THE STUDY OF BIOLOGICAL CONTROL OF ONION THRIPS IN PEPPER

STUDIUL COMBATERII BIOLOGICE A TRIPSULUI COMUN LA ARDEI

CĂLIN Maria[1], CRISTEA Tina Oana[1], AMBARUS Silvica[1], BREZEANU Creola[1], BREZEANU P. M.[1], MUSCALU S. P.[1], PRISECARU Maria[2], COSTACHE M.[3], ŞOVAREL Gabriela[3], BRATU Liliana[3]
e-mail: sclbac@legumebac.ro

Abstract. *The trials of trips attack and ecological control of pests were performed at Vegetable Research and Development Station Bacau – Romania, during 2016 - 2017. The dynamic of trips attack in pepper and effectiveness of Amblyseius swirskii At.-H. (Arachnida, Mesostigmata, Phytoseiidae) releases in control of onion trips at pepper collection of cultivars in tunnels was studied. The trial of A. swirskii in trips control was performed at the following release rates: V1 – 500,000 mites/ha; V2 – 700,000 mites/ha; V3 – 900,000 mites/ha; V4. 1 million mites/ha; V5 - Control. On observed that the reducing trips degree attack by release of A. swirskii at pepper is effective in August - September using the release rates between 700,000 ex /ha - 1,000,000 ex/ ha.*
Key words: thrips, attack, pepper, biological control, *Amblyseius swirskiii*

Rezumat. *În perioada 2016 - 2017 s-au efectuat studii privind atacul şi controlul ecologic al tripsului comun la Staţiunea de Cercetare - Dezvoltare pentru Legumicultura Bacău - România. S-a monitorizat dinamica atacului de trips la ardei şi s-a studiat eficacitatea prădătorului Amblyseius swirskii At.-H. în controlul tripsului comun intr-o colecţie cu soiuri de ardei cultivate în solarii. S-a efectuat studiul prădătorului A. swirskii în combaterea tripsului comun pentru următoarele rate de lansare: V1 - 500.000 prădători / ha; V2 - 700.000 ex. / ha; V3 - 900.000 ex. / ha; V4. 1 milion de ex. / ha; V5 - Control. Lansarea prădătorului A. swirskii la ardei a fost eficientă în august - septembrie, utilizând rate de lansare între 700.000 ex / ha şi 1.000.000 ex / ha.*
Cuvinte cheie: trips, atac, ardei, combatere biologică, *Amblyseius swieskii*

INTRODUCTION

Onion trips - *Thrips tabaci* Lind. is a cosmopolitan insect. It feed on a wide variety of vegetable and flower plants, small grains, field crops and weeds. It causes damage to plants by feeding adults and larvae. He is vector specie 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 pepper and bean in tunnels and green houses.

[1]Vegetable Research and Development Station Bacau, Romania
[2]"Vasile Alecsandri" University Bacau, Romania
[3]Vegetable and Flower Research and Development Institute Vidra, Romania

Amblyseius swirskii At.-H. (*Arachnida, Mesostigmata, Phytoseiidae)* is a beneficial predatory mite for onion trips. It is natives in: Israel, Italy, Cyprus, Greece and Egypt. Here it can be found on crops like apples, apricot, citrus, vegetables and cotton. This predator, feeds pest species as *Bemisia tabaci, Trialeurodes vaporariorum, Frankliniella occidentalis* or pollen and plant exudates (EPPO, 2013).

It was first released in 1983 in North America for control of citrus pests in California. Since 2005, it was used as biological control agent of mites, trips and whiteflies in greenhouse and nursery crops. Now is currently reared and sold commercially in Austria, Belarus, Belgium, Denmark, Finland, France, Germany, Greece, Guernsey, Hungary, Israel, Italy, Jersey, Morocco, Netherlands, Norway, Poland, Spain, Turkey, UK, USA, China, Japan, Argentina, etc. (Arthurs *et al.,* 2009; Cedola and Polack, 2011; EPPO, 2013; Kade *et al*., 2011; Sato and Mochizuki, 2011; Chen *et al*., 2011).

Amblyseius swirskii is used to control trips in greenhouse vegetables (cucumber, pepper and eggplant) and some ornamental crops (Buitenhuis *et al*., 2010; Messelink *et al*., 2006). *Amblyseius swirskii* is not susceptible to diapauses and it can be used in periods with temperatures that exceed 22°C. The mites are released directly in the crops in bran or vermiculite carriers sprinkled on the leaves or substrates, or may be broadcast via air blast (Buitenhuis *et al*., 2010; Opit *et al*., 2005). The release rates are 25 - 100 mites per m² depending on pest species, pest density, and crop. The effectiveness of *Amblyseius swirskii* as a biological control agent may be reduced when multiple pest species are present (Kumar *et al*., 2016). Another research showed that predator provided better control on the foliage of pepper plants, compared with the flowers. Similar results obtained and Kakkar *et al*., 2016 in cucumber crops, where *Amblyseius swirskii* fed preferentially and control melon trips on leaves, but didn't provide effective control of common blossom trips from cucumber flowers.

MATERIAL AND METHOD

During 2016 – 2017 period, tunnels experiments were performed in Vegetable Research-Development Station Bacau - Romania, in order to evaluate the biological control of onion trips attack in peppers.

The effectiveness of *A. swirskii* in control of *Thrips tabaci* Lind., was studied in pepper collection of cultivars, in tunnels. When the degree attack of trips exceeded the economic threshold of damage, the predatory mites were released in the 4 variants. The trial was accomplished during summer and early autumn period. The maximum day temperature was between 28-32°C with peaks up to 40°C.

The trial of *A. swirskii* in trips control was performed at the following release rates:

- V1 – 500,000 mites/ha;
- V2 – 700,000 mites/ha;
- V3 – 900,000 mites/ha;
- V4 - 1 million mites/ha;
- V5 - Control.

Each variant area had 45 square meters.

The effectiveness of predator releases was determined by decadal observations of the attack on the plant and monitoring the pest population of onion trips.

The observations were accomplished every 10 days in August and September.

The attack estimation was determined using the following indicators:

- Frequency of attack (F%),
- Intensity of attack (I%),
- Degree of attack (DA%).

The effectiveness processing of *A. swirskii* in trips control was performed by the Sun - Shepard method.

The obtained results will be used in integrated pest management control in organic agriculture in order to increase the ecological pest control practices in vegetables.

RESULTS AND DISCUSSIONS

The dynamic of degree attack of pests in release rate variants at pepper is presented in table 1 and fig. 1.

Table 1

Degree attack of *Thrips tabaci* at pepper plant

No.	Release rate (mites - ex/ha)	Degree attack (%) in month and decade					
		August			September		
		1	2	3	1	2	3
2016							
V1	500000	15.4	11.2	6.2	3.5	3.1	1.5
V2	700000	17.2	10.1	4.9	3.5	2.9	1.5
V3	900000	13.5	9.8	4.7	3.4	3.0	1.3
V4	1000000	14.9	9.1	4.7	3.1	2.8	1.4
V5	Control	12.4	15.2	20.4	25.1	23.3	18.5
2017							
V1	500000	2.1	2.0	2.4	2.8	2.1	2.1
V2	700000	1.6	1.5	1.7	2.4	2.0	2.0
V3	900000	1.3	1.3	1.6	2.1	2.1	2.1
V4	1000000	1.9	1.6	1.8	2.3	1.9	1.9
V5	Control	1.8	1.7	2.1	2.8	3.1	4.5

The presented results show a different effectiveness of different release rate of *A. swirskii* in reducing the trips attack. In 2016 in first variant, the degree of onion trips attack was reduced from 15.4% in the first decade of August to 1.5% in the third decade of September. Increasing of mite predator release rate at 700,000 ex. /ha, had a powerful downward dynamic during the last decades of August and first decades of September.

The release rate of *A. swirski* with 900 thousand and one million ex./ha decreased the degree attack of onion trips at 1.3% in V3 and 1.4% in V4. These

results were obtained in the conditions of upward dynamic of trips degree attack in control variant (25.1% until the first decade of September).

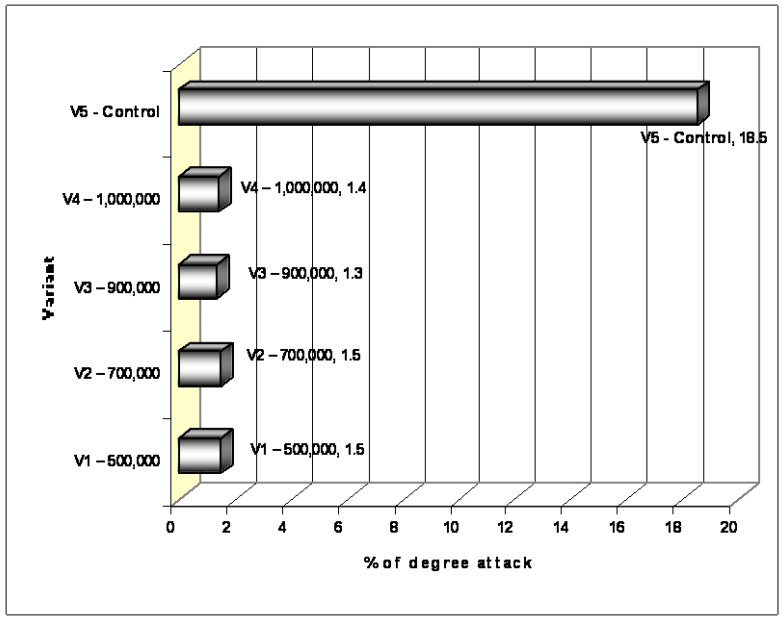

Fig. 1 The degree attack (%) of onion trips in last decade of September 2016

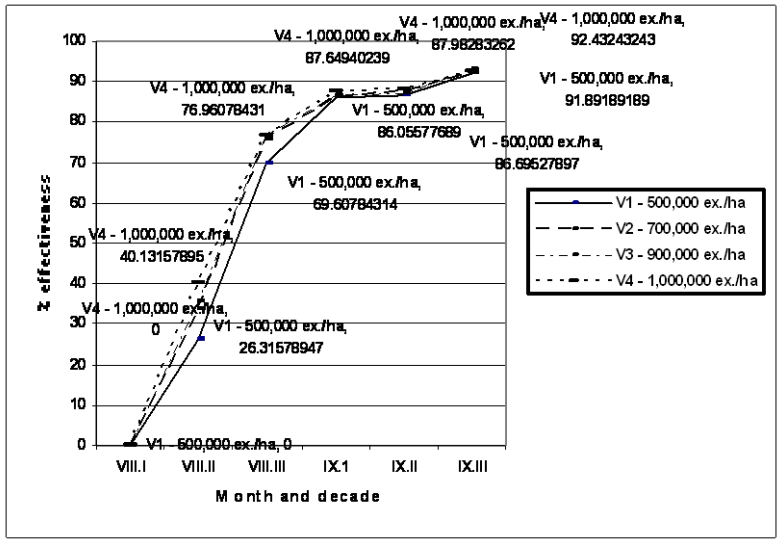

Fig. 2 Effectiveness of *A. swirski* releases for the control of onion trips at pepper in 2016

The effectiveness of different release rates (fig. 1) were:

- V1, 26.3% in second decade of August; 69.6% in third decade of August; 86.1% in first decade of September; 86.7% in second decade of September and 91.9% in last decade of September.
- V2, 33.5% in second decade of August; 75.9% in third decade of August; 86.1% in first decade of September; 87.6% in second decade of September and 91.8% in last decade of September.
- V3, 35.5% in second decade of August; 76.9% in third decade of August; 86.4% in first decade of September; 87.1% in second decade of September and 92.9% in last decade of September.
- V4, 40.1% in second decade of August; 76.9% in third decade of August; 87.6% in first decade of September; 87.9% in second decade of September and 92.4% in last decade of September.

The presented data show that reducing trips degree attack by release of *A. swirskii* at pepper is effective in August - September using the release rates between 700,000 ex /ha - 1,000,000 ex/ ha.

In 2017 the trips attack was reduced (below 2.1%). In these conditions the *A. swieski* release were accomplished during the first decade of September. All variants of releases had a very good efficacy, being over 95% (Fig. 3).

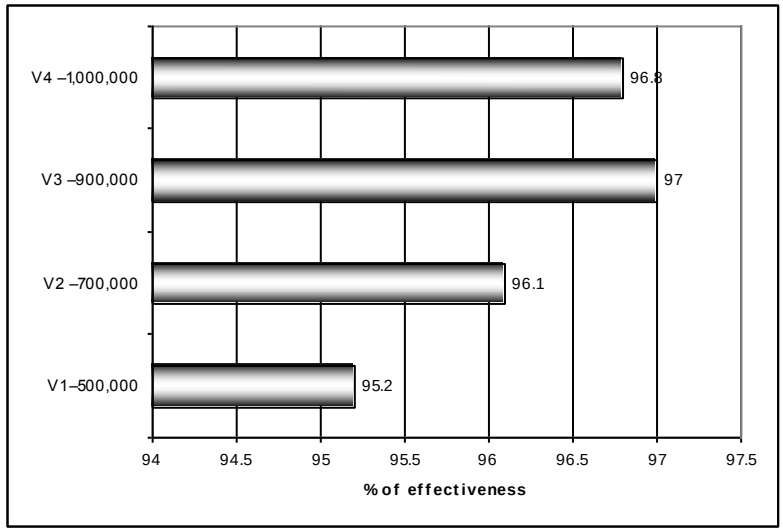

Fig. 3 Effectiveness of *A. swirski* releases in control of onion trips at pepper in 2017

CONCLUSIONS

In 2016 in first variant with *A. swirski* release, the degree of onion trips attack was reduced from 15.4% in the first decade of August to 1.5% in the third decade of September. Increasing of mite predator release rate at 700,000 ex. /ha, had a powerful downward dynamic during the last decades of August and first

decades of September. The release rate of *A. swirski* with 900 thousand and one million ex./ha decreased the degree attack of onion trips at 1.3% in V3 and 1.4% in V4.

The effectiveness of different release rates were: V1, 91.9% in last decade of September; V2, 91.8% in last decade of September; V3, 92.9% in last decade of September; V4, 92.4% in last decade of September. The obtained data show that reducing trips degree attack by release of *A. swirskii* at pepper is effective in August - September using the release rates between 700,000 ex /ha - 1,000,000 ex/ ha.

In 2017 the trips attack was reduced (below 2.1%). In these conditions the *A. swieski* releases were accomplished during the first decade of September. All variants of releases had a very good efficacy, being over 95%

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