

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

on

Tuberose

(Polianthes tuberosa L.)



Protection of Plant Varieties and Farmers' Rights Authority

PPV & FRA

GOVERNMENT OF INDIA

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1. Subject

These test guidelines shall apply to all varieties, hybrids and parental lines of Tuberose (*Polianthes tuberosa* L.)

II. Material required

1. The Protection of Plant Varieties and Farmers' Rights Authority (PPV & FRA) shall decide where and in what quantity and quality, the planting material is required for testing a variety denomination applied for registration under the Protection of Plant Varieties and Farmers' Rights Authority (PPV & FRA) 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 legislation are complied with.
2. In the case of vegetatively propagated crop like tuberose, the material has to be supplied in the form of bulbs of sufficient size to show full flowering in the first year. The bulbs should have at least one vegetation point.
3. The minimum quantity of plant material, to be supplied by the applicant, should be 75 bulbs of >2 cm (diameter at broadest point) weighing 25 to 30 grams.
4. The plant material supplied should be healthy, neither lacking in vigor, nor affected by any pest or disease.
5. The plant material should not have undergone any treatment which would affect the expression of the characteristics of the variety, unless the competent authorities 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 the DUS tests for the new varieties shall normally be at least two independent similar growing seasons.
2. The test shall normally be conducted at least at two locations. If any essential characteristic of the candidate variety is 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 favoring normal growth and expression of all test characteristics. The size of the plots shall be such that parts of plants could be removed for measurement and observation without prejudicing the other to the observations on the standing plants until the end of the growing period. Each test shall include about 64 plants, in the plot size and planting space specified below across

2 replications. Separate plots for observation and for measuring 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	:	2.5m
Row to row distance	:	30 cm
Plant to plant distance	:	30 cm
Expected plants/replication	:	32
Number of replications	:	2

5. Observations should not be recorded on plants in border rows

6. Additional test protocols for special test shall be established by the PPV&FR Authority.

IV. Methods and observations

1. The characteristics described in the table of characteristics shall be used for the testing of varieties and hybrids for their DUS characteristics.
2. For the assessment of distinctiveness and stability, observation shall be made on 10 plants or parts of 10 plants, which shall be equally divided among 2 replications (5 plants per replication).
3. For the assessment of uniformity of characteristics on the plot as a whole, this shall be done on simple visual observation of a group of plants or parts of plant. During such observation the entry shall be deemed uniform when the number of aberrant or odd plants or parts of plant shall not be exceeding 1 in 64. For the assessment of uniformity of vegetatively propagated varieties, a population standard of 1% and an acceptance probability of at least 95 % should be applied.
4. All the observations on leaf related parameters will be recorded from the 5th leaf from the meristem.
5. For the assessment of color characteristics, the latest Royal Horticultural Society (RHS) color chart shall be used.
6. Days taken for flowering should be recorded from date of planting to the opening of the first inflorescence on 50% of the population.
7. All observations on inflorescence, bud color, bract size, pigmentation on the peduncle and the floral characteristics should be made at the time of flowering. Flowering is considered to begin when the first flower on the inflorescence has opened and observations on the flower should be made on the most recently fully opened flowers on the inflorescence before fading of color.
8. Inflorescence axis length should be measured from the first pair of flowers till the tip of the inflorescence.

9. Measurements of the length of the Inflorescence should be taken from ground level to the tip of the inflorescence when the first pair of flowers open.
10. Inflorescence diameter should be measured at a gap of 10cm from the ground level, when the first pair of flowers open.
11. Perianth tube length (excluding the perianth lobes), perianth tube thickness and perianth lobe thickness are measured after the opening of first two flowers.
12. Fruit set is recorded under natural pollination (open pollination).
13. Fruit Locule should be recorded from fully matured capsules.
14. Standard cultural practices to be adopted specific to the area.
15. A decimal code number in the fourth column of table of characteristics indicates the optimum stage of observation of each characteristic during the growth and development of plant. The relevant growth stages corresponding to those stages are described below:

Decimal code	Stages
0	Planting
01	Sprouting
02	Leaf Emergence
03	Initiation of Inflorescence
04	Inflorescence Emergence
05	Opening of 1 Pair of florets
06	Opening of Last pair of florets
07	Fruit Set Initiation
08	Fruit Ripening (Green)

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 Tuberose varieties:

- a) Leaf variegation (Characteristic No.2)
- b) Pigmentation on leaf base on abaxial side (Characteristic. 5)
- c) Bud colour (Characteristic. 7)
- d) Flower type (Characteristic. 9)
- e) Flower shape (Characteristic.16)
- f) Inflorescence length (Characteristic .19)

- g) Stigma type (Characteristic.27)
- h) Stigmatic lobes (Characteristic. 28)
- i) Pigmentation on peduncle (Characteristic. 31)
- j) Days taken for flowering (Characteristic. 32)
- k) Fruit locule (Characteristic.34)

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. Scale 1 to 8 is used to describe the state of each character for the purpose of digital data processing.
3. The optimum stage for taking the observation of each characteristic during the plant growth and development is indicated by a decimal code.
4. Legend :
 - (*) Characteristics that should be observed during every growing period on all varieties and should 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 should be provided.
 - (+) See Explanations on the table of characteristics in Chapter VIII of UPOV Guidelines. Characteristics are illustrated by explanation and drawings in Explanation and Methods.
5. Characteristics denoted with symbols QL, QN and PQ in the first column of the Table of characteristics shall be indicated as
 - QL: Qualitative characteristics
 - QN: Quantitative characteristics
 - PQ: Pseudo- qualitative characteristics
6. Type of assessment of characteristics indicated in the table 2 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 on a group of plants or parts of plants
 - VS: Visual assessment by observations of individual plants or parts of plant

VII. Table of Characteristics

Sl. No (1)	Character (2)	State (3)	Note (4)	Stage of observation (5)	Example Variety (6)	Type of Assessment (7)
1. PQ	Leaf colour: Ref: RHS Chart	Light green Dark green	3 5	02	Phule Rajani Vaibhav	VS
2. * QL	Leaf variegation	Absent Present	1 9	02	Prajwal Variegated	VG
3. QN	Leaf length	Short <40 cm Medium 40-50 cm Long >50 cm	3 5 7	02	Suarna Rekha Arka Sugandhi Prajwal	MS
4. QN	Leaf breadth	Narrow <2 cm Medium 2-3 cm Broad >3 cm	3 5 7	02	Suarna Rekha Arka Sugandhi Prajwal	MS
5 * QL	Pigmentation at leaf base on abaxial side	Weak Medium Strong	3 5 7	02	Arka Sugandhi Hyderabad Single Hyderabad Double	VG
6 QN	Bud length	Short <5 cm Medium 5-6 cm Long >6 cm	3 5 7	05	Arka Sugandhi Shringar Prajwal	MS
7 * QL	Bud colour	Green Pink	3 5	05	Mexican Single Shringar	VG
8 QL	Flower colour	White Yellow Pink	3 5 7	05	Prajwal - -	VG
9 * (+) QL	Flower type	Single Double	3 5	05	Mexican Single Pearl Double	VG
10	Flower length	Short <6 cm	3	05	Suarna Rekha	MS

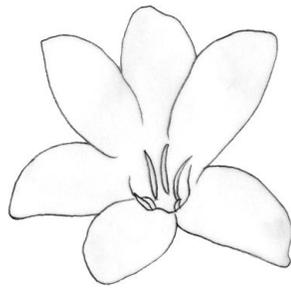
QN		Medium 6-7 cm	5		Suvasini	
		Long >7 cm	7		Arka Nirantara	
11	Flower diameter	Small <4 cm	3	05	Calcutta Single	MS
QN		Medium 4 - 4.5 cm	5		Mexican Single	
		Large >4.5 cm	7		Arka Nirantara	
12	Tepal tip	Acute	3	05	Arka Nirantara	VG
(+)		Apiculate	5		Prajwal	
QL		Obtuse	7		Mexican Single	
13	Rows of tepal	1	3	05	Prajwal	MG
QN		>3	5		Suvasini	
14	Inflorescence	Straight	3	05	Shringar	VG
(+)		Crooked	5		Arka Nirantara	
QL		Slightly Bent	7		GKTC-4	
15	Inflorescence axis	Short <20 cm	3	05	Phule Rajani	MS
QN		Medium 20-30 cm	5		Prajwal	
		Long >30 cm	7		Suvasini	
16	Flower shape	Tubular	3	05	Shringar	VG
*		Narrow funnel	5		Arka Nirantara	
(+)		Broad Funnel	7		Prajwal	
QL						
17	Flower tube shape	Bent	3	05	Prajwal	VG
(+)		Straight	5		Arka Sugandhi	
QL						
18	Flower opening	Wide Open	3	05	Suvasini	VG
(+)		Shy	5		Calcutta Double	
QL						
19	Inflorescence length	Short <70 cm	3	05	GKTC-4	MS
*		Medium 70-105 cm	5		Vaibhav	
QN		Long >105 cm	7		Prajwal	
20	Peduncle thickness	Thin <9 mm	3	05	GKTC-4	MS
QN		Medium 9-10 mm	5		Mexican Single	
		Thick >10mm	7		Prajwal	

21 QN	No of flowers/ inflorescence	Few < 42 Nos Medium 42-52 Nos Many >52 Nos	3 5 7	05	GKTC-4 Shringar Suvasini	MG
22 QN	Perianth tube length excluding tepals	Short < 3.5 cm Medium 3.5-4 cm Long >4 cm	3 5 7	05	Suarna Rekha Calcutta Double Suvasini	MS
23 QN	Perianth tube diameter	Thin <8 mm Medium 8-9 mm Thick >9 mm	3 5 7	05	GKTC-4 Vaibhav Prajwal	MS
24 QN	Perianth lobe thickness	Thin <1.1mm Medium 1.1-1.2 mm Thick >1.2 mm	3 5 7	05	Suarna Rekha Shringar Prajwal	MS
25 QL	Tepal colour on abaxial side	Greenish Tinge Pinkish Tinge	3 5	05	Vaibhav Suvasini	VG
26 (+) QL	Anthers	Normal Malformed	3 5	05	Prajwal Suvasini	VG
27 * (+) QL	Stigma type	Pin Type Thrum Type	3 5	05	Arka Sugandhi Prajwal	VG
28 * (+) QL	Stigmatic lobes	Trifid Tetrafid	3 5	05	Shringar Arka Nirantara	VG
29 QL	Fruit setting	Absent Present	1 9	08	Suvasini Arka Nirantara	VG
30 QL	Capsules	Profuse Scanty	3 5	08	Arka Nirantara Hyderabad Single	VG
31 * QL	Pigmentation on peduncle	Weak Medium Strong	3 5 7	05	Prajwal Calcutta Single Arka Sugandhi	VG

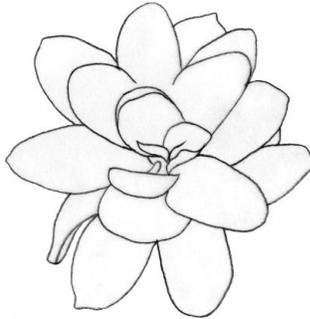
32	Days taken for flowering	Early 90-100 days	3	05	Shringar	MG
* QN		Late >100days	5		Pearl Double	
33	Bract length	Short <4cm	3	05	Phule Rajani	MS
QN		Medium 4-6cm	5		Arka Sugandhi	
		Long >6cm	7		Prajwal	
34	Fruit locule	Trilocular	3	08	Shringar	VG
* (+) QL		Tetralocular	5		Arka Nirantara	
35	Style Shape	Straight	3	05	Arka Sugandhi	VG
(+) QL		Bent	5		Prajwal	

VIII. Explanations on the table of characteristics

Characteristic 9: Flower type

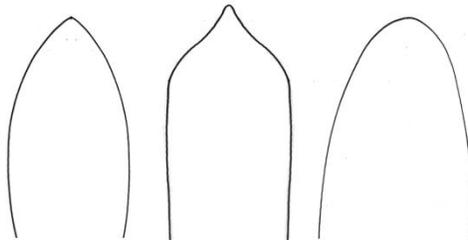


Single



Double

Characteristic 12: Tepal tip



Acute

Apiculate

Obtuse

Characteristic 14: Inflorescence

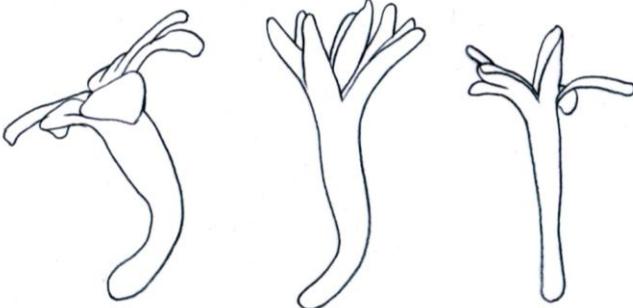


Straight

Crooked

Slightly bent

Characteristic 16: Flower shape



Broad

Narrow

Tubular

Characteristic 17: Flower tube shape

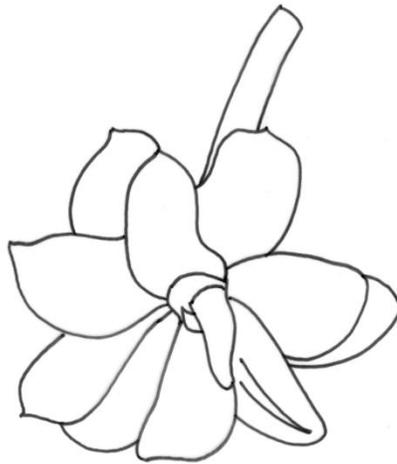


Bent



Straight

Characteristic 18: Flower opening

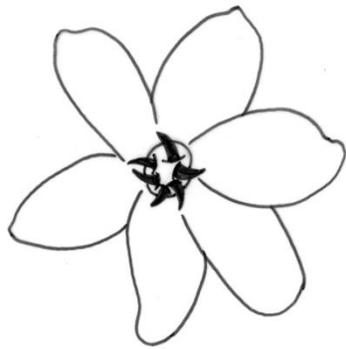


Wide open

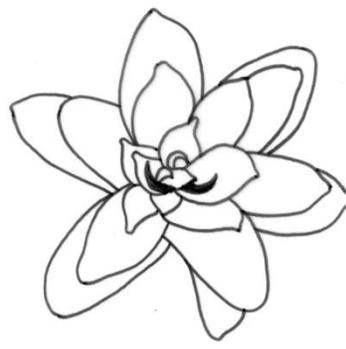


Shy

Characteristic 26: Anthers

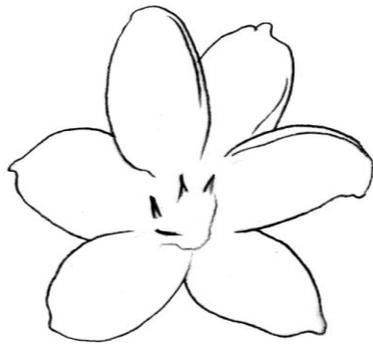


Normal

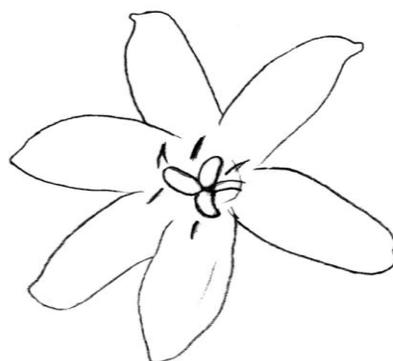


Malformed

Characteristic 27: Stigma type

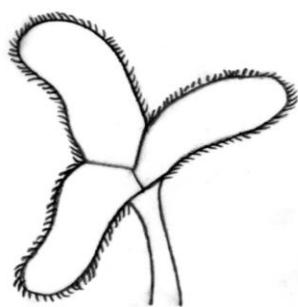


Thrum Type

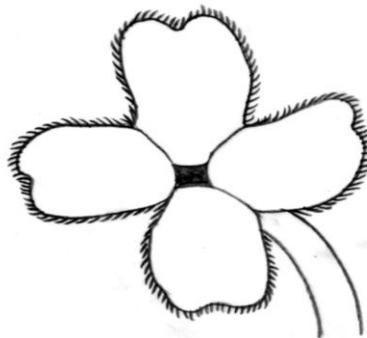


Pin Type

Characteristic 28: Stigmatic lobes



Trifid

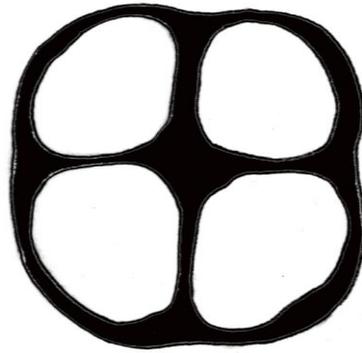


Tetrafid

Characteristic 34: Fruit Locule



Trilocular



Tetralocular

Characteristic 35: Style shape



Bent



Straight

VIII. Working group details

The test guidelines were developed by the Project Leader, Dr. Meenakshi Srinivas, Principal Scientist at IIHR, Bangalore. The suggestions and technical inputs provided by following task force constituted by the PPV&FR Authority (3/4/2013) for the development and finalization of this DUS test guidelines.

Members of the Task Force 3/4/2013

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Member

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Invitee

Dr. Manoj Srivastava

Registrar
PPV &FRA, New Delhi

Member Secretary

XI. DUS Test Centres

Nodal DUS Centre	Co-Nodal centre(s)
ICAR-Indian Institute of Horticultural Research, Hessarghatta, Bengaluru -560089	-