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Impact of Cotton Intercropping with Cowpea and Insecticides on Crops Characteristics and Infestation with *Aphis gossypii* and *Pectinophora gossypiella*

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ABSTRACT

The objective of the present study evaluates the effect of acetamiprid and profenofos to the two of the most important damage pests, *Aphis gossypii* (Glover Homoptera: Aphididae) and *Pectinophora gossypiella* (Saund. Lep.: Gelechiidae) on cotton plants intercropping with three cultivars of cowpea (qaha, kafr elsheikh and kareem) during successive seasons 2021 and 2022. The field experiments were performed at the farm of Sakha Agricultural Research Station, Kafr El-Sheikh Governorate**,** Egypt. The main plots were devoted for three components. The results recorded that all crop characteristics and the infestation levels by insect pests of cotton were difference when intercropping with cow pea varieties as compared with solid cotton. The percentage of reduction was higher when cotton is intercropping with cowpea varieties kareem compared with varieties Qaha and kafr elsheikh. Yield and yield components of were also significantly affected by the three components of cowpea cultivars. The yield of cotton with cowpea under first treatment components exceeded that with second treatment in the first and second seasons. The average reduction percentage in aphids population thought in the first and second seasons were had significantly different with 92.59 and 91.01 reduction percentage when using profenofos sprays applied to cotton+ cowpea varieties qaha compared to 82.21 and 84.90 reduction percentage for acetamiprid, respectively. Application of profenofos on *P. gossypiella* showed the highest reduction percentage was 85.06 and 79.27 % during 2021 and 2022 when used to cotton + cowpea varieties kareem and cultivars kafr elsheikh, respectively. While acetamiprid caused leas toxic was 48.01 and 52.55 reduction percentage during 1st and 2nd seasons when applied to cotton + cowpea cultivars kareem respectively. Found significantly different between of the two insecticides during studies seasons. The results, also indicated that yields and the infestation levels by insect pests of all cowpea cultivars were decreased under intercropping qaha cultivar surpassed the other cultivars (kafr elsheikh and kareem) in all treats except plant height but infestation levels was decreased. The first treatment components recorded the highest seed yield / fad and were significantly superior to those of second treatments.

Keywords: intercropping, cotton, cow pea cultivars, Aphis gossypii, Pectinophora gossypiella, insecticides.

1. Introduction

Egyptian cotton (*Gossypium barbadense* L.) is one the most important economic crops in Egypt and the world which is considered the basis of national income and used in many important industrial produced (Mesbah *et al*., 2004). In the present time the cultivated cotton area has begun to gradually decrease due to the decrease in prices and the increase in the costs of agricultural operations and pest control, with the decrease in the price of the cotton crop, less production costs and the same thing was explained by Aziz, (2011). Moshira *et al*. (2022) cotton plants are exposed to many insect pests, which are considered one of the most important factors determining the occurrence of many damage that lead to a decrease in the production of cotton yield. El-Henidy *et al*., (2015) indicated that the more than 70% of people depend on the use of pesticides to control pests in all agriculture crops. In the present

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study, intercropping systems are estimated to provide 15-20% of world's food supply and are particularly prevalent in small farms in the tropics where they are means of increasing efficiency of utilization of land, water and solar radiation. Features of an intercropping system can differ largely with soil conditions, local climate, economic situation, and preferences of the local community (Gandebe *et al.*, 2010). Traditional crop production system involves varied arrangement of component crops in time and space with implications for productivity and sustainability (Lithourgidis *et al*., 2006). Spatial arrangements and densities of component crops have been manipulated in order to enhance complementarity and to reduce competition between component crops so that physiological advantage from combining crop components is maximized (Olufajo and Singh, 2002). The need to maximize land productivity is becoming more evident in the semi-arid tropics because of high population pressure and other human activities competing with agriculture for the limited available land (Jackson *et al*., 2007). Vigna species, a diverse plant species which can grow under a wide range of climate and environment (Kharb *et al*., 1987) has been introduced worldwide. Some species such as V. radiata (mungbean) and V. unguiculata (cowpea) are used for human diet and for improving the soil fertility. Vigna species also have the nutritive value which is suitable for livestock production (Chujaroen *et al*., 2006; Kongcharoen *et al*., 2006; important forage crop in tropical region in the near future. This bean is thus a potential plant which may be used for intercropping with other economically important crops, such as coconut, Para-rubber and oil palm. These crops are perennial trees which have been planted with a space between rows wide enough for growing other annual economic plants. As a result, the shading effect of the trees may have detrimental effect on the productivity of the intercropped annual plants. Cotton plants are often exposed to many insect pests that contribute to a very large percentage in the decline in yield, especially the pink and spiny bollworm that infect green bolls, which is considered more harmful than other parts of the plants (Amin and Gergis 2006). Therefore, insecticides with mode of action with recommended rates to control bollworm in IPM program are required. Abdel- Megeed (2009) showed that the reduction infestation level of *P. gosspiella* was induced by Easternd Amivo fert/Greenzit S.P.00 with chlorpyrifos. Many researchers have used some insecticides to control bollworm and aphids. Thus, El- Seady, (2009) indicated that the initial effect against aphids was 58.81 and 57.55%after seven weeks by imidacloprid residues in cotton plants. Kandil and Moustafa, (2019) showed that the mortality percentage was 63% when *P. gossypiella* was treated with chlorpyrifos. In the present data showed that the results also indicated that yields and the infestation levels by insect pests of all cow pea cultivars were decreased under intercropping compared with solid, but application insecticides caused reduction infestation levels.

2. Material and Methods

2.1. Tested chemicals

Two the chemicals compounds which belong to two different chemical groups were tested against aphid and pink bollworm using field recommended rates and commercial formulation of each.

- Profenofos (Cord 72%EC), Elhelb pesticides. and Chemical. Co. recommended rates 750m/fed.
- Acetamiprid (Tasulan 20% SP), Elshaimaa Agric. Dev. and import Co. ltd.,

Nantong, Hong Kong, China, recommended rates 25g/fed.

2.2. Experimental design

Field trails were carried out at the farm of Sakha Agricultural Research Station, Kafr El-Sheikh, during the seasons 2021 and 2022 in area of 2100 m^2 (2 plots =2×3× 4×58.33m^2+700m^2control) were treated with used insecticides. The intended aim of this work was to study the effect of acetamiprid and profenofos of *A. gossypii* and *P. gossypiella* on cotton (Giza 94) intercropping with some cowpea varieties (Qaha, Kafer elsheikh and kareem). The popular cultivar was selected for the field experiments with a seeding drill and 80 cm row spacing, at a seeding rate of 25 kg/fed. Thinning was done to one plant when plants had three to four leaves. Fertilizers rates used were the same as generally practiced by the farmers, with rates of N, P and K were 120, 60 and 100 kg fed^{-1}, respectively. One dose of N was applied at planting. The remaining N was applied at the late vegetative stage, 55–69 days after sowing, following the recommend rates. The experimental soil was clay loam, non-saline, low in organic matter ranging from 0.59-0.56%, available phosphorus (3.00-3.50 mg kg-1) and high exchangeable potassium (168 mg kg-1). The trail was laid out in split plot design with three replicates was used. The main plots were devoted for two insecticides acetamiprid and profenofos were application against tow pests, while

the sub plots were devoted to three cow pea varieties (Qaha, Kafer elsheikh and kareem). During 1st and 2nd seasons, cotton was sown on 31th march and 1stApril, respectively. The area of each sub plot was 42 m^2, containing five broadcasts. Cotton seed rates was 30 kg seed/fed. was grown on two side of all ridges (100%) at 25 cm. between hills (2 pl/hill).While, cowpea was grown on broadcast (50%) on all broadcast, at 20 cm. between hills (2 pl /hill). Solid planting of cotton and cow pea were sowing as recommended. Application of super phosphate fertilizer was added at a rate of 30 kg P_2O_5 fed^{-1} in the form of calcium super phosphate (15.5% P_2O_5) before sowing and during soil preparation. Nitrogen fertilizer was applied at a rate of 60 kg N fed^{-1} was applied in two equal doses (i.e. at the first and second irrigation). Potassium fertilizer was applied at a rate of 24 kg K fed^{-1} was applied with the first dose for nitrogen fertilizer. Irrigation was added with recommended times during each growing season. The experiments were established on a clayey and well-drained soil. The previous crop was wheat during both of seasons.

2.3. Cotton characters

Plant height, number of fruiting branches and total bolls/ plant, boll weight, number of open bolls/ plant, seed cotton yield /plant, Lint cotton yield/plant, fiber length and finesse, fiber strength (g/tex.) and seed yield /fed.

2.4. Cowpea characters

Plant height, number of branches and pods /plant, pod filling % and length, weight of pods and seeds / plant, 100 seed weight and dry seed yield /fed.

2.5. Application insecticides

These experiments trails were performed to evaluate the efficacy of some insecticides, profenofos and acetamiprid at two of the most dangerous pests (*A. gossypii* and *P. gossypiella* on cotton plants intercropping on three verities of cowpea (Qaha, Kafer elsheikh and kareem). This field trails were arranged in a complete randomized block design. Beginning application of insecticides after three months of cultivar when the number of aphid individuals reached 10/ leave and were sprayed by a knapsack sprayer (cp3), the examination contained until 10 days after sprays (1, 3. 7 and 10 days). In each examination, 20 cotton leaves of the each replicate were randomly taken to count the adults and nymphs of aphid by magnifying glass; the average number per leave was recorded after per examination under field conditions. While the pink bollworm started applications spray when the infestation reached 3%. The interval between any two successive sprays was fifteen days. Samples of green bolls were taken every week after spraying for a period of two week (160 bolls /plot) were taken randomly and brought to the laboratory in clean cloth bags for examination and determination the level of injury, was calculated weekly over 2 weeks after each spray. The results average number of infected bolls for the first spray were calculated and combined with the second spray every week. The green bolls and the presence and absence of pink bollworm larvae were examined after every spray regardless of the presence of apparent injury or within. The results were calculated and recorded as previously described.

2.6. Statistical analysis

The collected data on cotton and cowpea were performed with Costat (version 6.3030 and Microsoft Office Excel 2010 programs). The experimental design was a spilt plot design with three replications. The reduction % results of pests infestation were calculated according to the formula of Henderson and Tilton (1955), and it was considered that there were significant differences, percentages of corrected mortality were subjected to one way ANOVA by SPSS (SPSS, 2004) followed by Duncan multiple range test (Duncan 1955) to determine the significant differences values between pests kill at $P<0.05\%$ by Costat system for windows.

3. Results and Discussion

3.1. Relation intercropping and crop characteristics

The results presented in Table (1) showed that acetamiprid and profenofos had a significant effect on all studied characters of cotton in both seasons. Acetamiprid treatment gave the tallest plants in the two seasons, while Profenofos treatment not gave the tallest plants in both seasons. (acetamiprid and profenofos) resulted in best values of cotton yield and yield components, in both seasons, but profenofos

was highest effective when acetamiprid on insect pests this is due to reducing the infestation level of insect pests. Similar results were obtained by Al-Kady (2021**)** indicated that the enzymes analyzed of cotton plants after treated with imedacloprid and acetamiprid insecticides to some control insect pests, it was stimulated the enzymes responsible for increasing the chemical and physical characteristics of the plant when the plant is stress. Also, results showed that the three cultivars of cowpea had a significant effect on all studied characters in two seasons. The cultivar of cow pea cv. Kareem produced the shortest plants in the both seasons. While, the cultivar of cowpea cv. Qaha gave the tallest plants during the two seasons. Concerning the yield components, the highest values were found at Qaha cultivar in two seasons.

Which in turn enhances the conversion of light energy to chemical energy and consequently encourages dry matter accumulation? These results are mainly due to the effect of distribution of plants for both crops per unit area, which resulted in low or high intra and inter specific competition among cotton plants, as well as between cotton and cow pea plants when intercropped at high densities (Table 2). Similar results were reported by Moshira *et al*., (2022).

Table 1: Effect of acetamiprid and profenofos on yield and yield components of cotton in two seasons.

Components	Plant height (cm)	Number of fruiting branches	Number of total bolls/ plant	Boll weight	Number of open bolls/ plant
			Season 2021		
Acetamiprid	173.36	7.27	18.03	3.36	13.22
Profenofos	171.70	7.04	17.07	3.26	11.58
LSD	1.049	0.062	0.98	0.059	0.16
Solid	180.03	8.10	23.15	4.02	16.32
			Season 2022		
Acetamiprid	173.58	7.30	18.16	3.39	13.40
Profenofos	171.63	7.12	17.22	3.29	11.76
LSD	1.45	0.044	0.94	0.07	0.17
Solid	181.22	8.23	23.21	4.13	16.44

Table 1: cont.

Components	Seed cotton yield /plant	Lint cotton yield/plant	Fiber length	Fiber strength (g/tex.)	Fiber finesse	Seed yield /fed (kantar)
			Season 2021			
Acetamiprid	185.66	76.33	28.64	38.13	3.36	10.51
Profenofos	183.411	75.26	25.61	37.12	3.26	9.84
LSD	22.76	0.11	0.51	0.29	0.07	0.16
Solid cotton	195.25	81.32	35.11	41.15	3.77	11.56
			Season 2022			
Acetamiprid	187.19	76.49	28.81	38.30	3.36	10.51
Profenofos	185.82	75.42	25.80	37.28	2.94	10.29
LSD	4.79	0.09	0.52	0.24	0.062	0.166
Solid cotton	198.32	82.11	36.32	42.36	3.84	11.48

3.2. Effect of interaction

Data recorded in Table (3) indicated that the effect was showed of the number total bolls/ plant, lint cotton yield/plant and fiber strength (g/tex.) in 2021 season. While, acetamiprid with Qaha cultivar was the highest value in this traits. While, in the second season, the effect was clear between compounds treatment and three cultivars of cowpea of the plant height, number of open bolls/ plant, lint cotton yield/plant, fiber length, fiber strength (g/tex.) and fiber finesse. acetamiprid with Qaha cultivar was the highest value in this traits. Similar results were obtained by Moshira *et al*. (2022), but acetamiprid was least effective when Profenofos when used on control insect pests.

Table 2: Effect of three cultivars of cowpea on yield and yield components of cotton in 2021and 2022 seasons.

Traits / Cultivars	Plant height cm	Number of fruiting branches	Number of total bolls/ plant	Boll weight	Number of open bolls/ plant
			Season2021		
Qaha	175.26	7.82	19.68	3.83	13.96
Kafer elsheikh	172.93	7.14	18.41	3.30	13.16
kareem	171.54	6.90	17.03	2.95	12.08
LSD	1.049	0.117	0.34	0.059	0.10
Solid cotton	180.12	8.01	20.35	4.11	15.21
			Season 2022		
Qaha	175.06	7.94	20.16	3.84	14.59
Kafer elsheikh	173.58	7.30	18.16	3.39	13.40
kareem	171.63	7.02	17.22	3.29	11.76
LSD	1.049	0.117	0.340	0.059	0.100
Solid cotton	180.01	8.23	21.18	4.34	15.33

Table 2: cont.

Traits / Cultivars	Seed cotton yield /plant	Lint cotton yield/plant	fiber length	fiber strength(g/tex.)	fiber finesse	Seed yield /fed. (kantar)
			Season 2021			
Qaha	190.8	78.01	30.02	38.83	3.50	10.64
Kafer elsheikh	187.76	76.94	28.92	38.28	3.21	10.38
kareem	179.69	75.99	27.30	37.36	3.03	10.17
LSD	17.80	0.167	0.327	0.182	0.096	0.159
Solid cotton	193.75	80.12	32.33	40.16	4.13	11.36
			Season 2022			
Qaha	191.06	78.18	30.23	38.96	3.64	10.77
Kafer elsheikh	189.87	77.11	29.08	38.43	3.34	10.51
kareem	185.69	76.13	27.48	37.56	3.14	10.29
LSD	4.79	0.091	0.521	0.186	0.815	0.166
Solid cotton	195.12	80.43	32.45	40.48	4.22	11.48

Table 3: Effect of interaction between two components and three cultivars on yield and yield components of cotton in 2021 and 2022 seasons.

Components	Cultivars	Number of total bolls/ plant	Lint cotton yield/plant	Fiber strength(g/tex.)
		Season 2021		
Acetamiprid	**Qaha**	18.57	77.63	39.03
	Kafer elsheikh	18.23	76.30	38.17
	kareem	17.83	76.20	38.10
Profenofos	**Qaha**	17.20	75.17	37.47
	Kafer elsheikh	16.83	75.13	37.20
	kareem	15.70	74.33	35.80

Components	Cultivars	Plant height (cm)	Number of open bolls/ plant	Lint cotton yield/plant	Fiber length	Fiber strength(g/tex.)	Fiber finesse
		Season 2022					
Acetamiprid	**Qaha**	173.5	13.73	77.80	30.03	39.17	3.50
	Kafer elsheikh	172.40	13.60	76.47	28.77	38.30	3.37
	kareem	172.37	12.73	76.40	27.63	38.20	3.20
Profenofos	**Qaha**	172.2	12.40	75.33	27.00	37.63	3.20
	Kafer elsheikh	171.73	11.87	75.27	25.90	37.43	2.90
	kareem	170.80	10.67	74.47	24.50	36.00	2.73

The planting cowpea intercropped with cotton under acetamiprid treatment induced the highest values in plant height, number of branches /plant, number of pods /plant, pod filling % , pod length, weight of pods / plant **,** weight of seeds / plant, 100 seed weight and dry seed yield, (Table 4) unlike profenofos the high impact on insect pests, but not give high results on the crop in both seasons; 2021 & 2022. Differences in yield may be due to the effect of intra and inter specific competition between onion plants and tomato plants. Similar results were obtained by Moshira *et al*., (2022).

Table 4: Effect of acetamiprid and profenofos on yield and yield components of cowpea in two seasons.

Components	Plant height (cm)	Number of branches /plant	Number of pods /plant	Pod filling %	Pod length (cm)
		Season 2021			
Acetamiprid	48.47	7.16	20.68	44.94	11.21
Profenofos	35.70	6.40	19.37	41.77	10.37
LSD	2.95	0.414	1.33	0.77	2.60
Solid cowpea	60.54	9.15	27.83	50.12	14.14
		Season 2022			
Acetamiprid	48.71	7.40	20.91	45.14	11.36
Profenofos	36.07	6.69	19.57	41.97	10.66
LSD	3.021	0.485	1.41	0.718	0.127
Solid cowpea	60.75	9.23	27.88	50.26	14.26

Table 4: cont.

Components	Weight of pods / plant (g)	Weight of seeds / plant (g)	100 seed weight (g)	Dry seed yield /fed (kg)
		Season2021		
Acetamiprid	98.08	72.17	13.82	722.23
Profenofos	93.66	70.27	13.04	711.17
LSD	1.185	1.107	1.41	18.32
Solid cowpea	110.33	80.25	18.26	754.16
		Season 2022		
Acetamiprid	98.34	72.42	14.23	723.49
Profenofos	93.911	70.48	13.31	712.46
LSD	1.173	1.082	1.31	17.01
Solid cowpea	111.12	82.16	18.55	765.23

Data in Table (5) showed that the plant height, number of branches /plant, number of pods /plant, pod filling %, pod length, weight of pods / plant**,** weight of seeds / plant, 100 seed weight and dry seed yield recorded the highest values with cow pea cultivar cv. Qaha. These results are mainly attributed to more light use efficiency of solar radiation utilized by cow pea plants, which resulted in minimizing competition between cowpea plants as well as between cowpea and cotton plants for light, which in turn enhances the conversion of light energy to chemical energy and consequently encourages the dry matter accumulation. These results may be due to the differences of distribution for both crops per unit area under three cowpea cultivars. This deferent of cowpea cultivars resulted in maximizing the effect of intra and inter specific competition among cowpea plants and also between cowpea and cotton plants, which leads to low light use efficiency of solar radiation utilized by cowpea, which in turn low in the conversion of light energy to chemical energy and consequently, low dry matter accumulation. Similar results were reported by Moshira *et al*. (2022).

3.3. Interaction

Data recorded in Table (6) indicated that the effect of interaction between compounds treatment and three cultivars of cowpea was clear for Plant height, number of branches /plant, number of pods /plant, Pod filling %, weight of pods / plant and 100 seed weight. The highest was attained when planting cowpea cv. Qaha intercropped with cotton at Acetamiprid treatment at all studied traits was positive compared to Profenofos. Similar results were obtained by Al-Kady (2021)

Table 5: Effect of three cultivars of cowpea on yield and yield components of cowpea

Varieties	Plant height(cm)	Number of branches /plant	Number of pods /plant	Pod filling %	Pod length
		Season 2021			
Qaha	59.91	11.71	23.78	48.26	12.61
Kafer elsheikh	46.34	5.25	22.74	44.12	11.54
kareem	36.72	4.78	20.52	42.62	10.72
LSD	2.042	0.38	0.411	0.727	10.44
Solid cowpea cv. Qaha	63.24	14.25	25.66	50.38	14.42
Solid cowpea cv. Kaferelsheikh	50.22	6.38	24.35	48.42	12.39
Solid cowpea cv. kareem	40.55	5.23	22.28	45.15	11.43
		Season 2022			
Qaha	60.23	12.44	23.98	48.52	11.67
Kafer elsheikh	46. 64	5.423	23.02	44.31	11.27
kareem	36.98	4.94	20.76	42.81	10.85
LSD	2.062	0.417	0.47	0.72	0.18
Solid cowpea cv. Qaha	65.11	15.13	25.75	50.45	14.75
Solid cowpea cv. Kafer elsheikh	50.36	6.45	24.43	48.50	12.46
Solid cowpea cv. kareem	40.73	5.37	33.36	45.23	11.52

Table 5: cont.

Varieties	Weight of pods / plant	Weight of seeds / plant (g)	100 seed weight (g)	Dry seed yield /fed (kg)
		Season 2021		
Qaha	106.16	75.84	17.01	809.88
Kafer elsheikh	98.99	73.80	15.02	704.14
kareem	95.68	71.78	11.51	660.13
LSD	0.52	0.612	0.26	36.88
Solid cowpea cv. Qaha	108.23	78.42	20.13	988.27
Solid cowpea cv. Kafer elsheikh	100..34	75.93	16.35	784.33
Solid cowpea cv. kareem	98.49	73.28	12.48	701.20
		Season 2022		
Qaha	106.389	76.08	17.3	811.956
Kafer elsheikh	99.26	74.03	15.322	704.922
kareem	95.99	72.01	11.81	661.6
LSD	0.506	0.618	0.282	36.69
Solid cowpea cv. Qaha	110.12	79.12	20.36	990.34
Solid cowpea cv. Kafer elsheikh	100.58	76.12	17.56	792.18
Solid cowpea cv. kareem	98.66	73.87	12.60	712.34

Table 6: Effect of interaction between two components and three cultivars of cowpea on yield and yield components of cowpea

Components	Cultivars	Plant height (cm.)	Number of branches /plant	Number of pods /plant	Pod filling %	Weight of pods / plant	100 seed weight (g)
			Season 2021				
Acetamiprid	**Qaha**	45.23	5.92	21.2	45.67	99.47	15.3
	Kafer elsheikh	43.03	5.36	20.57	44.43	98.57	14.3
	Kareem	40.70	5.20	20.27	44.00	95.43	13.53
Profenofos	**Qaha**	36.57	4.83	20.23	41.93	95.33	13.23
	Kafer elsheikh	35.83	4.63	19.57	41.03	93.3	11.00
	kareem	30.57	4.13	18.3	40.27	92.23	10.30
			Season 2022				
Acetamiprid	**Qaha**	45.53	5.97	21.4	45.83	99.87	15.6
	Kafer elsheikh	43.27	5.50	20.87	44.57	98.83	14.73
	Kareem	41.20	5.39	20.46	44.23	95.7	13.8
Profenofos	**Qaha**	36.8	5.03	20.43	42.20	95.63	13.47
	Kafer elsheikh	36.13	4.80	19.77	41.27	93.57	11.43
	kareem	30.86	4.40	18.50	40.40	92.47	10.53

3.4. Efficacy of some insecticides against *A. gossypii* and against *P. gossypiella*

In the present work, clear that the population of aphid on cotton plants intercropping with cowpea, the infestation started at low number on June and the populations increased gradually till they reach their

peak was observed on August during the two seasons 2021 and 2022. The highest population density was observed on solid cotton plants then cotton intercropping with cowpea, especially varietie Kafer elsheikh, over varieties Qaha and kareem, when the populations ranged from their peak, insecticides determined previously in the material are application. Also, the infestation level of pink bollworm was high in solid cotton plants then cotton intercropping. Also the same procedures are done in the spiny bollworm when the infestation level ranged from their peak was observed on August, (3%) insecticides are application. In the present work, the impact of different insecticides profonefos (cord 72%) and other one novel acetamiprid (Tasulan 20%) against aphid and pink bollworm larvae. Each of these chemicals has its own mode of action.

The results obtained (table 7and 8) revealed that all compounds reduced the infestation level of *A. gossipii* during the two seasons. Concerning the first season, the initial impact (24h after spraying), profonefos observed the higher impact showing 84.80, 81.71 and 83.96 reduction percentage in the infestation level then control intercropping and solid on cotton plants intercropping on the cowpea varieties Qaha, Kafer elsheikh and Kareem, respectively. Acetamiprid recorded the least reduction compering profonefos by 72.30, 70.70 and 80.80 % on cotton intercropping with cowpea Qaha, Kafer elsheikh and Kareem, respectively. The other days may be arranged descendingly in reduction % of A. *gossipii*. Thus, 10 days after spraying profonefos treatment showed the highest reduction by 98.0, 93.751 and 96.74%, followed, descendingly by acetamiprid with 91.91, 89.13 and 93.30 % on cotton intercropping on the cowpea Qaha , Kafer elsheikh and Kareem then control solid, respectively. In second season, results in table (8) indicated that, profonefos also had the higher initial effect against *A. gossipii* by 82.30, 79.63 and 83.34% R. in infestation level on cotton intercropping on the cowpea Qaha, Kafer elsheikh and Kareem then control solid, respectively. While acetamiprid by 76.38, 70.09 and 72.50 reduction percentage. Meanwhile 10 days after treatment, profonefos is gradually increased, the R %. on cotton intercropping on the cowpea Qaha, Kafer elsheikh and Kareem by 97.74, 92.23 and 98.01% R., respectively. While acetamiprid treatment also the resulted the best effect by 93.92, 87.99 and 91.88% R. compering control solid. Data in Table (9) indicated that profonefos reduction *P. gossypiella* damage compared with control in first and second examination. Concerning the first examination 7days after spraying, profonefos gave the higher impact and showed 64.16, 52.51 and 75.01 reduction percentage. on cotton + cowpea Qaha, Kafer elsheikh and Kareem then control solid, respectively. While acetamiprid was the least effective with 22.50, 21.72 and 37.47 % R. on cotton + cowpea Qaha, Kafer elsheikh and Kareem, respectively. Meanwhile, the second examination 15 days after spraying, profonefos indicated the highest reduction in infestation were 97.72, 87.26 and 95.11 reduction percentage. then control with cotton + cowpea Qaha, Kafer elsheikh and Kareem, respectively. Acetamiprid treatment, also data the lowest effective on *P. gossypiella* of 42.10, 67.20 and 58.54% R. during the first season. Data in Table (10) clear that the reduction percentage of the spiny after 7 days from treatment of profonefos, the R.% ranged from 65.76, 73.29 and 74.06 R % by using in on cotton + cowpea Qaha, Kafer elsheikh and kareem, respectively. While acetamiprid caused the least impact in the infestation level on pink bollworm were 33.90, 26.70 and 37.96 reduction percentage in Qaha, Kafer elsheikh and kareem, respectively. Meanwhile 15 days after spraying, profonefos treat cleared the high toxic of 92.12, 85.25 and 79.57 reduction percentage in cotton + Qaha, Kafer elsheikh and kareem, respectively. The obtained data are confirmed with those obtained Salem, S. M.(2021) showed that reduction in infestation level of *P. gosspiella* by used profenofos was higher (seasonal average reached from 72.9 to 81.2%). The toxicity of profenofos aganist *P. gosspiella* larval was the average reduction % in the infestation level was increased by profonefos was 78.38 % (El- sayed *et al.*, 2020). Acetamiprid recorded the low efficacy of spiny were 49.81, 44.14 and 67.14 reduction percentage in the infestation level on cotton + cowpea Qaha, Kafer elsheikh and Kareem, respectively. This data were on line with Darwish *et al*., (2017) indicated that insecticides caused R% in green boll infestation by 37, 78 and 47%. There are many studies indicated that profenofos had no direct effect on larval stage in *P. gosspiella*. Also El-Sharkawy (2015) reported that were insignificant difference between mortality % caused by trebon and cygcron on *P. gosspiella* they found trebon caused highest mortality (95.52) followed by cygron 93.39%, reaner 22.33 R %. Naik *et al*., (2019) found that damage level was significant lower in insecticides treated plots. profenofos and acetamiprid

Table 7: Efficacy of some insecticides and intercropping crops (cotton+cowpea) against *Aphis gossypii* 20 leaves / plot during season 2021

Treatment	Rates /fed.	Cotton + cowpea	N. Pre. Spray	Number and reduction % after spray								General average R%
				24 h		3 days		7 days		10 days		
				N	R%	N	R%	N	R%	N	R%	
Profenofos 72%EC	**750 ml/fed.**	**Qaha**	109.2	19.1	84.80 a	11.5	91.94 a	7.4	95.62 a	3.7	98.01 a	92.59a
Acetamiprid 20% SP	**25 g/fed.**		104.5	33.3b	72.30 b	29.4	78.47 b	22.7	85.98 b	15.4	91.91 b	82.21b
Control	**-**		100.5	115.6	-	131.3	-	155.8	-	171.2	-	-
Profenofos 72%EC	**750 ml/fed.**	**Kafer elsheikh**	174.9	32.8	81.71 a	22.5	87.39 a	14.4	92.59 a	11.3	93.75 a	88.86a
Acetamiprid 20% SP	**25 g/fed.**		151.5	44.2	70.70 b	36.3	76.32 b	23.1	86.27 b	17.0	89.13 b	80.60b
Control	**-**		179.2	178.4	-	182.8	-	199.0	-	185.5	-	-
Profenofos 72%EC	**750 ml/fed.**	**Kareem**	162.4	28.4	83.96 a	18.3	90.39 a	11.2	94.69 a	8.4	96.74 a	91.44a
Acetamiprid 20% SP	**25 g/fed.**		144.1	31.3	80.08 b	28.0	83.44 b	21.4	88.57 b	15.3	93.30 b	86.34b
Control	**-**		165.6	180.4	-	194.3	-	215.2	-	263.1	-	-
Control solid	**-**		211.3	223.1	-	255.7	-	298.4	-	311.3	-	-

In a column, means followed by the same letters are significantly different using DMRT (<0.05)
VA+VB-VC (cowpea varieties)

Table 8: Efficacy of some insecticides and intercropping crops (cotton + cowpea) against *Aphis gossypii* 20 leaves / replicate during season 2022

Treatment	Rates /fed.	Cotton + cowpea	N. Pre. Spray	Reduction % of days after spray								General average R%
				24 h		3 days		7 days		10 days		
				N	R%	N	R%	N	R%	N	R%	
Profenofos 72%EC	**750 ml/fed.**	**Qaha**	125.2	23.9	82.30 a	15.0	89.68 a	9.6	94.35 a	4.2	97.74 a	91.01 a
Acetamiprid 20% SP	**25 g/fed.**		115.4	29.4	76.38	26.3	80.37 b	17,3	88.96 b	11.5	93.92 b	84.90 b
Control	**-**		156.1	167.8	-	181.2	-	211.9	-	231.8	-	-
Profenofos 72%EC	**750 ml/fed.**	**Kafer elsheikh**	178.7	38.3	79.63 a	29.5	84.79 a	20.2	90.70 a	17.3	92.23 a	86.83 a
Acetamiprid 20% SP	**25 g/fed.**		165.2	52.0	70.09 b	43.8	75.58 b	31.7	84.22 b	24.7	87.99 b	79.47 b
Control	**-**		178.8	188.2	-	194.1	-	217.4	-	222.5	-	-
Profenofos 72%EC	**750 ml/fed.**	**Kareem**	145.4	25.1	83.34 a	14.0	91.51 a	7.3	96.09 a	4.6	98.01 a	92.2 a3
Acetamiprid 20% SP	**25 g/fed.**		156.9	44.7	72.50 b	38.7	78.26 b	28.5	85.88 b	20.3	91.88 b	82.13 b
Control	**-**		166.6	172.5	-	189.0	-	214.3	-	265.7	-	-
Control solid	-		198.3	216.2	-	234.9	-	271.7	-	254.1	-	-

Table 9: Efficacy of some insecticides and intercropping crops (cotton+cowpea) against *pectinophora gossypiella* larvae 50 bolls/ replicate during 2021 season

Treatment	Rates /fed.	Cotton + cowpea	N. per spray	Reduction % of days after spray				General average R%
				7 days		15 days		
				N	R%	N	R%	
Profenofos 72 % EC	**750 ml/fed.**	**Qaha**	3.54	1.51	64.16 a	0.34	90.72 a	77.44 a
Acetamiprid 20 % SP	**25 g/fed.**		3.23	2.98	22.50 b	2.63	42.10 b	32.3 b
Control	**-**		4.11	4.89	-	5.78	-	
Profenofos 72 % EC	**750 ml/fed.**	**Kafer elsheikh**	4.14	2.01	52.51 a	0.54	87.26 a	69.88 a
Acetamiprid 20 % SP	**25 g/fed.**		5.01	4.01	21.72 b	3.45	67.20 b	44.46 b
Control	**-**		5.86	5.99	-	6.00	-	
Profenofos 72 % EC	**750 ml/fed.**	**Kareem**	2.89	1.00	75.01 a	0.21	95.11 a	85.06 a
Acetamiprid 20 % SP	**25 g/fed.**		3.21	2.78	37.47 b	1.98	58.54 b	48.01 b
Control	**-**		4.34	6.01	-	6.45	-	-
Control solid	**-**		5.34	6.76	-	6.89	-	-

In a column, means followed by the same letters are significantly different using DMRT (<0.05)

Table 10: Efficacy of some insecticides and intercropping crops (cotton + cowpea) against *pectinophora gossypiella* larvae/50 bolls during 2022 season

Treatment	Rates /fed.	Cotton + cowpea	N. per spray	Reduction % of days after spray				General average R%
				7 days		15 days		
				N	R%	N	R%	
Profenofos 72%EC	**750 ml/fed.**	**Qaha**	4.00	1.65	65.76 a	0.45	92.12 a	78.94 a
Acetamiprid 20% SP	**25 g/fed.**		3.78	3.01	33.90 b	2.71	49.81 b	41.85 b
Control	**-**		3.88	4.67	-	5.54	-	-
Profenofos 72%EC	**750 ml/fed.**	**Kafer elsheikh**	5.03	1.65	73.29 a	0.98 c	85.25	79.27 a
Acetamiprid 20% SP	**25 g/fed.**		4.12	3.71	26.70 b	3.04	44.14	35.42 b
Control	**-**		4.80	5.89	-	6.34	-	-
Profenofos 72%EC	**750 ml/fed.**	**Kareem**	3.86	1.23	74.06 a	1.08	79.57 a	76.81 a
Acetamiprid 20% SP	**25 g/fed.**		3.91	2.98	37.96 b	1.76	67.14 b	52.55 b
Control	**-**		5.03	6.68	-	6.89	-	-
Control solid	**-**		5.77	6.87	-	6.96	-	-

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