

GUIDELINES
FOR THE CONDUCT OF TEST FOR
DISTINCTIVENESS, UNIFORMITY AND STABILITY

On

Finger millet
(Eleusine coracana (L.) Gaertn.



Protection of Plant Varieties and Farmers' Rights Authority
(PPV & FRA)
Government of India

Finger millet (*Eleusine coracana* (L.) Gaertn.

I. Subject

These test guidelines shall apply to all varieties, hybrids and parental lines of Finger millet (*Eleusine coracana* L. Gaertn.)

II. Materials required

1. The Protection of Plant Varieties and Farmers' Right Authority (PPV&FRA) shall decide when, where and in what quantity and quality of the seed material is required for testing a varietal denomination applied for registration, under The PPV&FR Act, 2001. Applicants submitting such seed material from a country other than India shall make sure that all customs and quarantine requirements stipulated under relevant National legislations and regulations are complied with. The minimum quantity of seed material to be supplied by the applicant shall be 250 grams. The seed shall be packed and sealed in ten equal weighing packets (25 gm each) and submitted in one lot. In addition, 10 panicles need to be submitted.
2. The seeds submitted shall have the following standards for germination capacity, moisture content and physical purity
 - a) Germination : 80% (Minimum)
 - b) Moisture content : 10-12% (Maximum)
 - c) Physical purity : 97% (Minimum)
 - d) Inert matter : 3% (Maximum)
3. The applicant shall also submit along with the seed a certified data on germination test made not more than one month prior to the date of submission. It also shall possess the highest genetic purity, uniformity, sanitary and phyto-sanitary standards as per national requirements.
4. The plant material shall not have been subjected to any chemical and bio-physical treatment.

III. Conduct of tests

1. The minimum duration of the DUS test shall normally be at least two independent similar growing seasons.
2. The test shall normally be conducted at least at two test locations. If any essential characteristics of the candidate variety are not expressed for visual observation at these locations, the variety shall be considered for further examination at another appropriate test site or under special test protocol on expressed request of the applicant.

3. The field test shall be carried out under conditions favouring normal growth and expression of all test characteristics. The size of the plots shall be such that plants or its parts could be removed for measurement and observation without prejudicing the other observations on the standing plants until the end of the growing period. Each test shall include about 480 plants across four replications.
4. Test plot design:

Number of rows	:	04
Row length	:	3.0m
Row to row distance	:	30cm
Plant to plant distance	:	10 cm
Number of replications	:	04
5. Observations shall not be recorded on plants in border rows.
6. Additional tests for special purpose shall be established by the PPV& FR Authority.

IV. Methods and observation

1. The characteristics described in the table of characteristics (see Section VII) shall be used for the testing of varieties, Parental lines and hybrids for their DUS.
2. For the assessment of Distinctness and Stability, observations shall be made on 40 plants or parts of 40 plants, which shall be divided among 4 replications (10 plants in each replication).
3. For the assessment of Uniformity of characteristics on the plot as a whole (visual assessment by a single observation of a group of plants or parts of plants), the number of off types (including plant parts) should not exceed 2 in 100.
4. For the assessment of all colour characteristics, the latest Royal Horticultural Society (RHS) colour chart shall be used.

V. Grouping of varieties

1. The candidate varieties for DUS testing shall be divided into groups to facilitate assessment of Distinctness. Characteristics which are suitable for grouping purpose are those which do not vary or vary slightly, within a variety. Their various states of expression should be fairly evenly distributed throughout the collection.
2. The following characteristics are proposed to be used for grouping Finger millet varieties:
 - a) Kharif , Summer or Rabi Adaptation
 - b) Plant: Pigmentation at leaf juncture (Characteristic 2)
 - c) Days to 50 percent flowering (Characteristic 4)

- d) Ear : Shape (Characteristic 10)
- e) Finger: Branching (Characteristic 11)
- f) Seed: Colour (Characteristic 23)

VI. Characteristics & symbol

1. To assess Distinctiveness, Uniformity and Stability, the characteristics and their states as given in the Table of characteristics (Section VII) shall be used.
2. Notes (1 to 9) shall be given for each state of expression for different characteristics for the purpose of electronic data processing.
3. Legend :

(*) Characteristics that shall be observed during every growing season on all varieties and shall always be included in the description of the variety, except when the state of expression of any of these characters is rendered impossible by a preceding phenological characteristic or by the environmental conditions of the testing region. Under such exceptional situation, adequate explanation shall be provided.

(+) See Explanation on the Table of characteristics in Section VIII. It is to be noted that for certain characteristics the plant parts on which observations to be taken are given in the explanation or figure(s) for clarity and not the colour variation.

4. A decimal code number in the sixth column of Table of characteristics indicates the optimum stage for the observation of each characteristic during the growth and development of plant.

Decimal code for the growth stage

Stage code	General Description
04	Seedling
15	2-4 Leaf stage
26	Vegetative
54	Flowering
67	Dough stage
77	Seed filling
83	Maturity
87	Harvest
95	After harvest

5. The optimum stage of plant growth for assessment of each characteristic is given in the sixth column.
6. Type of assessment of characteristics indicated in column 7 of Table of characteristics is as follows:
 - MG : Measurement by a single observation of a group of plants or parts of plants
 - MS : Measurement of a number of individual plants or parts of plants

VG : Visual assessment by a single observation of a group of plants or parts of plants

VS : Visual assessment by observation of individual plants or parts of plants

VII. Table of Characteristics

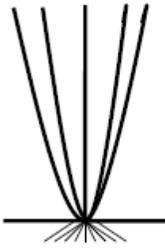
S No.	Characteristics	Status	Note	Example variety	Stage of observation	Type of assessment
1	2	3	4	5	6	7
1 (* (+)	Plant: Growth Habit	Erect	1	GPU67	15	VG
		Decumbent	5	GPU 45		
		Prostrate	7	IC 479016		
2 (* (+)	Plant: Pigmentation at leaf juncture	Absent	1	GPU 67	54	VS
		Present	9	GPU 48		
3	Leaf Sheath Pubescence	Absent	1	Indira Ragi 1	54	VG
		Present	9	VR 936(Hima)		
4 (* (+)	Days to 50 % flowering	Early (<55 days)	3	PRM 1	54	MG
		Medium (55- 70 days)	5	GPU 28		
		Late (>70 days)	7	Indira Ragi 1		
5 (* (+)	Glume: Colour	White RHS No NN155C	1	OUAT-2	54	VG
		Light Green RHS No 149A	3	GN 4		
		Dark green RHS No 141C	5	GPU 67		
		Light purple RHS No 59C	7	Indira Ragi 1		
		Dark purple RHS No 61C	9	IC 479088		
6 (+)	Stem: Culm branching	Absent	1	ML 365	67	VS
		Present	9	GPU 67		
7 (+)	Flag leaf : Blade length(cm)	Short (<15)	1	-	67	MS
		Medium(15.0-30.0)	3	Try 1		
		Long(30.1-45.0)	5	ML 365		
		Very long(>45.0)	7	GE 5004		
8 (+)	Flag leaf: Blade width (cm)	Narrow (<1.0)	3	GPU 67	67	MS
		Medium (1.0-2.0)	5	Indira Ragi 1		
		Wide (>2.0)	7	-		
9 (+)	Peduncle: Length (cm)	Very short (<10)	1	-	67	MS
		Short (10.0-20)	3	VR 762		
		Medium (20.1-30)	5	KMR 301		

		Long (30.1-40)	7	GN 4		
		Very long (>40)	9	-		
10 (* (+)	Ear : Shape	Fist type	1	VR 708	67	VG
		Compact	3	GPU 66		
		Semi compact	5	GPU 28		
		Open	7	Try 1		
		Droopy	9	GE 666		
11 (* (+)	Finger: Branching	Absent	1	GPU 45	67	VG
		Present	9	Indaf 7		
12 (+)	Finger: Position of branching	In thumb finger	3	Indaf 7	67	VG
		In all the fingers	5	GE 4846		
13 (+)	Finger: Multiple whorl	Absent	1	GPU 67	67	VG
		Present	9	GN 4		
14 (+)	Ear head: Length (cm)	Very Short (<4)	1	-	67	MS
		Short (4.0-6.0)	3	GPU 67		
		Short to medium (6.1-8.0)	4	GPU 45		
		Medium (8.1-10.0)	5	Indaf 15		
		Long (10.1-12)	7	KOPN 235		
		Very long (>12)	9	Indira Ragi 1		
15 (+)	Finger: Length (cm)	Short (<5)	3	VR 762	67	MS
		Medium (5.0-7.0)	5	GPU 28		
		Long (>7)	7	Indira Ragi 1		
16 (+)	Finger: Width (cm)	Narrow (<0.7)	3	GN 3	67	MS
		Medium (0.7-1.0)	5	MR 6		
		Wide (>1.0)	7	HR 911		
17	Finger: Number on main ear	Low (<5)	3	-	67	MS
		Medium (5.0-8.0)	5	KMR 204		
		High (>8)	7	GPU 66		
18 (*	No of productive tillers /plant	Low (1-3)	3	GPU 66	83	MS
		Medium(4-6)	5	GPU 67		

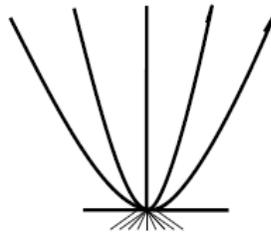
		High (>6)	7	GE 3666		
19 (* (+)	Plant: height at maturity (cm)	Very short (<40)	1	GE 6815	83	MS
		Short (40.0-80.0)	3	GPU 67		
		Medium (80.1-120.0)	5	Indira Ragi 1		
		Tall (120.1-160.0)	7	MR 6		
		Very Tall (>160)	9	-		
		Very low	3	VR 936 (Hima)		
		Moderate	5	ML 365		
		High	7	L5		
20 (*	Seed: Shattering	Absent	1	GPU 66	83	VG
		Present	9	GPU 67		
21 (*	Seed: Covering by glumes	Enclosed	2	Try 1	83	VG
		Intermediate	4	GPU 67		
		Exposed	6	GE 1126		
22 (*	Seed: Colour	White RHS No NN155C	2	OUAT 2	83	VG
		Light Brown RHS No N172D	4	ML 365		
		Copper Brown RHS No N175A	6	GPU 67		
		Dark Brown RHS No N178A	8	Indira ragi 1		
23 (*	Seed: Shape	Round	1	GPU 45	95	VG
		Reniform	3	GPU 66		
		Ovoid	5	-		
24 (*	Seed: Surface	Smooth	3	KOPN 235	95	VG
		Rough	7	PPR 2700 (Vakula)		
25	Pericarp: Persistence after threshing	Non Persistent	1	OEB 532	95	VG
		Persistent	9	GN 5		
26 (*	1000 grain weight(g)	Low (<2)	3	GE 2948	95	MG
		Medium (2-3)	5	PRM 1		
		High (>3)	7	ML 365		

VIII. Explanations for the Table of Characteristics

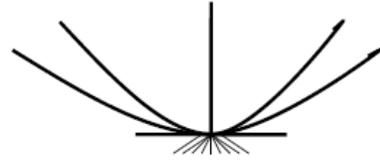
Characteristic 1. Plant: Growth habit



1
Erect



5
Decumbent



7
Prostrate

Characteristic 4. Days to 50 % flowering

Days to 50% flowering are from sowing to the stage when ears have emerged from 50% of main tiller.

Characteristic 6. Stem: Culm branching



1
Absent



9
Present

Characteristic 7. Flag Leaf: Blade length (cm)

Flag leaf blade length is measured from ligule to flag leaf blade tip.

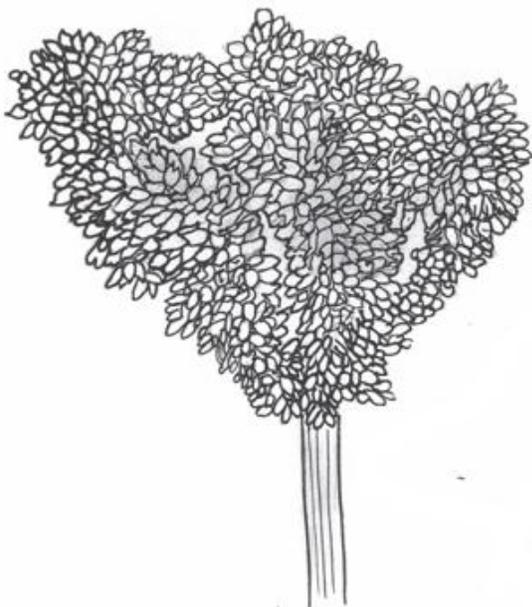
Characteristic 8. Flag Leaf: Blade width (cm)

Flag leaf blade width is measured at the widest point of the flag leaf.

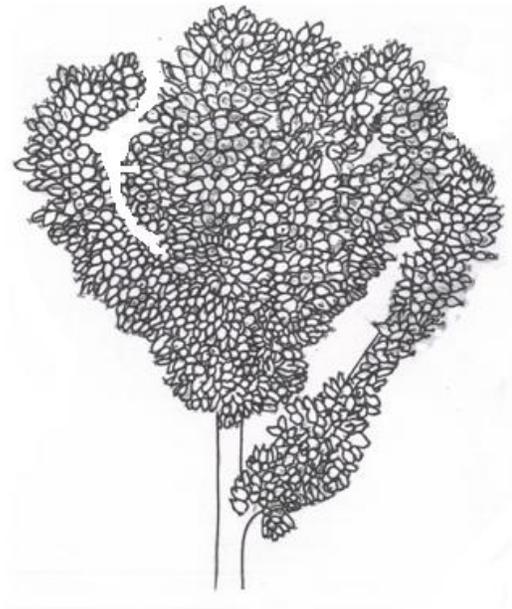
Characteristic 9. Peduncle: Length (cm)

Peduncle length is measured from earhead base to the topmost node of main tiller.

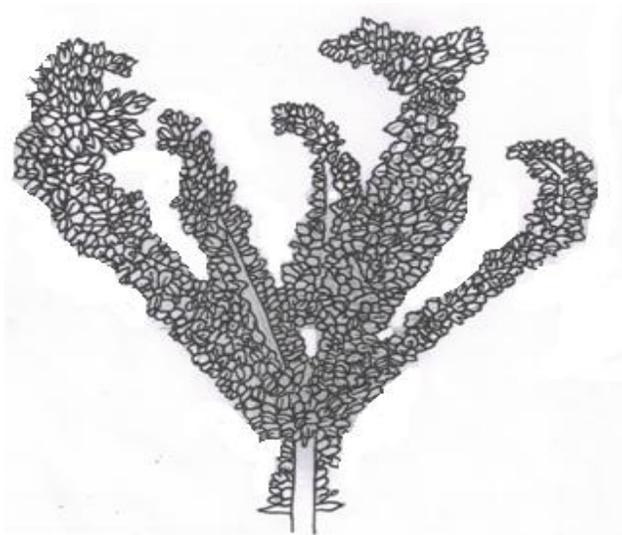
Characteristic 10. Ear: Shape



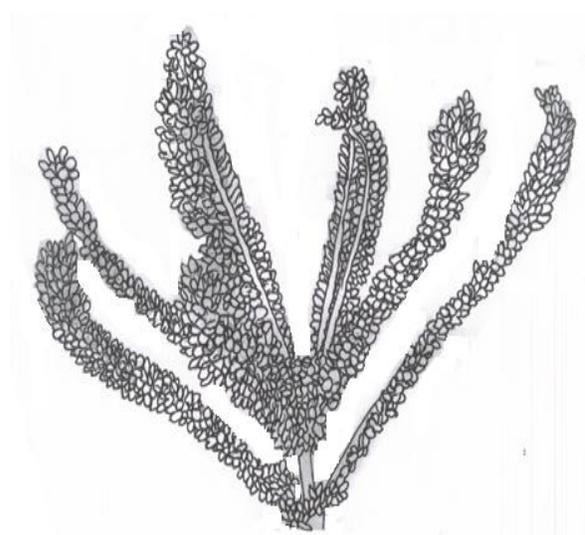
**(1)
Fist**



**(3)
Compact**



(5)
Semi compact

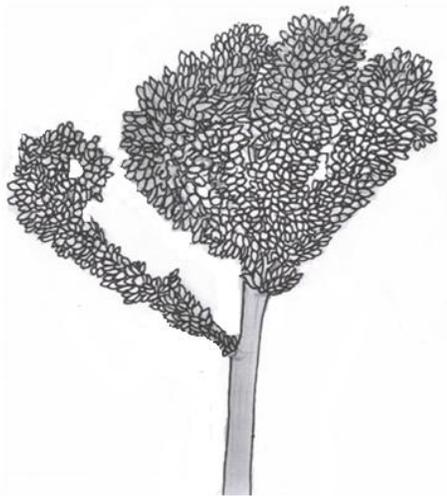


(7)
Open

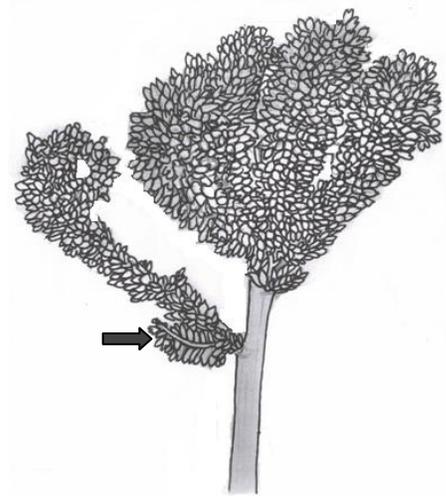


(9)
Droopy

Characteristic 11. Finger: Branching

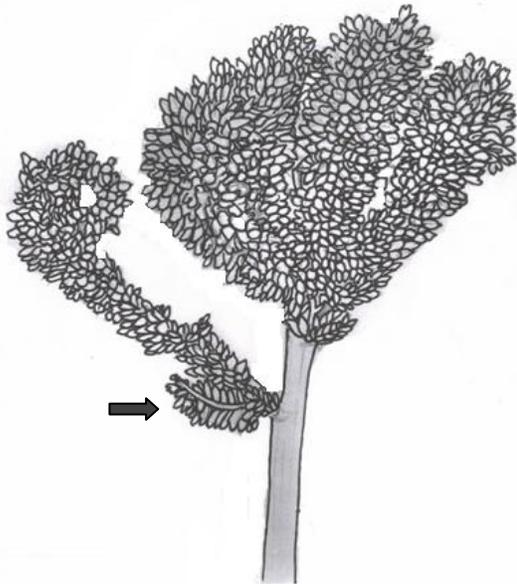


(1)
Absent



(9)
Present

Characteristic 12. Finger: Position of branching

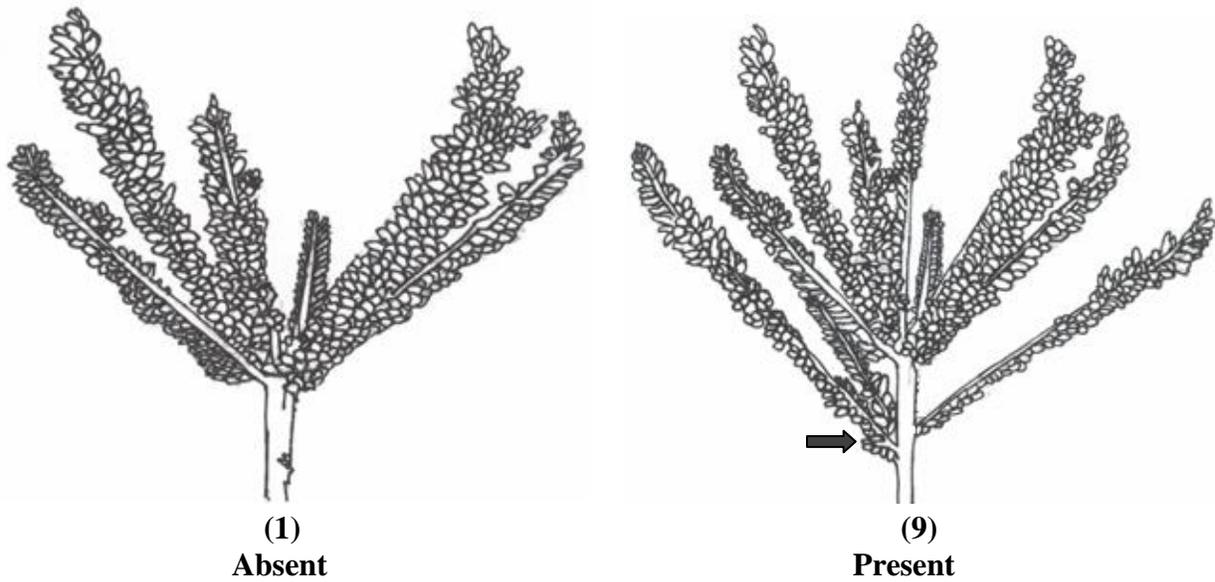


(3)
In thumb finger



(5)
In all the fingers

Characteristic 13. Finger: Multiple whorl

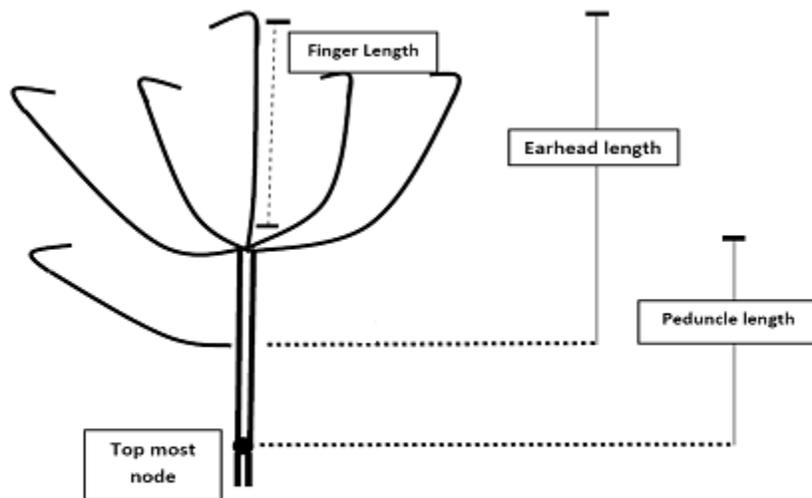


Characteristic 14. Earhead: Length (cm)

Earhead length is measured from base of thumb finger to the tip of the longest finger.

Characteristic 15. Finger: Length (cm)

Finger length is measured from the base of the longest finger on the main ear to the tip.



Characteristic 16. Finger: Width (cm)

Finger width is measured at the widest point of Finger.

Characteristic 19. Plant: Height at maturity (cm)

Plant height is measured from ground level to the tip of the earhead of the main tiller.

IX. Working Group Details:

These Test guidelines have been developed by the National Core Committee in Consultation with the Project Coordinator, All India Coordinated Small Millets Improvement Project at UAS, GKVK, Bangalore-560 065 and the Nodal Officer, DUS Test Centre and Task Force constituted by the Authority. Technical inputs were also provided by Dr. D.S. Pilonia (Technical Assistant), Dr. Ravinder Kumar (Technical Examiner), Ms. Vijaya Chaudhary (Technical Examiner) and Mr. Suneet Kumar (Technical Examiner).

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X. DUS Test Centres

Nodal DUS Centre	Other Test Centre(s)
All India Coordinated Small Millets Improvement Project UAS, GKVK, Bangalore-560 065	Agricultural Research Station, Gajularega, Vizianagaram-531 001, Andhra Pradesh