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## SUMMARY

The present studies include laboratory and field investigations. Firstly the laboratory studies aims to evaluate the toxicity of five recent plant extracts in laboratory against egg and larval stages of the pink bollworm, *Pectinophora gossypiella* ( Saund. ) and the cotton leafworm, *Spodoptera littoralis* ( Boisd. ). Also, the latent effects of the tested extracts on certain biological aspects were studied.

Later on, the population analysis of bollworms, pink and spiny was studied under field conditions during 2003 and 2004 cotton growing seasons in an attempt to contribute the best placement of either insecticides or / and plant extracts as control measure instead of classical conventional applications. Simultaneously the fluctuation of larvae ( in green bolls ) of bollworms *P. gossypiella* and *E. insulana* was also studied in the same seasons.

In addition, the five plant extracts and non traditional pest control agents were field investigated against cotton bollworms, *P. gossypiella* and *E. insulana* and two sucking pests, *Emboasca spp* and *Aphis gossypii*. Also, the five experimental materials were arranged in 6 different sequential systems and investigated against bollworms during 2004 and 2005 cotton seasons in compare with the official governmental program (RPMA ).

Finally, the effect of different investigated treatments on losses of cotton yield caused by bollworms infestation was calculated using mathematical model on field data.

The obtained data of the forementioned tested topics could be summarized as follow:

### **1- Laboratory studies :**

#### **1.1. Evaluation of toxicity against cotton leafworm *S. littoralis***

### **1.1.1. Ovicidal effects of plant extracts against egg stage :**

Laboratory bioassay of the 5 plant extracts using dipping technique revealed that Bioneem extract exhibited the highest ovicidal activity against egg stage of *S. littoralis* and was followed by Garlic, Rosemary, Marjorum and Thymus, respectively.

### **1.1.2. Larvicidal effect of plant extracts against larval stage :**

Laboratory bioassay using 2<sup>nd</sup> instar larvae of *S. littoralis* indicate that extracts of Bioneem, Garlic and Rosemary recorded almostly similar and relatively the highest larvicidal activity compared with Marjorum and Thymus extracts. However, the tested extracts exhibited larvicidal activity, arranged in the same order against the 4<sup>th</sup> instar larvae of *S. littoralis*, when fed for 24 h on castor oil leaves treated with extracts.

## **1.2. Evaluation of toxicity against pink bollworm *P. gossypiella***

### **1.2.1. Ovicidal effect of plant extracts against egg stage:**

LC<sub>50</sub> values based on laboratory bioassay, adapting dip technique, indicated that there was no significant difference between the tested extracts against pink bollworm egg stage.

### **1.2.2. Larvicidal effect of plant extracts against larval stage:**

Toxicity data against pink bollworm 2<sup>nd</sup> instar larvae revealed Bioneem extract was relatively the highest effective while Thymus was the least effective whereas other extracts came in between.

## **1.3. Evaluation of latent effects of sublethal concentrations of the tested extracts on certain biological aspects.**

### **1.3.1. Latent effects in *S. littoralis* surviving treatment with extracts:**

Exposure and feeding *S. littoralis* 2<sup>nd</sup> instar larvae on leaves treated with LC<sub>50</sub> values of all tested extracts except Thymus resulted in reducing

significantly pupation percentages and resulted insignificantly high pupal abnormality. Similarly, all extracts except Thymus exhibited significantly low percent of adult emergence as well as remarkable and significant percent deformed adults.

### **1.3.2. Latent effects in *P. gossypiella* surviving treatment with extracts:**

Likewise, pupation percentages of *P. gossypiella* surviving feeding the 2<sup>nd</sup> instar larvae on sublethal (LC<sub>50</sub>) conc. of all tested extracts except Thymus was significantly affected (reduced) and also the deformed pupae percent was significantly affected (increased) compared with check. However, Bioneem and Garlic reduced significantly adult emergence and increased significantly deformed adults compared with other extracts and untreated check whereas Thymus was the least in this respect.

## **2. Field studies**

### **2.1. Pupation dynamic of cotton bollworms**

#### **2.1.1. Population dynamic of pink bollworm *P. gossypiella*:**

Data of delta sticky pheromone traps revealed that the fluctuation in the population density of pink bollworm male moths changed from time to another forming five peaks of activity during both seasons (2003 and 2004).

#### **2.1.2. population dynamic of spiny bollworm *E. insulana***

As for spiny bollworm the data revealed that three peaks was only observed during 2003 cotton season versus five peaks were recorded during 2004 cotton season.

## **2.2. Relationship between the number of bollworms male moths caught and infested bolls :**

The data indicate that there is a high significant ( positive ) relationship between the number of captured male moths of pink and spiny bollworms and the rate of infested green bolls and the number of all larvae during the whole period of infestation within both seasons (2003 and 2004).

## **2.3. Effect of prevailing weather factors ( temperature and relative humidity ) on population dynamic of both bollworms :**

The data indicate that the simple correlation and partial regression values between the average number of captured pink and spiny bollworm male moths in sex pheromone traps and each of maximum temperature and night minimum temperature was significantly positive during both seasons ( 2003 and 2004 ).

Similarly, the effect of relative humidity on population of bollworms showed the same trend of the two other factors.

The combined effects of the tested weather factors (max., min. temperature and R.H.% ) played an obvious role on the population changes of the tested pink and spiny bollworms as indicated by the amount (percentage ) of explained variance through the successive season.

## **2.4. Effect of experimental treatments on bollworms infestation and infestation reduction :**

Data indicated that there was an appreciable reduction in bollworms infestation as a whole during both seasons, following testing different materials. The maximum reduction was obtained by applying Spinosad followed by the RPMA and Bioneem, whereas Thymus was the least in this respect.

## **2.5. Evaluation of different sequences of treatments against bollworms**

:

Data revealed that the sequence of Spinosad / *Trichogramma* / Spinosad came in the 1<sup>st</sup> rank and exhibited high reduction percentages in bollworms infestation similar as that obtained by RPMA.

Generally it was obvious that sequences free from traditional insecticides while containing some alternative Naturally like spinosad, some plant extracts like Garlic or releasing the parasitoid *T. evanescens* came in the 2<sup>nd</sup> rank and exhibiting high efficiency against the bollworms infestation , compared with RPMA.

## **2.6. Evaluation of experimental treatments against sucking pests:**

Reduction in *Emboasca spp*\_ population after 2 successive sprays of 7 different treatments during both seasons ( 2003 and 2004 ) revealed that the highest average reduction was recorded in RPMA treatment and was followed significantly by Spinosad and Bioneem treatments. Other treatments came in 3<sup>rd</sup> rank ( Garlic and Rosemary ) while Marjorum and Thymus were the least effective treatment and came significantly in the 4<sup>th</sup> rank.

Asimilar trend was almostly recorded against *Aphis gossypii* population during both seasons ( 2003 and 2004 )

## **2.7. Effect of experimental treatments on cotton yield losses :**

Data of losses in cotton yield due to the bollworm infestation revealed that each of Spinosad , RPMA and Bioneem were superior and exhibited the least reduction in cotton yield , without significant differences between each other. However , Garlic came next and was followed by *Trichogramma* and Rosemary , showing moderate losses and recording significant differences between each other. The highest losses in



cotton yield was recorded in Marjorum and Thymus treatments but still were less than in untreated check.