FIELD EXPERIMENTS WITH *AVENA* GENETIC RESOURCES – AN EUROPEAN PROJECT (AVEQ)

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Abstract

In a cooperative project with fifteen partners from nine European countries, in 2008, genebank material and current commercial varieties (323 cultivated and 17 wild accessions) were evaluated for traits related to quality in human consumption, mycotoxins and cold tolerance.
The work is done in 10 work packages: 1) Project management and coordination; 2) Selection and multiplication of a project working collection; 3) Field experiments and sampling seeds for quality analysis; 4) Field experiments with artificial *Fusarium* inoculation; 5) *Fusarium* and mycotoxin analysis; 6) Analysis for protein – including *Avenins*, fat and minerals; 7) Analysis for dietary fibre and *ß*-glucan; 8) Analysis for antioxidants, including *Avenanthramides*; 9) Analysis for cold tolerance; 10) Project documentation and internet portal.
In Work package 3, "Field experiments and sampling seeds for quality analysis" were involved seven countries distributed all over Europe (Bulgaria, Estonia, France, Italy, Poland, Romania and Sweden). The activities from WP3 were coordinated by Romanian partner.
Field experiments were laid out as augmented block designs with 11 standards (Argentina, Auteuil, Belinda, Evora, Genziana, Jaak, Krezus, Mina, Mures and Saul) in five replications. Plot size ranged, from 2.0m^2 to 3.0m^2.
The descriptors observed by all partners were: days to heading, days to maturity, crop height, lodging at immature stage, lodging at mature stage, panicle shape, occurrence of diseases, lemma colour, yield, seed weight and test weight,
Harvest results (yield, seed weight, test weight, moisture) were put on line into a project information system (http://eadb.bafz.de/aveqprod/). All data will be made available with the end of the project in the European *Avena* Database (http://eadb.bafz.de)
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Key words: filed experiments, descriptors, quality

Oat is a crop with an important European history and tradition. It has still high breeding potential, based on a wealth of genetic resources represented in the European gene banks. So far, cultivars have not been developed specifically for human consumption (Lapveteläinen et al. 2001).

The high value of oat in human nutrition, which is unique among cereals, is widely recognized (Hampshire, 1998, American Food and Drug Association, 1997). It is based on the following traits:

- Protein content of oat grain is relatively high. Unique among cereal grain proteins is the fact, that high values for protein are reflected by high Lysin contents (Hampshire, 1998). The biological value of the protein is high;
- Fat content in oat grain is high. Oat fat has a high proportion of polyunsaturated fatty acids. These have positive influence on the blood plasma (Berg *et al.* 1992). Fat has a positive impact on the aroma of oat products. On the other side it reduces storage stability of extruded products (Hampshire 1998);

- Contents of dietary fibre are high. Of special value are the soluble and highly viscous mixed linked (1->3)(1->4)-ß-D-glucans. They have hypocholesterolemic effects. Oat products can be added to carbohydrate containing food for reducing insulin requirements (Wood *et al.* 1989).It is suggested, that the reduction in serum cholesterol levels is effected mainly by increasing the viscosity in the gut. Thus molecular weight distribution of ß-glucans (Beer *et al.* 1997) is important;
- The focus of this paper is characterisation and evaluation of accessions from European *ex situ* collections for traits, which are important for the quality of oats in human nutrition.

MATERIAL AND METHOD

Field experiments for quality analysis have been accomplished by following countries: Bulgaria, Estonia, France, Italy, Poland and Romania. Field experiments were laid out as augmented block designs with 323 accessions and 11 standards.

As standards were used: Argentina, Auteuil, Belinda, Evora, Genziana, Jaak, Krezus, Mina, Mures and Saul. Three partners (Romania, Poland and Bulgaria, additionally included 17 wild species accessions. Plot sizes were ranged from 2.0 to 3.0 m^2. The field experiments started after the seeds were received from Germany, Poland and France, during February and first decade of March, 2008.

Experimental and agronomic measures at

The ***test weight*** emphasizes big differences between those four countries (fig. 2). In Bulgaria it was the biggest test weight at the modern cultivars and in Estonia at cultivated accessions. In Romania were registered the smallest test weight at all genotypes.

The evaluation sites were different function by specific crop technology of each country.

Each country observed in field the following descriptors: days to heading, days to maturity, crop height, lodging at immature stage, lodging at mature stage, panicle shape, occurrence of diseases, lemma colour, yield, seed weight and test weight, hull content.

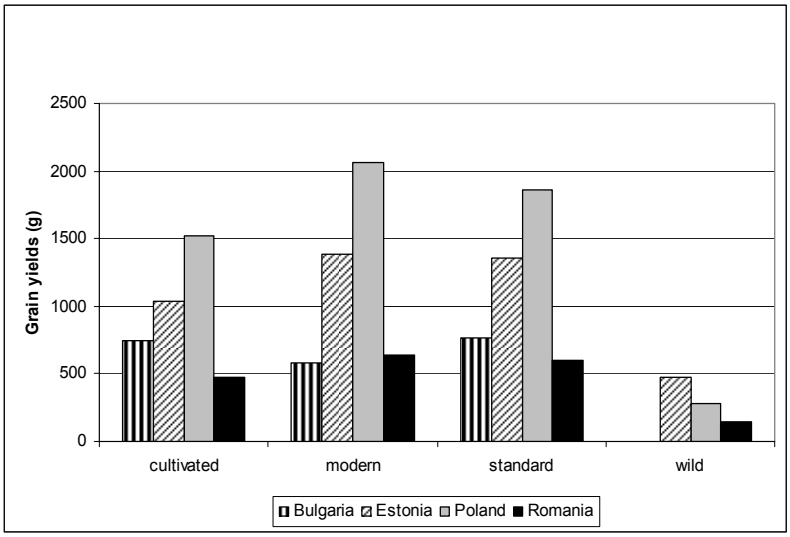

Figure 1 **Yield grains of Avena accessions in four European countries function by biological status**

RESULTS AND DISCUSSIONS

The descriptors: days to maturity, crop height, lodging at immature stage, lodging at mature stage, panicle shape, and occurrence of diseases in experimental fields of all countries were observed.

Following diseases were observed and scored:

France: *Erysiphe graminis avenae, Puccinia coronata avenae, Puccinia graminis f.sp. Avenae;*

Italy: *Puccinia coronata avenae, Puccinia graminis f.sp.avenae;*

Romania: *Puccinia coronata avenae*, *Septoria .avenae, Dreschlera spp.*

Concerning the descriptors which were achieved in laboratory we found different values such as:

Yield grains - was analyzed in four countries (Poland, Estonia, Romania and Bulgaria) - *fig. 1*. It is noticed that the highest yield was registered at modern cultivars in Poland.

Concerning the ***seed weight***, it noticed that in Estonia was registered the biggest seed weight in comparison with the results obtained at this descriptor in the other three countries (Romania, Poland, Bulgaria) (*fig. 3*). Harvest results (yield, TGW, test weight, moisture) were put on line into the web application by all countries.

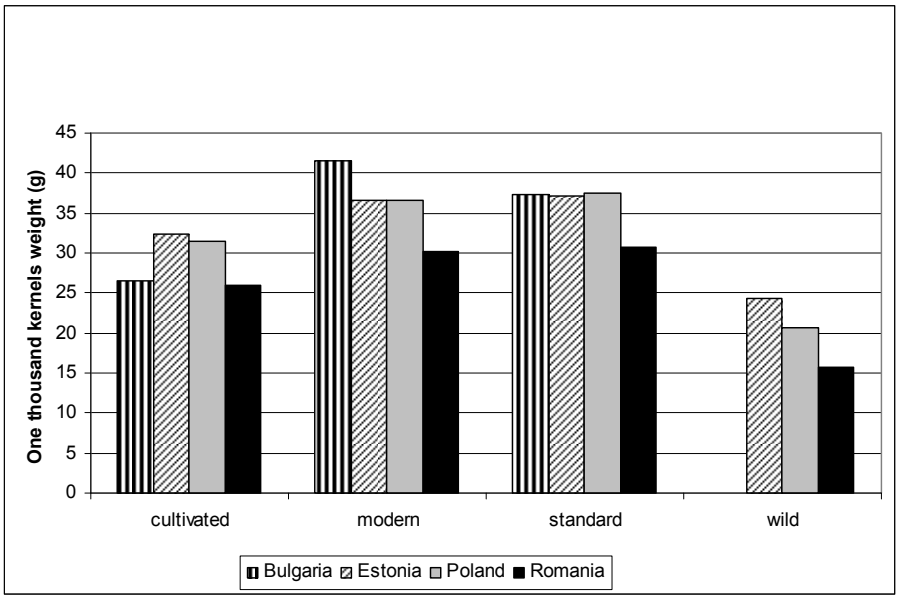

Figure 2 **Test weight of Avena accessions in four European countries function by biological status**

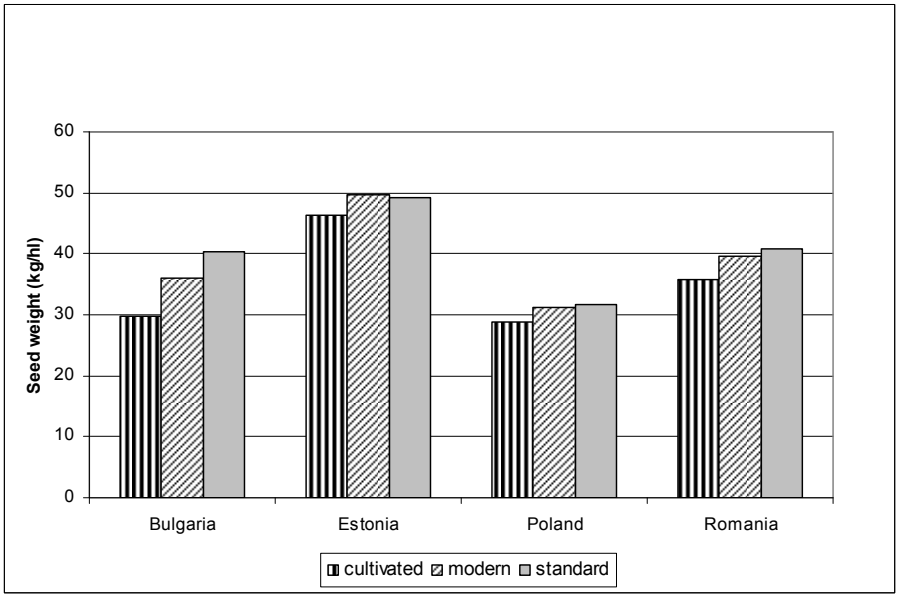

Figure 3 **Seed weight of Avena accessions in four European countries function by biological status**

CONCLUSIONS

The results of this research evidence the following aspects:

The characterization of the 340 oat accessions in 4 sites (Bulgaria, Romania, Poland and Estonia) emphasized a big variability of the agronomic traits (yield grain, seed weight and test weight).

The biggest yield grains, in Poland at modern cultivars were registered.

In Estonia was obtained the biggest seed weight in comparison with the other three countries.

The biggest test weight was registered in Bulgaria, at modern cultivars.

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