INCIDENCE OF SOME *FUSARIUM* SPECIES ARTIFICIAL INOCULATED ON DIFFERENT OAT CULTIVARS

Domnica Daniela PLĂCINTĂ [1], Danela MURARIU [1], Dan Mihai GIURCĂ [1]

[1] Bank of Plant Genetic Resources, Suceava

Abstract

Evaluation of oat genetic resources for resistance to *Fusarium sp.*, was done by highlighting relevant agronomic traits in the manifestation of infection.
The biological material used for the experiment was represented by 330 species of *Avena ssp.* (288 *A. sativa,* 8 - *A. byzantina*, 15 *A. strigosa* , 2 *A. abyssinica* and 17 wild species) from the collection of work of the European Project ''Avena Genetic Resources for Quality Avena-human consumption''(AVEQ-AGRI GEN RES 061).
Resistance testing was efectuated in the experimental field in 2008 through artificial inoculation of the panicles in three different periods of the stage of flowering with inoculum composed of species that: *F. culmorum, F. graminearum, F. sporotichioides, F. langesethiae, F. avenaceum*.
The results obtained were determined on the based of the symptoms emphased by fungi in test plots, through the correlations made between their incidence on kernel and panicles and some morphological characters such as the days to heading, panicle length, panicle number per m², days to maturity and 1000 grain weight.

Keys words: *Fusarium*, oat, inoculation, kernel.

Fusarium spp. are fungal plant pathogens causing disease symtomps knows as head blight or scab (Pomeranz *et al.* 1990) in the period heading-flowering at cereal species determing decrease of production and appearance of mycotoxins with potential risk to human health (COST 2003).

The several studies efectuated on cereals emphased the significant attacks degree at wheat, barley, ryce and low infections on oat due to the large spacing between florets (LANGEVIN *et al.* 2004).

Even it was a less contaminations on oat it was detected the higher levels with T2 and HT2 mycotoxins (Bottalico şi Perrone, 2002) with relevance in the quality seeds and food processing.

According to (TEKAUZ et al., 2005) there is rather a low genetic variability in modern cultivars and higher levels of resistance are presumed to be detectable within wild oats.

The present study involves evaluation the genetic variability at some cultivated and wild oat genotypes trough artificial inoculation with different *Fusarium* species and the importance of the morfologic traits in conducive *Fusarium* infection.

MATERIAL AND METHOD

The biological material for experimentation have been consist of the 330 *Avena ssp.* accesions (288 *A. sativa*, 8- *A. byzantina*, 15 *A.strigosa*, 2 *A.abyssinica* and 17 wild species.) from working collection to european project **"Avena genetic resources for quality in human consumption** "(AVEQ**-** AGRI GEN RES 061**)**. Suceava Genebank was partener in the work package 4 – „Field experiments with artificial Fusarium inoculation".

Investigations were conducted in the experimental field of the Suceava Genebank in the twelve block with every forty plots from which eleven standards in the five inoculated replication and two noninoculated replication.

Every block included the marker plots with maize that is a crop conducive for *Fusarium*

The plot size was 2,5 m² (1.7 m length /1.5 m width). In each plot, nine rows, with distances between rows 14 cm, have been manually sowed, in period 11-21 April 2008.

The inoculation was efectuated with inoculum prepared of a mixture of five species *Fusarium culmorum, Fusarium graminearum, Fusarium langsethiae, Fusarium sporotichioides, Fusarium avenaceum*. Inoculum was produced by Germany using isolates provided by the JKI Institute from Berlin Dahlem. These fungus were grew through the specific methodology on about 3 kg of boiled and autoclaved oat kernels in autoclaving bags. Sporulation was induced by air drying the substrate. Suspension was produced through washing 3 kg of dried material before the inoculations. Inoculation was done at three dates around flowering of the plants by spraying with 60 l of spore suspension with 1Mio spores ml^{-1} (200000 spores from each species) early morning in the 16 06 -14 07 2008 period.

Two days before and after inoculation plots was irrigated.

The infection panicles with *Fusarium* was visually assessed using the 1-9 scale (1-no

infection…, 9 =all spikelets and panicles are infected**).**

The infected seeds percent with *Fusarium sp.* was evaluated under magnifying glass in three classes: 1-sound, 2- suspicios infected, grey tips, 3-FDK- *Fusarium* damaged kernels, discoloured, smaller.

RESULTS AND DISCUSSIONS

Testing variability of genetic resistance to the studied oat cultivars by artificial inoculation with *Fusarium* sp. was done by analyzing the interaction between a number of agronomic traits and the degree of fungal infection identified on panicles and kernels. We evaluated following relevant agronomic traits in the event of infestation: days to heading (number of days from sowing to heading), length panicle (average of five panicles measured in cm), panicle number per sq m (panicles number per 1m at two adjacent rows), days to maturity (number of days from sowing to harvesting), test weight (average of 100 grains counted manually in three replications and weighed).

By statistical processing of data (table 1) as a result of interaction between FDK2, (*Fusarium* damaged kernels, score 2), FDK3 (*Fusarium* damaged kernels, score 3) and FHB (Fusarium head blight) significant and very significant correlation coefficients were obtained. Some morphological characters: days to heading, number of panicles and test weight were significantly correlated with the infection degree on panicle and grain.

Table 1

Extract of correlation analysis for results with differences concerning *Fusarium* incidence (after Erna Weber, 1961)

Corelated characters	Panicle number		Test weight (g)		Fusarium damaged kernels- Score 2		Fusarium damaged kernels- Score 3		Fusarium head blight	
	r	Signif.	r	Signif.	r	Signif.	r	Signif.	r	Signif
Days to heading	-0.1468	oo	-0.1143	o	-0.0451	-	-0.1161	*	-0.0749	-
Panicle lenght	-0.0403	-	-0.2050	-	0.0095	-	-0.0993	-	-0.0923	-
Test weight (g)	0.1535	* *	1.0000	-	0.1264	*	-0.0118	-	0.1691	***
Fusarium damaged kernels- Score 2	0.1057	*	0.1264	*	1.0000	-	-0.1341	oo	0.3571	***
Fusarium damaged kernels- Score 3	-0.0515	-	-0.0118	-	-0.1341	oo	1.0000	-	0.5620	***
Days to maturity	-0.2675	ooo	-0.2278	ooo	-0.0504	-	-0.1357	oo	-0.1603	ooo

In *figure 1* the regression line show an ascendant tendency emphasizing a positive correlation between panicle infection degree with *Fusarium* and the percentage of destroyed grains by the same fungus.

The regression line from *figure 2* shows a significant positive correlation between the infection degree of panicles and kernels and test weight.

Figure 3 presents the regression line with descendant tendency, revealing a significant negative correlation between seed infection and the day's number from sowing to heading of tested genotypes, being more accentuated on grains of the earlier accessions.

Concerning the correlation between the days number from sowing to maturity and infection degree on panicle and grains it is noticed that the regression line has and descendent tendency, the earlier genotypes are more powerful attack by fungus of genus *Fusarium* (*fig. 4*).

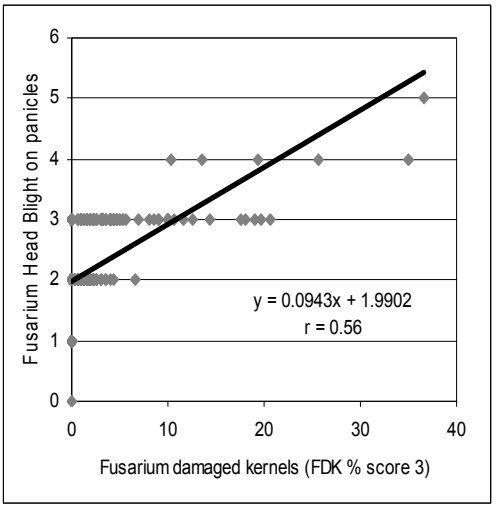

Figure 1**The regression line for the correlation between FHD (*Fusarium Head Blight*) and FDK (*Fusarium damaged kernels*) Score 3**

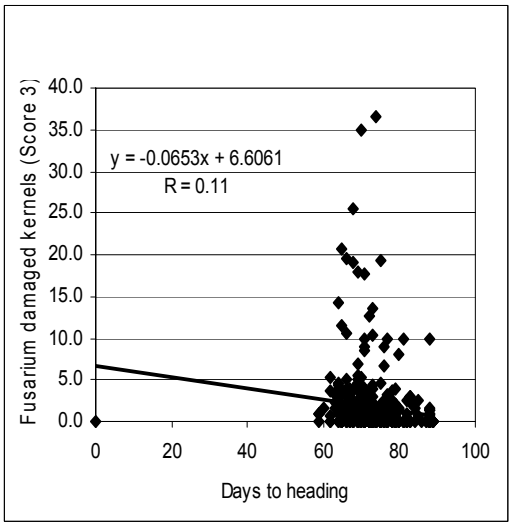

Figure 3**The regression line for the correlation between Fusarium damaged kernels (FDK Score 3) and the days to heading**

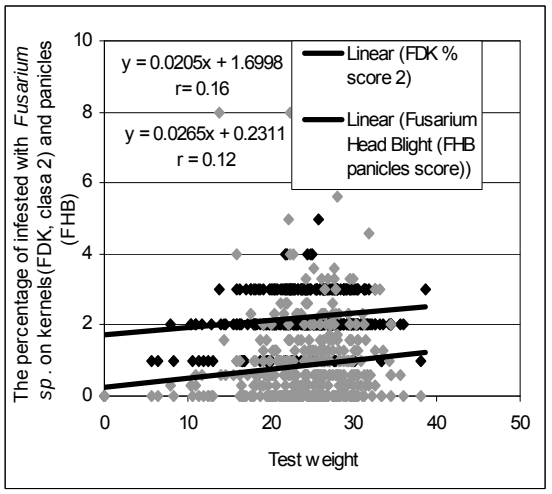

Fig. 2 The regression lines for the correlations between Thousand Kernel Weight and infection on the panicles and kernels (FHB panicles score, FDK score 2)

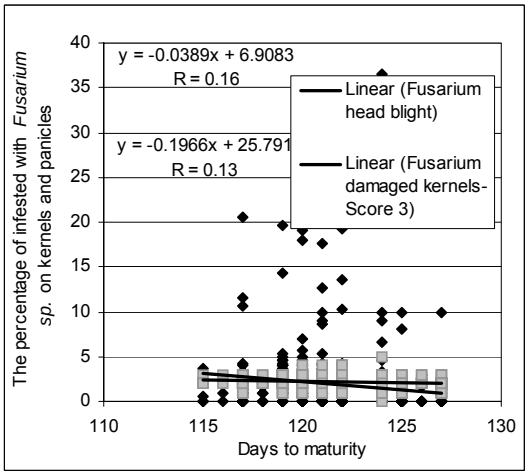

Figure 4 **The regression lines for the correlations between days to maturity and infection on the panicles and kernels (FHB panicles score, FDK score 3)**

CONCLUSIONS

As result of testing by artificial inoculation with the mixture of fungus by *Fusarium* sp on oat cultivars belonging to different biological categories showed specific symptoms on panicle and grains in natural and artificial atmospheric humidity conditions.

Among the evaluated agronomic traits showed correlations statistically assured the following descriptors: heading days, length panicle, and days to maturity and test weight.

These descriptors have a main role in the manifestation of infection by panicle and grains.

Fusarium fungus infestation had a different manifestation on studied genotypes, determining the decrease of test weight at the accessions which showed a high level of infection, especially at genotypes with early heading and shorter vegetation period.

BIBLIOGRAPHY

Bottalico, A., Perrone, G. 2002-*Toxigenic Fusarium species and mycotoxins associated with head blight in small-grain cereals in Europe European*, Journal of Plant Pathology 108: 611–624.

Cost, 2003 - *Mycotoxins: Risks in Plant, Animal, and Human Systems,* p. cm. -- (Task force report, ISSN 0194-4088 ; no. 139) 1. Mycotoxins. I. Council for Agricultural Science and Technology. II. Task force report (Council for Agricultural Science and Technology) ; no. 139.Council for Agricultural Science and Technology, Ames, Iowa, USA.

Langevin, F., Eudes, F., Comeau, **A., 2004** - *Effect of trichothecenes produced by Fusarium graminearum during Fusarium head blight development in six cereal species,* European Journal of Plant Pathology. 1–12 grains. Adv. Cereal Sci. Technol. 10 (1990) S. 373-433.

Pomeranz, Y., Bechtel, D.B., Sauer, D.B., Seitz, **L.M., 1990**- *Fusarium headblight (scab) in cereal grains*, Adv. Cereal Sci. Technol. 10 S. 373-433.

Tekauz, A., Fetch, J.M., Rossnagel, B.G., **2005** - *Fusarium Head Blight of Oat: Occurrence, Cultivar Responses and Research Update. Proceedings 4th Canadian Workshop on Fusarium Head Blight*, Ottawa, Canada, November 1-3, 22-23.

Weber, Erna, 1961 - *Grundriss der biologischen statistic fur naturwissenschaftler landwirte und mediziner,*veb Gustav Fisher, VerlaG Jena.