Guidelines for the conduct of tests

for Distinctiveness, Uniformity and Stability

Proso millet (*Panicum miliaceum* L.)

Protection of Plant varieties and Farmer's Rights Authority

Government of India

Proso millet (*Panicum miliaceum* L.)

I Subject:

These test guidelines apply to all the varieties, hybrids and parental lines of Proso millet (*Panicum miliaceum* L.)

II Material required:

1. The Protection 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 the seed material to be supplied by the applicant shall be 200 grams. The seed shall be packed and sealed in ten equal weighing packets of 20 grams each and submitted in one lot. In addition, 10 panicles need to be submitted, if required.

2. The seeds submitted shall have the following standards:
   a. Germination : 80% (Minimum)
   b. Moisture content : 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 posses the highest genetic purity, uniformity, sanitary and phyto- sanitary standards as per national requirement.
4. The seeds/ planting 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 for new varieties and one season in case of farmers' varieties and varieties of common knowledge (VCK).
2. The test shall normally be conducted at least at two test locations.
3. The field test shall be carried out under conditions favoring 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 plants until the end of growing period. Each test shall include about 360 plants across three replications. Separate plots for observation on

pest/ disease resistance for those varieties claiming resistance shall be laid out in two replications.

4. Test plot design:

   Number of rows: 04
   Row length: 3.0m
   Row to row distance: 30cm
   Plant to plant distance: 10 cm
   No. of replication: 3

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 (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 recorded on 30 plants or parts of 30 plants, which shall be divided among 3 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) color 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 to be used for grouping Proso millet varieties

   1) Days to 50% flowering (Characteristic 3)
   2) Plant: Pigmentation at leaf sheath (Characteristic 4)
   3) Leaf Sheath: Pubescence (Characteristic 5)
   4) Inflorescence : Shape (Characteristic 8)
   5) Panicle: Compactness (Characteristic 13)
   6) Grain: Colour(Characteristic 18)

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 (1-9) 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
15	Two- Four Leaf stage
26	Vegetative stage
51	50 % Flowering
59	Complete Flowering
67	Dough stage
83	Maturity
95	Post harvest

5. Type of assessment:

MG: Single measurement 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 plant parts.
VS: Visual assessment by observation of individual plant or parts of plants.

VII Table of Characteristics

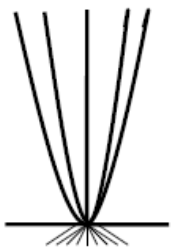
Sl no	Characteristics	States	Score/ Notes	Example varieties	Stage of observation	Type of assesment
1 (+)	Plant: Growth habit	Erect	3	TNAU 202	15	VG
		Decumbent	5	TNAU 151		
		Prostrate	7	-		
2	Basal tillers: Number	Low(<5)	3	TNAU 202	26	MS
		Medium(5-15)	5	TNAU 164		
		High(>15)	7	GPMS 213		
3 (*) (+)	Days to 50 % flowering	Early(<35)	3	GPMS 60	51	MG
		Medium(35-45)	5	TNAU 202		
		Late(>45)	7	GPMS 476		
4 (*)	Plant: Pigmentation at leaf sheath	Absent	1	GPUP 21	59	VG
		Present	9	GPMS 780		
5 (*)	Leaf Sheath: Pubescence	Glabrous	3	GPMS 3	59	VG
		Sparse	5	TNAU 145		
		Strong	7	TNAU 151		
6	Ligule: Pubescence	Absent	1	-	59	VG
		Present	9	TNAU 164		
7 (*)	Leaf Blade: pubescence	Glabrous	1	GPMS 131	59	VG
		Sparse	5	TNAU 151		
		Strong	7	TNAU 164		
8 (*) (+)	Inflorescence: shape	Arched	3	TNAU 145	59	VG
		Globose-elliptic	5	GPUP 21		
		Diffused	7	CO 5		
9 (+)	Peduncle: Length (cm)	Very short(<10)	1	GPMS 220	59	MS
		Short (10.0-20.0)	3	TNAU 164		
		Medium(20.1-30.0)	5	PRC 1		
		Long(30.1-40.0)	7	GPMS 591		
		Very long (>40.0)	9	-		

10 (+)	Flag leaf blade: Length (cm)	Short(<20)	3	TNAU 202	59	MS
		Medium(20-35)	5	TNAU 164		
		Long(>35)	7	GPMS 892		
11 (+)	Flag leaf blade: Width(cm)	Narrow(<1.5)	3	TNAU 202	59	MS
		Medium(1.5-2.5)	5	GPMS 840		
		Wide(>2.5)	7	-		
12	Culm: Branching	Absent	1	-	67	VS
		Present	9	TNAU 164		
13 (*) (+)	Panicle: Compactness	Compact	3	TNAU 151	67	VG
		Intermediate	5	TNAU 202		
		Open	7	GPMS 131		
14 (+)	Panicle: Length(cm)	Very Short (<10.0)	1	-	67	MS
		Short (10.0-20.0)	3	GPMS 541		
		Medium (20.1-30.0)	4	TNAU 151		
		Long (30.1-40.0)	5	GPMS 219		
		Very long (>40.0)	7	-		
15	Lodging	Absent	1	TNAU 145	83	VG
		Present	9	TNAU 151		
16 (*) (+)	Plant: Height (cm)	Dwarf (<60.0)	3	GPMS 491	83	MS
		Semi dwarf (60.1-90.0)	5	GPUP 21		
		Tall (90.1-120.0)	7	TNAU 151		
		Very Tall (>120)	9	-		
17	Seed: Shattering	Absent	1	-	83	VG
		Present	9	TNAU 145		
18 (*)	Grain: Colour	Straw white/cream RHS No 159C	2	GPMS 31	83	VG
		Golden yellow RHS No 13A	3	GPUP 21		
		Grey RHS No N199D	5	TNAU 151		
		Dark Grey RHS No N199C	7	GPMS 795		

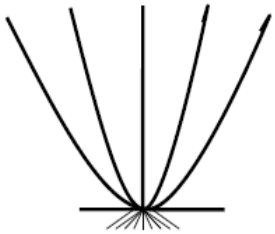
19	Grain: Shape	Elliptical	2	TNAU 151	95	VG
		Oval	4	TNAU 164		
20 (*)	1000 grain weight (g)	Low (<4.0)	3	-	95	MG
		Medium (4.0-6.0)	5	TNAU 151		
		High (>6.0)	7	GPMS 834		

VIII. Explanations for Table of Characteristics

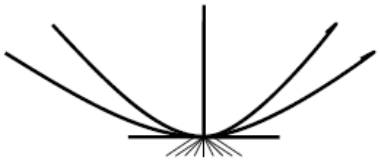
Characteristic 1 Plant: Growth habit



1
Erect



5
Decumbent

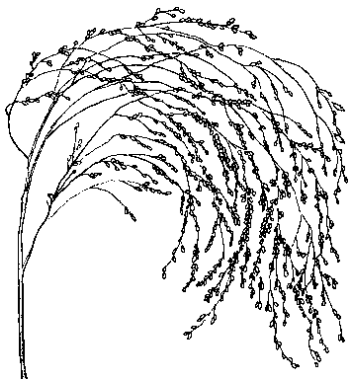


7
Prostrate

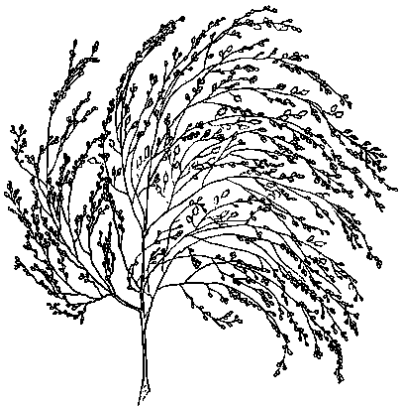
Characteristic 3 Days to 50 % flowering

Days to 50% flowering is from sowing to the stage when ears have emerged from main tiller in 50 percent population.

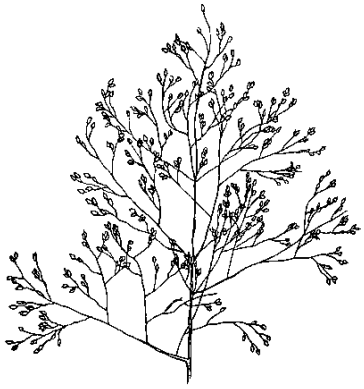
Characteristic 8 Inflorescence: Shape



3
Arched



5
Globose – Elliptic



7
Diffused

Characteristic 9 Peduncle: Length (cm)

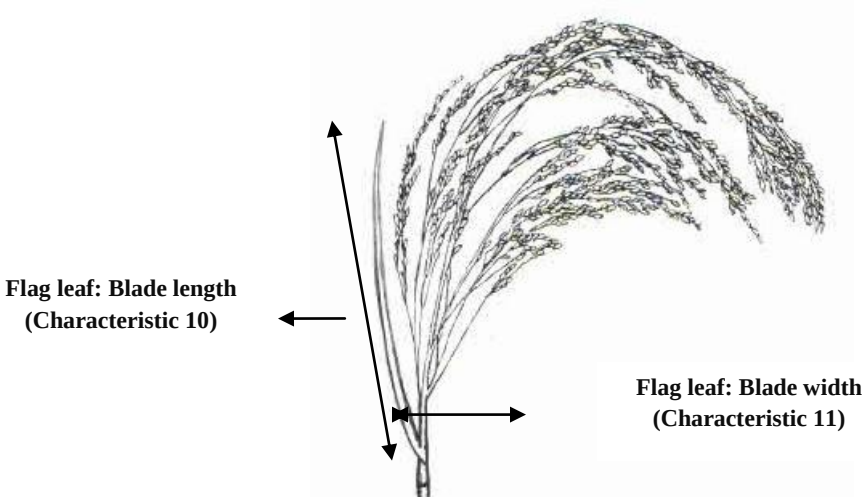
Peduncle length is measured from earhead base to the top most node on main tiller.

Characteristic 10 Flag leaf blade: Length (cm)

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

Characteristic 11 Flag leaf blade: Width (cm)

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

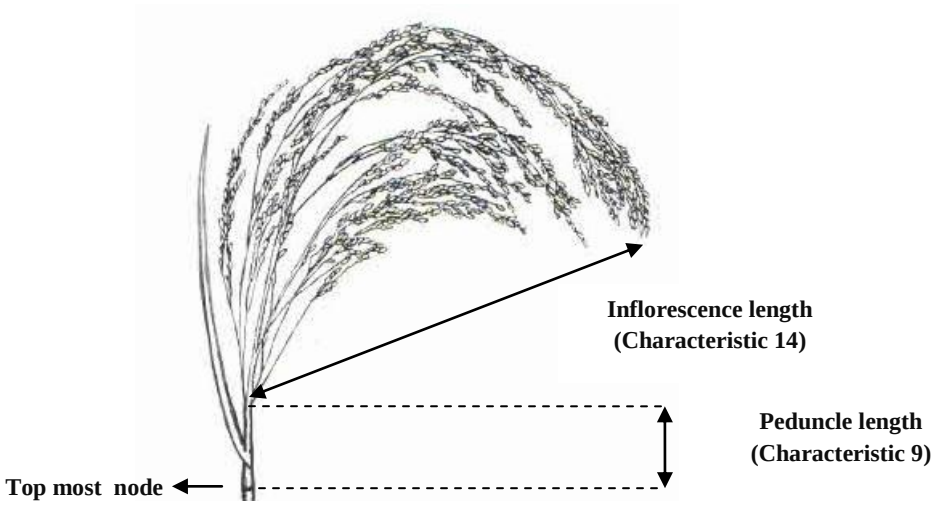


Characteristic 13 Panicle: Compactness

3	5	7
Compact	**Intermediate**	**Open**

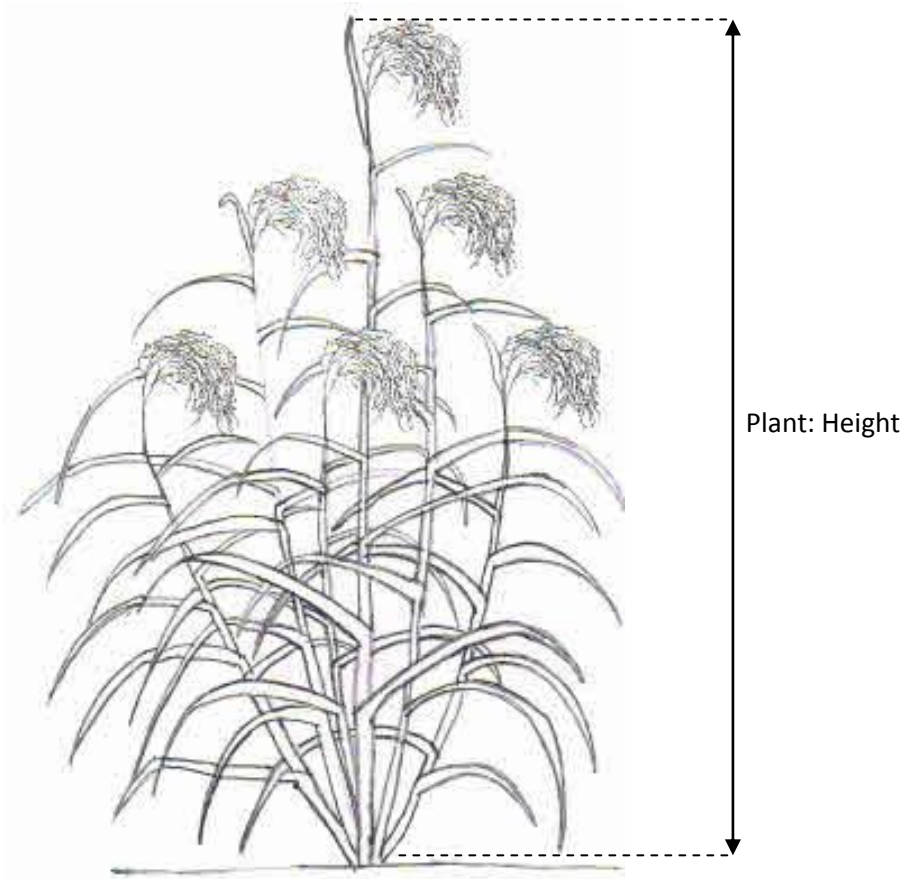
Characteristic 14 Panicle: Length (cm)

Panicle length is measured from base of panicle to the tip of panicle.

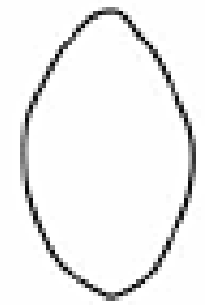


Characteristic 16 Plant: Height (cm)

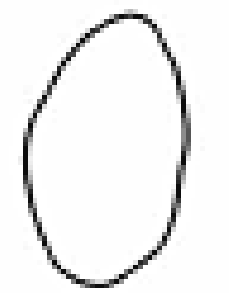
Plant height is measured from ground level to the tip of the earhead of main tiller.



Characteristic 19 grain: Shape



2
Elliptical



4
Oval

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.

The members of the Task Force

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X. DUS Test Centers

Nodal DUS centre	**Other Test Centre(s)**
All India Coordinated Research Project on Small millets, UAS, GKVK, Bangalore-560065, Karnataka	Centre of Excellence in Small millets, Athiyandal-606603, Thiruvannamalai, Tamil Nadu