

SOME SUGAR BEET CULTIVARS BEHAVIOR TO THE ATTACK OF *CERCOSPORA BETICOLA* SACC. FUNGUS UNDER CLIMATIC CONDITIONS FROM NEAMT COUNTY, ROMANIA

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Abstract

Cercospora leaf spot, caused by the fungus *Cercospora beticola* Sacc. is the most important disease of sugar beet (*Beta vulgaris* L.) worldwide. *Cercospora* leaf spot is a polycyclic disease that can cause multiple infections during the vegetation period. Preliminary observations and data regarding sugar beet yield and quality suggest a differential behavior of the cultivars to the *Cercospora beticola* Sacc. fungus infection. The experience highlights the behavior of the studied sugar beet cultivars to the attack of the *Cercospora beticola* Sacc. fungus and it was located in the Research and Agricultural Research and Development Station (SCDA Secuieni), Neamt County. The biological material used is represented of 36 sugar beet cultivars that belong to Strube D & S GmbH and their placement was randomized in 4 repetitions. Considering the climatic conditions and applied culture technology, the recorded results regarding the behavior of the 36 sugar beet cultivars have shown both different levels of resistance and similar to the attack of *Cercospora beticola* Sacc. fungus.

Key words: Sugar beet, cultivar, *Cercospora beticola* Sacc.

Cercospora beticola Sacc. fungus that cause *Cercospora* leaf spot is the most destructive pathogen of sugar beet (*Beta vulgaris* L.) that it is cultivated in temperate climates.

This fungus produces a polycyclic disease that causes multiple infections in a single crop season (Khan *et al.*, 2009; Bolton *et al.*, 2012). As the disease progresses, severe leaf necrosis can occur when favorable weather conditions exist, causing reduced sugar production (Weiland & Koch, 2004; Harveson 2013). This disease can cause significant economic losses due to decreased yield and sugar quality (Jacobsen & Franc, 2009; Khan *et al.*, 2009), and increased storage rot.

Preliminary observations and data regarding sugar beet yield and quality suggest a differential behavior of the cultivars to the *Cercospora beticola* Sacc. fungus infection.

In order to establish the optimal time for the treatments is very important to follow the epidemic evolution of the pathogen (Balau A.M., 2011). Considering the biological parameters of the fungus *Cercospora beticola* Sacc. is possible to do at the right time with optimal treatments and also to use an optimal number of spraying necessary to combat the pathogen.

MATERIAL AND METHOD

Experimental field were conducted during the year 2016, and the settlement of cultivars was based on blocks method, in four repetitions of mono-factorial type, without irrigation.

The main factor of the experience is the sugar beet hybrids with a graduation number of 36. The fertilization has been done since autumn, before the soil scarification with KCl 150 kg/ha and DAP 18.46.0 – 200 kg/ha. The second fertilization has been done in the spring before the germinative bed preparation with 250 kg/ha of urea.

The number of variants and the size of the experience is shown in *table 1*.

The biological material was represented by 36 different hybrids of sugar beet which belong to Strube GmbH - Germany company. The field observations and determinations were in scoring the attack of *Cercospora beticola* Sacc. on sugar beet leaf, aiming the frequency (F%), intensity (I%) and attack level (GA %).

As criteria for assessing the degree of attack on the plant, was reported the attacked surface with the area observed, using a scale with six classes of attack, corresponding to specific percentage ranges of the intensity of the attack (Rafailă C., 1980).

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Experience dimensions	
Parameter	Value
Variants	144
Replicates (block no.)	4
Front removals (m)	1
Side removals (m)	1,35
The harvested area of the plot (m ²)	13,5
Width of the sowing machine (m)	1,35
Plot sown width (m)	1,8
Plot harvest width (m) Plot harvest width	1,35
The width of the paths between the blocks (m)	1
Length of the harvest plot (m)	10
Total length of the plot (m)	12
Block length (m)	50
Total length (m)	50
Total width (m)	64,8
Protection plots (m)	8
Total area of the experiment (m ²)	2592

RESULTS AND DISCUSSIONS

Conducted observations allowed to set the moment in which the onset and epidemic evolution of the fungus *Cercospora beticola* Sacc. it started, also to know the behavior of 36 sugar beet hybrids against the attack of this pathogen, depending on climatic conditions.

Analyzing the evolution of *Cercospora beticola* Sacc. attack (figure 1) it was found that in 2016 climatic conditions were favorable to the fungus attack. The fungus attack was reported at the end of July, and at the first notation, in mid-

August were recorded low levels of attack. The highest value of the attack was recorded by the H1 hybrid, of 1.65% followed by the H4 hybrid of 1.4%.

The lowest attack rate was recorded for the H13 hybrid of 0.6%. The other hybrids recorded between them small difference average values (table 2).

Another grading of the fungus attack was carried out at the beginning of September and the attack rate values increased between 15.5% to H13 hybrid and 21.37% to H4 hybrid.



Figure 1 *Cercospora beticola* attack on sugar beet plants

The last observation was done in the last decade of September, when the intensity of the attack increased compared to the values identified in the previous observations. Thus, the maximum attack was recorded by H1 hybrid, of 26.5%, and the lowest by H13 hybrid of 22.37% (table 2).

Concerning the sucrose content, it oscillates between 14-20%, in some cases reaching 21-23%.

The sugar content of the dry substance in the root oscillates between 56-84%. Table number two shows the sugar content average of the 36 sugar beet hybrids of the experiment. It is noted that the percentage of sugar varies between 16 - 19%, the highest value being recorded by H31 hybrid of 19%.

Table 2

Attack produced by *Cercospora beticola* (GA%) during the vegetation period– ARDS Secuieni

Hybrid	Evaluation date of the average degree of attack GA%					The production of sugar (t/ha)	Sugar content media of the sugar beet roots (%)
	15.08.2016	22.08.2016	31.08.2016	10.09.2016	22.09.2016		
H1	1.65	3.6	10.4	20.5	26.5	15.2	18.76
H2	0.9	2.82	9.57	18.5	23.6	16.3	17.06
H3	1.22	3.65	7.6	18.37	23.2	15.9	17.60
H4	1.4	4.02	11.85	21.37	24.3	15.3	18.05
H5	0.76	2.8	7.6	17.5	23.7	15.1	17.2
H6	0.75	2.7	8.1	16.62	22.7	16.1	16.85
H7	1.32	3.6	10.37	19.62	25.1	18.1	17.73
H8	0.85	3.19	9.87	19	23.6	17.7	17.30
H9	0.85	3.25	8.32	17.62	23.1	16.8	16.81
H10	0.96	3.32	9.2	19.12	23.8	18.2	17.02
H11	1.25	3.25	8.2	17.62	23.1	17.1	17.56
H12	0.8	2.87	9.1	17.5	22.7	17.4	17.8
H13	0.6	2.57	6.47	15.5	22.3	17.1	17.8
H14	1.07	3.32	8.07	17.62	24	17.3	18.5
H15	0.9	2.65	8.3	16.75	23.7	17.2	17.22
H16	0.87	3.55	7.7	19.25	23.8	17.0	18.32
H17	1	3.6	10.87	19.87	23	17.6	18.22
H18	1.05	3.87	10.62	19.75	24.1	15.7	17.31
H19	1.15	2.97	8.87	17.5	23.7	18.6	17.70
H20	1.12	3.5	9.02	18.75	24.1	17.8	17.32
H21	0.98	3.8	10.87	20.12	24.1	15.7	17.25
H22	0.75	2.7	8.57	17.37	22.37	16.7	17.415
H23	1.32	3.35	10.7	19.12	24.37	19.1	17.80
H24	0.95	3.02	8.77	18	22.5	17.2	17.45
H25	0.87	3.32	9.17	18.5	23.37	15.3	17.22
H26	0.77	2.8	7.1	16.75	22.75	15.0	18.28
H27	1	3.42	8	18.12	23	16.3	18.12
H28	1.28	3.4	9.87	19.37	23.62	16.3	17.34
H29	1.1	3.87	10.87	20.5	24	16.7	16.93
H30	0.89	2.95	9.97	17.75	23.5	15.9	18.09
H31	1.07	3.5	9.75	17.75	23.37	16.0	19
H32	1.3	3.47	9.7	21.12	24.62	17.4	17.69
H33	1.3	3.77	10.25	20.5	25.62	16.3	17.52
H34	0.75	2.62	8.45	17	22.5	17.1	18.03
H35	0.68	2.45	7.4	16.87	22.5	15.1	16.83
H36	1	3.25	7.92	17.87	23.25	16.9	17.70

The average content of the sugar for all 36 hybrids is by 17.63% thus falling within the values imposed by specialty literature.

Analysis of annual roots and their average yields, reveals a differentiated behavior of studied cultivars, mainly due to the climatic conditions.

CONCLUSIONS

Depending on the variation of climatic factors, especially the change of the humidity that fungus like, during the growing season are created

differences between the moment of infection and the moment of the first spots appearance and then between the latter and the time of a massive attack.

The attack degree of the fungus *Cercospora beticola* Sacc. recorded at the last scoring showed an average value of 23.6%.

Sugar content showed an average value for all 36 hybrids by 17.63%.

Based on the results presented, it can be selected and recommend the hybrids with the best behavior in order to obtain superior qualitative and quantitative productions.

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