Guidelines

For the Conduct of Test for

Distinctiveness, Uniformity and Stability

On

Ginger

(*Zingiber officinale* Rosc.)

Protection of Plant Varieties & Farmers' Rights Authority

(PPV & FRA)

Government of India

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I. Subject

These test guidelines shall apply to all varieties of Ginger (*Zingiber officinale* Rosc.).

II. Planting 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 Varieties and Farmers' Rights (PPV & FR) Act, 2001. Applicants submitting such planting 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 planting material to be supplied by the applicant in one or several samples shall be: 5.0 kg (clean and wholesum rhizome of 25-30 g each of 150 pieces). The rhizomes shall be packed in cotton cloth bag with proper labeling.
2. The planting material supplied should be healthy, not lacking in vigor or affected by any pests or disease.
3. The planting material shall not have undergone any chemical or bio-physical treatment, unless the competent authority allow or request such treatment. If it has been treated, full details of the treatment must be given.

III. Conduct of tests

1. The minimum duration of DUS tests shall normally be at least two independent similar growing seasons with two consecutive plantings, the second being a replanting with same plant material.
2. The test shall normally be conducted 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. Each test shall include about 120 plants, in the plot size (3 m x 1 m) and planting space specified below across three replications. Separate plots for observation and for 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

Bed size	: 3 m^2 (3 m x 1 m)
Spacing	: 30 x 25 cm
Plants/ replication	: 40
Number of replications	: 3

5. Additional test protocols for special tests 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 three replications (10 plants per replication).
3. For the assessment of Uniformity, a population standard of 1% and an acceptance probability of at least 95 % shall be applied.
4. For the assessment of colour characteristics, the latest Royal Horticultural Society (RHS) colour chart shall be used.
5. Unless otherwise indicated, all observation on the plant, the leaf and the stem shall be made before the end of the growing phase and during the full expression time. Unless otherwise indicated, all observations on the shoot (pseudostem) shall be made on the main shoot (tallest).
6. All observations on the rhizome shall be made at the time of harvest.

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 shall be used for grouping ginger varieties:

i. Plant: Height (Characteristic 2)
ii. Plant: Number of shoots (pseudostem) (Characteristic 3)
iii. Rhizome: Thickness (Characteristic 14)
iv. Rhizome: Shape (Characteristic 15)
v. Crop duration (Characteristic 16)

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. Notes (1 to 9) shall be used to describe the state of each character for the purpose of digital data processing and these notes shall be given against the states of each characteristic.

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 explanations 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 for the colour variation.

4. The optimum stage of plant growth for assessment of each characteristic is given in the sixth column of the 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 observations of individual plants or parts of plants

VII. Table of characteristics

S No.	Characteristics	States	Note	Example varieties	Stage of observation	Type of Assess-ment
1	**2**	**3**	**4**	**5**	**6**	**7**
1.	Plant: Growth habit	Erect	1	PGS -5, Thiruvalla	At the end of the growing phase	VG
		Semi-erect	3	Varada		
		Spreading	5	---		
2. **(*)** **(+)**	Plant: Height (cm)	Short (<100)	3	Sabarimala	At the end of the growing phase	MS
		Medium (100 – 120)	5	Varada, Kunduli local		
		Tall (>120)	7	PGS-6		
3. **(*)** **(+)**	Plant: Number of shoots	Few (<10)	3	Jamaica	At the end of the growing phase	MS
		Medium (10 - 15)	5	Mahima, Himachal		
		Many (>15)	7	Suravi, Erattupetta		
4. **(+)**	Plant: Height of shoot (cm)	Short (<75)	3	Sabarimala	At the end of the growing phase	MS
		Medium (75 - 90)	5	Varada		
		Tall (> 90)	7	PGS-19		
5 **(+)**	Shoot: Diameter (cm)	Narrow (<3)	3	Sabarimala	At the end of the growing phase	MS
		Medium (3 - 5)	5	China, Erattupetta		
		Broad (>5)	7	Burdwan		

6	Shoot: Intensity of green colour	Light green Green Dark green	1 3 5	Supliang local Varada Jamaica	At the end of the growing phase	VG
7	Shoot: Number of leaves on main shoot	Few (<25) Medium (25-35) Many (>35)	3 5 7	Sawthingpui Burdwan, Erattupetta China	Full expansion of leaves achieved	MS
8 **(+)**	Leaf: Length (cm)	Short (<25) Medium (25 - 30) Long (>30)	3 5 7	Sabarimala Varada Burdwan	Full expansion of leaves achieved	MS
9. **(+)**	Leaf: Width (cm)	Narrow (<2.5) Medium (2.5 – 3.5) Broad (>3.5)	3 5 7	Sabarimala Burdwan, Erattupetta Jamaica	Full expansion of leaves achieved	MS
10.	Leaf: Intensity of green colour	Light green Green Dark green	1 3 5	Supliang local Varada Jamaica	Full expansion of leaves achieved	VG
11. (+)	Leaf: Petiole length (cm)	Short (<0.5) Medium (0.5-0.7) Long (>0.7)	3 5 7	Konni local Juggijan China, Erattupetta, Nadia	Full expansion of leaves achieved	MS

12. **(+)**	Spike: Length (cm)	Short (<25) Medium (25 - 35) Long (>35)	3 5 7	Dehradun Varada S666, Silent Valley	Maximum length and width of spike attained	MS
13. **(+)**	Colour of the bract tip of fully developed spike	Crimson Yellowish-white tip	3 5	H 687 Maran	Maximum length and width of spike attained	VS
14. **(*)** **(+)**	Rhizome: Thickness (cm)	Thin (<2) Medium (2-3) Bold (>3)	3 5 7	Sabarimala Maran Jorhat, Supliang local	At the time of harvest	MS
15. **(*)** **(+)**	Rhizome: Shape	Straight Curved Zigzagged	1 3 5	Sabarimala Kakkakalan Jamaica	At the time of harvest	VG
16. **(*)**	Crop duration(days)	Short (<200) Medium (200-210) Long (>210)	3 5 7	Sabarimala, Rio-de-Janerio. Maran, Varada Himagiri	Duration calculated from planting to maturity (After drying of above ground parts)	VG
17. **(+)**	Dry recovery (%)	Low (<16) Medium (16-18) High (>18)	3 5 7	Palai Himachal, Maran Varada, Mahima,	After drying	MG

VIII. Explanations for the Table of characteristics

Characteristic 2. Plant: Height

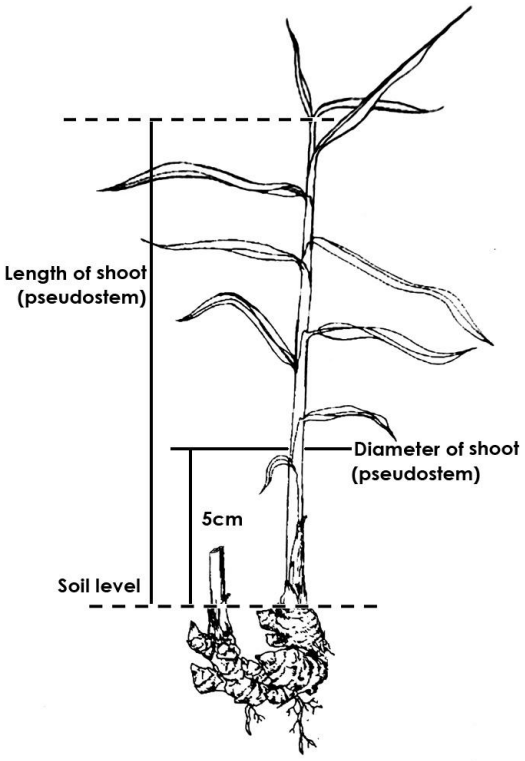
Plant height shall be measured from the soil level to the tip of the top leaf of the main shoot (pseudostem). Average of 10 clumps shall be taken from single replication.

Characteristic 3. Plant: Number of shoots (pseudostem)

Total number of shoots of single clump shall be counted. Average of 10 clumps shall be taken from single replication.

Characteristic 4 and 5. Plant: Height of shoot and Shoot: Diameter

Height and diameter shall be measured from the tallest pseudostem of each clump. Average of 10 clumps shall be taken from single replication.



Characteristic 8. Leaf: Length

Value of upper fourth leaf of the main shoot shall be taken. Average of 10 leaves shall be taken from each replication.

Characteristic 9. Leaf: Width

Value of upper fourth leaf of the main shoot shall be taken. Average of 10 leaves shall be taken from each replication.

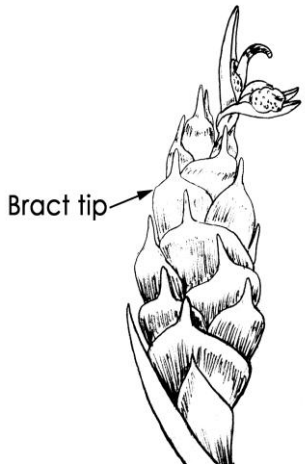
Characteristic 11. Leaf: Petiole length

Value of upper fourth leaf shall be measured from the tip of the leaf sheath to the base of the blade. Average of 10 leaves shall be taken from each replication.

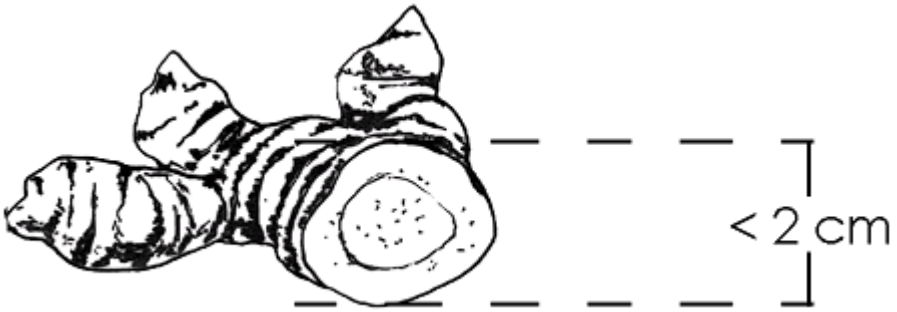
Characteristic 12. Spike: Length

It shall be measured from the soil level to the tip of the inflorescence.

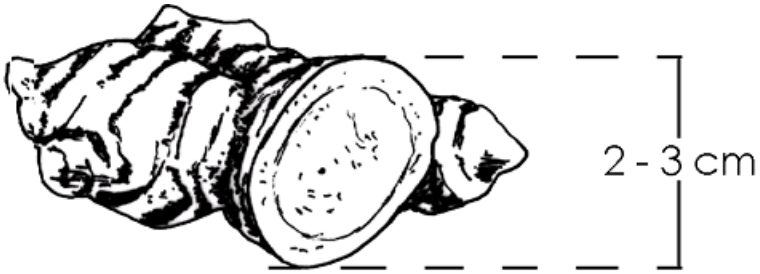
Characteristic 13. Colour of the bract tip of fully developed spike



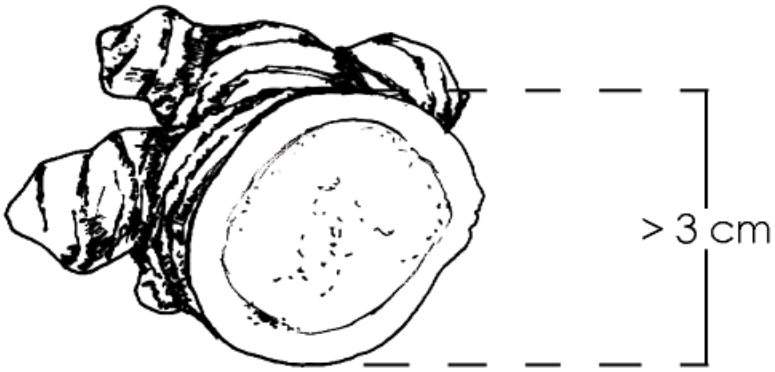
Characteristic 14. Rhizome: Thickness



3
Thin



5
Medium



7
Bold

Characteristic 15. Rhizome: Shape

1
Straight

3
Curved

5
Zigzagged

Characteristic 17. Dry recovery (%)

Shall be recorded for 5 kg fresh rhizome (peeled) and sun dried to a moisture level of 10 -11%.

IX. Literature

Mohanthy, D.C. and Panda, B.S. (1994) Genetic resources in ginger. In Chadha, K.L. and Rathinam, P. (eds), Advances in Horticulture. Vol.9. Plantation Crops and Spices, part 2, Malhothra Publications, New Delhi. pp. 157 – 168.

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X. Working group details

The test guidelines developed by Indian Institute of Spices Research, Calicut was finalized by the Task Force (7/2007) constituted by PPV & FR Authority.

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XI. DUS testing centers

Nodal centre	Other centres
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