Introduction: Oat is a crop with an important European history and tradition. The high value of oat in human nutrition, which is unique among cereals, is widely recognised and confirmed by health claims issued in various countries. It is based on a high content and quality of proteins, considerable content of fat with high proportion of polyunsaturated fatty acids, high contents of dietary fibre, especially the soluble, highly viscous mixed linked (1->3)(1->4)-β-D-glucans, which hypo-cholesterolemic effects, minerals and antioxidants, especially tocopherols, tocotrienols and avenanthramides. Oat is considered moderately susceptible to Fusarium spp. infection and mycotoxin contamination. Nevertheless T2/HT-2 toxins raise considerable concerns in the European health administration (European Commission, 2006).

In a cooperative project with 15 partners in nine European countries genebank material and current commercial varieties are evaluated for traits considered important for future oat breeding in a European premium market. These are quality traits, resistance to contamination by mycotoxins and tolerance to cold.

Materials and methods: The evaluated working collection contains 567 accessions of hexaploid cultivated oats (A. sativa and A. byzantina), including 117 commercial cultivars, 46 accessions of diploid cultivated sand oats (A. strigosa), 5 accessions of tetraploid Abyssinian oats (A. abyssinica) and 34 wild relatives of various ploidy levels (A. fatua, A. hybridra, A. sterilis, A. barbata, A. canariensis, A. damascena, A. hirtula, A. wiestii). In 2008 and 2009
field experiments laid out in augmented designs with eleven standard cultivars (mainly modern varieties bred in different European countries) were performed widely distributed all over Europe to sample harvest material for quality analysis. In three locations artificial inoculation with a mixture of *Fusarium* spp. isolates was performed to analyse *Fusarium* infection and mycotoxin contamination. For comparison a wheat variety was included into these trials. Backbone of a high throughput analysis is NIRS for quality traits and ELISA for deoxynivalenol and T-2 toxin. These are complemented with standard chemical or chromatographic analysis for protein, fat, total and soluble β-glucan, tocols and avenanthramides, various mycotoxins and a qPCR analysis for *Fusarium* spp. determination. Fluorescence is measured for detecting low temperature stress-induced injury on photosynthesis.

All project results will be made available to the genetic resources and breeding communities by the European *Avena* Database (EADB). Web applications are being developed for an oat crop portal supporting management of large cooperative projects on characterisation and evaluation of genetic resources.

**Results and discussion:** Large differences in yield and technological quality (e.g. seed weight) are observed as a result of genotype and environmental influences. Modern hexaploid cultivars are superior in these to obsolete cultivars, wild or diploid types. Overall less diversity with a trend to higher yield and higher seed weight was found in the field experiments for modern cultivars compared to the other types. A reverse trend is seen for protein content. Analytical work is still ongoing. Preliminary results for soluble β-glucan show moderate contents of 4.1 - 4.5 % with a very constant fraction of 63 % being soluble. For avenanthramides extraordinary high values have been observed in diploid *A. strigosa* accessions. The high variability of this trait described in the literature is confirmed. Because of low level of visible *Fusarium* infection in the panicles, seeds were scored for *Fusarium* damages kernels (FDK) or seed infection by freezing blotter test. A significant variability was found for the level of infected seeds without any correlation to other morphological traits measured. Mycotoxin analysis showed large effects of genotype and genotype-environment interaction on mycotoxins accumulation in oats. Within-field variability in the mycotoxins occurrence in the replicated standard cultivars was observed. Nevertheless significant differences could be observed between the replicated standard cultivars. Results from fluorescence analysis for cold tolerance correspond with field results during winter cropping in Bulgaria. Considerable variability for this trait can be found in *Avena* genetic resources.

**References**


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