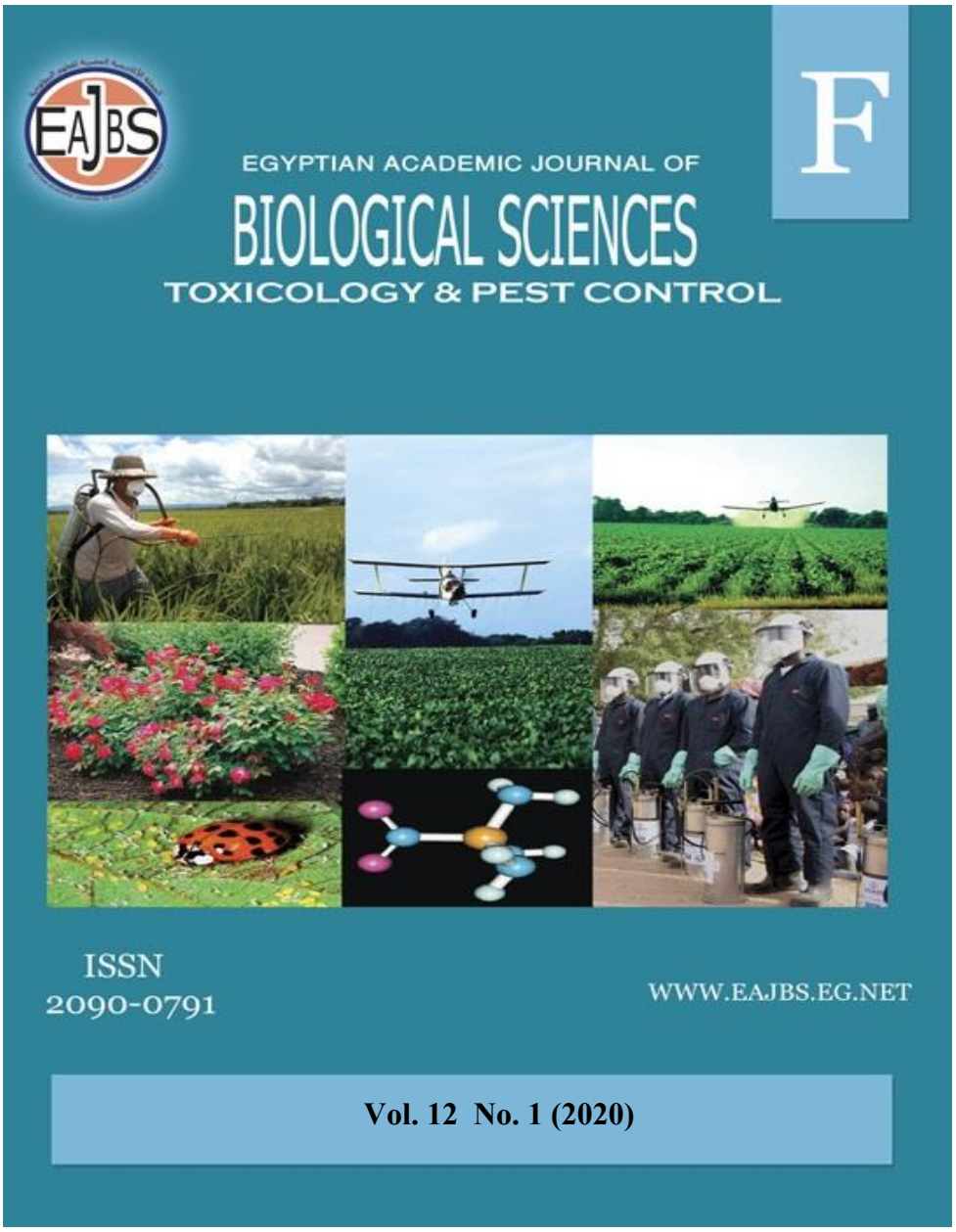

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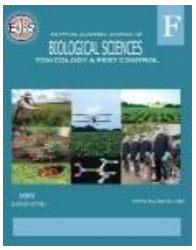

Influence of Some Insecticides on The Incidence of Common Lepidopterous Insect-Pests in Cotton Field

Seham, M. Ismail[1]; Farouk A. Abdel-Galil[2]; Sameh, Sh. Hafez[1] and Usama M. Abu El-Ghiet[3&4]

1- Central Agricultural Pesticides Laboratory, Agric. Research Center, Egypt
2- Plant Protection Dep., faculty of Agric. Assiut University, Egypt.
3- Plant protection Dept. Desert Research Center, Mataria, Cairo, Egypt.
4- Biology Department, Faculty of Science, Jazan University, KSA

E.mail : usama778@yahoo.com

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ABSTRACT

Field studies were conducted in Assiut Governorate during the growing cotton season of 2017 to investigate the effect of five IGR's compounds (Ivcoron, Cligeron, Kfarussel, Kligeron & Hixie) in addition to, Abizo as one oxadiazine and Defensor-c as one pyrethroid against the cotton leafworm, *Spodoptera littoralis* (Boisd.); two pyrethroids; (Super-Muthran & Karelot El-Nasr Gold); three organophorous compounds (Actacron, Agricron & Deliron El-Nasr Star) and Jinyu as one carbamate compound against the cotton bollworms; pink bollworm, *Pectinophora gossypiella* (Saund.) and spiny bollworm *Earias insulana* (Boisd.). Results indicated that Agricron gave a higher reduction of the cotton bollworms infestation amounted to 82.52% followed by Actacron (79.72%), then, Super-Muthran, Karelot El-Nasr Gold, Jinyu & Deliron El-Nasr Star (79.04, 79.04, 78.71 & 78.12%) respectively. For the cotton leafworm, Kfarussel and Abizo proved to be the most effective in initial and residual activity causing 65 & 75% mortality respectively, while Hixie was the least effective. The field trials suggest that these tested compounds reduce the population growth of cotton leafworm and bollworms by affecting its development (larval instars) so, these compounds can be integrated pest management programs of cotton.

INTRODUCTION

Cotton is still among the most important commercial crops in Egypt, heavy losses are yearly recorded due to attack by various pests during the different stages of its development, the major insect-pests of cotton plants under study are the cotton leafworm, *Spodoptera littoralis* (Boisd.); the cotton bollworms, pink bollworm, *Pectinophora gossypiella* (Saund.) and spiny bollworm, *Earias insulana* (Boisd.), considered are a worldwide pest of cotton and in some regions of the world are the key cotton pests where, considered of the most destructive serious pests attacking cotton plants in the subsequent vegetative and fruiting stages of growth and later stages, most of its damage is directed to the green bolls, as well to flower buds and flowers, larvae also damage the quality of the lint, seeds of fully-mature bolls and loss extend to oil contents in the seeds, it has been recorded to cause about 30-40% losses in the yield and increase the costs of insect control

with substantial indirect losses occur as a result of the destruction of beneficial insects and development of insecticides resistance in cotton (Haque, 1991; Mireulle *et al*., 1999 and El-Bassiony 2001). Therefore, cotton growers in Egypt have experienced severe economic loss from cotton pests due to reduced yield, low lint quality and increased costs of insecticides. Therefore, plant protection has now become a necessity of obtaining good yield. Control of these pests depended exclusively on insecticides, (Amin and Gergis 2006) as a result, this pest may develop resistance to those insecticides in many areas. Therefore, the continuous evaluation of the insecticides efficiency for controlling the insect in different areas became urgent. This will give the chance to replace the failed controlling agents by the effective alternatives. Moreover, the establishment of baseline susceptibility and the mechanism of resistance are necessary for effective resistance management strategies.

Therefore, the present study aimed to evaluate the efficacy of some recommended compounds to control some pests attacking cotton belonged five IGR's; Ivcoron, Cleveron, Kfarussel, Kligeron & Hixie); Defensor-c as one pyrethroids and Abizo as one oxadiazine against the cotton leafworm; two pyrethroids; (Super-Muthran & Karelot El-Nasr Gold); three organophorous compounds (Actacron, Agricron & Deliron El-Nasr Star) and Jinyu as one carbamate compound against the cotton bollworms.

MATERIALS AND METHODS

Tested Insecticides:

The evaluated insecticides, common names and rates were introduced in the following Table (1).

Table 1: The tested pesticides and their application rates which used in this study

Pesticides	Group	Rate of application feddan
Chlorfluazuron 5% EC (Ivcoron)	IGR's	400 cm^3
Lufenuron 5% EC (Cleveron)	IGR's	100 cm^3
Lufenuron 5% EC (Kfarussel)	IGR's	100 cm^3
Flufenoxuron 10% EC (Kligeron)	IGR's	200 cm^3
Hexa-Flumuron 10% EC (Hixie)	IGR's	200 cm^3
Indoxacarb 30% WG (Abizo)	Oxadiazine	125 cm^3
Methomyl 24.7% SC (Jinyu)	Carbamate	300 cm^3
Cypermethrin 25% EC (Super Muthran)	Pyrethroids	600 cm^3
Lambda-Cyhalothrin 5% EC (Karelot El-Nasr Gold)	Pyrethroids	375 cm^3
Lambda-Cyhalothrin 10% SC (Defensor-c)	Pyrethroids	50 cm^3 /100 litter
Profenofos 72% EC (Actacron)	O.P.	750 cm^3
Profenofos 50% EC (Agricron)	O.P.	1 liter
Profenofos 50% EC (Deliron El-Nasr Star)	O.P.	1 liter

Experiment:

Field experiments were carried out at the farm Faculty of Agriculture in Assiut Governorate during the season of 2017 whereas, in the season an area was cultivated with cotton variety "Giza 70". Five insect growth regulators (IGR's); one oxadiazine and one pyrethroid were evaluated against the cotton leafworm as shown in Table (1). The experimental area was consisting of five feddans for each treatment which divided into four replicates and involved an untreated check. The spraying was carried out on July, the 26th 2017. The performed treatments three organophosphorous insecticides; two pyrethroids and one carbamate compound were also evaluated against the cotton

bollworms. For all tested compounds, three sprays were done with two weeks interval between sprays. Sprays were done on July 26th, 1st and 23rd August for 1st, 2nd, and 3rd sprays, respectively in 2017 cotton season. In all treatments, one back motor was used with 80 litter of spraying preparation / feddan, for each compound.

Sampling Technique:

1. Determination of Insecticide Residual Toxicity:

Random samples of 100 cotton plants were chosen from each replicate (400 plants per each treatment) were collected from each replicate just before spraying and after 24h from spry (zero time) and then 7 & 10 days post spray and transferred directly to the laboratory for feeding 2nd and 4th larval instars field strain of *S. littoralis*, were collected as egg masses from cotton fields in farm Faculty of Agriculture in Assiut Governorate, larvae reared on castor oil leaves under laboratory conditions (27 ± 2 ºC and RH 65 % ± 5), experimental larvae were selected from the next generations of the first generation. The treated leaves had dried under laboratory conditions before being an offer to hundred larvae in four replicated used for each insecticide**.** Newly moulted 2nd and 4th larval instars were starved for three hours before used in the tests to make insure on empty intestine hundred larvae in four replicates of each insecticide were allowed to fed on the treated leaves in a glass jar covered with muslin for 24 h and then the survived larvae were transferred to jars containing fresh untreated leaves, larvae were fed on leaves immersed in only fresh castor oil leaves as a control. Mortality percentages were recorded after 24hr, 7 & 10 days of treatment, percent mortality was corrected according to Abbott equation (Abbott, 1925).

2.Representative Samples of Bollworms Infestation:

For assessing the infestation with cotton bollworms, *Pectinophora gossypiella* (Saund.) and *Earias insulana* (Boisd.), weekly random samples of 100 green bolls were collected from each replicate (400 bolls per each treatment) just before spraying and after 7 & 14 days of each spray; they were externally and internally examined. The collected bolls were transmitted directly to the laboratory and inspected carefully to find out the infested bolls with pink and/or spiny bollworms. The numbers of inspected larvae in green bolls were calculated to compare the efficacy of the tested insecticides with the untreated check. The equation of Henderson and Tilton (1955) was used to calculate the reduction percentage of infestation.

Tatistical Analysis:

The mean number for each treatment was calculated and compared with a one-way analysis of variance (ANOVA)**.** Duncan's multiple range test was used to determine significant differences ($P<0.05$) between treatments by Costat system for windows, Costat Program (2006).

RESULTS AND DISCUSSION

Insecticide Residual Toxicity:

The means of mortality percentages resulted from exposing 2nd and 4th instar larvae to different treatments are summarized in Table (2). The statistical analysis indicated that the high percentage of second instar larvae mortalities was recorded as 65% at zero interval time for Kfarussel@ the average of mortality percentage for second instar larvae throughout the experiment time indicated that Abizo was the most active treatment (79% mortality), while, the Hixie and Defensor-c were less active, also, all treatments low active against fourth instar larvae.According to the Ministry of Agriculture recommendation for using the chemical compounds on controlling pests, succeeded material should give more than 70% reduction and residual effect, not less than 40%(Rizk *et al*., 1999). The results obtained to evaluate the mortality percentage of second and

fourth instar larvaetogether carried out within the first 24h, during feeding of pretreated leaves sampled at zero time called initial effect, and that carried out within the followed 10 days as residue**.** As shown in Table (2) that the high initial effect (65% mortality) was recorded by Kfarussel[@] while low initial effect (38% mortality) was recorded by Abizo. Concerning the latent effect, Ivcoron, Kfarussel, and Abizo were caused 71; 71 & 75% mortality respectively, while each tested compound caused about 60% mortality. The residual effect of all tested treatments ranged from 75% to 50% mortality. Regarding to general effect, the most active treatment was Abizo, while the lowest active treatment was Hixie Clearly, and tested compounds have been equal residual effects, however, Kfarussel the only compound caused high initial effect, In general, the tested IGR's cause slight initial effect, while all tested treatments Abizo, Ivcoron, Kfarussel, Cleveron, Cligeron, Defensor-c, and Hixie had high latent and residual effect. The results are in agreement with Clarke and Jewess (1990) who showed that the enhanced toxicity of flufenoxuron to *S. littoralis* the compared with diflubenzuron can probably be attributed to its slow metabolism and reduced excretion. In addition, YuXian *et al*., (2003), found that the deduced inhibition values for carboxylesterase activity after feeding the second-instar larvae of *S. exigua* on treated leaves with chlorfluazuron (50 mg/litre) was 60.56%. Also, Sandeep *et al*., (2006) and Ismail (2018) proved that between four insecticides tested against cotton leafworm, indoxicarb was the most effectively controlled in cotton.

Table 2: Effects of tested insecticides against second and fourth instars *Spodoptera* larvae

Compounds	Mortality percentage of second larvae at				Mortality percentage of fourth larvae at				Mean of residual effect %
	zero time*	7 days**	10 days**	Average	zero time	7 days	10 days	Average	
Hixie	56	56	43	50	45	45	60	49	50
Abizo	38	82	76	79	33	71	68	70	75
Ivcoron	41	76	70	73	39	69	66	68	71
Cligeron	56	63	60	62	60	45	62	54	58
Cleveron	45	62	66	64	42	58	60	59	62
Kfarussel	65	60	78	69	50	77	67	72	71
Defensor-c	40	49	60	55	36	48	51	50	53

Zero time* = Initial effect % **7 days & 10 days** = Residual effect %**

Efficacy of the Evaluated Compounds on Cotton Bollworms:

The implied results in (Table, 3) elucidate that after the first sprat, Jinyu gave the least mean number of infested bolls (0.84 /100bolls), while, for the other treatments ranged from 1.2 for Agricron to 1.4 /100bolls for Deliron El-Nasr Star[@] compared to the untreated check (6.00 /100bolls). However, after the second and third sprays, there were significant differences between the tested compounds where they gave means values of infested bolls ranged between 1.2 to 2.4 and100bolls after the second spray and from 1.7 to 2.1 /100bolls after the third spray in comparison with the untreated check (7.1 and 7.7 infested bolls /100bolls, respectively). The calculated overall means of infested bolls \100 bolls amounted to 1.32, 1.36, 1.44, 1.61 and 1.9 for Actacron, Jinyu, Karelot El-Nasr Gold, Super-Muthran Deliron El-Nasr Star, and Agricron, respectively (Table, 4). Moreover, the exhibited data in (Table, 4) show that the performed treatments of Actacron and Super-Muthran gave high reduction of infested bolls after the first spray comprised 82.19% and 79.98% respectively, but values consequently, more or less decreased after the 2nd spray up to 79.26% and 78.41% respectively; and after the 3rd spray up to 77.70% and 77.29% respectively, in respect. Moreover, the treatment of

Actacron gave a high reduction of 82.19% after the first spray, then decreased to 79.26% after the second one, also, decreased again 77.70% after the third spray. In general, the overall means reduction values were higher for the treatments of Actacron and Agricron (79.72% and 82.52% respectively), while they were 79.04, 79.04, 78.71 and 78.12 for Super-Muthran, Karelot El-Nasr Gold, Jinyu and Deliron El-Nasr Star respectively. These data were in harmony with the finding of many investigators, Mahar *et al*., (2004), who reported that fenpropathrin, chlorpyrifos, and endosulfan insecticides were effective against the pink bollworm. Also, El-Aswad and Aly (2007) reported that the pyrethroids were more effective in reducing infestation bollworms than organophsphorus compounds. In addition, Zidan *et al*. (2012) indicated that alpha-cypermethrin and lambda-cyhalothrin were more toxic against predators than chlorpyrifos and methomyl, which induced moderate toxicity**.**

Table 3: Means numbers of infested bolls with bollworms before and after insecticides spraying

N.S	Ins.	Re.	Treatments													
			Super-Muthran®		Karelot El-Nasr Gold		Actacron®		Agricron®		Deliron El-Nasr Star®		Gito®		Untreated Check	
			N.B.S*	N.A.S**	N.B.S	N.A.S	N.B.S	N.A.S	N.B.S	N.A.S	N.B.S	N.A.S	N.B.S	N.A.S	N.B.S	N.A.S
1st Spray	1st Ins.	1	7.50	1.00	7.50	1.75	7.50	1.00	5.50	1.25	7.50	1.50	7.50	1.25	3.50	7.50
		2	6.25	1.00	6.25	1.00	6.25	0.50	6.25	1.00	6.25	1.25	6.25	1.00	4.25	6.25
		3	7.00	0.75	7.00	1.50	7.00	0.50	7.25	1.00	7.00	1.75	7.00	1.00	5.25	7.00
		4	6.50	0.75	6.50	1.25	6.50	0.75	6.50	1.00	6.50	1.50	6.50	1.25	5.50	6.50
		Av.	6.81	0.88	6.81	1.38	6.81	0.69	6.28	1.06	6.81	1.50	6.81	1.13	4.63	6.81
	2nd Ins.	1	6.00	1.50	6.00	1.00	6.00	1.25	7.00	1.50	6.00	1.50	6.00	0.75	3.50	6.00
		2	7.50	1.00	7.50	0.75	7.50	1.00	8.50	1.00	7.50	1.25	7.50	1.00	4.25	7.50
		3	8.75	1.50	8.75	1.00	8.75	1.50	8.00	1.50	8.75	1.00	8.75	1.25	5.25	8.75
		4	8.50	1.75	8.50	0.50	8.50	1.00	8.75	1.50	8.50	1.50	8.50	1.00	3.75	8.50
		Av.	9.25	1.44	9.25	1.06	9.25	1.19	8.06	1.38	9.25	1.31	9.25	1.19	4.19	9.25
G.M.N.S.***			------	1.16c	------	1.22c	-------	0.94b	------	1.22c	------	1.41c	------	1.16c	------	8.08a
2nd Spray	3rd Ins.	1	7.00	1.50	7.00	1.00	7.00	0.75	8.00	1.00	7.00	1.50	7.00	1.00	3.50	7.00
		2	8.50	1.25	8.50	1.25	8.50	1.25	7.75	0.75	8.50	2.00	8.50	1.25	4.25	8.50
		3	9.00	1.00	9.00	1.50	9.00	1.00	9.50	1.25	9.00	1.25	9.00	1.50	5.25	7.75
		4	7.75	1.25	7.75	1.75	7.75	1.25	8.50	1.00	7.75	1.75	7.75	1.00	5.50	6.00
		Av.	8.06	1.25	8.06	1.38	8.06	1.19	8.44	1.00	8.06	1.63	9.06	1.19	4.63	7.31
	4th Ins.	1	6.00	2.00	6.00	1.50	6.00	1.25	9.00	1.50	6.00	2.00	6.00	1.00	3.50	6.00
		2	11.00	1.50	11.00	1.50	11.00	1.50	10.50	1.25	11.00	1.50	11.00	1.25	4.25	9.50
		3	10.25	2.25	10.25	1.25	10.25	1.00	11.00	1.50	10.25	1.25	10.25	1.50	5.25	11.00
		4	9.50	1.75	9.50	1.25	9.50	1.75	9.75	1.00	9.50	1.75	9.50	1.25	3.75	10.25
		Av.	9.75	1.88	9.75	1.38	9.75	1.38	10.06	1.31	9.75	1.63	9.75	1.25	4.19	9.19
G.M.N.S.***			------	1.57d	------	1.38c	------	1.29c	------	1.16c	------	1.63d	----	1.22c	------	8.25a
3rd Spray	5th Ins.	1	7.50	1.00	7.50	2.00	7.50	1.50	10.00	2.50	7.50	1.50	7.50	1.50	3.50	7.50
		2	10.00	1.50	10.00	2.50	10.00	1.50	12.25	2.00	10.00	1.75	10.00	1.25	4.25	10.00
		3	12.50	2.00	12.50	1.25	12.50	2.00	13.50	1.75	12.50	2.00	12.50	1.75	5.25	12.50
		4	13.75	1.25	13.75	1.50	13.75	1.25	14.00	1.25	13.75	2.25	13.75	1.50	5.50	13.75
		Av.	10.94	1.81	10.94	1.63	10.94	1.56	12.44	1.88	10.94	1.88	10.94	1.50	4.63	10.94
	6th Ins.	1	6.00	2.75	6.00	2.00	6.00	2.25	11.25	1.50	6.00	2.50	6.00	2.00	3.50	6.00
		2	13.00	2.25	13.00	1.50	13.00	1.50	13.00	1.75	13.00	2.50	13.00	2.25	4.25	11.50
		3	15.25	2.00	15.25	1.75	15.25	2.50	14.75	1.00	15.25	1.50	15.25	1.50	5.25	13.00
		4	11.50	2.50	11.50	2.00	11.50	1.25	15.50	1.50	11.50	2.00	11.50	1.75	3.75	15.25
		Av.	14.75	2.38	14.75	1.81	14.75	1.88	13.63	1.44	14.75	2.13	14.75	1.89	4.19	11.43
G.M.N.S.***			-------	2.10d	------	1.72d	------	1.72d	------	3.32e	------	2.01d	------	1.70d	------	11.19a
O.M.N.****			-----	1.61d	-----	1.44c	-----	1.32c	----	1.9d	----	1.68d	----	1.36c	----	9.17a

Means followed by the same letter are not significantly different according to DMRT (P<0.05).
G.M.N.S.*** = General Mean Numbers of spray O.M.N.**** = Overall Man Numbers each insecticide
N.B.S* = Number Before Spray N.A.S** = Number After Spray

Table 4: The calculated percentage of reduction of infested bolls with bollworms after application of evaluated insecticides

N. Spray	Inspections	Replicates	The percentage reduction %					
			Super-Muthran[Ø]	Karelot El-Nasr Gold	Actacron[Ø]	Agricron[Ø]	Deliron El-Nasr Star[Ø]	Jinyu[Ø]
1st Spray	1st Ins.	1	78.47	78	80.61	81	75.19	82.19
		2	77.66	76.3	77.98	78	73.80	82.20
		3	81	78.10	85.59	84	73.35	70.56
		4	80.32	78.10	87.23	77	77	71.54
		M. R. %	79.36	78.02	82.85	80	74.84	76.62
	2nd Ins.	1	82	78.31	70.64	77.70	83	82.7
		2	83.5	75.55	89	82	82.14	82
		3	73	80.15	82.47	75.43	78.30	77
		4	84	80	84	83	73.77	73.66
		M. R. %	80.6	78.50	81.53	79.53	79.30	78.84
General Means Reduction % of Spray			79.98	78.26	82.19	79.77	77.07	77.73
2nd Spray	3rd Ins.	1	77.6	70.78	75	85	76.5	88.45
		2	82	89	77	83	75.44	89.60
		3	75	82.52	77	84	79	64.76
		4	77.2	84.36	81.46	80.99	77	73.21
		M. R. %	77.92	81.67	77.62	83.25	76.99	79.01
	4th Ins.	1	82.7	77	79.5	70.99	80	92.9
		2	82	79	83.5	82	80.20	91
		3	77.21	75.2	83	89	75.66	64.89
		4	73.70	76	77.6	84.35	78.93	72.39
		M. R. %	78.90	76.80	80.90	81.59	78.70	80.30
General Means Reduction % of Spray			78.41	79.24	79.26	82.42	77.85	79.66
3rd Spray	5th Ins.	1	75.50	79	75.19	80.61	74.6	73.14
		2	77	77.15	73.70	77.98	76	78.66
		3	76	85	73.35	85.50	82	83.10
		4	81	87	77	87	83	83
		M. R. %	77.38	82.04	74.81	82.77	79.65	79.48
	6th Ins.	1	77.34	77.20	83	85.38	77.80	79
		2	82	77	77.4	94	82.60	76
		3	82	76	83	83.57	75	78
		4	79	80.6	79	88.8	85.40	79
		M. R. %	80.09	77.20	80.60	87.94	79.20	78
General Means Reduction % of Spray			78.74	79.62	77.71	85.36	79.43	78.74
Overall Mean of Reduction			79.04	79.04	79.72	82.52	78.12	78.71

CONCLUSION

From the obtained results, it could be concluded that the tested compounds have a significant effect on cotton leafworm and cotton bollworms, where reduced the insect population these effects are very important from a practical point of view. Thus these compounds could be recommended as important tools in integrated management programs to obtain a successful control for these insect pests.

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ARABIC SUMMARY

تأثـير بعض المبيدات الحشرية على خفض مستويات الإصابة بآفات القطن الحشرية من رتبة حرشفية الأجنحة فى حقول القطن

سهام منصور إسماعيل[1], فاروق عبدالقوى عبدالجليل[2], سامح شعبان حافظ, اسامة محمد ابوالغيط[3,4]

1-المعمل المركزى للمبيدات مركز البحوث الزراعية الدقى جيزة

٢- قسم وقاية النبات كلية الزراعة جامعة اسيوط-2

3- قسم وقاية النبات- مركز بحوث الصحراء- المطرية- القاهرة

٤- قسم الأحياء- كلية العلوم- جامعة جازان - السعودية

إجريت هذه الدراسة فى محافظة أسيوط خلال موسم ٢٠١٧ بهدف دراسة تـأثير خمس مركبـات مـن منظمـات النمو الحشـرية (ايفكـورون؛ كليفـرون؛ كفروسـيل؛ كليجـرون وهيكسـي) ومركـب ابيـزو مـن مجموعـة اوكسـاديازين ودفنسر c كمركب بيرثرويد ضد دودة ورق القطن. وكذلك دراسة تأثير مـركبين بيرثرويـد (سـوبرمثرين وكـاريلوت النصر جولد) وثلاث مركبات فوسفورية (أكتاكرون؛ اجريكرون ودليرون النصر ستار) بالإضافة إلـى مركـب انجيـو من الكارباميت ضد ديدان اللوز (القرنفلية والشوكية). أوضـحت النتـائج بالنسـبة لديـدان اللـوز أن مركـب أجريكـرون أعطى معدل خفض ٨٢,٥٢٪ يليه الأكتاكرون ٧٩,٧٢٪ ثم يليهم كلاً من سوبر مثرين؛ كاريلوت النصر جولد؛ انجيو ودليرون النصر ستار بنسب خفض ٧٨,١٢٪، ٧٨,٧١، ٧٩,٠٤ و ٧٩,٠ على التوالى. أما بالنسبة لدودة ورق القطن فقد إنخفضت فاعلية المركبات تدريجياً بعد الرش فكان مركب كفروسيل أعلـى المركبـات فـى التـأثير الأولـي (٦٥٪) بينما ابيزو أعلى المركبات فى التأثير المتبقي (٧٥٪) وأقل المركبات فاعلية هو مركب هيكسي. ومن خلال نتائج هـذه التجارب الحقلية يتضح أن هذه المركبات المختبرة أدت إلى أنخفاض عالي فى أعداد دودة ورق القطـن وديـدان اللـوز من خلال التأثير على النمو (التأثير على الأطوار اليراقية) وعلى ذلـك يمكـن دمـج هـذه المركبـات فـى دورات تبادليـة ضمن برامج المكافحة المتكاملة للقطن.