Studii şi Cercetări	Martie 2019	Biologie	28/2	43-46	Universitatea"Vasile Alecsandri" din Bacău

STUDY OF TOMATO PESTS IN ORGANIC AGRICULTURE

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Key words: *control attack, tomato, pest, organic agriculture*

INTRODUCTION

Tomato is an important crop for Romania, being cultivated on 41 thousands ha in 2016 with an annual production of 627 thousands t (Romanian Ministry of Agriculture and Rural Development Romania, 2019). The main pests in tomato crops in our area were: onion thrips (*Thrips tabaci* Lind.), corn earworm (*Helicoverpa armigera* Hbn.) and Colorado potato beetle – *Leptinotarsa decemliniata* Say (Maria Calin, 2005).

Onion thrips, *Thrips tabaci* Lind. is a cosmopolitan insect, feeding on a wide variety of vegetable and flower plants, small grains, field crops and weeds. It causes damage to plants by feeding of both adults and larvae. This insect is a vector for the following viruses: *Iris yellow spot virus, Strawberry necrotic shock virus, Tobacco streak virus, Tomato spotted wilt virus*. It is an important pest of tomato, pepper and bean in tunnels and greenhouses.

H. armigera can attack more than 172 plant species from 68 different families of cultivated and spontaneous plants (Cunningham and Zalucki, 2014). The biggest damage is caused to: tomatoes, peppers, eggplants, beans, peas, and chickpeas. Young larvae feed on the epidermis and parenchyma of leaves, sometimes the flowers, and in the later stages, larvae can attack fruits and/or seeds.

Colorado beetle attacks tomatoes in seedling stage and after planting. In the management of pests in organic farming, widely used for the control of harmful species, including for the control of *L. decemlineata*, were the pyrethrin products extracted from *Chrysanthemum cinerariaefolium*. This natural insecticide has a knock-down effect but has a short residual activity (Zehnder et al., 2007). Piperonyl butoxide (PBO) with synergistic role for natural and synthetic pyrethrins was used to extend the active period. Because pyrethrins have no selectivity for useful fauna (parasites and entomophagous predators, bees), other products admitted by European Regulations (EC) no. 834/2007, (EC) no. 889/2008 (EEC) no. 2092/91, of which the insecticidal and acaricidal extracts of *Quassia amara* and *Azadirachta indica* have a greater extension, the bacteria viruses and fungi entomophagous, nematophagous, etc. (Alyokhin, 2009; Ragsdale and Radcliffe, 2012).

MATERIAL AND METHODS

In 2016–2019, open field and tunnels experiments were performed at the Vegetable Research-Development Station, Bacau. Pests were monitored from tomato crops grown in organic farming in tunnels and open fields. Observations were made decadal. The estimation of the attack was accomplished using the following indicators: Frequency of the attack (F%), Intensity of the attack (I%), Degree of attack (GA%). The main pests observed in tomato crops were: onion thrips (*Thrips tabaci* Lind.), corn earworm (*Helicoverpa armigera* Hbn.) and Colorado potato beetle – *Leptinotarsa decemliniata* Say.

Onion thrips control

The effectiveness of products in control of *Thrips tabaci* Lind., was studied in tomato cultivars grown in tunnels. The trial was accomplished during summer and early autumn period. The maximum day temperature was 28-32°C with peaks up to 40°C.

When onion thrips damage exceeded the economic threshold, the following insecticides were applied on leaves in order to evaluate the pest control (table 1).

Table 1. Study of the efficacy of some products in the control of onion thrips at tomato

Vari-ant	The product	Active substance	Concen-tration (%)
V1	Laser™ 240 SC	Spinosad	0,04%
V2	ProBalance	Azadirachtin and other natural active ingredients	0,3%
V3	Neem oil	Oil from *Azadirachta indica*	0,3%
V4	Untrated	x	x

The effectiveness analysis of insecticides in onion thrips control was performed according to the Sun-Shepard method (Püntener, 1981).

The obtained results will be used in future researches of integrated pest management control in organic agriculture in order to increase the ecological pest control practices in vegetable growing.

Corn earworm control

The experiments were performed aiming to monitor, evaluate and control of *Helicoverpa armigera* Hbn. attack in tomato. The observations were taken every 10 days from the beginning of May to the end of September. The following insecticides were applied on leaves and were evaluated for pest control (table 2).

Table 2. Study of the efficacy of some products in the control of corn earworm

Va-ri-ant	The product	Active substance	Concen-tration (%)
V1	Bactospeine DF	*54% Bacillus thuringiensis, subsp Kurstaki ABTS 351*	0,1%
V2	Konflic	50% extract of *Quassia amara*	0,3%
V3	Neemex	Oil from *Azadirachta indica*	0,3%
V4	Untrated	x	x

The results obtained will be used in pests control in order to decrease the number of treatments utilized in organic agriculture and to increase the parasite and predator populations of vegetable pests.

Efficacy was calculated 3 days after the treatment, according to the Sun-Shepard method (Püntener, 1981). Assessments were also made on phytotoxicity at plant, crop development and visible residues.

Colorado potato beetle control

The treatments applied to control Colorado beetle larvae, ages 1 – 2 are presented in table 3.

Efficacy was calculated 3 days after the treatment, according to the Sun-Shepard method (Püntener, 1981).

Assessments were also made on phytotoxicity at plant, crop development and visible residues.

Table 3. Study of the efficacy of some products in the control of Colorado potato beetle

Vari-ant	The product	Active substance	Concen-tration (%)
V1	Neem oil	Oil from *Azadirachta indica*	0,3%
V2	Konflic	50% extract of *Quassia amara*	0,3%
V3	ProBalance	Azadirachtin and other natural active ingredients	0,3%
V4	Untrated	x	x

RESULTS AND DISCUSSIONS

The thrips attack was observed in the seedling phase of tomato. Because this insect is a vector for the following viruses: *Iris yellow spot virus, Strawberry necrotic shock virus, Tobacco streak virus, Tomato spotted wilt virus*, treatments applied to a 3.6% - 4.8% frequency of the attack (F%), fig 1.

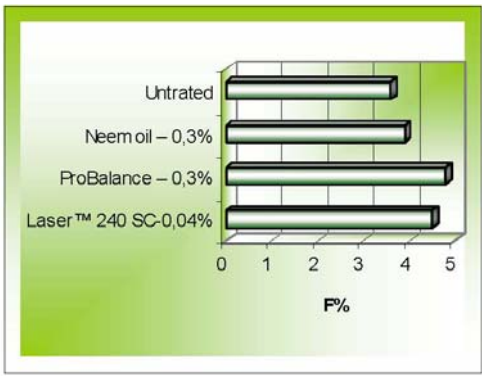

Fig. 1. Frequency F% of onion thrips attack

The efficacy of the treatments applied in onion thrips control is presented in fig.2.

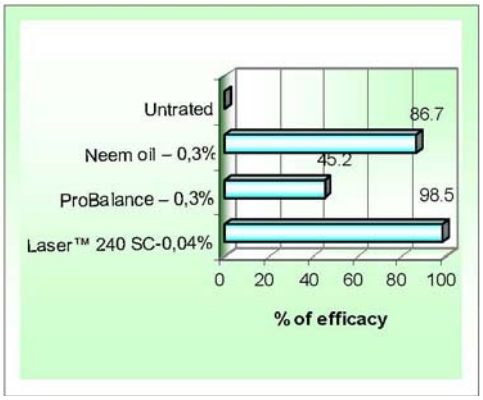

Fig. 2. % efficacy of tested products in control of onion thrips

The data presented show that the best results in control of the onion thrips in tomatoes had V1 - Laser ™ 240 SC - 0.04% with a efficiency of 98.5%, followed by the variant treated with Neem oil - 0.3%, 86.7% efficiency. ProBalance - 0.3% had insufficient efficacy for control the onion thrips - 45,2%.

Corn earworm control

The treatments applied to control the corn earworm had the following results (fig. 3). It is observed that the best efficacy were the following products: Bactospeine DF - 0.1% (96.3%), Konflic - 0.3% (95.8%) and Neemex - 0.3% (92.1%).

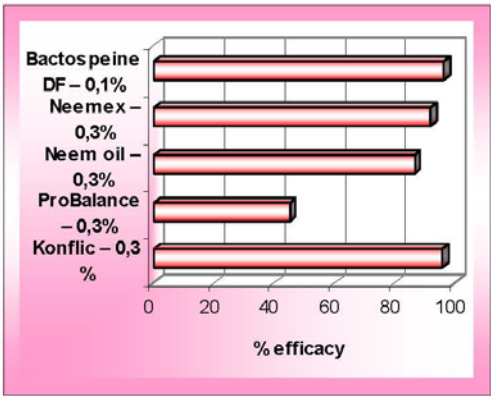

Fig. 3. % efficacy of tested products in control of corn earworm

Colorado potato beetle control

The obtained results are presented in fig. 4.

It can see that the best results in control of Colorado potato beetle larvae, ages 1 - 2 had Konflic - 0.3% (95.1% efficacy) and Neem Oil - 0.3% (91.4% efficacy).

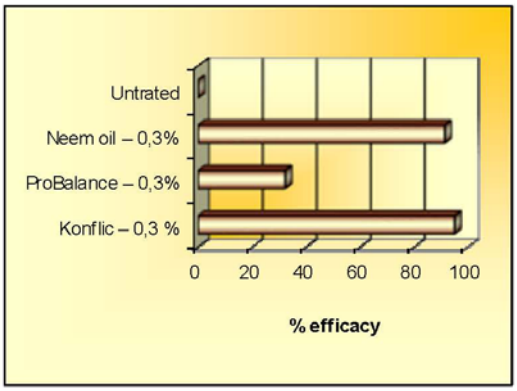

Fig. 4. Efficacy of *L. decemlineata* treatments

CONCLUSIONS

The main pests observed in tomato crops were: onion thrips - *Thrips tabaci* Lind., corn earworm - *Helicoverpa armigera* Hbn. and the Colorado potato beetle - *Leptinotarsa decemliniata* Say.

The best results in the control of onion thrips were Laser ™ 240 SC - 0.04% with 98.5% efficiency.

Konflic - 0.3%, Neemex - 0.3% and Bactospeine DF -

0.1% had an efficacy of over 92% in the control of Corn earworm larvae, ages 1 - 3.

The best effectiveness in control of Colorado potato beetle larvae, ages 1 - 2 had Konflic - 0.3% (95.1%) and Neem Oil - 0.3% (91.4%).

ABSTRACT

Experiments were carried out at the Bacau Vegetable Research and Development Station Bacau between 2016 and 2019. The main pests in tomato crops were: common trip - *Thrips tabaci* Lind., corn earworm - *Helicoverpa armigera* Hbn. and Colorado beetle - *Leptinotarsa decemliniata* Say. For the control of tomato pests treatments with insecticide products for organic farming were applied: Konflic - 0.3%, ProBalance - 0.3%, Neem oil - 0.3%, Neemex - 0.3%, Bactospeine DF - 0.1%, Laser ™ 240 SC. The best results in the control of onion thrips were Laser ™ 240 SC - 0.04% with 98.5% efficiency. Konflic - 0.3%, Neemex - 0.3% and Bactospeine DF - 0.1% had an efficacy of over 92% in the control of corn earworm larvae, ages 1 - 3. The best effectiveness in control of Colorado potato beetle larvae, ages 1 - 2 had Konflic - 0.3% (95.1%) and Neem Oil - 0.3% (91.4%).

ACKNOWLEDGEMENTS

This work was supported by a grant of the Romanian Ministery of Research and Innovation, CCCDI - UEFISCDI, project number PN-III-P1-1.2-PCCDI-2017-0850/ contract 14 PCCDI /2018, within PNCDI III.

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***European Regulations (EC) no. 834/2007, (EC) no. 889/2008 (EEC) no. 2092/91;

***Romanian Ministry of Agriculture and Rural Development Romania, 2019.

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