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

On

Bambara Groundnut
(*Vigna subterranea* (L.) Verdc.)

Protection of Plant Varieties and Farmers' Rights Authority

(PPV & FRA)

Government of India

Bambara Groundnut (*Vigna subterranea* (L.) Verdc.)

I. Subject

These test guidelines shall apply to all varieties, hybrids and parental lines of Bambara Groundnut (*Vigna subterranea* (L.) Verdc.).

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 2000 grams. The seed shall be packed and sealed in ten equal weighing packets and submitted in one lot.
2. The seeds submitted shall have the following standards for germination capacity, moisture content and physical purity

a) Germination : 80% (Minimum)

b) Moisture content: 8-9% (Maximum)

c) Physical purity: 98% (Minimum)

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 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 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 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 3 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 Bambara groundnut varieties:

a. Plant growth habit (Characteristic 2)

b. Days to 50% flowering (Characteristic 7)

c. Pod length (cm) (Characteristic 14)

d. Test weight (Characteristic 16)

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. The optimum stage of plant growth for assessment of each characteristic is given in the sixth column of Table of characteristics.

5. 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

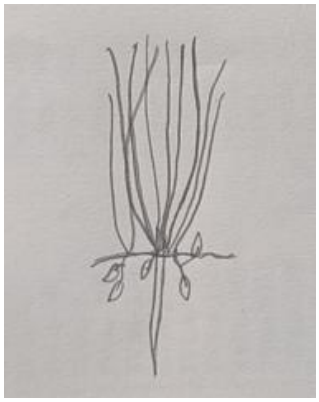
Sl No.	Characteristics	Status	Note	Example variety	Stage of observation	Type of assessment
1	Growth habit	Bunch type	1	TVSu-158	10 weeks after planting	VG
		Semibunch type	2	TVSu-11		
		Spreading type	3	TVSu-5		
2	Terminal leaflet length (mm)	Medium (10-20mm)	5	TVSu 330	10 weeks after planting	MS
		Long (>20mm)	7	TVSu 425		
3	Terminal leaflet width (mm)	Medium (5-10mm)	5	TVSu 330	10 weeks after planting	MS
		Long (>10mm)	7	TVSu 425		
4	Terminal Leaflet shape	Oval	1	TVSu 1648	Days to 50% flowering stage	VG
		Lanceolate	2	TVSu 1887		
		Elliptic	3	TVSu 1631		
5	Days to 50% flowering	Early (<50)	3	TVSu 878	50% of plants with at least one open flower	VG
		Medium (50-60)	5	TVSu 884		
		Late (>60)	7	TVSu 287		
6	Number of flowers per peduncle	Twin	2	TVSu 1887	50% Flowering	MS
7	Petiole length (mm)	Medium (10-20mm)	5	TVSu 592	10 weeks after planting	MS
		Long (>20mm)	7	TVSu 1321		
8	Peduncle length (cm)	Medium (10-20cm)	5	TVSu 1379	At the stage of open flower	MS
		Long (>20cm)	7	TVSu 425		

9	Plant height (cm)	Medium (10-15cm)	5	TVSu 611	Fully developed Pod stage	MS
		Tall (>15cm)	7	TVSu 640		
10	Pod Shape	Without point	1	TVSu-262	After harvesting	VG
		Ending in a point, round on the other side	2	TVSu-702		
		Ending in a point, with nook on the other side	3	TVSu-884		
11	Pod colour	Yellowish-brown	1	TVSu-217	After harvesting	VG
		Brown	2	TVSu-5		
		Reddish-brown	3	TVSu-455		
		Purple	4	TVSu-1394		
12	Pod texture	Smooth	1	TVSu-691	After harvesting	VG
		Little grooves	2	TVSu-425		
		Much grooved	3	TVSu-1620		
		Much folded	4	TVSu-106		
13	Pod length (mm)	Small (<15mm)	3	TVSu-1068	After harvesting	MS
		Medium (15-20mm)	5	TVSu-702		
		Large (>20mm)	7	TVSu-328		
14	Pod thickness (mm)	Thin (<1mm)	3	TVSu-723	After harvesting	MS
		Medium (1-1.5mm)	5	TVSu-574		
		Thick (>1.5 mm)	7	TVSu-262		
15	Test weight (weight of 100 seeds in grams)	Low (<20gm)	3	TVSu-611	After harvesting	MG
		Medium (20-35gm)	5	TVSu-1940		
		High (35-50gm)	7	TVSu-1394		
		Very high (>50)	9	TVSu-1620		
16	Seed length (mm)	Short (<7.5mm)	3	TVSu-1068	After harvesting	MS
		Medium (7.5-	5	TVSu-217		

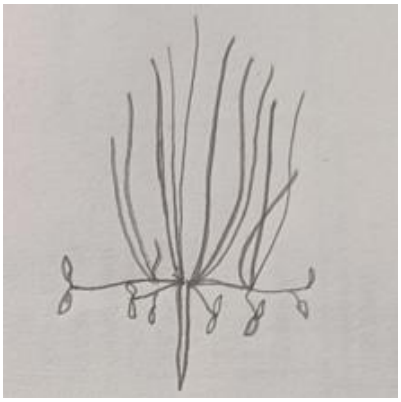
		10mm)				
		Long (>10mm)	7	TVSu-1038		
17	Seed shape	Round	1	TVSu-1379	After harvesting	MS
		Oval	2	TVSu-367		
18	Testa colour	Cream testa Light brown Light brownish red testa	1 2 3	TVSu-885 TVSu-592 TVSu-5		VG
19	Pattern colour of eye	Black butterfly-like eye	1	TVSu-885		VG
		Dark red butterfly like eye	2	TVSu-698		
		Grey butterfly like eye	3	TVSu-1364		
		Black triangular eye	4	TVSu-217		
		Brown triangular eye	5	TVSu-1887		
		Grey triangular eye	6	TVSu-640		
		Black irregular eye	7	TVSu-1940		
		Brown circular triangular eye	8	TVSu-627		
		Grey butterfly like eye	9	TVSu-592		
		Red testa with dark brown triangular eye	10	TVSu-5		

VIII. Explanations for the Table of Characteristics

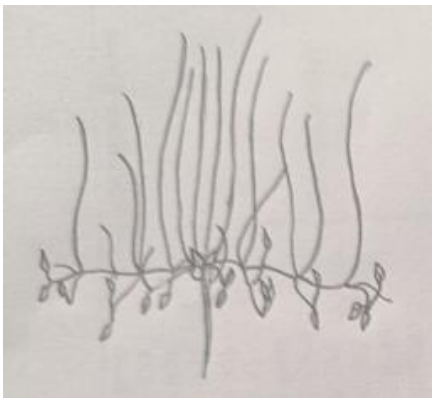
Character No. 1. : Growth habit



1.Bunch type



2. Semibunch type



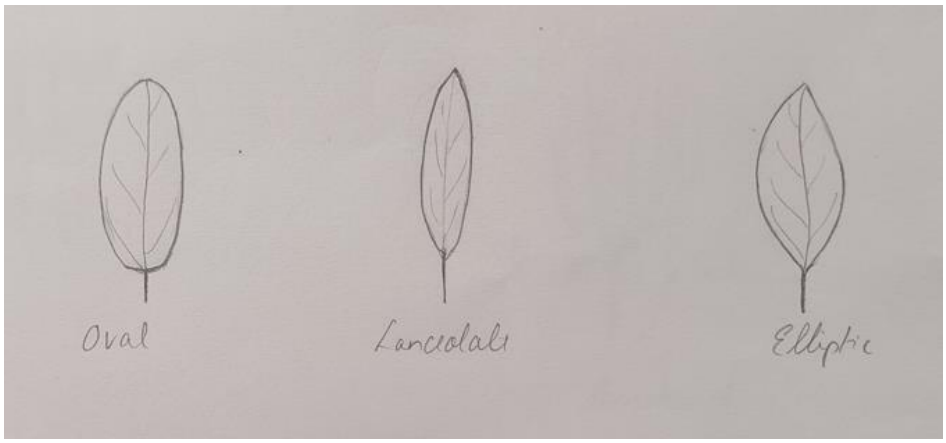
3.Spreading type

Bunch type (1)

Semibunch type (2)

Spreading type (3)

Character No. 4. : Terminal Leaflet shape

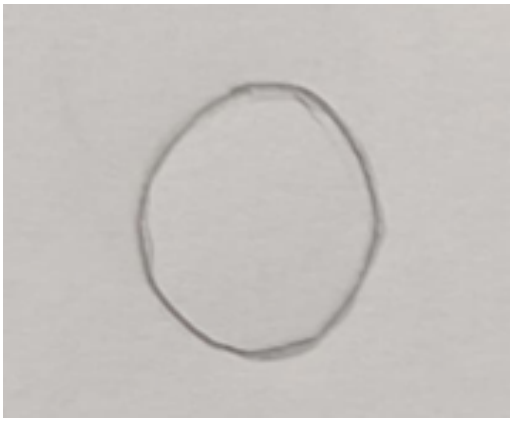


1. Oval

2. Lanceolate

3. Eliptic

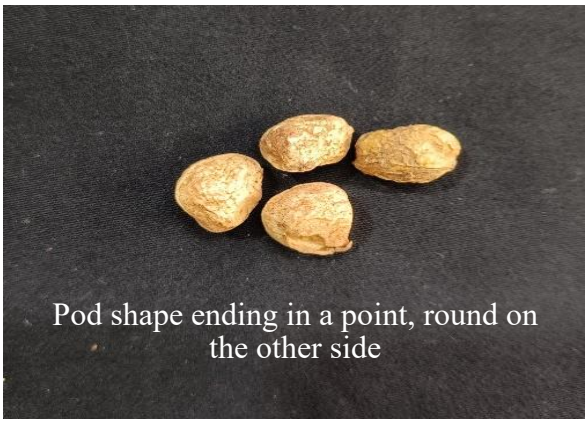
Character No. 10. : Pod Shape



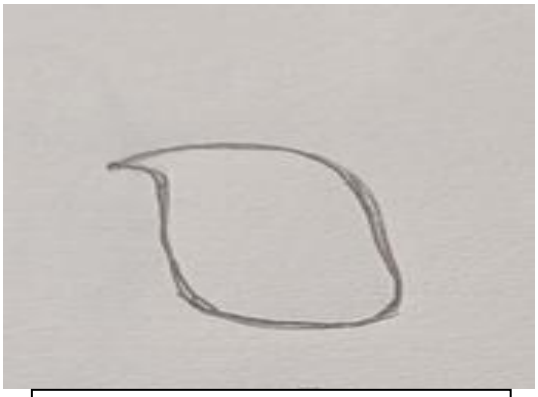
1. Without point

(1)

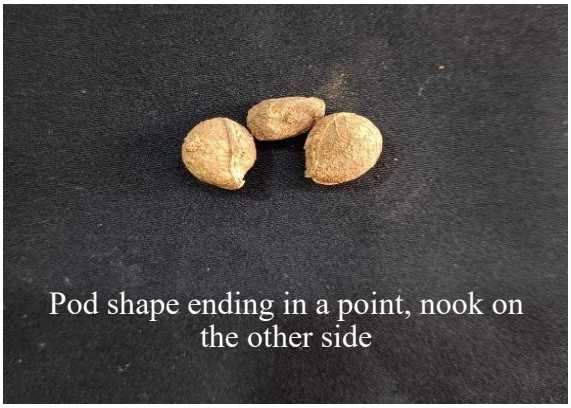
2. Ending in a point, round on the other side



(2)

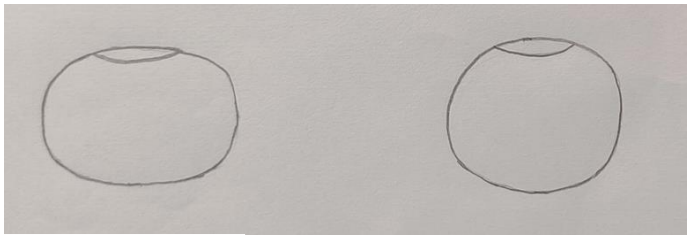


3. Ending in a point, with nook on the other side

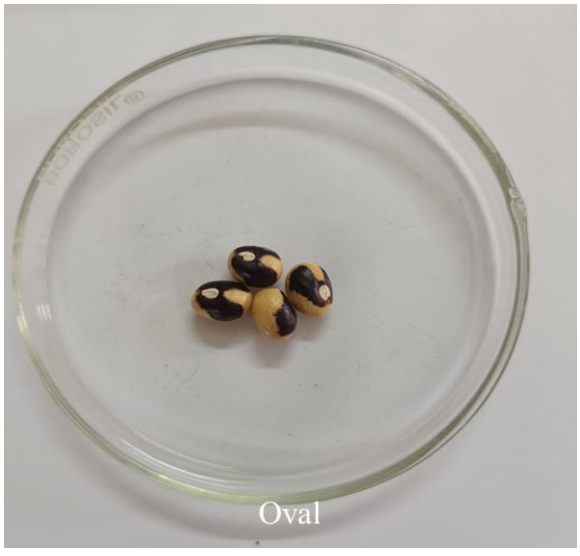


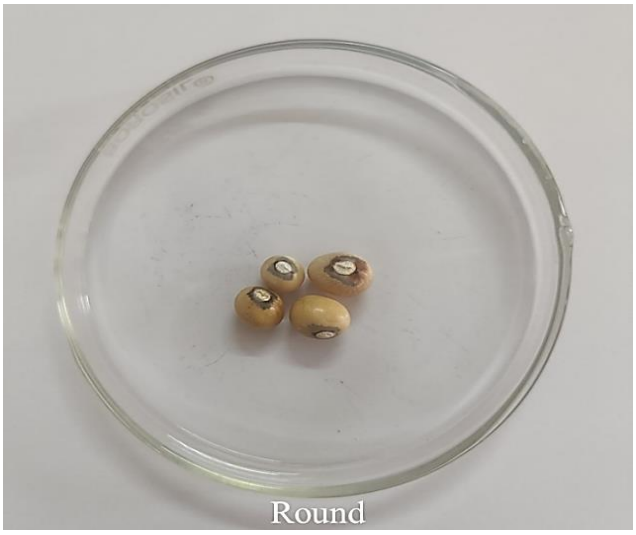
(3)

Character 17 : Seed shape



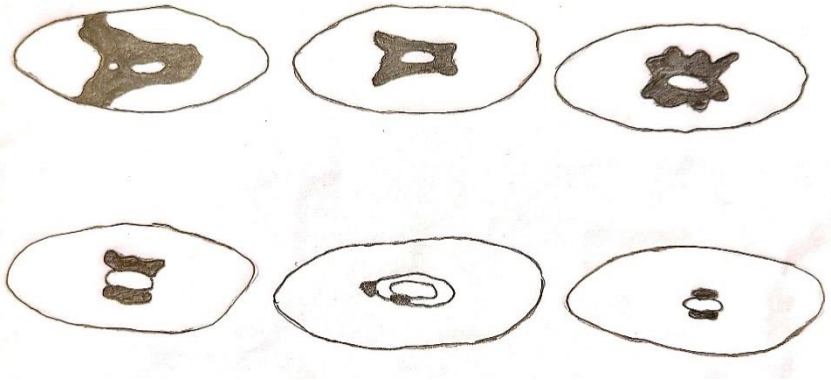
1. Oval
2. Round



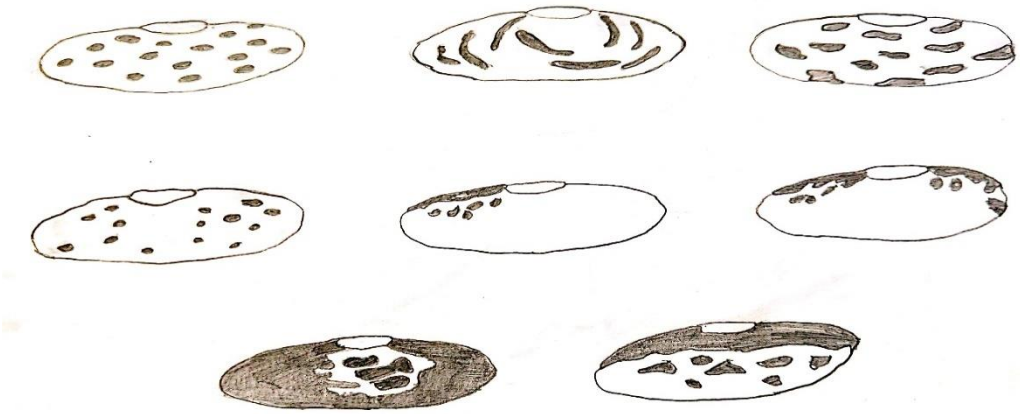


1 **2**

18.Testa pattern



1) Pattern colour of the eye



2) Testa colour

(1)

(2)

(3)

(4)

(5)

(6)

(7)

(8)

(9)

IX. Working Group Details:

These Test guidelines have been developed by the National Core Committee in Consultation with the Scheme Head, All India Coordinated Small Millets Improvement Project at GKVK, UAS, Bangalore and the Nodal Officer, DUS Test Centre and Task Force constituted by the Authority.

The members of the Task Force

Sl. No.	Name & Designation	Contact Details	
1.	Dr. N.P. Singh Former Vice-Chancellor Banda University of Agriculture & Technology Chilla Road, Banda- 210001, UP	8005383963 npsingh.iipr@gmail.com	Chairmen
2.	Dr. D.L. Savithramma Emeritus Professor Dept. of GPB UAS, GKVK, Bangalore- 50065	9448612557 Nesarns.rediffmail.com	Member
3.	Dr. Nilamani Dikshit Principal Scientist Division of Crop Improvement ICAR-Indian Grassland & Fodder Research Institute, Jansi-284003	9423445981 dikshitn@gmail.com nilamani.dikshit@icar.gov.in	Member
4.	Dr. Chellapilla Bharadwaj Principal Scientist, GPB ICAR-IARI New Delhi- 110012	011-25841481 Bharadwaj_gen@iari.res.in	Member
5.	Dr. R. Nandini Professor & Scheme Head AICRN on Potential Crops UAS, GKVK, Bangalore- 560065	9980370487 nandiniramesh@yahoo.com r.nandini@uasbangalore.edu.in	Member
6.	Dr. A.K. Singh Plant Variety Examiner PPV&FRA New Delhi- 110012	8876133357 akspdf@gmail.com	Member Secretary

Nodal Person(s) for development of the DUS Guideline

Dr. R. Nandini, Scheme Head, AICRP on Small millets, VC Farm, Mandya, UAS, Bangalore-560065.

X. DUS Test Centre

Department of Genetics and Plant Breeding, UAS, GKVK, Bengaluru-560065