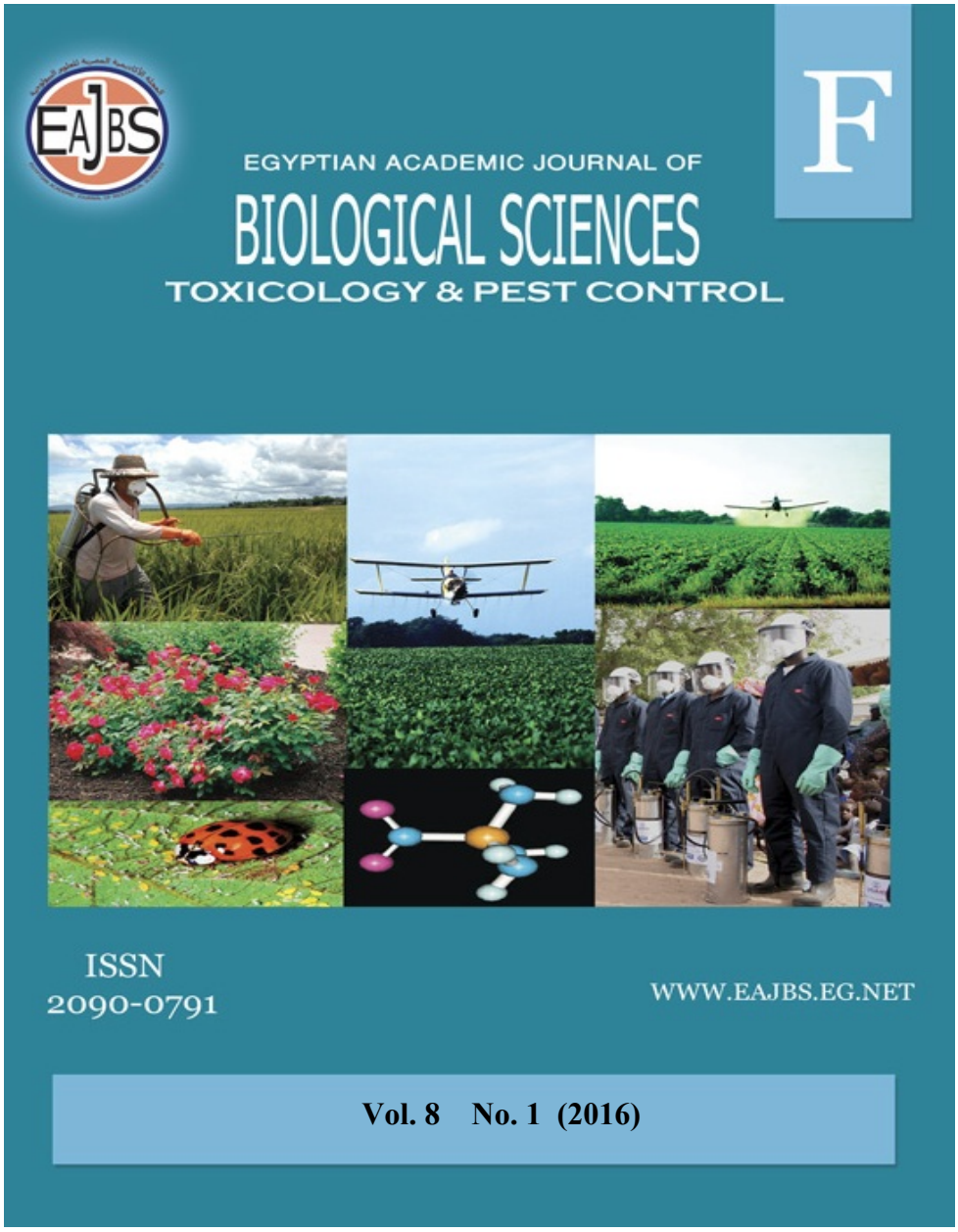


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# Impact Of Two Insecticides Recommended For Control of Bollworms by Using Different Sprayer Types on Certain Piercing-Sucking Pests and Associated Predators in Cotton Fields.

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## ABSTRACT

Field experiments were conducted for evaluating site effect of two insecticides namely, dursban (Chlorpyrifos) and sumi-alpha (Es-fenvalerate) recommended for cotton bollworms by using three sprayer types, convention motor sprayer (A), penumatic knapsack motor sprayer (Solo) (B) and penumatic knapsack motor sprayer (Solo) contact with micronor (developed knapsack motor) (C) on certain piercing-sucking pests and associated predators in cotton fields at Zagazig region Sharkia Governorate, Egypt throughout seasons 2014 and 2015. The results indicated that the highest mean reduction in the tested insects population was noticed for both dursban and sumi-alpha treatments by using the conventional sprayer (A). The corresponding averages of reduction percentages during the two seasons, 2014 and 2015 were 74.98 and 75.54 % for aphids,74.61 and 81.28 % for white fly,80.78 and 90.30 % for leafhoppers and 55.93 and 80.36 % for mites incase of dursban treatment, whereas these values were 65.48 and 73.25% for aphids,79.84 and 82,39 % for whight fly, 77.47 and 87.32 % for leafhoppers and 54.06 and 73.16% for mites when sumi-alpha was applied during the two seasons; respectively.

In regarding the harmful effect on the associated predators, the highest relatively initial reduction value were recorded in the predators populations in plots sprayed by the two tested pesticides when C sprayer type was used, where the initial effect recorded 100 % for the two tested pesticides for all inspected predators species, except for *Scymnus* spp. and *Chrysoprella carnea* in sumi-alpha plots which recorded 97.00 and 90.60 % in the 1st season and 97.32 and 93.60 % for the same predators species, respectively for dursban plots.

In case of the mean of residual effect of the two tested pesticides on inspected predators species, the relatively highest reduction percentages ranged 93.45-96.95 % and 96.32-99.11 % in the population of *Peaderus alfierii*. and *Coccinella* spp. in plots applied with dursban by using C sprayer in the 1st and 2nd seasons, respectively.

## INTRODUCTION

In Egypt, cotton plants are usually subjected to be attacked by numerous piercing- sucking pests under Egyptian conditions during different growth stages, i. e. cotton aphid, *Aphis gossypii* Glover; cotton whitefly, *Bemesia tabaci* (Genn.); the cotton leafhopper, *Empoasca lybica* (DeBerg;) and the common red spider mite, *Tetranychus* spp., Ibrahem (2001) and Aslam *et al* ., (2004).

Use of the electrodyn motor is a more promising implement for insecticide spraying by small farmers against cotton pests than ultra low volume and knapsack sprayers Mambiri (1987). Applied insecticides by knapsack sprayers, low volume and ultra low volume sprayers were equally effective against insect pests of cotton Ali *et al.*, (1995). Insecticides application techniques on cotton were compared different sprayers gave similar yields and control of insect pests Javaid (1991). The general reduction rates of spiny bollworm *Earias insulana* larval infestation after the treatment with profenofose were 91.15% and 91.13 % for Micron ULVA Knapsack motor Cifarilli sprayer; respectively Abd-El Rahman *et al*., (2015).

The aim of this work is to evaluate the toxic effect of dursban and sumi-alpha compounds recommended for bollworms control on certain piercing-sucking pests and major predators as non- target organisms of these compounds in cotton field using three types of sprayer machines, i.e. conventional motor, penumatic knapsack motor sprayer (Solo) and penumatic knapsack motor sprayer (Solo) contact with micronor.

## MATERIALS AND METHODS

**Pesticides used.**

**1- Dursban,** 48 % EC (Chlorpyrifos) used at the rate of one L/fed.

**2. Sumi-alpha, 5 % EC** (Es-fenvalerate) used at the rate of 150 $cm^3$ /fed.

**Sprayer motors types:**

**Convention motor sprayer (A):**

High spraying volume as conventional motor sprayer at 400 Litter /fad.. Spraying volume is composed mainly from a chemical tank (200 L./tank) and reciprocating pump powered by 5Hp benzene motor. The spray gun was connected to the pump by a 40-80 m. long rubber hose. The pump could provide pressure up to 30 $kg/cm^2$ .The spray angle of the produced pattern could be adjusted to give either wide or narrow angle.

**Penumatic knapsack motor sprayer (Solo) (B):**

A medium spraying volume was applied to pneumatic with sprayers at 160 L/Fad. spraying volume.

**Penumatic knapsack motor sprayer Solo contact with Micronor (C):**

A-Low medium spraying volume was applied to pneumatic with sprayers at 40 L/Fad spraying volume.

**Experimental design:**

The experiment area about 9800 $m^2$ was divided into 6 treatments as well as check (control), each treatment presented by 4 replicates each was of 350 $m^2$. To study the effect of the two insecticides, dursban and sumi-alpha, three types of sprayers, conventional motor sprayer, Knapsack motor sprayer (solo) and Knapsack motor sprayer (solo) with micronor (developed motor) were used. Each sprayer was used for testing each insecticide alone and one time during cotton growth season at recommended rates against Aphid, *Aphis gossypii*, whitefly, *Bemisia tabaci,* leafhoppers, *Empoasca* spp. and mites, *Tetranychus* spp. infesting cotton plants. The harmful effect of the tested compounds was also determined against some predators, Coccinelid beetles, *Coccinella* spp.; *Scymnus* spp.; anthocoride bugs, *Orious* spp.; staphylinid beetle, *Peaderus alfierii*; aphid lion, *Chrysoperla carnea* and true spiders species.

Samples of 25 cotton plant/ replicate were inspected actually in the cotton field. The pests and predators were counted on three levels of plants in four replicates of each treatment (100 cotton plant /treatment and control), before and after 48 hours, one and two weeks of insecticide applications. Samples of cotton plant were started from 20$^{th}$ of July until 3$^{rd}$ of August in

2014 season, from 24th of July until 7th of August in 2015 season. The reduction in number of piercing-sucking pests and associated predators were calculated as method described by Henderson and Tilton (1955).

**Statistical analysis:**

Data obtained were statistically analyzed as two way completely randomized ANOVA according to Little and Hills (1975).

## RESULTS AND DISCUSSIONS

**Season 2014:**

**1- Effect of tested compounds and sprayer types on piercing-sucking pests:**

Results presented in Table (1) clear that dursban sprayed by convention motor sprayer (A) was more effective insecticide than sumi-alpha, the reduction percentages in recorded in number of leafhoppers, aphid, white fly and spider mite, were 80.78, 74.98, 74.61, 55.93 %; respectively. When this insecticide sprayed against these pests by using penumatic knapsack motor sprayer (Solo) (B) the reduction rates in the numbers of these pests were 73.71, 71.98, 72.06 and 47.63 %, respectively. While in case of penumatic knapsack motor sprayer (Solo) contact with Micronor (C) these values recorded 68.84, 69.11,72.27 and 49.73 %; respectively.

Table 1: Reduction percentages of chlorpyrifose and es-fenvalerate sprayed use three types of sprayer tools on piercing-sucking pests in cotton fields during 2014 season.

| Insects | Insecticides / Sprayers | Dursban | | | | Mean of reduction percentages irrespective sprayers | Sumi-alpha | | | | Mean of reduction percentages irrespective sprayers | Mean of reduction percentages irrespective pesticides | Initial effect | | Residual effect | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | After spray | | | | | After spray | | | | | | Dursban | Sumi-alpha | Dursban | Sumi-alpha |
| | | 48h | One week | Two weeks | Mean | | 48h | One week | Two weeks | Mean | | | | | | |
| Aphid | A | 88.87 | 72.45 | 63.62 | 74.98 | 72.02 | 78.86 | 65.02 | 52.57 | 65.48 | 60.12 | 70.23 | 88. 87 | 78.86 | 68.04 | 58.80 |
| | B | 82.87 | 71.26 | 61.94 | 71.98 | | 76.81 | 66.24 | 52.75 | 65.27 | | 68.63 | 82.73 | 76.81 | 66.60 | 59.50 |
| | C | 73.62 | 69.47 | 64.24 | 69.11 | | 66.01 | 53.97 | 37.83 | 52.60 | | 60.86 | 73.62 | 66.01 | 66.86 | 45.90 |
| White fly | A | 81.47 | 75.98 | 66.37 | 74.61 | 72.98 | 88.62 | 78.98 | 71.93 | 79.84 | 78.09 | 77.23 | 81.47 | 88.62 | 71.18 | 75.46 |
| | B | 75.66 | 74.31 | 66.20 | 72.06 | | 85.92 | 77.18 | 75.24 | 79.45 | | 75.76 | 75.66 | 85.92 | 70.26 | 76.21 |
| | C | 75.86 | 72.88 | 68.06 | 72.27 | | 79.88 | 78.10 | 67.0 | 74.99 | | 73.63 | 75.86 | 79.88 | 70.47 | 72.55 |
| Leafhoppers | A | 83.59 | 80.0 | 78.75 | 80.78 | 74.44 | 79.91 | 77.14 | 75.36 | 77.47 | 70.02 | 79.13a | 83.59 | 79.91 | 79.38 | 76.25 |
| | B | 83.13 | 74.0 | 64.0 | 73.71 | | 73.75 | 72.0 | 65.0 | 70.25 | | 71.87b | 83.13 | 73.75 | 69.0 | 68.50 |
| | C | 73.36 | 66.32 | 66.84 | 68.84 | | 70.0 | 64.0 | 63.0 | 62.33 | | 65.59b | 73.36 | 70.0 | 66.58 | 63.50 |
| Mites | A | 61.63 | 53.35 | 52.81 | 55.93 | 51.10 | 56.82 | 52.82 | 52.53 | 54.06 | 46.0 | 55.0a | 61.63 | 56.82 | 53.08 | 52.68 |
| | B | 56.69 | 48.53 | 37.67 | 47.63 | | 44.89 | 44.92 | 38.10 | 42.64 | | 45.14b | 56.69 | 44.89 | 43.10 | 41.51 |
| | C | 54.02 | 48.4 | 46.78 | 49.73 | | 43.07 | 43.20 | 37.67 | 41.31 | | 45.52b | 54.02 | 43.07 | 47.59 | 40.44 |

*Convention motor sprayer (A) *Penumatic knapsack motor sprayer (Solo) (B) *Penumatic knapsack motor sprayer Solo contact with Micronor ( C) *For leafhoppers as sprayer variation F= 8.33** and LSD=6.37 *For spider mite as sprayer variation F= 6.96* and LSD=6.51

The general of reduction percentages in the numbers of the aforementioned pests resulted for dursban treatment by using different sprayer types were 74.44, 72.02, 72.98 and 51.10 %; respectively.

Generally, the results of statistical analysis revealed that highly significant differences were found between reduction percentages in leafhoppers and spider mites as sprayers varied ( F= 8.335 and LSD= 6.379) with the highest reduction percentages of 80.78 % recorded for dursban sprayed by using sprayer A on leafhoppers and tended to significant variation in case of spider mite reduction (F= 6.967 and LSD= 6.517) with the highest reduction rates in mite population (55.93 %) sprayed by sprayer A, also the high volume sprayer (A) was more effective as spraying tool against piercing-sucking pests.

In case of sumi-alpha compound, the results showed that the mean reduction percentages were 79.84, 77.47, 65.48 and 54.06 % when sprayed with

motor (A), these values recorded 79.45, 70.25, 65.27 and 42.64 % when sprayed with motor B, while in case of motor (C), the mean reduction values were 74.99, 52.60, 62.33 and 41.31 % for each of the white fly, leafhoppers, aphids and red spider mite, respectively.

Generally, sumi-alpha efficacy using the three sprayers types showed cased general mean reduction of 78.09,70.02,60.12 and 46.00 % in the numbers of white fly, leafhoppers, aphids and red spider mite, respectively; while the sprayers cane be arrangement in descending orders as its efficacy with the two tested pesticides, as follows: A, B and C for all piercing-sucking pests.

The previous results indicated that the tested pesticides achieved high reduction rate as initial effect, the efficacy of dursban can be arrange as reduction percentages in these pest; as, aphid (88.87 %), leafhoppers (83.59 %), whitefly (81.47%) and red spider mite (61.63%). The tested sprayer types cane be arranged as, A, B and C in accordance to the reduction percentages of the tested pests.

In case of sumi-alpha and as initial kill the efficacy as reduction percentages of the tested pests as, whitefly (88.12%), leafhoppers (79.91%), aphid and (78.86 %) and red spider mite; while the three tested sprayers recorded same trend of dursban.

Generally, the results indicated that the dursban recorded the highest reduction for all tested pests, except whitefly, which the highest reduction was recorded by sumi-alpha. Also, A sprayer as high volume type found more effective as spray tool against the piercing-sucking pests in regardless to used pesticides. The results of residual effect of tested pesticides on all tested pests recorded the same trend of initial effect of used sprayer motors, with highest reduction rates of 79.38 and 76.25 % for dursban and sumi-alpha sprayed use sprayer A recorded on leafhoppers.

The obtained results are agreement with those of Al-Shannaf (2010) who recorded that the es-fenvalerate compound, recorded reduction percentages ranged between 35.22-100.00 %, where the highest value was recorded in aphid and the lowest one for whitefly. Similarity, the results of Zidan (2012) cleared that the chlorpyrifose recorded reduction percentages of 39.50 % for whit fly and 74.80 % for Aphids.

**2. Effect of tested compounds and sprayer types on predators:**

Results illustrated in Table (2) showed that the tested compounds caused undesirable effect on all tested predators in the treated cotton fields. The organophosphorus compound, dursban recorder highest mean reduction percentage throughout tow weeks after application, where being 97.53,98.02 and 97.96 % in staphilinid beetle in case using sprayer A & B and lady beetle when use sprayer; respectively. The lowest mean of reduction percentages associated to dursban in aphid lion were 90.24, 84.58 in aphid lion and 92.48% recorded in true spider when sprayed by using sprayers A&B and true spider mite when sprayer (C ); respectively.

In case of sumi-alpha, the highest mean reduction percentages were 99.41 % recorded on lady bird when used sprayer (C), while the lowest one was 77.42 % recorded on aphid lion when use sprayer (A).

It could be concluded that the recommended compounds of cotton bollworms caused sever damage to tested predators in the treated cotton field and varied insignificantly as sprayer type used as well as insect species, except *for Orius* bug (F=6.308* and LSD=5.03), the organophosforous compound, dursban was more dangerous against the staphilinid beetle, while pyrothroid compound; sumi-alpha was more dangerous against lady bird.

Also, we can conclude that, the used sprayers were varied insignificantly

as its effect on tested compounds efficacy as well as insect species response, while the sprayer A was more effective with dursban compound against staphilinid beetle, sprayers B increased the efficacy of the same compound against lady bird.

Table 2: Reduction percentages of chlorpyrifose and es-fenvalerate sprayed use three types of sprayer tools on major predators in cotton fields during 2014 season.

| pests | Insecticides / Sprayers | Dursban After spray 48h | Dursban After spray One week | Dursban After spray Two weeks | Dursban After spray Mean | Mean of reduction percentages irrespective sprayers | Sumi-alpha After spray 48h | Sumi-alpha After spray One week | Sumi-alpha After spray Two weeks | Sumi-alpha After spray Mean | Mean of reduction percentages irrespective sprayers | reduction percentages irrespective insecticides | Initial effect Dursban | Initial effect Sumi-alpha | Residual effect Dursban | Residual effect Sumi-alpha |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lady bird beetles | A | 100.0 | 90.0 | 87.77 | 92.59 | 94.86 | 95.09 | 92.86 | 89.52 | 92.49 | 96.31 | 92.54 | 100.0 | 95.09 | 88.89 | 91.19 |
| | B | 100.0 | 95.45 | 86.67 | 94.09 | | 100.0 | 100.0 | 95.42 | 98.47 | | 96.26 | 100.0 | 100.0 | 91.06 | 97.71 |
| | C | 100.0 | 100.0 | 93.89 | 97.96 | | 100.0 | 100.0 | 93.89 | 97.96 | | 97.96 | 100.0 | 100.0 | 96.95 | 96.95 |
| Scymnus | A | 95.95 | 96.47 | 92.21 | 94.88 | 94.75 | 100.0 | 89.09 | 87.97 | 92.35 | 94.75 | 93.62 | 95.95 | 100.0 | 94.34 | 88.53 |
| | B | 100.0 | 90.0 | 87.75 | 92.58 | | 97.22 | 93.33 | 93.46 | 94.67 | | 93.63 | 100.0 | 97.22 | 88.88 | 93.40 |
| | C | 100.0 | 97.0 | 93.38 | 96.79 | | 97.0 | 95.20 | 99.50 | 97.23 | | 97.01 | 100.0 | 97.0 | 95.19 | 77.35 |
| Orius bug | A | 94.53 | 92.56 | 90.09 | 92.39 | 94.78a | 93.10 | 87.50 | 81.80 | 87.23 | 88.86b | 86.74 | 94.53 | 93.10 | 91.33 | 84.29 |
| | B | 100.00 | 94.01 | 89.64 | 94.55 | | 93.10 | 87.50 | 81.08 | 87.23 | | 90.89 | 100.0 | 93.10 | 91.83 | 84.29 |
| | C | 100.0 | 100.0 | 92.22 | 97.41 | | 96.39 | 93.47 | 85.87 | 91.91 | | 94.66 | 100.0 | 96.39 | 96.11 | 89.67 |
| Staphilinid beetle | A | 100.0 | 100.0 | 92.59 | 97.53 | 97.23 | 100.0 | 94.87 | 85.19 | 93.35 | 95.01 | 95.44 | 100.0 | 100.0 | 96.30 | 90.03 |
| | B | 100.0 | 100.0 | 94.07 | 98.02 | | 100.0 | 90.53 | 86.32 | 92.28 | | 95.15 | 100.0 | 100.0 | 97.04 | 88.42 |
| | C | 100.0 | 100.0 | 88.41 | 96.14 | | 100.0 | 100.0 | 98.22 | 99.41 | | 97.18 | 100.0 | 100.0 | 94.21 | 99.11 |
| Aphid lion | A | 89.85 | 87.86 | 84.0 | 90.24 | 89.75 | 84.89 | 78.33 | 69.05 | 77.42 | 82.82 | 83.83 | 89.85 | 84.89 | 85.93 | 73.69 |
| | B | 96.32 | 83.51 | 73.91 | 84.58 | | 90.33 | 86.45 | 78.57 | 85.32 | | 78.37 | 96.32 | 90.93 | 78.71 | 82.51 |
| | C | 100.0 | 93.93 | 89.33 | 94.42 | | 90.60 | 88.76 | 77.78 | 85.71 | | 90.07 | 100.0 | 90.60 | 91.63 | 83.27 |
| True spider mite | A | 100.0 | 95.42 | 87.04 | 94.15 | 93.36 | 95.14 | 93.14 | 90.28 | 92.52 | 96.53 | 93.34 | 100.0 | 95.14 | 91.23 | 91.71 |
| | B | 100.0 | 94.89 | 85.42 | 93.44 | | 100.0 | 100.0 | 94.44 | 98.15 | | 95.80 | 100.0 | 100.0 | 90.16 | 97.22 |
| | C | 100.0 | 94.11 | 83.33 | 92.48 | | 100.0 | 100.0 | 96.76 | 98.92 | | 95.70 | 100.0 | 100.0 | 88.72 | 98.38 |

*Convention motor sprayer (A) * Penumatic knapsack motor sprayer (Solo) (B) * Penumatic knapsack motor sprayer Solo contact with Micronor ( C) *For *Orius* as pesticides variation F= 6.3* and LSD=5.13

On the other hand, the sprayer A used to spray sumi-alpha recorded lowest mean reduction percentage on aphid lion, while sprayer C recorded the highest one against ladybird.

In where the aphid lion, *Ch. carnea*. recorded the highest tolerance rate to the tested compounds sprayed with the different sprayer types except that of initial effect of dursban when sprayed with C sprayer Season 2015.

**1. Effect of the tested compounds and sprayer types on piercing-sucking pests:**

The obtained results represented in Table (3) indicated that the organo-phosphorus compound, dursban was more effective against the tested pests especially when sprayed with sprayer A that recorded the highest mean reduction percentages of 90.30,81.28,80.36 and 75.54 % in the population of leafhopper, whitefly, spider mite and aphids, respectively; while when it represented by using sprayer (B) and (C) the reduction percentages were decreased recorded 81.57,77.62,76.01 and 69.33 % for prayer (B) plots and 80.79, 67.66, 65.15 and 63.48 % in sprayer (C) plots that in the population of whitefly, leafhoppers, spider mite and aphids, respectively.

In case of pyrothroid compound, es-fenvalerate the highest mean of reduction percentages recorded were 87.32,82.39,73.25 and 73.16 % on the population of leafhoppers, whitefly, aphids and spider mite, respectively in sprayer A plots, while its were 79.57,69.69,68.29 and 67.13 % in sprayer ( B) for whitefly, leafhoppers, aphids and spider mite, respectively; also, the percentages were 73.10,66.21,56.96 and 56.55 % in sprayer (C) plots for whitefly, leafhoppers, spider mite and aphids, respectively.

It could be summarized that, the obtained results and its statistical analysis revealed that, the tested compounds and sprayers were varied insignificantly as the mean reduction percentages in aphids population, while significant variance was found between sprayers

types as reduction percentages in whitefly population (F=2.656 and $LSD_{0.05}$=4.797). The mean reduction percentages of leafhoppers populations provide highly significant variation as sprayer type used (F=47.812* and $LSD_{0.05}$=4.992) and significant variation as pesticides efficacy (F=4.86* and $LSD_{0.05}$=4.07) with insignificant effect for interaction.

Table 3: Reduction percentages of chlorpyrifose and es-fenvalerate sprayed use three types of sprayer tools on piercing-sucking pests in cotton fields during 2015 season

| pests | Insecticides / Sprayers | Dursban | | | | Mean of reduction percentages irrespective sprayers | Sumi-alpha | | | | Mean of reduction percentages irrespective sprayers | Mean of reduction percentages irrespective pesticides | Initial effect | | Residual effect | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | After spray | | | | | After spray | | | | | | | | | |
| | | 48h | One week | Two weeks | Mean | | 48h | One week | Two weeks | Mean | | | Dursban | Sumi-alpha | Dursban | Sumi-alpha |
| Aphid | A | 91.08 | 77.89 | 57.64 | 75.54 | 69.45 | 84.63 | 74.99 | 60.12 | 73.25 | 66.03 | 74.40a | 91.08 | 84.63 | 67.77 | 67.56 |
| | B | 83.79 | 71.29 | 52.92 | 69.33 | | 80.0 | 68.71 | 56.16 | 68.29 | | 68.81 | 83.79 | 80.0 | 62.11 | 62.44 |
| | C | 75.24 | 56.96 | 58.23 | 63.48 | | 70.22 | 51.90 | 47.53 | 56.55 | | 60.02c | 75.24 | 70.22 | 57.60 | 49.72 |
| White fly | A | 86.08 | 81.90 | 75.87 | 81.28 | 81.21 | 87.10 | 85.10 | 74.98 | 82.39 | 78.35 | 81.84 | 86.08 | 87.10 | 78.89 | 80.04 |
| | B | 84.01 | 80.21 | 80.50 | 81.57 | | 82.24 | 77.17 | 79.30 | 79.57 | | 80.44 | 84.01 | 82.24 | 80.36 | 78.24 |
| | C | 79.12 | 81.90 | 81.36 | 80.79 | | 72.06 | 71.44 | 75.81 | 73.10 | | 76.95 | 79.12 | 72.06 | 81.63 | 73.63 |
| Leafhopers | A | 92.50 | 91.86 | 86.54 | 90.30 | 78.53 | 90.63 | 89.83 | 81.49 | 87.32 | 74.41 | 88.81a | 92.50 | 90.63 | 89.20 | 85.66 |
| | B | 81.25 | 79.65 | 71.96 | 77.62 | | 75.0 | 69.07 | 65.0 | 69.69 | | 73.66b | 81.25 | 75.0 | 75.81 | 67.04 |
| | C | 69.32 | 66.70 | 66.96 | 67.66 | | 66.13 | 63.77 | 68.73 | 66.21 | | 66.94c | 69.32 | 66.13 | 66.83 | 66.25 |
| Mites | A | 84.18 | 79.56 | 77.34 | 80.36 | 73.84 | 78.46 | 71.23 | 69.78 | 73.16 | 65.75 | 76.76a | 84.18 | 78.46 | 78.45 | 70.51 |
| | B | 82.83 | 72.51 | 72.70 | 76.01 | | 74.07 | 65.44 | 61.88 | 67.13 | | 71.57b | 82.83 | 74.07 | 72.61 | 63.66 |
| | C | 69.59 | 61.27 | 64.60 | 65.15 | | 68.58 | 56.43 | 45.86 | 56.96 | | 61.06c | 69.59 | 68.58 | 62.94 | 51.15 |

*Convention motor sprayer (A) * Penumatic knapsack motor sprayer (Solo) (B) *Penumatic knapsack motor sprayer Solo contact with Micronor ( C) *For white fly as sprayer variation F= 2.65* and LSD=4.79 *For leaf hoppers as sprayer variation F= 47.8*** and LSD=4.99 *For leaf hoppers as pesticides variation F= 4.85* and LSD=4.07 *For spider mite as pesticides variation F= 6.7* and LSD=6.75 *For spider mite as sprayer variation F= 8.91* and LSD=8.26

The highly significant variance was noticed for the reduction percentages of spider mite, as sprayer types variation (F=8.91 and $LSD_{0.05}$=8.268) and as tested compound (F= 6.706* and $LSD_{0.05}$=6.751). The interaction between sprayer types and the tested pesticides were insignificant for all inspected pests.

**2- Effect of the tested compounds and sprayer types on predators:**

The tabulated data shown in Table (4) cleared that, the tested insecticides recorded harmful effect on predators in the treated cotton field and its serous harmful on the predators population that varied as sprayer type as well as pest species, where the highest mean effect of dursban caused 93.57 & 88.69 % reduction in ladybird & true spider mite; respectively, when sprayed by A sprayer, while these values were 93.18,91.44,95.63 and 87.65 % reduction in population of *Scymnus*, *Orius*, staphilinid beetle and aphid lion, respectively; when it sprayed with C sprayer. The lowest mean of reduction percentage of dursban (71.09 %) was recorded in aphid lion when sprayed with A sprayer.

In case of the efficacy of pyrothroid compound, sumi-alpha against the populations of true spider mite using sprayer C, staphilinid beetle in case of using sprayer A and lady bird beetle in when it sprayed with C sprayer recorded 98.60, 98.02 and 97.54 % of population, while the lowest effect, reduction rate was 75.30 % in *Orius* bug population in plots sprayed with C sprayer.

It could be concluded that the reduction percentages were varied insignificantly as insecticides as well as sprayers types variation for all inspected predators except, that of aphid lion which varied significantly as sprayers varied (F=3.354* and $LSD_{0.05}$=10.7).

Table 4: Reduction percentages of chlorpyrifose and es-fenvalerate sprayed use three types of sprayer tools on major predators in cotton fields during 2015 season.

| pests | Insecticides / Sprayers | Dursban After spray 48h | Dursban After spray One week | Dursban After spray Two weeks | Dursban Mean | Mean of reduction percentages irrespective sprayers | Sumi-alpha After spray 48h | Sumi-alpha After spray One week | Sumi-alpha After spray Two weeks | Sumi-alpha Mean | Mean of reduction percentages irrespective sprayers | Mean of reduction percentages irrespective insecticides | Initial effect Dursban | Initial effect Sumi-alpha | Residual effect Dursban | Residual effect Sumi-alpha |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Lady bird beetles | A | 96.09 | 93.06 | 91.55 | 93.57 | 92.20 | 100.0 | 79.80 | 80.34 | 86.38 | 93.70 | 90.14 | 96.09 | 100.0 | 92.31 | 79.57 |
| | B | 85..83 | 87.65 | 85.59 | 89.69 | | 100.0 | 97.35 | 94.21 | 97.19 | | 93.44 | 95.83 | 100.0 | 86.62 | 95.78 |
| | C | 100.0 | 96.30 | 83.72 | 93.34 | | 100.0 | 100.0 | 92.63 | 97.54 | | 95.44 | 100.0 | 100.0 | 90.02 | 96.32 |
| Scymnus | A | 88.0 | 87.59 | 81.14 | 85.58 | 89.49 | 100.0 | 91.83 | 86.47 | 92.77 | 94.74 | 89.18 | 88.0 | 100.0 | 84.37 | 89.15 |
| | B | 96.74 | 91.0 | 81.37 | 89.70 | | 100.0 | 95.86 | 88.0 | 94.62 | | 92.16 | 96.74 | 100.0 | 86.19 | 91.93 |
| | C | 97.32 | 94.46 | 87.76 | 93.18 | | 100.0 | 97.12 | 93.41 | 96.84 | | 95.01 | 97.32 | 100.0 | 91.11 | 95.27 |
| Orius bug | A | 83.77 | 81.82 | 79.80 | 81.80 | 86.55 | 100.0 | 88.10 | 87.04 | 91.71 | 92.63 | 86.76 | 83.77 | 100.0 | 80.81 | 87.57 |
| | B | 93.65 | 87.30 | 78.27 | 86.41 | | 100.0 | 96.88 | 75.76 | 90.88 | | 88.65 | 93.65 | 100.0 | 82.79 | 86.32 |
| | C | 100.0 | 89.12 | 85.19 | 91.44 | | 100.0 | 95.77 | 90.12 | 75.30 | | 93.37 | 100.0 | 100.0 | 87.16 | 92.95 |
| Staphilinid beetle | A | 100.0 | 92.86 | 78.95 | 90.60 | 91.87 | 100.0 | 100.0 | 94.07 | 98.02 | 97.20 | 94.31 | 100.0 | 100.0 | 85.91 | 97.04 |
| | B | 100.0 | 85.71 | 82.46 | 89.39 | | 100.0 | 100.0 | 91.53 | 97.18 | | 93.29 | 100.0 | 100.0 | 84.09 | 95.77 |
| | C | 100.0 | 95.79 | 91.11 | 95.63 | | 100.0 | 100.0 | 89.23 | 96.41 | | 96.02 | 100.0 | 100.0 | 93.45 | 94.62 |
| Aphid lion | A | 78.41 | 72.86 | 62.0 | 71.09 | 80.25 | 93.09 | 81.0 | 76.11 | 83.40 | 87.16 | 77.25b | 78.41 | 93.09 | 67.43 | 78..56 |
| | B | 92.80 | 80.21 | 72.86 | 82.0 | | 96.92 | 83.04 | 76.73 | 85.56 | | 83.78ab | 92.80 | 96.92 | 76.54 | 79.89 |
| | C | 93.60 | 87.45 | 81.90 | 87.65 | | 100.0 | 92.17 | 85.38 | 92.52 | | 90.09a | 93.60 | 100.0 | 84.68 | 88.78 |
| True spider mite | A | 100.0 | 92.73 | 73.33 | 88.69 | 87.89 | 100.0 | 94.44 | 82.46 | 92.30 | 96.03 | 90.50 | 100.0 | 100.0 | 83.03 | 88.75 |
| | B | 100.0 | 81.82 | 80.86 | 87.56 | | 100.0 | 100.0 | 91.58 | 97.19 | | 92.38 | 100.0 | 100.0 | 81.34 | 95.79 |
| | C | 100.0 | 83.33 | 78.95 | 87.43 | | 100.0 | 100.0 | 95.79 | 98.60 | | 93.02 | 100.0 | 100.0 | 81.14 | 97.90 |

*Convention motor sprayer (A) * Penumatic knapsack motor sprayer (Solo) (B) *Penumatic knapsack motor sprayer Solo contact with Micronor ( C) *For aphid lion as sprayer variation F= 3.35* and LSD=10.79

The results are in agreement with these of Ibrahim (2001), Al-Shannaf (2010), Younis *et al.,* (2007), Zidan (2012) and Abd-El Rahman *et al*. (2015) who found that, the es-fenvalerate and chloropyrifos compounds recorded reduction percentages ranged 41-70.50% in the predators associated with cotton pests (*Coccinella, Chrysoprella, Scymnus ,Orius, Peadurus* and true spider mites).

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## ARABIC SUMMERY

**تأثير مركبين من المبيدات الحشرية الموصى بها لمكافحة ديدان اللوز باستخدام طرز مختلفة من آلات الرش على بعض الآفات الثاقبة الماصة والأعداء الحيوية المصاحبة لها فى حقول القطن**

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أجريت التجارب الحقليه لتقييم التاثير السام لبعض المبيدات الحشرية الموصى بها لمكافحة ديدان اللوز هى الدورسبان والسومى الفا باستخدام ثلاث طرز من ألات الرش تشمل الموتور التقليدى-الموتور الظهرى العادى-الموتور الظهرى االمطوروذلك على بعض الأفات الثاقبة الماصة والأعداء الحيويه المصاحبه لها فى حقول القطن فى منطقة الزقازيق محافظة الشرقيه-مصر خلال موسمى قطن ٢٠١٤، ٢٠١٥.

اوضحت النتائج المتحصل عليها أن اعلى نسبة خفض لتعداد الأفات سجلت فى المعاملات التى تم رشها بالموتور التقليدى ذو الحجوم الكبيره بالمركبين تحت الاختبار خلال موسمى الدراسه ، حيث تراوح التاثير الفورى بين ٨٨.٨٧-٩٢.٥٠% خفض فى تعداد حشرات المن ونطاطات الاوراق فى القطع التجريبية المعاملة بمركب الدورسبان وتراوحت بين ٨٨.٦٢-٩٠.٦٣ % خفض فى تعداد حشرات الذبابة البيضاء ونطاطات الاوراق المعامله بالسومى الفا. وسجل نفس الاتجاه للتاثير المتبقى على الآفات ولكن اختلفت استجابة الافه حيث تراوحت نسب الخفض مابين ٧٩.٣٨-٨٩.٢٩ % لتعداد حشرات المن ونطاطات الأوراق فى حالة معاملات الدورسبان وتراوحت بين ٧٩.٢٥-٨٥.٦٦% على نفس الحشرات عند معاملات السومى الفا وذلك باستخدام الموتور التقليدى لكلا المركبين خلال موسمى الدراسة.

وبالنظر الى التاثير الضار على المفترسات المصاحبة للحشرات فى حقول القطن ، تم تسجيل أعلى خفض نسبى للتأثير الفورى على تعداد هذه المفترسات فى القطع التجريبيه المعاملة بالموتور المطور (الموتور الظهرى ذو الحجوم المنخفضة) والذى سجل ١٠٠% خفض فى تعداد المفترسات، فيما عدا خنافس الاسكمنس واسد المن فى القطع التجريبية لمركب السومى الفا والتى سجلت ٩٧.٠٠، ٩٠.٦٠% فى الموسم الأول بينما سجلت ٩٧.٣٢،٩٣.٦٠ % لنفس المفترسات على الترتيب فى القطع التجريبيه لمركب الدورسبان.

أوضحت نتائج التاثير المتبقى للمركبات المختبره على انواع المفترسات أن أعلى نسبة خفض تراوحت بين ٩٣.٤٥-٩٦.٩٥% ، ٩٦.٣٢-٩٩.١١% فى تعداد حشرات الرواغة وانواع أبى العيد فى القطع التجريبية لمركب الدورسبان المعاملة بالموتور المطور خلال موسمى الدراسة على الترتيب.