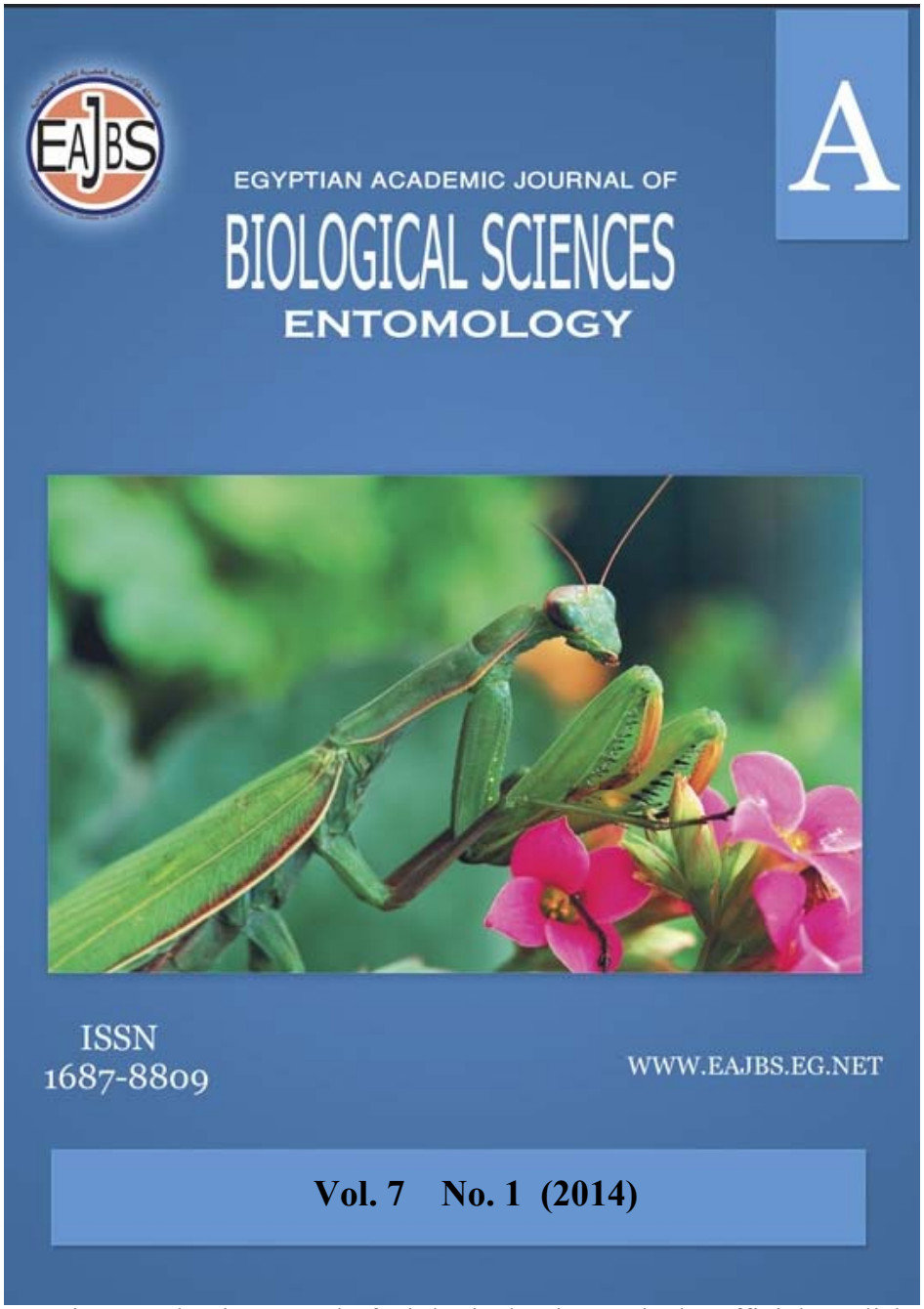

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Field comparison between droplet distribution and the bioresidual activity of different insecticides against *Spodoptera littoralis* (boisd) by using certain ground spraying equipment on cotton platns

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ABSTRACT

Field experiments are carried out in an area of about 1.9 feddan planted with cotton plants Giza (89) during season 2005 in 28th June at Kafr Bani Ghrian, Monofia governorate. The selected area was split into 18 plots and control plots. Three products were sprayed with Profenofos, Spinosad and Pyriproxyfen of recommended rate and ¾ recommended rate and one treatment left without spraying as control by using conventional motor sprayer (600 L./Fed.), Motorized Knapsack sprayer (Agromondo) (20L/Fed.) and hand held compression sprayer (Kwazar) (94L/Fed.) for each product the average number of egg-masses of cotton leaf worm/m² was 3. Data indicated that, all tested compounds induce negative influenced on larval survival. The most effective compounds are Profenofos and Pyripoxyfen followed by Spinosad. It could be recommended to use Profenofos and Pyriproxyfen followed by Spinosad with LV spraying equipment with not less than (20L/Fed.) and use ¾ recommended dose which revealed successful results in mortality.

Key words: Cotton Plants, Bioresidual activity, *Spodoptera Littoralis*, Profenofos, Pyriproxyfen, Spinosad, LV and Ground Equipment.

INTRODUCTION

Much attention has been focused in compounds which disrupt the normal process of insect development. They are known as Insect Growth Regulators (IGR's). The use of biological agents to control pests has been known and practiced for a long time. In Egypt, majority of interest was directed to the type, dosage of insecticides used, while a lesser attention was given to the application methods. A comparative studies on the efficiency of certain ground sprayers was carried out by (Hindi, 1992), who recorded significant variation in the deposit due to arrangement of the nozzles,

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spray technique and rate of application. The world attention was directed to minimization of spraying volumes and the costs of control pests which may be achieved by using a cheap and effective insecticide or using developmental ground spraying technique with low cost of application per feddan.

MATERIALS AND METHODS

The Tested Compunds:-

1. Pyrirpoxyfen (Admiral®), 10% E.C., 750 ml/fed. For total recommended dose rate and 562.5 ml/fed. For ¾ recommended dose rate.
2. Profenofos (Selecron®), 720 E.C., 750 ml/fed. For total recommended dose rate and 562.5ml/fed. For ¾ recommended dose rate.
3. Spinosad (Tracer®), 24 E.C., 50 ml/fed. For total recommended dose rate and 37.5 ml/fed. For ¾ recommended dose rate.

Spraying equipment tested on cotton fields:-

Three ground application machines were selected to perform the scope of this work as follows:

1. Conventional motor sprayer (Wisconsin) (600L./fed.)
2. Motorized Knapsack sprayer (Agromondo) (20L./fed.)
3. Hand held compression sprayer (Kwazar) (20L./fed.)

Execution of field experiments:-

Arrangements of the experiments.

Field experiments were carried out during season 2005 on 28th June in private cotton field located at Kafr Bani Ghrian, Koiesna District, Monofiya Governorate. The cotton cultivated was Giza 89. The experiments were done under local meteorological conditions of 32°c average temperature, 58% average RH and 2m/sec. average wind velocity. The selected area of 1.9 feddan was split into 18 plots and control plot. The area of each plot was about 420 m², two rows of cotton plants between treatments were not sprayed as barrier zones to avoid drift spray, spraying operations have not been done with any insecticides before execution the field experiment. The experimental fields was divided into nine plots and were sprayed with recommended rate, nine plots were sprayed with ¾ recommended rate and one treatment left without spraying as a control, with three alternative insecticides Spinosad, Profenofos and Pyriproxyfen, respectively. The average number of egg-masses of cotton leaf worm/m² was 3. The average number of egg-masses of cotton leaf worm/feddan was 12600. In each plot five cotton plants were selected and remarked to define the egg-masses and follow the results before and after spraying.

Bioassay Procedure:-

Field experiments was conducted in cotton field highly infested with egg-masses of *S. littoralis*, some of them were hatched into 1st and 2nd instars Larvae, others still un-hatched egg-masses. In order to evaluate the tested compounds on cotton leaf worm, pre-treatment count was recorded before spraying at five marked plants for each treatment, and post-treatment count was recorded after 1,3,7 days of treatment (1st – 2nd) larval instars were considered the small larvae in hatched egg-masses before the treatment, while the still un-hatched egg masses were marked and observed them to record their hatching or un-hatching due to the effect of the tested chemicals, also the pathogeninicity symptoms on the affected larvae were recorded.

Phytotoxic effect:-

It was determined by recording any color change, leaf curling or flaming up to 8 days of spraying, after Badr *et al*. (1995).

Calculation and data analysis:

a. The percentage of reduction in the field experiment was calculated according Henderson and Tilton (1955).

b. Statistical analysis of results according to SAS (1996) for Biological studies: Duncan's for biological evaluation of insecticides in field.

RESULTS

Bioresidual activity of Profenofos against *S.littoralis* larvae on cotton field:

Efficiency of Profenofos represented as mortality percentages after one day of treatments Tables (1& 2) indicated that, the 100% reduction in population larvae of *S.littoralis* was occurred by using the three sprayers, the droplet sizes were 154& 158μm and N/cm^2 were 163 & 149 for recommended and 3/4 recommended dose sprayed with Agromondo sprayer. The droplet sizes were 166& 177 μm (VMD) and number of droplets/cm^2 (N/cm^2) were 180 & 179 for recommended and 3/4 recommended dose sprayed with Kwazar sprayer.

Table 1: The relation between droplet distribution obtained by the tested ground spraying equipment and the corresponding mortality of (1st – 2nd) larval instars of *S. littoralis*, using the total recommended rate of insecticides on cotton field.

Insecticide & dose rate (ml / fed.)	Tested sprayer	VMD	N / cm^2	% Mortality	
				After 1 day of treatment	Average (Mean Residual)
Profenofos (750)	Agromondo	154	163	100	100
	Kwazar	166	180	100	100
Spinosad (50)	Agromondo	146	181	85	92.5
	Kwazar	149	125	75	88
Pyriproxyfen (750)	Agromondo	144	164	95	97.5
	Kwazar	139	130	84	92

VMD = Volume Mean Diameter.

N / cm^2 = Number of droplets per square centimeter.

Table2: The relation between droplet obtained by the tested ground spraying equipment and the corresponding mortality of (1st – 2nd) larval instars of *S. littoralis*, using 3/4 recommended rate of insecticides on cotton field.

Insecticide & dose rate (ml / fed.)	Tested sprayer	VMD	N / cm^2	% Mortality	
				After 1 day of treatment	Average (Mean Residual)
Profenofos (562.5)	Agromondo	158	149	100	100
	Kwazar	177	179	100	100
Spinosad (37.5)	Agromondo	162	166	85	92.5
	Kwazar	148	191	70	86
Pyriproxyfen (562.5)	Agromondo	151	161	91	95.5
	Kwazar	132	113	82	91

VMD = Volume Mean Diameter.

N /cm^2 = Number of droplets per square centimeter.

Bioresidual activity of Spinosad against *S. littoralis* larvae on cotton field:

Efficiency of Spinosad represented as mortality percentages after 24 hours of spraying as presented in Tables (1& 2). The highest reduction in population of *S.littoralis* larvae was occurred by Agromondo Motor sprayer (20 L/fed.); the droplet sizes and number of droplets/cm^2 were 146 & 162, &92.5% for residual for full recommended and 3/4 recommended percetages μm, 181 & 166, wherever, the

mortality percentages after two days were 85& 85 % for initial, 92.5, & 92.5% for residual for full recommended and 3/4 recommended percetages after one day were 80&80% for initial, 90&90% for residual for full recommended and 3\4 recommended dose, respectively. Kwazar sprayer (94L/fed.); revealed mortality percentages of larvae of *S.littoralis* after one day of treatment by using Spinosad formulation as 75&70% for initial, 88&86% for residual for full recommended &3/4 recommended percetages ended &3/4, &92.5% for residual for full recommended and 3/4 dose, respectively. The droplet sizes were 149 &148 μm, (VMD), the number of droplets \ cm^2 were 125 & 191 but the percentages of mortality after two days were 75&70 for full recommended and 3/4 recommended dose ,respectively.

Bioresidual activity of Pyriproxyfen formulation against *S.littoralis* larvae on cotton field:

Efficiency of Pyriproxyfen (IGR) represented as mortality percentages after one day of spraying. Tables (1& 2) indicated that, the highest reduction in population of *S. littoralis* larvae was occurred by using Agromondo motor sprayer (20 L/fed.); the droplet sizes were 144 & 151 μm (VMD), number of droplets/cm^2 were 164 & 161, and the mortality percentages after one day of treatments were 95 & 91% for full recommended and 3/4 recommended dose rate, respectively followed by wisconson motor sprayer (600 L/fed.); the mortality percentages were 90 & 82 % for intial, 95 and 93.5% for residual for full recommended dose and 3/4 recommended dose, respectively. On the other hand, Kwazar sprayer revealed the lowest mortality percentage after two days of treatments were 84 & 82% for recommended dose and 3/4 recommended dose, successively, wherever droplet sizes averages were 139 & 132 μm (VMD) and number of droplets/ cm^2 were 130 & 113.

It was noticed that, Pyriproxyfen with Agromondo Motor sprayer (20L/fed.) revealed more increase of the mortality percentages after two days of spraying ranged between 10& 6 for recommended and 3/4 recommended dose in comparison with the same sprayer and Spinosad formulation. The spray quality which obtained from Agromondo sprayer when used Pyriproxyfen formulation, also better than with Spinosad formulation, in the case of total recommended dose rate as shown in Tables (1&2).

Relationship between spray lost on ground and the bioresidual activity of insecticides used:

Data in Tables (3&4) showed that the relationship between spray lost on ground equipment and the bioresidual activity of insecticides used. This relationship was very important due to the mobility of the larvae certainly in the early stages on the cotton seedling, the lower parts of the cotton plant and the soil, therefore, water sensitive cards were put on a special wire on the surface of the soil between cotton plants to capture the droplets which fallen between plants and find a relationship between it and the mortality percentages after day for insecticides used and average mean mortality (residual).

Agromondo Motor sprayer (20 L/fed):

Data in Tables (3&4) showed that the lost spray percentages were 16, 16 & 15 % from the total spray volume in the case of Profenofos, Spinosad and Pyriproxyfen, and percentages of mortality were 100, 85 & 95% at total recommended dose, respectively, but the same sprayer revealed that the lost spray percentages between plants were 15, 14 & 14% from the total spray volume in the case of the same insecticides, and mortality percentages were 100, 85 & 91 % at 3/4 recommended dose and the same insecticides, successively.

Hand held compression (Kwazar) sprayer (94L/fed.):

Data in Tables (3& 4) showed that, the lost spray percentages were 19, 21 & 21% in the case of Profenofos, Spinosad & Pyriproxyfen, and mortality percentages were 100, 75 & 85% at total recommended dose, respectively, but the same sprayer revealed that, percentages of spray lost between plants were 18,18 & 20% from the total spray volume in the case of the same arrangement of insecticides, the mortality percentages were 100,70 & 82% at 3/4 recommended dose successively. The lost spray percentages increased with the increase in the spray volume and vice versa. There was no significant difference in the lost spray percentages between the total and ¾ recommended dose rate.

Table 3: Lost spray on ground, as produced by low volume ground spraying equipment, at the early cotton season (2005), using certain insecticides at total recommended rate against (1^{st} _ 2^{nd}) larval instars of *S. littoralis.*

Insecticide & dose rate (ml / fed.)	Tested sprayer & spray volume (L / fed.)	*N / cm^2 of total spray droplets	N / cm^2 droplets (on ground)	% N/cm^2 (ground) ——— x 100 N/Cm^2 (Plants+ground)	% Mortality	
					After1 day of treatment	Average (Mean Residual)
Profenofos (750)	Agromondo (20)	579	90	16	100	100
	Kwazar (94)	664	124	19	100	100
Spinosad (50)	Agromondo (20)	643	100	16	85	92.5
	Kwazar (94)	475	100	21	75	88
Pyriproxyfen (750)	Agromondo (20)	582	90	15	95	97.5
	Kwazar (94)	492	105	21	84	92

N / cm^2 = Number of droplets per square centimeter. * On cotton plants and lost spray on ground

Table 4: Lost spray on ground, as produced by low volume ground spraying equipment, at the early cotton season (2005), using certain insecticides at 3/4 recommended rate against (1^{st} _ 2^{nd}) larval instars of *S. littoralis.*

Insecticide & dose rate (ml / fed.)	Tested sprayer & spray volume (L / fed.)	*N / cm^2 of total spray droplets	N / cm^2 droplets (on ground)	% N/cm^2 (ground) ——— x 100 N/cm^2 (Plants+ground)	% Mortality	
					After1 day of treatment	Average (Mean Residual)
Profenofos (562.5)	Agromondo (20)	505	81	15	100	100
	Kwazar (94)	655	118	18	100	100
Spinosad (37.5)	Agromondo (20)	581	83	14	85	92.5
	Kwazar (94)	702	129	18	70	86
Pyriproxyfen (562.5)	Agromondo (20)	563	80	14	91	95.5
	Kwazar (94)	424	85	20	82	91

N / cm^2 = Number of droplets per square centimeter. * On cotton plants and lost spray on ground

Relationship between the tested chemicals, techniques, and the mortality percentages of *S. littoralis* on cotton field.

Bioassay evaluation:

To study the influence of various compounds and spraying techniques before and after application Abbot's formula (1925), and Handresson & Tilton's formula (1955) was adopted to calculate the reduction percentages in the population of *S. littoralis* on cotton plants. Tables (5&6) and showed that, the percentages of reduction of ($1^{st}$and 2^{nd}) larval instars of *S. littoralis* affected by certain insecticides sprayed with certain ground application techniques during the early cotton season of (2005) using total recommended and 3/4 recommended dose rate.

The following remarks and results were obtained:

There was no Phytotoxic effect on cotton leaves after treatments, on change in the leaves color, no leaf curling or flaming up phenomena was happened.

As soon after application treatments carried out, the larvae began aggregation on the cotton leaves inspite of dispersion on the leaf surfaces of untreated leaves.

The egg masses deposited two days after treatments began affected after hatching and feeding on treated cotton leaves with insecticides used.

Table 5: Reduction Percentage in (1 st- 2nd) larval of *S.littoralis* affected by certain insecticides sprayed with certain ground equipment during the early cotton season of (2005), using the total recommended dose rate, data are averages of five replicates.

Equipment / Treatment	Counted larvae before treatment			% Reduction after the day indicated																							
				2nd						4th						8th						General mean					
	Agromondo	Kwazar	Wisconson	Agromondo (20L/fed.)		Kwazar (94 L/fed.)		Wisconson (600 L/fed.)		Agromondo (20 L/fed.)		Kwazar (94 L/fed.)		Wisconson (600 L/fed.)		Agromondo (20 L/fed.)		Kwazar (94 L/fed.)		Wisconson (600 L/fed.)		Agromondo (20 L/fed.)		Kwazar (94 L/fed.)		Wisconson (600 L/fed.)	
				C	R%	C	R%	C	R%	C	R%	C	R%	C	R%	C	R%	C	R%	C	R%	C	R%	C	R%	C	R%	C	R%
Spinosad (50ml/fed.)	240	220	275	36	85	55	75	55	80	0	100	22	90	0	100	—	—	0	100	—	—	18	92.5	26	88	28	90
Pyriproxyfen (750ml/fed.)	225	375	215	12	95	60	84	22	90	0	100	0	100	0	100	—	—	—	—	—	—	6	97.5	30	92	11	95
Profenofos (750ml/fed.)	250	225	250	0	100	0	100	0	100	—	—	—	—	—	—	—	—	—	—	—	—	0	100	0	100	0	100
Untreated	235	200	240	235	—	200	—	240	—	220	—	270	—	243	—	225	—	265	—	237	—	230		272	—	243	—

C = Count of life larvae after treatment.
R = % Reduction of larvae.

Table 6: Reduction Percentage in (1 st- 2nd) larval of *S.littoralis* affected by certain insecticides sprayed with certain ground equipment during the early cotton season of (2005), using the 3/4 recommended dose rate, data are averages of five replicates.

Equipment / treatment	Counted Larvae before treatment			% Reduction after the day indicated																							
				2nd						4th						8th						General mean					
	Agromondo	Kwazar	Wisconson	Agromondo (20 L/fed.)		Kwazar (94 L/fed.)		Wisconson (600 L/fed.)		Agromondo (20 L/fed.)		Kwazar (94 L/fed.)		Wisconson (600 L/fed.)		Agromondo (20 L/fed.)		Kwazar (94 L/fed.)		Wisconson (600 L/fed.)		Agromondo (20 L/fed.)		Kwazar (94 L/fed.)		Wisconson (600 L/fed.)	
				C	R %	C	R %	C	R %	C	R %	C	R %	C	R %	C	R %	C	R %	C	R %	C	R %	C	R %	C	R %	C	R %
Spinosad (37.5ml/fed.)	240	378	240	37	85	113	70	49	80	0	100	49	87	0	100	—	—	0	100			19	92.5	54	86	25	90
Pyriproxyfen (562.5ml/fed)	280	250	210	26	91	45	82	29	87	0	100	0	100	0	100	—	—	—	—	—	—	13	95.5	32	91	15	93.5
Profenofos (562.5ml/fed)	225	388	260	0	100	0	100	0	100	—	—	—	—	—	—	—	—		—	—	—	0	100	0	100	0	100
Untreated	225	280	248	235	—	280	—	248	—	228	—	270	—	240	—	225	—	265	—	237	—	230	—	272	—	240	—

C = Count of life larvae after treatment.
R = % Reduction of larvae.

The larvae treated with tested insecticides began whitish in color from hind gut region to all body then death turned to pale black color after to days of treatment.

Insecticides treated plats revealed the lowest cotton yield loss in comparison with untreated plots; their application reduced the incidence of cotton leaf worm

infestation on cotton and decreased the percent loss of cotton yield in all treatments and with all sprayers.

Experimental data showed that, excellent control of *S. littoralis,* when Profenofos with the total recommended dose rate at any of the three spray volumes tested, Agromondo, Wisconson and Kwazar sprayers. The general mean of reduction percentages in *S.littoralis* infestation on cotton plants as calculated were 100% in all. However, Pyriproxyfen with total recommended dose rate at any of the three spray volumes tested, Motor sprayer (Agromondo), Motor spraye (Wisconson), and Kwazar sprayer, the general mean of reduction percentages in *S.littoralis* infestation on cotton plants were 97.5, 95 and 92 % for the (1^{st} and 2^{nd}) larval instars, respectively. On the other hand, Spinosad with total recommended dose gave promising results also, at any of three spray volumes tested, Motor sprayer (Agromondo), Motor sprayer (Wisconson), and Kwazar sprayer, the general mean of reduction percentages in *S.littoralis* infestation on cotton plants as calculated were 92.5, 90 &88% respectively.

Experimental data showed that, No significant difference between general percentages of reduction of 3/4 recommended dose and the general percentages reduction of the total recommended dose.

Statistical analysis of variance procedure Duncan's multiple range test for variable factors of cotton field at a degree of freedom 36. The tested spraying equipment could be categorized in descending order according to the quality of spray coverage, the percentage of lost spray on ground as a pollution indicator, and the bioefficiency of toxic insecticides used on cotton leaf worm larvae *S.littoralis* as follows:

Selecron with full and 3/4 recommended dose by any of the three sprayers used, motor sprayer Agromondo (20 L/fed.), motor sprayer wisconson (600L/fed.), and Kwazar sprayer (94 L/fed.), Pyriproxyfen, full dose with Agromondo sprayer (20 L/fed.), Pyriproxyfen, 3/4 recommended dose with Agromondo sprayer (20L/fed.), Pyriproxyfen, full dose with Wisconson sprayer (600L/fed.), Pyriproxyfen, 3/4 recommended dose with Wisconson sprayer (600L/fed.), Spinosad, full and 3/4 recommended dose with Agromondo sprayer (20 L/fed.), Pyriproxyfen, full dose with Kwazar sprayer (94L/fed.), Pyriproxyfen, 3/4 recommended dose with Kwazar sprayer (94L/fed.), Spinosad, full and 3/4 recommended dose with Wisconson sprayer (600L/fed.), Spinoad, full dose with Kwazar sprayer (94 L/fed.), and Spinosad, 3/4 recommended dose with Kwazar sprayer (94 L/fed.).

There was a negative complete correlation between (VMD) and the mean residual of mortality of *S.littoralis*, while there was a positive complete correlate correlation between N/cm^2 and the mean residual of mortality of *S. littoralis* .

DISCUSSION AND CONCLUTION

Field experiment was carried out on heavy infested area with cotton leafworm larvae at early season on cotton plants. For evaluation the field performance of Low-Volume spraying machines; Knapsack Motor sprayer (Agromondo)(20 L/fed.), Hand-held compression sprayer (Kwazar)(94 L/fed.) and a High-Volume spraying equipment Conventional Motor Sprayer (Wisconson)(600 L/fed.); to spray Profenofos (OP compound), Bio agent (Spinosad) and Pyriproxyfen (IGR) with full recommended dose and 3/4 recommended dose . A satisfactory coverage was obtained on cotton plants, the droplet spectrum was obtained in field experiment was agreed with the optimum droplet sizes which mentioned by Himel (1969). The best obtained result was 20 L/fed. as spray volume, 154 μm and 163 droplets/cm^2 , these

results agreed with (Himel *et al.*, 1969) in the optimum droplet size to control cotton leafworm in cotton fields by ground equipment. Profenofos revealed the best bioefficiacy results with the three tested sprayers (Agromondo) Motor sprayer (20 L/fed.), Kwazar sprayer (94 L/fed.) and Wisconson Motor sprayer (600 L/fed.) . Also , Pyriproxyfen revealed the best bioefficiacy results with motor sprayer Agromondo (20 L/fed.) followed by Spinosad with the same sprayer, and these results agreed with Hindy *et al*. (2004) and Genidy *et al.* (2005) which recommended KZ oil and Pyriproxyfen followed by Agerin using low volume spraying because of reducing the time lost in process filling the machines, improve the homogeneity of the spray solution on the plant leaves and saving the lost spray on the ground. Also, there was no significant difference between recommended dose rate and 3/4 recommended dose with low volume spraying.

The data showed that, Agromondo Motor sprayer (20L/fed.) is the best equipment to control cotton leafworm on cotton plants.Also , the lowest spray volume and the lowest percentage of lost spraying between plants, this results was agreed with Hindy *et al*. (1997) , who mentioned that, there was a positive relationship between rate of application and spray lost on ground.

Generally, Spinosad, and Pyriproxyfen are recent insecticides avoid the activity of cotton leafworm on cotton plants, and safe the children who were picked manually egg masses during hot days, and safing also the traditional insecticides which injures the human body and the agricultural environment.

It could be recommended to use Profenofos and Pyriproxyfen followed by Spinosad with low volume (LV) spraying equipment with not less than (20L./fed.) and use ¾ recommended dose which revealed successful results. There was a negative complete correlation between(VMD) and the mean residual of mortality of *S. littoralis* while there was a positive complete correlate between N/cm² and the mean residual of mortality of *S. littoralis* in all treatments.

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ARABIC SUMMARY

مقارنة حقلية بين توزيع القطيرات و الأثر المتبقي لبعض المبيدات الحشرية على دودة ورق القطن (سبودوبترا ليتورالز) باستخدام الات رش أرضية معينة على نبات القطن

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٣- المعمل المركزي للمبيدات – قسم متبقيات المبيدت و تلوث البيئة – الدقي – الجيزة

٤- قسم الاحياء – كلية العلوم – جامعة الملك خالد – أبها – المملكة العربية السعودية

أجريت التجارب الحقلية في مساحة ١,٩ فدان مزروعة بنباتات صنف جيزة ٨٩ أثناء موسم ٢٠٠٥ في يوم ٢٨ يونية في كفر بني غريان – مركز قويسنا – محافظة المنوفية. تم تقسيم المنطقة المختارة الى ١٨ قطعة معاملة و ضابط التجربة. و تم رش كل من المبيد الفوسفوري بروفينوفوس و المبيد الحيوي سباينوساد و مبيد الأدميرال (مانع انسلاخ) و ذلك بالجرعة الموصى بها من قبل وزارة الزراعة و استخدام ¾ الجرعة الموصى بها لكل مبيد. كما تم رش كل معاملة باستخدام ثلاث معدات رش و هى الموتور التقليدي (٦٠٠ لتر\فدان) و موتور الظهر أجروموندو (٢٠ لتر\فدان) و الرشاشة اليدوية كوازار ذات المكبس الهوائي (٩٤ لتر\فدان).

كان متوسط عدد لطع دودة ورق القطن على أوراق القطن بمعدل ٣ لطعة\م^2. أوضحت النتائج أن كل المراكبات حققت خفض و تأثير سلبي على اليرقات الحية. و كان أكثر المركبات كفاءة المبيد بروفينوفوس و الأدميرال ثم المبيد الحيوى سباينوساد. و من ذلك يمكن التوصية باستخدام بروفينوفوس و الأدميرال يليهم سباينوساد باستخدام معدات أرضية ذات حجوم رش قليلة التي لا تقل عن (٢٠ لتر\فدان) كما بمكن أستخدام ¾ الجرعة حيث حققت نجاح في الابادة مقارب مع الجرعة الكاملة.