Development of a database on the quality attributes of released improved sorghum varieties and cultivars in southern Africa

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The need for increased sorghum utilisation in southern Africa was noted by the South African Sorghum Section 7 Committee (2007). It recommended the use of improved sorghum varieties and cultivars to ensure high yield and better grain quality attributes. However, the adoption rate of the available improved sorghum varieties and cultivars in southern Africa is very low (Chisi 2003). This is due to a lack of adequate information and dissemination (Heinrich & Mgonja 2002) both to producers and processors. This study focused on the development of a database on the quality attributes of improved sorghum varieties and cultivars, in order to boost sorghum utilisation. A list of the released and available improved sorghum varieties and cultivars was compiled for eight countries in southern Africa. The information database spreadsheets developed contain the following information: cultivar yield potentials; agronomic and production requirements; plant and grain quality traits; end-use application with reference to malting and brewing quality attributes. Grain quality information provided: grain size, glume colour and traits, grain colour, 1000 kernel weight, percent floaters, dehulling loss, grain texture, milling yield, water absorption, Agtron reflectance value (wet/dry), flour colour, testa presence or absence, and tannin content. The information was gathered from various sources, including existing databases and research data. Nineteen open-pollinating-varieties (OPV) and 45 hybrid (H) cultivars of improved sorghum are available in southern Africa. Sixteen of these improved sorghums are white tan-plant type, while others are red and purple plant type. The grain yield potentials show significant improvement compared to the traditional landraces. Most of these improved sorghums have wide adaptability, resistance to diseases and are drought tolerant. The OPVs have early to medium maturity, while Hs are medium to late maturity. The high tannin cultivars (type III) are mostly Hs. The majority of these improved sorghums are characterised by having uniform grain size and intermediate to corneous endosperm texture. The available grain quality information is limited to milling quality. Malting quality attribute information is available only for few Hs.The high grain yield potentials of the improved sorghum varieties and cultivars can improve the level of sorghum production in southern Africa. Despite the available grain quality information being limited, it can be applied to a certain extent particularly with respect to malting and brewing quality. More complete quality characterisation is necessary, to help sorghum producers and end-users in southern Africa. The database has now been posted on the International Sorghum and Millet Collaborative Research Support Program (INTSORMIL) website (www.intsormil.org).

Keywords
sorghum; southern Africa; grain quality; tannins; hybrids; open-pollinating-varieties; yield potential.

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New insights into iron transport from maternal tissues to endosperm in mature wheat seed using synchrotron radiation

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Iron deficiency is estimated to affect over half of the world's population (Zheng *et al*., 2010). Wheat flour is the main ingredient of bread, and is a staple food for many civilizations. In wheat grains, iron is located in the outer layer, called bran and is lost substantially during milling and processing (Zhang *et al*., 2010). Thus, the flour is almost devoid of iron. Wheat grain with iron-enriched endosperm is of great interest. It is desirable to understand the bottlenecks which prevent iron translocation from the outer bran layers into the endosperm in cereals. Synchrotron radiation can be useful in identifying the transport and state of metals in plant tissues. We generated element localization maps in grains of contrasting genotypes of wheat by using synchrotron powered beam line, VESPERS (very sensitive elemental and structural probe employing radiation), at Canadian Light Source, Saskatoon, Canada. The X-ray Fluorescence analysis was focused at crease, aleurone and endosperm of mature seeds from *Triticum aestivum* and *Aegilops kotschyi*. In high iron genotypes, iron was present at higher concentration in the vascular cells than the aleurone. In contrast, in the low iron genotypes, most of the Fe was mobilized from vascular cells to aleurone cells. To further validate this result and to get accurate quantification of Fe in different tissues, micro-PIXE (Particle induced x-ray emission) analysis of the same samples is in progress at the Biotechnical Faculty and Jozef Stefan Institute, Ljubljana, Slovenia. We recorded XANES (X-ray Absorption Near Edge Structure) spectra at different points of the crease and aleurone layer. The oxidation state of iron in all cases was Fe^{3+}. The pre-edge structures showed one bump, suggesting tetraedric or octaedric Fe-oxygen coordination. To know the chemical coordination environment around iron centre in the cells of different tissues (such as vascular cells, transfer cells, aleurone cells, and endosperm cells), EXAFS (extended X-ray absorption fine structure) is being run on the wheat grain samples.

Keywords
wheat; crease; iron; synchrotron radiation; XRF; XANES; PIXE; EXAFS.

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