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EVALUATION OF MAJOR MORPHOLOGICAL VARIABILITY FOR QUALITATIVE TRAITS IN FINGER MILLET (*ELEUSINE CORACANA* L. GAERTN) ACCESSIONS

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ABSTRACT

The study was conducted in *Kharif* 2019 at Research Farm of S.G. College of Agriculture and Research Station, Kumhrawand, Jagdalpur, Bastar (C.G.) to characterize 85 accessions of finger millet in augmented design. Observations taken on qualitative characters on morphology, viz. leaf sheath pubescence, plant /nodal pigmentation, glume colour, stem culm branching, ear shape, Finger branching, position of finger branching, seed shattering, seed colour and pericarp persistence. Observed traits show their presence as leaf sheath pubescence (66%), plant /nodal pigmentation (41%), glume colour light green (34%) compact ear shape (33%); seed shattering (79%) and light brown colour of seed (35%) was found dominant among studied accessions.
Keywords: Evaluation, DUS, germplasm, qualitative traits.

Introduction

Finger millet, *Eleusine coracana* (L.) Gaertn is an allotetraploid (2n = 4X = 36, AABB) belonging to the Family Poaceae and the genus *Eleusine.* The genome size of finger millet is 1,593 Mb and is a self-pollinated crop (Goron and Raizada, 2015). It is an annual herbaceous cereal crop widely grown and consumed by poor people in Africa and Asia. It is a staple food crop for drought prone areas of the world and it is considered to be an important crop for food and nutritional security. In India it is an important crop amongst the small millets and third in its importance among millets, in the country in area and production after sorghum and pearl millet. It is cultivated mostly as a rainfed crop in India under diverse production environments. It contains rich amounts of protein, mineral nutrient as compared to other major cereals like wheat, rice, and sorghum (Gupta *et al*., 2017). In India Finger millet area 1169 ha., production 1873 ton and productivity 1601 kg ha^{-1} and in Chhattisgarh finger millet area 6.9 ha., production 1.3 ton and productivity 188 kg ha^{-1} (Anon.2018). Finger millet is very nutritious with good quality protein, minerals, dietary fibers, photochemical and vitamins. Selection for yield on the basis of per se performance alone may not be as effective as that based on the component qualitative characters associated. This germplasm is exposed to changing climatic conditions and accumulated considerable diversity for vegetative, reproductive and physiological characters over the years of domestication. (Karad *et al.,* 2013).

Materials and Methods

A set of 85 germplasm with four replicated checks of finger millet, were evaluated in augmented randomized block design conducted in *Kharif* 2019 at the Research Farm of S.G. College of Agriculture and Research Station, Kumhrawand, Jagdalpur, Bastar (C.G.) situated in 19°4'0" N and 82°2'0"E. The city is nestled on the Bastar Plateau and is positioned at a height of around 552 meters from the mean sea level. The crop was shown on 17th July 2019.The seeds were directly line sown. The spacing is of 23 cm within rows and 10 cm between the plants was followed. A basal dose of 20 kg N/ha and 25 kg DAP/ha was applied at the time of sowing. All recommended cultural practices were carried out to raise a good crop in one season. Recommended package of practices was followed during crop growth period. The visual observations were recorded on 10 qualitative traits viz.

leaf sheath pubescence, Plant /nodal pigmentation, glume colour, stem culm branching, ear shape, Finger branching, Position of finger branching, seed shattering, seed colour, and Pericarp persistence recorded according to morphological descriptor DUS guideline provided by Protection of Plant Variety and Farmers Right Authority.

Results and Discussion

Qualitative characters

Qualitative characters are encoded by one or few genes and generally do not change in response to the environment. These parameters are expressed as discrete values and can be analyzed by counts and ratios. Qualitative characters are useful criteria for characterization of genotype accessions, as they show high heritability and stable expression. Further, if qualitative characters show association with yield components, it can serve as a morphological marker in the selection process. The 10 qualitative characters *viz.,* leaf sheath pubescence, stem culm branching, pigmentation at node, glume color, ear shape, finger branching, the position of branching, seed color and Pericarp persistence were recorded and results so obtained are described character-wise below.

Leaf Sheath pubescence

All finger millet genotypes under study were classified into the presence and absence of leaf sheath Pubescence. Among 85 finger millet genotypes, 56 showed presence of Leaf Sheath pubescence (66%) and 29 genotypes showed the absence of leaf sheath pubescence (34%) (Fig.-1). Similar results in agreement with the present study were observed in Patil *et al.* (2019). The hairiness of leaf sheath was observed in 55 percent accessions**.**

Plant /nodal pigmentation

A total of 85 genotypes showed the presence of plant/nodal pigmentation *i.e.* purple color (41%) and 50 genotypes (59%) showed lack of pigmentation i.e. showed green color (Fig-2). Similar results were found in Malambane and Jaisil (2015) also observed that green (63.4%) and purple (36.6%) type plants in 82 accessions of finger millet. The results indicated that, if the accessions are deliberately chosen for evaluation and properly characterized nodal pigmentation can be used for distinguishing the genotypes as a morphological marker. Upadhyay and Singh (2009) also reported that plant color and the entire eastern African finger millet germplasm accessions were classified as green and pigmented. Among the 1993 accessions, 65% were green plant types and the rest were pigmented types 35% by the researchers.

Glume colour

Glume color in finger millet is of five types' i.e. white, light green, dark green light, purple and dark purple. Among 85 genotypes, 29(34%) had light green glume color, 14 (16%) showed dark green glume color, 27 genotypes (32%) showed light purple glume color and 15 genotypes (18%) showed dark purple glume color. No genotype had white glume color (Fig. 3). It is one of the most important traits of the morphological identity of a genotype which is highly heritable and helps to characterize the cultivars. Glume color can be used for identification, characterization, and classification of different genotypes. Kumar *et al.* (2019) reported that out of different variation for glume coloration, dark green was dominant (58.70 %), followed by light purple (28.26 %) and dark purple (13.04 %). However, none of the entries were found to be white or light green for glume color.

Stem culm branching

All finger millet genotypes under study were classified into branched and unbranched at the stem. Among 85 finger millet genotypes, 41 showed stem culm branching (49%) and 43 genotypes showed the absence of stem culm branching (51%) (Fig. 4). Stem culm branched genotypes are desirable as they increase the yield by producing a greater number of ears per plant, as compared to unbranched genotypes. Patil *et al.* (2019) is classified that the Culm branching was observed that 6(30%) accessions.

Ear shape

Ear shape in finger millet namely fist, compact, semi-compact, open and droops type. Among finger millet genotypes taken under consideration, 12 were fist type (14%), 28 were compact (33%), 19 were semi-compact (22%), 17 were open (20%) and 11 was droopy (11%) is of five types (Fig-5). Similarly, Patil *et al.* (2019) in their study it was reported that the shape of ear varied as open, semi-compact, compact and fist type. The majority of accessions (60 %) showed semi-compact type of ear; open (25 %) type followed by fist type (10 %) and compact (5 %) in about study.

Finger branching

The finger millet genotypes can be grouped into two categories based on the presence and absence of finger branching. Among test accessions, 23 genotypes showed the presence of finger branching which contribute to about 27% of the total materials studied. The remaining 62 genotypes showed the absence of finger branching which constitute 73% of the genotypes (Fig. 6). Patil *et al.* (2019) reported that the

finger branching was observed on 8 accessions, out of which 4 accessions are branching in all fingers while 4 accessions had branching only in thumb characterization and identification of genotypes and protection of plant breeder rights against infringement.

Position of finger branching

Based on the standard descriptors of finger millet, genotype that possessing finger branching can be again grouped into two classes based on the position of branching. The genotypes showed two types of position, *i.e*., branching in thumb fingers and branching in all fingers. Out of 85 genotypes, 73 genotypes showed branching in thumb fingers which constituted about 86% of the total genotypes consisting of finger branching. The remaining 12 genotypes showed branching in all fingers which was 14% of the finger branched genotypes (Fig-7). This character showed considerable variability in the genotypes studied therefore it can be fairly used for characterization and identification of genotypes. Similar results were observed in agreement with the present study by Patil *et al.* (2019) they recorded that Finger branching was observed in 8 accessions, out of which 4 accessions had branching in all fingers while 4 accessions had branching only in thumb finger.

Seed shattering

Seed shattering in finger millet was classified into two groups based on presence and absence. Among the test accession, 18 genotypes showed the presence of seed shattering of finger which contributes 21% of the total material studied. The remaining 67 genotypes showed the absence of seed shattering which constitutes 79% of the genotypes. (Fig. 8) Patil *et al.* (2019) was reported that 90 percent accessions were non-shattering type Most of the accessions (60 percent).

Seed colour

Seed color in finger millet is of five types' *i.e*. white, light brown, and copper brown, dark brown. Among 85 genotypes 30 (35%) had light brown seed color, 28(33%) showed copper brown seed color, and 27 (32%) showed a dark brown seed color. No genotype had white seed color (Fig. 9). Upadhyay and Singh (2009) were reported that, in a wide range of grain colors was observed in eastern African finger millet germplasm accessions: light brown (71.65%), reddish-brown (16.66%), dark brown (7.18%), ragi brown (4.26%) and white (0.25%). All types of grain color were observed in accessions from Ethiopia and Kenya.

The results in agreement with the present study were observed with Seed color varied as white, light brown, copper brown, and dark brown and light brown was the most dominant (75%) color among studied accessions. Malambane and Jaisil (2015) recorded ragi brown seed color as most dominant in Thailand germplasm among six seed colors viz. white, light brown, brown, ragi brown, red and purple. The studied accessions showed variation in seed shape as reniform (50%), round (40%) and ovoid (10%) while trait seed surface was observed as smooth (50%) and rough (50%).

Pericarp Persistence

All finger millet genotypes under study were classified into Persistence and Non-persistence seed. Among 85 finger millet genotypes, 60 showed Persistence of Pericarp after threshing (71%) and 25 genotypes showed Non-persistence of Pericarp after threshing (29%) (Fig.10). Kumar *et al.* (2019) for pericarp persistence after harvesting, non-persistent types were observed to be dominant, as they cover major (76.08 %) of the total population.

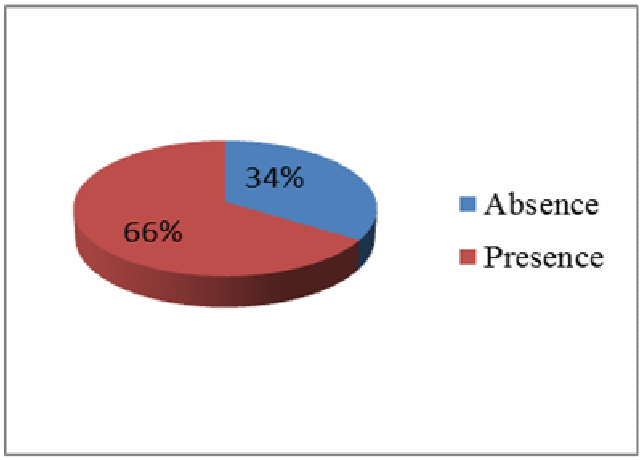

Fig. 1 : Leaf sheath pubescence

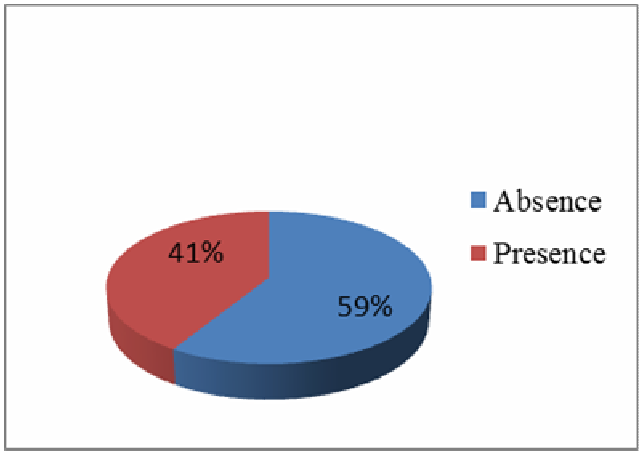

Fig. 2 Plant/ nodal pigmentation

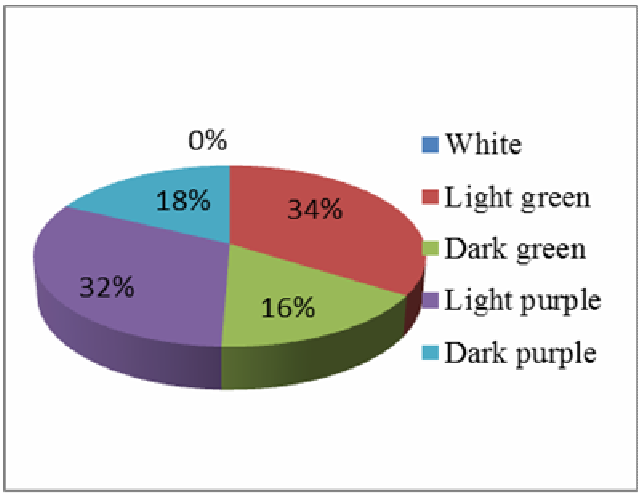

Fig. 3 : Glume colour

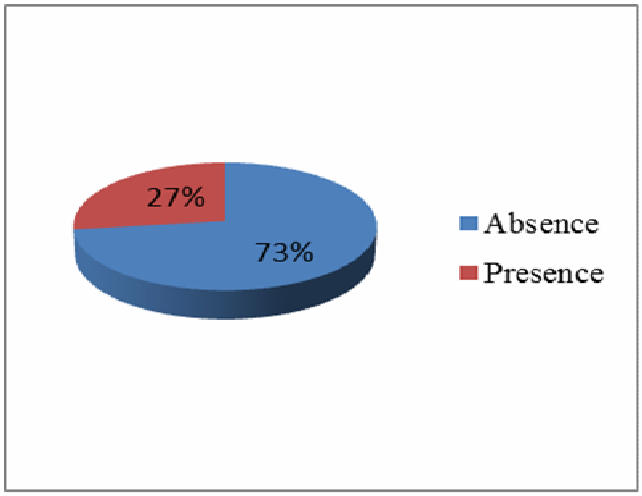

Fig. 6 : Finger branching

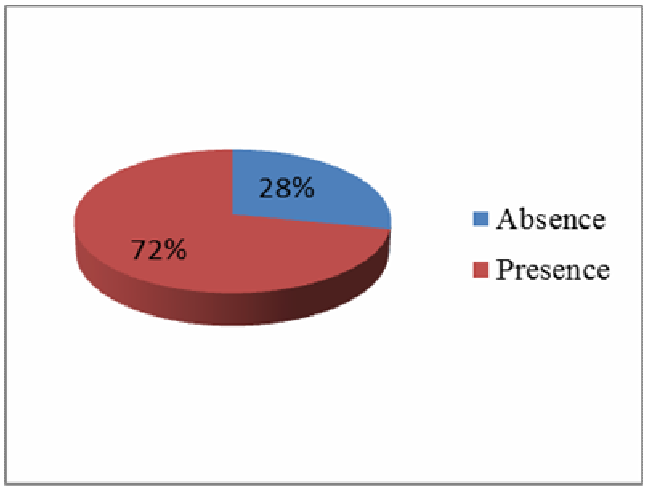

Fig. 4 : Stem culm branching

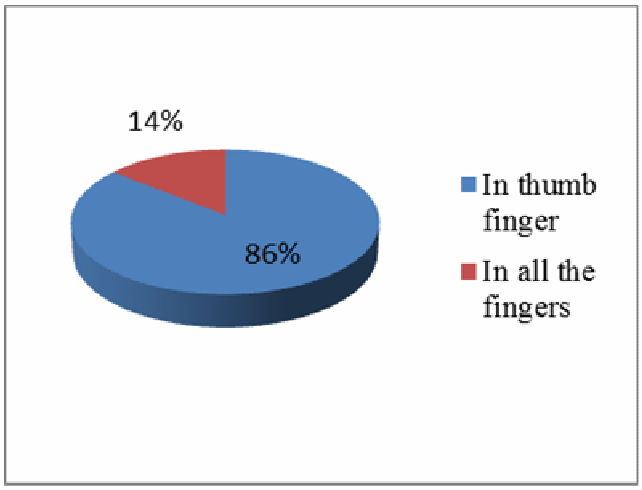

Fig. 7 : Position of finger branching

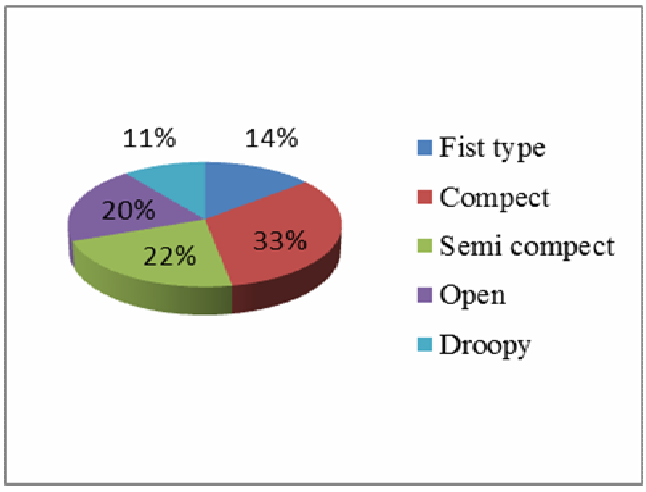

Fig. 5 : Ear shape

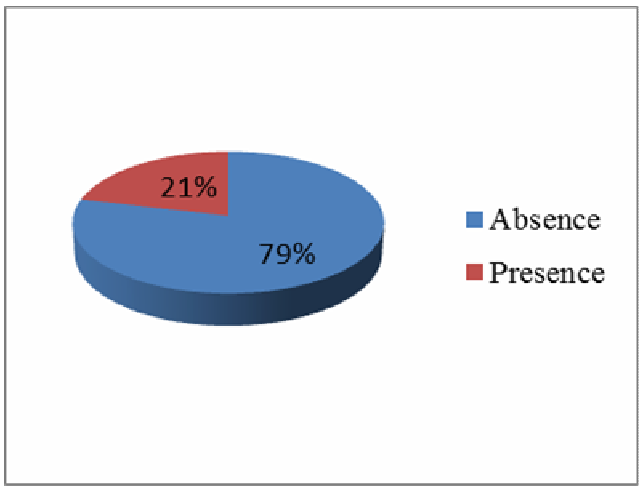

Fig. 8 : Seed shattering

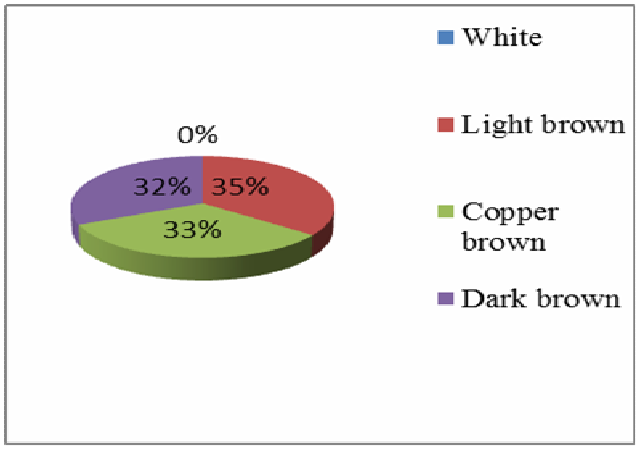

Fig. 9 : Seed colour

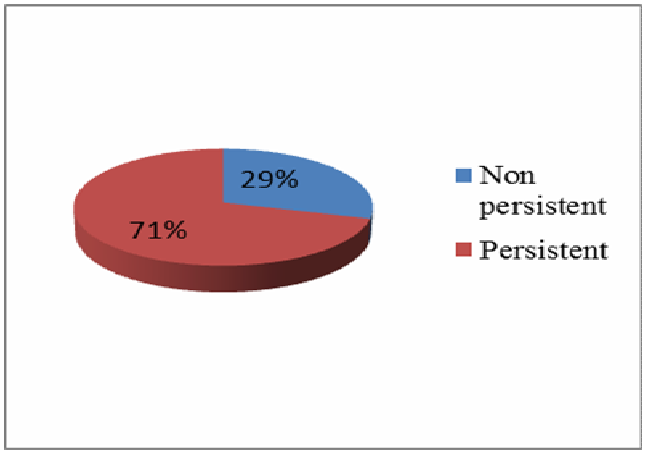

Fig. 10 : Pericarp persistence

Plate 1 : Plant /Nodal pigmentation

Table 1 : Description of qualitative characters in finger millet

S.No.	Characters	Growth stage	Types
1	Plant/nodal pigmentation	Flowering	Absent
			Present
2	Leaf sheath pubescence		Absent
			Present
3	Glume colour	Flowering	White
			Light green
			Dark green
			Light purple
			Dark purple
4	Stem culm branching	Flowering	Absent
			Present
5	Ear shape	Flowering	Fist type
			Compact
			Semi compact
			Open
			Droops
6	Finger branching	Dough stage	Absent
			Present
7	Position of finger branching	Dough stage	In thumb finger
			In all fingers
8	Seed colour	Maturity	White
			Light brown
			Copper brown
			Dark brown
9	Pericarp: Persistence after threshing	Non-Persistent	Absent
		Persistent	Present
10	Seed shattering		Absent
		Maturity stage	present

Conclusion

The study revealed significant differences among the finger millet accessions and evaluate existed in the collected germplasm. Major qualitative characters based on DUS descriptors Viz. Plant/nodal pigmentation, Leaf sheath pubescence, Glume colour, Stem culm branching, Ear shape, Finger branching, Position of finger branching, Seed colour, Pericarp: Persistence after threshing, Seed shattering was found dominant among studied accession are important influencing characters responsible for diversity. The conservation and further improvement of these germplasm is a need of an hour and the targeted finger millet improvement programme may be undertaken in future.

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