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RESEARCH ON THE INCIDENCE OF MICROMYCETES ON WHEAT SEEDS DURING STORAGE IN VIEW DAMAGE CONTROL

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Abstract

Wheat is the main cereal crop in the EU- world production is about 582.7 million tons from 213.8 million ha. (FAOSTAT, 2020). Romania is a traditional grower and producer of wheat; therefore it is necessary to obtain a high quality of seed material. Storage fungi are among the major factors causing post-harvest deterioration of crop produce worldwide. FAO estimates that annually, through conditioning and storage, the percentage of losses reaches 6-10%. Three varieties of wheat seeds from crops in south-eastern Romania were analysed, in storage conditions. Measurements were aimed at determining the associated fungal load of wheat seeds and establishing their influence on quality indicators. The paper presents a study on the appearance and development of storage-specific micromycetes. The research was carried out on common wheat seeds from the warehouses of the National Administration of State Reserves and Special Issues. Wheat is stored during the cold season at an optimal level of temperature and humidity, to preserve quality. Seed testing for germination and incidence of was performed in the laboratory by the classic method of filter paper and PDA medium.

Key words*: wheat, isolation, storage, micromycetes.*

INTRODUCTION

Romania is, by tradition, an important producer of cereals, occupying on average an area of 2000-2500 thousand ha, cultivated with wheat, the annual grain harvest amounts to 15-20 million tons. An important part of the wheat harvest is consumed in rural households and is not traded. The rest of the wheat crop enters the commercial circuit, it is conditioned, stored and processed for internal consumption (Roman, et al., 2012). The seed occupies a special position in the measures that can be taken to increase the biological potential and phytosanitary status of plants. For this reason it is necessary for the seed to be a good genetic material, to have biological purity, high cultural value and to be free of pathogens (Placinta, 2007). Crop yields are dependent on the interactions of socio economic, biological, technological and ecological factors. (Kesho et al., 2020; Onwueme and Sinha 1999). The ideal daily temperature for wheat development varies from 20-25^{0}C for germination, 16-20^{0}C for good processing and 20-23^{0}C for proper plant development (Beard et al., 2004). Specialist studies have shown that for some pathogens, seeds have an exclusive role in transmission and spread (Cristea & Berca, 2013).

The manifestation and the intensity of the damages produced by the micromycetes transmitted through the straw grain seed are an expression of the degree of its infestation, the virulence of the pathogen, the sensitivity of plants and environmental factors (Raicu et al., 1978).

The impact on the pathogenic fungus of wheat seed is necessary to determine its quality indicators. Research on the black spot wheat attack shows the special importance for both indices on the implications of the seed attack and the determination of the mycoflora associated with the production of this attack (Cristea & Berca, 2013).

Pathogenic fungi on wheat caryopsis in storage conditions were also observed corn seeds in the

same conditions (Dudoiu et al, 2016). Also, the fungi detected on corn seeds in storage conditions are fungi common to wheat seeds (Cristea et al., 2015; Cristea & Berca, 2013) but are also detected on the seeds of other species, being known as seed pots (Mardare et al., 2015; Manole & Cristea, 2015; Berca & Cristea, 2015; Pană, et al., 2014) affecting their qualitative indices (Matei et al., 2011; Tamba et al., 2010).

Stored cereals can have losses in both quantity and quality. Loss occurs during the storage of wheat grains after harvest due to biotic and abiotic factors. Wheat losses after harvest are estimated at about 8% of production. Several million colonies of storage fungi have been reported from a gram of dust collected from grain elevators and warehouses (Mathew, 2010).

The post-harvest loss of wheat cereals was found to be the largest during storage. The quality of cereals after harvest is influenced by a wide variety of biotic and abiotic factors and has been studied as a stored grain ecosystem. Stored grains can have losses in both quantity and quality. Losses occur when the grain is attacked by microorganisms and other organisms, including insects, mites, rodents and birds (Magan et al, 2003; Krasauskas et al., 2005; Zvicevičius et al., 2006; Neethirajan et al., 2007).

Cereal production varies from year to year and therefore cereals should be strategically stored from years of overproduction for use in the year under production. Cereals must also be stored because the point of production is not the point of consumption and the time of production is not the time of consumption. Stored grains can have losses in both quantity and quality. The quality of cereals after harvest is influenced by a wide variety of biotic and abiotic factors and has been studied as a stored grain ecosystem. Losses occur when the grain is attacked by microorganisms and other organisms, including insects, mites, rodents and birds. Loss of grain in quality can be in the form of depletion of seed viability, hardness, color, size and shape, grain weight and various biochemical parameters such as proteins, carbohydrates and vitamins in post-harvest deposits (Kalsa et al., 2019; Kaminski & Christiaensen 2014; Uygun et al., 2005; FAOSTAT 2020; Stathers et al., 2013).

MATERIALS AND METHODS

The research was carried out on common wheat seeds, 3 varieties: Balaton production 2019, Glosa production 2019, Dropia production 2015.

The wheat samples were stored in a cereal warehouse, in jumbo bags, placed on pallets; sampling from the bags for analysis was done with manual probes. The grain and microclimate temperature and humidity were determined as follow:

January-March: Microclimate: min T: -3° C and H: 35%; max T: 9°C and H: 88%; Product/grain: min T: 0°C and H: 11.4%; max T: 7.8°C and H: 13%;

April-May: Microclimate: min T: 1°C and H: 39%; max T: 18°C and H: 88%; Product/grain: min T: 4.4°C and H: 11.5%; max T: 15.3°C and H: 13%.

The storage rooms was natural ventilated.

The testing of the capacity of wheat seeds to produce plants in the field, by germination and the incidence of micromycetes was performed by incubating them on a drying substrate and agarized medium in optimal laboratory conditions, aims to assess their quality for sowing, marketing or long preservation duration.

Germination was determined according to the STAS 25^0C method.

Three seeds of the same varieties were placed on each Petri dish (ø 10 cm) on an agarized medium (Hulea, 1969; Constantinescu, 1974), in several replicates. The water agar media was preferred due to its low nutrient composition which allows the fungi to grow but not its abundant sporulation.

This is an important step in order to be able to isolate each fungus from the Petri dish multitude of pathogens. The dishes were kept at room temperature (22-24ºC) and normal light conditions. After 7 days there were performed macroscopic observations regarding the mycelia growth in Petri dishes, followed by optical microscope observations.

RESULTS AND DISCUSSIONS

The associated mycoflora from wheat caryopsis in the deposits under analysis is represented by microorganisms such as micromycetes and yeasts. Our study was focused on the micromycetes analysis.
First of all we determined the germination of wheat caryopsis during the experimentation period (Table 1).

Table 1. The germination faculty of wheat caryopsis

Variety	Germination (%)	
	4 days	7 days
Balaton	90	95
Glosa	90	95
Dropia	85	90

The data in the Table 1, show that, after 7 days of observation, the germination of wheat caryopsis was not affected by any fungus varieties. At the Balaton production 2019 and Glosa production 2019 varieties, the germination was 95% and at the Dropia production 2015 the germination was determined at the 90%.

Figure 1. Germination of wheat caryopsis of Balaton after 7 days

Figure 2 Germination of Dropia wheat caryopsis after 7 days

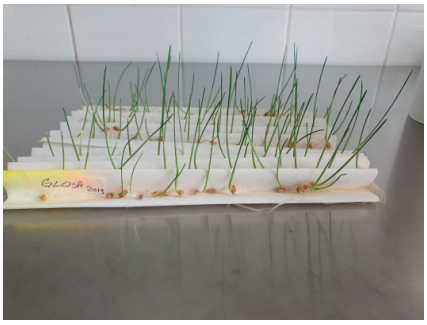

Figure 3 Germination of Glosa wheat caryopsis after 7 days

The second step of our experiment was to isolate specific fungi from our samples. After incubation on agarized medium were isolated fungi that belong to predominant species of *Alternaria* spp., *Penicillium* spp., *Rhizopus* spp., and *Fusarium* spp. (Table 2). The micromycetes *Alternaria* spp., *Penicillium* spp., *Rhizopus* spp., and *Fusarium* spp. were also detected on the seeds of other plant species in Romania (Cozea et al., 2011; Zala et al., 2011; Mardare et al., 2014; Pana et al., 2014).

Table 2. Mycoflora detected on wheat caryopsis

Variety	The pathogen			
	Alternaria spp.	*Penicillium* spp.	*Fusarium* spp.	*Rhizopus* spp
Balaton	+	+	-	-
Dropia	-	+	-	+
Glosa	+	-	+	-

The data in Table 2 show that the pathogens present on wheat caryopsis belonged to the species *Alternaria* spp. *Penicillium* spp, *Rhizopus* spp, *Fusarium* spp. The incidence of mycoflora show that *Alternaria* spp. was present on wheat caryopsis in the varieties Balaton and Glosa.
The micromycetes belonging to *Penicillium* spp were identified on Balaton and Dropia. The *Fusarium* spp fungi were present at the following to the Glosa variety. And the the micromycetes belonging to *Rhizopus* spp were identified on the Dropia variety.

CONCLUSIONS

According to the results the following comments can be made on the mycoflora of wheat caryopsis. Germination of wheat seeds was not affected by the detected fungi. Our

research confirmed the presence of fungus associated with wheat seeds from the genera: *Alternaria*, *Fusarium*, *Penicillium*, *Rhizopus.* The most common isolated pathogenic species belong to the genus *Alternaria* spp and *Fusarium* spp and have colonized the wheat seeds of the studied varieties. The *Alternaria* spp fungus was identified on the Balton and Glosa varieties. The *Peniciullium* spp fungus was identified on the Balatos and Dropia strains, and the *Fusarium* spp fungus was identified on the Glosa variety. The *Rhizopus* spp fungus were identified only on the Dropia variety.

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