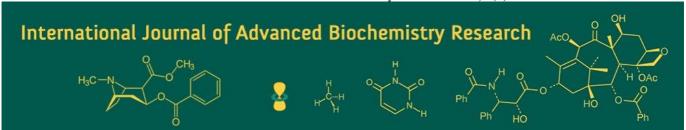
International Journal of Advanced Biochemistry Research 2025; 9(7): 655-662



ISSN Print: 2617-4693 ISSN Online: 2617-4707 NAAS Rating: 5.29 IJABR 2025; 9(7): 655-662 www.biochemjournal.com Received: 10-04-2025 Accepted: 12-05-2025

Vaidehee Ninama

Department of Floriculture, ASPEE College of Horticulture, NAU, Navsari, Gujarat, India

Chawla SL

Department of Floriculture, ASPEE College of Horticulture, NAU, Navsari, Gujarat, India

Patel RK

N. M. C. A, Navsari Agricultural University, Navsari, Gujarat, India

Dipal Bhatt

Department of Floriculture, ASPEE College of Horticulture, NAU, Navsari, Gujarat, India

Mallika Sindha

Department of Floriculture, ASPEE College of Horticulture, NAU, Navsari, Gujarat, India

Corresponding Author: Vaidehee Ninama Department of Floriculture, ASPEE College of Horticulture, NAU, Navsari, Gujarat, India

Characterization of different tuberose genotypes through DUS testing

Vaidehee Ninama, Chawla SL, Patel RK, Dipal Bhatt and Mallika Sindha

DOI: https://www.doi.org/10.33545/26174693.2025.v9.i7i.4809

Abstract

Tuberose is commercially significant bulbous ornamental crop, cultivated extensively for its attractive and fragrant cut flowers, as well as loose flower. As there is considerable misunderstanding in the nomenclature of genetic material existing in various Indian states because they are solely referred to as one genotype and all local duplicates are most likely from another. Apart from registration and commercial introduction of new kinds, the main focus at the moment is to maintain their purity. This study aimed to screening and identified the desirable tuberose genotypes from half sib population of ten different tuberose *viz*. Phule Rajani, Arka Shringar, Arka Sugandhi, Arka Nirantara, GKTC- 4, Hyderabad Single, Sikkim Selection, Bidhan Ujjawal, Bidhan Jyoti, Mexican Single. Among the population significant genetic diversity and variability were recorded morphological, flowering and yield parameters. However, distinct differences were noticed in floral and vegetative traits in half-sib genotypes which exhibited diverse characteristics, including yellow and pink flower colors, as well as semi-double and double florets.

Keywords: Bulbous, cut flower, loose flower, semi double

Introduction

Tuberose (*Polianthes tuberosa* L.) is one of the most important tropical ornamental bulbous flowering plants cultivated for production of long-lasting flower spikes. It is popularly known as 'Rajanigandha' or 'Nishigandha'. It belongs to the family Asparagaceae and is native of Mexico from where it was spread to the different parts of the world during the 16th century. It is commercially cultivated in different parts of India. There are about fifteen species under the genus Polianthes, of which twelve species have been reported from Mexico and Central America. Of these, nine species have white flowers, one is white tinged with red and two are red. Except Polianthes tuberosa L., all the others are found growing wild. The different varieties in tuberose. These are firstly named on the basis of the number of petals they bear. In the cultivar 'Single', the flowers are pure white with only one whorl of corolla segments. The 'Semi double' type, bear white flower with two to three whorls of corolla. The 'Double' type flowers have more than three whorls of corolla. The flower tinged with red in 'double' type is known as 'Pearl'. As flowers are very popular for its strong fragrance and its essential oil is important component for high grade perfume. 'Single' varieties are more fragrant than 'Double'. The high demand for tuberose concrete and absolute in international market which fetch a very good price. Flower of the single type commonly used for extraction of essential oil, loose flower, pot plant, making garland etc. while that of double type are used as cut flower, garden display and interior decoration. Fragrance of flower is very sweet floral and honey like can help give emotional strength. The flower spike of tuberose remain fresh for long time and finds a distinct place in the flower market.

Due to its immense export potential, cultivation of tuberose is gaining momentum day by day in India. (Bansil, 2018) ^[1]. In recent years, crop improvement had play important role in producing new types in tuberose and for that the knowledge of genetic base of crop is must. Morphological characterization is the first step in description and classification. With the advent of Protection of Plant Varieties and Farmers Right Act, 2001in India, the potential application of the DUS test guideline to distinguish a candidate variety from reference material was successfully demonstrated.

Table 1: List of sixty variants with 10 genotypes (Check) in experiment

Genotype	Half Sibs of Genotype and check
G1, G2, G3, G4, G5, G6, G7, G8, G9, G10, G11, G12, G13, G14, G15, G16, G17, G18, G19, G20, G21, G22, G23, G24, G25, G26, G27, G28, G29, G30, G31, G32, G33, G34, G35, G36, G37, G38, G39, G40, G41, G42, G43, G44, G45, G46, G48, G49, G50, G51, G52, G56, G57, G58, G59, G60, G61, G62, G63, G65	Selected 60 variants from half sib population of ten genotypes on the basis of desirable morphological characters
G47	Arka Shringar
G53	Arka Sugandhi
G54	GKTC 4
G55	Hyderabad Single
G64	Bidhan Jyoti
G66	Sikkim Selection
G67	Bidhan Ujjwal
G68	Phule Rajani
G69	Mexican Single
G70	Arka Nirantara

Materials and Methods

The present investigation was conducted at the Floriculture Research Farm, ASPEE College of Horticulture, Navsari Agricultural University, Navsari (Gujarat) for two successive years 2023- 24 to 2024-25. Tuberose uniform size bulbs were obtained from half-sib progenies of 10 different genotypes at Floriculture Research Farm, ASPEE College of Horticulture, Navsari Agricultural University, Navsari. The data for present investigation were recorded by following guidelines of "Protection of Plant Varieties and Farmers' Right Authority" in which ICAR- Indian Institute of Horticultural Research, Hessarghatta, Bengaluru was nodal DUS testing center. All half sibs of 10 genotypes and check were planted at 5.00 -7.00 cm depth with a spacing of 30 cm × 30 cm ridges. Among them screening and identification of desirable tuberose genotypes from half sib population of ten genotypes were done. The experiment material for the present investigation consisted half sibs of ten genotypes of tuberose are presented in Table 1. All ten check varieties were mentioned in Photo 1.

Results and Discussion

Morphological characters were prioritized due to their predominant genetic expression

and stability across generation. An effort was made to characterise the half sibs of tuberose genotypes exhibiting superior characteristics, including leaf colour, leaf variation, flower colour, flower type, tepal arrangement and flower length. The characterization was made as per PPV and FRA's DUS guideline on tuberose (2013) and presented in Table 2.

Moreover, origin of genotypes was also documented and presented in Table 3.

In case of leaf colour, dark green leaves were observed in 51 genotypes *viz*. Arka Nirantara, Arka Shringar, GKTC-4, Bidhan Jyoti, Bidhan Ujjawal, Mexican Single and other half sibs, however rest of genotypes showed light green coloured leaves which are mentioned in Table 3.

Among 70 genotype, Sikkim selection (G 66) and G 56 recorded leaf variation whereas, it was absent in rest of the genotypes.

Table 2: Morphological Characterization using DUS Guideline

Sr. No.	Character	State	Note	Stage of observation	Types of assessment
1 (+) DO	Leaf colour Ref.	Light green	3	02	VC
1. (+) PQ	RHS colour Chart	Dark green	5	02	VS
2 (1) (1	Lasfyaniaaatian	Absent	1	02	VG
2. (+) QL	Leaf variegation	Present	9	02	VG
		White	3		
3 (+) QL	Flower colour	Yellow	5	05	VG
		Pink	7		
4 (+) OI	El	Single	3	05	VC
4. (+) QL	Flower type	Double	5	05	VG
		Short < 6 cm	3		
5. (+) QN	Flower length	Medium 6-7 cm	5	05	MS
	_	Long >7 cm	7		
		Short < 4 cm	3		
6. (+) QN	Flower diameter	Medium 4-4.5 cm	5	05	MS
		Long >4.5	7		
7. (+) QN	Rows of tepal	1	3	05	VG
7. (+) QIV	Rows of tepar	>3	5	03	٧٥
		Straight	3		
8 (+) QL	Inflorescence	Crooked	5	05	VG
		Slightly bent	7		
		Short < 20 cm	3		
9 (+) QN	Inflorescence axis	Medium 20-30 cm	5	05	MS
		Long > 30 cm	7		
		Short < 70 cm	3		
10 (+) QN	Inflorescence length	Medium 70-105 cm	5	05	MS
		Long > 105 cm	7		

		Few < 40 Nos	3							
11 (+) QN	No. of flowers per inflorescence	Medium 42-52	5	05	MG					
		Many > 52 Nos	7							
12 (+) ON	Days taken for flowering	Early 90 - 100	3	05	MG					
12 (+) QN	Days taken for nowering	Late > 100	5	03	MIG					
		QL= Qualitative	charac	teristics						
		QN= Quantitative	chara	cteristics						
Note	PQ= Pseudo qualitative characteristics									
Note	MS= Measu	rement of a number of	indiv	idual plants or parts plan	t					
	VG= Visual assessme	ent by a single observa	tion o	n group of plants or parts	s of plants					
	MG= Measureme	ent by a single observa	ation o	of group of plants part of	plant					

With respect to flower color, all genotype produced white color flower except G^4 , G^5 had pink color flowers and yellow color in the following half sib genotypes of tuberose G^8 , G^{10} , G^{14} , G^{16} , G^{19} , G^{21} , G^{26} , G^2 , G^{38} , G^{41} , G^{60} , G^{61} , G^{62} , G^{63} .

In case of flower types single and double, G⁵, G⁹, G¹⁸, G²⁰ found with double and semidouble type while rest of all genotypes were observed with single type of tuberose represented in Table 3.

In case flower length maximum length, among the 70 genotypes 46 genotypes were recorded with short flower length which was shorter than 6 cm *viz*. Arka Shringar, GKTC-4, Hyderabad Single, Bidhan Ujjawal and other half sib of tuberose mentioned in the Table 3.and rest of all had medium length of flower ranges in 6-7 cm including check verities *viz*. Phule Rajani, Mexican Single, Arka Nirantara, Bidhan Jyoti, Sikkim Selection. While Maximum range, more than 4.5 cm flower diameter recorded in 17 half sib of tuberose.

With respect to row of tepals only four half sib genotypes tuberose had more than three row of petal in flower viz G⁵, G⁹, G¹⁸, G⁴⁰ which is mentioned in Table 3.

Straightness in spike is very important character and among all genotypes, 66 genotypes exhibited straight inflorescence except Arka Nirantara, Sikkim Selection and G²⁰, G³¹ with crocked and slightly bend spike respectively.

In case of inflorescence axis, among all the genotype studied, 17 genotypes including different half-sib of 10 genotypes and check *viz*. Hyderabad Single, Arka Sungadhi, Sikkim Selection, Arka Nirantara had short inflorescence axis short (< 20 cm), thirty seven genotypes including different half-sib of 10 genotypes and check *viz*. GKTC-4, Bidhan Jyoti had medium inflorescence axis medium (20-30 cm) and rest of all having long inflorescence axis (> 30 cm) with Sikkim Selection, Bidhan Ujjawal checks and half-sib of tuberose.

In case of inflorescence length, nine genotype of half sib including Sikkim Selection, Bidhan Jyoti had long inflorescence length (> 105 cm), while short range of inflorescence (< 70 cm) was recorded in twenty-eight genotype including Arka Sugandhi, Hyderabad Single check and other selected half sib of tuberose mentioned in Table 3. As tuberose used as loose flower and cut flower number of flower per spike is very important character for the crop. Half sib of tuberose genotypes had maximum number of flower per spike than rest of all seventy genotypes including checks.

In case of days taken to flowering all genotypes noted late varieties for flowering.

Table 3: Morphological Characterization using DUS Guideline

Sr. no.	Character	State	Note	\mathbf{G}^{1}	\mathbf{G}^2	G^3	G^4	G^5	G^6	G^7	G^8	G^9	G^{10}
1	Leaf colour Ref. RHS colour Chart	Light green Dark green	3 5	5	5	5	5	5	5	5	3	5	3
2	Lasf variagation	Absent	1	1	1	1	1	1	1	1	1	1	1
2	Leaf variegation	Present	9	1	1	1	1	1	1	1	1	1	1
		White	3										
3	Flower colour	Yellow	5	3	3	3	7	7	3	3	5	5	3
		Pink	7										
4	Flower type	Single	3	3	3	3	3	5	3	3	3	5	3
	1 lower type	Double	5	3	3	3	3	3	3	,	3	5	3
		Short < 6 cm	3										
5	Flower length	Medium 6-7 cm	5	3	3	3	3	3	5	5	3	3	5
		Long >7 cm	7										
		Short < 4 cm	3										
6	Flower diameter	Medium 4-4.5 cm	5	3	7	5	3	3	7	7	5	3	3
		Long >4.5	7										
7	Rows of tepal	1	3	3	3	3	3	5	3	3	3	5	3
,	Rows of tepar	>3	5	3	3	3	3	3	3	,	3	3	3
		Straight	3										
8	Inflorescence	Crooked	5	3	3	3	3	3	3	3	3	3	3
		Slightly bent	7										
		Short < 20 cm	3										
9	Inflorescence axis	Medium 20-30 cm	5	3	3	7	3	7	3	7	3	7	3
		Long > 30 cm	7										
		Short < 70 cm	3										
10	Inflorescence length	Medium 70-105 cm	5	3	3	5	3	5	3	7	3	7	5
		Long > 105 cm	7										
11	No. of flowers per inflorescence	Few < 40 Nos	3	3	5	5	3	7	3	5	3	3	3

1		Medium 42-52	5										
		Many > 52 Nos	7										
12	Days taken for flowering	Early 90 - 100	3	5	5	5	5	5	5	5	5	5	5
C	Character	Late > 100 State	5 No4e	G^{11}	G^{12}	G^{13}	G^{14}	G^{15}	G^{16}	G^{17}	G^{18}	G^{19}	G^{20}
Sr. no.		Light green	Note 3										
1	Leaf colour Ref. RHS colour Chart	Dark green	5	5	5	5	3	5	3	5	5	3	5
2	Lasf variagetien	Absent	1	1	1	1	1	1	1	1	1	1	1
2	Leaf variegation	Present	9	1	1	1	1	1	1	1	1	1	1
		White	3		_	_		_				_	_
3	Flower colour	Yellow Pink	5	3	3	3	5	3	5	3	3	5	3
		Single	3										
4	Flower type	Double	5	3	3	3	3	3	3	3	3	3	3
		Short < 6 cm	3										
5	Flower length	Medium 6-7 cm	5	3	5	3	3	3	5	5	5	3	3
		Long >7 cm	7										
		Short < 4 cm	3		_	_	_	_	l _	_	_	_	_
6	Flower diameter	Medium 4-4.5 cm	5 7	5	3	5	5	7	7	7	7	7	5
		Long >4.5	3										
7	Rows of tepal	>3	5	3	3	3	3	3	3	3	3	3	3
		Straight	3										
8	Inflorescence	Crooked	5	3	3	3	3	3	3	3	3	3	7
		Slightly bent	7										
		Short < 20 cm	3										
9	Inflorescence axis	Medium 20-30 cm	5	3	3	7	7	5	5	5	7	5	5
		Long > 30 cm	7										
10	Inflorescence length	Short < 70 cm Medium 70-105 cm	5	5	5	5	3	3	3	5	7	5	5
10	innorescence length	Long > 105 cm	7	,	3)	3	3	3	3	′	3)
		Few < 40 Nos	3										
11	No. of flowers per inflorescence	Medium 42-52	5	3	3	5	3	3	3	5	5	3	3
	•	Many > 52 Nos	7										
12	Days taken for flowering	Early 90 - 100	3	5	5	5	5	5	5	5	5	5	5
		Late > 100	5			_							
Sr. no.	Character	State	Note 3	G^{21}	G^{22}	G^{23}	G ²⁴	G^{25}	G^{26}	G^{27}	G^{28}	G ²⁹	G^{30}
1	T C I D C DIIG I GI			3	5	_							
ļ	Leaf colour Ref. RHS colour Chart	Light green		3		5	5	5	3	5	3	5	5
1 _		Dark green	5										
2	Leaf colour Ref. RHS colour Chart Leaf variegation			1	1	1	5	5	3	5	3	5	5
2		Dark green Absent Present White	5 1 9 3										
3		Dark green Absent Present White Yellow	5 1 9 3 5										
	Leaf variegation	Dark green Absent Present White Yellow Pink	5 1 9 3 5 7	1	1	1	1	1	1	1	1	1	1
	Leaf variegation	Dark green Absent Present White Yellow Pink Single	5 1 9 3 5 7 3	1	1	1	1	1	1	1	1	1	1
3	Leaf variegation Flower colour	Dark green Absent Present White Yellow Pink Single Double	5 1 9 3 5 7 3 5	5	3	3	3	3	5	3	5	3	3
3 4	Leaf variegation Flower colour Flower type	Dark green Absent Present White Yellow Pink Single Double Short < 6 cm	5 1 9 3 5 7 3 5 3	5	3	3	3	3	5	3	5	3	3
3	Leaf variegation Flower colour	Dark green Absent Present White Yellow Pink Single Double	5 1 9 3 5 7 3 5	5	3	3	3	3	5	3	5	3	3
3 4	Leaf variegation Flower colour Flower type	Dark green Absent Present White Yellow Pink Single Double Short < 6 cm Medium 6-7 cm Long >7 cm Short < 4 cm	5 1 9 3 5 7 3 5 3 5 7 3 5	5	3	3	3	3	5	3	5	3	3
3 4	Leaf variegation Flower colour Flower type	Dark green Absent Present White Yellow Pink Single Double Short < 6 cm Medium 6-7 cm Long >7 cm Short < 4 cm Medium 4-4.5 cm	5 1 9 3 5 7 3 5 3 5 7 7 3 5 7 3 5 7	5	3	3	3	3	5	3	5	3	3
3 4 5	Leaf variegation Flower colour Flower type Flower length	Dark green Absent Present White Yellow Pink Single Double Short < 6 cm Medium 6-7 cm Long >7 cm Short < 4 cm Medium 4-4.5 cm Long >4.5	5 1 9 3 5 7 3 5 7 3 5 7 7	5 3	1 3 3 5	3 3	3 3	3 3	1 5 3	1 3 3 5	1 5 3	1 3 3 5	3 3
3 4 5	Leaf variegation Flower colour Flower type Flower length	Dark green Absent Present White Yellow Pink Single Double Short < 6 cm Medium 6-7 cm Long >7 cm Short < 4 cm Medium 4-4.5 cm Long >4.5	5 1 9 3 5 7 3 5 3 5 7 3 5 7 7 3 5 7 7 3 5 7 7 3 5 7 7 7 7	5 3	1 3 3 5	3 3	3 3	3 3	1 5 3	1 3 3 5	1 5 3	1 3 3 5	3 3
3 4 5	Leaf variegation Flower colour Flower type Flower length Flower diameter	Dark green Absent Present White Yellow Pink Single Double Short < 6 cm Medium 6-7 cm Long >7 cm Short < 4 cm Medium 4-4.5 cm Long >4.5 1 >3	5 1 9 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7	5 3 3	1 3 3 5	1 3 3 7	1 3 3 5	1 3 3 3	1 5 3 3	1 3 3 5	1 5 3 3	1 3 3 5	1 3 3 7
3 4 5	Leaf variegation Flower colour Flower type Flower length Flower diameter Rows of tepal	Dark green Absent Present White Yellow Pink Single Double Short < 6 cm Medium 6-7 cm Long >7 cm Short < 4 cm Medium 4-4.5 cm Long >4.5 1 >3 Straight	5 1 9 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7	5 3 3	1 3 3 5	1 3 3 7	3 3 5 3	1 3 3 3	1 5 3 3 3	1 3 5 5	1 5 3 3	1 3 5 7	3 3 7 3
3 4 5 6 7	Leaf variegation Flower colour Flower type Flower length Flower diameter	Dark green Absent Present White Yellow Pink Single Double Short < 6 cm Medium 6-7 cm Long >7 cm Short < 4 cm Medium 4-4.5 cm Long >4.5 1 >3	5 1 9 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7	5 3 3	3 3 5 3	3 3 7 3	1 3 3 5	3 3 3	1 5 3 3	1 3 3 5	1 5 3 3 3	1 3 3 5	1 3 3 7
3 4 5 6 7	Leaf variegation Flower colour Flower type Flower length Flower diameter Rows of tepal	Dark green Absent Present White Yellow Pink Single Double Short < 6 cm Medium 6-7 cm Long >7 cm Short < 4 cm Medium 4-4.5 cm Long >4.5 1 >3 Straight Crooked Slightly bent Short < 20 cm	5 1 9 3 5 7 3 5 7 3 5 7 3 5 7 7 3 5 7 3 5 7 7 3 5 7 7 7 7	5 3 3	3 3 5 3	3 3 7 3	3 3 5 3	3 3 3	1 5 3 3 3	1 3 5 5	1 5 3 3 3	1 3 5 7	3 3 7 3
3 4 5 6 7	Leaf variegation Flower colour Flower type Flower length Flower diameter Rows of tepal	Dark green Absent Present White Yellow Pink Single Double Short < 6 cm Medium 6-7 cm Long >7 cm Short < 4 cm Medium 4-4.5 cm Long >4.5 1 >3 Straight Crooked Slightly bent Short < 20 cm Medium 20-30 cm	5 1 9 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 7 3 5 7 7 3 5 7 7 7 7	5 3 3	3 3 5 3	3 3 7 3	3 3 5 3	3 3 3	1 5 3 3 3	1 3 5 5	1 5 3 3 3	1 3 5 7	3 3 7 3
3 4 5 6 7 8	Leaf variegation Flower colour Flower type Flower length Flower diameter Rows of tepal Inflorescence	Dark green Absent Present White Yellow Pink Single Double Short < 6 cm Medium 6-7 cm Long >7 cm Short < 4 cm Medium 4-4.5 cm Long >4.5 1 >3 Straight Crooked Slightly bent Short < 20 cm Medium 20-30 cm Long > 30 cm	5 1 9 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 7 3 5 7 7 3 5 7 7 7 7	1 5 3 3 5 3 3 3	1 3 5 3 3	1 3 3 7 3	1 3 3 5 3	3 3 3 3	1 5 3 3 3 3	1 3 5 5 3	1 5 3 3 3 3	1 3 5 7 3	1 3 3 7 3 3
3 4 5 6 7 8	Leaf variegation Flower colour Flower type Flower length Flower diameter Rows of tepal Inflorescence	Dark green Absent Present White Yellow Pink Single Double Short < 6 cm Medium 6-7 cm Long >7 cm Short < 4 cm Medium 4-4.5 cm Long >4.5 1 >3 Straight Crooked Slightly bent Short < 20 cm Medium 20-30 cm Long > 30 cm Short < 70 cm	5 1 9 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 7 3 5 7 7 3 5 7 7 7 7	1 5 3 3 3 5 5 5 5	1 3 5 3 3 7	1 3 3 7 3 3	1 3 3 5 3 3 5	1 3 3 3 3 3 5	1 5 3 3 3 3 7	1 3 5 5 3 3	1 5 3 3 3 3 5	1 3 5 7 3 3	1 3 3 7 3 3 5
3 4 5 6 7 8	Leaf variegation Flower colour Flower type Flower length Flower diameter Rows of tepal Inflorescence	Dark green Absent Present White Yellow Pink Single Double Short < 6 cm Medium 6-7 cm Long >7 cm Short < 4 cm Medium 4-4.5 cm Long >4.5 1 >3 Straight Crooked Slightly bent Short < 20 cm Medium 20-30 cm Long > 30 cm Short < 70 cm	5 1 9 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 7 3 5 7 7 3 5 7 7 7 7	1 5 3 3 5 3 3 3	1 3 5 3 3	1 3 3 7 3	1 3 3 5 3	3 3 3 3	1 5 3 3 3 3	1 3 5 5 3	1 5 3 3 3 3	1 3 5 7 3	1 3 3 7 3 3
3 4 5 6 7 8	Leaf variegation Flower colour Flower type Flower length Flower diameter Rows of tepal Inflorescence	Dark green Absent Present White Yellow Pink Single Double Short < 6 cm Medium 6-7 cm Long >7 cm Short < 4 cm Medium 4-4.5 cm Long >4.5 1 >3 Straight Crooked Slightly bent Short < 20 cm Medium 20-30 cm Long > 30 cm Short < 70 cm Medium 70-105 cm Long > 105 cm	5 1 9 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 7 3 5 7 7 3 5 7 7 7 7	1 5 3 3 3 5 5 5 5	1 3 5 3 3 7	1 3 3 7 3 3	1 3 3 5 3 3 5	1 3 3 3 3 3 5	1 5 3 3 3 3 7	1 3 5 5 3 3	1 5 3 3 3 3 5	1 3 5 7 3 3	1 3 3 7 3 3 5
3 4 5 6 7 8 9	Leaf variegation Flower colour Flower type Flower length Flower diameter Rows of tepal Inflorescence Inflorescence axis	Dark green Absent Present White Yellow Pink Single Double Short < 6 cm Medium 6-7 cm Long >7 cm Short < 4 cm Medium 4-4.5 cm Long >4.5 1 >3 Straight Crooked Slightly bent Short < 20 cm Medium 20-30 cm Long > 30 cm Short < 70 cm Medium 70-105 cm Long > 105 cm Few < 40 Nos	5 1 9 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 7 3 5 7 7 3 5 7 7 7 7	1 5 3 3 3 5 5 5 5	1 3 5 3 3 7	1 3 3 7 3 3 3	1 3 3 5 3 5 5	1 3 3 3 3 3 5	1 5 3 3 3 3 7 5	1 3 5 5 3 5 5	1 5 3 3 3 3 5 5	1 3 5 7 3 3	1 3 3 7 3 3 5
3 4 5 6 7 8	Leaf variegation Flower colour Flower type Flower length Flower diameter Rows of tepal Inflorescence	Dark green Absent Present White Yellow Pink Single Double Short < 6 cm Medium 6-7 cm Long >7 cm Short < 4 cm Medium 4-4.5 cm Long >4.5 1 >3 Straight Crooked Slightly bent Short < 20 cm Medium 20-30 cm Long > 30 cm Short < 70 cm Medium 70-105 cm Long > 105 cm Few < 40 Nos Medium 42-52	5 1 9 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 7 3 5 7 7 3 5 7 7 7 7	1 5 3 3 3 5 5 5 5	1 3 3 5 3 3 7	1 3 3 7 3 3	1 3 3 5 3 3 5	1 3 3 3 3 3 5	1 5 3 3 3 3 7	1 3 5 5 3 3	1 5 3 3 3 3 5	1 3 5 7 3 3 7	1 3 3 7 3 3 5
3 4 5 6 7 8 9	Leaf variegation Flower colour Flower type Flower length Flower diameter Rows of tepal Inflorescence Inflorescence axis	Dark green Absent Present White Yellow Pink Single Double Short < 6 cm Medium 6-7 cm Long >7 cm Short < 4 cm Medium 4-4.5 cm Long >4.5 1 >3 Straight Crooked Slightly bent Short < 20 cm Medium 20-30 cm Long > 30 cm Short < 70 cm Medium 70-105 cm Long > 105 cm Few < 40 Nos	5 1 9 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 7 3 5 7 7 3 5 7 7 7 7	1 5 3 3 3 5 5 5 5	1 3 3 5 3 3 7	1 3 3 7 3 3 3	1 3 3 5 3 5 5	1 3 3 3 3 3 5	1 5 3 3 3 3 7 5	1 3 5 5 3 5 5	1 5 3 3 3 3 5 5	1 3 5 7 3 3 7	1 3 3 7 3 3 5

Sr. no.	Character	State	Note	G^{31}	G^{32}	G^{33}	G^{34}	G^{35}	G ³⁶	G^{37}	G^{38}	G ³⁹	G^{40}
1	Leaf colour Ref. RHS colour Chart	Light green	3	5	5	5	5	5	5	5	3	5	5
1	Lear colour Ref. RHS colour Chart	Dark green	5	,)	3	,)	3	3	3	3	
2	Leaf variegation	Absent	1	1	1	1	1	1	1	1	1	1	1
		Present White	9					-	 				┼
3	Flower colour	Yellow	5	3	3	3	3	3	3	3	5	3	3
3	Plower colour	Pink	7	3	3	3	3	3	3	3)	3	3
		Single	3										+
4	Flower type	Double	5	3	3	3	3	3	3	3	5	3	3
		Short < 6 cm	3										1
5	Flower length	Medium 6-7 cm	5	3	3	3	5	5	3	3	5	5	3
	-	Long >7 cm	7										
		Short < 4 cm	3										
6	Flower diameter	Medium 4-4.5 cm	5	5	5	5	5	3	7	5	7	5	3
		Long >4.5	7				<u> </u>	ļ	↓				4
7	Rows of tepal	>3	3 5	3	3	3	3	3	3	3	5	3	3
		>3 Straight	3	├	-		-	₩	₩				₩
8	Inflorescence	Crooked	5	7	3	3	3	3	3	3	3	3	3
8	innoiescence	Slightly bent	7	· '	3	3	3	3	3	3	3	3	3
		Short < 20 cm	3		1		 	1	1				†
9	Inflorescence axis	Medium 20-30 cm	5	3	5	5	5	.3	5	5	7	5	5
-		Long > 30 cm	7	1									
		Short < 70 cm	3										1
10	Inflorescence length	Medium 70-105 cm	5	3	5	5	3	3	3	3	7	5	5
		Long > 105 cm	7										
		Few < 40 Nos	3										
11	No. of flowers per inflorescence	Medium 42-52	5	3	3	3	3	5	3	3	5	3	5
		Many > 52 Nos	7	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>		<u> </u>		
12	Days taken for flowering	Early 90 - 100	5	- 5	5	5	5	5	5	5	5	5	5
Sr. no.	Character	Late > 100 State	Note	G^{41}	G^{42}	G^{43}	G ⁴⁴	G^{45}	G ⁴⁶	G ⁴⁷	G^{48}	C 49	G ⁵⁰
51.110.		Light green	3										
1	Leaf colour Ref. RHS colour Chart	Dark green	5	3	5	5	5	5	5	5	5	3	5
	T. C	Absent	1						<u> </u>				
2	Leaf variegation	Present	9	1	1	1	1	1	1	1	1	1	1
		White	3										
3	Flower colour	Yellow	5	5	3	3	3	3	3	3	3	3	3
		Pink	7		<u> </u>	<u> </u>		<u> </u>			<u> </u>		
4	Flower type	Single	3	3	3	3	3	3	3	3	3	3	3
-	31.	Double	5					<u> </u>	<u> </u>				ļ .
_	Elemente de la contraction de	Short < 6 cm	3 5	_	2	5	3	3	3	3	2	2	3
5	Flower length	Medium 6-7 cm Long >7 cm	7	5	3	3	3	3	3	3	3	3	3
		Short < 4 cm	3	1	1		-	1	-				+
6	Flower diameter	Medium 4-4.5 cm	5	5	3	3	3	3	3	3	3	3	3
	Trower diameter	Long >4.5	7									5 3 3 5 5 3 5 G ⁴⁹ (3	
7	D C. 1	1	3	_	2	_	_	_		2	_	2	_
7	Rows of tepal	>3	5	5	3	3	3	3	3	3	3		5
		Straight	3										
8	Inflorescence	Crooked	5	3	3	7	3	3	3	3	3	3	5
		Slightly bent	7	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	↓	<u> </u>	<u> </u>		Щ
		Short < 20 cm	3		_	_		_	l _			_	_
9	Inflorescence axis	Medium 20-30 cm	5	3	3	5	5	3	7	5	5	3	5
-		Long > 30 cm Short < 70 cm	7	₩	<u> </u>	-	 	 	\vdash	}	-		₩
10	Inflorescence length	Short < 70 cm Medium 70-105 cm	5	5	5	5	5	3	5	5	5	3	5
10	innotescence length	Long > 105 cm	7	,	')	,	٥	'))	د ا	'
		Few < 40 Nos	3	 		†			 	1	†		\vdash
11	No. of flowers per inflorescence	Medium 42-52	5	3	5	5	5	7	7	3	3	5	3
	F	Many > 52 Nos	7	1	-		1	1	1				
10	D 41 C C	Early 90 - 100	3	_		_	-	_	<u> </u>	_	_	_	_
12	Days taken for flowering	Late > 100	5	- 5	5	5	5	5	5	5	5	5	5
Sr. no.	Character	State	Note	G^{51}	G^{52}	G^{53}	G ⁵⁴	G^{55}	G ⁵⁶	G^{57}	G^{58}	G ⁵⁹	G^{60}
1	Leaf colour Ref. RHS colour Chart	Light green	3	5	5	3	5	3	5	5	5	5	3
	Low Colour Ren Paris Colour Chart	Dark green	5	1	1	1	1	1	1	1	1	1	1
2	Leaf variegation	Absent	1	1	1	1	1	1	9	1	1	1	1

		Present	9										
		White	3										
3	Flower colour	Yellow	5	3	3	3	3	3	3	3	3	3	5
	Tiower colour	Pink	7										
		Single	3										
4	Flower type	Double	5	3	3	3	3	3	3	3	3	3	3
		Short < 6 cm	3										
_	Elever length	Medium 6-7 cm	5	3	3	3	3	3	3	5	3	3	5
5	Flower length			3	3	3	3	3	3	3	3	3	3
		Long >7 cm	7						ļ				
	TH 11	Short < 4 cm	3	_	_	_	_	_	_	_		_	
6	Flower diameter	Medium 4-4.5 cm	5	7	3	3	3	5	7	7	3	3	3
		Long >4.5	7										
7	Rows of tepal	1	3	3	3	3	3	3	3	3	3	3	3
,	rtows of tepar	>3	5	J	J	J	٥	ì	,	J		J	٥
		Straight	3										
8	Inflorescence	Crooked	5	3	7	3	3	3	3	3	3	3	3
		Slightly bent	7										
		Short < 20 cm	3										
9	Inflorescence axis	Medium 20-30 cm	5	5	5	3	3	5	3	7	7	5	5
		Long > 30 cm	7	1									
		Short < 70 cm	3										
10	Inflorescence length	Medium 70-105 cm	5	5	5	3	5	7	3	3	3	3	3
	intorescence longin	Long > 105 cm	7	1				,					
		Few < 40 Nos	3										
11	No. of flowers per inflorescence	Medium 42-52	5	5	5	5	3	3	3	3	5	5	5
11	No. of flowers per filliorescence		7	- 3))	3	3	3	3))	3
		Many > 52 Nos											
12	Days taken for flowering	Early 90 - 100	3	5	5	5	5	5	5	5	5	5	5
~		Late > 100	5	Q 61	Q(2)	Q(2)	C) (1	~65	a44	~67	~60	~60	~70
Sr. no.	Character	State	Note	G ⁶¹	G ⁶²	G ⁶³	G ⁶⁴	G ⁶⁵	G ⁶⁶	G ⁶⁷	G ⁶⁸	G ⁶⁹	G^{70}
1	Leaf colour Ref. RHS colour Chart	Light green	3	3	3	3	5	3	3	5	3	5	5
		Dark green	5										
									1				
2	Leaf variegation	Absent	1	1	1	1	1	1	9	1	1	1	1
2	Leaf variegation	Absent Present	1 9	1	1	1	1	1	9	1	1	1	1
	· · · · · · · · · · · · · · · · · · ·	Absent Present White	1 9 3										
3	Leaf variegation Flower colour	Absent Present White Yellow	1 9	1 5	1 5	1 5	3	3	9	1	3	3	1
	· · · · · · · · · · · · · · · · · · ·	Absent Present White Yellow Pink	1 9 3 5 7										
3	Flower colour	Absent Present White Yellow	1 9 3 5 7 3	5	5	5	3	3	3	3	3	3	3
	· · · · · · · · · · · · · · · · · · ·	Absent Present White Yellow Pink	1 9 3 5 7										
3	Flower colour	Absent Present White Yellow Pink Single	1 9 3 5 7 3 5	5	5	5	3	3	3	3	3	3	3
3	Flower type	Absent Present White Yellow Pink Single Double Short < 6 cm	1 9 3 5 7 3 5 3	5	5	5	3	3	3	3	3	3	3
3	Flower colour	Absent Present White Yellow Pink Single Double Short < 6 cm Medium 6-7 cm	1 9 3 5 7 3 5 3 5	5	5	5	3	3	3	3	3	3	3
3	Flower type	Absent Present White Yellow Pink Single Double Short < 6 cm Medium 6-7 cm Long >7 cm	1 9 3 5 7 3 5 3 5 7	5	5	5	3	3	3	3	3	3	3
3 4 5	Flower colour Flower type Flower length	Absent Present White Yellow Pink Single Double Short < 6 cm Medium 6-7 cm Long >7 cm Short < 4 cm	1 9 3 5 7 3 5 3 5 7	5 3 5	5 3	5 3 5	3 3 5	3 3	3 3 5	3 3	3 3 5	3 3 5	3 3 5
3	Flower type	Absent Present White Yellow Pink Single Double Short < 6 cm Medium 6-7 cm Long >7 cm Short < 4 cm Medium 4-4.5 cm	1 9 3 5 7 3 5 3 5 7 3 5 7	5	5	5	3	3	3	3	3	3	3
3 4 5	Flower colour Flower type Flower length	Absent Present White Yellow Pink Single Double Short < 6 cm Medium 6-7 cm Long >7 cm Short < 4 cm Medium 4-4.5 cm Long >4.5	1 9 3 5 7 3 5 7 3 5 7 7 3 5 7 7 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9 9	5 3 5	5 3	5 3 5	3 3 5	3 3	3 3 5	3 3	3 3 5	3 3 5	3 3 5
3 4 5	Flower colour Flower type Flower length	Absent Present White Yellow Pink Single Double Short < 6 cm Medium 6-7 cm Long >7 cm Short < 4 cm Medium 4-4.5 cm Long >4.5	1 9 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 3 6 7 3 6 7 7 3 7 3 7 3 7 3 7 3 7 3 7	5 3 5	5 3	5 3 5	3 3 5	3 3	3 3 5	3 3	3 3 5	3 3 5	3 3 5
3 4 5 6	Flower type Flower length Flower diameter	Absent Present White Yellow Pink Single Double Short < 6 cm Medium 6-7 cm Long >7 cm Short < 4 cm Medium 4-4.5 cm Long >4.5 1 >3	1 9 3 5 7 3 5 7 3 5 5 7 3 5 5 7 3 5 5 7 3 5 5 7 3 5 5 7 7 3 5 5 7 7 3 5 5 7 7 3 5 5 7 7 3 5 5 7 7 3 5 5 7 7 7 7	5 3 5	5 3 3	5 3 5	3 3 5	3 3 3	3 5 3	3 3 3	3 5 3	3 5 5	3 3 5
3 4 5 6	Flower colour Flower type Flower length Flower diameter Rows of tepal	Absent Present White Yellow Pink Single Double Short < 6 cm Medium 6-7 cm Long >7 cm Short < 4 cm Medium 4-4.5 cm Long >4.5 1 >3 Straight	1 9 3 5 7 3 5 7 3 5 3 5 3 5 3 5 3 5 3 5 5 3 5 5 3 5 5 7 6 3 5 5 7 6 7 6 7 6 7 6 7 6 7 6 7 6 7 6 7 6	5 3 5 3	5 3 3 3	5 3 5 5	3 3 5 5	3 3 3 3	3 3 5 3	3 3 3	3 5 3	3 3 5 5	3 5 5
3 4 5 6	Flower type Flower length Flower diameter	Absent Present White Yellow Pink Single Double Short < 6 cm Medium 6-7 cm Long >7 cm Short < 4 cm Medium 4-4.5 cm Long >4.5 1 >3 Straight Crooked	1 9 3 5 7 3 5 7 3 5 3 5 5 3 5 5 5 5 5 5 5 5	5 3 5	5 3 3	5 3 5	3 3 5	3 3 3	3 5 3	3 3 3	3 5 3	3 5 5	3 3 5
3 4 5 6	Flower colour Flower type Flower length Flower diameter Rows of tepal	Absent Present White Yellow Pink Single Double Short < 6 cm Medium 6-7 cm Long >7 cm Short < 4 cm Medium 4-4.5 cm Long >4.5 1 >3 Straight Crooked Slightly bent	1 9 3 5 7 3 5 7 3 5 5 7 7 3 5 7 7 7 7 7 7 7	5 3 5 3	5 3 3 3	5 3 5 5	3 3 5 5	3 3 3 3	3 3 3	3 3 3	3 5 3	3 3 5 5	3 5 5
3 4 5 6 7 8	Flower type Flower length Flower diameter Rows of tepal Inflorescence	Absent Present White Yellow Pink Single Double Short < 6 cm Medium 6-7 cm Long >7 cm Short < 4 cm Medium 4-4.5 cm Long >4.5 1 >3 Straight Crooked Slightly bent Short < 20 cm	1 9 3 5 7 3 5 5 7 3 5 5 7 3 5 5 7 3 5 5 7 3 5 5 7 3 5 5 7 3 5 7 3 5 5 7 7 3 7 3	5 3 3 3 3	5 3 3 3	5 5 5 3 3	3 5 5 3	3 3 3 3	3 5 3 7	3 3 3 3	3 5 3 3	3 5 5 3	3 5 5 5
3 4 5 6	Flower colour Flower type Flower length Flower diameter Rows of tepal	Absent Present White Yellow Pink Single Double Short < 6 cm Medium 6-7 cm Long >7 cm Short < 4 cm Medium 4-4.5 cm Long >4.5 1 >3 Straight Crooked Slightly bent Short < 20 cm Medium 20-30 cm	1 9 3 5 7 3 5 5 7 3 5 5 7 3 5 5 7 3 5 5 7 5 5 5 7 5 5 5 7 7 5 5 5 7 7 5 5 5 7 7 5 5 5 7 7 5 5 5 7	5 3 5 3	5 3 3 3	5 3 5 5	3 3 5 5	3 3 3 3	3 3 3	3 3 3	3 5 3	3 3 5 5	3 5 5
3 4 5 6 7 8	Flower type Flower length Flower diameter Rows of tepal Inflorescence	Absent Present White Yellow Pink Single Double Short < 6 cm Medium 6-7 cm Long >7 cm Short < 4 cm Medium 4-4.5 cm Long >4.5 1 >3 Straight Crooked Slightly bent Short < 20 cm Medium 20-30 cm Long > 30 cm	1 9 3 5 7 3 5 5 7 3 5 5 7 7 3 5 5 7 7 3 7 5 7 7 3 7 7 7 7	5 3 3 3 3	5 3 3 3	5 5 5 3 3	3 5 5 3	3 3 3 3	3 5 3 7	3 3 3 3	3 5 3 3	3 5 5 3	3 5 5 5
3 4 5 6 7 8	Flower type Flower length Flower diameter Rows of tepal Inflorescence	Absent Present White Yellow Pink Single Double Short < 6 cm Medium 6-7 cm Long >7 cm Short < 4 cm Medium 4-4.5 cm Long >4.5 1 >3 Straight Crooked Slightly bent Short < 20 cm Medium 20-30 cm Long > 30 cm Short < 70 cm	1 9 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 7 3 7 3	5 3 3 3 3	5 3 3 3	5 5 5 3 3	3 5 5 3	3 3 3 3	3 5 3 7	3 3 3 3	3 5 3 3	3 5 5 3	3 5 5 5
3 4 5 6 7 8	Flower type Flower length Flower diameter Rows of tepal Inflorescence	Absent Present White Yellow Pink Single Double Short < 6 cm Medium 6-7 cm Long >7 cm Short < 4 cm Medium 4-4.5 cm Long >4.5 1 >3 Straight Crooked Slightly bent Short < 20 cm Medium 20-30 cm Long > 30 cm	1 9 3 5 7 3 5 5 7 3 5 5 7 7 3 5 5 7 7 3 7 5 7 7 3 7 7 7 7	5 3 3 3 3	5 3 3 3	5 5 5 3 3	3 5 5 3	3 3 3 3	3 5 3 7	3 3 3 3	3 5 3 3	3 5 5 3	3 5 5 5
3 4 5 6 7 8	Flower type Flower length Flower diameter Rows of tepal Inflorescence	Absent Present White Yellow Pink Single Double Short < 6 cm Medium 6-7 cm Long >7 cm Short < 4 cm Medium 4-4.5 cm Long >4.5 1 >3 Straight Crooked Slightly bent Short < 20 cm Medium 20-30 cm Long > 30 cm Short < 70 cm Medium 70-105 cm	1 9 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 7 3 7 3	5 3 5 3 3 5 5	5 3 3 3 3 5	5 3 5 5 3 3	3 5 5 3 3	3 3 3 3 3 5	3 3 5 3 7 7	3 3 3 3 7	3 5 3 3 5	3 5 5 3 3	3 5 5 3
3 4 5 6 7 8	Flower type Flower length Flower diameter Rows of tepal Inflorescence	Absent Present White Yellow Pink Single Double Short < 6 cm Medium 6-7 cm Long >7 cm Short < 4 cm Medium 4-4.5 cm Long >4.5 1 >3 Straight Crooked Slightly bent Short < 20 cm Medium 20-30 cm Long > 30 cm Short < 70 cm Medium 70-105 cm Long > 105 cm	1 9 3 5 7 3 5 5 7 3 5 5 7 3 5 5 7 3 5 5 7 7 3 5 5 7 7 3 7 5 7 7 7 7	5 3 5 3 3 5 5	5 3 3 3 3 5	5 3 5 5 3 3	3 5 5 3 3	3 3 3 3 3 5	3 3 5 3 7 7	3 3 3 3 7	3 5 3 3 5	3 5 5 3 3	3 5 5 3
3 4 5 6 7 8 9	Flower type Flower length Flower diameter Rows of tepal Inflorescence Inflorescence axis	Absent Present White Yellow Pink Single Double Short < 6 cm Medium 6-7 cm Long >7 cm Short < 4 cm Medium 4-4.5 cm Long >4.5 1 >3 Straight Crooked Slightly bent Short < 20 cm Medium 20-30 cm Long > 30 cm Short < 70 cm Medium 70-105 cm Long > 105 cm Few < 40 Nos	1 9 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 7 3 3 5 7 7 3 3 5 7 7 3 7 3	5 3 3 3 3 5 3	5 3 3 3 5 5	5 3 5 5 3 3	3 5 5 3 3 7	3 3 3 3 3 5 5	3 3 5 3 7 7	3 3 3 3 7 5	3 3 5 3 3 5 5	3 5 5 3 5 5	3 5 5 3 5
3 4 5 6 7 8	Flower type Flower length Flower diameter Rows of tepal Inflorescence	Absent Present White Yellow Pink Single Double Short < 6 cm Medium 6-7 cm Long >7 cm Short < 4 cm Medium 4-4.5 cm Long >4.5 1 >3 Straight Crooked Slightly bent Short < 20 cm Medium 20-30 cm Long > 30 cm Short < 70 cm Medium 70-105 cm Long > 105 cm Few < 40 Nos Medium 42-52	1 9 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 7 3 5 5 7 7 3 7 5 7 7 7 7	5 3 5 3 3 5 5	5 3 3 3 3 5	5 3 5 5 3 3	3 5 5 3 3	3 3 3 3 3 5	3 3 5 3 7 7	3 3 3 3 7	3 5 3 3 5	3 5 5 3 3	3 5 5 3
3 4 5 6 7 8 9 10	Flower colour Flower type Flower length Flower diameter Rows of tepal Inflorescence Inflorescence axis Inflorescence length No. of flowers per inflorescence	Absent Present White Yellow Pink Single Double Short < 6 cm Medium 6-7 cm Long >7 cm Short < 4 cm Medium 4-4.5 cm Long >4.5 1 >3 Straight Crooked Slightly bent Short < 20 cm Medium 20-30 cm Long > 30 cm Short < 70 cm Medium 70-105 cm Long > 105 cm Few < 40 Nos Medium 42-52 Many > 52 Nos	1 9 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 7 3 5 7 7 3 5 7 7 3 7 5 7 7 7 7	5 3 3 3 3 3	5 3 3 3 5 5	5 3 5 3 3 5	3 5 5 3 3 5 7	3 3 3 3 5 5 3	3 3 5 3 7 7 7	3 3 3 3 7 5	3 3 5 3 3 5 5 5	3 5 5 3 5 5 5	3 5 5 3 5 5
3 4 5 6 7 8 9	Flower type Flower length Flower diameter Rows of tepal Inflorescence Inflorescence axis	Absent Present White Yellow Pink Single Double Short < 6 cm Medium 6-7 cm Long >7 cm Short < 4 cm Medium 4-4.5 cm Long >4.5 1 >3 Straight Crooked Slightly bent Short < 20 cm Medium 20-30 cm Long > 30 cm Short < 70 cm Medium 70-105 cm Long > 105 cm Few < 40 Nos Medium 42-52	1 9 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 3 5 7 7 3 5 5 7 7 3 7 5 7 7 7 7	5 3 3 3 3 5 3	5 3 3 3 5 5	5 3 5 5 3 3	3 5 5 3 3 7	3 3 3 3 3 5 5	3 3 5 3 7 7	3 3 3 3 7 5	3 3 5 3 3 5 5	3 5 5 3 5 5	3 5 5 3 5

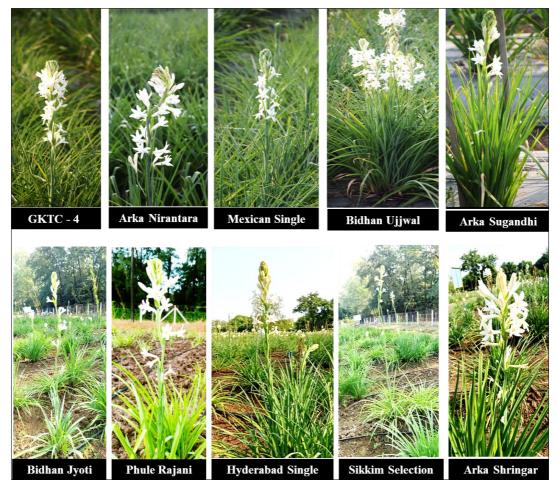


Photo 1: Ten check varieties of tuberose from experiment

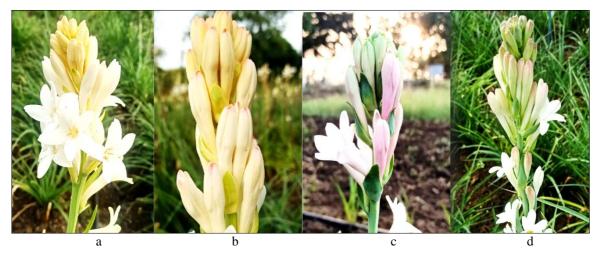


Photo 2: Tuberose spike with different flower color ((a) Pale Yellow (b) Yellow with Pink tinge (c) Pink flower (d) White flower with slightly pink tinge)

Conclusion

The morphological characterization of seventy genotypes including sixty half-sib and ten checks clearly brought out the difference as per the PPVFRA given DUS guideline. The data represented indicate that these genotypes differed highly.

References

1. Bansil PC. Floriculture cultivation, processing and marketing. New Delhi (India): Daya Publisher; 2018. p. 211.

- 2. Anonymous. Guidelines for the conduct of test for distinctiveness, uniformity and stability on tuberose (*Polianthes tuberosa* L.). New Delhi (India): Protection of Plant Varieties and Farmer's Rights Authority; 2013. p. 1-16.
- 3. Bharti H, Singh KP, Singh MC. Morphological characterization of tuberose (*Polianthes tuberosa* Linn.) germplasms using DUS testing. Progressive Horticulture. 2015;47(2):280-287.
- 4. Naik BC, Kamble BS, Tirakannanavar S, Parit S. Evaluation of different genotypes of tuberose (*Polianthes tuberosa* L.) for growth, flowering and

- yield characters. Int. J. Curr. Microbiol. App. Sci. 2018;7(7):4135-4141.
- 5. Bharti H, Singh KP, Singh R, Kumar R, Singh MC. Genetic diversity and relationship study of single and double petal tuberose (*Polianthes tuberosa* L.) cultivars based on RAPD and ISSR markers. Indian Journal of Horticulture. 2016;73(2):238-244.