

Sweet sorghum as biofuel crop for arid and semi-arid regions

■ SANDEEP SINGH TOMAR AND S. SIVAKUMAR

SUMMARY

The economic vulnerability of non renewable energy sources like oil and natural gas reserves, declining global productivity of fossil fuels and the fact that oil and natural gas reserves are finite have created a need to develop alternative fuels from renewable sources. Moreover, the heightening of global warming as a consequence of excessive fossil fuel burning increased the importance of new and eco-friendly sources of energy. Also, the increasing price of fossil fuel and gas due to decreasing supply has created a worldwide need to identify and develop alternative sources of energy. Therefore, development and implementation of technology to improve energy production using biologically available material without sacrificing food security is imperative. Sweet sorghum [*Sorghum bicolor* (L.) Moench] is listed as one of the potential feedstock sources for biofuel production. While sweet sorghum grain can be fermented into ethanol in a similar way as maize, the greatest potential of the crop is based on its massive biomass and sugar rich juices.

Key Words : Sweet sorghum, Ethanol, Grain yield, Juice yield

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Sorghum (*Sorghum bicolor*) is one of the major cereal crops consumed in India after rice (*Oryza sativa*) and wheat (*Triticum aestivum*). It is mainly a dry land cereal crop. The crop is primarily produced in the Deccan Plateau, central and western India apart from some parts of northern India (Rao, 2008). The three states namely Maharashtra, Karnataka and Andhra Pradesh together account for close to 80 per cent of the all-India production (Rao *et al.*, 2010). During 2008-2009, India was the largest grower and also producer of sorghum in the world followed by Nigeria, Sudan and UAS (FAOSTAT, 2010). FAO statistics indicate world grain sorghum production at 58.5 mt from 48.07 mha area with a productivity level of 1391 kg per ha (FAO STAT, 2010). In India, annual sorghum production was 7.25 mt from an area

of 9.18 m ha with a productivity of 962 kg per ha in 2008-2009 (ASCR, 2009).

Sorghum is currently a major staple food crop of rural India and because it is grown mostly by marginal and poor farmers, it has a significant impact on our countries food security. Sorghum has been classified under family *Graminae*, subfamily *Poaceae*, tribe *Andropogonae* and genus *Sorghum*. Sweet sorghum belongs to same species as grain sorghum and fodder sorghum, with a potential to accumulate sugars (10-20 %) in its stalks as in sugarcane (Hunter and Anderson, 1997). Since, sweet sorghum is relatively a new crop to India, the statistical data on its area and production is very meager.

Introduction of sorghum in India :

The origin(s) of the domestication of sorghum and its diversification into five major race and thousands of distinct genotypes is partially known (Smith and Frederiksen, 2000). Genus *Sorghum* showed the greatest variation in the region of the northeast quadrant of Africa comprising Ethiopia, the Sudan and East Africa (Doggett, 1970). Because of this, Africa is considered as the place of origin as it contains maximum number of wild and cultivated species (Chopra, 2001). India is considered as the second centre of origin. It is assumed that during first millennium B.C, sorghum was probably taken to

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Author to be contacted :

SANDEEP SINGH TOMAR, Department of Millets, Centre for Plant Breeding and Genetics, Tamil Nadu Agricultural University, COIMBATORE (T.N.) INDIA
Email: sandeeptomar483624@gmail.com

Address of the Co-authors:

S. SIVAKUMAR, Department of Millets, Centre for Plant Breeding and Genetics, Tamil Nadu Agricultural University, COIMBATORE (T.N.) INDIA