

BIOLOGICAL CONTROL OF SOME PESTS ON MELON CROPS IN GREENHOUSES

COMBATEREA BIOLOGICĂ A UNOR AGENȚI DE DĂUNARE LA CULTURA DE PEPENI GALBENI DIN SPAȚII PROTEJATE

ȘOVĂREL Gabriela^{1*}, HOGEA Simona Stefania¹

*Corresponding author e-mail: gabriela_sovarel@yahoo.com

Abstract. *The cultivation of melons occupies an important area worldwide, the main cultivating countries being China, Turkey, Iran, India and Egypt. In Europe, Romania ranks 4th in terms of area after Spain, Italy and France. Foliar diseases of melons have a negative impact on fruit production and quality. This experiment aimed to study the efficacy of some biological plant protection products for the control of mites (*Tetranychus urticae*) and powdery mildew (*Sphaerotheca fuliginea*) on melons crops in greenhouse. The bifactorial experiment includes 7 variants, 3 biological products used to control mites: Flipper (potassium salts of C7-C20 fatty acids) 16 l / ha, Requiem prime (mixture of terpenoids QRD 460) 10 l / ha and Canelys (cinnamon extract) 0.3% and 2 biological fungicides for powdery mildew: Taegro (*Bacillus amyloliquefaciens* strain FZB24) 0.37 kg / ha, Sonata (*Bacillus pumilus* strain QST 2808) 10 l / ha, 6 foliar applications. The Flipper product 16 l / ha had a very high efficacy of over 90% in the control of the mite *Tetranychus urticae*, in all 3 stages: eggs, nymphs and adults. The products Taegro 0.37kg / ha and Sonata 10 l / ha had an efficacy between 73.6 and 99.9% in powdery mildew (*Sphaerotheca fuliginea*) control. It is recommended to use the biological products Flipper 16 l / ha, Requiem prime 10 l / ha in the control of the mite (*Tetranychus urticae*) and Taegro 0.37kg / ha and Sonata 10 l / ha for powdery mildew (*Sphaerotheca fuliginea*).*

Key words: melon, pathogens, pests, biological control, greenhouse

Rezumat. *Cultura pepenilor galbeni ocupă o suprafață importantă pe plan mondial, principalele țări cultivatoare fiind China, Turcia, Iran, India și Egipt. În Europa, România ocupă locul 4 ca suprafață după Spania, Italia și Franța. Bolile foliare la pepenii galbeni au un impact negativ asupra producției și calității fructelor. Aceasta experiența a avut ca scop studiul eficacității unor produse biologice de protecție a plantelor, pentru controlul acarienilor (*Tetranychus urticae*) și fainării (*Sphaerotheca fuliginea*) la cultura de pepeni galbeni din spații protejate. Experiența bifactorială cuprinde 7 variante, la care s-au folosit 3 produse biologice pentru controlul acarienilor: Flipper (săruri de potasiu ai acizilor grași C7-C20) 16 l/ha, Requiem prime (amestec de terpenoizi QRD 460) 10 l/ha și Canelys (extract de scorișoară) 0,3% și*

¹Research Development Institute for Vegetable and Flower Growing Vidra, Romania

2 fungicide biologice pentru fainare: Taegro (*Bacillus amyloliquefaciens tulpina FZB24*) 0,37kg/ha, Sonata (*Bacillus pumilus tulpina QST 2808*) 10 l/ha, la care s-au aplicat 6 tratamente foliare. Produsul Flipper 16 l/ha la cultura de pepene galben din solar, a avut o eficacitate foarte ridicată de peste 90% în controlul acarianului *Tetranychus urticae*, în toate cele 3 stadii: oua, nimfe și adulți. Produsele Taegro 0,37kg/ha și Sonata 10 l/ha au avut o eficacitate cuprinsă între 73,6 și 99,9% în combaterea fainării (*Sphaerotheca fuliginea*). Se recomandă utilizarea produselor biologice Flipper 16 l/ha, Requiem prime 10 l/ha în combaterea acarianului *Tetranychus urticae* și Taegro 0,37kg/ha și Sonata 10 l/ha pentru fainare (*Sphaerotheca fuliginea*).

Cuvinte cheie: pepene galben, patogeni, dăunători, combatere biologică, solar

INTRODUCTION

The cultivation of melons occupies an important area worldwide, the main cultivating countries being China, Turkey, Iran, India and Egypt. In Europe, Romania ranks 4th in terms of area after Spain, Italy and France. Foliar diseases of melons have a negative impact on fruit production and quality (FAO, 2020).

The main foliar diseases of melons, *Pseudoperonospora cubensis* (Berk. & M.A. Curtis) Rostovzev and *Sphaerotheca fuliginea* (Schlecht.:Fr.) Pollacci, have a negative impact on fruit yield in Romania (Velichi, 2009; Sovarel *et al.*, 2019), USA (Colucci and Holmes, 2010; Savory *et al.*, 2011; Ojiambo *et al.*, 2015), Europe and Asia. Also, in warm and dry summer, the mites (*Tetranychus urticae*) caused significant damages on melons crop.

The most common and important plant fungal pathogen is *Sphaerotheca fuliginea* (powdery mildew) which attack nearly 10.000 species of angiosperms (Vielba-Fernandez *et al.*, 2020). The pathogen attacks leaves, stems and even fruits (Kamel and Afifi, 2020) and affects the crop during cool and dry weather conditions (Sivakumar *et al.*, 2020).

One of the main pest of melon crop is two-spotted spider mite (*Tetranychus urticae* Koch), is a polyphagous species and has been reported in numerous food crop and ornamental plants (Pavela, 2016). The mites are found in large colonies on the underside of leaves and after feeding, yellow chlorotic spots on leaves appears (Patel *et al.*, 2020).

MATERIAL AND METHOD

This experiment aimed to study the efficacy of some biological plant protection products for the control of mites (*Tetranychus urticae*) and powdery mildew (*Sphaerotheca fuliginea*) on melons crops in greenhouse. The bifactorial experiment includes 7 variants, 3 biological products used to control mites: Flipper (potassium salts of C7-C20 fatty acids) 16 l / ha, Requiem prime (mixture of terpenoids QRD 460) 10 l / ha and Canelys (cinnamon extract) 0.3% and 2 biological fungicides for powdery mildew: Taegro (*Bacillus amyloliquefaciens* strain FZB24) 0.37 kg / ha, Sonata (*Bacillus pumilus* strain QST 2808) 10 l/ha.

In greenhouse, climate data monitoring was done using thermohydrometers, which record the temperature and humidity of the air every one hour.

The average temperature varied between 15.5°C in March and 28.5°C in July. The maximum temperature was registered in August, 41.7°C. the atmospheric humidity varied between 55.5% in August and 67.1% in June. Also, the highest value of humidity was registered in June, 93.8% (tab. 1).

Table 1

Greenhouse climatic data (March – September 2021)

Month	Temperature (°C)			Atmospheric humidity (%)		
	minimum	maximum	average	minimum	maximum	average
March	2.9	34.5	15.5	28.7	84.7	61.4
April	5.3	34.3	16.9	33.2	90.5	66.6
May	11.1	38.1	22.9	25.0	90.4	60.0
June	15.8	40.0	25.3	29.8	93.8	67.1
July	19.7	40.6	28.5	34.6	88.1	63.3
August	16.8	41.7	27.9	23.6	86.2	55.5
September	10.9	34.9	20.8	25.7	88.1	59.7

The biological material is represented by „Festiv” melon variety, which was planted in the solarium on May 4, 2021. During the vegetation period, 6 treatments were applied to control the pests *Tetranychus urticae* and *Sphaerotheca fuliginea*, at intervals of 7 days: July 19 (T1), July 26 (T2), August 2 (T3), August 9 (T4), August 16 (T5) and August 23 (T6).

Observations and determinations were made on 5 plants / variant for the study of the pathogen *Sphaerotheca fuliginea* according to EUF 657/2006 and for *Tetranychus urticae* mites the mobile forms (nymphs, adults) and eggs on 25 discs with 1.5cm in diameter / variant were determined, according to EPPO 37(2) standards. On August 28, 2021, the last observations were made for the control of the common red mite (*Tetranychus urticae*) and the pathogen *Sphaerotheca fuliginea*.

RESULTS AND DISCUSSIONS

Requiem Prime, applied at a dose of 10 l/ha, had the highest efficacy in controlling mites (98.96%) when is used with Taegro 0.37 kg/ha and lower (85.38%) when is used with Sonata 10 l/ha (tab. 2).

The Flipper product, applied in a dose of 16 l/ha to the melon crop from the high plastic tunnel, had a very high efficacy in the control of the pest *T. urticae*, with an average of 94.99% when used with Taegro fungicide 0.37 kg/ha and 96.01% with Sonata 10 l/ha.

The Flipper product 16 l/ha had a very high efficacy of over 90% in the control of the mite *Tetranychus urticae*, in all 3 stages: eggs, nymphs and adults. The products Taegro 0.37 kg/ha and Sonata 10 l/ha had an efficacy between 73.6 and 99.9% in powdery mildew (*Sphaerotheca fuliginea*) control.

The very dry summer greatly favored the mite attack, in the high plastic tunnel the attack was 42 adults, 62 nymphs and 66 eggs on the leaves of the untreated control.

Table 2

**Efficacy of biological products for the control of mites (*Tetranychus urticae*)
in melon crop in high plastic tunnels**

Variant	Number of:			Efficacy (%)			
	Eggs	Nymphs	Adults	Eggs	Nymphs	Adults	Average
Flipper 16 l/ha, Taegro 0.37 kg/ha	2	3	3	96.97	95.16	92.86	94.99
Flipper 16 l/ha, Sonata 10 l/ha	1	5	1	98.48	97.62	91.94	96.01
Requiem prime 10 l/ha, Taegro 0.37 kg/ha	1	1	0	98.48	100.0	98.39	98.96
Requiem prime 10 l/ha, Sonata 10 l/ha	17	13	3	84.24	92.86	79.03	85.38
Canelys 0,3%, Taegro 0,37 kg/ha	42	60	32	36.36	3.23	23.81	21.13
Canelys 0,3%, Sonata 10 l/ha	33	57	29	50.00	8.06	30.9	29.65
Control	66	62	42	-	-	-	-

The products used to control the pathogen *Sphaerotheca fuliginea*, Taegro 0.37 kg / ha and Sonata 10 l / ha, had a very good efficacy, with values between 73.59 and 99.88%, regardless of the acaricide applied in the scheme for treatment (tab. 3).

Also, this summer there were very favorable conditions for the appearance and evolution of powdery mildew (*Sphaerotheca fuliginea*), in the untreated control the frequency of attack was 56.06%, with a severity of attack 61.94%, resulting in a degree of attack 34.72%.

Table 3

Efficacy of biological products to control powdery mildew (*Sphaerotheca fuliginea*) in melon crop in protected areas

Variant	<i>Sphaerotheca fuliginea</i>			
	Frequency of attack (%)	Severity of attack (%)	Degree of attack (%)	Efficacy (%)
Flipper 16 l/ha, Taegro 0.37 kg/ha	6.01	14.37	0.86	97.52
Flipper 16 l/ha, Sonata 10 l/ha	25.6	10.85	2.77	92.02
Requiem prime 10 l/ha Taegro 0.37 kg/ha	0.83	5.00	0.04	99.88
Requiem prime 10 l/ha, Sonata 10 l/ha	13.33	22.5	3.00	91.35
Canelys 0.3%, Taegro 0.37 kg/ha	18.04	34.82	6.28	81.91
Canelys 0.3%, Sonata 10 l/ha	38.7	23.7	9.17	73.59
Control	56.06	61.94	34.72	-

At the variants to which Flipper 16 l/ha and Requiem Prime 10 l/ha acaricides were applied, yields were much higher than the untreated control, with yield differences between 7.46 and 10.5 t/ha compared to control, regardless of the fungicide with which they were used in combination (tab. 4). In all 4 variants there are very significant differences in production compared to the control.

The highest yield (41.02 t/ha) was recorded at the variant with the products Requiem Prime 10 l/ha and Taegro 0.37 kg/ha, with an increase of production of 10.5 t/ha in compared to the untreated control, followed by the variant treated with Flipper 16 l/ha and Taegro 0.37 kg/ha with a yield of 39.65 t/ha.

Table 4

Melon yield for high plastic tunnels crop*

Variant	Yield			
	t/ha	Yield difference (t/ha)	Relative yield (%)	Signification
Flipper 16 l/ha, Taegro 0.37 kg/ha	39.65	+9.13	129.91	xxx
Flipper 16 l/ha, Sonata 10 l/ha	37.98	+7.46	124.44	xxx
Requiem prime 10 l/ha Taegro 0.37 kg/ha	41.02	+10.5	134.40	xxx
Requiem prime 10 l/ha, Sonata 10 l/ha	38.05	+7.52	124.67	xxx
Canelys 0.3%, Taegro 0.37 kg/ha	33.12	+2.6	108.52	xx
Canelys 0.3%, Sonata 10 l/ha	33.71	+3.19	110.45	xx
Control	30.52	-	100.0	-

LD5%=1.72t/ha; LD1%=2.39t/ha; LD0.1%=3.25t/ha

CONCLUSIONS

1. It is recommended to use Flipper 16 l/ha and Requiem prime 10 l/ha products to control mites (*Tetranychus urticae*) and Taegro fungicides 0.37 kg/ha and Sonata 10 l / ha to control powdery mildew (*Sphaerotheca fuliginea*).

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