THE DYNAMICS OF OCCURENCE OF SOME SPECIFIC PATHOGENIC AGENTS ATTACK AT TOMATOES (VIRUSES AND MYCOPLASMAS), UNDER PEDO-CLIMATIC CONDITIONS OF NORTHERN BARAGAN (BRĂILA COUNTY)

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Abstract

An experiment was set up with different cultivars of tomatoes in 2013, 4 variants (two varieties and two hybrids). These cultivars were: V1 - ACC 35, V2 - Ofira F1, V3 – Rio Grande, V4 – Belarosa F1. The scope of the experiments was to monitor the occurrence and evolution of the attack of some specific pathogenic agents (viruses, organisms of mycoplasma type), at tomatoes. It was also monitored the correlation between the attack degree (G.A.%) of the mentioned pathogenic agents and the production, as well and the quality of the production. The experiment was set up in a Latin square, with strict compliance with the experimental technique requirements. During the vegetation period, symptoms produced by viroses have appeared differentially at each experimental variant. Remotely, there were signalled also clear symptoms produced by stolbur (*Mycoplasma*). Other diseases, like those produced by the attack of some bacteria species (for example, *Xanthomonas campestris* p.v. *vesicatoria*) or fungi (for example, *Phythophthora infestans, Colletrotrichum coccodes etc*), did not manifest in the tomatoes crop that were subject to the experiment. Production's harvest was done in instalments. Between the results of the production, achieved variant wise, there were obtained differences ensured statistically. The most productive cultivar was Belarosa F1, in the climatic conditions of the year 2013. Also, this cultivar proved to be the one least affected by viroses.

Key words: tomatoes, viruses, mycoplasma, Latin square, *Phytophthora*

During hot and droughty years, the tomatoes (*Lycopersicon esculentum*) are attacked by a series of dangerous pathogenic agents like: viruses – for example, *Tobacco Mosaic Virus in Tomato, Cucumber Mosaic Virus* which produces the "fern leaves" disease at tomatoes and the organisms of mycoplasma type which produce, at tomatoes, the disease known under the name of stolbur (Iacob Viorica, Hatman, M., Ulea, E., Puiu, I. 2000). During droughty and hot years, in Northern Bărăgan area, the above-mentioned pathogenic agents are the most damaging ones, especially at the sensitive cultivars of tomatoes. More affected are the tomatoes crops set up into the field, as opposed to the crops set up in greenhouses and solaria.

Table 1

Frequency (F.%), intensity (I.%) and the attack degree (G.A.%) of viroses to the tomatoes cultivars which were the subject of the experiment in 2013

Variant (cultivar)	F.%	I.%	G.A.% =F%xI%/100
V1 – ACC 35	78,25	10,47	8,19
V2 – Ofira F1	96,50	26,52	25,60
V3 – Rio Grande (Mt.)	96,50	19,00	18,33
V4 – Bellarosa F1	96,50	6,42	6,19

Table 2

Results of the experiment at tomato crop, set up with 2 varieties and 2 hybrids

Variant (cultivar)	G.A.%	Dif. against mt. (%)	Significance	Prod. t/ha	Relative Prod. %	Dif. against mt.(t/ha)	Significance
V1 – ACC 35	8,19	10,2	0	20,45	96,9	-0,65	00
V2 – Ofira F1	25,60	-7,9	*	20,52	97,7	-0,59	0
V3 – Rio Grande (Mt.)	18,33	-	-	21,10	100,0	-	-
V4 – Bellarosa F1	6,19	-13,3	**	22,35	105,9	1,25	**

for GA%: $S\bar{x}$ = 5,13 DL5% = 5,13 x 2,45 = 12,57 = 5% DL 1% = 5,13 x 3,71 = 19,03 =11%

for production DL 5% = 0,17 x 2,45 = 0,41 t/ha $S\bar{x}$ = 0,17 DL 1% = 0,17 x 3,71 = 0,63 t/ha

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Figure 1 **Experiment with tomatoes set up in Mărtăceşti locality (4 variants placed in 4 repetitions) on 4th June 2013**

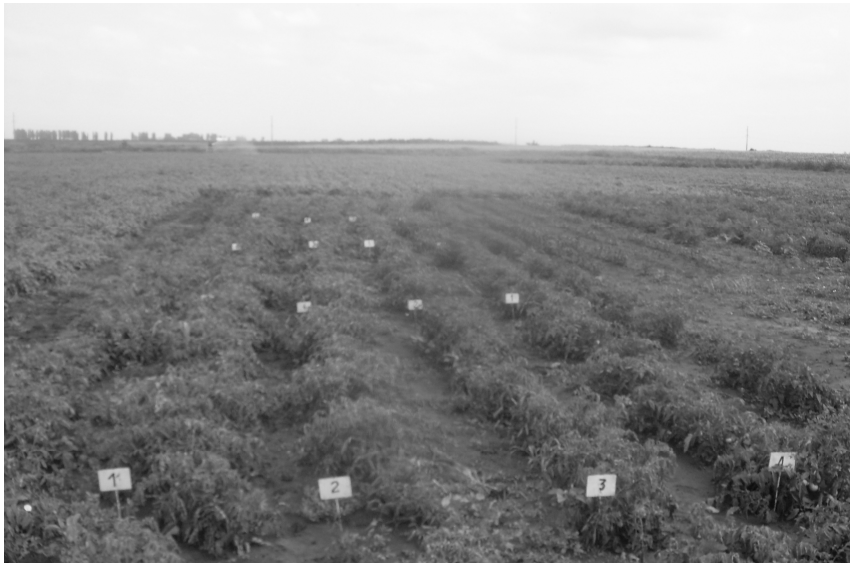

Figure 2 **Tomatoes experiment set up in Mărtăceşti locality (4 variants placed in 4 repetitions) on 22nd July 2013**

MATERIAL AND METHOD

The experiment was placed in Mărtăceşti locality – Siliştea parish. The locality is situated in the northern part of Brăila county, respectively in the northern part of Bărăgan Plain. The soil is of vermic chernozem type, with medium texture. The climate is characterized through hot and dry springs and summers. The winters are cold and also, poor in rain.

The scope of the experiment was to identify some varieties or hybrids which would present resistance or tolerance to the attack of some diseases, especially to viroses and mycoplasmoses. These diseases have been the most damaging to tomatoes – onto the field, during many years. It is well known the fact that, up to the present, the above mentioned diseases cannot be fight against at plants, in production conditions, through curative methods.

This experiment was set up through seedling planting, with four tomato cultivars, two varieties (ACC35 and Rio Grande) and two hybrids (Ofira F1 and Belarosa F1), which have a determined growth and are fit for the crop onto the field. The control sample chosen was Rio Grande variety, which is well known by the local farmers. The planting was performed on the date of 19th May 2013. The distance used between rows was of 1 m, and between the plants on one row of 25 cm. The lane between repetitions was of 50 cm. During the period of vegetation, the crop was maintained according to the technology specific to field tomatoes, with determined behaviour. Fighting against weeds was performed only through manual hoeing. Fighting against the diseases which are not subject to this study, such as: leaves spotting and fruit blistering produced by X. *campestris* pv. *vesicatoria* bacteria or the blight produced by *Ph*. *infestans* fungus, was done through applying treatments with fungicide, homologated chemical products, like: Melody Compact – 0,2% and

Equation Pro – 0,4%. At each treatment, into the fungicide solution was also added an insecticide product (Novadim Progress – 0,2%), in order to prevent the caterpillar's attack of the fructifications - *Helicoverpa armigera*, that, in the respective area, produced large damages at tomatoes and pepper.

The way of setting up the experiment was the Latin square. Those 4 variants were placed in 4 repetitions. Interpreting the differences was done through the method of limit differences (DL 5%, DL 1%). In order to interpret the limit differences of the degree of attack (GA%), it was used *arcsin√%* transformation.

Also, it was calculated the coefficient of correlation between the value of the degree of attack (G.A.) and the value of the production at each cultivar (variant) which was the subject of the experiment. (Săulescu N. 1967).

The surface of an experimental plot was of 6 m^2, and the number of plants/experimental plot was of 25.

The harvesting was done in instalments, separately on each experimental plot.

The attack degree (G.A. %) of the attack of the pathogenic agents mentioned was calculated through the previous calculation of the frequency (F.%) and of the intensity (I.%) of the attack. It was worked with entire plants, at which the percentage of being affected by the symptoms produced by viroses, sometimes by mycoplasmoses was monitored. The number of entire plants, observed on each experimental plot was 7. Each plant observed received grades from 0 to 6, proportional to the affecting percentage, in order to find the value of the attack's intensity. For example, grade 0 corresponds to 0% attack symptoms, grade 1 to 1-3% attack symptoms...grade 4 to 26 – 50% attack symptoms, etc. G.A.% value was obtained with the relation G.A.% = FxI/100. (M.A.I.A – Methods of Prognosis and Warning, 1980).

RESULTS AND DISCUSSIONS

The first symptoms of the diseases that are subject of this study had manifested starting with the date of 16th June at the variety ACC 35. It followed then the hybrid Ofira F1 (24th June), Rio Grande variety (30th June) and, finally, Belarosa hybrid (4th July). These symptoms appeared under the form of some discolouring of the leaves, accompanied by slight cockling and curling of leaves' foliolum.

Remotely, the symptoms evolved also towards violet colouring of the foliolum. Also, remotely, clear symptoms produced by stolbur (*Mycoplasma*) also appeared at all 4 cultivars studied, under the form of some green colouring of the petals (virescens) (Velichi E. 2012).

The symptoms had constantly evolved during July when, on the date of 31st of the respective month, the degree of attack (G.A%) reached the value of 8,19% at ACC 35 variety, 25,60% at Ofira F1 hybrid, 18,33% at Rio Grande variety and 6,19% at Bellarosa F1 hybrid (*tab. 1*). The differences in what concerns the degree of attack (G.A.%), as against the control sample (Rio Grande variety), have been statistically ensured.

The degree of attack of the viroses was significantly higher than the control sample at ACC35 variety and significantly smaller at Ofira F1 hybrid and significantly distinct at Bellarosa F1 hybrid. (*tab. 2*). After the date of 4th August 2013, the evolution of the symptoms of the respective diseases had known a relative dormancy.

The production was distinctly negative as against the control sample at Ofira F1 hybrid (0,59 t/ha) and very distinctly negative at ACC 35 variety (0,65 t/ha). Also, the production was very distinctly positive as against the control sample at Bellarosa F1 hybrid (+1,25 t/ha) (*tab. 2*).

The correlation coefficient (r) between the value of the degree of attack (G.A.) of viroses and the value of production of each experimental variant was positive, very small, of only r = 0,17 (inconclusive).

It must be observed also the fact that, in the second half of June and in the first half of July there was a strong attack of homopteres from *Cicadellidae* family, known under the name of cicade.

They are known as being the main vectors of spreading the organisms of *Mycoplasma* type, which produce the stolbur at some cultivated species of plants which belong to *Solanaceae* family (tomatoes, potatoes, pepper).

CONCLUSIONS

The climatic conditions of the year 2013 have proved to be difficult ones for the vegetable crops from the field. During this year, the diseases that have raised problems for tomatoes have been especially the viroses and, in some cases, mycoplasmoses. Other diseases specific to tomatoes, produced by some species of bacteria and by some species of fungi, did not raise problems.

Usually, in the area of Bărăgan Plain, the years when *X. campestris* pv. *vesicatoria* bacteria and *Ph. infestans* fungus raised problems for tomatoes were very rare (1997, 2004 and 2005). As a parenthesis, in the mentioned area, *X. campestris* pv. *vesicatoria* bacteria raises very serious problems for pepper, every year.

At the experiment with those 4 cultivars of tomatoes set up in 2013, the most productive proved to be Bellarosa F1 hybrid. This proved to be the least affected by viroses. However, from this cultivar, which is a hybrid one, the expectations were higher due to the fact that the production plus

per ha achieved over the control sample Rio Grande (which is a variety), was pretty small (+1,25 t/ha). Surprising was also Ofira F1 hydrid's production which was significantly smaller as against the control sample (-0,59 t/ha). Also, ACC 35 variety had a weaker behaviour than the control sample (-0,65 t/ha).

The degree of correlation between the degree of attack (G.A.%) and the production level of r = 0,17. This fact leads to the conclusion that, under the climatic conditions of the year 2013, the production level of each of the 4 cultivars studies was not influenced by the degree of attack (G.A.%) of the diseases studied. This fact is very important for the vegetable farmer. It is well known the fact that the price of seeds for hybrids is much higher than for the varieties, especially for the autogamous vegetable species, like tomatoes and aubergines or a high degree of autogamy, like pepper.

The general conclusion of this experiment, very important for the farmer, is that choosing the variety or hybrid that follows to be cultivated must be done with great care. In many cases, different hybrids, very expensive, have offered, in production conditions, results which were bellow expectations at the tomatoes crop set up into the field, both from the point of view of production's level and from the point of view of the resistance to the attack of some dangerous pathogenous agents. Unfortunately, at present, the comparative crops with varieties/hybrids of vegetables, set up according to the experimental technique, are very few.

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