STUDY ON THE ATTACK OF *FUSARIUM SP.* ON WHEAT STEM BASE UNDER CONDITIONS FROM TMISOARA DIDACTIC RESEARCH STATION BETWEEN 2009-2011

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Abstract: *Research aim was to test the tolerance of a range of wheat cultivars to infectious pressure of the pathogen Fusarium sp. in climatic conditions from Timisoara Didactic Research Station between 2009 and 2010. Stage of research is being characteristic for two years interpretation of experimental data, in preparation the doctoral thesis. Experimental field was located in climatic conditions from Timişoara. Wheat crop technology was standard applied to this areal. The experience statistic calculation was the trifactorial model. Factor A was the year with two graduations(2009 and 2010). Factor B was the cultivar with three graduations (Ciprian, Arieşan and Kristina). Factor C was the nitrogen amount(in kilograms active substance for one hectar) with three graduations N 100 kg/ha, N 150 kg/ha and N 200 kg/ha. All nitrogen amounts was tested on a background 60 kg/ha phosphorus and 60 kg/ha potassium. The novelty is relatively high, work providing important data for agricultural practice in the experimental area, taking in consideration the implications of fungus Fusarium sp. in yield amount due to infection propagation on wheat ears in some years. In this work were carried out researches including those done by the one of the authors, known as the reference and possible reactions of the pathogen depending on local biocoenosis factors, including the competition between stem base pathogens. Limits of the research are that data from the fungus Fusarium spp. are just after two years of fungus bonitation in this experimental conditions. 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 author's doctoral preparing, to evaluate the accuracy of techniques addressed. All data are relevant for experimental conditions amd give an overview over the possibility of prevention of the pathogen attack on the wheat ears, judging after the relevance on the yield of Fusarium sp. attack.*

Key words**:** *Fusarium spp., wheat stem base rot, fertilizers*

INTRODUCTION

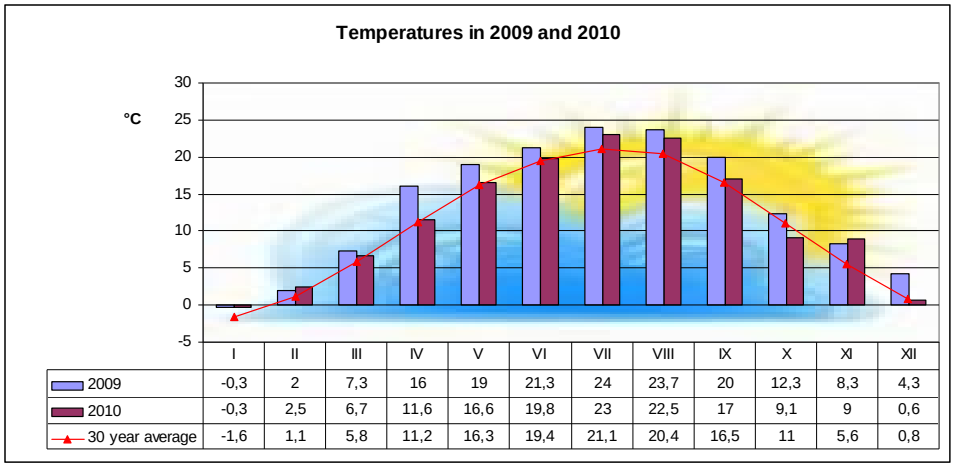
Between March and end of May from 2009 and 2010 we have made a number of observations in the wheat experimental of field crops discipline from Didactic Research Station. It was very interesting to see the differences between cultivars to the attack of fungus *Fusarium spp.* and, as a part of a larger 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 (figure 2) from the year 2009 and the multiannual average for this two whether parameters available for the experimental field.

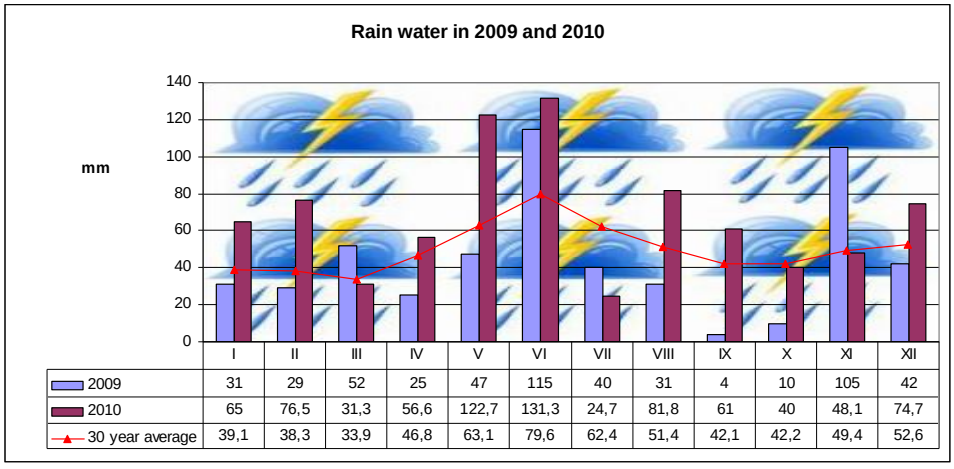
Assessing pathogen population dynamics was done by statistic analysis of attack

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 2009 and 2010, when 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 tri-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 from 2009 and 2010, 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 from 2009 and 2010, compared with long term averages recorded at Timişoara Meteorological Station

The factors we monitored during the two experimental years were the cultivated variety and amount of nitrogen applied. These two factors we monitored has both one of the strongest influence on the initiation and development of attack by pathogens, as follows: variety by resistance or degree of tolerance of varieties to attack and 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.

The first factor was the year with two graduations: 2009 and 2010. The second factor was the experimental cultivar, with three graduations: Ciprian, Arieşan and Kristina. The third factor, was the nitrogen amount also with three graduations, on the background of constant phosphorus and potassium amount: N_{100} P_{60} K_{60}, N_{150} P_{60} K_{60} and N_{200} P_{80} K_{80}.

Statistic calculation was done after the model of experiment with three factors.

Attack frequency and intensity were read from the experimental trials in two different vegetation stages:

- first reading is on the stage when the second node of the stem is at least 2 cm above first node, the stage 32 on BBCH scale
- second reading when plants are on early milk stage, the stage 73 on BBCH scale.

To have a better and comprehensive idea about the fungus *Fusarium spp.* attack on the stem base we use as witness on statistic evaluation the average for factors A and B and the lowest level of nitrogen amount to see the nitrogen effect across the experimental years and varieties.

RESULTS AND DISCUSSIONS

Observations figures concerning attack frequency and intensity from the field are in table 1. The attack degree calculated based on frequency and intensity of attack are also in table 1. Considering the attack degree is a synthetic indicator of attack frequency and intensity of attack and this is the reason why we will refer at it for statistic calculation.

In the year 2009, frequency registered normal values, but the intensity of attack have very low values than frequency. Also as it can be observed, the higher values was in the trials where was applied the largest amount of nitrogen.

Almost the same phenomenon was in 2010 but, unlike 2009, in 2010 the amount of water from rainfall was higher in January, February and also in the April-June, only in March, rainfall was lower in 2010 than in 2009

Even at this low values of frequency and intensity from 2009, we can consider that fungus *Fusarium spp.* is shown a constant infectious pressure because all the readings was done after infections in natural conditions and after a few years with low rate of rains. This theory prove to be correct because in 2010, after the growing of rainfall rate, both frequency and intensity of attack registered higher values than those from 2009(table 1).

The differences between the rainfall registered in 2009 and 2010 comparing also with a multiannual average is represented in the figure 2. It can be easy concluded that except March, in each month of the period pbetween January and June, the rainfall amount was significantly higher than both values from 2009 and the multiannual average.

Based on the variation of the frequency and intensity values it is proved that the biological material used in the experience, prove to have a significant diversity. The variation of frequency and intensity point out again that the tolerance of varieties is an individual propriety and it has a strict dependency on the weather conditions and technology applied.

Statistic calculation performed for attack degree data (table 2), point out that the experimental years were very different as the climate issue has a major influence over the behavior of varieties on the *Fusarium spp*. attack. Thus we can see that the whole variety and dosage of nitrogen in 2009 attack of the base of the stem rot has registered a very significant negative average compared to the control, while the degree of attack in 2010 saw a very significant difference to witness.

All of this behavior was due to higher amount of rainfall from January to June of 2010 over the same period in 2009.

Analyzing the influence of the second experimental factor, the first think pointed out

were the differences between attack degree averages of the experimental years, over the all nitrogen amounts tested. From table 2 it is clear that the best tolerance was at on the was very different the varieties differences of attack degree averages. This is underlined by the fact that both 150 kg/ha and 200 kg/ha dosage has as immediate response an increase of fungus attack degree with a very significant differences reported to control.

Table 1.

Field readings for frequency and intensity and calculated attack degree of fungus *Fusarium graminearum*, for the experimental variants in the years 2009 and 2010

Year	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	1	5	5	3,66	5	5	1	3,66	0,05	0,25	0,05	0,11
		150	10	18	15	14,33	10	5	5	6,66	1	0,9	0,75	0,88
		200	25	15	15	18,33	5	10	10	8,33	1,25	1,5	1,5	1,41
	Arieşan	100	5	5	5	5	7	5	5	5,66	0,35	0,25	0,25	0,28
		150	15	5	18	12,66	5	7	7	6,33	0,75	0,35	1,26	0,78
		200	20	25	15	20	10	5	10	8,33	2	1,25	1,5	1,58
	Kristina	100	5	10	5	6,66	5	1	5	3,66	0,25	0,1	0,25	0,2
		150	10	10	5	8,33	5	5	7	5,66	0,5	0,5	0,35	0,45
		200	25	10	20	18,33	10	10	10	10	2,5	1	2	1,83
2010	Ciprian	100	5	10	10	8,33	5	5	5	5	0,25	0,5	0,5	0,41
		150	15	10	20	15	10	5	10	8,33	1,5	0,5	2	1,33
		200	20	25	25	23,33	15	10	10	11,66	3	2,5	2,5	2,66
	Arieşan	100	5	10	15	10	5	5	1	3,66	0,25	0,5	0,15	0,3
		150	20	15	20	18,33	10	5	5	6,66	2	0,75	1	1,25
		200	25	18	20	21	10	15	10	11,66	2,5	2,7	2	2,4
	Kristina	100	10	5	5	6,66	5	10	5	6,66	0,5	0,5	0,25	0,41
		150	15	10	15	13,33	15	5	10	10	2,25	0,5	1,5	1,41
		200	20	28	25	24,33	15	20	10	15	3	5,6	2,5	3,7
Average		100	11,66	11,66	5,16	7,5	7,5	6,72	5,33	5,16	3,66	4,72	0,275	0,35
		150	15,33	15,33	14,16	11,33	15,5	13,66	9,16	5,33	7,33	7,27	1,33	0,58
		200	18,5	18,5	22,5	20,166	20	20,88	10,83	11,66	10	10,83	2,37	2,42

Table 2

Attack degree statistic interpretation data for fungus *Fusarium spp* 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	0,11	0,88	1,41	0,83	-0,36	**ooo**
	Arieşan	0,28	0,78	1,58			
	Kristina	0,2	0,45	1,83			
2010	Ciprian	0,41	1,33	2,66	1,54	0,35	***
	Arieşan	0,3	1,25	2,4			
	Kristina	0,41	1,41	3,7			
Average	Ciprian	0,26	1,10	2,03	1,19	Control	-
	Arieşan	0,29	1,01	1,99			
	Kristina	0,30	0,93	2,76			

DL 5% = 0,010 DL 1% = 0,014 DL 0,1% = 0,020

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	0,26	1,105	2,035	1,13	-0,055	**ooo**
Arieşan	0,29	1,015	1,99	1,09	-0,090	**ooo**
Kristina	0,305	0,93	2,765	1,33	0,145	***
Average	0,285	1,02	2,26	1,19	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	0,285	1,016	2,263
Differences	Control	0,731	1,978
Significance	-	***	***

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

The result show a very balanced situation on the attack degree, proved by the very close differences on the attack degree averages regarding to the experimental average and this was the defining behavior of tested varieties on fungus *Fusarium spp.* attack.

The nitrogen prove to have a stimulating effect on stem base rot caused by *Fusarium spp.*, even if the experimental averages has no significance for 150 kg/ha. But growing the nitrogen dosage to 200 kg /ha lead to an increase of fungus attack which registered a very significant difference (table 2).

CONCLUSIONS

- frequency and intensity of fungus *Fusarium spp.* attack have a high variation between the years 2009 and 2010, and this variation is reflected in attack degree values, wich have a very significant difference in 2010 and a negative significant difference in 2009 reported to witness
- varieties have a different behavior throughout the experimental factors, the attack degree register a very significant negative differences on Ciprian and Ariesan varietys and with a very significant difference on Kristina;
- nitrogen fertilizers application increases the sensitivity of the plants to the stem base rot, incresing of nitrogen dosage conduct to an increase of attack degree which registry a very significan value of difference on both nitrogen amount of 150 kg/ha and 200 kg /ha comparing with amount of 100 kg/ ha.

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