THE INFLUENCE OF STORAGE PRACTICES ON AFLATOXIN CONTAMINATION IN WHEAT

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Abstract

"Fungal growth is a major problem in agriculture commodities, throughout the world and lead to poor quality on the production as well as adverse effects to human and animal health because of mycotoxin production.

Mycotoxins - metabolites produced by filamentous fungi - are a major risk in food and feed. Regulations minimizing human exposure to mycotoxins result in high economic loss to handlers, producers, processors, and marketer crops. Mycotoxin are inevitably consumed or ingested by animals or humans. Aspergillus parasiticus and Aspergillus flavus are the most important filamentous fungi producing aflatoxin and may occur following vegetable products: spices, cereals and oil seeds. Aflatoxins can have a significant effect on human and animal health, because they can be carcinogenic, and they are very heat-stable and thus difficult to destroy during processing".

Key words: wheat, aflatoxin, mycotoxin.

INTRODUCTION

Mycotoxins pose a real threat to both animals and humans, and it is imperative that sample handling should be done carefully and work be made under conditions which prevent contamination of materials and the atmosphere.

The result of the consumption by animals of contaminated fodder, usually containing several mycotoxins, consists in the major risk that mycotoxins reach the foods of animal origin - eggs, milk, meat (Chiș, 2009).

In addition, certain fungi that produce these substances are very toxic themselves: it is the example of *Aspergillus flavus* and *Aspergillus parasiticus*, for which three types of symptoms were diagnosed in humans: infection, allergy and toxicosis (Cotuna et al., 2009).

MATERIAL AND METHOD

The purpose of this paper is to:

- establish a correlation between the moisture of stored seed and the evolution of deposit microflora activity;

- establish the influence of CGA medium substrate type (potato - dextrose - agar), Sabourand medium (yeast extract - dextrose - chloramphenicol - agar), on the development of fungal pathogens;
- specific storage conditions for preserving on environment are: T = + 4°C (± 1°C), relative air humidity = 30 - 40% and seed moisture percentage between 5-8% (Sara et all., 2007).

In this context, it is mandatory to develop the determination capacity of mycotoxins in the whole food chain: plant-animal-food of animal origin.

In this respect, the following tools shall be used:

- specific culture media: CGA, Sabourand
- thermostat
- microscope.

The test material consists of:

- samples of wheat *Triticum aestivum ssp. Vulgar, sort from variety Erythrospermum, Crisana;*
- samples of wheat *Triticum aestivum ssp. Vulgar, sort from variety Erythrospermum, Alex - Lovrin 50*.

The first wheat variety was created at SCDA Crisana Oradea. It is a semi-late to late sort that has an average resistance to winter conditions and good resistance to lodging, drought and heat.

The sort is susceptible to powdery, medium resistant at leaf septoria, tolerant to a high concentration of aluminum ions.

It falls in the group of sorts with good bread-making qualities.

The second sort type, *Alex - Lovrin 50*, was created at SCA Lovrin. This is a semi-early sort, zoned in the plains of west and south.

Samples for measurements were taken in July of 2014.

Biological material chosen is represented by local populations and species belonging to a species of grain (*Triticum aestivum*), with two varieties: Crisana and Alex - Lovrin 50.

Within each variety, 3 samples of 100 seeds of each sort were formed: the seeds were stored for 5 days at + 27.5°C (for *Triticum aestivum*) for both sorts.

Most seed samples come from the same biological category (local populations).

For studied seed samples were studied using the classical methods of analysis (method CGA medium (potato - dextrose - agar), and the method Sabourand (yeast extract - dextrose - chloramphenicol - agar) (Naghi et al., 2010).

In order to make possible this study of assessing the micromycetes found in the kernels of grain and the samples analyzed, the following methods were applied:

- macroscopic analysis of the seed;
- CGA medium method (potato - dextrose - agar);
- method Sabourand (yeast extract - dextrose - chloramphenicol - agar).

RESULTS AND DISSCUSIONS

Chosen biological material has undergone qualitative assessments, as shown below.

Within each sort 3 samples of 100 seeds of each sort were created: the seeds were stored in the oven for 5 days at + 27,5°C for both sorts.

Propagation, growth and degradation activity of parasitic and saprophytic micromycetes are favored by storage conditions in which they live, such as:

- nutrient substrate which develops seed mass;
- temperature and light;
- relative humidity in the atmosphere and deposit between intergranular spaces;
- air ventilation and atmospheric composition of deposit (Străjeru et al., 2001).

Microbiological analysis is indispensable both to ensure product better quality and preservability and to ensure hygienic quality and consumer safety.

For microbiological, quantitative and qualitative analysis techniques, were bought grain for human and animal consumption.

The samples were qualitatively assessed in order to study the degree of contamination by molds.

In order to assess aspects of colonies developed by growing cereal grains on selective media (CGA and Saubourand medium, in aerobically conditions, at 27.5˚ C), a qualitative evaluation was carried out.

Culture media have been liquefied and distributed in Petri plates. After medium solidification, wheat grains are added to each plate, with a sterile forceps. The plates are thermostated at 27.5 °C for 5 days.

Mold colonies developed after 5 days in Petri plates are isolated and analyzed by microscopy.

After thermostating, it was noticed that the degree of mold contamination of cereals is different, but high on both tested sorts (Table 1).

Thus, out of 3 samples of wheat with 100 seeds of the analyzed Crişana sort, 70% were contaminated with mold, and out of 3 samples of Lovrin wheat sort, 90% were contaminated with mold.

Table 1

The degree of contamination of wheat with mold

Cereals	Number of wheat samples	Samples contaminated whit mold (%)
Wheat - *Crisana*	300	70
Wheat - *Lovrin*	300	90

After analyzing microscopic mold colonies developed on the culture medium after the thermostat, a presence of different species of mold has been noticed: *Penicillium sp., Penicillium notatum, Trichoderma sp., Fusarium sp., Aspergillus flavus, Thricothecium sp.*

All these saprophytic and parasitic fungal species occurred in analyzed samples *Triticum aestivum - Crisana* and the first five of them in samples of *Triticum aestivum - Lovrin*.

On the same seed, fungal microorganisms are present, attacking outer layers of the seed or resulting in infections inside the embryo, without determining a pronounced decrease of the seeds germination faculty (Coman et all., 2007).

The distribution of the mold species on the two types of tested samples is shown on the graph from figure 1, separately for both wheat sorts that have been tested.

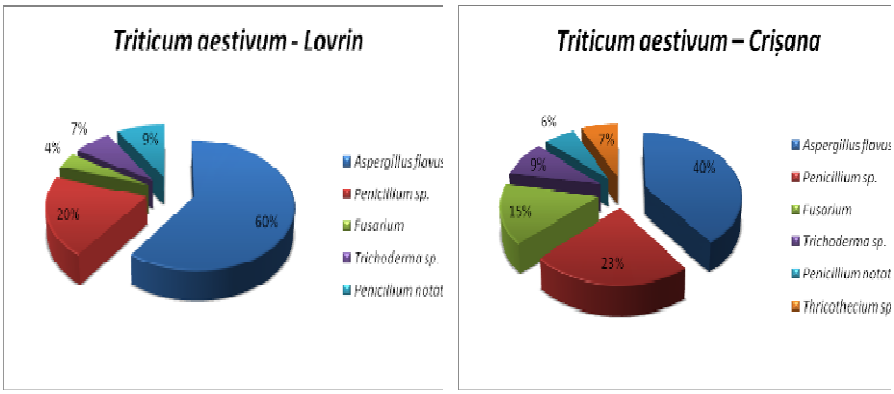

Fig. 1. The main species of mold present in wheat, variety Lovrin and variety Crişana

It is noted that the incidence of mold species is very different, Crişana sort hovering between 6 and 40% and Lovrin sort between 4 and 60%. In samples of Crisana wheat sort, the highest percentage had *Aspergillus flavus* (40%) as in samples of the Lovrin sort, where this mold was a majority (60%).

The graph in Figure 2 shows compared incidences of all fungi identified on the two wheat sorts tested.

The species of fungi *Penicillium sp*. (20% and 23%) and *Trichoderma sp*. (7% and 9%) are the only ones whose incidence is similar to the two sorts of wheat tested.

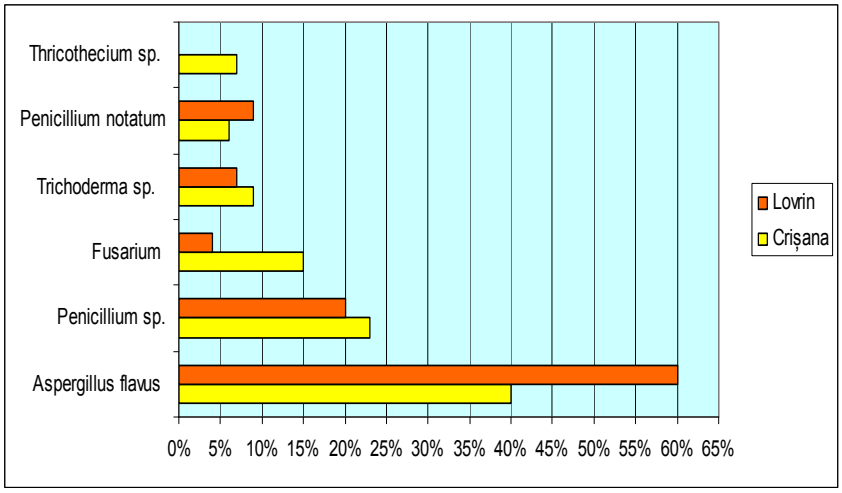

Fig. 2. The incidence of fungi in wheat species

The species of fungi *Penicillium sp*. (20% and 23%) and *Trichoderma sp*. (7% and 9%) are the only ones whose incidence is similar to the two sorts of wheat tested.

CONCLUSIONS

The experiment followed in this paper leads to the following conclusions:

After the thermostating has been observed that the degree of mold contamination of grains is relatively high, a maximum number of six molds being identified.

Of these molds, some are producing mycotoxins, such as *Aspergillus* and *Penicillium* types.

The incidence of fungi is extremely different between the tested wheat species.

Mold of *Aspergillus flavus* type is predominant in the tested wheat samples but at different levels of contamination.

It can be stated that the Lovrin sort is more prone to contamination with molds in the general and especially with those producing mycotoxins than Crişana sort.

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