SUMMARY

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Cotton is one of the important economical crops in Egypt, which employed in several industrial productions i.e. ginning, textile, food oil, soap, furniture and many other industries, as well as a source of foreign coin when exported to another countries.

Pink and spiny bollworms are the most effective pests infested cotton plants. The two pests represented the major factor in decreasing the cotton yield.

Spray cotton fields with chemical toxicants are still the important factor in integrated pest management programs. These chemicals are represented different chemical groups and have different mode of actions against the pests, at the same time there are different types of sprayers used to spray these chemical, and every type had its demands of water, number of trained men and area / time can spray.

In according to that mentioned before, laboratory and field experiments were carried out to investigate the acute and chronic effects of some chemical toxicants in laboratory, as well as their efficiency in the cotton fields with different sprayers against pink bollworm.

Laboratory experiments were carried out in the laboratories of plant protection institute (Sharkia Branch) at Zagazig to evaluate the potency of some different insecticides, the delayed effect on different stages of the pink bollworm, *Pectinophora gossypiella* and the spiny bollworm, *Earias insulana*. The selected compounds were Esfenvalerate (synthetic pyrethroids), chlorpyrifos (organophosphorus),

thiodicarb (carbamate), chlorfluazuron and hexaflumuron (insect growth regulator [IGRs]).

Field experiments were carried out to study the effect of different sprayers, Knapsack motor sprayer (solo), Knapsack motor sprayer (solo) with micronor, conventional motor sprayer using 160, 40 and 400 liters chemical solution respectively, with different recommended compounds (esfenvalerate, chlorpyrifos and thiodicarb) at recommended rates against the pink bollworm infesting cotton bolls.

Also, to evaluate efficacy of hexaflumuron and chlorfluazuron alone at recommended rates against the pink bollworm infesting cotton plants with reference to the conventional insecticide chlorpyrifos.

A) Laboratory bioassay studies:

1. Toxicity of tested compounds against pink and spiny bollworms.

1.1. Egg stage.

The efficiency of the tested insecticides against the eggs of pink and spiny bollworms can summarized as follows:

1- Pink bollworm eggs at LC_{50} were highly affected with chlorpyrifos followed by Thiodicarb, Esfenvalerate, Chlorfluazuron and Hexaflumuron. While, at the LC_{90} Esfenvalerate was the most active one followed by Thiodicarb Chlorpyrifos, Chlorfluazuron and Hexaflumuron.

2- Spiny bollworm eggs at LC_{50} were highly affected with Esfenvalerate followed by Chlorpyrifos, Thiodicarb,

Hexaflumuron, and Chlorfluazuron. While, at the LC_{90} Thiodicarb, was the most active one followed by Chlorpyrifos, Hexaflumuron, Esfenvalerate, and Chlorfluazuron.

1.2. Larval stage.

The efficiency of the tested insecticides against the larvae of pink and spiny bollworms can summarized as follows:

1- Newly hatched larvae of Pink bollworm at LC_{50} were highly affected with esfenvalerate followed by chlorpyrifos, chlorfluazuron, thiodicarb, and hexaflumuron. While, at the LC_{90} esfenvalerate was the most active one followed by chlorpyrifos, thiodicarb, chlorfluazuron and hexaflumuron.

2- Newly hatched larvae of Spiny bollworm at LC_{50} were highly affected with esfenvalerate followed by chlorpyrifos, chlorfluazuron, thiodicarb and hexaflumuron .But, at the LC_{90} the same trend was obtained esfenvalerate followed by chlorpyrifos, chlorfluazuron, thiodicarb and hexaflumuron.

1.3. Adult stage.

The efficiency of the tested insecticides against the adults of pink and spiny bollworms can summarized as follows:

1- Pink bollworm adults at LC_{50} were highly affected with Chlorpyrifos, followed by esfenvalerate and thiodicarb. While, at the LC_{90} chlorpyrifos, was the most active one followed by Thiodicarb and esfenvalerate.

2- Spiny bollworm adults at both LC50 and LC_{90} were highly affected with esfenvalerate followed by, thiodicarb and chlorpyrifos.

2. Latent effect of tested compounds on some biological aspects of pink and spiny bollworms when treated :

2.1. Egg stage

It could be concluded, generally from the obtained results that both tested compounds and their concentrations affected significantly or non-significantly on the most biological aspects of pink and spiny bollworms when on day old eggs were treated using the dipping technique.

Increasing the concentrations of all tested compounds induced a gradual increases in mortality of larvae and pupae and a gradual prolonged in incubation period of eggs, larval and pupal durations except that of esfenvalerate, thiodicarb and chlorpyrifos which shortened the pupal duration of pink bollworm, pre–oviposition period except thiodicarb and chlorfluazuron where they shortened pre-oviposition period for pink boll worm and post oviposition period except chlorpyrifos and chlorfluazuron where they shortened post-oviposition period for spiny boll worm.

On the other hand, increasing the concentrations of all tested compounds induced a gradual decrease in larval and pupal weight, adult emergence, number of deposited eggs / female and hatchability of eggs and a gradual shortened in male and female longevity except hexaflumuron which prolonged pink bollworm male longevity and oviposition period. All tested compounds caused decreased in sex ratio of pink bollworm, while increased that belonging spiny bollworm.

2.2. Larval stage

The results obtained revealed that both five tested compounds and the three concentrations of each compound affected significantly or non-significantly on the most biological aspects of pink and spiny bollworms when newly hatched larvae were treated using residual film techniques. Increasing the concentration of all tested compounds induced a gradual increase in mortality of larvae and pupae and a gradual prolonged in pre-oviposition period, with the exception of hexaflumuron and chlorfluazuron which caused shortened of pre-oviposition period, incubation period and larval duration with exception of chlorfluazuron in pink bollworm which caused a gradual shortened in larval duration.

Pupal duration was gradually prolonged with hexaflumuron and chlorfluazuron, but gradually shortened with esfenvalerate, chlorpyrifos and thiodicarb.

Also, increasing the concentration of all tested compounds caused a gradual decrease in larval and pupal weight with the exception of hexaflumuron and chlorfluazuron which caused increased in pupal weight, number of laid eggs/ female, hatchability of eggs, adults emergence and a gradual shortened of oviposition period with the exception of hexaflumuron and chlorfluazuron which prolonged the oviposition period for pink bollworm and post oviposition period with the exception for esfenvalerate in spiny bollworm which caused a gradual prolonged in post oviposition periods, male and female longevity with exception chlorpyrifos in spiny bollworm a gradual prolonged in female longevity. All tested compounds caused increased in sex ratio, which was non-significant for pink bollworm and spiny bollworm.

2.3. Adult stage:

The results obtained clearly show that both tested insecticides and concentrations of each insecticide effected significantly or non-significantly on the most biological aspects of pink and spiny bollworms, when adults were treated using the dry film techniques. Increasing the concentration of all tested insecticides induced a gradual prolonged in incubation period, pre-oviposition period with the exception of hexaflumuron in spiny bollworm induced a gradual shortened and post oviposition period exception chlorpyrifos in pink bollworm and all tested insecticides in spiny bollworm induced shortened. On the other hand, increasing the concentration induced a gradual decrease in number of deposited eggs / female and hatchability of eggs and shortened in oviposition period, and male & female longevity.

B- Field experiments:

1- Effect of different sprayers and different recommended compounds against pink bollworm.

These experiments were carried out at Sharkia region during 2002 and 2003 cotton season to study the effect of different sprayers and different recommended compounds against pink bollworm.

In this part of study, three known pesticides namely, Esfenvalerate, Chlorpyrifos and Thiodicarb were evaluated in the field against pink bollworm using three different types of sprayers. The tested equipments of spraying were knapsack motor sprayer

(solo) with micronor, knapsack motor sprayer (solo) and conventional motor sprayer.

During 2002 season:

Belonging the efficiency of tested insecticides in reducing the infestation in cotton fields with pink bollworm, esfenvalerate and thiodicarb were have a powerful efficiency against pink bollworm and differed highly significant comparing with chlorpyrifos which had a moderate effect and resulted in reductions. The mean average of the seasonal reductions of pink bollworm with the three different sprayers were 92.93, 92.96 and 65.24 for Esfenvalerate, Thiodicarb and Chlorpyrifos, respectively.

According to the efficiency of the different sprayers used, the averages reduction of pink bollworm for all the three tested insecticides with each tested sprayer alone, were 84.27, 83.30 and 83.56% for knapsack motor sprayers (solo) with micro nor, knapsack motor sprayer (solo) and conventional motor sprayer, respectively, with non significant differences between them.

During 2003 season:

There was highly significant differences between Esfenvalerate and Thiodicarb as comparing with Chlorpyrifos in reducing the bollworm infestation in cotton fields, which the average of the seasonal reductions of pink bollworm infestation with the three different sprayers were 91.52, 89.28 and 52.71% for Esfenvalerate, Thiodicarb and Chlorpyrifos, respectively.

According to the efficiency of the different sprayers used, the mean average reduction of pink bollworm for all the three tested

insecticides with each tested sprayer alone showed no significant between them.

2- Effect of some insect growth regulators alone on pink bollworm.

This experiment, was conducted to study the effect of some insect growth regulators alone, comparing with the recommended insecticide, Chlorpyrifos, on pink bollworm, during 2002 and 2003 cotton seasons.

During 2002 season:

The percent reductions of infestation with pink bollworm after spray cotton fields with these two IGRs with reference to the recommended insecticide chlorpyrifos. Hexaflumuron was efficient against pink bollworm than Chlorfluazuron. Both Hexaflumuron and Chlorfluazuron were less in active than the recommended insecticide Chlorpyrifos.

The seasonal averages of reduction of pink bollworm infestations, were 59.90, 57.75 and 73.27% for Hexaflumuron, Chlorfluazuron and Chlorpyrifos, respectively.

During 2003 season:

The percents of reduction of pink bollworm infestation with Hexaflumuron and Chlorfluazuron were 60.05% and 56.83%, respectively, comparing with that concerning Chlorpyrifos, which was 65.67%.

There were little differences in the efficacy between the two tested IGRs, as well as between the IGR's and the recommended insecticides Chlorpyrifos.