

## RESEARCH ON COMBATING ALTERNARIOSIS (*Alternaria porri* (Ellis) Cif.) IN TOMATOES UNDER THE CLIMATIC CONDITIONS OF SĂLSIG VILLAGE, MARAMUREȘ COUNTY, ROMANIA

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**Abstract.** The purpose of the research was the monitoring of two tomato varieties behavior, Petula F<sub>1</sub>RZ and Gravitet F<sub>1</sub> under the attack of *Alternaria porri* fungus, as well as determination of biologic efficiency for five fungicides, in order to recommend the most efficient products in treatment schedules. The experimental researches were carried out during 2014 and 2015 in the Sălsig village, Maramureș County, Romania. Ten products of plants protection were tested on the two varieties, and only 5 products were selected for their biologic efficiency, in 2014. The attack was calculated by determining the frequency and intensity of the disease. The linear-interrupted laying method was used. The obtained values showed that Gravitet F<sub>1</sub> variety had a much higher sensitivity to the attack of the pathogen than Petula F<sub>1</sub>RZ variety. The data analysis showed that for Petula F<sub>1</sub>RZ variety the most efficient was V<sub>1</sub>, using the product Score 250EC, with the efficiency of 90.6%, followed by V<sub>2</sub> – Cabrio TOP with 90.0%, and the last one, V<sub>5</sub> – Pergado MZ with 84.5%. For Gravitet F<sub>1</sub> variety, the scale was the same, but the efficiency of the products was diminished due to the sensitivity of the variety.

**Keywords:** alternariosis, attack, fungicide, tomato.

### INTRODUCTION

Tomatoes are highly important as food, with a pleasant taste, and being used both for fresh or processed consumption [10]. The nutritional value of tomatoes is due to the high content of vitamins, sugars, minerals, amino-acids, and organic acids, both in fresh vegetables and after processing [5]. In order to enjoy their benefits, a healthful cultivation of tomatoes is required, in order to offer a high degree of productivity [19]. The disease can cause the reduction of vegetables production (eg. *Allium cepa*, *Solanum lycopersicum*, *Solanum tuberosum*) with 30-50% [15]. It can also influence the reduction of seed production with 20-25% in India [20], and with 41-44% in Bangladesh [4]. For *Allium cepa* there was found a reduction in bulb production of 70% [13] and even up to 100% [7]. The important problems in the tomatoes crops, from the phytosanitary point of view, are developed by the brown spotting of tomato leaves (*Alternaria porri* (Ellis) Cif.), as they were signaled during all the plants developing stages [9]. Significant damage regarding this disease have been remarked around the world, even in other crops such as onion [6, 11].

The knowledge of the resistance or sensitivity degree of the varieties is essential in the differential application of the treatments, in order to reduce their number, under the stipulation of ensuring an optimal efficacy [18]. The number of treatments can be established depending on climatic conditions and the resistance of cultivated varieties [14].

The chemical products show their efficiency if they are only rationally used, and their usage without discernment leads to the obtaining of low and qualitatively depreciated yields [12].

The aims of the research was the monitoring of two tomato varieties behavior, Petula F<sub>1</sub>RZ and Gravitet F<sub>1</sub> under the attack of *Alternaria porri* (Ellis) Cif. fungus, and the determination of the most efficient phytosanitary products in combating tomatoes alternariosis, in order to recommend them for the treatment schedules of this disease.

### MATERIALS AND METHODS

The experimental researches were carried out during 2014 and 2015 on the Baban vegetable farm of the Sălsig village, Maramureș County, Romania. The farm extends on an area of 3 ha, of which an area of 0.40 ha was filled with greenhouses and hothouses, which comprise cultures of tomatoes, peppers, eggplants; the highest share was formed by the tomato crops.

The greenhouses, in which the degree of attack of the fungus was medium to large, were selected for the experiment, just to be able to monitor the biologic efficiency of the tested fungicides.

Ten products of plants protection for alternariosis combating were tested in 2014, and following the analysis regarding the attack degree of fungus, only 5 products were selected for their biologic efficiency. These products were tested on the two studied varieties, Petula F<sub>1</sub>RZ and Gravitet F<sub>1</sub>, in the conditions of 2015 year.

In order to carry out the experiments, 5 plants/variant, in three repetitions for each product, were used. Three plants were monitored, and those on the borders were the control. The attack was calculated by determining the frequency and intensity of the disease, and the agrometeorological data were recorded by the AgroExpert system. The assessment of the

efficiency was made respecting the technique against the control.

## RESULTS

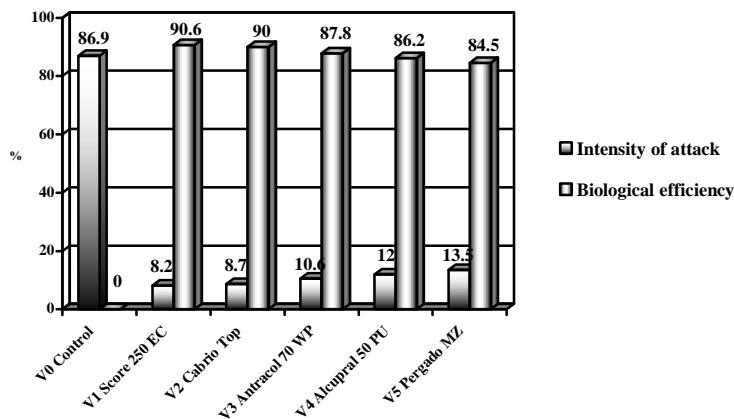
The results obtained following the testing of the 10 fungicides on the two varieties, in the climatic

conditions of 2014 can be observed in table 1. Regarding the biological efficiency of the 5 selected and tested fungicides, for Petula RZF1 variety, the obtained results are shown in Fig. 1. In Fig. 2 we could observe the biologic efficiency of the treatments for the variety Gravitet F<sub>1</sub>.

**Table 1.** Testing of fungicides in the control of brown leaves (*A. porri*) in the Petula RZ F1 and Gravitet F1 varieties in the year 2014

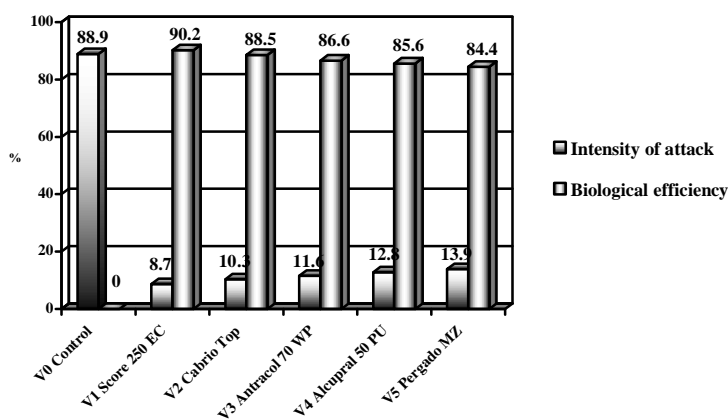
No	Product	Conc. %	Attack on Petula RZ F1		Attack on Gravitet F1	
			F %	I 1-6	F%	I 1-6
1.	ALCUPRAL 50 PU	0.2%	1.3	2	1.9	3
2.	ANTRACOL 70 WP	0.3%	0.5	1	0.9	2
3.	CABRIO TOP	1.5-2.0kg/ha	0.2	1	0.3	2
4.	SCORE 250 EC	0.02%	0.1	1	0.2	1
5.	BRAVO 500 SC	0.2%	1.5	2	2.0	2
6.	CUPROXAT FLOWABLE	3.0-4.0 l/ha	2.0	3	1.0	1
7.	MELODY COMPACT 49 WG	0.2%	1.5	2	1.6	3
8.	ORTIVA TOP	1.0 l/ha	0.2	1	0.2	1
9.	PERGADO MZ	0.2-0.25%	2.3	3	2.1	3
10.	POLYRAM DF	0.2%	1.8	2	2.5	3
Control sample			30.3		36.8	

**Biologic efficiency of the fungicides for the variety Petula F<sub>1</sub>RZ**



**Figure 1.** Biologic efficiency of the 5 tested fungicides for the variety Petula F<sub>1</sub>RZ, under the conditions of the year 2015

**Biologic efficiency of the fungicides for the variety Gravitet F<sub>1</sub>**



**Figure 2.** The biologic efficiency of the tested fungicides for the variety Gravitet F<sub>1</sub>, under the conditions of the year 2015

## DISCUSSION

The climatic conditions of 2014 and 2015 years, were characterized by relatively high humidity of air, with monthly average values comprised between 62 and 95%, also due to the geographic location of Sălsig village RO, on the banks of the Someș River, were favorable to the appearance and development of phytopathogen agents, especially alternariosis of tomatoes. The studies regarding the *Alternaria porri* (Ellis) Cif. degree of sporulation under the influence of climatic factors on tomatoes have shown special sensitivity to humidity [16].

Following the determinations on the attack degree, in the case of the 10 products that were tested on the two varieties, for combating alternariosis (Table 1), it was observed that, for the Petula F<sub>1</sub>RZ variety, the treatments with Score 250EC, Cabrio TOP, Ortiva TOP and Antracol 7 WP was remarked with a frequency of the attack on the plant comprised between 0.1 and 0.5%, and for the Pergado MZ product, the frequency was 2.3%, thus it had a very low efficiency.

In the case of Gravitet F<sub>1</sub> variety, the products with the highest efficiency proved to be Ortiva TOP, Score 250EC, for which the attack on the plant was 0.2%, followed by Cabrio TOP, with the frequency on the plant of 0.3% and Antracol 7 WP with 0.9%. The product with the lowest efficiency it turned out to be Polyram DF, with an attack of 2.5%.

Analyzing the two varieties, we can conclude that Gravitet F<sub>1</sub> variety had a much higher sensitivity against the attack of the pathogen than Petula F<sub>1</sub>RZ variety, because the frequency of the attack on the control was 36.8% for Gravitet F<sub>1</sub> variety, comparatively with Petula F<sub>1</sub>RZ variety, for which it was 30.3%. Such fungicides tests for *Alternaria porri* (Ellis) Cif. were also performed for *Allium cepa*, where the most tested products which were proven to have a low efficiency, noting the importance of cultivation for varieties with genetic resistance to this disease [11]. This finding is also valid for tomatoes based on the studies conducted in this direction [8, 21].

The calculation of the biologic efficiency of the 5 selected products, from the list of the 10 tested products for the fungus combating, was carried out in 2015.

Analyzing the 5 options for Petula F<sub>1</sub>RZ variety (Fig. 1), we could observe that the intensity of the attack on the plant was between 8.2% for the Score 250EC product, and 13.5% for the Pergado MZ product.

We can conclude that the best efficiency was obtained in the case of V<sub>1</sub> variant, using the Score 250EC product, with a biologic efficiency of 90.6%, followed by V<sub>2</sub> - Cabrio TOP, with a biologic efficiency of 90.0%, and the last, V<sub>5</sub> - Pergado MZ, with a biologic efficiency of 84.5%. Similar studies were conducted by Sadana 2015 [17], on tomato plants grown in vitro, who tested more fungicides for alternariosis combat. The most effective products were

Mancozeb, Tiram and Captan, and the least effective was Carbendazim [1].

The biologic efficiency of the tested fungicides had lower values for Gravitet F<sub>1</sub> variety, comparatively with Petula F<sub>1</sub>RZ variety, as we could remark the sensitivity of this variety. The Score 250EC product proved the highest biologic efficiency of all used products, a value of 90.2% (Fig. 2) was recorded. This was followed by Cabrio TOP product, with the efficiency of 88.5%, and the lowest efficiency was proved by Pergado MZ product of 84.4%.

Therefore, the hierarchy of the biologic efficiency of the products was maintained for both studied variants, and the little percentage differences were probably given by the resistance of the varieties against the attack of fungus.

The obtained values showed that Gravitet F<sub>1</sub> variety had a much higher sensitivity to the attack of the pathogen than Petula F<sub>1</sub>RZ variety.

From the data analysis, the best biological efficiency were showed by the products: Score 250EC, CabrioTop and Antracol 70 WP, that is why they can be recommended in the programs of fighting against this fungus.

It was found that in the absence of chemical treatments against this fungus, for early tomatoes, the attack on leaves, stems and fruits was great, and produced plant defoliation over 60% [22]. Such defoliations were also found in potatoes, where they reduced production yield by 20% and even 80% [3], in the absence of chemical treatments.

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