

EFFECTIVENESS OF PHYTOPESTICIDE NEEM AZAL T/S[®] AGAINST TOMATO LEAF MINER (*TUTA ABSOLUTA* MEYRICK) IN GREENHOUSE TOMATO

V. YANKOVA^{1*}, N. VALCHEV² and D. MARKOVA¹

¹ „Maritsa” Vegetable Crops Research Institute, BG - 4000 Plovdiv, Bulgaria

² Trakia University, BG - 6000 Stara Zagora, Bulgaria

Abstract

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In recent years tomato leaf miner (*Tuta absoluta* Meyrick) became one of the most dangerous pests for tomato greenhouse production. The larvae make damages on all aboveground parts of the plant from seedlings production stage to the harvesting. In the period 2011-2012 studies were performed for determination of the effectiveness of the phytopesticide Neem Azal T/S[®] 0.3% with active ingredient azadirachtin against *T. absoluta*, in tomato growing variety Velocity under greenhouses. High effectiveness of the product (E=80.51%) was established 14 days after treatment against early stages of the larvae (L1 and L2) of the pest. Neem Azal T/S 0.3% shows very good effectiveness (84.10% and 86.61% respectively) both in twofold and threefold treatment in intervals of 7 days against mixed population of larvae 1-4 instars of *T. absoluta*. The good biological activity of Neem Azal T/S 0.3% makes possible its including in the integrated and biological systems for control of the pest in tomato greenhouse production.

Key words: *Tuta absoluta*, botanic insecticides, biological activity, tomato, greenhouse

Introduction

Tomato leaf miner (*Tuta absoluta* Meyrick) (*Lepidoptera: Gelechiidae*) is a dangerous pest in tomato growing both in cultivation facilities and in open field. The larva makes damages on all above-ground parts of the plant from the phase seedlings production to the harvesting (Caffarini et al., 1999; Harizanova et al., 2009; Yankova, 2012). The excessive use of chemical insecticides results in arising of resistance of the pest populations to the applied products that makes difficult conducting of effective control against this pest (Lietti et al., 2005; Guedes and Picanço, 2012). The including of bioproducts in the plant protection systems like phytopesticides is an alternative possibility to avoid this negative direction in the system.

The botanical products for plant protection possess a number of priorities that make them preferable in modern agriculture. They are safety both for environment and for human health. The phytopesticide properties of many plants are known from the remote past. These properties are due to

the natural chemical compounds – alkaloids, esters, glycosides etc. that are part of plant composition (Mateeva, 2000). Standard products for plant protection based on plant extract are offered in the network of shops. Products with active ingredient azadirachtin (Neem Azal T/S, Azatin EC, Neemix, BioNeem Plus 1,5 EC and etc.) extracted from seeds and vegetative mass of the Neem tree (*Azadirachta indica* A. Juss) belong to this group. According to their chemical composition they are limonoids and possess specific antifeedant and deterrent activity – suppressing and stopping of the feeding, reduction of moulting and deformations in pupae and in the imago decrease of fecundity of the females (Kleeberg, 2001; Isman, 2006; Hiiesaar et al., 2009). The application of plant extracts is an important element of the strategy for integrated management of *T. absoluta* (Braham and Hajji, 2012).

The purpose of the study is to establish the effectiveness of the phytopesticide Neem Azal T/S[®] 0.3% against the larvae of tomato leaf miner (*Tuta absoluta* Meyrick) in tomato growing in cultivation facilities.

*E-mail: vinelina@abv.bg

Materials and Methods

Studies were performed in the period 2011-2012 with tomato variety Velocity grown in greenhouses. The effectiveness of the product Neem Azal T/S® 0.3% with active ingredient (a.i.) azadirachtin was established. Readings were made on preliminary marked plants and leaves at natural population density from larvae in different instars of the tomato leaf miner (*Tuta absoluta* Meyrick). The living larvae were counted up before treatment and in intervals 3rd, 7th and 14th day after the treatment. Treatment – single, twofold and threefold in 7 day’s intervals. Number of replications per variant is 4. The effectiveness (E%) was calculated by the Henderson-Tilton formula. A comparative analysis by the method of Duncan’s multiple range tests was made (1955).

Results and Discussion

Although the product Neem Azal T/S® is with vegetable origin shows specific effect on the pests. It causes disturbances in basic processes - feeding, metamorphosis and fecundity, followed by lethality. Neem Azal T/S® registered in many countries, including Bulgaria, shows good initial effectiveness in recommended by the manufacturer dose 0.3%.

The highest effectiveness of the product Neem Azal T/S 0.3 % was observed 14 days after the treatment in the trials where the plants have been treated in phenophase “fruitage starting” against the larvae 1 and 2 instar (L1 and L2) and in the phenophase “total fruitage” against larvae 3 and 4 instar (L3 and L4) of *Tuta absoluta* Meyrick. The effectiveness was considerably higher (E=80.51%) against young larvae (L1 and L2) in the treatment that has been carried out in June (start of fruitage) compared to the effectiveness in larvae 3-4 instars. This is due to the lower population density of the pest and to the earlier stage of development when the larvae are more susceptible to the treatment with the product Neem Azal T/S 0.3% (Table 1).

In conducting of the treatment in the phenophase “total fruitage” of tomato (June), in higher density of the larvae and in later stage of development (L3 and L4), the effectiveness of the product Neem Azal T/S 0.3% is lower. Nevertheless the recorded values for the effectiveness 14-th day after treatment are satisfactory (E=70.85%) (Table 1).

In the performed biological study of the phytopesticide Neem Azal T/S 0,3% in August (phenophase – total fruit ripening) against mixed population of larvae 1-4 instar of *T. absoluta*, was recorded the best biological activity in the two experimental years 14 days after the treatment. The established average effectiveness for the product in this period is 78.42% (Table 2).

Table 1
Effectiveness of the product for plant protection Neem Azal T/S 0.3% against different instars of tomato leaf miner larvae (*Tuta absoluta* Meyrick)

Variant	Year	Days after treatment		
		3	7	14
Larvae 1-2 instar (L1-L2)				
Neem Azal T/S 0.3%	2011	41.31 ± 19.26 b	66.79 ± 6.98 a	79.60 ± 4.95 a
	2012	49.29 ± 7.05 b	73.07 ± 5.31 a	81.42 ± 4.29 a
	Average	45.30 ± 10.44 b	69.93 ± 5.00 a	80.51 ± 1.37 a
Larvae 3-4 instar (L3-L4)				
Neem Azal T/S 0.3%	2011	38.09 ± 12.90 b	57.78 ± 9.43 ab	70.04 ± 15.47 a
	2012	41.25 ± 14.36 b	64.79 ± 9.59 a	71.67 ± 10.00 a
	average	39.68 ± 8.56 b	61.28 ± 7.23 a	70.85 ± 11.86 a

a. b. c. d...n. s. - Duncan’s multiple range test (p≤0.05)

Table 2
Effectiveness of the product for plant protection Neem Azal T/S 0.3% against mixed population from larvae in different instars (L1-L4) of tomato leaf miner (*Tuta absoluta* Meyrick)

Variant	Year	Days after treatment		
		3	7	14
Neem Azal T/S 0.3%	2011	45.83 ± 10.17 b	63.00 ± 12.10 a	78.42 ± 8.25 a
	2012	43.33 ± 15.87 b	68.45 ± 8.50 a	77.78 ± 3.93 a
	average	44.58 ± 8.77 c	65.72 ± 6.08 b	78.42 ± 8.25 a

a. b. c. d...n. s. - Duncan’s multiple range test (p≤0.05)

Comparative experiments were carried out with phytopesticide Neem Azal T/S 0.3% in single, twofold and threefold treatment against mixed population from larvae 1-4 instars of *T. absoluta*. The highest average values of the effectiveness (E=86.61%) were recorded in threefold treatment in interval of 7 days. Close to these values were recorded in twofold treatment (E=84.10%). This scheme for pest control could be applied successfully in the integrated and biological systems for tomato production in cultivation facilities. It was established a considerably lower effectiveness for Neem Azal T/S 0.3% at 7-th day in single treatment 66.62% (Figure 1).

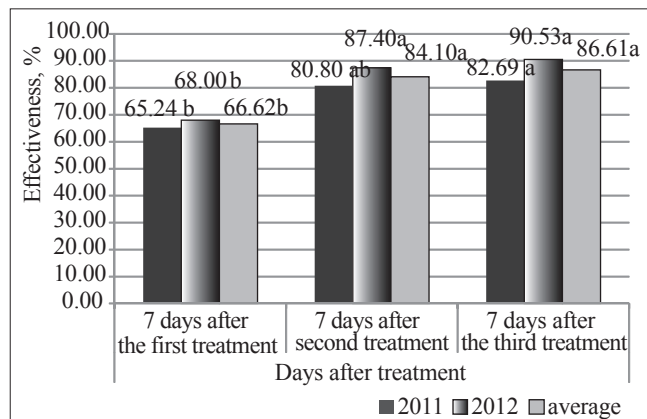


Fig. 1. Effectiveness of the product for plant protection Neem Azal T/S 0.3% against mixed population of larvae at different instars (L1-L4) of tomato leaf miner (*Tuta absoluta* Meyrick)

According to our previous studies was established a very good effectiveness of the product Neem Azal T/S as an insect-acaricide. This phytopesticide is slight toxic (toxicity 20.69%) in tomato growing in cultivation facilities towards one of the most frequently used bioagents *Encarsia formosa* Gah. Neem Azal T/S in concentration 0.3% could be applied in combination with the parasite input (Masheva et al., 2012).

The results from the conducted experiments confirm data established by Isman et al. (1990) for the good effectiveness of the product with a. i. azirachtin against pests from the order *Lepidoptera*. The phytopesticide Neem Azal T/S 0.3% shows very good biological activity against larvae of tomato leaf miner and it could be successfully applied for control in tomato production in cultivation facilities. This product is a successful alternative of the used chemical insecticides.

Conclusions

It was established high effectiveness (E=80.51%) of the phytopesticide Neem Azal T/S 0.3%, 14 days after single

treatment against the early stages of larvae (L1 and L2) of *Tuta absoluta* Meyrick.

The product Neem Azal T/S 0.3% shows very good effectiveness (84.10% and 86.61%, respectively) in twofold and threefold treatment in intervals of 7 days against mixed population of larvae 1-4 instars of *Tuta absoluta* Meyrick.

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