STUDIES CONCERNING PODOSPHAERA LEUCOTRICHA ELL. ET EV. SALMON FUNGAI PERFORMANCE OF IN FIVE APPLE VARIETIES DURRING THE CLIMATIC CONDITIONS IN 2009, AT S.D.E. TIMISOARA

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Abstract: *The work presents data about the behavior in respect to powdery mildew disease (Podosphaera leucotricha Ell. et Ev. Salmon) of Ionatan, Florina, Romus 2, Pionier and Delicios de Voineşti apple varieties. The varieties were chosen so they can be as heterogeneous as possible for the performance to powdery mildew disease. It is necessary to mention that there were other observations performed by the members of the phytopathology department in other years. The orchard in which observations were made is an intensive apple orchard, where in recent years has made minimal treatments against diseases and pests, namely one winter treatment and four treatments in vegetation, but in 2009 were added two vegetation treatments. Observations were made on five trees in three repetitions, it was noted the frequency, intensity and was calculated in the final level of appeal. The frequency was noted by percentile and the intensity was scored by a scoring scale from 0-6. Degree of attack was calculated by well known classical formula. Results were compared with the average experience in the end. At fungus attack, the best performances were registered, as expected, at Romus2 and Florina varieties. The results were satisfactory for Delicios de Voinesti. Ionatan variety confirmed that it has the most sensitive variety at the fungal attach from Podosphaera leucotricha Ell. et Ev. Salmon. After the study we concluded that 7 treatments a year are not enough for having a healthy culture, that the inoculators source is consistent, that at Ionatan variety the disease is chronic. We recommend that a special attention should be given to Ionatan variety for powdery mildew disease even from the first year from planting if there is a desire for a healthy orchard from phythosanitary point of view.*

Key words: *Podosphaera leucotricha, apple powdery mildew, fungal diseases*

INTRODUCTION

Apple is the best known and most important fruit growing species from temperate climate. The importance becomes from the culture age, area and obtained production, food, dietic value, and therapeutic value of fruit, ecologic plasticity, yield and suitability to the various culture technologies of varieties. Areas planted, yield per hectare and total production of apples in the world and on each continent during 2000-2008 (FAO data) are presented in Table 1.

Fungus was reported for the first time in our country by TRAIAN SAVULESCU between 1928-1929. Pathogen is currently being extended all across the country and it is very harmful (BAICU T ŞESAN TATIANA, 1996). It is considered that the greatest losses caused by the fungus *Podosphaera leucotricha*, began after 1950, more precisely after the introduction of plantations of the variety Jonathan, recognized as highly productive variety with fruits of an excellent quality but very sensitive to the fungus *Podosphaera leucotricha* (HATMANU M. et all, 1989, POPESCU GH., 2005).

The highest frequency and intensity of attack is reported in orchards and nurseries where it produces significant danages. (GH. SMITH., 1998).

Along with scab and moniliosis, powdery mildew disease is one of the most common diseases in apple plantations. In favorable years, the disease produces serious damage to sensitive varieties, 37-80% leaves recorded attacked, attacked shoots 46-98%, 6-20% and 8-25% of inflorescences in vegetative buds.

Table 1

Statistical data on surface area, average yield per hectare and total production of apples, the continents and the world.

Continent	Specification	Years						
		2000	2003	2004	2005	2006	2007	2008
Africa	Cultivated surface	123740.00	125749.00	127403.00	137648.00	165398,00	168269,00	170469,00
	Production kg/ha	12651.62	14180.84	16043.20	13860.88	12231,10	12025,10	11608,90
	Total production (t)	1565512.00	1783227.00	2043952.00	1907922.00	2023009,00	2023466,00	1978968,00
America	Cultivated surface	390726.00	374166.00	365733.00	371701.00	369235,00	358360,00	357679,00
	Production kg/ha	22094.05	22683.21	25850.15	24636.40	25251,30	25650,90	26231,5
	Total production (t)	8632719.00	8487284.00	9454253.00	9157374.00	9323676,00	9192279,00	9382491,00
Asia	Cultivated surface	3271844.00	2983399.00	2960997.00	2978251.00	2927485,00	305063,00	3159864,00
	Production kg/ha	9231.20	10576.14	11273.55	11776.43	12598,30	12878,40	13190,80
	Total production (t)	30203034.00	31552854.00	33380940.00	35073154.00	36881566,00	39287932,00	41681431,00
Europe	Cultivated surface	1529569.00	1362948.00	1344852.00	1313657.00	1268949,00	1261007,00	1130351,00
	Production kg/ha	11577.09	11551.96	12589.88	11446.72	12176,8	11865,60	14097,60
	Total production (t)	17707953.00	15744715.00	16931519.00	15037065.00	15451750,00	14962695,00	15935274,00
Oceania	Cultivated surface	33814.00	31580.00	31434.00	30980.00	29720,00	29247,00	29247,00
	Production kg/ha	27815.93	26222.55	25506.49	27483.31	21211,30	21385,90	21385,90
	Total production (t)	940568.00	828108.00	801771.00	851433.00	630400,00	625476,00	625476,00
In the world	Cultivated surface	5349693.00	4877842.00	4830419.00	4832237.00	4760787,00	4867546,00	4847610,00
	Production kg/ha	11037.98	11971.73	12962.11	12836.07	13508,30	13578,00	14358,30
	Total production (t)	59049786.00	58396188.00	62612435.00	62026948.00	64310401,00	66091848,00	69603640,00

MATHERIAL AND METHODS

In research carried out in the Didactical Station fromTimisoara were studied five apple varieties namely: Romus 2, Pionier, Jonathan, Delicios de Voinesti and Florina.

Trees are grafted on M26 vegetative rootstock were planted in spring of 1997 at a distance of 4x2 m, density of 1250 trees / ha, are conducted by Polspindelbuch system having two frames at base and the axis garnished with semischeleton and branches of fruit. Crown directing and training was made more difficult because the missing support system. During vegetation only seven treatments against diseases and pests were applied.

For analysis of powdery mildew disease attack, the calculation method of monofactorial experiences was used. In accordance with existing plant control, data were collected from three trees located along the line, they constitute one repetition. At each of the three trees, leaves from three frames locate on different positions to the tree axis were analyzed, frequency and intensity of attacks was noted.

Calculation of frequency, intensity and degree of attack was done using the usual formulas, and comparing the results was done with experience average. It is to note that the intensity was determined using the grading from 0 to 6.

Weather conditions that actively participate in the emergence and development of fungi are temperature, precipitation and relative humidity. Weather conditions of 2009 along with those multiannual are presented in Table 2.

Table 2

Weather conditions (temperature, precipitation and relative humidity) in 2009, compared with multiannual average

		I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
Temperature (t◦C)	2009	-0,3	2,0	7,3	16,0	19,0	21,3	24,0	23,7	20,0	12,3	8,3	4,3
	multiannual average	-1,6	1,1	5,8	11,2	16,3	19,4	21,1	20,4	16,5	11,0	5,6	0,8
Precipitations (mm)	2009	31,0	29,0	52,0	25,0	47,0	115,0	40,0	31,0	4,0	10,0	105,0	42,0
	multiannual average	39,1	38,3	33,9	46,8	63,1	79,6	62,4	51,4	42,1	42,2	49,4	52,6
Air humidity (%)	2009	83	78	67	56	61	73	68	67	67	84	93	91
	multiannual average	87	79	70	68	66	69	67	65	73	77	83	87

RESULTS AND DICUSSIONS

Frequency

Experimental results on frequency of powdery mildew disease attack are presented in Table 3 and Figure 1.

Tabelul 3

Frequency of *Podosphaera leucotricha* Ell et. Ev Slam *f.c. Oidium farinosum Cke.* fungus attack, in climatic conditions of 2009, compared with the experience average

Experience average	Repetition			Average	%	difference from control	Signification
	R1	R2	R3				
Ionathan	89,05	89,67	89,85	89,52	74,22	-23,08	000
Florina	58,15	58,53	61,44	59,37	111,91	7,07	***
Pionier	65,10	65,71	65,32	65,38	101,63	1,07	-
Romus	57,16	54,63	57,17	56,32	117,98	10,12	***
Delicios de Voineşti	63,14	61,41	60,34	61,63	107,81	4,81	***
Experience average	66,52	65,99	66,82	66,44	100,00	0,00	Ctrl.

DL5% = 2,118; DL1% = 3,011; DL0,1% = 4,360

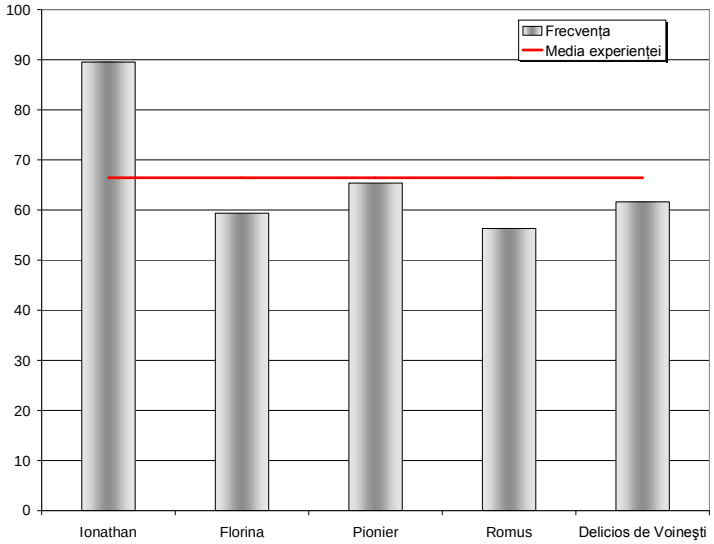

Figure 1: Frequency of *Podosphaera leucotricha* Ell et. Ev Slam *f.c. Oidium farinosum Cke.* fungus attack, in climatic conditions of 2009, compared with the experience average.

Pioneer variety, with an average of 65.38 was not different from the experience average. Florina and Romus varieties with an average of 56.32 and 59.37 respectively, showed positive differences from the experience average. Also, Delicios de Voinesti variety performed better against fungus attack, because the difference from the control of 61.63 indicates a difference statistically assured being very significant.

Attack intensity

In Table 4 and Figure 2 are presents the results on intensity of powdery mildew disease attack compared with the experience average.

Table 4

Attack intensity of *Podosphaera leucotricha* Ell et. Ev Slam *f.c. Oidium farinosum Cke.* fungus, in climatic conditions of 2009, compared with the experience average

	Repetition			Average	%	difference from control	Signification
	R1	R2	R3				
Ionathan	5,00	4,80	4,91	4,90	68,24	-1,56	000
Florina	2,75	2,98	2,89	2,87	116,47	0,47	***
Pionier	3,05	3,40	3,27	3,24	103,28	0,11	-
Romus	2,55	2,82	2,76	2,71	123,50	0,64	***
Delicios de Voineşti	3,09	3,11	2,82	3,00	111,37	0,34	**
Experience average	3,29	3,42	3,33	3,34	100,00	0,00	Ctrl.

DL5% = 0,225; DL1% = 0,321; DL0,1% = 0,465

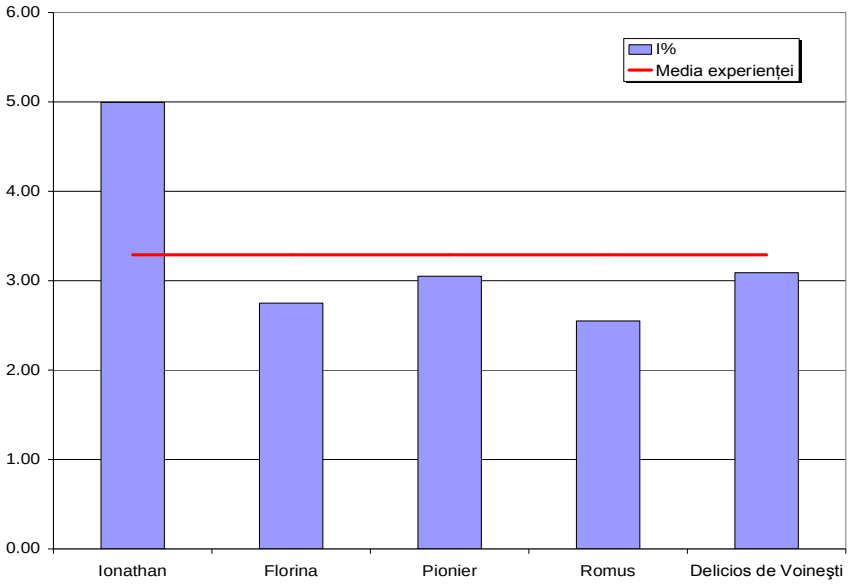

Figure 2. Attack intensity of *Podosphaera leucotricha* Ell et. Ev Slam *f.c. Oidium farinosum Cke.* fungus, in climatic conditions of 2009, compared with the experience average.

Also in this case, compared with the experience average, variety Ionathan proved to be the most sensitive to attack by powdery mildew disease, with an average of 4.90. Florina and Romus varieties revealed a highly significant difference from the experience average and Delicios de Voinesti variety difference was distinct significant.

In terms of attack intensity compared with the control variety, Pioneer variety has not presented differences statistically assured compared experience average.

Attack degree

In Table 5 are presented data on the attack degree obtained by calculation procedures for each variety and comparing them with experience average as control variety. To the experience average, as expected, Ionathan variety registered very negative differences. Pioneer variety, compared to control variety presented statistically insured differences as distinct significant, as for Florina, Romus separate and varieties, Delicios de Voinesti showed significant differences.

Tabelul 5.

Attack degree of *Podosphaera leucotricha* Ell et. Ev Slam *f.c. Oidium farinosum Cke.* fungus, in climatic conditions of 2009, compared with the experience average.

Experience average	Repetition			Average	%	difference from control	Signification
	R1	R2	R3				
Ionathan	4,45	4,31	4,41	4,39	52,82	-2,07	000
Florina	1,60	1,74	1,78	1,71	135,86	0,61	***
Pionier	1,99	2,23	2,13	2,12	109,50	0,20	**
Romus	1,46	1,54	1,58	1,53	151,91	0,79	***
Delicios de Voineşti	1,95	1,91	1,70	1,85	125,11	0,47	***
Experience average	2,29	2,35	2,32	2,32	100,00	0,00	Mt.

DL5% = 0,177; DL1% = 0,252; DL0,1% = 0,365

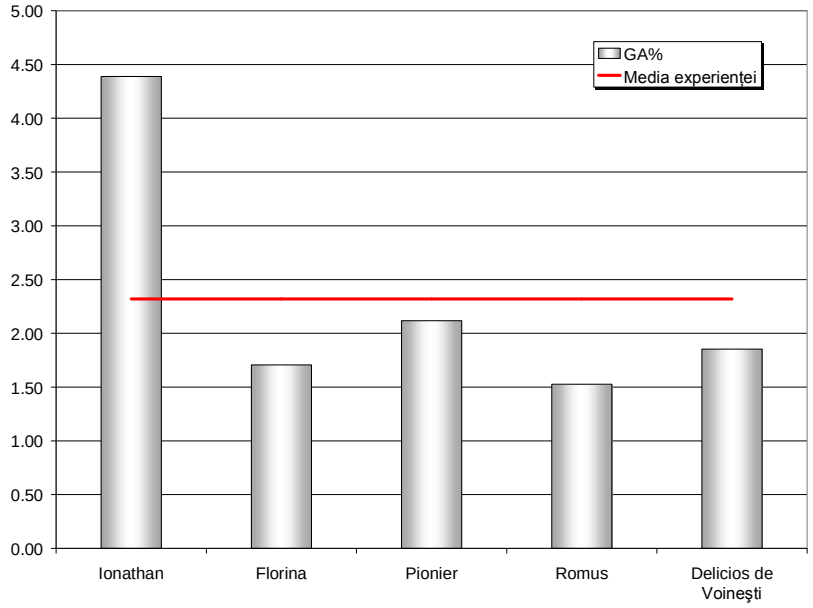

Figure 3. Attack degree of *Podosphaera leucotricha* Ell et. Ev Slam *f.c. Oidium farinosum Cke.* fungus, in climatic conditions of 2009, compared with the experience average

Analyzing the data from Table 5 and Figure 3 it can be oserved that, just as in the intensity and frequency of attacks, the highest degree of attack is to control Ionathan variety, compared to control variety, all studied varieties showed very positive differences, reinforcing the claim that Ionathan variety is the most sensitive of all species taken in observation for the attack of powdery mildew disease.

CONCLUSIONS

Values of determinations for the *Podosphaera leucotricha* Ell et. Ev Slam *f.c. Oidium farinosum Cke.* fungus that produces apple powdery mildew disease, concerning the frequency, intensity and degree of attack, calculated based on statistical processing emphasize the following conclusions:

- Climatic conditions of 2009 were less favorable to the emergence and development of the fungus *Podosphaera leucotricha* Ell et. Ev Slam *f.c. Oidium farinosum Cke.*, compared with recent years.
- Attack the fungus *Podosphaera leucotricha* Ell et. Ev Slam *f.c. Oidium farinosum Cke.* has declined not only because of climate, but also because this year the number of treatmentsapplied in the apple orchard has grown from the five to seven treatments.
- Variety Ionathan was confirmed to be the most sensitive variety to attack by fungi.

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