Fruit Growing Research, Vol. XXXVII, 2021 DOI 10.33045/fgr.v37.2021.19
https://publications.icdp.ro/index.php

INCIDENȚA VIRUSURILOR TBRV ȘI ArMV ÎN NOILE PLANTAȚII DE CIREȘ DIN ZONA DE SUD A ROMÂNIEI

INCIDENCE OF TBRV AND ArMV VIRUSES IN NEW CHERRY PLANTATIONS FROM AREA OF ROMANIA

Plopa Catița, Iancu Adina, Butac Mădălina
Research Institute for Fruit Growing Pitesti, Romania

Abstract

Viral diseases can influence negatively a good evolution of cherry plantations. Two of the viral diseases that attack this species are caused by the *ArMV* virus, which spreads by multiplying the infected propagating material, by seed and nematodes, and by the *TBRV* virus, which spreads by multiplying the infected material and nematodes. In order to study the incidence of the two viruses, 10 cherry plantations located in the south of the country were evaluated, in the district of Argeș, Dolj, Ialomița, Ilfov, Călărași, Dâmbovița, Buzău. The planting material used to set up the plantations was both from Romania and from an external source: the Netherlands, Greece, Italy. Viral evaluation performed visually and serologically by DAS-ELISA technique, identified viral infections in 2 of the 10 plantations. In one plantation, *TBRV* was identified in 20% of the tested samples and in the second, *ArMV* viruses were identified in 20% of the samples and *TBRV* in 5% of the samples.

Cuvinte cheie: virusuri, cireș, testare.
Key words: viruses,sweet cherry, testing.

1. Introduction

Arabis mosaic virus (ArMV) - in cherries, is manifested by leaf deformation and the appearance of sparse enactions. Experimentally the virus can be transmitted by juice inoculation and grafting. In nature, it is spread by multiplying the infected propagating material, by seed and by means of the nematode *Xiphinema diversicaudatum* (Pop, 1988; EPPO PM 4/29 (1)).

Tomato black ring virus (TBRV) - produced transient ring formations on the leaves of infected trees. Experimentally the virus can be transmitted by grafting and juice inoculation. Dissemination in the wild occurs by multiplying the infected material and by the nematode *Longidorus attenuatus* (Pop, 1988) and *Longidorus elongatus*, (EPPO PM 4/29 (1)). Mandic, et, al, 2007, after the evaluation of 125 samples of cherry and sour cherry, did not identify the two viruses *ArMV* and *TBRV*, in Serbia. Pavliuk et. al, 2021, after testing 138 samples of cherries, 99 samples of cherries and 54 samples of vegetative rootstocks, collected from different regions of Ukraine, detects *TBRV* in 0.7% of samples of cherries and 5% of samples of sour cherries. EFSA (European Food Safety Authority) Panel on Plant Health (PLH), in a study conducted in the European Union in 2013, considers that the potential impact for the two viruses is assessed from minimal to minor in all hosts.

The purpose of this paper is to evaluate the presence of *TBRV* and *ArMV* in young cherry plantations in southern Romania, given that studies previously conducted by Plopa et. al., 2010, in the cherry gene bank of ICDP Pitești-Mărăcineni, which at the time respectively he was 27 years old, in which 55 cvs. were tested virally (300 samples), *TBRV* was identified in 30% of the tested trees and *ArMV* in 2% of the tested trees.

2. Material and methods

During June 2021, from the regions of Muntenia and Oltenia were collected leaf samples from 10 locations (coded 1, 2, 3, 4, 5, 6, 7, 8, 9, 10), aged between 2 and 12 years, with the origin of the planting material both from Romania and from other countries (Table 1).

For evaluation and sampling of leaves, 2 blocks of 100 trees were delimited in each plantation, containing all the varieties from plantation. Visual observations were made in each block and 10 samples were collected randomly.

In the laboratory, the evaluation was performed using DAS-ELISA serological technique (Cark & Adams, 1977), with commercial polyclonal sera for *ArMV* and *TBRV* viruses (Bioreba, Switzerland). The intensity of the color reaction, which measures the amount of specific antibodies bound to the antigens present in the serum to be investigated, was determined photometrically. Positive samples were those that had the value of extinction at least 2.5 times higher than the average of negative witnesses. The

absorbance and cut-off value are measured in nanometers. The readings were made at Microplate reader.

3. Results and discussions

Visual observations made in the evaluated plantations showed only a very small number of viral symptoms. Leaf deformities were observed in the 'Sweetheart' cv. from plantation 4, (Fig. 1) which could be attributed to viral infections, which was confirmed by diagnosis with the DAS-ELISA test, the samples showing such symptoms being identified as infected with *ArMV*.

The viral evaluation by the serological method ELISA, revealed infections with *ArMV* and *TBRV* viruses, in different locations:

- Plantation 1, out of the 20 samples collected from 'Kordia', 'Skeena' and 'Ferrovia' cvs., were identified 4 positive samples at *TBRV*, the virus being thus identified at 'Skeena' cv., 4 samples out of 20 (Table 2). It is important to mention that this plantation is located at a distance of about 200 m from the germplasm fund assessed virally and presented in the study conducted by Plopa et. al., 2010, a study in which 30% of the analyzed trees were identified as being infected with *TBRV*. It should be noted that the germplasm fund was cleared in 2010 and the plantation evaluated in 2021, was established in 2009.
- Plantation 2, located at about 600 m from the germplasm fund analyzed in the study conducted by Plopa et al. 2010, was established in 2017, showed no symptoms suggestive of viral infections and even after serological tests the two viruses were not identified.
- Plantation 3, located about 4 km from plantation 1 and plantation 2, did not have identified positiv trees for the viruses studied.
- Plantation 4, the visual symptoms observed on a tree of the 'Sweetheart' cv., were confirmed following the serological test, to be produced by *ArMV*. The *ArMV* virus was also identified by two other trees from the 'Sweetheart' cv. and one from the 'Kordia' cv. A positive tree at *TBRV* was also identified from the 'Kordia' cv. (Table 3).
- Plantation 5, cvs.: 'Regina', 'Prime Giant', not identified infected trees.
- Plantation 6, with cvs. 'Kordia' and 'Stella', not identified positive samples.
- Plantation 7, with the 'Regina' cv., did not show symptoms indicating a viral disease, and following laboratory tests, not viruses were also identified.
- Plantation 8, not identified virally infected samples.
- Plantation 9, in the two blocks analyzed with the cvs. 'Regina' and 'Kordia', were not identified in the serological testing of virally infected plants.
- Plantation 10, established with an assortment of 'Regina', 'Kordia', 'Van', and 'Maria cvs., not showed viral symptoms and not evidence positive samples after the ELISA test.

Analyzing the viral situation identified in the evaluated plantations, following visual observations and tests by DAS-ELISA serological method, which also confirmed the symptoms, it is found that the *ArMV* virus was identified in a single plantation (plantation 4) of 10 analyzed (Fig. 2) where it had an incidence of 20%. *TBRV* virus was identified in 2 plantations out of 10 evaluated with an incidence of 20% in plantation 1 and an incidence of 5% of the plants tested in plantation 4 (Fig. 3). In plantation 4, were identified plants infected with both viruses *TBRV* and *ArMV* (Fig. 4).

4. Conclusions

For viral health, cannot be established in this case the age of the plantation as a cause, from which derives the possibility of reinfection of the plants in time, the infections being detected in a plantation aged 12 years (plantation 1) and a plantation aged for 3 years (plantation 4). In view of the spread of viruses detected in a higher percentage: *ArMV*, which spreads by multiplying the infected propagating material, by seed and by means of the nematode *Xiphinema diversicaudatum* and *TBRV*, whose dissemination takes place by multiplying the infected material and by the nematode *Longidorus attenuatus* and *Longidorus elongatus*, great attention is paid to the health of the soil in terms of nematode infestation and greater rigor is required with regard to the health of the propagating material used.

Acknowledgment

This work was supported by the Romanian Ministry of Agriculture and Rural Development, project ADER 7.3.13/2019.

References

1. Clark M.F., Adams A.N., 1977. Characteristics of the micro plate method of enzyme-linked immunosorbent assay for the detection of plant viruses. J. Gen. Virol. 34: 475-483.

2. Mandic B., Matic S., Al Rwahnih M. W., Jelkmann W., Myrta A., 2007, Viruses of sweet and sour cherry in Serbia, Journal of Plant Pathology, 89 (1): 103-108.
3. Plopa Catiţa, Budan Sergiu, 2010. Study regarding the natural virus infections in sweet cherry genebank. Analele Universitatii din Craiova, volumul XV (XLXI), ISSN 1435-1275.
4. Pop V. Ioan, 1988. Virusurile plantelor horticole și combaterea lor (in Romanian). Editura Ceres, București.
5. Pavliuk L, Udovychenko K., Riaba K., Bublyk M, 2021. Detection of sour and sweet cherry viruses in Ukraine, Agronomy Research 19(1): 199–209.
6. EPPO (European and Mediterranean Plant Protection Organization), 2001. Schemes for the production of healthy plants for planting certification scheme for cherry PM 4/29(1). Bulletin OEPP/EPPO, Bulletin 31: 447-461.
7. EFSA (European Food Safety Authority) Panel on Plant Health (PLH), 2013. Scientific opinion on the risk to plant health posed by *Arabis mosaic virus*, *Raspberry ringspot virus*, *Strawberry latent ringspot virus* and *Tomato black ring virus* to the EU territory with the identification and evaluation of risk reduction options1 EFSA Journal 2013, 11(10): 3377.

Tables and Figures

Table 1. Cherry plantations viral assessed

Plantations code	Location	Assortment	Age plantations	Source planting material
1	Argeș	Kordia, Skeena, Ferrovia	12	Greece
2	Argeș	Burlat, Vanda, Karina, Lapins, Penny, Kordia	4	Netherlands
3	Argeș	Summit, Lapins, Karina, Regina, Kordia	10	Romania
4	Ilfov	Burlat, Sweetheart, Kordia	3	Italy
5	Ialomița	Regina, Prime Giant	3	Romania
6	Dolj	Regina	2	Romania
7	Dolj	Kordia, Stella	2	Romania
8	Buzău	Kordia, Sweetheart	9	Italy
9	Călărași	Regina, Kordia	3	Italy
10	Dâmbovița	Regina, Kordia, Van, Maria	2	Romania

Table 2. Results of viral evaluation for *TBRV* virus in plantation no. 1

No.	Samples	Visual observations	DAS-ELISA serological test for *TBRV*	
			Absorbance value	Cut-off
	Block A			1.246
1	R1P5-Kordia	Without symptoms	0.834	
2	R1P10-Kordia	Without symptoms	0.985	
3	R2P15-Skeena	Without symptoms	1.038	
4	R2P20-Skeena	Without symptoms	1.042	
5	R3P4-Skeena	Without symptoms	1.070	
6	R3P10-Skeena	Without symptoms	1.002	
7	**R4P20-Skeena**	Without symptoms	**+1.561**	
8	R4P15-Skeena	Without symptoms	0.776	
9	**R5P1-Ferrovia**	Without symptoms	**+1.252**	
10	R5P5-Ferrovia	Without symptoms	0.705	
	Block B		0.809	
11	R1P1-Kordia	Without symptoms	0.909	
12	R1P5-Kordia	Without symptoms	0.973	
13	**R2P16-Skeena**	Without symptoms	**+1.527**	
14	R2P20- Skeena	Without symptoms	0.810	
15	R3P1-Skeena	Without symptoms	0.829	
16	R3P5-Skeena	Without symptoms	0.708	
17	R4P15-Skeena	Without symptoms	0.627	
18	**R4P20-Skeena**	Without symptoms	**+1.346**	
19	R5P3-Ferrovia	Without symptoms	0.787	
20	R5P8-Ferrovia	Without symptoms	0.746	

 DOI 10.33045/fgr.v37.2021.19

Table 3. Results of viral evaluation for *TBRV and ArMV* viruses in plantation no. 4

No.	Samples	Visual observations	DAS-ELISA serological test			
			ArMV		*TBRV*	
			Absorbance value	Cut-off	Absorbance value	Cut-off
	Block A			**1.317**		**0.573**
1	R1P10 Burlat	Without symptoms	0.655		0.229	
2	R1P20 Burlat	Without symptoms	0.627		0.208	
3	R1P30 Burlat	Without symptoms	0.574		0.239	
4	R1P40-Burlat	Without symptoms	0.600		0.207	
5	R1P50-Burlat	Without symptoms	0.641		0.228	
6	**R2P1-Sweetheart**	**Symptoms present**	**+1.655**		0.250	
7	R2P5-Sweetheart	Without symptoms	0.632		0.263	
8	R2P15-Sweetheart	Without symptoms	0.601		0.256	
9	**R2P25-Sweetheart**	Without symptoms	**+1.703**		0.245	
10	R2P35-Sweetheart	Without symptoms	0.701		0.261	
	Block B				0.272	
11	R1P10-Kordia	Without symptoms	0.586		0.252	
12	R1P20-Kordia	Without symptoms	0.569		0.237	
13	R1P30-Kordia	Without symptoms	0.576		0.250	
14	**R1P40-Kordia**	Without symptoms	**+1.711**		0.249	
15	R1P50-Kordia	Without symptoms	0.700		0.258	
16	**R2P6-Kordia**	Without symptoms	0.725		**+0.588**	
17	R2P15-Kordia	Without symptoms	0.635		0.254	
18	**R2P25-Kordia**	Without symptoms	**+1.776**		0.251	
19	R2P35-Kordia	Without symptoms	0.718		0.255	
20	R2P45-Kordia	Without symptoms	0.715		0.236	

Fig. 1. Deformation of the leaves produced by *ArMV* in the Sweetheart cv.

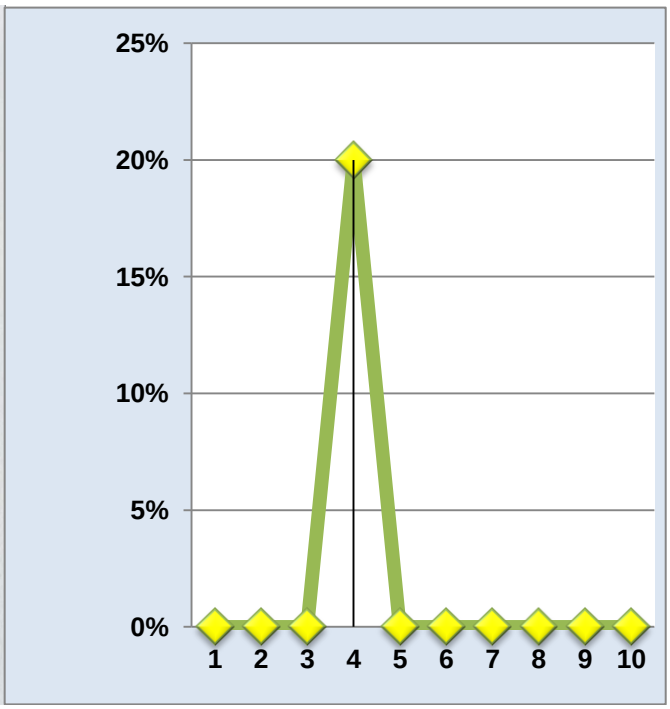

Fig. 2. Values (%) *ArMV* incidence

DOI 10.33045/fgr.v37.2021.19

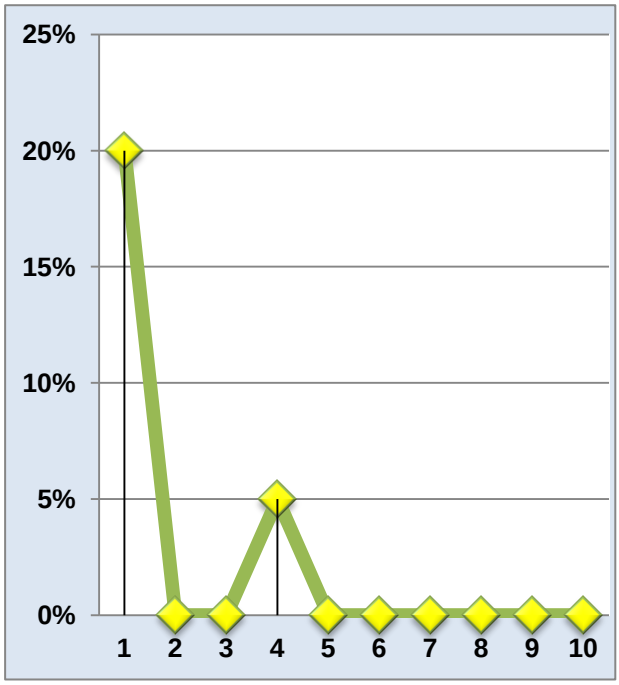

Fig. 3. Values (%) *TBRV* incidence

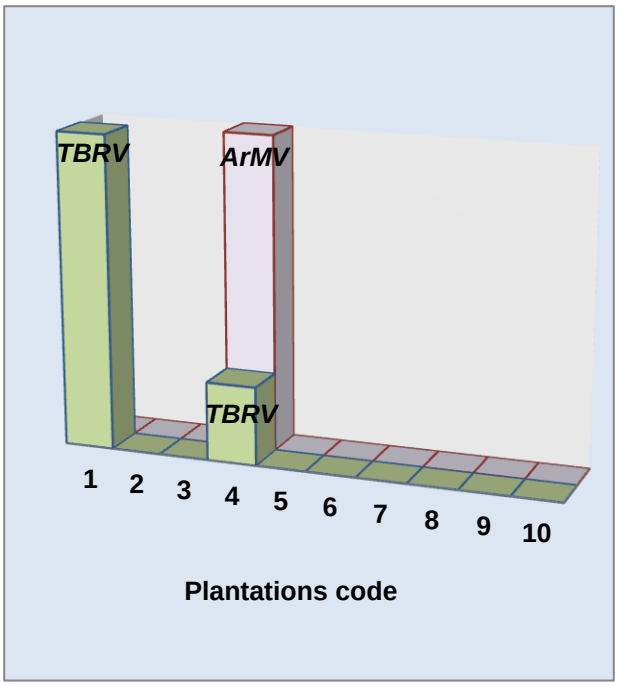

Fig. 4. Presence of *ArMV* and *TBRV* in 10 cherry plantations evaluated