Biological Forum – An International Journal **13(4): 353-356(2021)**

ISSN No. (Print): 0975-1130
ISSN No. (Online): 2249-3239

Morphological characterization of White Finger Millet [*Eleusine coracana* (L.) Gaertn] Genotypes for Qualitative Traits

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(Received 23 August 2021, Accepted 23 October, 2021)
(Published by Research Trend, Website: www.researchtrend.net)

ABSTRACT: White finger millet gaining importance due to its superior colour appearance, consumer acceptability and wider application in bakery industries. Among 55 accessions, most of the entries recorded erect growth (67.27 %), semi compact ears (27.27 %), non-pigmented leaf juncture (50.90 %), non-pubescent leaf sheath (52.72 %) and non-culm stem branching (58.18 %). Most of the accessions exhibited absence of branched fingers (63.63 %) with absence of multiple whorls (58.18 %) among non-branched fingers was for in thumb position (54.54 %). Seeds of majority of accessions exhibited enclosed glume cover (50.90 %), round shape (60 %), smooth surface (61.81 %) and non-persistent pericarp (43.63 %) with non-shattering nature (58.18 %). White finger millet accessions showed wider variation for qualitative characters and selection of genotypes for high yield helps in white finger millet improvement programme.

Keywords: Characterization; Germplasm; Qualitative traits; White finger millet.

INTRODUCTION

Finger millet (*Eleusine coracana* (L.) Gaertn) is a subsistence farming crop cultivated in Africa and South Asia. Finger millet accounts for 4-4.5 mha at global scenario with the production of about 5 million tonnes (Anon., 2012). Finger millet seeds are used in a variety of products, including unleavened bread (roti), mudde, thin or thick porridge, fermented porridge, and brewing. Due to its higher grain fiber content and health benefits associated with its consumption demand for white finger millet has gained importance in urban and metropolitan areas. However, brown or dark brown colour has been a key barrier to their acceptance in the baking and culinary industries. White seed types are typically preferred among the dark brown and white seed types because of their higher protein, low fibre, low tannins, and higher consumer acceptance. (Sharathbabu *et al*., 2008). However, the yield of white seeded finger millets is lower than that of brown finger millet. White finger millet is nutrition rich millet with a protein content of about (7.3g/100g) (Malleshi and Klopfenstein., 1998), higher dietary fibre (15-20 %), (Chethan and Malleshi, 2007) and contains highest amount of calcium (344mg/100g) (Gopalan *et al.*, 2002). Finger millet is an excellent staple food and famine reserve crop because of its wider adaptability to diverse climatic condition (Uphadhayaya *et al*., 2007), higher nutritional content, higher seed multiplication rate, and longer shelf life under ambient conditions.

Characterization consists recording those traits that are highly heritable, visible to the naked eye and expressed in all environments. Qualitative traits are more reliable for characterization of verities since they are more stable over generations. Plant growth habit, stem culm branching, ear shape, finger branching, finger position of branching, finger multiple whorl, pigmentation at leaf juncture, seed shattering, leaf sheath pubescence, pericarp persistent after threshing, seed shape, seed surface, and seed covering by glumes were among the 13 qualitative traits used to characterize 55 white finger millet genotypes.

MATERIALS AND METHODS

The preset experiment with 55 white finger millet genotypes for qualitative morphological descriptors were evaluated at the Agricultural Research Station,

Hagari, Ballari, Karnataka. The experiment was set up in a Randomized Block Design with one check variety of white finger millet (KMR-340) procured from the Indian Institute of Millets Research (IIMR), Hyderabad. Observations for 13 qualitative traits were recorded such as plant growth habit, stem culm branching, ear shape, finger branching, finger position of branching, finger multiple whorl, pigmentation at leaf juncture, seed shattering, leaf sheath pubescence, pericarp persistent after threshing, seed shape, seed surface and seed covering by glumes. Above observations were recorded based on phenotypic appearance during different crop stages which followed the guidelines of DUS formulised by PPV&FR (Anon., 2019).

RESULTS AND DISCUSSION

Visual assessment of 55 white finger millet accessions was recorded for 13 qualitative traits mentioned in Table 1. Erect growth habit was observed in 67.27 % of the entries, whereas decumbent and prostrate growth habits were observed in 23.63 % and 9.09 % of the entries, respectively. Leaf juncture of 49.09 % germplasm, including IC0475624, IC0473924, IC0474183, IC0474219, E 319 and E 331 etc had recorded pigmented leaf juncture, while leaf junctures of remaining genotypes were shown unpigmented. Leaf sheath pubescence is vital trait of the white finger millet which resists water and heat tolerance by reducing the temperature of the canopy.

Table 1: Qualitative grouping of white finger millet genotypes.

Sr.No.		Code	Characters	No. of germplasms	% contribution of germplasms
1.			**Plant growth habit**		
		1	Erect	37	67.27
		5	Decumbent	13	23.63
		7	Prostrate	5	9.09
2.			**Stem culm branching**		
		1	Absent	32	58.18
		9	Present	23	41.81
3.			**Ear shape**		
		1	Fist type	8	14.54
		3	Compact	13	23.63
		5	Semi compact	15	27.27
		7	Open	10	18.18
		9	Droopy	9	16.36
4.			**Finger branching**		
		1	Absent	35	63.63
		9	Present	20	36.36
5.			**Finger: position of branching**		
		3	In thumb finger	30	54.54
		5	In all the fingers	25	45.45
6.			**Finger: multiple whorl**		
		1	Absent	32	58.18
		9	Present	23	41.81
7.			**Pigmentation at leaf juncture**		
		1	Absent	28	50.90
		9	Present	27	49.09
8.			**Seed shattering**		
		1	Absent	32	58.18
		9	Present	23	41.81
9.			**Leaf sheath pubescence**		
		1	Absent	29	52.72
		9	Present	26	47.27
10.			**Pericarp: persistent after threshing**		
		1	Non persistent	24	43.63
		9	Persistent	16	29.09
		6	Semi-persistent	15	27.27
11.			**Seed shape**		
		1	Round	33	60
		3	Reniform	0	0
		5	Ovoid	22	40
12.			**Seed surface**		
		3	Smooth	34	61.81
		7	Rough	21	38.18
13.			**Seed covering by glumes**		
		2	Enclosed	28	50.90
		4	Intermediate	17	30.90
		6	Exposed	10	18.18

Among 55 white finger millet evaluated entries, genotypes with smooth seed surface were the dominant (61.8 %), followed by the rough seed surface (38.18 %) genotypes. Out of different variation for seed covering by glumes enclosed was dominant (50.90 %), followed by intermediate (30.9 %) and exposed (18.18 %). Stem Culm branching provides lodging resistance during physiological maturity stage of the crop growth period. Culm branching of stem was present 41.81% of germplasm entries, including IC0473924, IC0474227, IC0474215, IC0473948 and IC0473971 etc. Ear shape is a essential trait in yield improvement and contributes to sub-racial identification of finger millet. Among all the studied accessions, semi compact type ears were prominent (27.27%) includes IC0474183, IC0473957, IC0473972, IC062196 and ER 97 followed by entries with compact (23.63 %), open (22.82 %), droopy (18.18 %) and first type (16.36 %) ear shapes.

The genotypes were categorized as absent or present for trait finger branching. Only 36.36% of accessions *viz.*, IC0474219, IC0474227, IC0474232, IC0065595, IC0474215, IC0473970, IC0473986, E 325 and E 331 have shown profuse finger branching, while rest of the accessions exhibited non branched fingers. Out of total genotypes, 54.54 % genotypes shown in thumb finger branching, includes IC0473989, IC0474207, IC0474232, VL 352 and IC0473972. While remaining 45.45% genotypes have shown in all the fingers branching.

This trait could also be considered as yield attributing character. Among total evaluated genotypes 41.81 % IC0473989, IC0473986, IC0473993, IC0474045, IC0474206, IC0474225, IC0621993, E 325 and E 331 exhibited the presence of multiple whorls in finger, while remaining genotypes recorded 58.18 % absence of multiple whorls. Seed shattering is a vital trait for harvesting point of view, with non-shattered accessions considered more desirable. Out of total, only 41.81 % entries were non-shattering including genotypes *viz.*, IC0473989, IC0474183, VL 352, IC0473947, IC0473980, E331, IC0621996 and IC0402775.

CONCLUSION

The present experiment was conducted to characterization of white finger millet genotypes based qualitative traits. Study revealed that white finger millet accessions showed wider variation for qualitative characters and selection for high yielding genotype which helps in white finger millet improvement programme. The superior high yielding genotypes identified in the present study are further tested in the multi location trails to study their stability performance for yield. Diverse genotypes identified from the study can used for hybridization programme for isolation of high yielding transgressive segregants of white finger millet.

Open | Compact | Droopy | Semi compact

Variation for ear shape in white finger millet genotypes

In all the fingers | In thumb finger | Erect | Prostrate

Variation for finger position of branching in white finger millet genotypes

Variation for plant growth habit in white finger millet genotypes

Accessions are classified as enclosed, intermediate, and exposed based on seed covering by glumes. Enclosed glumes coverings were observed in 50.90 % of the accessions, whereas intermediate and exposed glume coverings were found in 30.90 % and 18.18 % of the entries, respectively. Seed shape is an important economic trait. Based on seed shape entries grouped as round, reniform and ovoid. Most of the white finger millet genotypes (60 %) produced round shaped seeds, none of the genotypes were recorded reniform shape and ovoid (40 %). Round shaped seeds have higher consumer acceptability over other type seed shape. Out of total entries, non-persistent types were shown dominant in pericarp persistent after threshing, as they recorded (43.63 %) of total population. Whereas persistent and semi persistent were reported in 29.09 % and 27.27 % respectively.

Finger millet characterization based on visual agro-morphological characters was found to be the quickest and most successful method, requiring less time and money even when a large number of entries were evaluated. Bezaweletaw *et al.*, (2007); Reddy *et al.*, (2009); Malambane and Jaisil (2015); Bisht *et al.*, (2015); Patil *et al.*, (2019) have been performed qualitative characterization in finger millet genotypes.

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How to cite this article: Basavaraj, Yogeesh, L.N.; Lokesh, G.Y.; Girish, G. and Hiremath, U. (2021). Morphological characterization of White Finger Millet [*Eleusine coracana* (L.) Gaertn] Genotypes for Qualitative Traits. *Biological Forum – An International Journal, 13*(4): 353-356.