0 (87.8	39.0* (93.0)
	250 cm^3+93.7 cm^3	405.0	88.0 (79.0)	104.0 (74.9)	78.0 (81.8)	84.0 (83.4)	104.0 (81.1)	210.0 (74.0)	194.0 (77.9)	123.1* (78.9)
Achook 0.15% EC. + Admiral 10% EC.	200 cm^3+300 cm^3	385.0	41.0 (89.7)	15.0 (96.1)	10.0 (97.5)	9.0 (98.1)	10.0 (98.0)	20.0 (97.4)	115.0 (86.2)	31.4* (94.7)
	100 cm^3+300 cm^3	400.0	45.0 (89.1)	41.0 (90.0)	21.0 (95.0)	35.0 (93.0)	35.0 (93.5)	40.5 (94.9)	145.0 (83.3)	51.7* (91.2)
	100 cm^3+150 cm^3	375.0	87.0 (77.6)	77.0 (79.9)	70.0 (82.4)	61.0 (86.9)	84.0 (83.5)	200.0 (73.3)	255.0 (68.7)	119.1* (78.9)
Control	--	400.0	415.0	410.0	425.0	500.0	545.0	800.0	870.0	566.4

L.S.D. =92.87
*= Significant at 5% level
% Reduction rates are given in brackets

Table (54-B): continued.

Treatments	Rate / 100L	Mean number of immature stages per 20 leaves and reduction rates at indicated days from treatment								
		Pre-spray	Second spray							
			1	2	3	5	7	10	14	Average
Achook 0.15% EC. + Selecron 72% EC.	200 cm^3+93.7 cm^3	97.0	11.0 (88.7)#	5.0 (94.6)	2.5 (97.3)	3.5 (96.2)	4.0 (95.5)	9.0 (86.0)	10.0 (84.4)	6.4* (91.8)
	100 cm^3+93.7 cm^3	264.0	55.0 (79.2)	55.0 (78.5)	26.0 (89.7)	30.0 (88.2)	31.0 (87.2)	46.0 (73.8)	61.0 (65.0)	43.4* (80.2)
Bemistop 21.1% EC. + Selecron 72% EC.	500 cm^3+93.7 cm^3	102.0	10.0 (90.2)	4.0 (95.9)	2.5 (97.4)	3.0 (96.9)	3.0 (96.8)	3.5.0 (94.8)	4.0 (94.0)	4.2* (95.1)
	250 cm^3+93.7 cm^3	194.0	24.0 (87.6)	10.0 (94.6)	9.0 (95.1)	18.0 (90.3)	40.0 (77.5)	45.0 (65.2)	39.0 (69.5)	26.4* (82.9)
Achook 0.15% EC. + Admiral 10% EC.	200 cm^3+300 cm^3	115.0	10.0 (91.3)	5.5 (95.0)	4.0 (96.3)	4.0 (96.3)	5.0 (95.2)	5.0 (93.4)	7.0 (90.7)	5.7* (94.1)
	100 cm^3+300 cm^3	145.0	14.0 (90.4)	8.0 (94.3)	6.5 (95.3)	6.0 (95.7)	7.0 (94.7)	7.0 (92.7)	12.0 (87.4)	8.6* (92.9)
	100 cm^3+150 cm^3	255.0	28.0 (89.0)	25.0 (89.9)	22.0 (91.0)	28.0 (88.6)	50.0 (78.6)	50.0 (70.5)	65.0 (61.4)	38.2* (81.3)
Control	--	870.0	875.0	845.0	835.0	840.0	800. 0	580. 0	575. 0	764.2

L.S.D. = 51.74
*= Significant at 5% level
% Reduction rates are given in brackets

Table (55): Co-toxicity resulted from addition of Selecron at its half-recommended rate to the botanical insecticides (Achook/or Bemistop) for *Bemisia tabaci* (Genn.) during the summer plantation.

Application rate (cm^3/100 L.)		% Mortality after 3 days from treatment						Co-toxicity factor		Type of joint action	
		Selecron alone		Botanical insecticide alone		Botanical Insecticide + Selecron					
		Expected mortality				*Observed mortality*					
		A	I	A	I	A	I	A	I	A	I
Achook 0.15 % EC.											
1st spray	200	64.0	73.4	78.0	80.7	89.6	94.8	-10.4	-5.2	d	d
	100			66.4	55.9	82.8	87.3	-17.2	-12.7	d	d
2nd spray	200	70.4	86.8	90.0	80.8	95.7	97.3	-4.3	-6.7	d	d
	100			70.0	78.9	85.3	89.7	-14.7	-10.3	d	d
Bemistop 21.1% EC.											
1st spray	500	64.0	73.4	85.7	86.1	94.7	95.4	-5.3	-4.6	d	d
	250			68.0	62.2	81.5	81.8	-18.5	-18.2	d	d
2nd spray	500	70.4	86.8	85.4	93.9	96.1	97.4	-3.9	-2.6	d	d
	250			74.3	79.2	84.6	95.1	-15.4	-4.9	d	d

d: additive effect (between –20 & +20)
A: adults
I: immature stages

Table (56): Co-toxicity resulted from addition of Achook at 200 and 100cm^3/100L to Admiral at two rates for *Bemisia tabaci* (Genn.) during summer plantation.

Application rate (cm^3/100 L.)		% Mortality after 3 days from treatment						Co-toxicity factor		Type of joint action	
		Achook alone		Admiral alone		Admiral + Achook					
		Expected mortality				*Observed mortality*					
		A	I	A	I	A	I	A	I	A	I
At 200cm^3/100L											
1st spray	300	78.0	80.7	77.7	76.9	97.1	97.5	-2.9	-2.5	d	d
2nd spray	300	90.0	80.8	88.8	93.0	96.6	96.3	-3.4	-3.7	d	d
At 100cm3/100L.											
1st spray	300	66.4	55.9	77.7	76.9	94.6	95.0	-5.4	-5.0	d	d
	150			62.9	54.7	78.8	82.4	-21.2	-17.6	a	d
2nd spray	300	70.0	78.9	88.8	93.0	95.1	95.3	-4.9	-4.7	d	d
	150			74.3	81.1	84.4	91.0	-15.6	-9.0	d	d

a: antagonistic effect (-20 or more)
d: additive effect (between –20 & +20)
A: adults
I: immature stages

II.2.2.C- The two-spotted spider mite, *Tetranychus urticae* Koch:

The effects of mixtures of the botanical insecticide, Achook 0.15% at (high, 200 cm^3 and low application rate, 100 cm^3/100 L.) and/or Bemistop 21.1% at (high, 500 cm^3 and low application rate, 250 cm^3/100L.) plus Selecron (Profenofos) 72% at its half recommended rate (93.7 cm^3/100L.), also mixtures of the insect growth regulator, Admiral 10% at (high, 300 cm^3 and low application rate, 150 cm^3/100L.) plus Achook 0.15% against *Tetranychus urticae* during 2004 season are presented in **Tables** (57-A & 57-B).

Data of the first spray in **Table** (57-A) showed that, the averages number of *T. urticae* were reduced evidently after the following 3 days from spraying as compared with the control to reach (20.0, 185.0), (15.5, 100.0) and (46.0, 61.0 and 200.0 individuals/10 inches) on the 3rd day post-treatment for the mixture of Selecron plus Achook at (200, 100 cm^3/100 L.), mixture of Selecron plus Bemistop at (500, 250 cm^3/ 100 L.) and mixture of Achook at (200, 100 cm^3/100 L.) plus Admiral at (300, 300 and 150 cm^3/100 L.), respectively. The corresponding reduction rates were (95.9, 70.6), (95.3, 84.1) and (92.3, 86.3 and 67.1%) for various combinations, respectively.

The averages reduction rates of *T. urticae* population of various combinations during the 1st spray reached (77.9, 50.4), (84.4, 67.4) and (73.2, 66.1 and 49.1%) for various treatments, respectively. Values of the general means of *T. urticae* population showed a significant decrease in all treatments as compared with the control.

On the other hand, the 2nd spray **Table** (57-B) showed the same trend as indicated in the 1st spray.

Co-toxicity resulted from addition of the organophosphorus compound, Selecron to the two botanical insecticides, Achook and Bemistop against *T. urticae* during the season of 2004 were presented in **Table** (58), also co-toxicity resulted from addition of the botanical compound, Achook to the Admiral were summarized in **Table** (59).

Results indicated that, addition of insecticide, Selecron at its half recommended rate to Achook at its high application rate induced an additive effect while, at its low application rate induced an antagonistic effect where, the high application rate of Achook plus Selecron increased the toxicity of the combination against *T. urticae* than separately at the two sprays. Whereas, the addition of the insecticide, Selecron at its half recommended rate to Bemistop at its high and low application rate induced an additive effect at the two sprays.

Also, results obtained of addition of the botanical compound, Achook at its high and low application rate, (200 & 100cm^3) to Admiral at its recommended rate at the two sprays, **Table** (59) induced an additive effect. Thus, the joint action of the two compounds in the mixtures was more effective against the tested pest than each compound alone. But, an antagonistic effect was obtained from the same combination at the low application rate of Achook and low application rate of Admiral.

In this respect, **El-Lakwah *et al.* (1996)** studied the efficiency of Acetone and Petroleum ether extracts of *Lantana camara* and *Nerium oleander* alone and in mixtures with the LC_{50} of Pirimiphos methyl and/or Fenvalerate. Results of co-toxicity factor values for *R. dominica* showed that, all Pirimiphos methyl and *L. camara* Acetone extracts mixtures resulted in a pronounced additive effect, while in case of *N. oleander* the combinations induced an antagonistic effect. The mixtures of Pirimiphos methyl plus *L. camara* Petroleum ether extracts produced additive effect at 1 and 16% concentrations and synergistic effect at 2, 4 and 8% concentrations. while in case of *N. oleander* plus Pirimiphos methyl mixtures an obvious antagonistic effect was shown. Mixtures of the LC_{50} of Fenvalerate plus Acetone or Petroleum ether extracts of *N. oleander* or *L. camara* resulted in a pronounced antagonism at all concentrations.

El-Lakwah *et al.* (1997) revealed that, Pirimiphos-methyl plus extract of *Nerium oleander* and *Lantana camara* in Acetone showed a potentiating action with *Tribolium castaneum*. Also, co-toxicity factor values in case of Pirimiphos-methyl plus Petroleum ether extract of the plant indicated an additive effect at 8 and 16% concentrations, and a pronounce antagonism at 1, 2 and 4% concentrations of *L. camara* Petroleum ether extracts plus Pirimiphos-methyl. Combinations *N. oleander* extracts and the insecticide mixtures produced an additive effect. Results concerning co-toxicity factor values for *T. castaneum* with the mixtures of Fenvalerate plus Acetone or Petroleum ether extract of the plants showed clearly antagonistic effects.

Mohamed (1997) stated that, co-toxicity factor values showed a pronounce synergistic effect for the combination of datura (*Datura stramonium*) extract in Petroleum ether plus Malathion and an additive effect for the mixture of datura in Ethyl alcohol plus Malathion. Meanwhile, mixtures of datura in Acetone plus Malathion exhibited a synergistic effect at higher concentrations and an additive effect at low concentrations (1.25 & 2.5%).

El-Lakwah *et al.* (1998) reported that, addition of Chlorpyrifos-methyl to the plant extract (datura leaves and black pepper seeds) or Neemazal-T increased its effectiveness against cabbage aphid, *Brevicoryne brassicae* L. (adult and immature stages), cabbage butterfly, *Pieris brassicae* L. (larvae) and diamondback moth, *Plutella maculipennis* (larvae) and induced an additive effect. This result indicates that the joint action of the two compounds in the mixture was more effective against the population of the tested insects than the compound alone.

El-Lakwah and Mohamed (1999) investigated the toxic effects of datura (*Datura stramonium*) fruit extracts in Acetone, Petroleum ether and Ethyl alcohol alone and in combination with the LC_{50} of Malathion on mortalities of the cowpea beetle, *Callosobruchus maculatus* (F). Results of co-toxicity factor values revealed a pronounced additive effect at all tested concentrations for the mixtures of plant Acetone extract and plant Petroleum ether extract plus Malathion. But, in case of the Ethyl alcohol plant extract plus insecticide, a pronounced synergistic effect at higher concentrations (5 & 10%) and an additive effect at the two lower concentrations (1.25 & 2.5%), were achieved.

El-Lakwah *et al.* (1999) revealed that, co-toxicity resulted from addition of the LC_{50} of Malathion to Neemazal-W (powder contains 10% Azadirachtin) indicated an additive effect with the cowpea weevil, *Callosobruchus maculatus* (F). at 50, 100, 250, 500 and 1000 ppm.

Table (57-A): Effect of various combinations on *Tetranychus urticae* Koch individuals infesting common bean plants during summer plantation of 2004 at Qalyubia Governorates.

Treatments	Rate / 100L	Mean number of individuals per 10 inches and reduction rates at indicated days from treatment								
		Pre-spray	First spray							
			1	2	3	5	7	10	14	Average
Achook 0.15% EC. + Selecron 72% EC.	200 cm^3+93.7 cm^3	415.0	100.0 (77.6)#	60.0 (86.3)	20.0 (96.0)	45.0 (91.3)	125.0 (78.2)	322.0 (64.5)	466.0 (55.0)	162.5* (78.4)
	100 cm^3+93.7 cm^3	390.0	198.0 (52.9)	100.0 (75.8)	100.0 (79.0)	144.0 (70.4)	322.0 (40.3)	485.0 (43.1)	600.0 (38.4)	278.4* (57.1)
Bemistop 21.1% EC. + Selecron 72% EC.	500 cm^3+93.7 cm^3	375.0	95.0 (76.5)	55.0 (86.1)	20.0 (95.6)	21.0 (95.5)	45.0 (91.3)	100.0 (87.8)	320.0 (65.8)	93.7* (85.5)
	250 cm^3+93.7 cm^3	400.0	210.0 (51.3)	90.0 (78.8)	85.0 (82.6)	100.0 (80.0)	147.0 (73.4)	300.0 (65.7)	600.0 (40.0)	218.8* (67.4)
Achook 0.15% EC. + Admiral 10% EC.	200 cm^3+300 cm^3	385.0	166.0 (60.0)	120.0 (70.6)	20.0 (95.7)	55.0 (88.5)	125.0 (76.5)	230.0 (72.6)	570.0 (40.7)	183.7* (72.1)
	100 cm^3+300 cm^3	375.0	200.0 (50.6)	110.0 (72.3)	75.0 (83.6)	80.0 (82.9)	140.0 (73.0)	285.0 (65.2)	425.0 (54.6)	187.8* (68.9)
	100 cm^3+150 cm^3	400.0	244.0 (43.5)	200.0 (52.9)	200.0 (59.1)	254.0 (49.2)	300.0 (45.8)	412.0 (52.9)	580.0 (42.0)	312.8* (49.3)
Control	--	400.0	432.0	425.0	490.0	500.0	554.0	875.0	1000.0	610.8

L.S.D. =189.5
*= Significant at 5% level
% Reduction rates are given in brackets

Table (57-B): continued.

Treatments	Rate / 100L	Mean number of individuals per 10 inches and reduction rates at indicated days from treatment								
		Pre-spray	Second spray							
			1	2	3	5	7	10	14	Average
Achook 0.15% EC. + Selecron 72% EC.	200 cm^3+93.7 cm^3	466.0	180.0 (63.0)#	70.0 (84.1)	20.0 (95.9)	46.0 (91.0)	78.0 (86.5)	164.0 (73.8)	320.0 (50.9)	125.4* (77.9)
	100 cm^3+93.7 cm^3	600.0	340.0 (45.7)	250.0 (56.1)	185.0 (70.6)	230.0 (65.1)	354.0 (52.5)	455.0 (43.6)	680.0 (19.0)	356.2* (50.4)
Bemistop 21.1% C. + Selecron 72% EC.	500 cm^3+93.7 cm^3	320.0	87.0 (73.9)	33.0 (89.1)	15.5 (95.3)	20.0 (94.3)	35.0 (91.2)	85.0 (80.2)	147.0 (67.1)	60.3* (84.4)
	250 cm^3+93.7 cm^3	600.0	230.0 (63.3)	160.0 (71.9)	100.0 (84.1)	110.0 (83.3)	226.0 (69.7)	355.0 (56.0)	472.0 (43.8)	236.1* (67.4)
Achook 0.15% EC. + Admiral 10% EC.	200 cm^3+300 cm^3	570.0	185.0 (68.9)	96.0 (82.2)	46.0 (92.3)	80.0 (87.2)	152.0 (78.5)	260.0 (66.0)	500.0 (37.3)	188.4* (73.2)
	100 cm^3+300 cm^3	425.0	210.0 (52.7)	110.0 (72.7)	61.0 (86.3)	70.0 (85.0)	152.0 (71.2)	238.0 (58.3)	378.0 (36.4)	174.1* (66.1)
	100 cm^3+150 cm^3	580.0	400.0 (34.0)	213.0 (61.3)	200.0 (67.1)	245.0 (61.5)	342.0 (52.6)	478.0 (38.7)	578.0 (28.8)	350.8* (49.1)
Control	--	1000.0	1045.0	950.0	1050.0	1100.0	1244.0	1345.0	1400.0	1162.0

L.S.D. = 149.3
*= Significant at 5% level
% Reduction rates are given in brackets

Table (58): Co-toxicity resulted from addition of Selecron at its half-recommended rate to the botanical insecticides (Achook/or Bemistop) for *Tetranychus urticae* Koch. during summer plantation.

Application rate (cm^3/100 L.)		% Mortality after 3 days from treatment			Co-toxicity factor	Type of joint action
		Selecron alone	Botanical insecticide alone	Botanical insecticide + Selecron		
		Expected mortality		*Observed mortality*		
Achook 0.15 % EC.						
1st spray	200	69.1	89.5	96.0	-4.0	d
	100		72.1	79.0	-21.0	a
2nd spray	200	76.2	81.6	95.9	-4.1	d
	100		77.1	70.6	-29.4	a
Bemistop 21.1% EC.						
1st spray	500	69.1	88.6	95.6	-4.4	d
	250		69.7	82.6	-17.4	d
2nd spray	500	76.2	83.2	95.3	-4.7	d
	250		77.0	84.1	-15.9	d

a: antagonistic effect (-20 or more)
d: additive effect (between –20 & +20)

Table (59): Co-toxicity resulted from addition of Achook at 200 and 100cm^3/100L to Admiral at two rates for *Tetranychus urticae* Koch. during summer plantation.

Application rate (cm^3/100 L.)		% Mortality after 3 days from treatment			Co-toxicity factor	Type of joint action
		Achook alone	Admiral alone	Admiral + Achook		
		Expected mortality		*Observed mortality*		
At 200cm^3/100L						
1st spray	300	89.2	96.4	95.7	-4.3	d
2nd spray	300	81.6	88.0	92.3	-7.7	d
At 100cm3/100L.						
1st spray	300	72.1	96.4	83.6	-16.4	d
	150		72.1	59.1	-40.9	a
2nd spray	300	77.1	88.0	86.3	-13.7	d
	150		67.1	67.1	-32.9	a

a: antagonistic effect (-20 or more)
d: additive effect (between –20 & +20)

II.2.2.D- Effect of various treatments on some yield components during summer plantation:

Table (60) showed the effect of different treatments on yield components during summer plantation of 2004. The effect of Selecron, Achook, Bemistop, Biosect and Admiral separately or mixtures of Achook and/or Bemistop plus Selecron and mixtures of Achook plus Admiral on number of pods/plant demonstrated that, the differences in number of pods/plant failed to reach the level of significance.

Concerning the weight of 100-seeds (g), there were significant differences between the higher application rate of all treatments as compared with the control except for Biosect while, at lower application rate all treatments failed to reach the level of significance as compared with the control. In this respect, mixture of Bemistop plus Selecron produced the heaviest seeds (32.0 ± 1.5g) followed by mixture of the botanical compound, Achook plus Selecron (31.6 ± 1.3g), the organophosphorus compound, Selecron (31.3 ± 1.7g) and Bemistop (30.0 ± 0.5g). Achook (26.6 ± 0.8g) and the bioinsecticide, Biosect (26.0 ± 1.1g) gave the lightest seeds.

With reference to seed weight per plant, there was significant increase in seed weight/plant for all treatments as compared with the control with the exception of the lower application rate of Biosect and mixture of Bemistop plus Selecron that produced lightest seeds/plant. Also, mixture of Bemistop plus Selecron gave the highest seed weight/plant (56.8% increase than control) followed by mixture of Achook plus Selecron (46.5% increase than control), Bemistop (44.8% increase than control) and Selecron (44.8% increase than control). Biosect as well took the last grade concerning the seed weight/plant (10.0% increase than control) at high application rate.

In brief, mixture of Bemistop plus Selecron gave higher seed yield followed by mixtures of Achook plus Selecron, the botanical compound Bemistop and Selecron. In addition, bioinsecticide gave lower seed yield. This could be due to the efficiency of these treatments to control the pests that infesting common bean plants while; the bioinsecticide had less efficacy to control the pests on common bean plants.

In spite of this result, botanical and bioinsecticide could be used successfully for controlling the pests under study especially, in combinations as they gave a satisfactory reduction in pests' populations, increased the yield and more safe to mammals and environment.

Results of nili and summer plantations stated that, Selecron, mixture of Selecron plus Bemistop and/or Achook, Bemistop and Achook showed high efficiency against tested pests of common bean, also gave higher seed yield.

Table (60): Effect of different treatments on some yield components of common bean during summer plantation of 2004 at Qalyubia Governorate.

Treatments	Rate/100L	No. of pods/plant	Weight of 100-seeds (g)	Seed weight per plant (g)	
				Seed weight	% increase
Selecron 72% EC.	187.5 cm^3	19.0 ± 0.5	31.3 ± 1.7*	14.0 ± 0.5*	44.8
	93.7 cm^3	18.0 ± 0.5	25.0 ± 1.5	10.6 ± 0.3*	10.3
Achook 0.15% EC.	200 cm^3	17.6 ± 0.3	26.6 ± 0.8*	12.6 ± 1.2*	30.3
	100 cm^3	18.0 ± 1.5	25.6 ± 1.2	9.3 ± 0.3	-3.4
Bemistop21.1% EC.	500 cm^3	17.6 ± 1.7	30.0 ± 0.5*	14.0 ± 1.1*	44.8
	250 cm^3	17.3 ± 1.2	23.6 ± 2.6	10.8 ± 1.0*	12.0
Biosect 32x106 conidia/mg	200 gm.	18.3 ± 0.6	26.0 ± 1.1	10.6 ± 0.5*	10.0
	100 gm.	16.6 ± 0.8	24.6 ± 2.0	10.0 ± 0.5*	3.4
Admiral 10% EC.	300 cm^3	18.0 ± 0.5	29.0 ± 1.5*	11.6 ± 0.8*	20.6
	150 cm^3	17.3 ± 1.3	24.3 ± 2.0	10.0 ± 1.1*	3.4
Achook 0.15% EC. + Selecron 72% EC	200 cm^3 + 93.7 cm^3	20.3 ± 0.6	31.6 ± 1.3*	14.1 ± 0.4*	46.5
	100 cm^3 + 93.7 cm^3	18.3 ± 1.3	26.0 ± 2.0	10.6 ± 0.8*	10.3
Bemistop 21.1% EC. + Selecron 72% EC.	500 cm^3 + 93.7 cm^3	20 ± 0.5	32.0 ± 1.5*	15.1 ± 0.6*	56.8
	250 cm^3 + 93.7 cm^3	17.3 ± 1.2	26.0 ± 2.0	9.8 ± 0.16	1.7
Achook 0.15% EC. + Admiral 10% EC.	200 cm^3 + 300 cm^3	18.0 ± 2.1	29.6 ± 0.3*	13.5 ± 0.7*	39.6
	100 cm^3 + 300 cm^3	19.0 ± 0.5	28.0± 0.5*	13.0 ± 0.5*	34.4
	100 cm^3 + 150 cm^3	15.6 ± 1.2	24.0 ± 1.0	10.5 ± 0.5*	8.6
Control	--	18.3 ± 0.8	24.6 ± 1.4	9.6 ± 0.4	--
L.S.D.		N.S	1.81	0.86	

*: Significant at 5% level.

Comparing the efficiency of the tested compounds during the two plantations (nili & summer), results revealed that:

1- *Aphis craccivora* Koch.:

Data in **Table** (61) showed averages numbers and reduction rates of *Aphis craccivora* individuals during the observation period of two weeks post-treatment for nili and summer plantation.

All tested materials showed high efficiency (at higher application rate) at 1^{st} and 2^{nd} spray against *A. craccivora* during nili and summer plantation. However, the organophosphorus compound, Selecron and the botanical one, Achook showed higher efficiency during nili plantation as compared with summer one. On contrary, the botanical insecticide, Bemistop and the biocide, Biosect demonstrated higher efficiency during summer plantation than nili one. While, the I.G.R., Admiral showed an equal efficiency for *A. craccivora* during the two plantations.

Results of the efficiency of the combinations, Achook and/or Bemistop plus Selecron and mixtures of Achook plus Admiral revealed in general that, the efficiency of all combinations was higher during summer plantation than nili one, **Table** (62).

2- *Bemisia tabaci* (Genn.):

average numbers and reduction rates of *Bemisia tabaci* adults and immature stages during the observation period of two weeks post-treatment for nili and summer plantation were presented in **Tables** (63 & 64).

At the higher application rate, all tested materials alone and in combinations revealed a satisfactory efficiency at 1^{st} and 2^{nd} spray against *B. tabaci* adults and immature stages during nili and summer plantation, also indicated higher effectiveness against immature stages than adult stage. In addition, all compounds alone demonstrated higher efficiency during nili plantation than summer one but all combinations proved to be more effective at summer plantation.

Generally, it could be concluded that, the effectiveness of the tested compounds alone was reduced during summer plantation; this could be attributed to high temperatures dominating during this period resulting in higher degradation of the compounds as compared with nili plantation.

On the other hand, the effectiveness of the tested mixtures was increased during summer plantation.

In this respect, the efficiency values at the 14^{th} day post-treatment results shoed the following:

- *Liriomyza trifolii* (Burg.):

Data in **Tables** (65 & 66) showed numbers of larvae and the reduction rates of *Liriomyza trifolii* on the 14^{th} day post-treatment for nili plantation.

It was found that, during the 1^{st} spray all treatments used alone indicated low persistence on the 14^{th} day after treatment except for Selecron. While, during the 2^{nd} spray all treatments (at higher concentration) exhibited high persistence against *L. trifolii* larval population with the exception of the biocide, Biosect that showed a moderate persistence, **Table** (65).

Regarding to the persistence of combinations, **Table** (66) data showed that, persistence of all combinations was higher during the 2^{nd} spray than 1^{st} spray; additionally, the persistence of the combinations proved to be higher than compounds in separate.

- ***Aphis craccivora* Koch.:**

Tables (67 & 68) showed numbers of *Aphis craccivora* individuals and their reduction rates on the 14th day post-treatment for nili and summer plantation.

Results demonstrated that, the persistence of combinations was higher than the each compound alone against *A. craccivora* population for the two plantations (nili & summer). Also, all materials alone and in combinations showed higher persistence during nili plantation as compared with summer one (although the mortality at the 14th was 100% for all treatments where, this due to the decline of *A. craccivora* population in control at this time during summer plantation).

- ***Bemisia tabaci* (Genn.)**

Table (69) showed that, all compounds in separate indicated high persistence during nili plantation at the 14th day as compared with summer one regarding to *B. tabaci* adults and immature stages. While, in combinations, **Table** (70) the persistence of the compounds exhibited approximately, the same trend during the two plantations.

- ***Tetranychus urticae* Koch:**

Concerning the 14th day post-treatment, **Tables** (71 & 72), it was obvious that, the persistence of all treatments against *T. urticae* was clearly low during summer plantation, this may due to their high degradation during this plantation.

In conclusion, the efficiency and the persistence of tested compounds were evidently reduced during summer plantation as compared with nili one due to higher degradation of the compounds resulting from high temperatures dominating during summer time.

The results of the summer plantation during 2004 indicated clearly that, the occurrence of the common bean pests at economic population level was plantation-dependent.

Tetranychus urticae was found at economic population during summer plantation, while its population was very low and under the economic level during nili plantation. On contrary, *Liriomyza trifolii* population was below the economic level during the summer plantation.

Meanwhile, the persistence of the various treatments was reduced during summer plantation as compared with nili one, due to higher degradation of the compounds at higher temperature dominating during summer time.

Table (61): Comparison of efficiency of various treatments during nili and summer plantations against *Aphis craccivora* Koch. individuals infesting common bean plants.

Treatments	Rate / 100L	Mean number of individuals per 20 leaves and reduction rates			
		Nili plantation [Œ]		Summer plantation	
		First spray	Second spray	First spray	Second spray
Selecron 72% EC.	187.5 cm^3	10.4 (98.2)	1.1 (98.3)	25.8 (93.1)	2.8 (93.2)
	93.7 cm^3	49.5 (91.7)	20.1 (85.8)	83.2 (82.8)	25.5 (83.4)
Achook 0.15% EC.	200 cm^3	68.3 (87.4)	15.8 (94.4)	81.8 (82.7)	22.2 (82.8)
	100 cm^3	116.2 (71.6)	41.9 (70.7)	113.7 (76.3)	22.8 (85.9)
Bemistop 21.1% EC.	500 cm^3	69.6 (83.3)	17.7 (87.8)	64.7 (85.2)	2.1 (98.7)
	250 cm^3	123.7 (69.1)	47.1 (70.3)	111.4 (73.4)	17.4 (88.7)
Biosect32x10^6 conidia/mg	200 gm.	73.9 (79.7)	16.9 (78.5)	68.0 (84.6)	18.5 (85.2)
	100 gm.	116.2 (70.9)	51.8 (60.0)	152.4 (63.9)	36.2 (82.7)
Admiral 10% EC.	300 cm^3	32.8 (90.1)	2.6 (92.8)	66.0 (82.8)	4.2 (95.6)
	150 cm^3	91.5 (75.4)	30.6 (69.4)	146.4 (66.9)	35 (82.0)
Control	--	412.4	719.7	467.8	362.1

% Reduction rates are given in brackets
Œ = Mean of 1999 & 2000 seasons

Table (62): Comparison of the efficiency of various combinations during nili and summer plantations against *Aphis craccivora* Koch. infesting common bean plants.

Treatments	Rate / 100L	Mean number of individuals per 20 leaves and reduction rates			
		Nili plantation [Œ]		Summer plantation	
		First spray	Second spray	First spray	Second spray
Achook 0.15% EC. + Selecron 72% EC	200 cm^3+93.7 cm^3	7.5 (98.8)	4.7 (88.4)	12.7 (96.3)	2.8 (93.2)
	100 cm^3+93.7 cm^3	30.9 (94.2)	16.0 (80.4)	75.7 (83.8)	25.5 (83.4)
Bemistop 21.1%EC. + Selecron 72% EC.	500 cm^3+93.7 cm^3	11.7 (98.0)	5.0 (89.4)	7.4 (98.3)	22.2 (82.8)
	250 cm^3+93.7 cm^3	27.8 (94.7)	15.2 (80.3)	54.7 (87.6)	22.8 (85.9)
Achook 0.15% EC. + Amiral 10% EC	200 cm^3+300 cm^3	9.4 (98.2)	5.3 (84.1)	5.2 (98.3)	2.1 (98.7)
	100 cm^3+300 cm^3	16.1 (93.8)	5.2 (80.1)	26 (93.9)	17.4 (88.7)
	100 cm^3+150 cm^3	21.6 (94.9)	17.8 (70.2)	31.5 (92.7)	18.5 (85.2)
Control	--	412.4	719.7	467.8	362.1

% Reduction rates are given in brackets
[Œ] = Mean of 1999 & 2000 seasons

Table (63): Comparison of efficiency of various treatments during nili and summer plantations against *Bemisia tabaci* (Genn.) adults infesting common bean plants.

Treatments	Rate / 100L	Mean number of individuals per 20 leaves and reduction rates							
		Nili plantation Œ				Summer plantation			
		First spray		Second spray		First spray		Second spray	
		Adults	Immature stages	Adults	Immature stages	Adults	Immature stages	Adults	Immature stages
Selecron 72% EC.	187.5 cm^3	42.8 (85.5)	74.2 (91.5)	9.2 (89.4)	12.5 (92.5)	26.7 (78.1)	72.5 (88.9)	6.8 (80.8)	18.0 (89.1)
	93.7 cm^3	94.05 (66.6)	207.6 (70.7)	40.3 (63.9)	106.0 (52.4)	46.5 (59.3)	165.9 (71.2)	24.7 (58.9)	69.7 (72.2)
Achook 0.15% EC.	200 cm^3	63.2 (79.3)	156.5 (79.0)	25.5 (78.6)	50.1 (80.4)	31.3 (71.1)	154.2 (74.1)	10.8 (74.1)	61.4 (73.9)
	100 cm^3	116.4 (58.9)	236.7 (66.8)	50.6 (57.0)	96.9 (54.7)	60.8 (54.3)	216.2 (62.6)	40.7 (51.5)	97.4 (65.8)
Bemistop 21.1% EC.	500 cm^3	47.4 (81.9)	131.3 (82.1)	8.8 (79.4)	17.8 (82.1)	28.2 (76.2)	92.2 (84.4)	13.5 (75.1)	25.0 (85.4)
	250 cm^3	100.3 (63.3)	233.9 (64.2)	37.2 (58.9)	60.7 (56.3)	46.7 (57.1)	189.5 (65.0)	25.2 (60.5)	91.8 (68.7)
Biosect32x10^6 conidia/mg	200 gm.	93.6 (65.9)	208.9 (68.9)	37.6 (70.7)	81.9 (63.3)	42.4 (64.1)	151.2 (70.4)	15.4 (64.1)	34.1 (72.6)
	100 gm.	148.2 (50.3)	285.6 (59.5)	80.4 (48.9)	131.8 (53.0)	65.7 (42.3)	265.1 (46.5)	37 (49.3)	181.7 (47.5)
Admiral 10% EC.	300 cm^3	50.8 (82.7)	72.2 (90.6)	9.3 (77.2)	15.6 (77.8)	25.2 (75.1)	108.0 (80.3)	8.7 (76.4)	20.2 (83.7)
	150 cm^3	124.1 (50.5)	228 (63.8)	60.8 (50.2)	82.3) (56.8)	49.1 (52.3)	207.7 (60.7)	27.5 (58.5)	95.7 (63.7)
Control	--	271.1	877.2	284.4	879.85	107.1	566.4	120.0	764.2

% Reduction rates are given in brackets
Œ = Mean of 1999 & 2000 seasons

Table (64): Comparison of the efficiency of various combinations during nili and summer plantations against *Bemisia tabaci* (Genn.) infesting common bean plants.

Treatments	Rate / 100L	Mean number of individuals per 20 leaves and reduction rates							
		Nili plantation Œ				Summer plantation			
		First spray		Second spray		First spray		Second spray	
		Adults	Immature stages	Adults	Immature stages	Adults	Immature stages	Adults	Immature stages
Achook 0.15% EC. + Selecron 72% EC	200 cm^3+93.7 cm^3	40.3 (87.3)	71.2 (90.8)	13.1 (85.6)	16.8 (85.3)	14.9 (87.9)	47.2 (91.2)	3.4 (87.8)	6.4 (91.8)
	100 cm^3+93.7 cm^3	87.4 (73.5)	144.0 (77.9)	27.9 (67.9)	49.9 (57.9)	31.0 (75.8)	120 (79.8)	13.5 (75.7)	43.4 (80.2)
Bemistop 21.1%EC. + Selecron 72% EC.	500 cm^3+93.7 cm^3	56.6 (83.0)	92.6 (84.5)	7.4 (86.2)	21.4 (71.4)	10.1 (91.4)	39.0 (93.0)	1.6 (92.1)	4.2 (95.1)
	250 cm^3+93.7 cm^3	101.0 (69.9)	180.2 (68.7)	28.7 (69.3)	61.9 (62.4)	27.2 (75.3)	123.1 (78.9)	9.0 (76.5)	26.4 (82.9)
Achook 0.15% EC. + Amiral 10% EC	200 cm^3+300 cm^3	46.3 (85.2)	86.9 (85.9)	7.6 (84.5)	20.5 (81.7)	8.1 (92.9)	31.4 (94.7)	0.7 (93.7)	5.7 (94.1)
	100 cm^3+300 cm^3	77.2 (74.5)	97.5 (83.8)	26.4 (66.9)	28.7 (72.8)	13.7 (88.3)	51.7 (91.2)	1.8 (89.1)	8.6 (92.9)
	100 cm^3+150 cm^3	101.5 (64.0)	136.7 (78.0)	52.5 (56.0)	46.5 (61.0)	30.3 (70.6)	119.1 (78.9)	9.4 (75.6)	38.2 (81.3)
Control	--	271.1	877.2	284.3	879.8	107.1	566.4	120.0	764.2

% Reduction rates are given in brackets
Œ = Mean of 1999 & 2000 seasons

Table (65): Efficiency of certain treatments against *Liriomyza trifolii* (Burg.) larvae infesting common bean plants during nili plantation.

Treatments	Rate / 100L	Mean number of larvae per 20 leaves and reduction rates on the 14th day post-treatment	
		First spray	Second spray
Selecron 72% EC.	187.5 cm^3	11.4 (77.5)	3.3 (82.4)
	93.7 cm^3	12.6 (77.1)	9.7 (41.2)
Achook 0.15% EC.	200 cm^3	26.0 (54.7)	6.6 (81.1)
	100 cm^3	26.0 (50.0)	12.6 (63.7)
Bemistop 21.1% EC.	500 cm^3	31.2 (27.5)	11.0 (70.7)
	250 cm^3	30.3 (40.4)	21.0 (46.9)
Biosect32x10^6 conidia/mg	200 gm.	34.9 (38.4)	17.3 (61.3)
	100 gm.	37.3 (32.5)	29.0 (35.9)
Admiral 10% EC.	300 cm^3	36.9 (26.6)	8.6 (79.2)
	150 cm^3	38.9 (26.7)	29.9 (38.2)
Control	--	52.6	63.3

% Reduction rates are given in brackets

Table (66): Effect of various combinations on *Liriomyza trifolii* (Burg.) larvae infesting common bean plants during nili plantation.

Treatments	Rate / 100L	Mean number of larvae per 20 leaves and reduction rates on the 14th day post-treatment	
		First spray	Second spray
Achook 0.15% EC. + Selecron 72% EC	200 cm^3+93.7 cm^3	14.9 (68.9)	1.2 (93.4)
	100 cm^3+93.7 cm^3	18.3 (60.2)	8.0 (64.4)
Bemistop 21.1%EC. + Selecron 72% EC.	500 cm^3+93.7 cm^3	15.9 (65.3)	5.3 (73.0)
	250 cm^3+93.7 cm^3	14.9 (70.1)	7.6 (58.6)
Achook 0.15% EC. + Admiral 10% EC	200 cm^3+300 cm^3	17.2 (67.3)	3.1 (84.8)
	100 cm^3+300 cm^3	20.9 (57.4)	7.3 (71.1)
	100 cm^3+150 cm^3	20.9 (59.5)	9.0 (65.3)
Control	--	52.6	63.3

% Reduction rates are given in brackets

Table (67): Comparison of efficiency of various treatments during nili and summer plantations against *Aphis craccivora* Koch. individuals infesting common bean.

Treatments	Rate / 100L	Mean number of individuals per 20 leaves and reduction rates on the 14th day post-treatment			
		Nili plantation Œ		Summer plantation	
		First spray	Second spray	First spray	Second spray
Selecron 72% EC.	187.5 cm^3	43.1 (93.3)	3.3 (95.4)	68.0 (87.7)	0.0 (100)
	93.7 cm^3	128.0 (83.8)	42.0 (65.9)	210.0 (67.6)	0.0 (100)
Achook 0.15% EC.	200 cm^3	205.3 (66.1)	22.5 (91.8)	195.0 (69.4)	0.0 (100)
	100 cm^3	133.7 (83.6)	40.5 (64.9)	200.0 (69.2)	0.0 (100)
Bemistop 21.1% EC.	500 cm^3	138.6 (79.7)	8.6 (92.3)	210.0 (65.9)	0.0 (100)
	250 cm^3	148.4) (77.2)	38.5 (67.0)	240.0 (59.7)	0.0 (100)
Biosect32x10^6 conidia/mg	200 gm.	73.7 (88.8)	15.1 (77.6)	188.0 (71.0)	0.0 (100)
	100 gm.	122.3 (81.7)	54.6 (54.3)	276.0 (56.8)	0.0 (100)
Admiral 10% EC.	300 cm^3	29.0 (95.6)	4.6 (86.8)	120.0 (79.8)	0.0 (100)
	150 cm^3	85.4 (86.1)	32.0 (62.8)	280.0 (54.6)	0.0 (100)
Control	--	591.3	587.3	650.0	60.0

% Reduction rates are given in brackets
Œ = Mean of 1999 & 2000 seasons

Table (70): Comparison of the efficiency of various combinations during nili and summer plantations against *Bemisia tabaci* (Genn.) infesting common bean plants.

Treatments	Rate / 100L	Mean number of individuals per 20 leaves and reduction rates on the 14th day post-treatment							
		Nili plantation Œ				Summer plantation			
		First spray		Second spray		First spray		Second spray	
		Adults	Immature stages	Adults	Immature stages	Adults	Immature stages	Adults	Immature stages
Achook 0.15% EC. + Selecron 72% EC	200 cm^3+93.7 cm^3	101.6 (70.5)	127.2 (85.9)	8.0 (86.6)	7.0 (90.2)	35.0 (76.6)	97.0 (88.4	7.0 (68.2)	97.0 (88.4
	100 cm^3+93.7 cm^3	103.6 (70.0)	134.9 (84.9)	24.1 (61.4)	19.1 (76.4)	65.0 (58.7)	264.0 (70.3)	15.0 (63.3)	264.0 (70.3)
Bemistop 21.1%EC. + Selecron 72% EC.	500 cm^3+93.7 cm^3	77.0 (82.9)	86.3 (89.7)	4.0 (90.4)	5.1 (90.6)	26.0 (81.7)	102.0 (87.8	3.5 (78.6)	102.0 (87.8
	250 cm^3+93.7 cm^3	133.1 (71.4)	177.6 (74.9)	38.6 (55.9)	72.9 (54.8)	45.5 (66.2)	194.0 (77.9)	10.0 (65.0)	194.0 (77.9)
Achook 0.15% EC. + Amiral 10% EC	200 cm^3+300 cm^3	63.3 (83.2)	130.6 (83.3)	6.1 (85.5)	8.0 (89.5)	15.0 (89.4)	115.0 (86.2)	1.0 (89.4)	115.0 (86.2)
	100 cm^3+300 cm^3	98.3 (71.2)	124.6 (83.7)	15.0 (73.6)	14.0 (81.1)	20.5 (86.3)	145.0 (83.3)	2.5 (80.6)	145.0 (83.3)
	100 cm^3+150 cm^3	143.3 (57.4)	141.9 (81.9)	38.0 (56.0)	23.0 (74.1)	45.0 (64.7)	255.0 (68.7)	9.0 (68.2)	255.0 (68.7)
Control	--	342.3	1017.0	820.3	669.0	135.0	870.0	85.0	870.0

% Reduction rates are given in brackets
Œ = Mean of 1999 & 2000 seasons

Table (71): Efficiency of certain treatments against *Tetranychus urticae* Koch individuals infesting common bean plants during summer plantation.

Treatments	Rate / 100L	Mean number of individuals per 10 inches and reduction rates on the 14th day post-treatment	
		First spray	Second spray
Selecron 72% EC.	187.5 cm^3	541.0 (40.8)	400.0 (47.1)
	93.7 cm^3	755.0 (26.3)	740.0 (29.9)
Achook 0.15% EC.	200 cm^3	700.0 (30.0)	474.0 (51.6)
	100 cm^3	890.0 (21.7)	850.0 (31.7)
Bemistop 21.1% EC.	500 cm^3	500.0 (49.3)	410.0 (41.4)
	250 cm^3	644.0 (32.2)	630.0 (30.1)
Biosect32x10^6 conidia/mg	200 gm.	585.0 (41.5)	545.0 (33.4)
	100 gm.	650.0 (28.7)	645.0 (29.1)
Admiral 10% EC.	300 cm^3	855.0 (14.5)	845.0 (29.4)
	150 cm^3	870.0 (15.1)	980.0 (19.5)
Control	--	1000.0	1400.0

% Reduction rates are given in brackets

Table (72): Effect of various combinations on *Tetranychus urticae* Koch individuals infesting common bean plants during summer plantation.

Treatments	Rate / 100L	Mean number of individuals per 10 inches and reduction rates on the 14th day post-treatment	
		First spray	**Second spray**
Achook 0.15% EC. + Selecron 72% EC	200 cm^3+93.7 cm^3	466.0 (55.0)	320.0 (50.9)
	100 cm^3+93.7 cm^3	600.0 (38.4)	680.0 (19.0)
Bemistop 21.1%EC. + Selecron 72% EC.	500 cm^3+93.7 cm^3	320.0 (65.8)	147.0 (67.1)
	250 cm^3+93.7 cm^3	600.0 (40.0)	472.0 (43.8)
Achook 0.15% EC. + Amiral 10% EC	200 cm^3+300 cm^3	570.0 (40.7)	500.0 (37.3)
	100 cm^3+300 cm^3	425.0 (54.6)	378.0 (36.4)
	100 cm^3+150 cm^3	580.0 (42.0)	578.0 (28.8)
Control	--	1000.0	1400.0

% Reduction rates are given in brackets

III- Effect of tested compounds on some biological aspects of *Liriomyza trifolii* (Burg.):

Some biological aspects observed after treatment of *L. trifolii* larvae on common bean plants with LC_{50} of the organophosphorus compound, Selecron 72% EC., the two botanical compounds, Achook 0.15% EC and Bemistop 21.1% EC and the insect growth regulator, Admiral 10% EC under glasshouse conditions (25 ± 3°C and 65 ± 5% R.H.).

III.1- Larval mortality:

Mortality of *L. trifolii* larvae resulted from LC_{50} of the aforementioned treatments for the three successive generations were presented in **Table** (73).

The greatest percentage of mortality occurred for Selecron treatment (61.52%) followed by Bemistop (59.6%), Admiral (56.9%) and botanical compound, Achook (42.9%), which gave the lowest larval mortality.

The percentage of larval mortality for the 2^{nd} and 3^{rd} generation indicated the same trend as achieved for the 1^{st} generation. Where, the greatest larval mortality resulted from Selecron treatment (63.8, 71.1%) followed by Bemistop (57.4, 60.8%), Admiral (57.4, 57.1%) and Achook (44.7, 46.8%) that induced the lowest one, for the 2^{nd} and 3^{rd} generation, respectively.

Concerning the larval mortality among the three generations, there were no significant differences between generations for all treatments, but it was evident that, the percentage of mortality increased by succession generations, this could be due to the residual effect of the chemical compounds through the generations.

In this regard, **Webb *et al*. (1983)** found that, the treated leaves of lima bean plants with 0.1% of neem extract were effective for up to 7 days in killing *L. trifolii* larvae hatching from eggs. In addition, **Schuster and Taylor (1987)** found that, high adult mortality was performed only on the day of the treatment of Abamectin against *L. trifolii* in the laboratory.

Table (73): Effect of LC_{50} of tested compounds on mortality of *Liriomyza trifolii* (Burg.) larvae during three successive generations.

Treatments	Concentration	Corrected mortality %			
		1st G#	2nd G	3rd G	Mean
		Mortality %	Mortality %	Mortality %	Mortality %
Selecron 72% EC.	10.7 cm^3/100L.	61.5	63.8	71.1	65.5
Achook 0.15% EC.	33.0 cm^3/100 L	42.9	44.7	46.8	44.8
Bemistop 21.1% EC.	103.8 cm^3/100 L	59.6	57.4	60.8	59.3
Admiral 10% EC.	93.4 cm^3/100 L	56.9	57.4	57.1	57.1

*: significant at 5% level.

Table (74): Effect of LC_{50} of tested compounds on duration of immature stages and total developmental period of *Liriomyza trifolii* (Burg.).

Treatments	Concentration/100L. (LC_{50})	Duration of immature stages (days)														
		1st G#					2nd G					3rd G				
		Egg	Larvae	Pupa	Total	Wr°%	Egg	Larvae	Pupa	Total	Wr%	Egg	Larvae	Pupa	Total	Wr%
Selecron 72% EC.	10.7cm^3	3.7±0.4	5.2±0.4	12.9±0.5	21.8±0.8	+22.5	3.8±0.6	5.4±0.6	14.0±1.1	23.2±1.1	+28.94	3.6±0.4	6.4±0.6	13.9±0.8	23.9±0.9	+35.2
Achook0.15%EC.	33.0 cm^3	3.2±0.3	4.2±0.5	7.2±0.5	14.7±0.7	-17.5	3.2±0.4	4.2±0.6	8.0±0.7	15.4±1.01	-14.22	3.0±0.4	4.0±0.4	9.2±1.2	16.2±1.3	-8.2
Bemistop21.1%EC.	103.8cm^3	4.2±0.4	6.4±0.3	12.2±0.9	22.9±1.2	+28.8	4.0±0.4	6.6±0.9	13.0±0.8	23.6±1.2	±30.83	3.7±0.4	6.7±0.5	13.3±0.9	23.7±1.6	+33.9
Admiral 10% EC.	93.4 cm^3	3.4±0.3	5.0±0.4	13.2±0.7	21.7±0.5	+21.9	3.3±0.4	5.0±0.7	15.0±1.1	23.3±0.9	+29.61	3.1±0.3	5.0±0.5	15.4±0.6	23.6±0.7	+33.4
Control	--	3.2±0.3	4.9±0.4	9.7±0.6	17.8±0.9	--	3.0±0.4	5.0±0.5	10.0±0.9	18.0±0.7	--	3.2±0.4	5.0±0.4	9.4±0.8	17.7±1.3	--
L.S.D.		2.7					2.7					3.5				

G#: generation.

$$Wr^{\circ}\% = \frac{\text{Treated x 100}}{\text{Untreated}} - 100$$

Also, the abovementioned results are coincidence with the data obtained by **Saito *et al.* (1992)** who stated that, in laboratory tests, sprayed the 1-day-old larvae of *L. trifolii* with the IGRs, Cyromazine and Flufenoxuron on *Phaseolus vulgaris* plants gave high mortality.

III.2- Duration of immature stages:

Data in **Table** (74) showed effect of LC_{50} for different treatments on duration of immature stages (eggs, larvae and pupae) of *L. trifolii* at 25 ± 3°C and 65 ± 5% R.H. throughout three successive generations.

Regarding the treatments, results showed that the longest total developmental period of *L. trifolii* was (22.9±1.2 days) for the botanical compound, Bemistop while; the shortest one was (14.7 ± 0.7 days) for Achook. There was significant increase in total developmental period for Bemistop (22.9 ± 1.2), Selecron (21.8 ± 0.8) and Admiral (21.7 ± 0.5 days) in comparison with the control (17.8 ± 0.9 days), meanwhile a significant decrease was recorded for the botanical insecticide, Achook (14.7 ± 0.7 days) as compared with the control for the 1st generation.

However, for the 2nd generation the results reflect the same trend as indicated with the 1st generation where, the longest total developmental period of *L. trifolii* immature stages was (23.6 ± 1.2 days) for Bemistop treatment, while the shortest period was (15.4 ± 1.1days) for Achook treatment.

Whereas, data of 3rd generation indicated that the longest total developmental period was (23.9 ± 0.9 days) for the insecticide, Selecron, while the shortest one was (16.2 ± 1.3 days) for Achook treatment. There was significant increase in total developmental period for Selecron (23.9 ± 0.9), Bemistop (23.7 ±

1.6) and Admiral (23.6 ± 0.7 days) as compared with the control (17.8 ± 1.3), while there was no significant difference between Achook (16.2 ± 1.3 days) and the control.

Concerning intra-generations, it was noticed that there were no significant differences among the three generations for all treatments with the exception of Admiral which gave a significant decrease between the 1st generation and the two others (21.7 ± 0.5, 23.3 ± 0.9 and 23.6 ± 0.7 days) for 1st, 2nd and 3rd generation, respectively.

Generally, it was obvious that the total developmental period of *L. trifolii* immature stages was clearly affected by various compounds resulting in either lasting the total developmental period by (28.8, 30.8 and 33.9%) for Bemistop, (22.5, 28.9 and 35.2%) for Selecron and by (21.9, 29.6 and 33.4%) for Admiral than the control or shorting this period by (17.5, 14.2 and 8.2%) for Achook during the 1st, 2nd and 3rd generation, respectively, as compared with control. However, the botanical compound induced the longer total developmental period. While, the other botanical compound, Achook induced the shorter one.

On the other hand, the total developmental period of *L. trifolii* immature stages showed a negligible increase among generations where, the total developmental period slightly prolonged by succession of generations.

In this respect, **Giray (1970)** recorded in the laboratory at 26°C., the egg, larval and pupal stages lasted 2-4, 5-7 and 9-11 days, respectively, for *Liriomyza cicerina* Rond. Also, **Prieto and Chaco De Vlloa (1982)** stated that the egg, larval and pupal stages of *Liriomyza trifolii* (Burg.) at 18°C and 82% R.H. lasted 4.1, 9.9 and 15 days, respectively. In addition, **Leibee (1984)** stated that, the total developmental time for *Liriomyza trifolii* immature stages was 29.83 and 18.67 days at 20 and 25°C, respectively.

III.3- Percentage of adult emergence:

Data presented in **Table** (75) showed the effect of some chemical compounds (LC_{50}) at the percentage of emergence of *Liriomyza trifolii* adults.

The obtained results revealed that, all treatments clearly caused sharp decrease in the rate of adult emergence during the three successive generations in comparison with the control.

Intra-generations, there were no noticeable differences in the rate of adult emergence for all treatments.

The insect growth regulator, Admiral caused the height decrease in percentage of adult emergence during the three generations (20.1, 19.8 and 20.9%, respectively) followed by the botanical compound, Bemistop (22.99, 21.73 and 23.78% for the three generations, respectively) and the organophosphorus insecticide, Selecron (27.4, 25.6 and 22.5%, respectively) while, the botanical insecticide, Achook caused the lowest decrease in the rate of adult emergence through the three generations (52.2, 54.65 and 37.5%, respectively). However, the percentage of adult emergence in the control was 64.7, 64.6 and 61.2% for the 1^{st}, 2^{nd} and 3^{rd} generation, respectively.

In this respect, **Nishijima *et al.* (1963)** mentioned that, the percentage of adult emergence of *Agromyza albipennis* Meigen was 8.5% and 55.9% in summer and autumn, respectively.

III.4- Percentage of malformation:

Malformation of pupae and adults of *L. trifolii* resulted from treated larvae with LC_{50} of Selecron, botanical insecticides, Achook Bemistop and Admiral presented in **Table** (76) and **Fig.** (14) showed that, all treatments obviously resulted in sharp increase in the malformation rate for the three successive generations as compared with the control.

Regarding the percentage of malformation intra-generations, there were no clear differences in the rate of malformation for all treatments with the exception of the botanical compound, Bemistop which resulted in increasing the malformation rate by the succession of generations, where it were 13.1, 17.4 and 19.0%, for the 1^{st}, 2^{nd} and 3^{rd} generation, respectively.

While, between treatments and with the 1^{st} and 2^{nd} generation, it was evident the highest rate of malformation resulted from the organophosphorus compound (36.3 and 33.5% for 1^{st} and 2^{nd} generation respectively) followed by the botanical insecticide, Achook (25.5 and 26.8%) and the Admiral (24.5 and 23.7%, respectively). While, the botanical compound, Bemistop gave the lowest rate of malformation (13.1 and 17.4%, respectively).

On the other hand, in the 3^{rd} generation, Admiral caused the highest rate followed by Achook and Selecron while, Bemistop showed the lowest one (19.03%).

Concerning the effect of treatments on the 1^{st} and 2^{nd} generation treatments could be arranged in relation to their effect on malformation in descending order, as follows:

The organophosphorus compound followed by the botanical compound, Achook, Admiral and the botanical insecticide, Bemistop that had the lowest effect on malformation rate.

In this regard, **Dimetry *et al.* (1995)** stated that, different percentages of malformed pupae were obtained post-infestation treatment of bean seedling containing 3^{rd}- instar larvae of *L. trifolii* with extract of Neem Azal-S and Margosan-O.

III.5- Sex ratio:

Table (77) showed the effect of LC_{50} of Selecron, Achook, Bemistop and Admiral on sex ratio of *L. trifolii* through three generations.

Results indicated that, there was no clear difference in sex ratio between the three generations for all treatments; however, there was irregular variation in sex ratio by the succession of generations.

According treatments, females were more numerous than males for all treatments. However, the treatments took the same trend and line through the three successive generations where, within each treatment the male ratio did not differ by the succession of generations. However, between treatments the male ratio was sharply decreased as compared with the control.

It was obvious that the number of females exceeded than males by (73.0, 73.6 and 76.2% during 1^{st}, 2^{nd} and 3^{rd} generation, respectively) for Bemistop treatment, (50.4, 56.4 and 55.2%) for Achook, (36.6, 41.6 and 33.4%) for Admiral and (24.0, 24.6 and 20.0% for the three generations respectively) for Selecron. While, the number of females exceeded than males by (11.6, 9.6 and 14.6%, for the three generations, respectively) for the control. Thus, the botanical insecticide, Bemistop was the most compound affect the sex ratio resulting in the highest female ratio through the three generations followed by the other botanical one, Achook, Admiral and finally the organophosphorus compound was the least one affecting the sex ratio which was nearly equal to or slightly more than control. This result indicates that, the tested compounds had more adversely effects on *L. trifolii* males than females, which were more sensitive.

In this regard, **Oatman and Michelbacher (1958)** recorded that, emerging females were about 5% more numerous than males in *L. pictella* (Thomson). In addition, **Hincapie *et al.* (1993)** found in laboratory studies that, the ratio of females to males of *Liriomyza huidobrensis* at 24.7°C and 64.3% R.H. was 1.42: 1.00. But the obtained results were in coincidence with the findings of those recorded by **Dimetry *et al.* (1995)** who found that, the sex ratio between the resulting adults of *L. trifolii* from treated larvae with 2% Neem Azal-S was adversely affected where all the resulting progeny were females.

III.6- Longevity of adult:

Data in **Table** (78) showed the effect of LC_{50} of different compounds on longevity of *L. trifolii* adult during three successive generations.

Pre-oviposition period:

It is clear that, the various compounds tested were considerably increased the duration of pre-oviposition period as compared with the control.

The longest mean of pre-oviposition period was resulted from Achook treatment during the three generations (11.0 ± 1.5, 11.0 ± 0.7 and 10.0 ± 0.9 days, respectively) followed by Bemistop, Admiral and Selecron induced the shortest one (6.5 ± 0.6, 7.0 ± 0.9 and 5.8 ± 0.5 days, respectively). However, this period did not differ by succession of generations for all treatments.

Oviposition period:

It is evident that, the different compounds used were noticeably decreased the duration of oviposition period as compared with the control during the three generations. However, the shortest mean oviposition period was induced by Bemistop and Achook during the 1^{st}, 2^{nd} and 3^{rd} generation (2.0 ± 0.7, 2.0 ± 0.4 and 3.0 ± 0.7 days) and (4.0 ± 0.7, 3.0 ± 0.4 and 3.0 ± 0.4 days, respectively), followed by the Admiral and Selecron was the longest compound where it lasted to (6.0 ± 0.70, 5.0 ± 0.91 and 3.5 ± 0.6 days, respectively). Also, this period did not differ by succession of generations for all treatments.

Post oviposition period:

This period showed variation from treatment to other, once noticeably increased and once more considerably decreased (**Table**, 78). It was found that, Selecron clearly increased this period where, it prolonged to reach its maximum during the three generations (4.0 ± 0.5, 3.0 ± 0.4 and 5.3 ± 0.5 days, respectively). Whereas, this period reach its minimum or flies die without passing this period with Admiral (1.0 ± 0.4, 0.0 ± 0.0 and 1.5 ± 0.3 days) and Achook (0.0 ± 0.0, 0.0 ± 0.0 and 1.0 ± 0.7 day for 1^{st}, 2^{nd} and 3^{rd} generation, respectively).

Adult longevity:

The longevity of adults reared on common bean plants (**Table**, 78) reveled that, females lived for long period than males resulting in an average of 18.7 ± 1.3 days for female and 6.6 ± 1.1 days for male for the control.

Data also showed that, there was a significant decrease in longevity of female and male during the 1^{st} and 2^{nd} generation for all treatments, on the other hand, longevity in the 3^{rd} generation failed to reach the level of the significance for female with all treatments and for male with Selecron and Admiral.

It can concluded that, flies had minimum longevity resulted from the botanical compound, Bemistop for both sex

(10.0 ± 1.1 and 3.5 ± 0.6), (12.5 ± 0.9 and 3.0 ± 0.7) and (13.0 ± 1.2 and 2.5 ± 0.3 days for female and male) during the three generations, respectively, and the insect growth regulator, Admiral for both sex (14.0 ± 1.1 and 3.0 ± 0.4), (11.5 ± 0.6 and 3.5 ± 0.6) and (12.5 ± 1.3 and 4.0 ± 0.6 days) for 1st, 2nd and 3rd generation, respectively. While, flies had maximum longevity resulted from the organophosphorus compound for both sex reached to (16.5 ± 4.1 and 4.0 ± 0.6), (15.0 ± 0.9) and (14.5 ± 1.2 and 4.0 ± 0.7 days) for the three generations, respectively. However, the botanical compound Achook induced intermediate longevity for female and male amounted (15.0 ± 1.5 and 4.0 ± 0.9), (14.0 ± 1.6 and 3.5 ± 0.6) and (14.0 ± 1.5 and 3.5 ± 0.9 days) for the three generations, respectively.

Statistical analysis revealed that, all treatments failed to reach the level of the significance in flies' longevity (female and male) regarding intra-generations.

Generally, the tested compounds adversely influenced flies' longevity of *L. trifolii*. Thus, the compounds can be arranged in descending order, in relation to their effect on longevity as follows: Bemistop followed by Admiral, Achook and Selecron was the least one. Where, Bemistop decreased female longevity by (46.7, 34.2 and 28.8% for the three generations, respectively as compared with control, while, the insecticide, Selecron reduced it by (12.0, 21.1 and 20.5% for 1st, 2nd and 3rd generation, respectively, as compared with control treatment.

In this respect, **Oatman and Michelbacher (1958)** stated that, the pre-oviposition period of *L. pictella* (Thomson) lasted 2 days. Also, **Dimetry (1971)** found that the oviposition period of *L. trifolii* under laboratory conditions ranged from 7-23 days with an average of 15.0 ± 1.49 days in February and from 5-11 days with an average of 7.6 ± 0.7 days in May. She also mentioned that, the post oviposition of the same insect differed from 2 to 5 days. Additionally, **Suss (1975)** recorded that the pre oviposition period of *L. nietzkei* Spencer lasted about 4-6 days.

Concerning the adult longevity, results are agreement with finding by **Prieto and Chaco De Ulloa (1982)** who reported that, *L. trifolii* females lived for longer time than males showing 14.5 and 26.3 days at 18°C and 82% R.H., respectively.

Also, **Hincupie *et al.* (1993)** mentioned that longevity of *L. huidobrensis* at 24.7°C and 64.3% R.H. was 15 and 7.6 days for females and males, respectively.

III.7- Fecundity:

Fecundity of *L. trifolii* females was estimated as the total number of produced larvae as mentioned by **Leibee (1984)** who stated that, the fecundity of *L. trifolii* on celery was defined as the total number of larvae produced from each female. Thus, the larvae instead of the eggs were counted because of the difficulty of seeing the eggs in the leaves. Larval counts were considered accurate estimates of egg numbers because, upon close inspection, the number of unhatched eggs was negligible.

Data in **Table** (79) showed the effect of LC_{50} for different compounds on fecundity of adult female of *L. trifolii* (represented by No. of larvae/female).

Regarding the treatments, results showed that there was a significant decrease in number of larvae per female for all treatments as compared with the control.

Females resulted from Bemistop produced the lowest number of larvae/female (6.0 ± 2.0, 6.5 ± 0.9 and 6.0 ± 0.4 larvae/female) for the 1^{st}, 2^{nd} and 3^{rd} generation, respectively, followed by the insecticide, Selecron (8.0 ± 0.7, 8.0 ± 0.9 and 10.0 ± 0.7 larvae/female), Achook (12.0 ± 1.6, 11.0 ± 0.9 and 12.0 ± 1.2 larvae/female) and Admiral which resulted in the highest number of larvae/female during the three generations (31.0 ± 6.0, 28.0 ± 2.9 and 24.0 ± 1.6 larvae/female, respectively). On the other hand, females flies resulted from the control plants produced 153.0 ± 7.7, 166.0 ± 13.0 and 153.0 ± 10.4 larvae/female for 1st, 2nd and 3rd generation, respectively.

On contrary, the number of larvae/female showed in significant differences concerning intra-generations for all treatments.

Generally, materials used resulting in this in descending order arrangement adversely affected fecundity of *L. trifolii* reared on common bean plants: Bemistop > Selecron > Achook > Admiral.

Where, Bemistop decreased the number of larvae/female (fecundity) by (96.1, 96.1 and 96.1%), Selecron by (94.8, 95.2 and 93.9%), Achook by (92.2, 93.4 and 92.2%) and Admiral decreased fecundity by (79.7, 83.1 and 84.3%) for the three generations, respectively comparing with the control.

It can be concluded that, all tested compounds reduced fecundity of *L. trifolii* females. This is may be due to the tested compounds had negative effect on the ovi-position period (**Table,** 79).

Table (78): Effect of LC_{50} of tested compounds on longevity of *Liriomyza trifolii* (Burgess).

Treatments	Concentration/100L. (LC_{50})	Longevity (days)																	
		1st G#						2nd G						3rd G					
		Pre-oviposition	Oviposition	Post-oviposition	Female Total	Female Wr¤%	Male	Pre-oviposition	Oviposition	Post-oviposition	Female Total	Female Wr%	Male	Pre-oviposition	Oviposition	Post-oviposition	Female Total	Female Wr%	Male
Selecron 72% EC.	107cm³	6.5±0.6	6.0±0.7	4.0± 0.5	16.5±4.1	-12.0	4.0± 0.6	7.0±0.9	5.0±0.9	3.0± 0.4	15.0±0.9	-21.05	3.0± 0.4	5.8±0.5	3.5±0.6	5.3± 0.5	14.5±1.2	-20.54	4.0± 0.7
Achook0.15%EC.	330cm³	11.0±1.5	4.0±0.7	0.0± 0.0	15.0±1.5	-20.0	4.0± 0.9	11.0±0.7	3.0±0.4	0.0± 0.0	14.0±1.6	-26.31	3.5± 0.6	10.0±0.9	3.0±0.4	1.0± 0.7	14.0±1.5	-23.28	3.5± 0.9
Bemistop21.1%EC	1038cm³/	7.0± 1.1	2.0±0.7	1.0± 0.4	10.0±1.1	-46.66	3.5± 0.6	9.0±0.9	2.0±0.4	1.5± 0.3	12.5±0.9	-34.21	3.0± 0.7	9.0±1.1	3.0±0.7	1.0± 0.5	13.0±1.2	-28.76	2.5± 0.3
Admiral 10% EC.	934cm³/	8.0±0.9	5.0±0.7	1.0± 0.4	14.0±1.1	-25.33	3.0± 0.4	7.0±0.9	4.5±0.9	0.0± 0.0	11.5±0.6	-39.47	3.5± 0.6	6.0±0.9	5.0±0.7	1.5± 0.3	12.5±1.3	-31.50	4.0± 0.6
Control	--	2.8±0.5	14.5±1.2	1.5± 0.3	18.8±1.0	--	7.3± 0.8	2.5±0.3	15.0±1.8	1.5± 0.3	19.0±1.2	--	6.5± 0.9	1.8±0.3	15.2±1.7	1.5± 0.3	18.3±1.8	--	6.0± 0.8
L.S.D.					3.6		21				3.4		2.0				N.S.		2.1

L.S.D. between generations: non-significant
G#: generation

$$Wr^{¤}\% = \frac{\text{Treated x 100}}{\text{Untreated}} -100$$

Table (79): Effect of LC_{50} of tested compounds on fecundity of *Liriomyza trifolii* (Burg.).

Treatments	Concentration/100L (LC_{50}).	Fecundity (Number of larvae/female)							
		1[st] G[#]		2[nd] G		3[rd] G		Mean	
		Mean	Wr[¤]%	Mean	Wr%	Mean	Wr%	Mean	Wr%
Selecron 72% EC.	10.7 cm^3.	8.0±0.7	-94.8	8.0±0.91	-95.2	10.0± 0.7	-93.5	8.6	-94.5
Achook 0.15% EC.	33.0 cm^3	12.0±1.6	-92.2	11.0±0.9	-93.2	12.0±1.2	-92.2	11.6	-92.5
Bemistop 21.1% EC.	103.8 cm^3	6.0±2.0	-96.1	6.50±0.9	-96.1	6.0±0.4	-96.1	6.1	-96.1
Admiral 10% EC.	93.4 cm^3	31.0±6.0	-79.7	28.0±2.9	-83.1	24.0±1.6	-84.3	27.6	-82.3
Control	--	153.0±7.7	--	166.0±13.0	--	153.0±10.4	--	157.3	
L.S.D		13.7		18.1		31.1			

G[#]: generation

$$Wr^{¤}\% = \frac{\text{Treated x 100}}{\text{Untreated}} -100$$

Results obtained are in agreement with that achieved by **Webb *et al* (1983)** who found that neem extract applied at 0.1% to leaves of lima bean plants significantly reduced the egg numbers laid by *L. trifolii* females.

Also, obtained data are in harmony with the findings of both **Robb and Parrella (1985)** who conclude that, Permethrin or microencapsulated methyl parathion reduced feeding and oviposition compared to the check.

In laboratory, **Schuster and Taylor (1987)** mentioned that, Abamectin reduced oviposition till 7 days after application against *Liriomyza trifolii.*

Parkman and Peinkowski (1990) pointed out that sub lethal concentrations (1.0 and 2.0 ppm) of Azadirachtin significantly reduced female fecundity of *Liriomyza trifolii.* Also in laboratory tests, **Saito *et al.* (1992)** evaluated the insect growth regulators (IGRs), Cyromazine and Flufenoxuron by spraying 1-day-old larvae of *Liriomyza trifolii* on *Phaseolus vulgaris* plants, the authors found that adult females that survived the IGRs treatment as larvae produced fewer progeny. In this regard, **Hincupie *et al.* (1993)** mentioned that the fecundity of *L. huidobrensis* at 24.7°C and 64.3% R.H. being 100 eggs/female.

IV- Effect of different treatments on fecundity of *Aphis craccivora* Koch.

Data in **Table** (80) showed the effect of three sub lethal concentrations i.e., LC_{50}, LC_{25} and $LC_{12.5}$, of the organophosphorus insecticide, Selecron, two botanical compounds, Achook and Bemistop, the bioinsecticide, Biosect and Admiral on the progeny number of *Aphis craccivora* during 10 days at three period of infestation after application (zero, three and seven days) under glasshouse conditions (25 ± 3°C and 65 ± 5 R.H.). Ten adults of aphid were used/each concentration.

Results showed that, the organophosphorus compound, Selecron decreased the fecundity of aphid at zero time infestation after application greater than the two other periods for all concentrations, where fecundity was decreased by (99.6, 94.0 and 60.6% at LC_{50}, LC_{25} and $LC_{12.5}$, respectively) than the fecundity in control. The decrease in progeny production at 3 days infestation after application was less than at zero time infestation after application at all concentrations amounted 95.2, 86.5 and 62.7% decrease than control. Whereas, decrease in fecundity at 7 days infestation after application was the lowest one recorded the highest aphid survival and fecundity, where the progeny production decreased by 83.2, 66.2 and 30.9% for the three concentrations, respectively than the control treatment.

It was evident that, the initial decrease in aphid fecundity (after 24 hours) resulting from Selecron treatment reached to the highest values as compared with the remaining treatments. Then the residual effect of Selecron on fecundity was gradually decreased by the time lapses, where aphid fecundity recorded its greatest values at 7 days infestation after application followed by the infestation after 3 days post-application and zero time infestation after application that recorded the lowest number of aphid progeny.

Regarding the botanical compound, Achook, aphid fecundity decreased by 71.9, 48.7 and 18.4% for LC_{50}, LC_{25} and $LC_{12.5}$, respectively than control at zero time infestation post-application, then the compound showed more decrease in fecundity at 3 days infestation after application where, fecundity decreased by 78.0, 59.3 and 40.9% for the three concentrations than control treatment. However, at 7 days infestation after spraying decrease in fecundity reduced once more where, fecundity decreased by 64.4, 50.2 and 22.8% for the three concentrations, respectively than the fecundity in control.

Thus, Achook resulting in intermediate decrease in fecundity at zero time infestation after application then showed the greatest decrease at 3 days infestation post-application, after that showed less decrease in aphid fecundity at 7 days infestation after application.

In this respect, the botanical insecticide, Bemistop, bioinsecticide, Biosect and Admiral at LC_{50} resulted in greatest decrease in fecundity at zero time infestation after application, where they produced 84.4, 86.6 and 88.9% less off spring (than the control) for Bemistop, Biosect and Admiral, respectively; then their residual effect on aphid fecundity at 3 days infestation after application was slightly reduced, where the fecundity decreased by 82.0, 83.8 and 81.9% (than control) for the three compounds.

However, at 7 days infestation after application their residual effect was gradually reduced producing 73.6, 64.4 and 66.1% less progeny (than those of control) for Bemistop, Biosect and Admiral, respectively Additionally LC_{25} and $LC_{12.5}$ for the three previous compounds showed different behavior on fecundity, where at zero time infestation after application achieved an intermediate and low decrease in aphid offspring (45.7 and 9.7% for Bemistop), (41.3 and 1.2% for Biosect) and (51.3 and 15.5% for Admiral) less than the control at LC_{25} and $LC_{12.5}$, respectively

There after LC_{25} and $LC_{12.5}$ produced the greatest decrease in fecundity at 3 days infestation after application, where fecundity decreased by (59.3 and 31.9% for Bemistop), (67.8 and 22.9% for Biosect) and (65.3 and 33.3% for Admiral) than the control at LC_{25} and $LC_{12.5}$, respectively The effect of the three above compounds once more decreased at 7 days infestation after application at LC_{25} and $LC_{12.5}$ where, fecundity decreased by (34.9 and 13.7% for Bemistop), (19.1 and 16.1% for Biosect) and (22.7 and 14.4% for Admiral) than fecundity in control.

Generally, among the treatments the lowest aphid survival and fecundity were observed at zero time infestation after application with the organophosphorus compound followed by Admiral, the botanical compound, Bemistop and the bioinsecticide, Biosect at zero time infestation after application at LC_{50} and at 3 days infestation after application at LC_{25} and $LC_{12.5}$ and the botanical compound, Achook at 3 days infestation after application at the three concentrations.

Concerning the persistence of the studied compounds it was found that, at 7 days infestation after application the compounds could be arranged in descending order according to persistence as follows:

Selecron, Bemistop, Achook, Admiral and Biosect were the least ones.

Results in **Table** (81) showed the percentage of mortality of *A. craccivora* resulted from treatments of LC_{50}, LC_{25} and $LC_{12.5}$

of different chemical compounds at three infestation periods after application i.e., zero, three and seven days. Results indicated that, maximum mortality values were obtained at zero time infestation after application for all compounds at all concentrations. However, values of mortality gradually decreased by the time lapses at 3 and 7 days infestation after application for all compounds and all concentrations.

Regarding the period of 7 days infestation after spraying, the organophosphorus compound was the most toxic and led to the greatest reduction in progeny number (79.1, 60.9 and 30.5%), followed by the botanical compound, Bemistop (70.0, 33.8 and 16.0%), the botanical compound, Achook (62.2, 49.4 and 20.0%), Admiral (59.8, 20.6 and 11.6%) and the bioinsecticide, Biosect (58.1, 18.9 and 15.6%, mortality for LC_{50}, LC_{25} and $LC_{12.5}$, respectively) which was the less toxic one to *A. craccivora*.

This investigation detected that; Selecron had an immediate and prolonged effect on *A. craccivora*. However, the remaining compound Bemistop, Achook, Admiral and Biosect have considerably delayed effect as compared with Selecron.

The previous results are in agreement with the other investigators **Ammer *et al.* (1986)** evaluated in laboratory the effectiveness of 5 moult-inhibiting insect growth regulators of the benzoyl-phenol urea group against *Brevicoryna brassicae*. They mentioned that, exposure of 3rd instar nymphs to cabbage leaves treated with any of the test compounds (Diflubenzuron, Triflumuron, Dowco 439 (2-chloro-N-CCC4 [4-(2,2 dichloro-1,1-difluoroethoxy)phenyl]amino]carbonyl]benxamide), 1KI-7899
[chlorfluazuron]-or-XRD-473[N-CCC3,5-dichloro-4-(1,2,2,2-tet rafluoroethoxy)phenyl] amino] carbonyl] –

Z96-difluorobenzamide]) at 0.1–100 ppm showed that at 10-100 ppm they acted more as insecticides than as growth regulators, causing 100% delayed accumulated mortality by the adult stage. More than 50% mortality of nymphs occurred within 24 h of exposure to the compounds at 100 ppm. At 0.1-5 ppm the compounds resulted in a 70-100% reduction in progeny production.

Chaunan *et al.* **(1988)** stated that, phosphamidon, monochrotophos and oxydemeton-methyl caused > 70% mortality for up to 10 days after application against *Aphis craccivora*. It is recommended that application of phosphamidon, monochrotophos, oxydemeton-methyl and dimethoate should be repeated at 13 to 15 days intervals, those of Malathion at 7 days intervals.

Dimetry and El-Hawary (1997) studied under the laboratory conditions the effect of various conc. of Neem Azal-T and Neem Azal-T/S (both containing extracts of *Azadirachta indica*) on the biology and percentage mortality of adults *Aphis craccivora* **Koch.,** in Egypt. They mentioned that, both extracts had an aphicidal effect against adults and significantly decreased fecundity.

Wood *et al.* **(1998)** examined in controlled greenhouse experiments with cotton, the efficacy of knack (Pyriproxyfen) and applaud (Buprofezin) applications before and after aphid (*Aphis gossypii*) infestation. They stated that knack was the effective in reducing the number of offspring produced by adult aphids.

Kerns and Stewart (2000) in USA studied the sub lethal effects of dosages of Bifenthrin, Acephate, Carbofuran or Pyriproxyfen on cotton aphid reproduction. They did not detect any increase or decrease in the intrinsic rate of increase of cotton aphids exposed to Bifenthrin, Acephate or Carbofuran. However, they detected some increases in the net reproductive rate of aphids treated with Bifenthrin justifying further investigation of the effect on reproduction by these insecticides. Pyriproxyfen demonstrated significant activity towards cotton aphid reared on treated cotton in the bioassays. Pyriproxyfen caused sterility in most aphids exposed to dosage exceeding 1 ppm and it did not appear to greatly influence the reproductive potential.

Table (80): Effect of sub-lethal concentrations of tested compounds on *Aphis craccivora* Koch. at various periods from treatment.

Waiting Period after treatment (days)		Mean number of individuals/10 days															
		Selecron 72% EC.			Achook 0.15% EC.			Bemistop 21.1% EC.			Biosect 32x10^{6} conidia/mg			Admiral 10% EC			Control
		LC$_{50}$	LC$_{25}$	LC$_{12}$	LC$_{50}$	LC$_{25}$	LC$_{12.5}$	LC$_{50}$	LC$_{25}$	LC$_{12.5}$	LC$_{50}$	LC$_{25}$	LC$_{12.5}$	LC$_{50}$	LC$_{25}$	LC$_{12.5}$	
Zero	Mean	0.4±0.1	6.7±1.3	44.0±3.8	31.4±3.9	57.3±5.8	91.2±7.9	15.2±2.6	60.7±4.1	101.0±9.5	15.0±2.58	65.6±5.9	110.5±7.86	12.4±1.88	54.5±5.02	94.5±5.5	111.8±13.2
	Wr%	-99.6	-94.0	-60.6	-71.9	-48.7	-18.4	-86.4	-45.7	-9.7	-86.6	-41.3	-1.2	-88.9	-51.3	-15.5	–
Three	Mean	9.3±1.9	26.2±3.5	72.6±7.9	42.7±5.8	79.2±11.4	114.9±11.3	34.9±6.56	79.2±10.9	132.2±10.7	31.5±6.4	62.6±11.3	149.9±16.1	35.1±5.04	67.4±8.9	129.6±15.3	194.4±16.3
	Wr%	-95.2	-86.5	-62.7	-78.0	-59.3	-40.9	-82.0	-59.3	-31.9	83.8	-67.8	-22.9	-81.9	-65.3	-33.3	–
Seven	Mean	27.8±5.4	56.0±1.6	114.5±17	59.1±13.6	82.6±15.1	128.1±18.7	43.8±8.3	108.0±15.7	143.2±10.7	59.1±9.1	134.2±17.0	139.2±16.1	56.2±10.2	128.3±15.6	142.0±19.2	165.9±21.3
	Wr%	-83.2	-66.2	-30.9	-64.4	-50.2	-22.8	-73.6	-34.9	-13.7	-64.4	-19.1	-16.1	-66.1	-22.7	-14.4	–

Table (81): Effect of sub-lethal concentrations of tested compounds on mortality of *Aphis craccivora* Koch. at various periods from treatment.

Waiting Period after treatment (days)	% Mortality/10 days														
	Selecron 72% EC.			Achook 0.15% EC.			Bemistop 21.1% EC.			Biosect 32x10^{6} conidia/mg			Admiral 10% EC		
	LC$_{50}$	LC$_{25}$	LC$_{12.5}$	LC$_{50}$	LC$_{25}$	LC$_{12.5}$	LC$_{50}$	LC$_{25}$	LC$_{12.5}$	LC$_{50}$	LC$_{25}$	LC$_{12.5}$	LC$_{50}$	LC$_{25}$	LC$_{12.5}$
Zero	99.5	93.0	75.8	82.0	67.6	46.9	88.2	63.9	39.6	90.8	62.1	33.6	90.9	66.0	41.5
Three	94.7	84.9	61.0	78.9	61.1	39.3	83.2	60.0	30.4	84.9	68.1	23.5	84.2	65.8	31.4
Seven	79.1	60.9	30.5	62.2	49.4	20.0	70.0	33.8	16.0	58.1	18.9	15.6	59.8	20.6	11.6

V- The efficiency of the ecto-larval parasitoid, *Diglyphus isaea* (Walker) against *Liriomyza trifolii* (Burg.):

This investigation was carried out under glasshouse conditions (25 ± 3°C and 65 ± 5% R.H.) and lasted for two generations of *L. trifolii*. The parasitoid released after one week of artificial infestation and repeated 10 days later.

Data in **Table** (82) showed that the number of alive *L. trifolii* larvae per plant was decreased gradually after first release of the parasite in all parasite levels as compared with the initial number of alive larvae (in pre-release). On contrary in control plants the number of alive larvae/plant was increased, gradually after first release to reach 8.9 ± 0.7 larvae/plant.

Statistically, the three rates of releases (4/30, 2/30 and 1/30 parasite/larvae) had a significantly less alive larvae/plant (3.2 ± 0.4, 4.0 ± 0.8 and 5.1 ± 0.9 larvae/plant, respectively) than the control plants (8.9 ± 0.7 larvae/plant). The differences among the three releases of the parasitoid were not pronounced. But relatively few live larvae were found at the highest parasite level (4/30 parasite/larvae).

Concerning the second release, the results obtained at the first release indicated the same achieved with second release, where the control plants significantly harbored more alive larvae/plant. The two parasite levels (4/30 and 2/30 parasite/larva) had a fewer alive larvae of *Liriomyza*/plant (0.88 ± 0.36 and 1.22 ± 0.48 larvae/plant, respectively).

It was also; found that the three parasite levels significantly decreased the number of alive larvae/plant (2.0 ± 0.4, 2.6 ± 0.6 and 8.1 ± 1.2 larvae/plant, respectively) as compared with the control plants, which found to be containing the greater number of alive larvae/plant (22.6 ± 1.4).

Data in **Table** (82) also, indicated that the two rates of the parasitoid (4/30 and 2/30 parasite/larvae) were found to have nearly an equal effect on suppression the number of *L. trifolii* larvae. Also, an increase in number of live larvae was noticeably, detected after the 7th day from the second release to reach (1.0 ± 0.4, 1.0 ± 0.4 and 32.0 ± 4.2 larvae/plant for the three rates of release, respectively) at the end of second release, while the number of alive larvae/plant was declined to reach zero within the 7th day of second release. After the second release, the parasitoid had adversely affected the numbers of alive *L. trifolii* larvae, where their numbers were sharply decreased and reached to zero on the 7th day.

This indicates that, more than two releases of *D. isaea* are needed to keep the population of *L. trifolii* larvae under the level of economic infestation i.e., weekly releases of the parasitoid could be recommended.

Concerning the percentage of parasitism, data in **Table** (83) indicated that, parasitism was gradually increased after the first release to reach its maximum on the 10th day (88.8, 85.7 and 62.5% for the highest, intermediate and lowest rate of release, respectively). However, the mean percentage of parasitism after the 1st release amounted (64.4, 60.7 and 47.3% for the three levels of parasite release, respectively). Also, the percentages of parasitism values increased considerably after the second parasite release amounted (87.9, 83.1 and 50.6% for the three parasite levels, respectively). The percentage of parasitism reached its maximum (100%) for all parasite levels at the 7th day from the 2nd release, then decreased by the time lapses and increased once more at the end of second release at the two parasite rates (4/30 and 2/30 parasite/larvae) amounted 91.7 and 93.3%, respectively.

On the other hand, the percentage of parasitism at the rate of 1/30 (parasite/larvae) sharply declined after the 7th day to record the minimum percent parasitism by the end of 2nd *Liriomyza* generation (23.8%).

This indicated that, *D. isaea* was capable to eradicate *L. trifolii* within two weeks by two releases at the rate of 4/30 and 2/30 (parasite/larvae) after that the population of *L. trifolii* was gradually increased resulting in incapability of the parasitoid for controlling the leaf miner by the time lapses.

It can be concluded that, the leaf miner, *L. trifolii* need weekly releases of *D. isaea* for controlling it. Also, the rate of 4/30 and 2/30 (parasite/larvae) induced a satisfactory control of the pest.

Table (84) shows the percentage of infestation that resulted from the number of infested leaves related to the whole number of plant leaves.

Results revealed that, percentage of infestation by *L. trifolii* larvae did not showed any differences at the end of the first release for all parasite rates and the control plants.

This percentage clearly affected by different rates of *D. isaea* at the second release, where obviously decreased at the 7th day to reach 35.7, 30.8 and 38.5% for the three release rates (4/30, 2/30 and 1/30 (parasite/larvae), this value in the control was 41.7%. Therefore, the % infestation showed an irregular decrease by the time lapses to reach its minimum at the end of the second release, only at the rate of 4/30 and 2/30 (parasite/larvae) amounted 26.7 and 25.0%, respectively. On the other hand, percent infestation at the lowest rate of release showed an increase by the time lapses to reach its maximum (60.0%) by the end of the second release, meanwhile, this value was 92.9% for the control. At the end of second release the lowest percentage of infestation resulted from the two parasite rates 4/30 and 2/30 (parasite/larvae) amounted 37.0 and 37.3%, respectively While, the rate of 1/30 (parasite/larvae) did not show any differences (50.3%) as before. Whereas the control plants contained the highest infestation (71.1%).

According the total mean percentage for the duration of the study, relatively few differences were noted among the three parasite release rates (44.1, 44.9 and 46.8% for 4/30, 2/30 and 1/30 (parasite/larvae, respectively) however this value was considerable more (59.1%) at the control plants.

Table (85) showed the number of mines/plant as affected by the parasitoid rates. It was found that the number of mines/plant was gradually increased for all treatments to reach 13.3 ± 0.8, 14.5 ± 1.1, 14.3 ± 1.3 for the three rates, respectively, and 12.7 ± 1.1 mines/plant for control at the first release. However, there were no significant differences between the three rates and the control.

Concerning the second release, number of mines/plant was decreased after the 7th day at the rates of 4/30 and 2/30 (parasite/larvae) and amounted 10.0 ± 0.5 and 11.0 ± 1.1 mines/plant, respect at the 10th day then increased once more to reach 30.0 ± 2.4 and 31.0 ± 3.5 mines/plant, respect at the end of the second release. While the lowest rate (1/30, parasite/larvae) did not show any decrease and still gradually increased to reached 63.0 ± 3.19 mines/plant at the end of second release as well as the control plants (140.0 ± 13.8 mines/plant).

The mean number of mines at the second release showed a significant decrease between the three parasite rates and control. While there were no significant differences among the three release rates. Whereas, the total mean number of mines/plant for the whole period of experiment showed no significant differences between the three parasite rates and the control plants. Thereby, the percentage of infestation and number of mines indicated significant differences between the three parasite rates and control only after the second parasite release.

Generally, *Diglyphus isaea* can be considered an effective agent for biological control of the leaf miner, *L. trifolii* at weekly releases or combined with parasite-compatible materials such as some insect growth regulators (Admiral) to be an effective agent in *L. trifolii* integrated pest management programs. It was also, reported by **Ozawa *et al.*, (1998)**.

The obtained results were in agreement with the findings of other investigators as **Cabitza *et al.* (1993)** in Italy, released of mass-reared individuals of *Diglyphus isaea* for control the *Liriomyza trifolii* (Burgess) on spring tomato grown in greenhouses. They stated that *D. isaea* was effective in controlling *L. trifolii*; in spite of high levels of infestation of the pest (which reached 74 mines/plant) the level of parasitism was up to 100%. **Ulubilir *et al.* (1997)** in Turkey, comparing the percentage of parasitism of the pest after releasing *Diglyphus isaea* on greenhouse tomatoes (400 m^2) with insecticide treated and untreated control plots. The release rate was 100-adults/100 m^2, achieved by releasing the parasitoids at 10 different spots (10 adults/10 m^2). For chemical control, Cyromazine was applied at a rate of 20 g/day. They concluded that when compared with non-chemical control plots, the parasitoid was effective as chemical control. Populations of *Liriomyza trifolii* (Burgess) larvae increased to a peak of 1.75 larvae/leaf by the fourth week and stayed more or less steady between 1.0 and 1.5 larvae/leaf in both experiments.

Table (82): Effect of different rates of releases of the parasitoid, *Diglyphus isaea* on number of alive *Liriomyza trifolii* larvae.

Rates of release	Average number of alive larvae/plant																			
	Pre-release	First release						Second release									Total	Mean
		3	5	7	10	Total	Mean	3	5	7	10	17	24	31	Total	Mean		
4/30*	7.0	6.0±0.5	4.0±0.6	2.0±0.3	0.7±0.2	12.7±1.5	3.2±0.4	1.7±0.3	0.0±0.0	0.0±0.0	1.0±0.6	1.5±0.8	1.0±0.4	1.0±0.4	6.2±2.6	0.9±0.4	4.1±0.7	2.0±0.4
2/30*	8.0	8.0±0.5	5.0±1.1	2.0±1.1	1.0±0.4	16.0±3.1	4.0±0.8	2.0±0.7	0.2±0.2	0.0±0.0	1.7±0.7	1.7±0.6	2.0±0.9	1.0±0.4	8.5±3.4	1.2±0.5	5.2±1.3	2.6±0.6
1/30*	5.0	8.0±1.2	6.0±1.2	3.3±1.2	3.0±0.4	20.4±3.9	5.1±0.9	2.0±0.3	0.7±0.3	0.0±0.0	6.7±0.8	13.0±1.7	23.0±2.9	32.0±4.2	77.3±10.2	11.0±1.5	16.1±2.4	8.1±1.2
Control	6.0	9.66±1.2	10.3±0.8	9.3±0.4	6.0±0.3	35.3±2.7	8.9±0.7	3.8±0.7	2.3±0.4	2.0±0.4	1.7±1.9	60.0±3.3	84.5±3.5	85.0±4.0	254.7±14.0	36.4±2.0	45.3±2.7	22.6±1.4
L.S.D.		3.1						12.4									14.2	

*= No. of Parasites/ no. of larvae

Table (83): Effect of different rates of releases of the parasitoid, *Diglyphus isaea* on percentage of parasitism on *Liriomyza trifolii* (Burgess).

Rates of release	Average number of parasitized larvae/plant and percentage of parasitism																	
	First release						Second release									Total	Mean
	3	5	7	10	Total	Mean	3	5	7	10	17	24	31	Total	Mean		
4/30*	3.0±0.3 (33.3)	5.0±0.4 (55.6)	8.0±0.8 (80.0)	5.3±0.4 (88.8)	21.3±1.8 (257.7)	5.3±0.5 (64.4)	2.3±0.4 (58.3)	2.0±0.4 (100.0)	2.0±0.5 (100.0)	7.0±0.5 (87.5)	8.5±0.7 (85.0)	13.0±0.8 (92.9)	11.0±1.0 (91.7)	45.8±4.3 (615.3)	6.5±0.6 (87.9)	11.9±1.1 (152.3)	5.9±0.5 (76.2)
2/30*	3.0±0.4 (27.3)	5.0±0.8 (50.0)	8.0±0.6 (80.0)	6.0±0.6 (85.7)	22.0±2.3 (242.9)	5.5±0.6 (60.7)	2.0±0.6 (50.0)	1.2±0.2 (87.21)	1.3±0.2 (100.0)	7.33±0.8 (81.4)	8.3±0.9 (83.3)	13.0±1.2 (86.7)	14.0±1.2 (93.3)	47.2±5.0 (581.9)	6.7±0.7 (83.1)	12.2±1.3 (143.9)	6.1±0.6 (71.9)
1/30*	2.0±0.6 (20.0)	4.0±0.6 (40.0)	6.7±0.6 (66.6)	5.0±0.4 (62.5)	17.7±2.1 (189.1)	4.4±0.5 (47.3)	2.0±0.4) (50.0)	1.1±0.3 (66.5)	2.0±0.3 (100.0)	6.3±0.6 (48.7)	7.0±1.1 (35.0)	10.0±0.6 (30.3)	10.0±0.6 (23.8)	38.5±3.9 (354.3)	5.5±0.6 (50.6)	9.9±1.1 (97.9)	4.9±0.5 (48.9)

*= No. of Parasites/ no. of larvae
% parasitism rates are given in brackets.

Table (84): Effect of different rates of releases of the parasitoid, *Diglyphus isaea* on Percentage of *Liriomyza trifolii* infestation

Rates of release	% infestation #																
	Pre-release	First release						Second release									Total	Mean
		3	5	7	10	Total	Mean	3	5	7	10	17	24	31	Total	Mean		
4/30*	28.6	50.0	50.0	50.0	54.5	204.5	51.1	50.0	41.7	35.7	42.9	26.7	35.3	26.7	259.0	37.0	88.1	44.1
2/30*	37.5	44.4	55.6	60.0	50.0	209.9	52.5	41.7	41.7	30.8	42.9	37.5	41.2	25.0	260.8	37.3	89.8	44.9
1/30*	50.0	42.9	44.4	40.0	45.5	172.7	43.2	50.0	39.0	38.5	52.0	53.3	59.0	60.0	351.8	50.3	93.5	46.8
Control	33.3	42.9	44.4	55.6	45.5	188.3	47.1	54.5	50.0	41.7	71.4	93.3	93.8	92.9	497.6	71.1	118.2	55.1

*= No. of Parasites/ no. of larvae
% infestation #: no. of infested leaves/total plant leaves

Table (85): Effect of different rates of releases of the parasitoid, *Diglyphus isaea* on number of mines induced by *Liriomyza trifolii*

Rates of release	Average number of mines/plant																
	Pre-release	First release						Second release									Total	Mean
		3	5	7	10	Total	Mean	3	5	7	10	17	24	31	Total	Mean		
4/30*	7.0	13.0±0.6	10.0±0.4	16.0±1.3	14.0±1.1	53.0±3.3	13.3±0.8	13.0±1.1	14.0±0.8	12.0±0.9	10.0±0.5	13.0±0.5	19.0±1.5	30.0±2.4	111.0±7.7	15.9±1.1	29.1±1.9	14.6±0.9
2/30*	8.0	14.0±1.1	15.0±1.1	14.0±1.1	15.0±1.2	58.0±4.3	14.5±1.1	14.0±1.1	14.0±1.3	14.0±1.1	11.0±1.1	13.0±0.9	20.0±2.1	31.0±3.5	1170±109	16.7±1.6	31.2±2.6	15.6±1.3
1/30*	8.0	13.0±0.9	14.0±1.3	15.0±1.6	15.0±1.3	57.0±5.1	14.3±1.3	14.0±1.1	13.0±1.3	15.0±1.5	18.0±1.4	28.0±3.1	45.0±2.2	63.0±3.2	1960±138	28.0±1.9	42.3±3.2	21.1±1.6
Control	7.0	11.7±1.3	13.2±0.7	12.0±1.2	14.0±1.2	50.8±4.4	12.7±1.1	16.0±1.6	15.0±1.7	15.0±1.4	24.0±1.2	85.0±3.8	1360±111	1400±138	4310±346	61.6±4.9	74.3±6.0	37.1±3.0
L.S.D.		Non signifiant						23.9									Non signifiant	

*= Parasite/larvae