THE EVALUATION OF FUNGAL LOAD OF WHEAT KERNELS IN STORAGE CONDITIONS

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Abstract

The knowledge of grain storage health is extremely important because production losses due to the activity of microorganisms can reach up to 20% (Beattie, 2005). In lead to the development of the micromycetes in the plants and to the stored products, which will be used as aliment for people and animals, a number of mycotoxins and black point attack will result. Most often incriminated micromycetes in the production of mycotoxins in cereals are species of the genera: *Aspergillus*, *Penicillium* and *Fusarium*, but alongside they appear *Rhizopus*, *Trichotecium*, *Trichoderma*, *Myrothecium, Stachybotriys, Cephalosporium, Alternaria* and *Claviceps purpurea*. Research objectives consisted in identifying and describing micromycetes developed on wheat kernels, determining the attack frequency of black point and mycoflora involved in the analyzed varieties. The studied material is represented by the following wheat varieties: Alex, Exotic, Ilinca, Antonius and after the phytosanitary analysis the frecquency of mycromycetes varied from each variety

Key words: wheat, mycromycetes, mycotoxins, black point.

Officials from the Food and Agriculture Organization (FAO), the ones in the position to make a statistical estimate, have akcnoleged that up to 5% of all grain harvested is lost before being consumed. The magnitude of losses will see some variation from country to country and from year to year, being more pronounced in developing countries – in part this is due to the favorable climate of grain deterioration during storage, but also by lack of knowledge and facilities to prevent such losses.

An important group of fungi that grow on the surface of the kernels is represented by the epiphytic fungi that do not realize a profound relation with the substrate on which it grows. This category includes most of the molds, the most common genera being: *Alternaria, Aspergillus, Cladosporium, Epicoccum, Penicillium, Trichotecium,* etc.

MATERIAL AND METHOD

The studied material consists of five winter wheat varieties, two varieties are intended for consumption: Alex and Exotic and three varieties are for seed Ilinca, Antonius and Izvor. To determine the fungal load of the wheat seed, the moist chamber method has been used. For each sample 400 of kernels were analyzed immediately after harvesting. The seeds were germinated in pleated filter paper at a distance of 1.5 cm, were then moistened with distilled water and kept in the moist chamber at 22°C for 7 days (Hatman M., 1986). The incubator was desinfected priorly and the spatula needle used for de prelevation of the mycelium developed on the wheat kernels was desinfected with alchool before each use.

Micromycetes were analyzed under a microscope for identification, and their determination the on the surface of the seeds was based on the characteristics listed in the speciality literature.

RESULTS AND DISCUSSIONS

Following the phytosanitary analysis conducted the following types of fungal genera were determined: *Alternaria, Aspergillus, Penicillium, Fusarium, Cladosporium and Rhizopus.*

On the Alex variety, the *Alternaria* genus showed a higher frequency at the point of harvest than during the period of storaging, probably due to high humidity conditionsof the kernels at the the point of harvest. During storage, the frequency of the *Aspergillus* genus was 3%, which is too low to have an impact on health. The same value was also applied to the *Fusarium* genus, but at harvest. After 6 months of storage, the genus *Rhizopus* indicated 11% of the kernels in the sample.

The micromycetes of the *Penicillium* genus

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showed a constant value of 7%. This is a very worrying aspect because the micromycetes of this kind can produce unhealthy metabolites such as citroviridine, citrinine, cyclopiazonic acid, ochratoxin A, patulin, penitrem A, PR toxin, Roquefortin C and D secalonic acid. In the case of the *Cladosporium* genus there were values of 5% at harvest and after the storage, the presence of this genus has not been registred (*figure 1*).

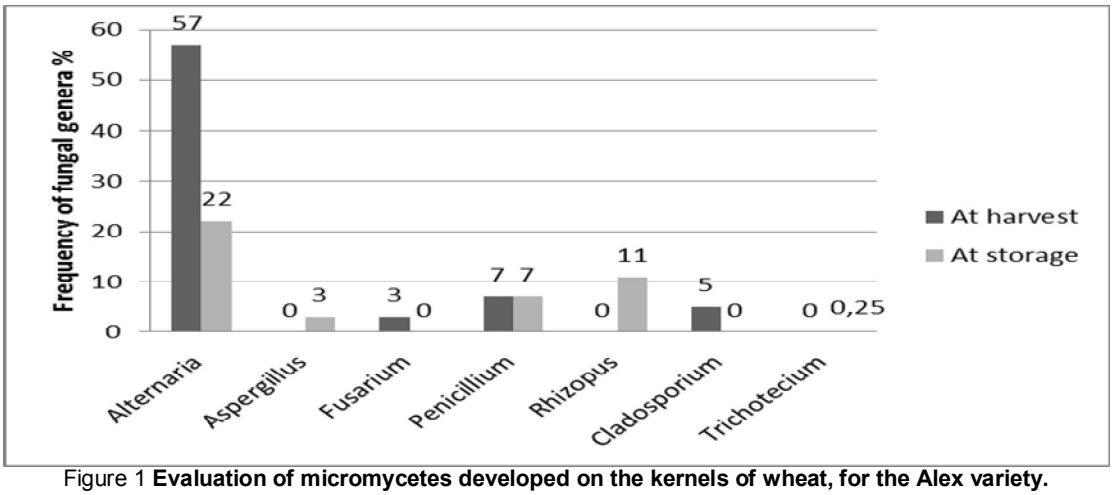

Figure 1 **Evaluation of micromycetes developed on the kernels of wheat, for the Alex variety.**

In the Exotic variety, the *Alternaria* genus showed the highest frequency, but after 6 months of storage. The storage conditions favored the growth rate of this genus with 35% from the time of the harvest.

The *Penicillium* genus was noted in storage at a rate of 7%, 3% more than in samples analyzed immediately after harvest. Micromycetes from the Aspergillus genus registered a very low value of 0.5%.

The *Rhizopus* genus was reported with a value of 12% at harvest, 10 percent higher than the value recorded after 6 months storage (*figure 2*).

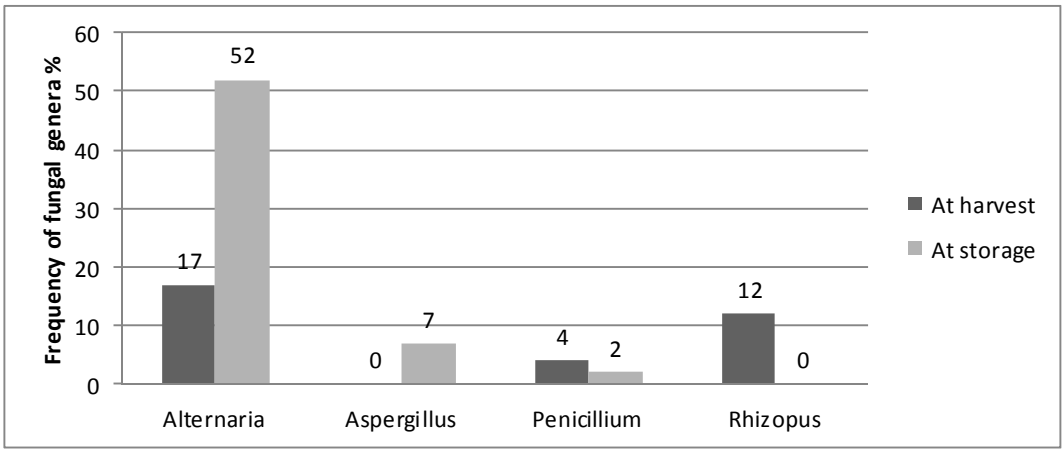

Figure 2 **Evaluation of micromycetes developed on the kernels of wheat, for the Exotic variety.**

The Ilinca variety used as seed material, presented the highest value of frequency in the *Alternaria* genus, but this kind of fungal presence is irrelevant in this case regarding the intended product (*figure 3*). The *Penicillium* genus, filed 11% of kernels, but may have a negative effect on the germination of the kernels.

On the Antonius variety, used as seed material, the highest value of the frequency was observed in the *Alternaria* genus and the *Penicillium* genus showed a frequency value of just 1.5%.

The presence of the Fusarium genus raises concern given the use of kernels as kernels sown as seed material can be a source of inoculum to the next crop.

Fungi of the *Fusarium* genus can produce mature plants and seedlings after sowing death. These fungal can produce a number of secondary

metabolites that cause severe disease in consuming populations (Botalico A. and Perrone G., 2002).

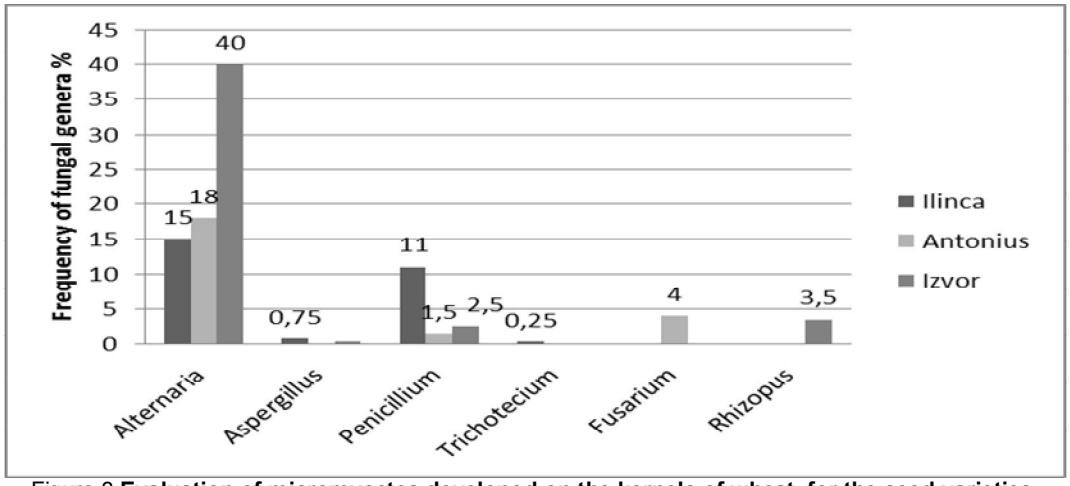

Figure 3 **Evaluation of micromycetes developed on the kernels of wheat, for the seed varieties.**

Variety Izvor presented high values of the frequency of micromycetes genus the *Alternaria*, a percentage of 40% of the kernels were affected. The *Penicillium* and *Rhizopus* genera were identified as insignificant values.

A study conducted in 2008 associated emergence of black point attack with several fungal genera: *Alternaria, Stemphyllium, Fusarium, Aspergillus, Penicillium and Cladosporium* (Gheorgieş C. and al., 2008).

Table 1

The fungal load of the wheat samples and the frequency of the caryopses attacked with Black point

Variety/ Sample	Pathogen agent	Frequency of attack (%)	Black point attacked caryopses (%)
Alex – at harvest (GCRs1)	*Alternaria* sp.	57	13.5
	Aspergillus sp.	0	
	Fusarium sp.	3	
	Penicillium sp.	7	
	Rhizopus sp.	0	
	Cladosporium sp.	5	
Exotic - at harvest (GCRs2)	*Alternaria* sp.	17	10.9
	Penicillium sp.	4	
	Rhizopus sp.	12	
Alex - at storage (GCDs1)	*Alternaria* sp.	22	13.7
	Aspergillus sp.	3	
	Penicillium sp.	7	
	Rhizopus sp.	11	
	Trichotecium sp.	0.25	
Exotic - at storage (GCDs2)	*Alternaria* sp.	52	13.2
	Aspergillus sp.	0.5	
	Penicillium sp.	7	
	Rhizopus sp.	2	
Ilinca - at storage (GSDs1)	*Alternaria* sp.	15	10.2
	Aspergillus sp.	0.75	
	Penicillium sp.	11	
	Trichotecium sp.	0.25	
Antonius - at storage (GSDs2)	*Alternaria* sp.	18	10
	Fusarium sp.	4	
	Penicillium sp.	1.5	
Izvor – at storage (GSDs3)	*Alternaria* sp.	40	14
	Aspergillus sp.	0.25	
	Penicillium sp.	2.5	
	Rhizopus sp.	3.5	

The same research group consisted that the germination of black point affected seed is higher than those of healthy ones, but has a lower germination energy. The attack has little impact on the quantity harvested, but may affect the quality of wheat for milling. Discoloration kernels may result in obtaining flour with weak baking qualities and poor color.

The infection seems to be more severe on the grains with a higher hectolitrical weight. This would be due to the fact that larger grains produce a wider flower, thus allowing easier access fungal spores from seed located at the end of the caryopsis.

Following the study, the most sensitive variety tot the attack of black point proved to be the Izvor variety, with an incidence of attacks by 14%.

CONCLUSIONS

The lowest frequency values were represented by the genera *Aspergillus, Rhizopus* and *Trichotecium.*

Black point attack frequency registred higher values in the variants where the frequency of the *Alternaria* genus was higher.

The Black point attack and the presence of the identified micromycetes did not affect the vegetative capacity of the analyzed kernels.

The micromycetes identified during the study conducted belonging to the genera *Alternaria, Aspergillus, Penicillum, Fusarium, Trichotecium, Cladosporium and Rhizopus.*

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