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SHORT COMMUNICATION

# Characterization of Sorghum (*Sorghum bicolor* (L.) Moench) Germplasm under CRP-Agro Biodiversity

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One thousand sorghum germplasm accessions were evaluated and characterized at SDAU Deesa (Gujarat) under Consortium Research Platform on Agro-biodiversity and majority of accession showed good early vigour, dark green leaves, non-tan type, drooping leaf orientation, white mid rib color, non-senescence, awn less, semi compact ear head, oblong ear head shape, half glum covered, bold and white seeded. The quantitative characters also showed wide variation and the potential germplasm may be utilized for further breeding program.

**Key Words: Agro-biodiversity, Correlation, Genetic Variation, Germplasm**

Plant genetic resources collection and characterization provides researcher with essential genetic variation to develop new varieties that can significantly impact agricultural systems. Germplasm characterization and documentation are important activity in plant genetic resources management and it eases data retrieval and short listing accessions for the genetic improvement. Germplasm utilization is increased if detailed characterization data is obtained for individual accessions, which should include qualitative and quantitative phenotypic traits, genotypic data, and responses to biotic and abiotic stresses. Detailed characterization data is lacking for more than 50% of the sorghum collections, which emphasizes the need for further data collection. Characterization and evaluation of sorghum accessions are the pre-requisite for the utilization of available diversity in the sorghum crop improvement programme. The study of relationships among quantitative traits is important for assessing the feasibility of joint selection of two or more traits and hence for evaluating the effect of selection for secondary traits on genetic gain for the primary trait under consideration. A positive genetic correlation between two desirable traits makes the job of the plant breeder easy for improving both traits simultaneously. Hence, the present study was under taken by the ICAR-Indian Institute of Millets Research (IIMR), Hyderabad through the All India Coordinated Research Project on Sorghum at Sorghum Research Station, Sardarkrushinagar Dantiwada Agriculture University, Deesa under Consortium Research Platform on Agro-biodiversity to characterize 1000 accessions of sorghum germplasm. The variability present in the germplasm was studied through preliminary characterization for different quantitative and qualitative traits provide essential data to researchers for development of new high yielding varieties and parental lines in sorghum.

The trial was grown in Augmented Block Design (ABD) during *Kharif* 2016 at Sorghum Research Station, Sardarkrushinagar Dantiwada Agricultural University, Deesa, Gujarat (72ºE longitude, 24.5º latitude, 136 m altitude above MSL). These accessions were divided into twenty blocks and each block consisted of 50 accessions with two check varieties viz., CSV 15 and CSV-21F. The soil of the field was sandy in texture with pH value of 7.5 to 8.00 having good physical and chemical properties (Organic Carbon= 0.23, EC dsm- = 0.232, $K_2O$= 259.9 kg/ha and $P_2O_5$= 46.2 kg/ha). The experimental unit was a single-row plot of 2.5 m long, spaced at 0.60 m apart. NPK 120:40:00 fertilizers was applied as half basal dose of nitrogen and full dose of phosphorus at the time of sowing and half nitrogen applied after one month of sowing. Plots were thinned down

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after two weeks of crop emergence and plant-to-plant distance of 0.10 m was maintained. The experimental year showed different temperature regimes, humidity, rainfall and sunshine hours during the crop duration. All the other recommended agronomical packages and practices were followed to raise a good crop. Data was collected based on the minimal descriptors released by NBPGR, New Delhi (Mahajan *et al.*, 2000) and the list of sorghum descriptor released by Anonymous (1993). Five representative plants in each accession were tagged for recording the qualitative and quantitative traits. A descriptive statistical analysis and correlation estimate was done for the quantitative characteristics only.

The data of preliminary characterization of 1000 accessions of sorghum germplasm were recorded for 22 agro-morphological characters revealed a wide range of variability in both quantitative and qualitative characters. The range of variability and frequency observed in qualitative characters are given in Table 1. Majority of the accessions showed good early vigour (580 acc.), dark green leaves (457 acc.), non-tan type (956 acc.), drooping leaf orientation (741 acc.), white midrib color (902 acc.), awn-less (353 acc.), non-senescence (309 acc.), semi compact earhead (520 acc.), oblong earhead shape (109 acc.), white (65 acc.), bold seed (109 acc.) and half glume covered seed (147 acc.).

The quantitative characters also showed wide variation in the characterized sorghum germplasm. In the quantitative traits, days to 50% flowering (23.00-100.00 days), total number of leaves (5.00-25.200), leaf length (38.40-145.60 cm), leaf width (3.14-11.62 cm), ear head length (5.94-45.20 cm), ear head width (1.58-22.10 cm), plant height (56.00-368.60 cm), 100-seed weight (1.00-5.27 g), dry-fodder yield (26.00-924.80 g) and grain yield (23.00-100.00 g) showed wider ranges. The preliminary characterization and descriptive statistics revealed that dry-fodder yield, plant height, grain yield, leaf length, days to 50% flowering and ear head length were the most variable characters because they showed higher variance and standard deviation. Earlier reports by Elangovan *et al.* (2009, 2013), Seetharam and Ganesamurthy (2013) and Sujatha and Pushpavalli (2017) have also exhibited the presence of variation for different quantitative characters in sorghum germplasm accessions.

Generally, yield is the complex characters controlled by several components which reflect positive and negative effect on this traits. Thus, to achieve regular enhancement in the yield and component traits, understanding of mechanism of association provides a foundation for formulating suitable breeding approaches for enhancing the yield. On the basis of the present data on grain yield per plant, showed positive and significant correlation with days to 50% flowering (+0.430), total number of leaves (+0.251), leaf length (+0.349), leaf width (+0.428), ear head length (+0.144), ear head width (+0.301), 100-seed weight (+0.311) and dry-fodder yield per plant (+0.021) while plant height (-0.602) showed negative correlation with grain yield which help to identify high seed yield genotypes. High positive and significant correlation was observed between days to 50% flowering with total number of leaves per plant (+0.377), leaf length (+0.590), leaf width (+0.166), plant height (+0.645), grain yield (+0.430) and dry-fodder yield per plant (+0.500) which helps in identifying early genotypes with high biomass.

**Table 1. Frequency distribution of sorghum germplasm for different qualitative traits**

| Characters | Frequency | Characters | Frequency |
|---|---|---|---|
| Early vigour | | 6. Broom comb | 1.00 |
| Poor | 46.00 | Glum covering | |
| Good | 580.0 | 1. One fourth | 136 |
| Very good | 376.00 | 2. Half covering | 147 |
| Leaf color | | 3. ¾ covering | 24 |
| Pale green | 148.00 | Grain color | |
| Dull green | 395.00 | White | 65.00 |
| Dark green | 457.00 | Straw | 30.00 |
| Leaf sheath pigmentation | | Light brown | 46.00 |
| Tan | 46.00 | Brown | 6.00 |
| Non tan | 956.00 | Reddish brown | 9.00 |
| Leaf orientation | | Light red | 7.00 |
| Erect | 259.00 | Red | 21.00 |
| Drooping | 741.00 | Dark red | 11.00 |
| Leaf mid rib color | | Purple | 46.00 |
| White | 902.00 | Black | 25.00 |
| Green | 76.00 | Straw &brown | 2.00 |
| Yellow | 22.00 | Straw & purple | 4.00 |
| Ear head compactness | | White and red mix | 27.00 |
| Compact | 29.00 | Grain size | |
| Semi compact | 125.00 | Small | 96.00 |
| Loose | 97.00 | Medium | 94.00 |
| Very loose | 25.00 | Bold | 109.00 |
| Ear head shape | | Presence of Awn | |
| Round | 1.00 | 1. Absent | 353 |
| Oblong | 109.00 | 2. Present | 30 |
| Ovate | 75.00 | Stay green color | |
| Elliptical | 28.00 | Non senescence | 309 |
| Cylindrical | 84.00 | Senescence | 44 |

The dry-fodder yield was also significant and positively correlated with days to 50% flowering (+0.500), total number of leaves (+0.351), leaf length (+0.545), leaf width (+0.228) and plant height (+0.602). The other component traits were also showed inter-correlated with each other which will also help in selection of suitable sorghum genotypes. Based on the mean some of the accessions showed outstanding performance for different agro-morphological traits viz., early flowering (EC487069 and EC486957 with 23 and 43 days) total number of leaves (EC486946 and EC487120 with < 19.6), leaf length (EC487226 and EC487500 with < 104.4 cm), leaf width (EC487499 and EC487501 with < 10.1 cm), ear-head length (EC487023 and EC487205 with < 42.7 cm), ear-head width (EC486919 and EC487091 with < 14.80 cm), plant height (EC487273 and EC487116 with < 316.2 cm), 100-seed weight (EC486884 and EC487085 with < 4.9 g), dry fodder yield (EC487409 and EC486839 < 696.0 g/ plant) and seed yield (EC486956 and EC486809 with < 139.2g). These accessions with potential for different agro-morphological traits may be utilized in crop improvement program for developing superior varieties and parental lines.

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