BARLEY SEED MICOFLORA AND THEIR INFLUENCE ON QUALITY INDICATORS

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Abstract

To obtain a high quality and quantity of yields is necessary to know the health status of the seed. For fifteen varieties of barley from South-East of Romania were performed analyzes for determination of the associated fungal load of seeds and setting the influence they have on the quality indicators. Classical method was used (PDA medium plate inoculation). Micromycetes proportion identified to be as follows: *Alternaria* spp fungal colonized seeds of most varieties, the minimum being 5% to Vanessa variety and a maximum of 60% at the Cardinal variety. *Fusarium* spp was present in 80% of varieties with a maximum of 60% grains affected Scarpia variety and a minimum of 10% based Alora and Andrei varieties. *Epicoccum purpurascens* was present on seeds, the maximum incidence were recorded for Madalin variety (30%). *Rhizopus* spp and *Stemphylium* spp micromicetes colonized seeds of 40% varieties with incidents between 10% and 40%. *Curvularia lunata*, *Oedocephalum* spp, *Penicillium* spp, *Pyrenophora* spp and *Trichoderma viride* colonized seeds in a smaller percentage under 35%. Germination of seeds recorded the lowest value of 94% for the Scarpia variety. The best germination was noted Andrew and Vanessa varieties in 99%. The physico-chemical analyzes showed a minimum hectoliter mass (kg/hl) 51.8 kg/hl of Maresal variety and maximum 73.5 kg/hl for Cardinal variety. The percentage of moisture ranged from 12.5% for Regent and to 15.7% at Cardinal. The amount of protein contained in barley seeds varied from 12.2% Universe variety to 15.7% for Andreea variety.

Key words: barley, fungus, variety, seed

Barley, along with wheat provide the most important source of food worldwide (Axinte M., 2006). Quality of seeds as vegetative breeding material, has a great influence as it is an essential factor that contributes to achieve large production increases (Raicu C., Baciu D., 1978). The most important factor in the transmission of diseases in general is the source of infection (Beratlief C., Oprea M., 1994). The seeds are the source most frequently infected, the richest source of transmission of pathogens and especially of fungi (Alexandri Al. *et al,* 1969; Hulea A., 1973; Cristea S. *et al,* 2008; Cristea C.M., Berca M., 2013). Knowledge of seed pathology enables avoidance of massive field infections and prevents the introduction of new pathogens in crops (Gheorghies C., Cristea S., 2001; Mardare E. S. *et al*, 2014; Pană M. *et al*, 2014; Cristea-Manole M.S. *et al*, 2015)

MATERIAL AND METHOD

Research has been conducted on barley varieties taken from barley plots from local producers in SE Romania, at harvest, in the climatic conditions of 2014.

The material consisted of samples of seeds from varieties: Alora basic, Amical, Andreea, Andrei, Cardinal, Compact, Friderichus, Hanzi basic, Maresal, Madalin, Orizont, Regent, Scarpia, Univers, Vanessa. After sampling, the seeds were packaged properly in paper bags, not to influence the physico-chemical and microbiological properties of seeds (Petcu C.D., 2014).

For each variety there were analyzed 100 seeds not disinfected, placed in Petri dishes in 3 replicates.

To identify the fungi spectrum we successively isolated and replicated on the PDA culture medium (potato-glucosys-agar), (Hulea A., 1969). The inoculated pots were incubated for 7 days at 22^{o}C. Fungal identification was performed with a Zeiss Primo microscope based on the literature (Constantinescu O., 1974; Hulea A. Iliescu P., 1986). Micromycetes percentage incidence was assessed. The germination of seeds was determined on filter paper, the "fan" method.

Quality indicators: relative moisture (U%), hectoliter mass (HM- kg/hl) and protein content (%) were performed with a Perten Inframatic device.

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RESULTS AND DISCUSSIONS

The data in *figure 1* shows the spectrum of identified pathogens and their incidence in the varieties analyzed. The fungus *Alternaria* spp presented values of different incidents during the 15 varieties tested, with a maximum value of 60% for the variety Cardinal and a minimum 5% from Vanessa variety. On the seeds of the variety Scarpia this fungal was not identified.

Another fungus identified with a high incidence was *Fusarium* spp. The maximum for this fungal was registered by the variety Scarpia, 60% and the 10% minimum was recorded in two varieties, Alora basic and Andrei.

Curvularia lunata fungus was identified on seeds from the varieties Cardinal and Andrei at 20% and 30% respectively.

Purpurascens epicoccum colonized seeds of nine varieties analyzed (Alora basic, Cardinal, Friderichus, Hanzi basic, Maresal, Madalin, Regent, Scarpia and Vanessa), the maximum percentage of 30% being recorded in variety Madalin.

Oedocephalum spp fungus was identified in three varieties, with values of 20% incidence in Amical and Madalin varieties and 35% in Friderichus.

Penicillium spp fungal recorded a maximum incidence of 20% in the variety Maresal, 15% in the Univers variety and 10% in Compact, Madalin and Scarpia. *Pyrenophora* spp colonized seeds of three varieties with incidence peaks at the variety Univers (30%), a value of 25% for Orizont and 15% for the Andreea variety.

Stemphylium spp was present in 40% in the Madalin variety, for the cultivar Compact, incidence was 25% and for the varieties Cardinal, Hanzi basic and Scarpia, 20%. The lowest value was determined at the Univers variety. *Trichoderma viride* was present in a proportion of 10% in the Cardinal and Andreea varieties.

Regarding seed germination (*figure 2*) we see that the good germination was recorded in the varieties Andrei and Vanessa, 99%. The lowest values of germination of 94%, was shown in the varieties Cardinal, Madalin and Scarpia.

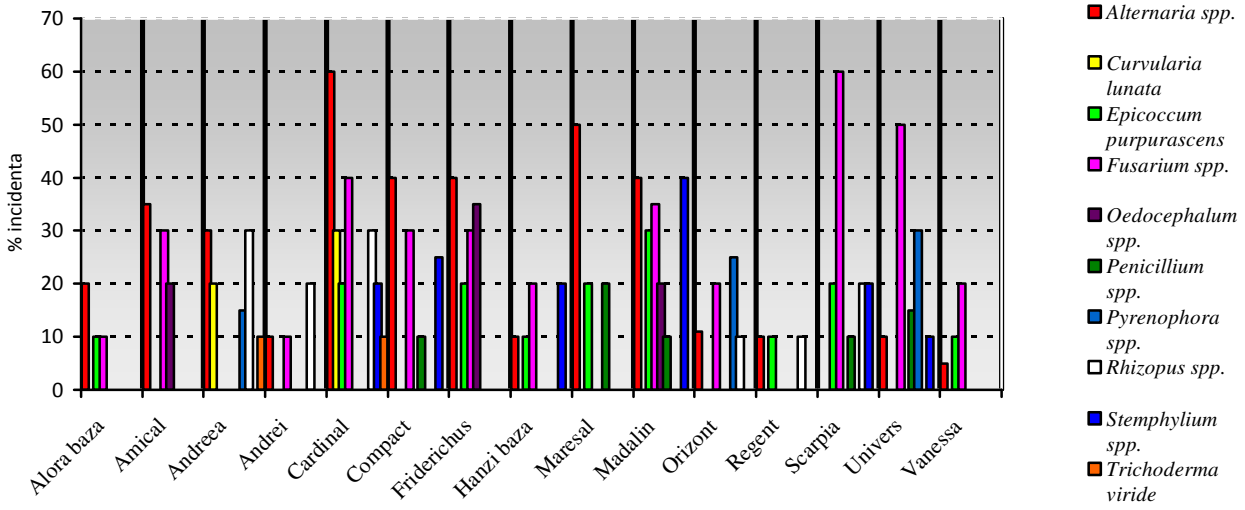


Figure1 **The Evaluation of mycromicetes present on the seeds of barley**

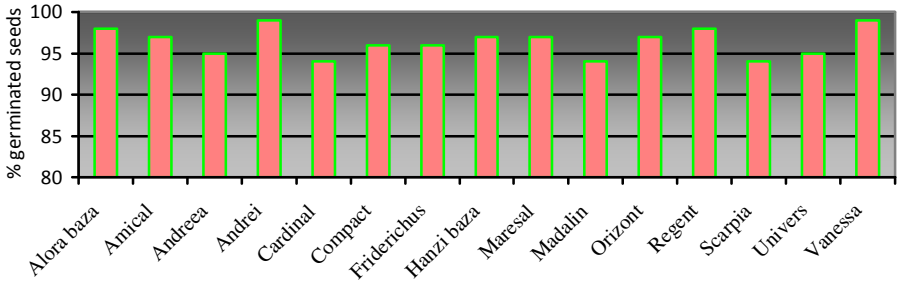


Figure 2 **Seed germination**

With help from the graphical representation of the simple linear regression equation (*figure 3*), we can say that we found a correlation between the number of high intensity pathogens and seed germination (r^2 = 0.75), which shows a strong influence of the pathogens on germination.

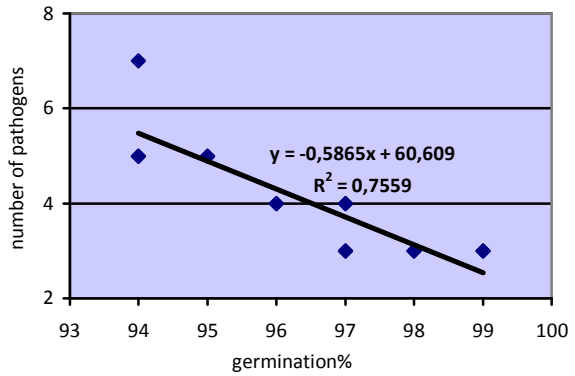


Figure 3 **The relationship between pathogen load and germination percentage**

Table 1 shows data regarding the quality indicators of the barley varieties analyzed. Regarding hectoliter mass, the barley varieties showed big differences, so we calculated a 42% difference between the lowest value recorded for the variety Maresal hectoliter mass (51.8 kg/hl) and the highest value for this indicator at the Cardinal variety, 73.5 kg /hl.

Regarding the varieties moisture, this ranged from 12.5% to 15.7% for the Regent variety to the Cardinal variety. It was found that for the varieties with high pathogenic loads, seed moisture value was higher (Andreea 14.6%, Madalin 14.8% and Cardinal 15.7%), which can be attributed to the extra moisture brought by fungi detected .

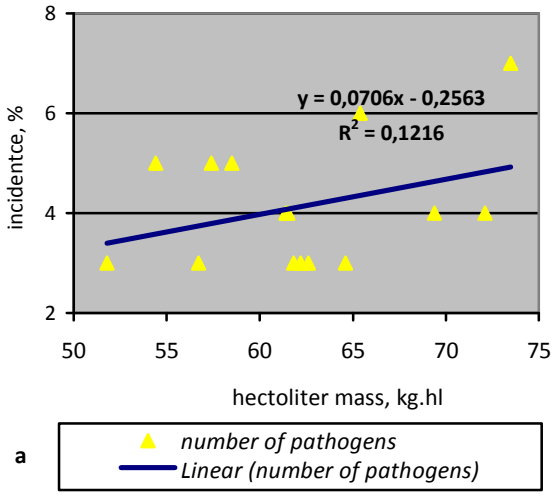
Regarding protein content, its value varies from 12.2% for the variety Universe to 15.7% for Andreea.

To explain in what extent the presence of pathogens on the surface of seeds may influence the quality parameters, 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 4*), we can say that there were established significant correlations between hectoliter mass and presence of micromycetes, the correlation coefficient being r^2 = 0.12 (*figura 4, a*).

Regarding the protein content of seeds we may indicate that, pathogens present in the skin, may have a mild influence on the protein, the correlation coefficient being r^2 = 0.34 (*figura 4, b*).

Using linear regression equation, we can say that, we found mild intensity correlations between pathogenic loads and seed moisture percentage (r^2 = 0.47) which shows that seeds moisture can be influenced by the pathogens on them (*figura 4, c*).



a

Table 1

Quality parameters for the varieties

Qualitative Indices	Variety														
	Alora baza	*Amical*	*Andreea*	*Andrei*	*Cardinal*	*Compact*	*Friderichus*	*Hanzi baza*	*Maresal*	*Madalin*	*Orizont*	*Regent*	*Scarpia*	*Univers*	*Vanessa*
Hectoliter mass, kg/hl	62.6	56.7	54.4	61.8	73.5	69.4	61.5	61.4	51.8	65.4	72.1	62.2	58.5	57.4	64.6
Moisture, U%	13.5	13.5	14.6	14.0	15.7	12.8	13.8	13.0	13.3	14.8	12.9	12.5	12.7	13.5	12.7
Protein, %	15.2	14.9	15.7	13.4	12.4	15.3	15.6	14.6	14.5	12.5	13.5	14.1	12.9	12.2	15.1

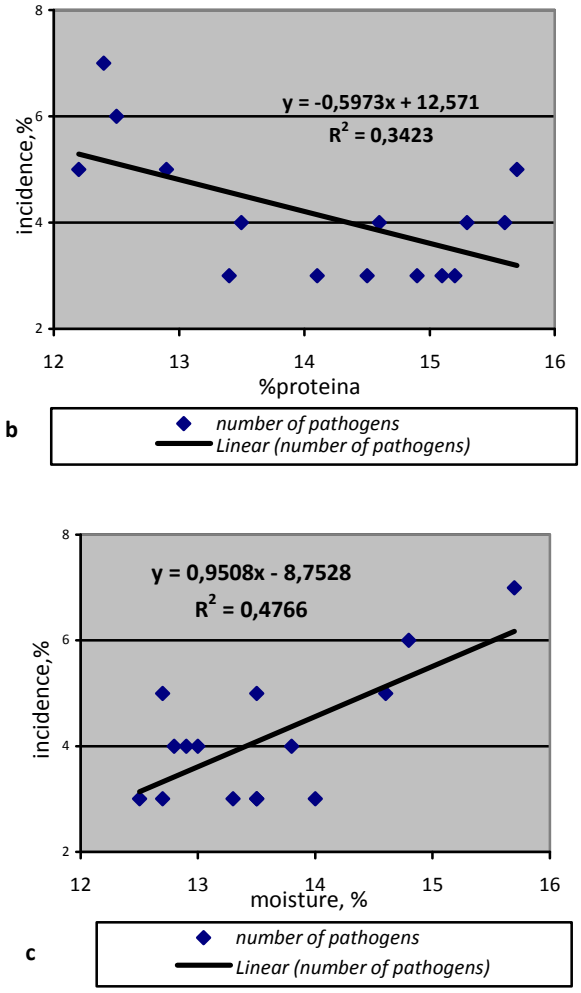


Figure 4 **The relationship between the quality parameters and the presence of some pathogens on the seeds**

CONCLUSIONS

The pathogens with the greatest weight were: *Alternaria* spp who colonized the seeds of most varieties, the minimum being 5% to Vanessa variety and a maximum of 60% at the Cardinal variety.

Fusarium spp was present on the seed varieties, whith a maximum incidence of 60% affected seed was on the variety Scarpia and a minimum of 10% on the Alora basic and Andrei.

The correlation of high intensity between the number of pathogens and seed germination (r^2 = 0.75), shows their strong influence on germination. Seeds moisture was influenced by the presence of pathogens detected.

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REFERENCES

Alexandri Al., Olangiu M., Petrescu M., Pop I., Radulescu E., Rafaila C., Severin V.1969, *Tratat de fitopatologie agricola*, vol.II, Ed. Academiei RSR, Bucuresti.

Axinte M., Gh.V. Roman, I. Borcean, L.S. Muntean, 2006, *Fitotehnie*. Editura "Ion Ionescu de la Brad" Iaşi.

Beratlief C., Oprea M., 1994, *Ecosystem characteristics of agricultural products storages and health implication*, Plant Protection issues, Bucharest, 13, 22, 44.

Constantinescu O., 1974, *Metode şi tehnici în micologie*. Ed. Ceres, Bucureşti,

Cristea C. M., Berca M., 2013, *Researches concerning the caryopses mycoflora of wheat to varieties grown in Modelu Location, Calarasi country*, Research Journal of Agricultural Science (RJAS), vol 43, Agroprint Timisoara, Agriculture Faculty, Banat`s University of Agricultural Science and Veterinary Medicine from Timisoara

Cristea S., Georgescu M., Patrascu N., Groza O, 2008, *Research regarding the pathology and anatomy of the seed- the extension of wheat kernel*. Scientifical Papers USAMVB Seria A, vol LI

Cristea-Manole M.S., Cristea S., Zală C. 2015, *Research on mycoflora present in the caryopses of wheat (Triticum aestivum) in the S-E of Romania, in terms of 2014,* Romanian Biotechnological Letter, Vol. 20, No. 1, 10183-10189.

Gheorghies C., Cristea S., 2001, *Fitopatologie*, Vol.1, Ed. Ceres, Bucuresti.

Hulea A., 1969 - Ghid pentru laboratoare de *micologie şi bacteriologie,* Ed. Agro-Silvică, Bucuresti.

Hulea A., Iliescu P., 1986, *Determinator pentru identificarea mucegaiurilor potential toxigene*, Societatea de Medicina Veterinara din R.S.Romania, Bucuresti.

Mardare E. Ş.; Cristea S., Zală R. C. 2014, *Researches on the mycoflora of sunflower's achenes for the hybrids cultivated in Fetesti area, Ialomita country*. Sciencific Papers USAMV Iasi, Seria Agronomie, vol, 57, nr 2, 213.

Pană. M., Cristea S., Cernat S., Negrilă E. 2014, *The mycoflora of barley- the varieties extension certificated at ards- Teleorman*. Sciencific Papers USAMV Iasi, Seria Agronomie, vol, 57, nr 2, 217.

Petcu C.D., 2014, *Ambalaje utilizate in industria alimentara*, cap. *Materiale celulozice*, 56-60, Ed Granada, Bucuresti, ISBN 978-606-8254-55-5.

Raicu C., Baciu D., 1978, *Patologia semintei*. Ed. Ceres, Bucuresti.