Guidelines for the conduct of test for Distinctiveness, Uniformity and Stability On Adenium

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

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Adenium

1. Subject:

Adenium, commonly known as the desert rose, is a succulent from the dogbane family (Apocynaceae) with a swollen, woody stem called a caudex. These Test Guidelines will apply to all varieties, especially under the genus *Adenium* and *species obesum, arabicum, crispum* and *swazicum*.

Planting Material Required for Testing:

1.1 The Protection of Plant Varieties and Farmers' Rights Authority (PPV&FRA) shall decide when, where and in what quantity and quality of plant material is required for testing of the new variety denomination for registration under Protection of Plant Varieties and Farmers' Rights (PPV&FR) Act, 2001.

Applicant submitting such plant material from country other than India shall make sure that all customs and quarantine requirements stipulated under relevant national legislations and regulations are fulfilled and complied with.

1.2 For all varieties, the minimum quantity of plant material, to be provided by the applicant, should be: 12 well established plants. Any specific requirement for the expression of characters pertaining to DUS test shall have to be specified by the applicant.

1.3 The plant material provided for DUS test should be 2-3 years old healthy uniform planting material (plant height, number of leaves and caudex diameter), vigorous and free from pests or diseases.

1.4 The plant material should **NOT** be treated with any chemicals and bio-physical agents. If it has been treated, full details of the treatment must be provided along with the application.

1.5 The applicant should submit plant material having genetic purity and uniformity, besides data on the method of propagation/multiplication for raising the population.

2. Conducting DUS Test:

2.1 The minimum duration of the DUS test should be one complete growing cycle (minimum one year). However, in case of any inconsistency of some characters, the test is to be extended further for another complete growing cycles.

2.2 The test should be conducted at two test location and two seasons, planted in pots for better expression of the phenotypic characters. In case of non-expression of any diagnostic character at that specific location, the test is to be shifted to other suitable location for further visual examination. Otherwise, the applicant must provide details about the specific requirement of the character.

2.3 The field test should be carried out in naturally ventilated poly house (NVPH) for observing the expression of all tested characteristics. The experimental site should be

large enough to accommodate plants in rows having spacing 0.45 m x 0.45 m for proper vegetative growth and flowering.

2.4 Any kind of growth promoting hormones should **NOT** be used throughout the vegetative growth period and flowering.

2.5 Testing shall be done only in soilless media containing pots of the prescribed size. Plastic pot of 22 cm-top diameter, height 15 cm, bottom-13 cm having 3500cc. Soilless media Sand: Cocopeat: charcoal (8:1:1) is utilized for planting.

2.6 In case of any discrepancy, additional test protocols for special purpose shall be recommended by the PPV&FR Authority.

3. Methods and Observations:

3.1 The morphological characteristics described in the Table of characteristics should be used for the DUS testing of varieties (Section-7).

3.2 Unless otherwise indicated, all observations of vegetative characteristics shall be made during the first flush of growth and flowering shoots. The colour of vegetative organs / flower shall be observed on plants exposed to proper sunlight under NVPH.

3.3 For the assessment of colour characteristics, the latest Royal Horticultural Society (RHS) colour chart shall be used. Because daylight varies, colour determinations made against colour chart shall be made either in a suitable cabinet providing artificial daylight or in the middle of the day in a room without direct sunlight. The special distribution of illuminant for artificial daylight shall conform to the CIE Standard of Preferred daylight D 6500 and should fall within the tolerance set out in the British Standard 950, Part 1. These determinations shall be made with the plant part placed against a white background. The colour chart and version used should be specified in the variety description.

3.4 All observations on single character should be made on the three randomly selected plants.

3.5 For the assessment of uniformity, a population standard of 1% and an acceptance probability of at least 95% should be applied. In the case of a sample size of 10 plants, 1 off-type is allowed.

3.6 For the assessment of Distinctiveness and Stability, all observations on single plants should be made on 9 plants or parts taken from each of 9 plants and any other observations made on all plants in the test, disregarding any off-type plants.

4. Grouping of Varieties:

4.1 The candidate varieties for DUS testing shall be divided into groups to facilitate the assessment of Distinctiveness. Characteristics which are known from experience usually do not vary or to vary slightly with in a variety and which in their various states are fairly evenly distributed across all varieties in the collection are suitable for grouping purpose.

4.2 The following characteristics shall be used for **grouping of Adenium varieties**:

(a) Plant growth habit: (Characteristic 2)

(b) Leaf blade shape: (Characteristic 8)

(c) Leaf colour: (Characteristic 12)

(d) Caudex circumference: (Characteristic 23)

(e) Presence of flower streak: (Characteristic 31)

(f) Flower petal color**:** (characteristic 32)

(g) Types of flower: Single / Semidouble / Double (characteristic 34)

5. Characteristics and Symbols

5.1 To assess Distinctiveness, Uniformity and Stability, the characteristics and their states as given in the Table of characteristics (Section 7) shall be used.

5.2 Notes 0-9 (flower colour group) shall be used to describe the state of each character for the purpose of digital data processing.

5.3 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 an exceptional situation, an adequate explanation shall be provided.

(+) See explanations in the Table of characteristics

5.4 Characteristics containing the following key in the fourth column of the table of phenological characteristics shall be examined at full blooming stage as indicated below:

QL: Qualitative characteristics

QN: Quantitative characteristics

PQ: Pseudo-qualitative characteristic

5.5 **(a) - (c):** See section 8 for explanation

5.6 Type of assessment of characteristics indicated in column six of the table of phenological 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

7.Table of Phenological Characteristics

Sr.N.	Characteristics	States	Note	Example of variety	Stage of observation	Type of assessment
	1	2	3	4	5	6
1 **QN**	**Plant height (cm)**	Tall: (>60cm) Medium: (30-60cm) Dwarf: (<30cm)	1 3 5	G. NAd.3 (Aabha) Arrogant, Mung Siam Taiwan Dwarf, Dinosaur	-	MS
2 **PQ**	**Plant growth habit**	Upright Semi-upright Spreading	1 2 3	Shashank, Double Sweetheart Sudarshan Taiwan Dwarf, Star	-	VG
3 **PQ**	**Plant compactness**	Compact Intermediate Loose	3 5 7	Taiwan Dwarf**,** Godgi Deang Udam Sap, Harry Potter G.N.Ad.5 (Shashank), G. NAd.3 (Aabha)	B	VG/VS
4 **QL**	**Pubescence on leaf surface**	Absent Present	1 9	Picotee, Sudarshan G.N.Ad.5 (Shashank), Mor Lok Dok	B	VS
5 **QL**	**Leaf texture**	Absent Present	1 9	Anant Yellow, Jade Concubine, Lemon Ice G.Ad.2, Yak Saudi	B	VG/VS
6 **(*)** **QN**	**Leaf blade length (cm)**	Short: (<6 cm) Medium: (6-9 cm) Long: (>9 cm)	3 5 9	Taiwan Dwarf, Black Dragon Mung Siam, Picotee Harry Potter, Joker	B	MS
7 **(*)** **QN**	**Leaf blade width (cm)**	Narrow: (<3 cm) Medium: (3-5 cm) Broad: (>5 cm)	3 5 7	Joker, Star Lemon Ice, Mor Lok Dok GNAd3 (Aabha)	B	MS
8 **(*)** **PQ** **(+)**	**Leaf blade shape**	Obovate Lanceolate Oblanceolate Elliptic Oval Obcordate	1 2 3 4 5 6	G.Ad.1, Harry Potter Joker, Sudarshan Picotee, Deang Udam Sap, G.N.Ad.5 (Shashank) Red Doxon Taiwan Dwarf GNAd3 (Aabha)	B	VS
9 **(*)** **QN**	**Leaf blade thickness (mm)**	Thin: (<0.50mm) Thick: (>0.50mm)	1 2	G.N.Ad.4 (Shobhita), Joker GNAd3 (Aabha), G.Ad.5 (Shashank)	B	MS
10 **(+)** **PQ**	**Leaf tip shape**	Acute Acuminate Cuspidate Retuse Rounded Obtuse	1 2 3 4 5 6	Joker, Star Picotee, Arrogant G.N.Ad.4 (Shobhita), Double Sweet Heart GNAd3 (Aabha), Mor Lok Dok Red Doxon, Taiwan Dwarf Mung Siam, Lemon Ice	B	VS
11 **(+)** **PQ**	**Leaf base shape**	Acute Cuneate	1 2	GNAd3 (Aabha) G.Ad.5 (Shashank), Black Dragon	B	VS

		Attenuate	3	Harry Potter, Deang Udam Sap		
12 **(+)** **PQ**	**Leaf colour based on (RHS colour chart)**	Greyish olive-green A (NN137) Moderate yellowish-green C (137) Greyish olive-green B (NN137)	1 2 3	**Dark green:** G.Ad.5 (Shashank), Joker **Medium green:** GNAd3 (Aabha), Arrogant **Light green:** Harry Potter, Vithoons White	B	VS/VG
13 **(+)** **QN**	**Wavyness of leaf margin**	Absent Present	1 9	G.Ad.5 (Shashank), Deang Udam Sap G.N.Ad.4 (Shobhita), Sudarshan	B	VS
14 **(+)** **PQ**	**Leaf curling**	Absent Present	1 2	Harry Potter, Joker G.Ad. 2, Taiwan Dwarf	B	
15	**Color of midrib of leaf**	Pinkish red Greenish white	1 2	Joker, Star Arrogant, Deang Udam Sap	B	VS
16 **QN**	**Petiole length (cm)**	Short: (<0.5 cm) Medium: (0.5-1 cm) Long: (>1 cm)	1 2 3	Sudarshan, Arrogant Vithoons White, Blush GNAd3 (Aabha), G.Ad.5 (Shashank)	B	MS
17 **(*)** **(+)** **QN**	**Petiole leaf orientation**	Upward Horizontal	1 2	Dinosaur, Deang Udam Sap Harry Potter	B	VS
18 **PQ**	**Petiole colour**	Green color White color Reddish color	3 5 7	Arrogant, Deang Udam Sap Shashank, G.Ad. 2 Joker, Star	B	VS
19 **QN**	**Number of leaves on primary branch**	Sparse: (<10) Medium: (10-30) Dense: (>30)	3 5 7	Yak Saudi Harry Potter, Mung Siam G.N.Ad.4 (Shobhita), Arrogant	D	MS
20 **QN**	**Number of leaves on secondary branch**	Sparse: (<10) Medium: (10-30) Dense: (>30)	3 5 7	G.Ad. 2 Harry Potter, Double Sweet Heart Sudarshan, Deang Udam Sap	C	MS
21 **QN**	**Primary branch density**	Low (<3) Medium (3-6) High (>6)	3 5 7	Arrogant, Blush Taiwan Dwarf Dinosaur, Yak Saudi	D	MS
22 **(*)** **(+)** **QN**	**Internodal length (cm)**	Short: (<0.5 cm) Medium: (0.5-1.0 cm) Long: (>1 cm)	3 5 7	G.N.Ad.4 (Shobhita), Double Sweet Heart Mor Lok Dok, Arrogant GNAd3 (Aabha), G.Ad.5 (Shashank)	B	MS
23 **QL**	**Caudex Circumference**	Thin (<10 cm) Medium (10-30 cm)) Large (30-50 cm) Extra-large (>50 cm)	3 5 7 9	Star, Joker Harry Potter Taiwan Dwarf Dinosaur , Yak Saudi	E	MS

24 **QN**	**Number of flowers/cluster**	Sparse: (<6) Medium: (6-10) Dense: (>10)	3 5 7	Pineapple Rose, Super Gold Mung Siam, Velvet Dream, Vithoons White G.N.Ad.4 (Shobhita), Deang Udam Sap	F	MS
25 **QN**	**Maximum no. of flowers open at a time/cluster**	Sparse: (<4) Medium: (4-8) Dense: (>8)	3 5 7	Lemon Ice, Pineapple rose Harry Potter, Joker G.N.Ad.4 (Shobhita), Deang Udam Sap	F	MS
26 **QN**	**Flower length (cm)**	Short: **(<**5 cm) Medium: (5-7 cm) Long: (>7 cm)	3 5 7	Joker, Taiwan Dwarf Harry Potter, Arrogant GNAd3 (Aabha), Deang Udam Sap	F	MS
27 **QN**	**Flower diameter (cm)**	Small: (<5 cm) Medium: (5-7 cm) Large: (>7 cm)	5 7 9	Taiwan Dwarf, Anant Yellow Picotee, Sudarshan GNAd3 (Aabha), Arrogant,	F	MS
28 **(*)** **(+)** **PQ**	**Flower petal shape**	Oval Ovate Orbicular Elliptic Lanceolate Obtuse Spatulate	1 2 3 4 5 6 7	G.Ad. 1 G.Ad. 2, Harry Potter GNAd3 (Aabha), Deang Udam Sap Mor Lok Dok Joker, Picotee G.N.Ad.4 (Shobhita) Vithoons White	F	VS
29 **(*)** **(+)** **PQ**	**Flower petal tip shape**	Acute Acuminate Rounded Mucronate Mucronulate Cuspidate Aristate	1 2 3 4 5 6 7	Harry Potter, Picotee G.Ad.5 (Shashank), G.N.Ad.4 (Shobhita) Taiwan Beauty, Pineapple rose G.Ad. 1, Arrogant Velvet Dream, Deang Udam Sap Mor Lok Dok, Rainbow Blush	F	VS
30 **(+)** **QN**	**Wavyness of flower petal margin**	Non wavy Wavy	1 9	Velvet Dream, Black Dragon G.Ad. 1, G.Ad.5 (Shashank)	F	VS/VG
31 **(+)** **QL**	**Presence of flower streak**	Absent Present	0 1	Arrogant, Deang Udam Sap GNAd3 (Aabha), Jade Concubine	F	VS/VG

32 **(*)** **(+)** **PQ**	**Flower petal colour based on (RHS colour chart)**	Vivid purplish red A (N 57) Strong purplish pink B (68) Strong purplish pink A (62) White B (NN155) Pale yellow green D (4) Pale yellow green C (157) Strong purplish pink A (62)	1 2 3 4 5 6 7	**Red:** G.Ad 1, Joker, Rainbow **Purple:** G.Ad 2, Mung Siam **Pink:** GNAd3 (Aabha), Taiwan Beauty **White:** G.Ad.5 (Shashank), Mor Lok Dok **Yellow:** Pineapple rose, Anant Yellow **Yellowish white:** Lemon Ice **Reddish purple:** Red Doxon, Double Sweet Heart	F	VS/VG
33 **(*)** **(+)** **PQ**	**Flower petal margin colour based on (RHS colour chart)**	Dark red A (183) Dark purplish red B (N 79) Strong purplish red A (67) Light purplish pink C (62) Pinkish white B (N 155)	1 2 3 4 5	**Deep red:** Harry Potter, Jade Concubine **Dark purple:** G.Ad 2, Mung Siam **Pink:** GNAd3 (Aabha) **Light purplish pink:** Sudarshan **Pinkish white:** Blush	F	VS
34 **(*)** **(+)** **QL**	**Flower form Types** **Single (1 whorl of petals)** **Semidouble (2 whorl of petals)** **Double (3 whorl of petals)**	Single: (5 petals) Semi-double: (10 petals) Double: (15 petals)	1 3 5	Arrogant, Deang Udam Sap G.Ad. 2, GNAd3 (Aabha) G.Ad. 1	F	MG
35 **QN**	**Flower petal thickness (mm)**	Thin: (<0.25 mm) Thick: (>0.25 mm)	1 9	G.Ad.5 (Shashank), Picotee, Sudarshan Arrogant, Deang Udam Sap	F	MG/MS

36 **QN**	**Peduncle length (cm)**	Short: (<0.5 cm) Medium: (0.5-1 cm) Long: (>1 cm)	3 5 7	Taiwan Dwarf, Black Dragon G.Ad. 2, Mor Lok Dok Arrogant, Deang Udam Sap, Double Sweet Heart	F	MG/MS
37 **QN**	**Corolla tube length (cm)**	Short: (<2 cm) Medium: (2-4 cm) Long: (>4 cm)	3 5 7	Red Doxon, Taiwan Dwarf G.Ad. 1, G.N.Ad.4 (Shobhita) GNAd3 (Aabha)	F	MG/MS
38 **QN**	**Corolla tube circumference (cm)**	Narrow: (<3 cm) Medium: (3-5 cm) Large: (> 5cm)	3 5 7	Taiwan Dwarf Velvet Dream, Vithoons White, Arrogant, GNAd3 (Aabha), Deang Udam Sap	F	MG/MS
39 **(+) PQ**	**Corolla tube main colour from outward side based on (RHS color chart)**	Pale yellow green B (157) Very pale purple D (69) Greenish white C (155) Light greenish yellow C (4)	1 2 3 4	**Pale yellowish green:** Picotee, Deang Udam Sap **Red:** Joker, Arrogant **Greenish white:** Pineapple rose, Taiwan Dwarf **Light yellowish:** Anant Yellow	F	VG/VS
40 **(+) PQ**	**Corolla tube main colour from inward side based on (RHS color chart)**	Pale yellow green C (157) Strong purplish red B (63) Dark red A (59) Light yellow B (160) Brilliant yellow C (14) Deep purplish pink B (54)	1 2 3 4 5 6	**Light yellowish green:** Picotee, Pineapple rose **Pale Purplish pink:** Harry Potter, Velvet Dream **Red:** Joker, Rainbow **Light yellowish:** Mor Lok Dok, Super Gold **Brilliant yellow:** Arrogant **Deep purplish pink:** Deang Udam Sap	F	VG/VS
41 **QN**	**Thickness of corolla tube (mm)**	Thin: (<0.25 mm) Thick: (> 0.25 mm)	1 9	G.N.Ad.4 (Shobhita), Harry Potter Arrogant, Black Dragon	F	MG/MS

42 **QN**	**Anther tale length (cm)**	Short: (<2 cm) Medium: (2-4 cm) Long: (> 4 cm)	3 5 7	Joker, Mung Siam G.Ad.5 (Shashank), Deang Udam Sap GNAd3 (Aabha)	F	MG/MS
43 **QL**	**Flower Persistence**	Persistent Non-Persistent	1 2	Black Dragon Shobhita, Mung Siam	F	VG
44 **QL**	**Flowering behavior**	Recurrent Non-Recurrent	1 2	G.Ad.2, Shobhita Deang Udam Sap, Anant Yellow	F	VG

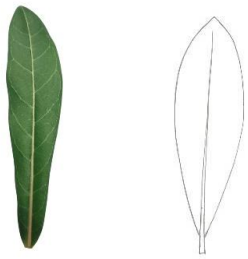
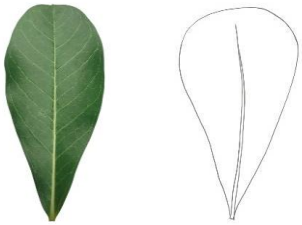
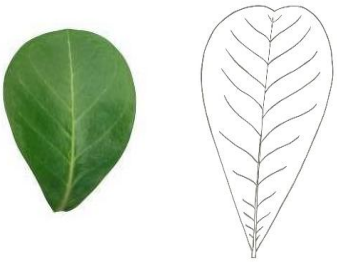
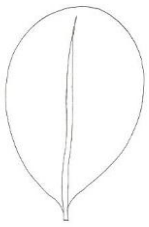
8. **Explanations for the Table of Characteristics:**

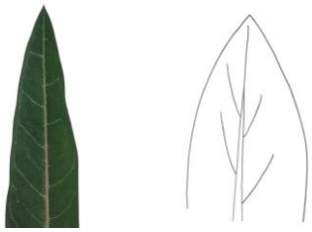
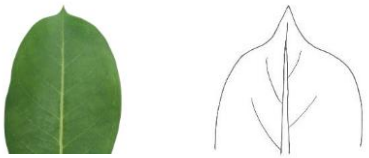
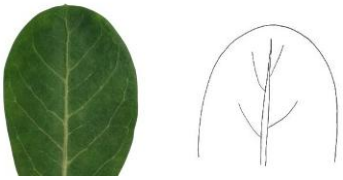
The right stage of development for the assessment / evaluation of the characteristics is at the time of opening of one flower per inflorescences during full blooming. In the case of double flowered varieties, observations should be made when one third of the flower are fully developed and open. Characteristics indicated with (A), (B) and (C) in the first column of the Table of characteristics should be examined as indicated below:

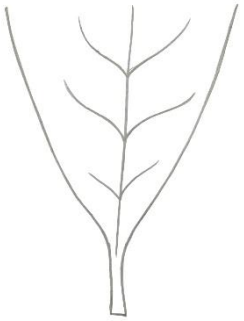
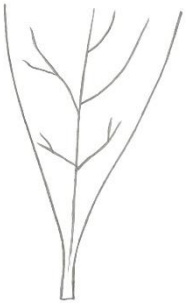
A. Observations should be made on the upper third of the main shoot.
B. Observations should be made on the middle third of the main shoot.
C. Observations should be made on a developed leaf from the middle third of the secondary shoot.
D. Observations should be made on a developed leaf from the middle third of the main shoot.
E. Observations should be taken on middle of developed caudex.
F. Observations should be taken on full blooming stage.

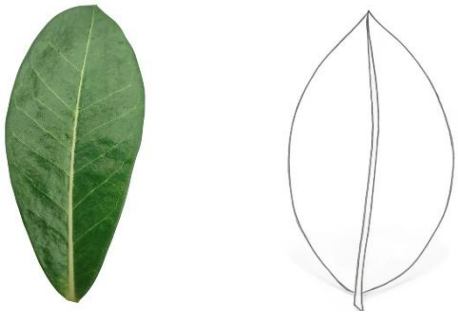
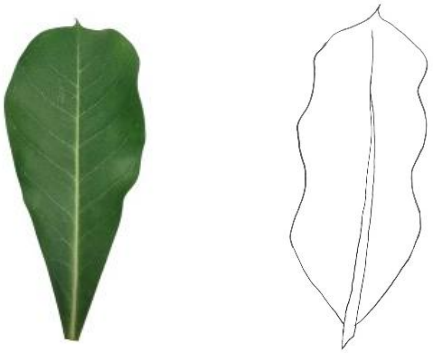
9. **Explanations for Individual Characteristics**

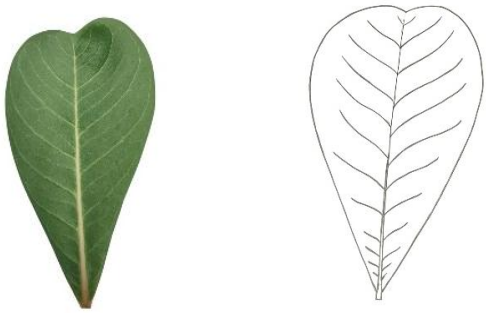
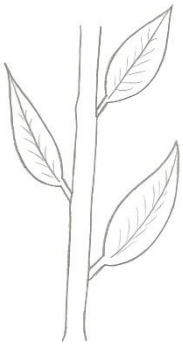
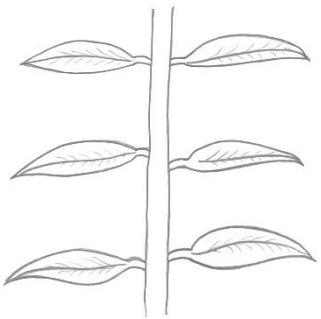
<table>
<tr><td colspan="3">Characteristics 2: Plant Growth Habit</td></tr>
<tr><td> 
Upright (1)</td><td> 
Semi-upright (2)</td><td> 
Spreading (3)</td></tr>
<tr><td colspan="3">Characteristics 3: Plant compactness</td></tr>
</table>

 Compact (3)	 Intermediate (5)	 Loose (7)
Characteristics 8: Leaf blade shape		
 Lanceolate (1)  Obovate (4)	 Oblanceolate (2)  Elliptic (5)	 Obcordate (3) Oval (6) 
Characteristics 10: Leaf tip shape		

 Acute (1)	 Acuminate (2)	 Cuspidate (3)
 Retuse (4)	 Rounded (5)	 Obtuse (6)

Characteristics 11: Leaf base shape		
 Acute (1)	 Cuneate (2)	 Attenuate (3)

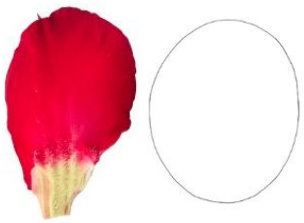
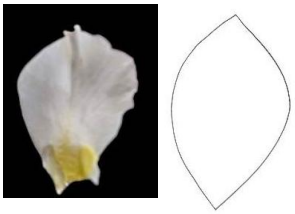
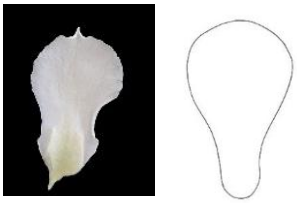
Characteristics 13: Wavyness of leaf margin	
 Absent (0)	 Present (1)

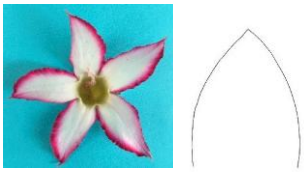
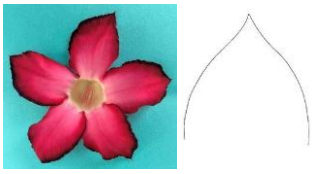
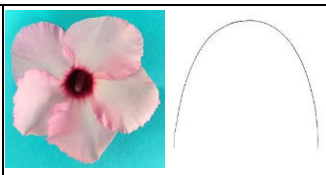
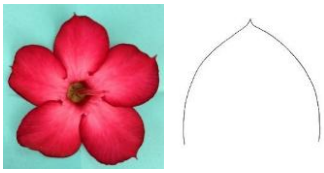
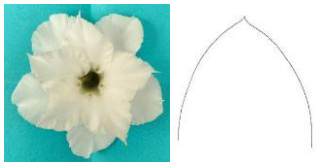
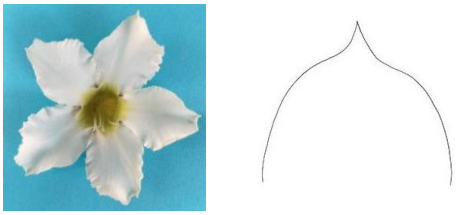
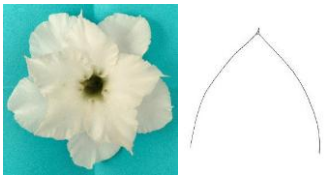
Characteristics 14: Leaf curling	
 Absent (0)	 Present (1)
Characteristics 15: Color of midrib of leaf	
 Pinkish red (1)	 Greenish white (2)
Characteristics 17: Petiole leaf orientation	
 Upward (1)	 Horizontal (2)

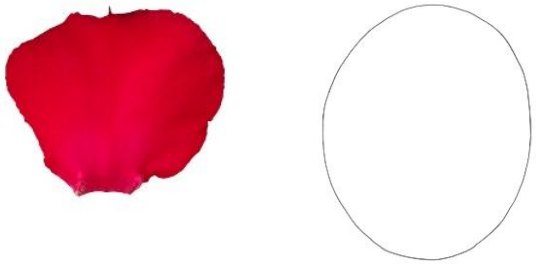
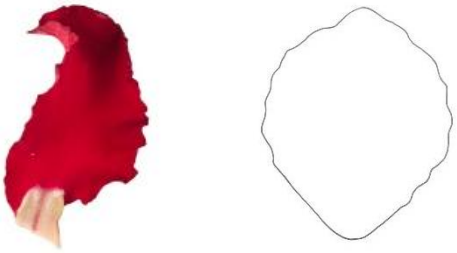
Characteristics 21: Primary branch density		
 Low (3)	 Medium (5)	 High (7)

Characteristics 22: Internodal length		
 Short (3)	 Medium (5)	 Long (7)

Characteristics 21: Caudex diameter			
 Thin (3)	 Medium (5)	 Large (7)	 Extra-large (9)
Characteristics 28: Flower petal shape			

 Oval (1)	 Ovate (2)	 Orbicular (3)	 Elliptic (4)
 Lanceolate (5)	 Obtuse (6)	 Spatulate (7)	

Characteristics 29: Flower petal tip shape			
 Acute (1)	 Acuminate (2)	 Round (3)	 Mucronate (4)
 Mucronulate (5)	 Cuspidate (6)	 Aristate (7)	

Characteristics 30: Flower petal margin	
 Non wavy (1)	 Wavy (9)
Characteristics 31: Flower petal streak	
 Absent (0)	 Present (1)

Characteristics 32: Flower petal color		
 Red (1)	 Purple (2)	 Pink (3)
 White (4)	 Yellow (5)	 Reddish purple (7)

Characteristics 34: Flower Form Types		
 Single (1)	 Semi-double (3)	 Double (5)

10.Working Group Details:

These test guidelines have been developed by a group of Scientists and technical staff members in consultation with other experts in the field and in commensurate with the international guidelines specially UPOV.

Member of the task force (4/2024):

1	**Dr. Ramesh Kumar** Former Director ICAR-Directorate of Floricultural Research	**Chairman**
2	**Dr. S. S. Sindhu** Former Principal Scientist & Head Division of Floriculture and Landscaping, ICAR-IARI, New Delhi	**Member**
3	**Dr. P. Naveen Kumar** Principal Scientist/PI & Head Division of Flower and Medicinal Crops, IIHR, Bangalore	**Member**
4	**Dr. Dilipbhai Dhirubhai Patel** Professor (Botany) B.K.M. Science College, Valsad	**Member**
5	**Dr. Alka Singh** Principal & Dean College of Horticulture NAU, Navsari	**Member**
6	**Dr. D. S. Pilania** Technical Assistant, PPVFRA, New Delhi	**Member Secretary**

11.Name of DUS test centre:

Nodal DUS Centre
Navsari Agricultural University www.nau.in