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INFLUENCE OF THE TREATMENT SCHEME ON THE CERCOSPORIOSIS ATTACK (*Cercospora beticola* Sacc.)

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Abstract

Researches were carried out in the experimental field from the locality Sanzieni, Covasna county, with the aim of determining the effectiveness of some treatment schemes in combating the pathogen Cercospora beticola Sacc. of the sugar beet. The biological material was represented by the Damian, Matti, Vangelis and Tatry varieties. Different treatment schemes were tested and efficacy was calculated. The treatment reduced significantly the attack of cercosporiosis in all the analyzed varieties. The Damian variety registered the highest efficacy value of 91.27% in the Flowbrix + Amistar Gold + Sphere 535 Sc + Solar Bor treatment scheme. The application of treatment schemes led to statistically guaranteed production increases.

Key words*: sugar beet, treatment, cercosporiosis, efficacy.*

INTRODUCTION

Sugar beet (*Beta vulgaris* L.) represents one of the most important agricultural plants grown for sugar production in Romania and in many countries around the world (Toth & Cristea, 2018). Leaf spot disease or cercosporiosis is caused by the attack of the mycromycete *Cercospora beticola* Sacc. Cercosporiosis is one of the most common and destructive diseases of sugar beet (Skaracis et al., 2010; Cristea, 2005), with a major impact on root production and sugar content (Smith & Martin, 1978). An integrated control strategy of the attack of this pathogen takes into account the reaction of varieties (Rosi, 1995), proper rotation, cultural hygiene, fungicide treatments paying attention in their application to the resistance of the fungus *Cercospora beticola* to the administered substances (Wolf & Verreet, 2002; Shane & Teng, 1992; Dovas et al.., 1976; Meriggi et al., 2000). In controlling the attack of the fungus *Cercospora beticola* it is necessary to take into account all the factors involved in the onset and evolution of the disease and in the use of treatment schemes that will ensure a high effectiveness on root production (Toth & Cristea, 2020). Given the importance and implications of the attack of cercosporiosis in sugar beet culture, comprehensive studies have recently been conducted on the disease, the involved pathogen and on dealing with its attack. (Asher et al., 2000).

MATERIALS AND METHODS

The research was carried out in 2020 in the experimental field within SC Sînzieni, Covasna County, and consisted in monitoring the influence of some fungicide treatment schemes recommended in combating the pathogen *Cercospora beticola*. The biological material used was represented by the monogerm varieties: Damian, Matti, Vangelis and Tatry. The experiments were placed in three repetitions according to the randomized block scheme. The seed of the monitored hybrids was treated with Cruiser 600 products at a dose of 60 g/UG (insecticide) and Tachigaren at a dose of 10 g/UG (fungicide). In the treatment schemes consideration was given to factor 1-variety, factor 2-fungicide and factor 3-fertilizer. Observations were made on frequency (F%) and intensity(I%) of the attack, on which the attack rate was calculated (GA%) The following formulas were used: F = nx100/N, where N = number of plants observed (%), n = number of plants characteristic symptoms (%), I = Σ (ixf)/n (% 0 where, i =

provided percentage, f = number of plants (organs) with the respective percentage, n = total number of attacked plants (organs). Intensity was marked in percentage. The degree of attack was calculated according to the formula: DA (degree of attack) = F x I/100 (%), where: F = attack frequency (%), I = attack intensity (%), DA = rate was calculated by: DA = F x I/100 (%), where: F = attack frequency (%), I = attack intensity (%). The efficacy of the treatments was calculated by the Abbott's formula: E = [(GAm-GAv)/GAm] x 100, where GAm = control level, GAv = variant attack level. Data regarding the obtained productions were statistically processed by the analysis of the variant.

RESULTS AND DISCUSSIONS

The three experiments were located in the experimental field in Sînzieni, Covasna County, in order to monitor the influence of some fungicides that were subject of some treatment schemes in controlling the micromycete *Cercrospora beticola* at sugar beet, in 2020.

The applied scheme also includes a product with contact action, Flowbrix and two products with systemic action, Sfera 535 SC and Amistar Gold. The treatment scheme also includes the applied fertilizer (Table 1). The application of boron reduces the attack of sugar beet specific diseases (Lazar et al., 1977).

The data regarding the observations made on the influence of the treatment scheme on the attack of the micromycete *Cercospora beticola* in the conditions of the year 2020, show that the highest attack frequency value (F = 38%) was registered at the Vangelis variety in the third experiment, and the lowest value of its incidence determined in the third treatment experience (F = 25%) in the Matti variety. For the Vangelis and Tatry varieties a frequency value of 37% was determined under the conditions of the first experiment. High values of frequency (F = 37%) were recorded by the Vangelis variety in the case of the second experiment.

Table 1. Application Scheme of Treatments to Sugar Beet in Controlling the Attack of *Cercospora beticola* at SC Agromiki SRL, Location Sânzieni, Covasna County, 2020

Experiment 1/Scheme I				
Treatment No.	**Product**	**Active substance**	**Dose (l/ha)**	**Date/Period of Application**
1	Sfera 535 SC	trifloxystrobin 375 g/l + cyproconazole160 g/l	0.5	July 6
	Wuxal macromix	NPK	1.0	
2	Flowbrix	copper metal in the form of copper oxychloride 380g/l	2.5	July 25
	Solar Bor	15% Bor	2.0	
3	Amistar Gold	azoxystrobin 125g/l + difenoconazole 125g/l	1.0	August 27
	Solar Bor	15% Boron	2.0	
Experiment 2/Scheme II				
1	Amistar Gold	azoxystrobin 125g/l + difenoconazole 125g/l	1.0	July 6
	Yara	3,1%N, 34,3% K2O	2.0	
2	Sfera 535 SC	trifloxystrobin 375 g/l + cyproconazole160 g/l	0.5	July 25
	Solar Bor	15% Boron		
3	Flowbrix	copper metal in the form of copper oxychloride 380g/l	2.5	August 27
	Solar Bor	15% Boron		
Experiment 3/Scheme III				
1	Flowbrix	copper metal in the form of copper oxychloride 380g/l	2.5	July 6
	Wuxalmacromix	NPK	2.0	
2	Amistar Gold	azoxystrobin 125g/l + difenoconazole 125g/l	1.0	July 25
3	Sfera 535 SC	trifloxystrobin 375 g/l + cyproconazole160 g/l	0.5	August 27
	Solar Bor	15% Boron	2.0	

The Matti variety registered low attack frequency values in the other variants of the treatment scheme, as well, with attack frequency values of cercosporiosis of 28% in the second experiment and respectively 29% in the case of the first experiment. In the case of the Damian variety, the lowest value of the leaf attack frequency was noted in the case of experiment three, where the value was F = 28%. In the second and third experiments on the Damian variety the incidence of the attack had values close to 31% and 33%. The frequency of the attack of cercosporiosis in the Tatry variety showed a high level between 35%

in the second experiment, 36% in the third experiment and 37% in the first experiment. The frequency values in the control variant amounted to 92% for the Vangelis variety and to 89% for the Tatry variety (Table 2).

Table 2. Influence of Treatments Scheme on the Attack of *Cercospora beticola* Sacc. on Sugar Beet at SC Agromiki SRL, Location Sânzieni, Covasna County, 2020

Experiment /Witness	Frequency(F%) Intensity(I%) Degree of attack (DA%)	Variety			
		Damian	Matti	Vangelis	Tatry
Experiment 1	Frequency	31	29	37	37
	Intensity	3.6	2.4	3.8	3.2
	Degree of attack	1.11	0.69	1.40	1.18
Experiment 2	Frequency	33	28	37	35
	Intensity	3.2	2.1	3.1	2.7
	Degree of attack	1.05	0.58	1.14	0.94
Experiment 3	Frequency	28	25	38	36
	Intensity	2.1	3.1	3.1	2.1
	Degree of attack	0.58	1.17	1.17	0.75
Control	Frequency	87	81	92	89
	Intensity	6.5	5.8	7.2	6.7
	Degree of attack	6.65	4.69	6.62	5.96

As for the observations regarding the attack intensity of *Cercospora beticola* Sacc. the data from the same table show that the values were remarkably lower than those of the attack frequency. The lowest intensity values were calculated for the Damian and Tatry varieties in treatment scheme three, at I = 2.1%. For the Vangelis variety, the intensity of the attack had the same value in the second and third experiments in the treatment scheme, I = 3.1%. A reduced value of intensity was also calculated for the Matti variety in the case of the second experiment (I = 2.1%) (Table 2). Regarding the degree of attack, it was found that its subunit values were determined for the Matti varieties following the application of the treatments from the first and second experiments in the scheme (DA = 0.69% and DA = 58%) for the Tatry variety in the second (DA = 0.94%) and third (DA = 0.75%) experiment. The Damian variety recorded a minimum value of the degree of attack of DA = 0.58% in the third experiment. The highest values were calculated in the control variant for the Vangelis varieties (DA = 6.62%) and for the Damian variety (DA = 6.65%). Research shows that the application of fungicides has significantly reduced the attack of cercosporiosis in varieties monitored in the experimental area (Toth & Cristea, 2020). Application of fungicide treatments for controlling the pathogen *Cercospora beticola* Sacc. is one of the important interventions in controlling the sugar beet pathogen. Research has shown that the application of treatments is effective in controlling cercosporiosis (Toth & Cristea, 2020). Sugar beet cercosporiosis control strategy considers the genotype and control by using approved fungicides (Skaracis et al., 2010; Cristea 2005). The calculation of the effectiveness of the treatments applied in the experimental variants was taken into consideration (Table 3).

Table 3. Efficacy on Attack of *Cercospora beticola* on Sugar Beet, Location Sânzieni, Covasna County, 2020

Variety	Treatment Scheme/ Witness	DA (%)	E (%)
Damian	I	1.11	83.3
	Control	6.65	
Matti	I	0.69	85.28
	Control	4.69	
Vangelis	I	1.40	78.85
	Control	6.62	
Tatry	I	1.18	80.20
	Control	5.96	
Damian	II	1.05	84.21
	Control	6.65	
Matti	II	0.58	87.63
	Control	4.69	
Vangelis	II	1.14	82.77
	Control	6.62	
Tatry	II	0.94	84.22
	Control	5.96	
Damian	III	0.58	91.27
	Control	6.65	
Matti	III	1.17	75.05
	Control	4.69	
Vangelis	III	1.17	82.32
	Control	6.62	
Tatry	III	0.75	87.41
	Control	5.96	

Efficacy of treatments in plant disease control is of particular importance in establishing schemes to combat them (Balasu et al.., 2015; Mindru et al., 2018; Buzatu et al., 2018; Jalobă et al., 2019; Alexandru et al., 2019; Doncila 1995). The data in Table 3 show that the highest efficacy value of the treatment scheme was registered for the Damian variety under the conditions of treatment scheme III, at E = 91.27%. High efficacy values were obtained for the Matti variety in the case of

treatment scheme II (E = 87.63%) and Tatry in treatment scheme III at E = 87.41%. In the case of the Matti variety, the lowest efficacy value was registered in the case of treatment scheme III at E = 75.05%, followed by the Vangelis variety in scheme I (E = 78.85%), which can be attributed to its influence. For the Damian variety, an efficacy of over 83% was observed in all the treatment schemes tested. Research on the effectiveness of treatment schemes in controlling the sugar beet cercosporiosis has confirmed values of over 80% in decreasing the level of attack (Toth & Cristea, 2020). The application of an integrated management has an effect on the attack of cercosporiosis on beets (Biancardi et al., 1999).

The influence of the treatment scheme on the production of roots was also followed and it was found that in all variants were obtained statistically guaranteed, very significantly positive production increases. The data in Table 4 show that the Damian variety had the highest average production of beet root, at 58.00 t/ha in treatment scheme 3, for which the degree of attack of micromycete and the effectiveness were the highest, as well.

Table 4. Sugar Beet Roots Production in the Locality Sânzieni, Covasna County, 2020

Experiment Scheme	Damian			Matti			Vangelis			Tatr		
	T / ha	% compared to MT	Significance	T / ha	% compared to MT	Significance	T / ha	% compared to MT	Significance	T / ha	% compared to MT	Significance
Experiment 1	56.50	131	***	56.20	139	***	49.80	132	***	53.50	134	***
Experiment 2	57.00	132	***	56.40	139	***	51.20	136	***	55.20	139	***
Experiment 3	58.30	135	***	54.60	135	***	48.70	130	***	51.80	130	***
Control (MT)	43.20	-	-	40.70	-	-	37.60	-	-	39.80	-	-
DL 5%	0.62			0.66			0.71			0.67		
DL 1%	0.82			0.87			0.94			0.89		
DL 0.5%	1.04			1.11			1.20			1.13		

CONCLUSIONS

The application of treatments in different control schemes and the behavior of varieties continues to be important measures in controlling cercosporiosis at sugar beet. As a result of the application of treatments in vegetation, the degree of attack decreased considerably in all experimental variants compared to the witness. Under the conditions of the year 2020, for the Damian variety, in the experiment scheme 3 of the treatment, the highest value of efficacy was registered, E = 91.27%. In all treatment schemes production increases were obtained, the results being statistically assured.

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