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Evaluation of some microbial agents, natural and chemical compounds for controlling tomato leaf miner, *Tuta absoluta* (Meyrick) (Lepidoptera: Gelechiidae)

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Abstract: Solanaceous plants have a great economic impact in Egypt. These groups of plants include potatoes, tomatoes and eggplants. The new invasive pest of tomatoes, *Tuta absoluta* (Meyrick) causes the greatest crop losses which can range from 60 to 100%. After its detection in Egypt during the last half of 2009, it spread quickly to all provinces in the country. We aiming to propose a sustainable control program for this devastating pest. In this research we tested three groups of control agents. The first was microbial and natural, the second – plant extracts and the third – chemical insecticides. Our results showed that the impact of *T. absoluta* can be greatly reduced by the use of sustainable control measures represented by different insecticide groups. Bioassay experiments showed that this devastating pest can be controlled with some compounds that give high mortality rates. Of these compounds, spinosad and *Beauveria bassiana*, microbial control agents, followed by azadirachtin, gave the best results in controlling *T. absoluta*. Of the chemical insecticides, lambda-cyhalotrin was the most effective, followed by lufenuron and profenofos. In conclusion we encourage farmers to use microbial and natural control measures in combating the tomato leafminer, *T. absoluta,* in Integrated Pest Mangement (IPM) programs.

Key words: biopesticides, IPM programs, natural insecticides, tomato leaf miner

Introduction

The tomato leaf miner, *Tuta absoluta* (Meyrick) (Lepidoptera: Gelechiidae) is considered to be one of the most serious pests of tomatoes all over the world. The female adults lay their eggs on different parts of the plant and even on the tomato fruits themselves when there is heavy infestation (Eppo 2005). The damage to tomato crops comes from hatched larvae feeding on the vegetative parts of the tomato plant, causing delayed plant growth. In severe infestation the larvae can attack the tomato fruits (Caceres 1992; Cely *et al.* 2006). In some countries such as Spain and Brazil, tomato crop losses due to infestation by this pest has reached up to 90% (Korycinska and Moram 2009). This pest has 10–12 generations per year (Mahmoud *et al.* 2015).

The control strategies of this pest are mainly based on using chemical insecticides. The crops are sprayed several times during the plantation period, leading to resistance to these chemical insecticides in many countries (Siqueira *et al*. 2000; Torres *et al*. 2002). Additionally, these chemical insecticides cause adverse environmental effects including water pollution, eradication of beneficial wildlife and human health problems (Abd El-Ghany *et al.* 2016). In this research, three groups of control agents were evaluated. The first group included different biopesticides such as, *Bacillus thuringiensis* (Bt), *Beauveria bassiana, Heterorhabditis bacteriophora,* and spinosad**.** The second group included natural plant extracts, garlic, neem and green miracle. The third group included trade formulations of the most popular chemical insecticides used against this pest i.e. lufenuron, profenofos, lambda-cyhalotrin, cyfluthrin.

The aim of this research was the selection of the most effective and safest group that could be used in controlling this pest alone or even in Integrated Pest Management (IPM) programs as a safe and ecofriendly alternative to the hazards of chemical insecticides.

Materials and Methods

Insects

Tomato plants were grown in a greenhouse at National Research Centre in pots (20 cm diam.) with fertilized soil. They were watered three times a week. These studies were done in the Laboratory of Microbial Control, National Research Centre, Egypt. The colonies of *T. absoluta* had been reared with tomato leaves under laboratory

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