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Grain quality improvement of rainy season sorghums

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The grain yield of rainy season sorghum has doubled in India during the 1970s due to the development of high yielding sorghum hybrids. But the area under rainy season sorghum has come down drastically due to a significant reduction in consumption of the rainy season produce. The main reason for this is the poor quality and consequently the low market prices of the grain produced during the rainy season. The high yielding genotypes mature at the time of heavy rains and get infected by grain moulds, which are caused by a complex of fungi. Besides grain moulds, apparent grain quality is another important reason for the lower market price. The grain of rainy season sorghums is usually small, flat and non-lustrous. Post rainy season sorghum grain has higher consumer preference and the market price is about double that of rainy season grain. Grain size, shape, lustre and colour are some of the important grain quality traits that contribute towards consumer preference.

Any improvement in the quality of rainy season sorghum grain would make it more competitive in the market and fetch a remunerative price to the farmer. Breeding efforts to develop grain mould resistance in high yielding genotypes have not paid much dividend because of the complex genetics involved in resistance breeding and high Genetics × Environment interactions (Rodriguez-Herrera *et al.*, 2000; Stenhouse *et al.*, 1997). To reduce grain deterioration and to improve grain quality during rainy season, alternative approaches were developed and tested as a package of technologies (Audilakshmi *et al.*, 2007). The package of technologies include: i. Harvesting at physiological maturity and artificial drying; ii. Identification of cultivars for superior grain quality among the released cultivars; iii. Anti-heating chemical spray to reduce grain deterioration in the wet heaped produce; iv. Pearling of grain to improve the deteriorated grains; and v. Solarization to improve storability of rainy season sorghum. Significant improvement in grain quality and also the market price of the produce were observed by harvesting at physiological maturity and artificial drying. Among the released cultivars, CSH 16 was identified for its good quality and mould tolerance. Its bold, round and lustrous grain fetched up to 16% higher market price. Among the anti-heating chemicals, acetic acid treatment was most effective in reducing grain moulds. The market price was improved when normal deteriorated grain was pearled. The technology of solarization of harvested produce and storing in metal bins helped in reducing the insect infestation by 40%. These technologies can be practiced either independently or in combination to improve the quality of sorghum grain.

The apparent grain quality like grain size, shape and lustre can be improved through genetic means. Genetic analysis revealed that grain size is governed by dominant genes that are polygenic in nature. Predominance of dominance and epistatic interactions indicates that selection for higher grain size would be more effective if *the dominance and epistatic effects are first reduced by a few generations of selfing* (Audilakshmi *et al.*, 2005). Round grain shape is governed by a single dominant gene and grain lustre by two complementary recessive genes. It suggests that developing a sorghum hybrid with bold, round grain is feasible provided either of the parents has bold and/or round grain. However, for the hybrid to be lustrous, both parents need to be lustrous and homozygous for the alleles conferring grain lustre at a common locus. Based on this, crosses were made between the elite lines and the bold seed germplasm lines from world collection and genotypes with improved grain quality were obtained. With genetic manipulation of apparent grain quality, and reducing the grain damage caused by grain moulds by using processing technologies, there is scope for improvement in consumer preference of rainy season sorghum grain and its value addition.

Keywords
grain moulds; physiological maturity; pearling; grain size; lustre; genetics.

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