STUDY ON THE ATTACK OF *PSEUDOCERCOSPORELLA HERPOTRICHOIDES* ON WHEAT STEM BASE UNDER CONDITIONS FROM TIMISOARA DIDACTIC RESEARCH STATION

Diana VELIMIROVICI, A. BORCEAN

U.S.A.M.V.B. Timişoara, Calea Aradului 119, Timişoara, 300645, Romania
E-mail: vlmdiana@yahoo.com

Abstract: *Research aim was to test the tolerance of a range of wheat cultivars to infectious pressure of the pathogen Pseudocercosporella herpotrichoides in climatic conditions from Timisoara Didactic Research Station. Stage of research is being characteristic for partial interpretation of experimental data after two experimental years, in preparation the doctoral thesis. Experimental field was located in climatic conditions from Timişoara. Technology was the standard applied to this area. The experience was trifactorial with first factor the experimental year with two graduations, 2009 and 2010. The second factor was the variety with three graduations (Ciprian, Arieşan and Kristina). The third factor was the nitrogen amount with three graduations (N_{50}, N_{100} and N_{150}) all three doses were applied on a constant background elements of P_{60} K_{60}. The novelty is relatively high, work providing important data for agricultural practice in the experimental area, taking in consideration the implications of fungus Pseudocercosporella herpotrichoides in yield amount and harvesting problems in some years. In this work were carried out research including one of authors, known as the reference and possible reactions of the pathogen depending on local biocoenosis factors, including the competiotin between stem base pathogens. Limits of the research are that data from the fungus Pseudocercosporella herpotrichoides are just after one year bonitation. Practical implications of the research consisted of playing a part of a complex study of strategy in the of wheat protection reference experience. The originality of the work comes from the fact that data are relevant in view of cultivars behaviour under specific conditions. These data are only part of the data submitted for interpretation in the preparation of the doctoral experience of the main author. Importance of the paper became from bringing in front of the specialists of one of the topics in the experiences of the main author's doctoral preparing, to evaluate the accuracy of techniques addressed. The relevant data and experimental results give an overview of pathogen behavior in relation to experimental conditions and technology used in the reference area of experimental field.*

Key words**:** *Pseudocercosporella herpotrichoides, eye spot of wheat stem, fertilizers*

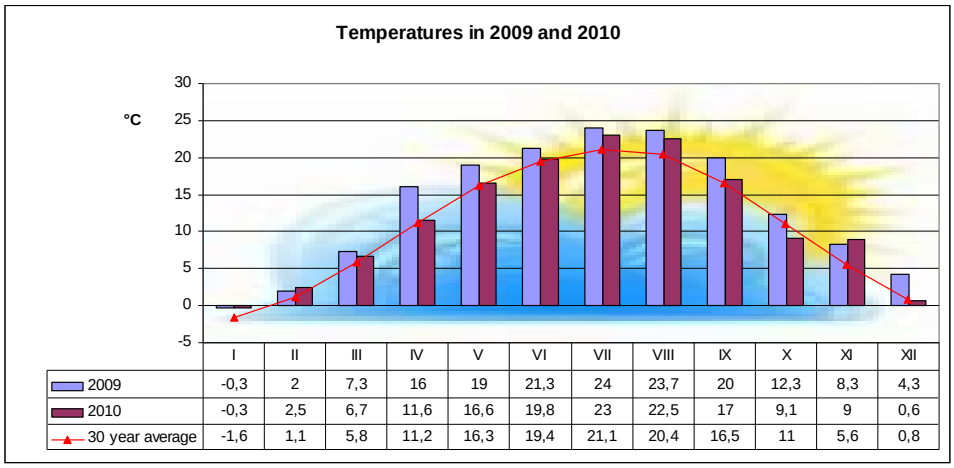
INTRODUCTION

In the period between March and end of May of the years 2009 and 2010 we have made a number of observations in the wheat experimental of field crops discipline from Didactic Research Station. It was very interesting to see the differences between varieties to the attack of fungus *Pseudocercosporella herpotrichoides* and the reaction at different nitrogen amounts. The data from this paper are a sample from the larger study concern the main pathogens of the stem base and roots of wheat behavior in the climate conditions from Timisoara.

MATERIAL AND METHODS

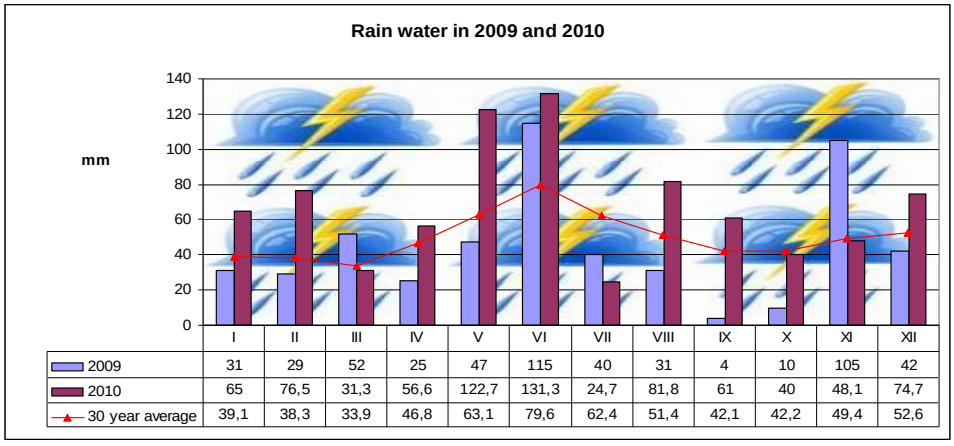
Experimental conditions where those from Didactic Research Station from Timişoara and consist from a chernozem soil and ecological conditions. In the figures below are described temperature (figure 1) and rain (figure2) from the year 2009 and the multiannual average for this two whether parameters available for the experimental field.

Assessing pathogen population dynamics was done by statistic analysis of attack degree, calculated as synthetic indicator on the base of the readings performed on the experimental field of frequency and intensity of attack in the interval between March and May from 2009 and 2010. During this period the pathogen of the root and stem base of the wheat were monitored at the Didactic Station of the University of Agricultural Sciences and Veterinary Medicine of the Banat in Timişoara in a bi-factorial experiment.



	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
2009	-0,3	2	7,3	16	19	21,3	24	23,7	20	12,3	8,3	4,3
2010	-0,3	2,5	6,7	11,6	16,6	19,8	23	22,5	17	9,1	9	0,6
30 year average	-1,6	1,1	5,8	11,2	16,3	19,4	21,1	20,4	16,5	11	5,6	0,8

Figure 1. Monthly temperature averages, compared with long term averages recorded at Timişoara Meteorological Station



	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII
2009	31	29	52	25	47	115	40	31	4	10	105	42
2010	65	76,5	31,3	56,6	122,7	131,3	24,7	81,8	61	40	48,1	74,7
30 year 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

Figure 2. Monthly rainfall water amount, compared with long term averages recorded at Timişoara Meteorological Station

The factors we monitored during the three experimental years were the cultivated cultivar and amount of nitrogen applyed. These two factors was chosen to be monitored because all the literature recomand them as some of the key factors which have a strong influence on appearance and development of attack by pathogens, as follows: first factor was

Table 1.

Field readings for frequency and intensity and calculated attack degree of fungus *Pseudocercosporella herpotrichoides* for the experimental variants between 2009-2010

Nr crt	Variety	Nitrogen amount kg/ha s.a.	Frequency				Intensity				Attack degree			
			R1	R2	R3	X	R1	R2	R3	X	R1	R2	R3	X
2009	Ciprian	100	10	5	10	8,33	1	5	1	2,33	0,1	0,25	0,1	0,15
		150	10	12	17	13	5	3	5	4,33	0,5	0,36	0,85	0,57
		200	15	20	14	16,33	10	5	5	6,66	1,5	1	0,7	1,06
	Arieşan	100	10	15	14	13	1	5	5	3,66	0,1	0,75	0,7	0,51
		150	17	23	15	18,33	10	5	10	8,33	1,7	1,15	1,5	1,45
		200	10	26	18	18	10	20	25	18,33	1	5,2	4,5	3,56
	Kristina	100	15	10	12	12,33	5	5	5	5	0,75	0,5	0,6	0,61
		150	15	15	22	17,33	5	10	5	6,66	0,75	1,5	1,1	1,11
		200	23	16	21	20	15	10	15	13,33	3,45	1,6	3,15	2,73
2010	Ciprian	100	10	10	15	11,66	5	5	1	3,66	0,5	0,5	0,15	0,38
		150	15	18	17	16,66	5	5	10	6,66	0,75	0,9	1,7	1,11
		200	25	25	20	23,33	10	5	10	8,33	2,5	1,25	2	1,91
	Arieşan	100	10	15	15	13,33	5	5	10	6,66	0,5	0,75	1,5	0,91
		150	15	25	20	20	10	15	15	13,33	1,5	3,75	3	2,75
		200	15	30	23	22,66	20	20	25	21,66	3	6	5,75	4,91
	Kristina	100	15	10	15	13,33	5	10	5	6,666	0,75	1	0,75	0,83
		150	20	20	23	21	15	15	5	11,66	3	3	1,15	2,38
		200	23	25	25	24,33	20	18	15	17,66	4,6	4,5	3,75	4,28
Average		100	11,66	10,83	13,5	12	3,66	5,83	4,5	4,66	0,45	0,625	0,633	0,569
		150	15,33	18,83	19	17,72	8,33	8,83	8,33	8,5	1,36	1,77	1,55	1,564
		200	18,5	23,66	20,166	20,77	14,166	13	15,83	14,33	2,67	3,25	3,308	3,08

the cultivar by resistance or degree of tolerance of cultivars to attack and second factor was the nitrogen amount by the physiological influence on the length of different vegetation period and on the influence of physiological vigour of the plants and the easiness the pathogen is transmitted.

For statistic interpretation of the data from the experience we use the calculation method for randomized experiences with three factors. The first factor was the experimental year (with two graduations, 2009 and 2010), the second factor was the cultivar (with three graduations: Ciprian, Arieşan and Kristina) and the third factor was chosen to be the nitrogen amount also with three graduations(nitrogen applied on the background of constant phosphorus and potassium amount, doses was N_{100} P_{60} K_{60}, N_{150} P_{60} K_{60} and N_{200} P_{80} K_{80}). To compare the data from statistic calculation we take as control the experimental average.

RESULTS AND DISCUSSIONS

All the observations figures concerning attack frequency and intensity from the field are in table 1. Based on the frequency and intensity we calculate the attack degree which is also in table 1. Considering the attack degree as a synthetic indicator of attack frequency and intensity of attack and this we agree that this is a reason strong enough to take only to the attack degree data for statistic calculation, as they are given in table 2 complex.

Table 2

Attack degree statistic interpretation data for fungus *Pseudocercosporella herpotrichoides* between 2009-2010 depending on the variety and dose of nitrogen

Factor A Year	Factor B Variety	Factor C - Fertilizers			Averages of Factor A	Differences	Significance
		N_{100} P_{80} K_{80}	N_{150} P_{80} K_{80}	N_{200} P_{80} K_{80}			
2009	Ciprian	0,15	0,57	1,06	1,31	-0,42	000
	Arieşan	0,51	1,45	3,56			
	Kristina	0,61	1,11	2,73			
2010	Ciprian	0,38	1,11	1,91	2,16	0,43	***
	Arieşan	0,91	2,75	4,91			
	Kristina	0,83	2,38	4,28			
Average	Ciprian	0,26	0,84	1,48	1,73	Control	-
	Arieşan	0,71	2,1	4,23			
	Kristina	0,72	1,745	3,50			

DL 5% = 0,008 DL 1% = 0,012 DL 0,1% = 0,02

Factor A Variety	Factor B - Fertilizers			Averages of Factor A	Differences	Significance
	N_{100} P_{80} K_{80}	N_{150} P_{80} K_{80}	N_{200} P_{80} K_{80}			
Ciprian	0,265	0,84	1,485	0,863	-0,870	000
Arieşan	0,71	2,1	4,235	2,348	0,614	***
Kristina	0,72	1,745	3,505	1,99	0,256	***
Average	0,565	1,561	3,075	1,733	Control	-

DL 5% = 0,014 DL 1% = 0,019 DL 0,1% = 0,018

Factor B - Fertilizers	N_{100} P_{80} K_{80}	N_{150} P_{80} K_{80}	N_{200} P_{80} K_{80}
Averages of Factor B	0,565	1,561	3,075
Differences	Control	0,996	2,51
Significance	-	***	***

DL 5% = 0,18 DL 1% = 0,26 DL 0,1% = 0,36

As it comes from the year comparation it is obviously that reporting to the average, the best year for eyespot was 2010, when the attack degree registered a very significant

difference to reported to control. All this behavior is due by the fact that all observations of attack frequency and intensity are done after infections in natural conditions. On this conditions the year 2009 was in terms at the average of environmental conditions, but in 2010, because of the higher amount of rainfall from the spring, in January, February and April.

Infectious pressure of fungus *Pseudocercosporella herpotrichoides* is shown by the fungus by this values of frequency and intensity because all the readings was done in 2009 and 200 after a sequence of years with consistent droughts in the spring period. In 2009 the quantity of water from rain is lower then multiannual average (figure 2) and the rain distribution is deficient because the water was collected in just a few rains. But the situation was very different in 2010 when the plants benefit of water from consistent in January, February and April (figure 2).

The biological material used in the experience, prove to have a nice diversity, based on the variation of the frequency and intensity values. As it prove from table 2, the best tolerance on the eyespot attack was at Ciprian with a very significant negative difference reported to contol. In the same time, the varieties Krisina and Arieşan show almost the same susceptibility to eyespot, with a very significant difference reported to contol. But, if the variation of frequency and intensity show one more time that the tolerance of varieties is an individual propriety, it have a strict dependency on the weather conditions and technology applied.

Statistic calculation performed for attack degree data on nitrogen amount experience values (table 2), point out that the differences can't cover the influence of nitrogen on the fungus behavior. Growing the nitrogen amount from 100 kg/ha to 150 kg/ha and 200 kg/ha prove to have a stimulating effect on eyespot, as it shown by the experimental averages has a very significant difference on both 150 kg/ha nitrogen and 200 kg/ha nitrogen amount (table 2).

CONCLUSIONS

- Frequency and intensity of fungus *Pseudocercosporella herpotrichoides* attack point out a high personality on the cultivars tolerance reaction, with very important influence from weather conditions and technology factors.
- Rainfall water registered in the spring of 2010 rise the attack degree of eyespot to a very significant difference.
- The only cultivar which prove to have tolerance on eyespot attack was Ciprian.
- Nitrogen application increases the disposition of the plants to be infected by eyespot by extension of the period of maximum sensitivity.
- Regarding to the effect of nitrogen, it is very clear that the incresing of nitrogen dosage conduct to an increase of attack degree wich registry a distinct significan value of difference on the nitrogen amount of 150 kg/ha and a very significant difference on the nitrogen amount of 200 kg/ ha.

BIBLIOGRAPHY

1. BÂLTEANU GH., BÎRNAURE V., SALONTAI AL., BORCEAN I., VASILICĂ C., Fitotehnie, Ed. Didactică şi Pedagogică Bucureşti, 515 pag., 1991
2. BORCEAN I,TABĂRĂ V., PÎRŞAN P., DEMENESCU T., BORCEAN A., Cercetări privind stabilirea principalelor verigi tehnologice la porumb în condiţiile Banatului, Lucrări Ştiinţifice, U.A.Iaşi,Vol. XXXIV, pag 157-163, 1992.
3. BORCEAN I.,TABĂRĂ V., PÎRŞAN P., DAVID GH., POP GEORGETA, BORCEAN A., ŞUVEŢI SIMONA,CIULOI ANCA.,BORUGĂ L. Comportarea a 40 hibrizi de porumb în condiţiile cernoziomului de la Timişoara, Simpozin-Cultura plantelor de câmp U.S.A.M.V.B. Timişoara, pag 3-9, 1996.

4. DAVID GH., BORCEAN A., Sweet corn – A crop plant with high perspectives on the Western Plain of Romania, University of Agricultural Sciences College of Agricuklture Mezötúr, 1999.
5. BORCEAN I. , MIRCOVV. , IMBREA F., BORCEAN A.,_Preliminary results concerning the influence of electromagnetic treatments at maize, Universitatea Novi Sad, Biofizika u poljoprivrednoi proizvodnji, pag. 187-190, Novi Sad 2002
6. BORCEAN I. , DAVID GH.,BORCEAN A., IMBREA F., BOTOŞ L., On the behaviour of some new maize hybrids in the conditions of brown luvic soils in the hill area of the Banat, Lucrări Ştiinţifice Facultatea de Agricultură, U.S.A.M.V.B. Timişoara, Vol XXXIV, pag 187-192, 2002.
7. BORCEAN A, DAVID GH., MOLNAR L., Observaţii privind comportarea unui sortiment de hibrizi de porumb la atacul ciupercii Ustilago maydis în condiţiile anului 2006 de la SD a USAMVB Timişoara. Trends in European agriculture development, Faculty of Agriculture Timisoara and Faculty of Agriculture Novi Sad International Symposium, 2007
8. BORCEAN I, BORCEAN A., 2004**,** Cultura si protecţia integrată a cerealelor, leguminoaselor şi plantelor tehnice, Editura de Vest, 509 pag.
9. BORCEAN I., ŢĂRĂU D., BORCEAN A., DAVID GH., BORCEAN EUGENIA, Fitotehnia şi protecţia culturilor de câmp, Editura de Vest, 198 pag.
10. BORCEAN I., DAVID GH., BORCEAN A., Tehnici de cultură şi protecţie a cerealelor şi leguminoaselor, Editura de Vest, 346 pag.
11. POPESCU GH. – Fitopatologie, Ed. Mirton, Timişoara, 1998
12. M. HATMANU, I. BOBEŞ, AL. LAZĂR, C. GHEORGHIEŞ, C. GLODEANU, V. SEVERIN, Corina Tuşa – Fitopatologie, Ed. Didactică şi Pedagogică, Bucureşti, 1989, 468 pag.
13. NIŢĂ SIMONA, BORCEAN A., Study regarding some varieties of Zea mays everta Stuart which grow under the pedo-climatic conditions in Almaj Depresion, „60 de ani de învăţământ superior în Oltenia", Annales of University of Craiova, Vol XXXVII / A 2007, pag. 664-666, 2007
14. PÎRŞAN P., DAVID GH., BORCEAN A., WAUTERS S., Cercetări cu privire la studiul unui sortiment de hibrizi proveniţi din vestul Europei în condiţiile de la Timişoara, Lucrări Ştiinţifice, U.S.A.M.V.B. Timişoara, Vol XXX, 1998.