

## Morphological characterization of sorghum [*Sorghum bicolor* (L.) Moench] landraces using DUS descriptor

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### ABSTRACT

Sorghum landraces collected from Dhadgaon and Akkalkua block of Nandurbar district were studied to assess the diversity among these landraces. An experiment was conducted at village level *in-situ* conservation center during *kharif* season of 2016 and 2017. Morphological characterization of 13 landraces of sorghum was undertaken for 25 characters as per DUS guidelines. Traits such as anthocyanin coloured coleoptiles (53.85 %), white coloured leaf midrib (38.46 %), yellow colouration on stigma (84.62 %), grayed orange coloured dry anther (53.85 %), yellow white colour of glumes (30.77 %), semi-compact density of panicle (53.85 %) symmetrical type ear (69.2 %) grayed orange coloured seeds (53.85 %) were dominant in studied landraces. The results of present study showed that panicle branch length was most diverse trait (22.93 %), followed by 1000 grain wt. (17.23 %) and stem diameter (19.71 %) whereas leaf width showed the lowest variation (6.16 %) among studied lines. Analysis of variance showed that all the characters were highly significant among the landraces.

**Key words:** DUS descriptors, Landraces, Morphological characterization, Sorghum.

### INTRODUCTION

Sorghum [*Sorghum bicolor* (L.) Moench; family Poaceae] is a widely grown and important cereal crop in the world, particularly in dry and hot climate. Sorghum has been utilized in different ways including human consumption and animal feed. Sorghum is the fifth most important food security crop serving as the staple dietary source for more than 500 million people worldwide (Amelework, *et al.* 2016). India has enormous diversity of sorghum in both cultivated and wild species; about 19402 and 36,774 accessions of sorghum are being maintained at NBPGR, New Delhi and ICRISAT, Andhra Pradesh respectively (Singh, 2017, Reddy *et al.*, 2006). There are many more studies had been undertaken on diversity of sorghum using agro-morphological traits by various researchers (Durrishahwar *et al.*, 2012, Bhusal *et al.*, 2017, Tesfaye, 2017, Prajapati *et al.*, 2018).

Many annual and dual purpose varieties have been released time to time for cultivation in diverse climatic regions of India (Prajapati *et al.*, 2018) then also there is a need for development of new varieties which will meet the needs of farmers and will resilient in climate change. For the efficient utilization of germplasm, it is prerequisite that it must be properly evaluated, characterized and documented in a workable retrieval system (Reddy *et al.*, 2006; Prajapati *et al.*, 2018). Many tools are now available to study relationships among cultivars including various types of molecular markers however morphological characterization

is the first step in the description and classification of germplasm (Smith and Smith, 1989) and it also help in formation of descriptor's catalogue which is essential in collection, management or for future use in agriculture. Therefore, morphological data becomes very essential to identify diagnostic traits of different genotypes which facilitate plant breeder to select suitable genotypes with distinct traits in crop improvement program. Therefore, the objective of this study was to characterize morphological variability among sorghum landraces, collected from tribal block of Nandurbar district of Maharashtra, India.

### MATERIALS AND METHODS

Thirteen landraces of sorghum have been collected from seed saver farmers in Dhadgaon and Akkalkua block of Nandurbar District. The geographical location of the experiment site was 21°48'49.0" N latitude; 074°11'53.0" E longitude at an altitude of 439 m above sea level. The annual average rain fall of this location is 600 mm. The experiment was conducted at village level *in-situ* conservation center established under Maharashtra Gene Bank Program, which is designed for conservation and revival of local bio-resources through active participation of community. The experiment was laid in randomized block design of plot size 5 m x 4 m replicated three times. The landraces were sown during the month of July 2016 and 2017 at a row spacing of 60 cm and plant to plant spacing of 20 cm. The recommended agronomical package of practices was followed during the active crop growth period. Data on

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yellow, yellow white, grayed orange and grayed purple; among them yellowish white colour of glumes was found at highest (30.77 %) number. Elangovan *et al.*, (2007) evaluated 157 sorghum landraces of Karnataka state also reported a wider variation in glum colour with predominant brown coloured glumes.

Bhusal *et al.*, (2017) also observed glume colour as most diverse character in their study on Sorghum accessions. The semi-compact type of panicle density was most common with 53.85 % landraces. The symmetrical head types of sorghum landraces were the most predominant at 69.2 %. Across studied samples, 53.85 % landraces had freely threshable grains. Grain colour is another diverse character which varied as grayed orange, grayed white, yellow white and yellow orange. Among these grayed orange colour had shown by highest number of (53.85 %) landraces. About 85 % landraces had circular grain shape in dorsal view, 46.15 % landraces had small size of mark of germ on seed and about 46 % landraces had luster on grains. Elangovan *et al.*, (2007) and Thangavel *et al.* (2005) evaluated sorghum accessions on the basis of seed and glume character and observed significant variation in seed colour, seed size, seed shape, size of mark of germ and seed luster. During present study it was found that all the genotypes were distinct from each other and have got different characteristics.

**II) Quantitative traits:** The mean values of quantitative characters of sorghum landraces are given in Table 2. The results of present study showed that panicle branch length was most varied trait giving very less degree of uniformity (22.93 %), followed by 1000 grain wt. (17.23 %) and stem diameter (19.71 %). Among the studied traits, leaf width showed the lowest variation (6.16 %). Among the tested landraces, stem diameter varied from 2.10- 3.74 cm. The leaf length and leaf width ranged between 74.76 - 95.28 cm and 7.64 - 8.28 cm respectively. The plant height varied between 173.5cm to 278.3 cm. Period require for panicle

emergence is one of important traits as it determines crop period. S-40 landrace require minimum (58 days) duration while S-35 landrace requires maximum (83 days) duration for panicle emergence. Anther length varies from 2.90 mm (S-33) to 4.24 mm (S-27). The yield contributing characters like panicle length, panicle branch length and 1000 grain weight were evaluated. An average 1000 grain weight was 24.75 g and ranged between 17.78 g (S-13) to 33.8 g (S-19). 20.33 cm and 8.68 cm were an average panicle length and panicle branch length respectively. The panicle length was found highest in S-29 (25.88 cm) and lowest in S-33 (14.9 cm) while panicle branch length was found highest in S-27 (13.88 cm) and lowest in S-33 (5.78 cm). Observations also showed the variation in panicle neck (6.1 cm to 14.5 cm) and yield per hectare (975 kg - 1090 kg).

## CONCLUSION

Characterization of sorghum landraces during present evaluation based on 25 agro-morphological traits in sorghum for DUS testing indicated that evaluated genotypes had variation for studied traits, particularly for 1000 grain weight, stem diameter, panicle emergence. Some landraces of sorghum showed desired characters like more plant height (S-33 and S-2), early flowering (S-40) and more 1000 grain weight (S-19). The mentioned characters are useful in developing trait specific varieties in Sorghum. Such unexploited genepool existing in remote areas of Maharashtra could be utilized by plant breeders while planning targeted sorghum breeding program.

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