INTRODUCTION

1. INTRODUCTION

Cotton (primarily *Gossypium hirsutum* but also *G.barbadense*) is the most important fiber crop grown worldwide. The need for irrigation and the dominant influence of pest problems in most system greatly affects potential profits by increasing production costs and reducing yield. Insects are a major constraint and cotton was one of the first crops on which insecticidal use reached unacceptable levels.

The pink and spiny bollworms are main pests in the most cotton growing areas of the world, infestation of bollworms on cotton squares, flowers and green bolls at the end of the season ranged from 47 to 70 % **(Abd El-Naser *et al.*, 1979).** Also, **Makkar and Kostandy (1995)** in Egypt, found that infestation with bollworms, PBW and SBW during flowering and fruiting stages, significantly and negatively, affected the cotton yield. Percentages of infestation ranged between 4.5-12.8% in July, 6.9-24.2% in August and 38% during September.

The problems that have subsequently arisen because of the heavy insecticidal treatments had a dramatic effect on the cotton production industry environmental population and led to a concerned effort to find alternative system of pest management. Among the important elements of integrated crop/pest management (ICM/IPM) is the achievement of nutrient balance by introducing balanced fertilization to achieve good plant growth, fruiting, yield and tolerance against pest attack. **Hango and Uthamasamy (1992)** mentioned that infestation *of H. armigera* and *P.gossypiella* in cotton was lowest when N, P and

K were applied at rate of 40:40:120 kg /ha. Also, the damage caused by *Earias vittela* was lowest at 40:40:120 kg NPK/ha. In general, incidence of bollworm complex was lowest when the fertilizers were added 25 and 55 days after sowing.

In Egypt, cotton (*Gossypium barbadense*) is one of the most important crops contributing to the national income. It is well known that the protection of crop plants from pests is one of the important components profitable farming systems. The pink bollworm *Pectinophora gossypiella* and spiny bollworm *Earias insulana* are main insect pests in the most cotton growing areas of the world. **Henneberry (2003)** stated that the PBW has been a key pest in the cotton (*Gossypium spp.*) growing areas of Arizona and southern California for almost 40 years. Control costs, lint yield and quality losses have been conducted by many researchers in the USA, Mexico and in numerous other countries. Much information had been gathered on PBW distribution, biology, ecology, physiology and genetics. Ecology oriented integrated pest management (IPM) approaches using one or more environmentally compatible technology components that proved effective on cooperative farm and small community action level programs. The host plant resistance component of IPM was made a reality with incorporation of the genetic material from *Bacillus thuringiensis* (*Bt*) that controls production of *Bt* crystal toxic protein in cotton plants. This breakthrough provided the cohesive IPM element that gave stability to PBW – IPM and increased the margin of probability for successfully implementing area wide PBW management with the ultimate goal of eradication from infested areas.

Bollworms threaten the growing cotton, especially at the late growing stage. The main approach for controlling these pests is still by using insecticides. There are many problems appeared with the repeated use of insecticides includes hazards to man and animals either by direct consumption of treated crops or by environmental pollution and the appearance of resistant insect strains to insecticides. **Sharma *et al.*, (1984)** compared the effectiveness of cypermethrin, Decis (deltamethrin), permethrin and fenvalerate was compared with that of carbaryl against *Earias vittella*, *E. insulana* and *P.gossypiella* on cotton. At harvest, residues were extracted from cotton seed and lint and determined by gas-liquid chromatography.

Bioinsecticides depending upon the entomopathogenic bacteria *Bacillus thuringiensis* proved safe to animal and man but highly toxic to many insect pests, mainly Lepidoptera. **Khoja *et al.*, (2006)** evaluated that the efficiency of two *B. thuringiensis* products (Dipel 2X and Protecto) in laboratory on eggs and 1st instar larvae of *E.insulana*. Application of the two products on eggs caused 75.5 and 60% mortality to newly hatched larvae which fed on parts of the contaminated egg shell after 7 days of treatment. While, 1st instar larvae when treated, Dipel 2X was more effective than Protecto, (100 vs. 73.3% larval mortality, respectively, 10 days after treated) and pupal weight was significantly reduced when larvae were treated with either *Bt* products

The changing of indols, phenols and alkaloids compounds of cotton bolls wall led to inducing the resistance of cotton bolls against bollworms by the effect of the tested agrochemicals.

Paech and Tracey (1955) found that alkaloids, even in very small amount, have physiological effects on living organisms. Alkaloids are widely distributing in plant families such as legumes and Solanaceae, they contain toxic substance which protect plants from insects attack.

Also, **Hango and Uthamasamy (1989)** found that total phenol compound content decreased with an increase in boll age, declining from 0.98 to 0.42 mg/g in JK260 and from 0.80 to 0.31 mg/g in Sharada. Gossypol content, which is known to be deleterious to bollworms, declined with boll age but was consistently higher in JK260. This, together with the higher total phenol and crude fiber contents, are thought to contribute to the greater resistance.

The present study aimed to clarify the following:

1- The effect of different agrochemicals (EM (effective microorganisms), Mikrofol (foliar fertilizer), Dipel 2X (bioinsecticide) and Pleo (chemical insecticide) on the infestation with the bollworms in Egyptian cotton fields.

2- The effect of different agrochemicals on certain biochemical aspects of cotton bolls and their relationship with inducing resistance of cotton bolls against bollworms.

3- The effect of different agrochemicals on the population of the bollworms predators.