

## INTEGRATED PEST CONTROL MANAGEMENT OF *TUTA ABSOLUTA* (TOMATO LEAFMINER) ON TOMATO CROPS UNDER HIGH PLASTIC TUNNELS

### MANAGEMENTUL INTEGRAT AL CONTROLULUI DĂUNĂTORULUI *TUTA ABSOLUTA* (MOLIA MINIERĂ) LA CULTURILE DE TOMATE DIN SPAȚII PROTEJATE

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**Abstract.** *Tuta absoluta* (tomato leafminer) (Meyrick) (Lepidoptera: Gelechiidae) is considered one of the main pests of tomato crops globally and since 2009, it represents a potential danger for tomato crops under high plastic tunnels in Romania. The attack is manifested through mines and galleries produced by young larvae in leaves, stems and fruits, in which they feed and grow. The experience done in 2021, at the R.D.I.V.F.G. Vidra, had as purpose the application of an integrated set of measures and means to control this pest (use of healthy seedlings for planting, use of insect-proof nets, dynamic monitoring of adult's density using Delta traps and application of warning treatments for this pest control at two tomato hybrids. From the tested products those based on spinosad 240 g/l - 0.05%, chlorantraniliprol 120 g/l - 0.0175% and cyantraniliprol 100 g/l + acibenzolar-S-methyl 12.5 g/l - 0.125% had an efficiency between 68.64 and 79.96% (Prekos F1 hybrid), respectively 83.60 and 87.39% (Vitara F1 hybrid).

**Key words:** insecticides, pest, tomato crop

**Rezumat.** *Tuta absoluta* (molia minieră a tomatelor) (Meyrick) (Lepidoptera: Gelechiidae) este considerat unul din principalii dăunători ai culturilor de tomate la nivel global și, începând din anul 2009, reprezintă un pericol potențial pentru culturile de tomate din spațiile protejate din România. Atacul se manifestă prin mine și galerii produse de larvele tinere în frunze, tulpini și fructe, în care se hrănesc și se dezvoltă. Experiența efectuată în anul 2021 la ICDLF Vidra, a avut ca scop aplicarea unui complex integrat de măsuri și mijloace pentru controlul acestui dăunător (folosirea la plantare a răsadului sănătos, utilizarea plaselor „insect-proof”, monitorizarea în dinamică a densității adulților cu ajutorul capcanelor „Delta” și aplicarea tratamentelor la avertizare pentru controlul dăunătorului, la doi hibrizi de tomate. Dintre produsele testate s-au remarcat cele pe bază de spinosad 240 g/l - 0,05%, clorantraniliprol 120 g/l - 0,0175% și ciantraniliprol (100 g/l) + acibenzolar-S-metil 12,5 g/l - 0,125% cu o eficacitate cuprinsă între 68,64 și 79,96% (hibridul Prekos F1), respectiv 83,60 și 87,39% (hibridul Vitara F1).

**Cuvinte cheie:** cultură de tomate, dăunător, insecticide

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## INTRODUCTION

*Tuta absoluta* (tomato leafminer) (Meyrick) (Lepidoptera: Gelechiidae) is considered one of the main pests of tomato crops globally (Arno et al., 2021) and, since 2009, it is a real danger for tomato crops in glasshouses and high plastic tunnels in Romania (Bratu et al., 2015).

In optimal development conditions, the pest can have 10 - 12 generations / year (Desneux et al., 2010; Hoge, 2020). The optimal temperature for development is 30°C, and the life cycle varies between 26 and 75 days (Biondi et al., 2016), having four stages of development: egg, larva, pupa and adult (Desneux et al., 2010; Hoge, 2020).

The pest attack is represented by mines and galleries produced by young larvae that penetrate leaves, stems and fruits, where they feed and grow (Desneux, 2010).

The experience done in 2021 at R.D.I.V.F.G. Vidra, had as purpose applying an integrated complex of measures and means for the control of this pest (use of healthy seedlings for planting, use of “insect-proof” nets, dynamic monitoring of adults’ density using “Delta” traps and application of warning treatments for pest control), at two tomato hybrids, Prekos F1 and Vitara F1.

## MATERIAL AND METHOD

The experience was conducted in 2021, at R.D.I.V.F.G. Vidra, using 2 hybrids of tomatoes (Prekos F1 and Vitara F1) and included 7 variants of treatments in 4 replications. Planting was done on June 8th. The experimental variants were the following: V1. Affirm 0.15%, V2. Alverde 0.1%, V3. Coragen 0.0175%, V4. Laser 240 SC 0.05%, V5. Voliam Targo 0.08%, V6. Minecto Alpha 0.125% and V7. Untreated control (table 1). Seven treatments were applied at 10 days’ intervals.

Table 1

**Pesticides used for *Tuta absoluta* control in tomato crop under high plastic tunnels (Vidra, 2021)**

Product and concentration (%)	Active substance	Waiting period (days)
Affirm 0.15%	emamectin benzoate 0.95%	3
Alverde 0.1%	metaflumizone 240 g/l	3
Coragen 0.0175%	chlorantraniliprol 200 g/l	1
Laser 240 SC 0.05%	spinosad 240 g/l	3
Voliam Targo 0.08%	abamectin 18 g/l + chlorantraniliprol 45 g/l	3
Minecto Alpha 0.125%	cyantraniliprol 100 g/l + acibenzolar – S – metil 12.5 g/l	3

The degree of attack was calculated according to the S.O.P./March standard 2010. The damage assessment was done on 5 plants from each replication and 5 leaves from each plant were chosen (25 leaves/replication; 100 leaves/variant). The efficacy of the control products was calculated using Abbott’s formula.

The number of captured adults in the Delta pheromone trap was recorded weekly (fig. 1). The number of adults was reported on the surface of the sticky plate, which has the size of 397.75 cm<sup>2</sup> (21.5 x 18.5 cm).



**Fig. 1** Delta trap placed in tomato crop

Prekos F1 is a very early hybrid, with semi-determined growth. The fruits weigh 160 - 200 g, are smooth, strong, with a sweet taste ([www.marcoser.ro](http://www.marcoser.ro)).

Vitara F1 is a hybrid of early tomatoes with undetermined growth, with intermediate resistance to TSWV and tolerance to the attack of *Tuta absoluta* ([www.marcoser.ro](http://www.marcoser.ro)).



**Fig. 2** Tomato crop under high plastic tunnel  
(Prekos F1 – left, Vitara F1 – right)

A healthy seedling was used for planting, and during the development of the plants, they were fertilized. Insect-proof nets have been placed on the sides of the high plastic tunnel to reduce the penetration of the pest from the outside.

## RESULTS AND DISCUSSIONS

During the growing season, the number of captured adults on the sticky plates of the Delta trap varied between 9 and 512 (fig. 3, fig. 4).

At both tomato hybrids the lowest degree of attack was recorded at variant V4. Laser 240 SC (spinosad 240 g/l) 0.05% (Prekos F1: GA = 4.5%; E = 79.9%, respectively Vitara F1: GA = 5.1%, E = 87.4%; table 2).

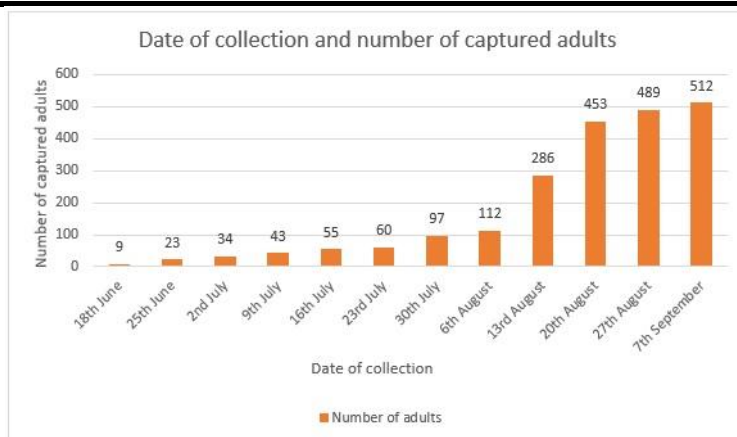
Table 2

The degree of attack and the efficacy of the variants on the hybrid

Variant	The degree of attack (%) and efficacy (%)			
	Prekos F1		Vitara F1	
	GA (%)	E (%)	GA (%)	E (%)
1	15.1	64.4	10.2	74.8
2	13.5	68.0	7.5	81.5
3	13.0	69.3	6.6	83.6
4	4.5	79.9	5.1	87.4
5	17.6	58.3	15.9	60.7
6	13.3	68.6	6.2	84.6
7 (untreated control)	42.3	-	40.4	-

9<sup>th</sup> July 20217<sup>th</sup> September 2021

Fig. 3. Captured adults



**Fig. 4** Dynamics of the number of captured adults between June and September

According with the treatment variants, the yield, in the case of the Prekos F1 hybrid, varied between 4.75 and 4.93 kg/m<sup>2</sup>, compared to the untreated control variant where it was 4.51 kg/m<sup>2</sup>. The highest yield (4.93 kg/m<sup>2</sup>) was recorded at the variant V4. Laser 240 SC 0.05%.

For the Vitara F1 hybrid, the yield varied between 5.81 and 5.99 kg/m<sup>2</sup>, compared to the untreated control variant, which was 5.53 kg/m<sup>2</sup>. The highest yield (5.99 kg/m<sup>2</sup>) was also recorded at the variant V4. Laser 240 SC 0.05% (tab. 5).

*Table 5*

**The yield obtained on both hybrids**

Variant	Yield					
	Prekos F1			Vitara F1		
	kg/m <sup>2</sup>	Difference from untreated control (kg/m <sup>2</sup> )	% to the untreated control	kg/m <sup>2</sup>	Difference from untreated control (kg/m <sup>2</sup> )	% to the untreated control
1.	4.76	+0.25	105.5	5.89	+0.36	106.5
2.	4.77	+0.26	105.8	5.96	+0.43	107.8
3.	4.77	+0.26	105.8	5.95	+0.42	107.6
4.	4.93	+0.42	109.3	5.99	+0.46	108.3
5.	4.75	+0.24	105.3	5.81	+0.28	105.1
6.	4.76	+0.25	105.5	5.94	+0.41	107.4
7. (untreated control)	4.51	-	100.0	5.53	-	100.0

The differences in the obtained yields between the two tomato hybrids (Prekos F1 and Vitara F1) is due to the fact that the Vitara F1 hybrid has tolerance to the attack of the pest *Tuta absoluta*.

## CONCLUSIONS

1. Monitoring the appearance and evolution of populations of the pest *Tuta absoluta* was performed using Delta pheromone traps. Between June and September, was recorded 2173 adults.

2. From the pesticides applied for control of this pest, at both tomato hybrids the most effective was Laser 240 SC (spinosad 240 g/l) 0.05%, which had the lowest degree of attack (Prekos F1: GA = 4.5%; E = 79.9%, respectively Vitara F1: GA = 5.1%, E = 87.4%).

3. At both hybrids, the highest yield was also recorded at the variant V4. Laser 240 SC 0.05% (4.93 kg/m<sup>2</sup> and 5.53 kg/m<sup>2</sup>, respectively).

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