

Efficacy of Emamectin Benzoate on *Tuta absoluta* Meyrick (Lepidoptera: Gelechiidae) Infesting a Protected Tomato Crop in Algeria

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Abstract: *Tuta absoluta* Meyrick became the most important pest of tomato crops in Algeria since 2008. Increasing problems in control of *Tuta absoluta* necessitate development of an integrated control program through a combination of preventive methods, biological control and chemical control if needed in order to keep the population density as low as possible. In the vicinity of Mostaganem, the density of *T. absoluta* population's increase dramatically with 50 to 100% damage to fruit production. When biological control is not efficient, chemical control can be used with selective pesticides in an integrated strategy. This study is conducted in order to evaluate the efficacy of Emamectin-benzoate against larvae of the tomato leaf miner. A field trial was conducted in tomato greenhouse during 2009- 2010. Three foliar applications were made at 7 days interval in a tomato greenhouse. The results showed a good activity on *Tuta absoluta* larvae with a mortality reaching 87%; but it is important to use it with a great attention when native natural enemies are working.

Key words: Tomato • *Tuta absoluta* • Emamectin-Benzoate • Efficacy • Integrated Control

INTRODUCTION

Tomato (*Lycopersicon esculentum* L.) belonging to Solanaceae and its origin is the Andean zone particularly Peru-Ecuador-Bolivian areas [1] but cultivated tomato originated in Mexico [2].

It is one of the attain a high and stable growth under deficient moisture most popular and versatile vegetable all over the world. It conditions [3]. Present investigation was undertaken to plays a vital role in providing a substantial quantity of study some of the morphological parameters, like root and vitamin C and A in human diet [4-5].

Tuta absoluta Meyrick (Lepidoptera: Gelechiidae) is a native microlepidopteron of South America [6-7], which can affect all aerial parts of the plant (leaves, flowers, stems and fruit). This pest has the potential to cause damage which can be up to 100% losses [8-9].

This South American tomato leafminer, *T. absoluta*, is one of the major pests of tomato crop since its detection in the Mediterranean basin [10]. *T. absoluta* was reported for the first time in Algeria in 2008 [10-12]. It causes extensive damage on tomato in the north western of Algeria. When population explosion occurs

chemical control is the most useful method in combination with other tactics and strategies of tomato integrated pest management (cultural tactics, mass trapping with sex pheromones, biological control...).

In Algeria, some bio-pesticides began to be used against this pest. The insecticide 'Emamectin benzoate' is a new macrocyclic lactone insecticide derived from the avermectin family of natural products. These products have been developed for the control of Lepidoptera pests on a variety of vegetable crops worldwide [13], with a particular efficacy against *T. absoluta*. The compound is not systemic, but it exhibits good translaminar activity [14].

The present study was carried out to test the efficacy of Emamectin benzoate against the larval stages of *T. absoluta* in a greenhouse tomato crop.

MATERIALS AND METHODS

Plant Cultivars: The variety of tomato planted is Tafna (it is the most used cultivar in the vicinity of Mostaganem (Algeria). The tomato crop was conducted in an unheated where was installed an insect-proof and a sex-pheromonal trap (Delta) during spring season.

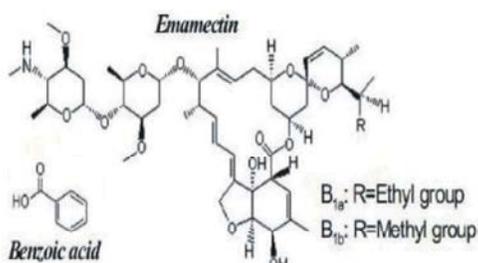


Fig. 1: Chemical structure of Emamectin- Benzoate [15-16].

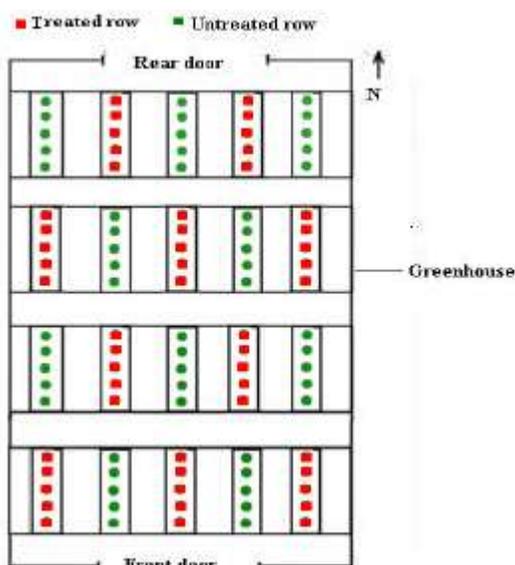


Fig. 2: Method of treatment of larvae by Emamectin-benzoate in greenhouse.

Pesticide: Emamectine-Benzoate is a novel foliar insecticide of Lepidoptera group. It is a derivative of the natural Avermectin family produced by fermentation of a soil microorganism *Streptomyces avermitilis* [15,16]. Emamectin-benzoate had been homologated by the National Institute of Plant Protection (INPV). It is registered under the number 06.44.046. It can be an active ingredient against *T. absoluta* larvae if farmers understand better its application periods when needed.

Treatment Test: The tested treatments are carried out on tomato plants in greenhouse, it was divided into four blocks with five rows/block and five plants/ row. We used a knapsack sprayer. The used dose of pesticide is 0.6gr/l or (60 gr/hl).

The treatment relates to a row on two in all the blocks, alternating rows (one treated with the pesticide and another not treated). Corresponding to 50% of tomato's plants is treated and 50% control (Fig.2).

During treatment, plastic sheetings were installed between rows to avoid contamination of control groups by the pesticide. Three treatments were applied during Jun 2010 at 7 days intervals. Ten leaflets/ plant were taken randomly from 24 plants and observed under a stereomicroscope in order to evaluate the mortality of larvae. The observation was performed 2 days after each treatment [17].

Statistical Analysis: The variances, averages and standard deviation of various repetitions were calculated and analyzed by the software of Statistics (STAT BOX 6.0.4. GRIMMERSOFT) and the device used are the unifactorial total randomization (one studied factor) by the test of Newman - Keuls (P 0.05 and P 0.01) [17].

RESULTS

Emamectin benzoate caused an important mortality of *T. absoluta* larvae (Figure 03 a dead larva after treatment).

After observing the samples, we identified the dead larvae and live larvae in the treated group and untreated. Mortality rates were calculated and corrected by the Schneider-Orelli formula:

$$\text{Corrected mortality (\%)} = \frac{\text{Mortality in the treated (\%)} - \text{Mortality in the control (\%)}}{100 - \text{Mortality in the control (\%)}}$$



Fig. 3: Comparison between treated larva (on the left) and healthy one (on the right)

Table 1: Mortality rates of *T. absoluta* larvae treated by Emamectin-benzoate.

	1 st Treatment	Control	2 nd Treatment	Control	3 rd Treatment	Control
Mortality Rates (%)	84.88	19.53	92.18	21.98	83.18	19.08

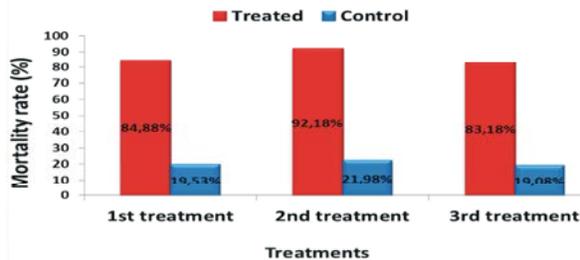


Fig. 4: Mortality rates of *T. absoluta* larvae treated by Emamectin-benzoate.

Larval population of *T. absoluta* in the greenhouse

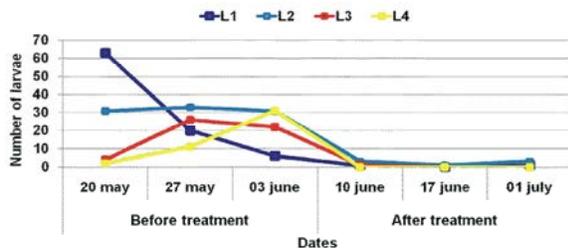


Fig. 5: Estimated larval population of *T. absoluta* in the greenhouse before and after treatment.

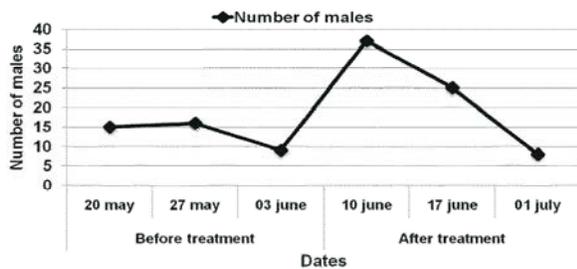


Fig. 6: Population of males of *Tuta absoluta* weekly caught in the sex pheromone trap

Mortality rates were 84.88% in first treatment, 92.18% in second and 83.18% in third treatment (Fig. 4).

DISCUSSION

The results show a good efficacy of Emamectin-benzoate against tomato leafminer *T. absoluta*.

We obtained a mean of 86.7% of mortality (with three treatments). The persistence of the product according to the firm can vary between 7 and 14 days. We think that the number of treatments does not exceed three when need.

Lopez *et al.* [18] obtained a mortality rate of 90% of larvae on tomato leaves. Jansson *et al.* [19] reported the efficiency of the same bio-pesticide on others lepidopteran pests on the tomato crop such as *Keiferia lycopersicella* Walsingham (Lepidoptera: Gelechiidae).

The efficacy of Emamectin benzoate was reported by other authors on other pests of different crops like corn earworm *Helicoverpa zea* Boddie (Lepidoptera: Noctuidae) [20] and Cotton leafworm *Spodoptera littoralis* Boisd. (Lepidoptera: Noctuidae) [21].

We should be very tactful to avoid the use of this bio-insecticide by farmers without explaining a good reason for their action. When natural enemies are involved in the control of the pest, they have to be careful what they are doing so that they do not kill it. If they act without thinking they risk a lot of problems.

The results gave an acceptable efficacy of the biopesticide Emamectin-benzoate against the tomato leafminer *Tuta absoluta* Meyrick (Lepidoptera: Gelechiidae).

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