

RESEARCH ON FOLIAR DISEASES ON TWO- ROW BARLEY, MURIGHIOL LOCATION, TULCEA COUNTY

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Abstract

The aim of our research was to detect diseases and the effectiveness of some treatments on two-row barley during 2021-2023, in the Murighiol location, Tulcea County. The biological material was represented by the Romanița spring two-row barley variety. The experiment monitored the attack in treated and control variants. The analyzed pathogens were *Blumeria graminis* f. sp. *hordei*, the powdery mildew pathogen, *Pyrenophora teres*, the net blotch pathogen and *Rhynchosporium secalis*, responsible for the appearance of rhynchosporiosis. The lowest values of the powdery mildew attack in the control variant were recorded in 2023, with values of the degree of attack of 14.9% and 23.5% in 2022. The application of treatments reduced the attack and had an effectiveness of over 73% in controlling powdery mildew during the analyzed period, around 71% in 2022 and 75% in 2023 in controlling net blotch. The rhynchosporiosis attack was sub-unitary.

Key words: two-row barley, pathogens, diseases, degree of attack.

INTRODUCTION

Monitoring the state of health of the two row barley crop is a necessity in obtaining crops that are as little affected by the attack of pathogens and high productions from a quantitative point of view. In addition, a special attention from the phytosanitary point of view is required as a result of the main destination of this crop for industrialization, in obtaining malt. Barley of two-rows attacked by pathogens specific to barley, with an identical symptomatic picture.

Blumeria graminis f. sp. *hordei*, which causes powdery mildew, is found mainly on the leaves and causes them to dry, with important production losses and for which the cultivation of resistant varieties is necessary (Jorgensen, 1993). The control of the pathogen through treatments with fungicides can lead to the development of its resistance to some molecules (De Waard et al., 1993). Investigations regarding the approach of using natural components extracted from microorganisms as biopesticides showed that yeast extracts or different substances such as various phenolic acids protected barley from the attack of the fungus *Blumeria graminis* f. sp. *hordei* (Reglinski et al., 1994; Gregersen P.L. and

Smedegaard V., 1898; Walters et al., 1993). Also, the cultivation of mixtures of varieties can be a part of the integrated protection of barley against the pathogen *Blumeria graminis* f. sp. *hordei* (Tratwal and Bocianowski, 2018).

A common pathogen in barley crops is *Pyrenophora teres* (net blotch) is considered one of the most widespread diseases of barley (Popescu and Cristea, 2022; Popescu et al., 2023; Soovali and Koppel, 2010) can produce important losses up to compromising the harvest (Liu et al., 2011). The disease determines not only the reduction of production (Khan, 1897) but also the characteristics of the seeds, which can lead to their general downgrading (Vanova et al., 2006). The barley scald caused by the micromycete *Rhynchosporium secalis* causes drying of the leaves and is widespread in barley (Goodwin, 2002) and favored by conditions of high humidity and monoculture (Cristea S., 2005). A special importance is given to studies on the biological control of plant pathogens (Cristea et al., 2017; Ichim et al., 2017). The application of treatments or integrated treatment schemes were effective in controlling plant diseases (Buzatu et al., 2018; Alexandru et al., 2019; Jalobă et al., 2019; Toth and Cristea, 2020).

MATERIALS AND METHODS

The researches were carried out within the experiences of Sarinasuf, Murighiol, Tulcea county during 2021-2023. An experience with two-row barley, the Romanița variety, was studied. A classical culture technology was applied. The variants were plots to which treatments were applied in vegetation period and the control variant in three repetitions. In 2021, seed treatment with Orius 1.5 kg/t and the fungicide Zamir 0.75 l/ha were applied in vegetation. In 2022, the applied technology included seed treatment with Orius 1.5 kg/ha and treatment with the fungicide Falcon 0.8 l/ha. In 2023 the seed was treated with Biosem 1.5 l/ha and the vegetation was treated with the product Falcon 0.8 l/ha. No vegetation treatments were applied to the control variant. Observations were made on the detected foliar diseases and the frequency, intensity and degree of attack was noted, using the formulas: Frequency (F%) = $n \times 100/N$, where N = number of plants observed (%), n = number of plants specific symptoms (%), Intensity (I%) = $\Sigma (ixf)/n$ (%) where, i = percentage given, f = number of plants/organs with the respective percentage, n = total number of attacked plants/organs, GA - attack degree (%), F = frequency (%), I = intensity (%). The results regarding the degree of attack were used in the calculation of the effectiveness of the treatments in the control of the monitored diseases. The effectiveness of the treatment was calculated

according to the formula $E (\%) = [(GA \text{ var } c - GA \text{ var } t)/GA \text{ var } c]$, where: GA var c = degree of attack in the control variant and GA var t = degree of attack in the treated variant.

RESULTS AND DISCUSSIONS

The research during the experimental period 2021-2023 also aimed at monitoring some foliar diseases and identifying the pathogens responsible for the attack on the Romania genotype, a variety of spring two-row barley. The 2021-2023 research period was characterized by moderate temperatures and precipitation, but with higher precipitation values in January and June 2021 (Figure 1).

A powdery mildew attack was detected on the leaves, which manifested itself as white spots, in the form of mycelial pustules that quickly spread on the basal leaves. The spots became powdery and then gray (Figure 2), as a result of the development of the cleistothecia of the fungus *Blumeria graminis* f. sp. *hordei* (Figure 3). The attack of net blotch was observed by the appearance of yellowish spots that became brown, with a velvety appearance (Figure 4), after the formation of asexual fruiting (*Drechslera teres*) (Figure 5). The barley scab attack was also observed, characterized by ellipsoidal, lenticular spots, bordered by a reddish-brown border, with a whitish center and covered by a loose fluff (Figure 6), formed by the fructifications of the fungus (Cristea, 2005) (Figure 7).

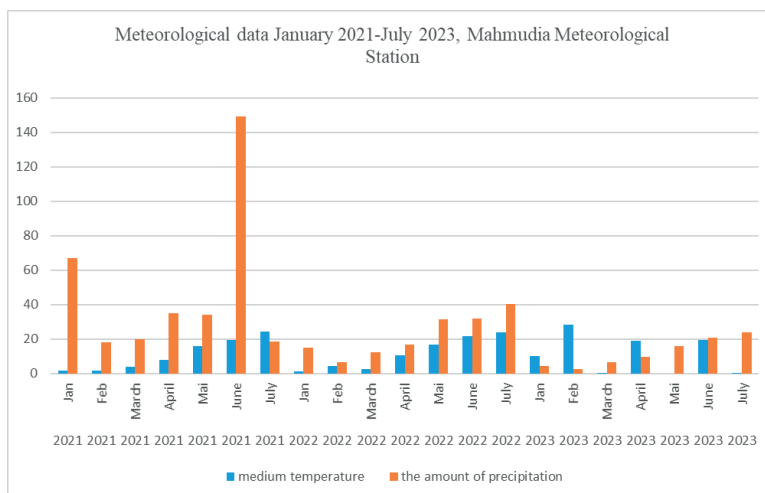


Figure 1. Meteorological data January 2021- July 2023, Mahmudia Meteorological Station, Tulcea County



Figure 2. Powdery mildew attack on leaves

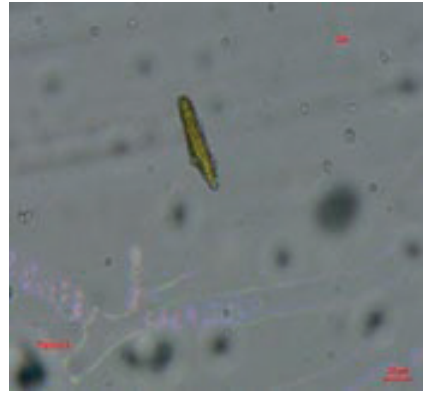


Figure 5. *Drechslera teres* - conidia



Figure 3. *Blumeria graminis* f. sp. *hordei* cleistothecia



Figure 6. The barley scab attack



Figure 4. Net blotch attack

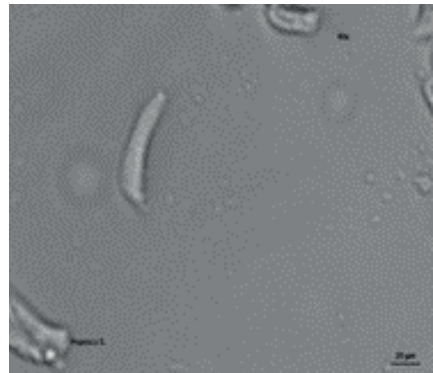


Figure 7. *Rhynchosporium secalis* - conidia

Regarding the evolution of the attack of the diseases detected on the two row barley, it was found that the attack of powdery mildew the monitored pathogens had higher values than the untreated variants. Under the conditions of 2021, the attack had a frequency of 78% and an intensity value of 36%, resulting in an attack degree value of 28%. The attack of net blotch occurred with an incidence of 100% and the intensity had the value of 34%, which led to a value of the degree of attack of 34%. The fungus *Rhynchosporium secalis* had a weaker presence on leaves with F = 14.5 and I = 7.5, resulting in a value of the degree of attack of 1%. The application of the treatment reduced the attack of the analyzed pathogens, so that in the case of the micromycete *Blumeria graminis* f. sp. *hordei* both the incidence and the intensity had low values which determined a level of the attack degree of 6.9%. The net blotch attack was significantly reduced in terms of the intensity value of 16%, calculating a value of the degree of attack of 16%. The barley scab attack reduced to sub-unit values. In 2022 conditions, in the variant without treatment, the frequency of the powdery mildew attack in the two rows barley, variety Romanita had higher frequency values that reached 84%, but the intensity value was 34%. The value of the degree of attack was 23.5%. The attack of net blotch also had a maximum frequency but an intensity value of 33.5%, which determined a similar value of the attack. In the treated variant, the intensity of the attack decreased to 9.5%. The barley scab attack

was significantly higher than 1.7% in the control variant and also subunit after the application of the treatment.

In 2023 conditions, the powdery mildew attack recorded lower values of the incident (F = 68%) and intensity (I = 11%) and the value of the degree of attack was lower compared to previous years (GA = 4%). The frequency of the net blotch attack remained at the maximum value, but the intensity was 7.5%, which also established the value of the degree of attack. The rhynchosporiosis attack, although with reduced values, was still higher than in the previous period taken into analysis (Table 1). The presence of net blotch attack at maximum frequency values was also determined in barley, in the same period (Popescu et al., 2022, Popescu and Cristea, 2023).

The effectiveness of the treatment applied during vegetation on two row barley, Romanita spring variety, was also calculated, and it was found that in the case of the powdery mildew attack, the effectiveness had values of over 75% in the conditions of the years 2021 and 2022 and of 73.15% in the year 2023. The values of effectiveness against the attack of net blotch were lower, with the highest value in the year 2023 when E = 75.4%. The lowest value was found in 2021 when E = 64.70%. Regarding the rhynchosporiosis attack, the application of the treatments had an effectiveness of 72.72% in 2021 and 70% in 2023 and 64.7% in 2022.

Table 1. Evolution of the attack of foliar diseases on two-row barley, during 2021-2023, Murighiol, Tulcea county

Variety	Year	Variants control / treat	Pathogen/Disease								
			<i>Blumeria graminis</i> f. sp. <i>hordei</i> /powdery mildew			<i>Pyrenophora teres</i> / net blotch			<i>Rhynchosporium secalis</i> /the barley scab		
			F (%)	I (%)	GA (%)	F (%)	I (%)	GA (%)	F (%)	I (%)	GA (%)
Romanita	2021	control	78	36	28.0	100	34	34	14.5	7.5	1.1
		treat	48	14.5	6.9	100	12	12	8.5	4	0.3
	2022	control	84	28	23.5	100	33.5	33.5	18	9.5	1.7
		treat	46	12.5	5.7	100	9.5	9.5	11.5	5.5	0.6
	2023	control	68	22	14.9	100	30.5	30.5	23.5	8.5	2.0
		treat	36.5	11.0	4.0	100	7.5	7.5	10.5	6.5	0.6

Table 2. Effectiveness of treatments in the control of foliar diseases on two row barley during 2021-2023, Murighiol, Tulcea county

Variety	Year	Variants control /treat	Pathogen/Disease					
			<i>Blumeria graminis</i> f. sp. <i>hordeii</i> / powdery mildew		<i>Pyrenophora teres</i> / net blotch		<i>Rynchosporium secalis</i> / barley scab	
			GA (%)	E (%)	GA (%)	E (%)	GA (%)	E (%)
Romanița	2021	control	28.0	-	34	-	1.1	-
		treat	6.9	75.35	12	64.70	0.3	72.72
	2022	control	23.5	-	33.5	-	1.7	-
		treat	5.7	75.74	9.5	71.64	0.6	64.70
	2023	control	14.9	-	30.5	-	2.0	-
		treat	4.0	73.15	7.5	75.4	0.6	70.0

CONCLUSIONS

During 2012-2023, the pathogens responsible for the appearance of powdery mildew, net blotch, rhynchosporiosis were detected and monitored on the two row barley culture. In the control variants, the lowest values of the attack of analyzed pathogens were calculated in 2023 and the highest level of attack in 2021. The application of treatments reduced the attack of pathogens during the research period. The effectiveness of treatments in controlling powdery mildew had the highest value in 2022 (E = 75.74%) and in controlling net blotch in 2023. The effectiveness of the phytosanitary intervention against rhynchosporiosis exceeded 72% in 2021.

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