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Guidelines
for the Conduct of Test for
Distinctiveness, Uniformity and Stability

On

Green gram
(*Vigna radiata* (L.) Wilczek)

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

Government of India

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CONTENTS

I. Subject

These test guidelines shall apply to all varieties, hybrids and parental lines of Green gram (*Vigna radiata* (L.) Wilczek)

II. Seed material required

1. The Protection of Plant Varieties and Farmers' Rights Authority (PPV & FRA) shall decide when, where and in what quantity and quality of the seed material are required for testing a variety denomination applied for registration under the Protection of Plant Variety and Farmers' Rights (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 to be provided by the applicant shall be 1000 gram in the case of the candidate variety. Each of these seed lots shall be packed and sealed in ten equal weighing packets and submitted in one lot.

2. The seed submitted shall have at least 95 % germination, 98% physical purity, highest genetic purity, uniformity, sanitary and phyto-sanitary standards. In addition the moisture content of the seed shall not exceed 8 - 9% to meet the safe storage requirement. 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.

3. The seed material shall not have been subjected to any chemical or bio-physical treatment.

III. Conduct of tests

1. The minimum duration of the DUS tests 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 tests 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 parts of plants 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 400 plants, in the plot size and planting space specified below across three replications. Separate plots for observation and measurement can only be used if they have been subjected to similar environmental conditions. All the replications shall be sharing similar environmental conditions of the test location.

4. **Test plot design**

Number of rows	:	4
Row length	:	5 m
Row to row distance	:	45 cm
Plant to plant distance	:	15 cm
Expected plants/replication	:	140
Number of replications	:	3

5. Observations shall not be recorded on plants in border rows.
6. Additional test protocols for special purpose shall be established by the PPV & FR Authority.

IV. Methods and observations

1. The characteristics described in the Table of characteristics (see section VII) shall be used for the testing of varieties for their DUS.
2. For the assessment of Distinctiveness, and stability observations shall be made on 30 plants or parts of 30 plants, which shall be equally divided among 3 replications (10 plants per replication).
3. For the assessment of uniformity of characteristics on the plot as a whole, which shall be done by single visual observation of a group of plants or parts of plant a population standard of 0.5% with an acceptance probability of at least 95%, shall be applied. In the case of a sample size of 250 plants, the number of off-types shall not exceed 4.
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 the assessment of Distinctiveness. Characteristics, which are known from experience not to vary, or to vary only slightly within a variety and which in their various states are fairly evenly distributed across all varieties in the collection are suitable for grouping purposes.
2. The following characteristics are proposed to be used for grouping mungbean varieties:
    a) Hypocotyl: Anthocyanin colouration (Characteristic 1)
    b) Time of flowering (Characteristic 2)
    c) Seed: Lusture (Characteristic 22)
    d) Seed: Size (Characteristic 24)

VI. Characteristics and symbols

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. Note (1 to 9) shall be used to describe the state of each character for the purpose of digital 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 seven 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	States	Note	Example varieties	Stage of observation	Type of assessment
1	2	3	4	5	6	7
1. (*)	Hypocotyl: Anthocyanin colouration	Absent	1	PM 3, HUM 12	Cotyledons Unfolded	VS
		Present	9	PDM 54, Pant M2		
2. (*)	Time of flowering	Early (<40 days)	3	PDM 139, Pusa Vishal	50% plants with atleast one open flower	VG
		Medium (40-50days)	5	Pant M 4, NDM 1		
		Late (>50 days)	7	CO 4, CO 5		
3. (+)	Plant: Growth habit	Erect	3	NDM-1, IPM 99-125	50% flowering	VG
		Semi-erect	5	K 851, PDM 139		
		Spreading	7	CO 5		
4. (*) (+).	Plant: Habit	Determinate	1	PDM 139, Pusa Vishal	50% flowering	VG
		Indeterminate	3	CO 5		
5. (*)	Stem: Colour	Green	1	PDM 54, HUM 6	50% flowering	VG
		Green with purple splashes	2	RMG 62, NDM 1		
		Purple	3	PKVM 8802		
6. (*)	Stem: Pubescence	Absent	1	---	50% flowering	VG
		Present	9	Pant M 2, SML 668		
7. (+)	Leaflet: Lobes (terminal)	Absent	1	NDM 1,	50% flowering	VG
		Present	9	Ganga 8 ---		
8. (+)	Leaf: Shape (terminal)	Deltoid	1	---	50% flowering	VG
		Ovate	2	PDM 11		
		Lanceolate	3	---		
		Cuneate	4	---		
9. (*)	Leaf: Colour	Green	1	PDM 54, Pant M 5	50% flowering	VG
		Dark green	2	AKM 8802, TARM 1		

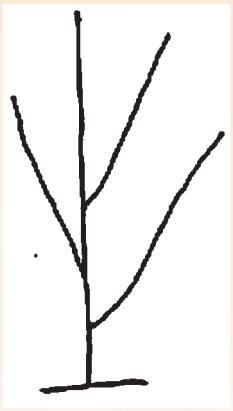
10.	Leaf: Vein colour	Green Greenish purple Purple	1 2 3	COGG 912, HUM 12 Pant M3, Pusa Vishal TARM 1, NDM 1	50% flowering	VG
11.	Petiole: Colour	Green Green with purple splashes Purple	1 2 3	HUM 12 NDM 1, Pant M 4 AKM 8802	50% flowering	VG
12. (*)	Leaf: size (at 5th node from the base)	Small Medium Large	3 5 7	PDM 139, Sona Pant M 4, Pant M 5 Pant Moong 3, Pant Moong 1	50% flowering	MS
13.	Flower: Colour of petal (standard)	Yellow Light yellow	3 5	TARM 1, Pusa 9072 PDM 139, HUM 12	50% flowering	VG
14.	Pod: Colour of premature pod	Green Green with pigmented suture	1 2	PDM 11, PDM 54 TARM 1, TARM 2	Fully developed green pods	VG
15. (*)	Pod: Pubescence	Absent Present	1 9	--- Pant M 4, NDM 1	Fully developed green pods	VS
16. (*)	Pod: Position	Above canopy Intermediate Not visible	1 2 3	AKM 8803, Pusa Vishal Sujata ---	Fully developed green pods	VG
17. (*)	Plant: Height	Short (<50 cm) Medium (50-70 cm) Long (>70 cm)	3 5 7	AKM 8802, Sona PDM 11, Pant M 5 CO 4, Pusa 9072	Fully developed green pods	MS

18. (*)	Pod: Colour	Brown Black	1 2	--- PDM 139, Pant M 3	Harvest maturity	VG
19. (+)	Pod: Curvature of mature pod	Straight Curved	1 3	PDM 11, PDM 139 RMG 268, RMG 344	Harvest maturity	VG
20. (*)	Pod: Length (mature pod)	Short (< 8 cm) Medium (8-10 cm) Long (> 10 cm)	3 5 7	Sujata, Sona IPM 99-125 Pusa Ratna, Pusa Vishal	Harvest maturity	MS
21. (*)	Seed: Colour	Yellow Green Mottled Black	1 2 3 4	Sona IPM 99-125, Asha, HUM 1 --- ---	Mature seeds	VG
22. (*)	Seed: Lusture	Shiny Dull	1 2	IPM 99-125, HUM 1 Pant M 4, NDM 1	Mature seeds	VG
23. (+)	Seed: Shape	Oval Drum shaped	1 3	PDM 54, PDM 139 Pusa Ratna, NDM 1	Mature seeds	VG
24. (*)	Seed: Size (weight of 100 seeds)	Small (<3 g) Medium (3 to 5 g) Large (> 5 g)	3 5 7	Sona, PDM 139 AKM 9910, IPM 99-125 Pusa Vishal, SML 668	Mature seeds	MG

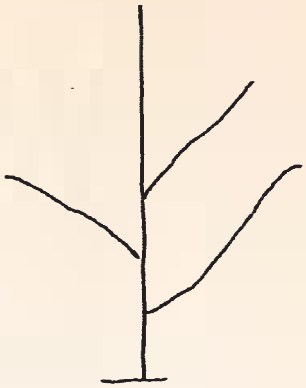
VIII. Explanations for the Table of characteristics

Characteristic 3. Plant: Growth habit

3
Erect



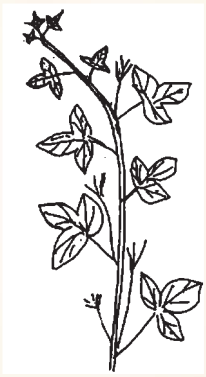
5
Semi-erect



7
Spreading

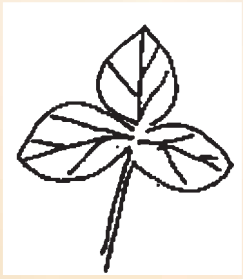
Characteristic 4. Plant: Habit

1
Determinate

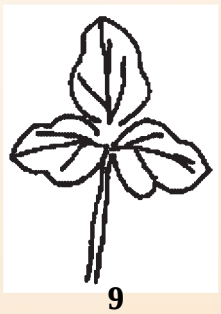


3
Indeterminate

Characteristic 7. Leaflet: Lobes

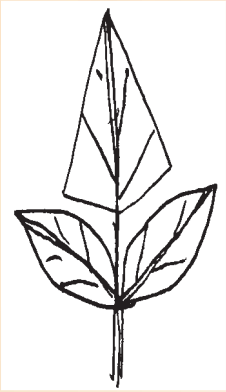


1
Absent

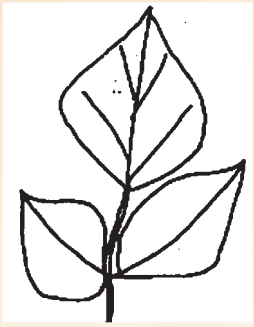


9
Present

Characteristic 8. Terminal leaflet: Shape



1
Deltoid



2
Ovate

3
Lanceolate

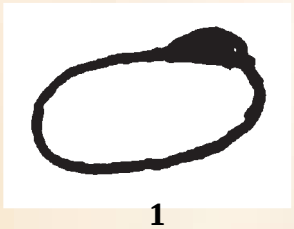
4
Cuneate

Characteristic 19. Pod: Curvature of mature pod

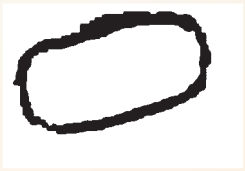
1
Straight

3
Curved

Characteristic 23. Seed: Shape



1
Oval



3
Drum shaped

IX. Working Group details

The Test Guideline developed by the National Core Committee in consultation with the Project co-ordinator (Mulla RP, Indian Institute of Pulses Research (IIPR), Kanpur, the Nodal Officer, DUS Testing, IIPR, Kanpur and the Task Force (1/2005) constituted by the PPV & FR Authority

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