THE MICOFLORA INFLUENCE OF WHEAT SEEDS ON THEIR QUALITY INDICATORS

Mali Sanda (MANOLE) CRISTEA[1], Stelica CRISTEA[1], Maria TOADER[1]

e-mail: malismanole@yahoo.com

Abstract

There were analyzed the fifteen varieties of wheat seeds from lots of crops from South East of Romania, in conditions of 2014. Measurements were aimed at determining the associated fungal load of wheat seeds and establishing their influence on quality indicators. Classical method was used (PDA medium plate inoculation). It was established micromycetes proportion identified as follows: fungus *Fusarium* spp had minimum values of 30% at Solehio variety and maximum values at Alex variety of 80%. *Alternaria* spp colonized Flamura 85 variety seeds at a rate of 14%, with a maximum value of 60% at Solehio variety. *Stemphylium* spp micromicetes was present in 6% at Flamura 85 variety and recorded maximum value of 20% at Boema and Glosa varieties. *Oedocephalum* spp and *Rhizopus* spp colonized seeds of Glosa and Ilinca varieties, in proportion of 45%. *Penicillium* spp micromicetes recorded a maximum incidence of 25% at Elemenco variety. *Epicoccum purpurascens* was present on the seeds of wheat in a maximum proportion of 10% at Solehio variety. Germination of seeds recorded the lowest value of 87% at Solehio and a maximum value of 99% at Ilinca variety. Quality index determinations reveal a seeds moisture of minimum 12,3% of Apache variety and a maximum value of 16,6% for Flamura 85 variety. Minimum amount of protein was determined for Exotic variety (11,2%) and maximum content for Boema 1 variety (15,4%). Zeleny sedimentation index showed a satisfactory quality and good for all varieties, except Exotic variety which showed an index of 8, for a poor quality. Hardness seeds ranged between 22% at Exotic variety and 34% at Flamura 85. The amount of starch of varieties had a maximum difference of 2,7% and hectoliter mass ranged from 67,8% at Exotic variety and 78,2% at Dropia variety.

Key words: wheat, fungi, seeds, physico-chemical parameters

Wheat is the most important crop, of which bread is mainly made, the main food for approx. 40% of the world population. The most important source of food, both directly and indirectly for human consumption as a factor in animal production (Axinte M., 2006).

In today's global view of agricultural development, in order to protect biodiversity and to return to a more environmentally friendly agriculture, great importance should be given to seed pathology (Gheorghies C., S. Cristea, 2001; S. Cristea, 2005; Cristea C.M., M. Berca, 2013).

Quality seed depends largely on genetic nature, but also on their ability to germinate and their health. Seed germination of wheat is a key factor contributing to higher yields. Achieving a superior quality index is dependent on the potential of the varieties, which materializes only by ensuring all links of crop technology amid pathogen-free seed material usage, seed health being an important attribute of quality (Gheorghies C., S. Cristea, 2001; Mardare E. S. *et a*, 2014; Pană M. *et al*, 2014; Cristea-Manole M.S. *et al*, 2015)

MATERIAL AND METHOD

The biological material was represented by seeds from varieties: Alex, Apache, Arnold, Boema 1, Capo, Delabrad, Dropia, Elemenco, Exotic, Fundulea 4, Flamura 85, Glosa, Ilinca, Rapid, Solehio from various locations in the county of Calarasi. Packaging and storage of samples was done properly in order not to influence the physico-chemical and microbiological properties of seeds, in paper bags (Petcu CD, 2014). For each variety we analyzed 100 seeds not disinfected, placed in Petri dishes in three repetitions. To identify the fungi spectrum we performed fungal isolation and successive repetitions on the PDA culture medium (potato-glucose-agar), after the Hulea A. recipe, 1969. The inoculated dishes were incubated for 7 days at 22°C. Based on literature (Constantinescu O., 1974; Raicu C., Baciu D., 1978; Hulea A., Iliescu C., 1986) we performed the micromycetes identification, using a Zeiss Primo microscope. Micromycetes percentage incidence was assessed from the seeds analyzed. The germination

[1] University of Agronomy Sciences and Veterinary Medicine of Bucharest

of seeds was determined on filter paper, the "fan" method. The determination of the following indicators: the relative humidity (U%), hectoliter weight (MH kg/hl), protein content (%) Zelleny index (ml), starch content (%) and the hardness was carried out using a Perten Inframatic device.

RESULTS AND DISCUSSIONS

The spectrum of fungi associated with seeds of 15 varieties of wheat and their incidence (*table 1*) was determined. The fungus *Fusarium* spp had 80% values for the variety Alex, the varieties Elemenco and Flamura 85 presented an incidence of 60% while the minimum was determined at 30% for the Solehio variety.

Alternaria spp colonized seeds of the varieties Flamura 85 and Fundulea 4 in 14%, registering a maximum frequency of 60% for the Solehio variety.

Stemphylium spp fungus was present in 6% to Flamura 85 variety and had the maximum incidence of 20% for the Boema 1 and Glosa varieties.

Rhizopus spp fungus was determined with an incidence of 10% for Delabrad and Rapid varieties and 45% in Ilinca.

Penicillium spp fungus recorded a maximum incidence of 25% in the Elemenco variety and for four other varieties the maximum incidence has not exceeded 20% (Arnold, Delabrad, Dropia, Rapid).

Epicoccum purpurascens was present on the seeds of five varieties tested: Alex and Apache 5% incidence, Capo and Exotic 8% and the variety Solehio which recorded a maximum incidence of 10%.

Oedocephalum spp was present on the skin of the seeds of three varieties: Glosa in 45%, Apache and Capo, where the percentages were 9% and 7%.

Table 1

Rating of the micromycetes present on the seeds of wheat

Pathogens/ variety	*Fusarium* spp.	*Alternaria* spp.	*Stemphylium* spp.	*Rhizopus* spp.	*Penicillium* spp.	*Epicoccum purpurascens*	*Oedoce-phalum* spp
Alex	80	10	5	0	0	5	0
Apache	40	35	8	0	0	5	9
Arnold	35	20	0	40	10	0	0
Boema	45	35	20	0	0	0	0
Capo	55	30	0	0	0	8	7
De la Brad	0	0	20	10	20	0	0
Dropia	0	30	0	20	10	0	0
Elemenco	0	0	10	35	25	0	0
Exotic	60	20	12	0	0	8	0
Fundulea4	35	14	0	21	0	0	0
Flamura85	60	14	6	0	0	0	0
Glosa	40	0	20	0	0	0	45
Ilinca	35	10	0	45	0	0	0
Rapid	0	24	0	10	20	0	0
Solehio	30	60	0	0	0	10	0

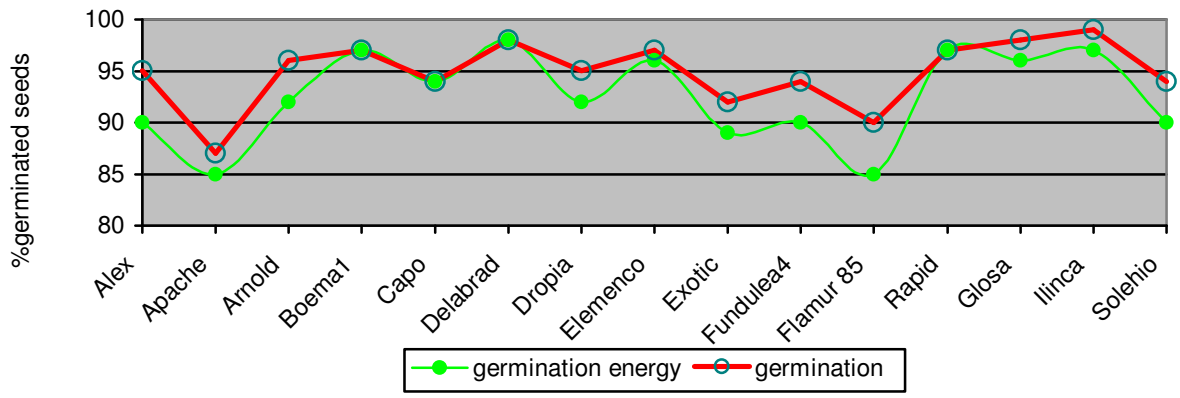


Figure 1 **Seed germination**

Regarding seed germination (*figure 1*) is seen that the highest values were recorded at 99% at Ilinca variety and for varieties Glosa and Delabrad, germination value was 98%. A small value germination was recorded both after four and after eight days, for variety Flamura 85, 87% and Apache, 90%.

Analyzing the data in *figure 2*, with help from the the linear regression equation, we can say that we have found mild intensity correlations between the number pathogens and seed germination ($r^2 = 0.42$) which shows that the presence of pathogens on seeds can there of affect germination.

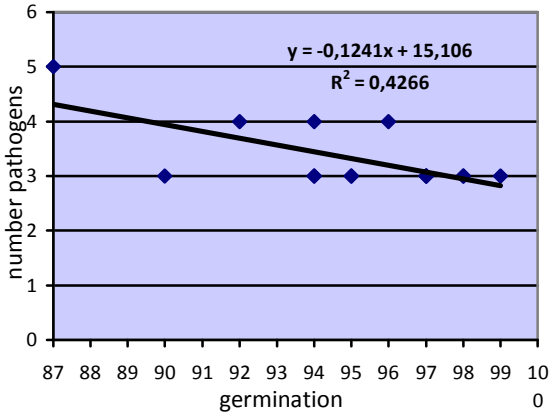


Figure 2 **The relationship between pathogens load and seed germination**

Quality index were determined for varieties with specified pathogen loads in table 1. *Table 2* shows a moisture of seeds between 12.3% for the Apache variety and 16.6% for the Flamura 85 variety. The moisture had lower values for the varieties with lower pathogenic loads.

Regarding protein content, it was found that its value varies from 11.2% for the Exotic variety to 15.4% for the Boema1.

The Zeleny sedimentation index, which reflects the amount and quality of gluten, ranged from values of 27ml (Elemenco and Dropia) to 50 ml (Flamura 85), excepting the Exotic variety where the value was 8 ml.

The hardness/ vitrescence ranged between 22% at the Exotic variety and 34% at the Flamura 85 variety.

The amount of starch for the studied varieties varied with the cultivar and had a maximum percent difference of 2.7% starch.

Regarding pathogenic influence on hectoliter mass load, the data from *table 2* shows that this was not influenced by the number of pathogens determined.

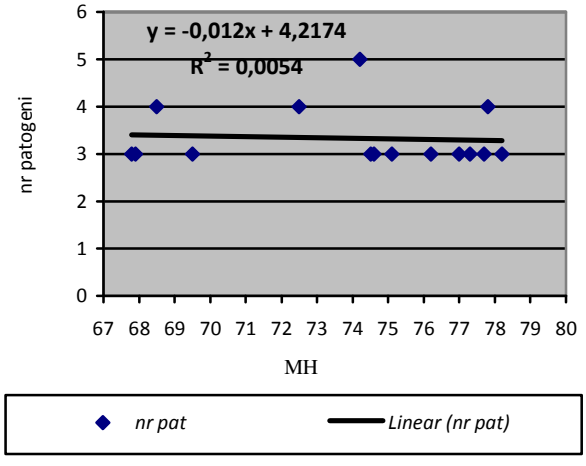
Table 2

Varieties quality parameters

Varieties	Mois ture U%	Protein %	I Zeleny ml	Hard Ness %	Starch %	HM hl/kg
Alex	12,80	12,90	32	28	65,60	74,60
Apache	12,30	13,10	32	27	65,90	74,20
Arnold	14,10	12,90	30	29	64,90	72,50
Boema 1	13,10	15,40	47	26	63,80	77,30
Capo	12,90	13,10	36	30	65,90	77,80
Dropia	15,40	12,00	27	30	66,00	78,20
Delabrad	14,60	14,00	35	29	64,00	69,50
Exotic	12,80	11,20	8	22	66,50	67,80
Elemenco	14,50	12,90	27	30	63,90	68,50
Fundulea 4	14,50	15,00	31	25	64,50	67,90
Flamura 85	16,60	14,00	50	34	63,40	77,70
Glosa	13,20	12,80	31	28	66,50	75,10
Ilinca	13,40	12,60	32	28	66,30	76,20
Rapid	14,20	12,60	40	25	65,30	74,50
Solehio	13,90	13,50	43	32	64,90	77,00

To explain in what extent the presence of pathogens on the surface of seeds may influence some grain quality parameters analyzed, we noticed the simple linear regression equation, and to measure the intensity of the connection between them, the linear correlation coefficient r^2 was calculated. Analyzing data using the regression equation (*figure 3*), we can say that this pathogens found on the surface of seeds in proportions determined in the samples analyzed, did not influenced hectoliter mass ($r^2 = 0.005$) starch content ($r^2 = 0.006$) and protein ($r^2 = 0.009$).

This pathogens can have a low influence on the percentage of moisture ($r^2 = 0.11$).



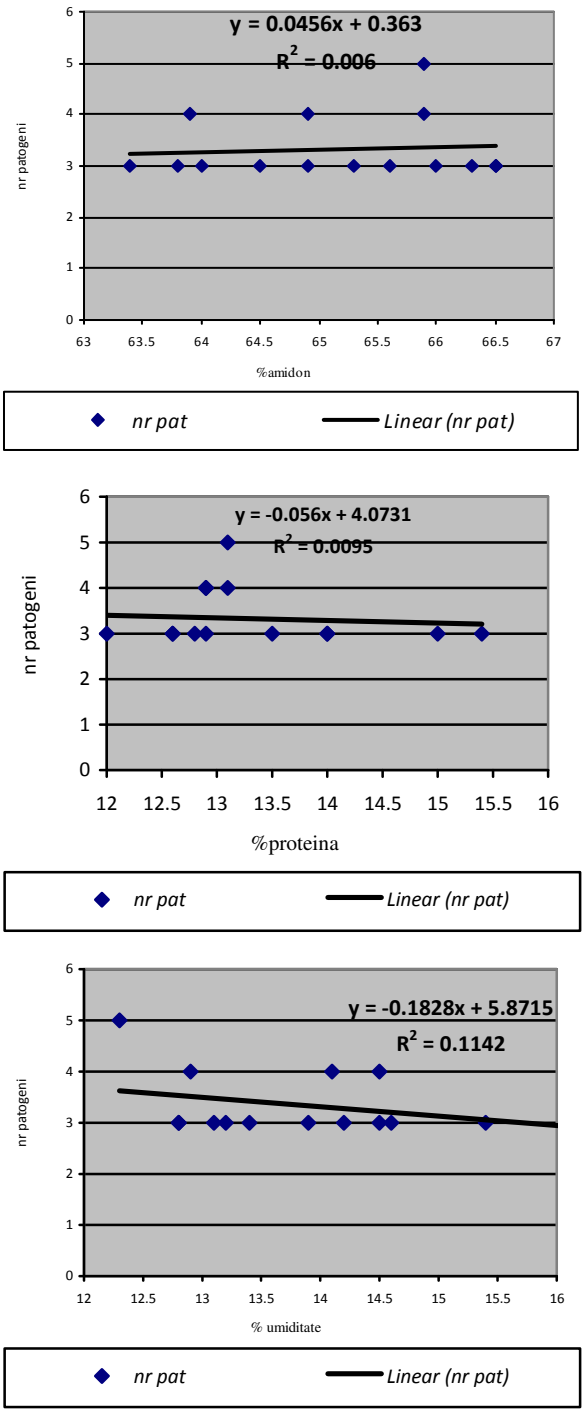


Figure 3 **The relationship between quality parameters and the pathogenic load of the seeds**

CONCLUSIONS

The spectrum of pathogens determined on the wheat seeds was composed of *Fusarium* spp, *Alternaria* spp, *Stemphylium* spp., *Rhizopus* spp, *Penicillium* spp, *Epicoccum purpurascens* and *Oedocephalum* spp.

The *Fusarium* spp and *Alternaria* spp pathogens had the highest incidence on the varieties.

The pathogenic load influenced the seed germination identifying a medium intensity correlation ($r^2 = 0.42$).

The pathogens detected on the surface of seeds analyzed did not had a significant influence over hectolitre mass, protein content and starch. The seeds moisture was influenced by the pathogens on the surface of seeds.

ACKNOWLEGMENTS

This paper was published under the frame of European Social Found, Human Resources Development Operational Programme 2007-2013, project no. POSDRU/159/1.5/S/132765

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