A PROPOSAL FOR A LIST OF MINIMUM DESCRIPTORS FOR PEARL MILLET

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ICRISAT
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The world collection of Pearl millet being enlarged by ICRISAT needs to be evaluated so that the collection can be fully utilized by scientists involved in the improvement of the crop. In order to have effective co-ordination between different Pearl millet data banks and for the results from different recorders, locations and seasons to be meaningful and comparable a standard set of a minimum number of traits (descriptors) with the attendant definitions (descriptor states) is necessary. This could easily be achieved with the common use of an extensive list of descriptors but such a list becomes unmanageable in practice where a large number of accessions are to be catalogued. It is therefore necessary to select a minimum number of easy-to-record traits which, when used in conjunction, will adequately differentiate between most accessions in different environments, yet also provide sufficient information to enable crop improvement scientists to select accessions likely to be useful to them from a catalogue. The ICRISAT Pearl millet germplasm unit therefore proposes the following descriptors and descriptor states, in terms of which it plans to evaluate the present world collection. We welcome comments and suggestions in finalising the minimum descriptors and their definitions.

"-genetic resources, cereal germplasm and Pearl millet germplasm, respectively.

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Observations are recorded at maturity unless otherwise stated. They are expressed as mean of five random plants. Many of the descriptors are as used by or modified from Murty et al. (1967).

1. **IP number (IPN)**: Each accession in the Pearl millet germplasm bank will be identified by its accession number. To avoid duplication, the IBPGR Advisory Committee on Sorghum and Millet germplasm authorized ICRISAT to assign IP numbers.

2. **Pedigree (PDC)**: The actual local name, collectors number, or the pedigree assigned by the originating station/breeder.

3. **Origin (ORC)**: The country, state (province), district from which the accession originated and date of collection.

4. **Days to 50% flowering (DFL)**: Number of days from sowing to when 50% of the plants in the plot start flowering. Stigma emergence on the primary tiller head is considered as flowering.

5. **Plant height (PHT)**: Measured in cm from the ground level to the tip of the ear.

6. **Pigmentation (PGM)**: Presence or absence of pigmentation (other than green) on internode/leaf sheath, bristles and glumes recorded at dough stage of grain maturity is scored as follows:

<table>
<thead>
<tr>
<th>Code</th>
<th>Internode</th>
<th>Bristles</th>
<th>Glume</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>G</td>
<td>G</td>
<td>G</td>
</tr>
<tr>
<td>2.</td>
<td>P</td>
<td>G</td>
<td>G</td>
</tr>
<tr>
<td>3.</td>
<td>G</td>
<td>P</td>
<td>G</td>
</tr>
<tr>
<td>4.</td>
<td>G</td>
<td>P</td>
<td>P</td>
</tr>
<tr>
<td>5.</td>
<td>P</td>
<td>P</td>
<td>P</td>
</tr>
</tbody>
</table>

*If any line is not uniform for pigmentation, this fact should be noted and the record taken on the expression of the majority of the plants.
7. Pilosity (PLS) : 1. All vegetative parts glabrous
2. Only a ring of long white silky hairs at the nodes
3. Leaf sheath hairy
4. Leaf sheath and leaf blade hairy
5. Leaf sheath, leaf blade and internode hairy

8. Number of basal tillers (NBT) : A culm having an ear is defined as a tiller. Those tillers originating from the basal node considered.

9. Number of total tillers (NTT) : Includes both basal and nodal tillers. It is the count of total number of mature and immature heads at the time of harvest on plants where heads on primary and basal tillers are not damaged.

10. Number of effective tillers (NET) : Only those tillers which contribute to yield. Immature heads at the time of harvest are not considered.

11. Ear exsertion (EXN) : (Fig. 1) Observations taken on primary tiller. It is recorded as the distance in cm (P for positive and N for negative) between the ligule of the top (boot) leaf and the base of the ear.

12. Synchrony of ear maturity (SEM) : 1. All the ears on the plant mature at the same time
   2. The ears on the plant mature within ten days
   3. The range in maturity between ears on a plant exceeds ten days.

13. Ear length (ELT) : Measured in cm from the base to the tip of the ear on the primary tiller.

14. Ear thickness (ETH) : Maximum diameter of the ear on the primary tiller measured in mm.

15. *Ear shape (ESP) : (Fig. 3)
   1. Cylindrical: Ear thickness more or less uniform throughout its length.
   2. Conical: Ear thickness maximum at the base, and gradually tapering towards the apex.
   3. Spindle: Ear thickness maximum in the middle gradually tapers towards both sides.

*Marius Bono (1972) classified ear shapes into four types viz., conical, fusiform, cylindrical, and club. However in the world collection many other shapes which are intermediate between these types are common. When the relative thickness of the ear at base, middle and apex are considered there are 9 types apparent.
15. Ear shape

4. Club: Maximum thickness of the ear at the apex and gradually tapering towards base.

5. Candle shape: Perhaps the most common type, which is intermediate between cylindrical and conical. About 3/4 length of the ear cylindrical and the rest gradually tapers towards the apex to appear conical.

6. Souna: The characteristic ear of the souna type from Mali. Maximum ear thickness is at the base, gradually tapers to 2/3 of the ear, and then ear thickness increases slightly.

7. Lanceolate: Intermediate between spindle and conical. Maximum ear thickness is at the middle of the head but tapers more towards the apex than base.

8. Oblanceolate: The opposite of lanceolate, maximum ear thickness is at the middle of the head but tapers more towards the base than apex.

9. Globose: Almost spherical, ear length not more than twice the diameter.

16. Compactness of grain on ear (CGE)

: Depends on the number of seeds per unit area and seed size. A visual estimate made by comparing the ear with a standard series. The number of seeds per square centimeter in centre of ear of each of the classes follows:

1. Compact: Number of seeds per cm² exceeds 25.
2. Semi-compact: Number of seeds per cm² range between 16-25
3. Loose: Number of seeds per cm² less than 15

17. Bristle length (BLT)

1. Bristles shorter than glumes or as long as glumes but less than 20 mm measured from grain surface.
2. Bristles longer than 20 mm

18. Endosperm texture (ENT)

: (Fig.2) Scored as in Sorghum (Prasada Rao and House 1978)

1. Completely corneous
2. Almost corneous
3. Partly corneous
4. Almost starchy
5. Completely starchy
19. **Grain shape**: (Fig. 4) As proposed by Bono (1972)
   - 1. Obovate
   - 2. Oblanceolate
   - 3. Cuneiform
   - 4. Pyriform
   - 5. Pyramidal
   - 6. Elliptical
   - 7. Hexagonal
   - 8. Globular

20. **Grain colour**: Scored according to Murty *et al* (1967) with slight modification.
   - 1. White yellow
   - 2. Yellow
   - 3. Deep yellow
   - 4. Brown
   - 5. Deep brown
   - 6. Brownish grey
   - 7. Grey
   - 8. Deep grey
   - 9. Purple
   - 10. Purple black

21. **Grain weight**: Weight (g) of 1000 random grains dried at room temperature.

22. **Photosensitivity**: 1. Photosensitive: Lines in which flowering appears to be greatly delayed by long day lengths.
   2. Photoinsensitive: Flowering not unusually delayed by long days.

**APPENDIX 1:**

**Diseases**: The major factors reducing yields and causing unstable yields are fungal diseases the most important of which are: downy mildew (green ear) caused by *Sclerospora graminicola* (Sacc.) Schroet., ergot caused by *Claviceps microcephala* (Wallr.) Tul., smut caused by *Tolyposporium penicillariae* Bref. and rust *Puccinia penniseti Zimm*. Scores for disease reaction will be taken only when there is judged to be sufficient disease.

* For standard color identification refer to Munsell color chart...
incidence to differentiate between accessions. The rating scales described by Williams, Singh and Thakur (1976) will be used. They recommend that each disease is scored on a 1-5 scale, 1 and 2 representing the categories highly resistant and resistant respectively, 3 representing an intermediate reaction and 4 and 5 representing susceptible and highly susceptible respectively. There follows a description of the symptoms that are applicable to each of these reaction categories. Records should be taken at dough stage of grain maturity, except for rust where flowering is the best physiological growth stage to record incidence.

Scoring scales for Pearl millet downy mildew, ergot, smut and rust:

23. Downy mildew (DML): Observations recorded once at seedling stage and the other when the primary tiller is in dough stage (50 days after planting) of grain maturity.

1. No symptoms
2. Symptoms on nodal tillers only
3. Symptoms on main tillers but still three or more productive heads.
4. Symptoms on many main tillers so that there are only one or two productive heads.
5. Symptoms on main stems and tillers so that there are no productive heads (plants may have died at an earlier stage leaving clumps of straw gaps).

24. Ergot (ERG): 1. No symptoms
2. Less than 5 per cent of grain become sclerotia
3. 6-10 per cent of grain become sclerotia
4. 11-20 per cent of grain become sclerotia
5. More than 20 per cent of grain become sclerotia

25. Smut (SMT): 1. No symptoms
2. Less than 5 per cent of grain become smut sori
3. 6-10 per cent of grain become smut sori
4. 11-20 per cent of grain become smut sori
5. More than 20 per cent of grain become smut sori
26. Rust (RST): Assess the top four leaves and indicate whether infection also occurs on the sheaths at flowering time for it is these leaves which contribute most to the yields.

1. No symptoms
2. Few scattered lesions
3. Pustules on up to 10 per cent of leaf surface
4. Pustules covering 11-25 per cent of leaf surface
5. Pustules covering more than 25 per cent of leaf surface.

REFERENCES:


EAR EXSERTION IN PEARL MILLET

(Fig. 1)

ENDOSPERM TEXTURE IN PEARL MILLET

(Fig. 2)
DIFFERENT EAR SHAPES IN PEARL MILLET

Cylindrical  Conical  Spindle  Club  Candle shape

Souna  Lanceolate  Oblanceolate  Globose

Fig. 3