

THE DYNAMICS OF WHEAT DISEASES IN THE PERIOD 2015-2019 IN THE MOARA DOMNEASCA LOCATION, ILFOV COUNTY

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Abstract

The aim of the research was to evaluate the presence and attack of wheat micromycetes in the period 2015-2019 within the Moara Domneasca Didactic Resort, Ilfov County. There was monitored the attack of micromycetes *Blumeria graminis* f. sp. *tritici*, *Zymoseptoria tritici* (FA *Septoria tritici*) *Septoria* spp. (FA) and *Fusarium* spp. and *Puccinia recondita* to the Glosa and Boema varieties in the period 2015-2017 and to the Katou, Pitbul and Jaguar varieties in the period 2017-2019. In the experimenting years of 2015-2017 for the Glosa variety, the lowest values of the attack on the detected pathogens were registered. In 2017-2018, the frequency of the *Fusarium* attack was noted, which was 4% for the Glosa variety and 65 for the Boema variety. In the conditions of 2018-2019 year, the Pitbul variety was noticed, on which the attack of *Septoria* spp. was observed in a percentage of 5.85%.

Key words: wheat, micromycetes, variety, degree of attack.

INTRODUCTION

Wheat is an important crop in Romania and wherever this plant is the main source in bread preparation (Muntean et al., 2003). This is why the health of wheat crops is a permanent concern for fundamental and applied research. The importance of knowing the diseases and pathogens of wheat, the dynamics of their evolution are relevant in the elaboration of intervention schemes in stopping their attack. The application of the most effective and efficient control measures, their integration ensures superior productions from a quantitative and qualitative point of view (Weber et al., 2001). Wheat is attacked every year by fungal infections such as powdery mildew, caused by the micromycete *Blumeria graminis* f. sp. *tritici*, septoria, caused by the pathogens *Zymoseptoria tritici* and *Parastagonospora nodorum*, rust, the most widespread of which is the brown rust produced by the micromycete *Puccinia recondita*, fusariosis caused by *Fusarium* spp. If they are not subject to phytosanitary control, the attack of these pathogens can have major consequences for the grower, both in terms of placement in time and space of crops and harvest. Also, a considerable number of

micromycetes are associated with wheat caryopsis, involved in the black point phenomenon (Cristea et al., 2008), which could have consequences for seed quality (Tamba-Berehoiu et al., 2010). Research on micromycetes associated with wheat seeds (Cristea et al., 2015; Cristea and Berca, 2013; Khanzada et al., 2002; Singh et al., 2011) showed that some of these micromycetes were also present on the seeds of some species of plants with which wheat usually enters in rotation and crop rotation in our agriculture (Dudoiu et al., 2016; Cristea et al., 2015, Cristea et al., Manole et al. 2015, Mardare et al., 2015; Pană et al., 2014; Berca et al., 2014).

MATERIALS AND METHODS

The research took into account the wheat crop from the Didactic Resort from Moara Domneasca within USAMV from Bucharest, in the period 2015-2019. Observations were made on the attack of the present diseases and the pathogens responsible for their appearance in the period 2015-2019 were identified. The frequency (F%) and intensity (I%) of the attack were calculated. Frequency (F%) = $n \times 100 / N$, where N = number of plants observed (%), n = number of

plants specific symptoms (%). The intensity was noted in percentages and calculated according to the formula: Intensity (I%) = Σ (ixf) / n (%) where, i = percentage given, f = number of plants (organs) with the respective percentage, n = total number of attacked plants (organs). The biological material was represented by the varieties Glosa and Boema (2015/2016, 2016/2017) and Katou and Pitbul (2017/2018) Jaguar and Pitbul (2018/2019). Observations were made in the plots before the treatments were performed. The seed was treated with specific products. Based on the obtained data, the degree of attack (GA%) was calculated. Degree of attack (GA%) = (FxI) / 100, where F (%) represents the frequency of the attack and I (%) the intensity of the attack. Regarding the attack of *Fusarium* spp. its frequency was noted considering the intensity as having maximum value, by extending the attack on the monitored ears.

RESULTS AND DISCUSSIONS

The research focused on the phytosanitary condition of wheat in the research location during 2015-2019. The research period was characterized by specific weather conditions that influenced the presence of wheat-specific pathogens and their dynamics (table 1 and table 2). The data from table 1 regarding the

temperature values in the period 2015/2017 show higher values compared to the multiannual average values and the fluctuating precipitation values in their annual distribution compared to the multiannual average. In 2017/2018 the accentuated deficit of precipitations is noticed and in 2018/2019 a large amount of precipitations was found in May and June, compared to the multiannual average (table 2). In the climatic conditions of the experimental period for wheat cultivation in the localized research area, the following foliar and ear diseases were identified: powdery mildew, produced by the micromycete *Blumeria graminis* f. sp. *tritici*, leaf septoria caused by micromycete *Zimoseptoria tritici* (2015/2016). In 2016/2017, the observations regarding wheat diseases highlighted the presence of pathogens: *Blumeria graminis* f.sp. *tritici*, *Septoria* spp. *Fusarium* spp. and in 2017/2018 the attack of *Septoria* spp., *Fusarium* spp. was noted. In the agricultural year 2018/2019 in wheat crop there was an attack of *Septoria* spp. And *Puccinia recondita* f. sp. *tritici*, micromycete responsible for the appearance of brown rust. Observations and notations of the attack were made on wheat leaves in the case of pathogens *Blumeria graminis* f.sp. *tritici*, *Septoria* spp. and *Puccinia recondita* f. sp. *tritici* and on ears and caryopsis in the case of *Fusarium* spp. attack.

Table 1. Climatic conditions in the agricultural year 2015-2017, Moara Domneasă, Ilfov county

Month	Temperature (°C)		Rainfall (mm)		Temperature (°C)		Rainfall (mm)	
	2015-2016	Multiannual average	2015-2016	Multiannual average	2016-2017	Multiannual average	2016-2017	Multiannual average
October	10.7	11.0	81.7	35.8	11.2	11.0	70.0	35.8
November	7.7	5.3	17.6	40.6	6.5	5.3	32.5	40.6
December	3.1	0.4	1.2	36.7	2.0	0.4	25.5	36.7
January	-3.45	-3.0	33.2	30.0	-2.5	-3.0	41.0	30.0
February	1.79	-0.9	7.6	32.1	2.2	-0.9	17.5	32.1
March	7.58	4.4	37.3	31.6	15.0	4.4	44.5	31.6
April	14.34	11.2	116	48.1	16.5	11.2	90.0	48.1
May	15.86	16.5	88.0	67.7	18.6	16.5	47.3	67.7
June	22.41	20.2	113.0	86.3	22.4	20.2	46.8	86.3
July	24.18	22.1	38.0	63.1	26.4	22.1	105.2	63.1
August	23.08	21.1	26.2	50.5	24.2	21.1	37.1	50.5
September	18.9	17.5	60.6	33.6	19.1	17.5	37.0	33.6

Source: Afumați weather station, Ilfovcounty

Table 2. Climatic conditions in the agricultural year 2017/2019, Moara Domnească, Ilfov county

Month	Temperature (°C)		Rainfall (mm)		Temperature (°C)		Rainfall (mm)	
	2017-2018	Multiannual average	2017-2018	Multiannual average	2018-2019	Multiannual average	2018-2019	Multiannual average
October	11.5	11.0	70.9	35.8	13.8	11.0	10.4	35.8
November	7.2	5.3	55.1	40.6	5.0	5.3	53.7	40.6
December	2.4	0.4	30.0	36.7	-0.1	0.4	25.1	36.7
January	-1.3	-3.0	0.0	30.0	-1.2	-3.0	32.0	30.0
February	1.3	-0.9	0.0	32.1	3.4	-0.9	14.6	32.1
March	3.7	4.4	0.2	31.6	9.5	4.4	31.2	31.6
April	16.4	11.2	0.0	48.1	11.1	11.2	78.4	48.1
May	19.7	16.5	0.0	67.7	16.7	16.5	148.2	67.7
June	22.5	20.2	53.2	86.3	20.4	20.2	109.4	86.3
July	23.0	22.1	107.6	63.1	22.6	22.1	76.0	63.1
August	24.1	21.1	2.0	50.5	24.3	21.1	2.4	50.5
September	19.2	17.5	28.9	33.6	-19.1	17.5	4.8	33.6

Source: Afumați weather station, Ilfov county

The data from table 3 show that in 2015/2016 in wheat, the pathogens *Blumeria graminis* f. sp. *tritici* and *Zimoseptoria tritici* anamorphic form (*Septoria tritici*), were detected in both analyzed varieties. It can be seen that in the Glosa variety the value of the frequency of the powdery mildew attack was higher, of 72% and in the Boema variety of 65% but in terms of the intensity of the attack the higher value was noted in the Boema variety (I = 20%). The value of the degree of attack in case of powdery mildew was higher for the Boema variety. The degree of powdery mildew attack (*Blumeria graminis* f. sp. *tritici*) was 13% compared to 10.8% Glosa variety. As a result, the level of attack degree of fungus *Blumeria graminis* f.

sp. *tritici* was determined by the frequency of attack, evaluated quite high in both varieties. As for the attack of the leaves, it can be seen that the frequency of the attack was 75% for the Glosa variety and 70% for the Boema variety. The intensity of the *Septoria* spp. attack was 20% for the Glosa variety and 25% for the Boema variety, respectively. This shows that although the values are close, in the Glosa variety the pathogen was more aggressive, and in the Boema variety more virulent. The values of the attack frequency were high for both varieties. Thus, the values of the degree of attack were 15% (Glosa) and 17.5% (Boema) (Table 3).

Table 3. Phytosanitary condition of wheat, M. Domnească, Ilfov county, 2015-2017

Variety	The pathogen / 2015-2016						The pathogen/ 2016-2017						
	<i>Blumeria graminis</i> f. sp. <i>tritici</i>			<i>Zimoseptoria tritici</i> (FA <i>Septoria tritici</i>)			<i>Blumeria graminis</i> f. sp. <i>tritici</i>			<i>Septoria</i> spp. (FA)			<i>Fusarium</i> spp.
	F (%)	I (%)	GA (%)	F (%)	I (%)	GA (%)	F (%)	I (%)	GA (%)	F (%)	I (%)	GA (%)	F (%)
Glosa	72	15	10.8	75	20	15	58	12	6.96	56	15	8.4	4
Boema	65	20	13	70	25	17.5	45	14	6.3	75	17	12.75	6

In the conditions of 2016/2017 for the same varieties, the attack of powdery mildew, septoria (FA *Septoria* spp.) and the frequency of attack of fusarium wilt on ears were noted. It was found that the attack of the pathogen *Blumeria graminis* f. sp. *tritici* had values close to the two varieties of 6.3% (Boema) and 6.96% (Glosa). Under this year's conditions, the values of the frequency of the powdery

mildew attack were lower, of 58% for the Glosa variety and 48% for the Boema variety. Regarding the intensity of the attack, it had values of 12% for the gloss variety and 14% for the Boema variety. As a result, the values of the powdery mildew attack were lower compared to the previous year. Regarding the attack of the *Septoria* spp. fungus, it was found that in the Boema variety the value of the attack

degree was 12.75% compared to 8.4% in the Glosa variety. In the case of the attack of *Septoria* spp. micromycetes, the data in table 3 show that the Boema variety had a high level of attack frequency of 75%, even higher than the attack of the previous year. In contrast to the Glosa variety, the intensity level was lower by 56% compared to 75% in the previous year. The intensity of the attack was lower, of 15% for the Glosa variety and 17% for the Boema variety. In both varieties the intensity values were lower than in 2015/2016. So, in the conditions of 2016/2017, a low value of the attack of septoria on leaves was noted. In 2016/2017, the frequency of the attack of fusariosis on the ears was also observed and noted. The micromycete *Fusarium* spp. had an

incidence of 6% in the Boema variety and 4% in the Glosa variety, the micromycete being known for the attack on ears and wheat caryopsis (Ittu et al., 2010). As a result, in the conditions of the period 2015-2017, at the Glosa variety, lower levels of the detected micromycete attack were determined compared to the Boema variety (Table 3). The presence of *Fusarium* spp. fungus on caryopsis implies a special attention on the treatment of wheat seeds and their quality in conditions similar to the experimental year. *Septoria* spp. micromycetes are common year after year in wheat (Cioneag et al., 2015) and the conditions at the monitored location also favored the attack of *Blumeria graminis* f. sp. *tritici* and *Fusarium* spp.

Table 4. Phytosanitary condition of wheat, M. Domnească, Ilfov county, 2017-2018

Variety	The pathogen/ 2017-2018					
	<i>Blumeriagraminis</i> f. sp. <i>tritici</i>			<i>Septoria</i> spp.(FA)		
	F (%)	I (%)	GA (%)	F (%)	I (%)	GA (%)
Katou	80	20	16	85	20	17
Pitbul	45	15	6,75	65	15	9.75

In 2017/2018, the varieties Katou and Pitbul varieties were cultivated. The attack of powdery mildew and septoria on wheat leaves was observed and noted. Also, the frequency and intensity of the attack of the two micromycetes were evaluated and the degree of attack was calculated. Regarding the powdery mildew attack, it was observed in the Katou and Pitbul varieties, with frequency values of 80% in the Katou variety and 45% in the Pitbul variety. Intensity of pathogen attack *Blumeria graminis* f. sp. *tritici* was 20% in the Katou variety and 15% in the Pitbul variety. As a result, an attack value of 16% was calculated for the Katou variety and 6.75% for the Pitbul variety. As it results from the data of table 4 for the Katou variety, the highest values of the frequency and intensity of the leaf powdery mildew attack were registered. As a result, we

consider that the high value of the attack frequency determined a high level of attack degree. The septoria attack recorded the highest frequency value, 85% for the Katou variety. Also, the value of the intensity was quite high, namely 20%, which led to a level of attack of 17%, the highest in the analyzed period. In the Pitbul variety, the values of frequency and intensity of septoria attack were lower, of 65% and 15%, respectively. The level of attack by *Septoria* spp. reached 9.75%. It was found that in the Katou variety the attack values were higher than in the Pitbul variety in both monitored pathogens (Table 4). In 2017/2018, the Pitbul and Jaguar varieties were cultivated and analyzed. In 2017/2018, the Pitbul and Jaguar varieties were cultivated and analysed (Table 5).

Table 5. Phytosanitary condition of wheat, M. Domnească, Ilfov county, 2018-2019

Variety	The pathogen/ 2018-2019								
	<i>Blumeria graminis</i> f. sp. <i>tritici</i>			<i>Septoria</i> spp. (FA)			<i>Puccinia recondita</i>		
	F (%)	I (%)	GA (%)	F (%)	I (%)	GA (%)	F (%)	I (%)	GA (%)
Pitbul	-	-	-	45	13	5.85	-	-	-
Jaguar	48	11	5.3	65	20	13	35	13	4.55

In 2018/2019, the varieties analyzed, Pitbul and Jaguar, were attacked by *Blumeria graminis* f. sp. *tritici*, and *Puccinia recondita* (Jaguar) and *Septoria* spp (Jaguar and Pitbul). In the case of the Jaguar variety, the powdery mildew attack had values of 5.3% on the leaves, the *Septoria* spp. attack was 13% and the brown rust attack of 4.55% was also calculated. The intensity of the septoria attack registered values of 20%, one of the highest values in the monitored period for the analyzed varieties. The Pitbul variety was also noticed this year, on which only a reduced attack of septoria of 5.85% was observed. No attack of powdery mildew and brown rust was detected on wheat leaves of the Pitbul variety (table 5). Both the environmental conditions and the genotype contributed to the onset and evolution of the attack of pathogens specific to agricultural crops (Cristea, 2005; Iacob et al., 1998; Cioneag 2015).

CONCLUSIONS

During the analyzed period in wheat culture, the micromycetes *Blumeria graminis* f.sp. *tritici*, and *Septoria* spp. the attack of *Fusarium* spp. was presented in the conditions of 2016/2017 for the varieties Boema and Glosa. In 2018-2019 the Pitbul variety presented an attack of *Septoria* spp. with reduced values of 5, 85 %. In the conditions of 2018-2019, the Pitbul variety did not show an attack of powdery mildew and brown rust

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