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Dus Test Guidelines in Cattleya orchids

Agriculture

KEYWORDS : DUS, cattleya, descriptors, hybrids, varieties

L.C. De	NRC for Orchids, Sikkim
A.N. Rao	Centre for Orchid Gene Conservation of Eastern Himalayan Region, Senapati District, Manipur State
P.K. Rajeevan	Ex-Professor, Department of Pomology and Floriculture, College of Horticulture, Kerala Agricultural University, Vellanikkara, Trichur
S. R. Dhiman	Floriculturist, Y.S. Parmer University of Horticulture and Forestry, Nauni, Solan
Manoj Srivastava	PPV & FRA, NASC Complex, New Delhi
R.P. Medhi	NRC for Orchids, Sikkim
Geetamani Chhetri	NRC for Orchids, Sikkim

ABSTRACT

According to UPOV Convention 1961, DUS (Distinctiveness, Uniformity and Stability) testing is useful system for protection of varieties, for evolving of new genotypes of plants and for the utility of breeders and farmers. It provides rights for breeders and farmers to exploit or develop new plant varieties, to allow access to foreign varieties with widen gene pool, to promote intensive breeding activities and to prevent unauthorized varieties exploitations.

In the present study, 8 hybrids of Cattleya were evaluated for development of DUS test guidelines using common descriptors. Out of 53 common descriptors developed, plant height, leaf number/ pseudobulb, flower width in front view, petal predominant colour, lip predominant colour and lip colour pattern were used for grouping of hybrids.

Introduction

Orchids belong to family Orchidaceae, one of the largest family of flowering plants with both terrestrial and epiphytic members (Karasawa, 1996). Taxonomically, they represent the most highly evolved family among monocotyledons with more than 25,000 species and account for nearly 8% of the total species of flowering plant. More than 2,00,000 natural and man made hybrids are on record and these include several multi generics involving three, four, five and even six genera. Amongst orchids, cattleyas are most people's fascinating home garden orchid. Flowers are long lasting and possess a beautiful fragrance.Cattleya hybrids also produce the biggest orchid flowers. Named in the honour of William Cattley, a noted 19th century English Horticulturist, this genus falls into subtribeLaeliinae, which comprises many Cattleya like species. Of the many intergeneric hybrids, Laelia, Sophrinitis and Brassovola are the main genera used in hybridization program. Cattleya orchids are also popularly called as the 'Queen of Orchids'. Cattleya orchids are long lived epiphytes having well-developed water-storage organs (called pseudobulbs) and large, fleshy roots. These orchid plants are naturally erect, without need of much staking, bears flowers annually. In addition to cut flowers and pot plants, Cattleya orchids are ideal components for flower decorations including bouquets and flower arrangements. Besides, this orchid is used for making clay flowers. Being of high socio-economic and cultural importance, The Plant Authority of India on March 27, 2010 notified three genera Cymbidium Sw., Dendrobium Sw. and Vanda Jones ex R. Br.andon April, 2014, notified CattleyaLindl.andPhalaenopsisBlumefor registration of their varieties and hybrids.

Materials and Methods

These test guidelines were used for all vegetativelypropagated varietiesand hybrids of CattleyaLindl. and alliance of the family Orchidaceae (Withnar& Harding, 2004).

Plant Material Required

For all varieties, twoto three years old 20 plants (10 for each Centre) with at least two shoots wereselected for DUS testing. Usually, healthy and insect pest and disease free plants are required for testing for taking morphological observations without any chemical and bio-physical treatment.

Conduct of Test

The test was conducted for two similar flowering seasons at two different places. The variety or hybrid shall be considered for further examination at another appropriate test site or under special test protocol on request of the applicant if any essential characteristic of the variety is not expressed for visual observations at these places. It is always advised to test with at least 10 plants under greenhouse conditions ensuring satisfactory growth for the expression of the relevant characteristics of the variety and for the conduct of the examination. All observationswere taken by measuring or counting made on 10 plants or parts taken from each of 10 plants.Additional tests for special purposes may be carried out. Normally, growth regulators are notapplied.

Methods and Observations

The characteristics described in the Table of Characteristics were used for the testing of varieties for their DUS. For the assessment of Distinctiveness and Stability, all observations were taken from 10 plants or parts taken from each of 10 plants. For the assessment of Uniformity, a population standard of 1% and an acceptance probability of at least 95% was applied. In the case of a sample size of 10 plants, the maximum permissible number of off-types was considered 1. All observations were taken of the shoot on the flowering shoot, of the leaf on the longest leaf of a flowering shoot, of the inflorescence and the flower at the time when 50% of the flowers on the inflorescence have opened and on the most recently fully opened flower on the inflorescence before fading of colour, of the length and width of the flower and parts of the flower in the spread out position, of the colour of sepal, petal, lip and column on the inner side. For the assessment of colour characteristics, the Royal Horticultural Society (RHS) colour chart was used.

Grouping of varieties and hybrids

The varieties and hybrids of common knowledge were selected to be grown in the trial with thecandidate varieties and the way in which these varieties or hybrids are divided into groups to make easy for the assessment of distinctiveness is supported by the use of grouping characteristics.Grouping characteristics are defined as the documented states of expression, evenwhere produced at different locations, can be used, either individually or in combination withother such characteristics: (a) by choosing varieties and hybrids of common knowledge that can be excludedfrom the growing trial used for examination of distinctiveness; and (b) by conducting the growingtrial so that similar varieties or hybrids are grouped together.The following have been identified as useful grouping characteristics:

a) Plant height
b) Leaf number/pseudobulb
c) Flower breadth in front view
d) Predominant colour of petal
e) Predominant colourof lip
f) Colour pattern of lip

Characteristics and Symbols

A table of characteristics can be used to assess Distinctiveness, Uniformity and Stability of the morphological characteristics and their states. Notes 1-9 (numbers) wereused to explain the state of each character for the purpose of electronic data processing.(*) Characteristics was observed during every growing season for varieties and hybrids and included in the description of the varieties and hybrids, except when the state of expression of any of these characters is rendered impossible by a preceding phenological characteristic or by the environment conditions of the testing places. Under such exceptional situation, adequate explanation is required.(+)indicates theexplanations on the Table of Characteristics. Characteristics denoted with symbols QL, QN and PQ in the first column of the Table of Characteristics were described as Qualitative characteristic, Quantitative characteristic and Pseudo-qualitative characteristic, respectively.

Characteristics indicated with (a), (b), (c), (d) and (e) in the first column of the Table of Characteristics were observations on the leaf made on the longest leaf of flowering plant (a), on the inflorescence and the flower made at the time when 50% of the flowers on the inflorescence have opened and the most recently fully opened flower on the inflorescence before the color starts to fade (b), on the length and width of the flower and parts of the flower made on the spread out positions (c), on the color of the sepal, the petal and the lip made on inner side at apex, mid and base portion (d) and on the colour of column made on inner side at apex, mid and basal region (e).Type of assessment of characteristics indicated in column six of the Table of Characteristics were estimated by a single observation of a group of plants or parts of plants (MG), measurement of a number of individual plants or parts of plants (MS), visual assessment by a single observation of a group of plants or parts of plants (VG) and visual assessment by observations of individual plants or parts of plant (VS).

Results and Discussion

A variety can be registered if it essentially fulfils the criteria of Distinctiveness, Uniformity and Stability (DUS) which means that the candidate variety must be distinguishable by at least one essential characteristic from a variety which is sufficiently uniform in expression of its essential characteristics which should remain fixed even after repeated multiplication. The variety should also have a single and distinct denomination (Henke, 2008).

In the present study, using 8 hybrids, all total 53 common descriptors were developed for preparation of DUS test guidelines in Cattleya and those are plant height (cm), Nature of pseudobulb (at flowering), Pseudobulb length (cm) (at flowering), Pseudobulb breadth at broadest part (cm), Shoot numbers / plant, Leaf numbers/ pseudobulb, Length of leaf (largest leaf) (cm), Width of leaf (largest leaf) (cm), Shape of leaf (largest leaf), Colour pattern of leaf, Number of inflorescence / pseudobulb at a time, Spike length (cm), Sheath length of peduncle(cm), Peduncle length (cm), Flower number per peduncle, Flower length (cm), Flower breadth in front view (cm), Flower longevity on plants (days), Length of dorsal sepal (cm), width of dorsal sepal (at middle) (cm), Shape of dorsal sepal , Apex of dorsal sepal, Curvature of dorsal sepal, Length of lateral sepal (cm), Width of lateral sepal(cm), Shape of lateral sepal, Apex of lateral sepal, Curvature of lateral sepal, Dominant colour of sepal , Inside colour pattern of sepal, Length of petal(cm), Width of petal(cm), Petal shape, Petal curvature, Petal margin, Petal predominant colour, Petal colour pattern, Lip length (cm), Lip width (cm), Lip shape, Lip predominant colour, Lipcolour numbers, Colour pattern of lip, Shape of lip lateral lobe, Margin of lip lateral lobe,Shape of lip mid lobe, Lip mid lobe margin, Inside lip surface, Length of column(cm), No of colours in column, Colour pattern of column, Flower pedicellength (cm) and Flowering season.

Out of 53 common descriptors developed, plant height, leaf number/ pseudobulb, flower width, predominant colour of petal , predominant colourof lip and colour pattern of lip were used for grouping of hybrids (Table 1).A hybrid genera Potinara which is a tetrageneric hybrid combined Cattleya, Laelia, Brassavola and Sophronitis was registered for the first time in 1922 (Bhattacharjee and Das, 2008). Introduction of blue colour in Cattleya breeding was discussed by Granier, 2002. One of the prominent hybrids used extensively for blue Cattleyabreeding is Laeliocattleya 'Canhamiana', a cross between C. mossiae and Laeliapurpurea. Among Brassavola, B. cucullata, B. cordata, B. nodosa and B. perrinii are extensively used in hybridization as studied by Mathews (1996). Herman (1997) reported that the large flowered Cattleya hybrids are the results of breeding involving fifteen Cattleya species, two Laeliaand Brassavoladigbyana.Bhattacharjee and Das (2008) suggested that in Brassocattleya the varieties 'Deesse' and 'Hortland' are reported to produce many hybrids in Cattleya alliance. The trigeneric hybrid Brassolaeliocattleya are also well known for their varieties like 'Edwin Chong', golden Myth', 'Herons Ghyll', 'Jane Helton', 'Malvern', 'Marjorie Frey', 'Mellow Glow', Molflora', 'Norman' Bay', 'Nugget', etc which have produced many interesting hybrids. InLaeliocattleya are the varieties 'Charlesworthii', Easier Bonnet', 'Edgard Van Belle', Elissa', 'Grandee', 'Harold J Peterson', 'Ishtar', 'Morro Rock', Nugget', 'Pacific' 'Paradasio', 'Princess Margaret', 'S.J. Bracy', 'South Esk', Supervia', Twinkle Star', which are famous proven parent plants for hybridization work.

Table 1: Grouping characteristics in Cattleya

Sl. No.	Characteristic	State	Note	Example Varieties /hybrids	Type of Assessment
1. (*) QN	Plant height (cm) (From base to the tip of the flowering shoot)	Small (< 15)	3	Lc 'Manriner Far Horizon x L. ancepscoerulea, Lc 'Ahmad Sheikhi'	MS
		Medium (15-30)	5	Lc 'Purple Cascade Fragrant B', Blc 'Mem Ann BalmoresConvess', C. 'Queen Sirikhit', Blc 'Hsinging Catherine', Blc 'Chinese Beauty Orchid Queen', Blc 'Guanmiau City'	
		Large (> 30)	7	--	

2. (*) QN (a)	Number of leaves/ pseudobulb	One (Unifoliate)	1	Lc 'Purple Cascade Fragrant B', Blc 'Mem Ann BalmoresConvess', Blc 'Hsinging Catherine', Blc 'Chinese Beauty Orchid Queen', Blc 'Guanmiau City', Lc 'Manriner Far Horizon x L. ancepscoerulea, Lc 'Ahmad Sheikhi'	VG
		Two (Bifoliate)	9	C. 'Queen Sirikhit',	
3. (*) QN (c)	Flower breadth (cm) in front view (distance between tips of two lateral petals)	Narrow (<8)	3	C. 'Queen Sirikhit'	MS
		Medium (8-16)	5	Lc 'Purple Cascade Fragrant B', Blc 'Mem Ann BalmoresConvess', Blc 'Hsinging Catherine', Blc 'Chinese Beauty Orchid Queen', Blc 'Guanmiau City', Lc 'Manriner Far Horizon x L. ancepscoerulea, Lc 'Ahmad Sheikhi'	
		Broad (>16)	7	--	
4. (*) QL (d)	Predominant colourof petal	Green	1	--	VG
		White	2	C. 'Queen Sirikhit', Blc 'Hsinging Catherine'	
		Yellow	3	Blc 'Mem Ann BalmoresConvess', Blc 'Chinese Beauty Orchid Queen', Lc 'Ahmad Sheikhi'	
		Pink	4	--	
		Red	5	--	
		Purple	6	Lc 'Purple Cascade Fragrant B',Lc 'Manriner Far Horizon x L. ancepscoerulea	
		Blue	7	--	
		Violet	8	Blc 'Guanmiau-City'	
5. (*) QL (d)	Predominant colour of lip	Green	1	--	VS
		White	2	--	
		Yellow	3	Blc 'Mem Ann BalmoresConvess', C. 'Queen Sirikhit', Lc 'Ahmad Sheikhi'	
		Pink	4	--	
		Red	5	Blc 'Chinese Beauty Orchid Queen',	
		Purple	6	Lc 'Purple Cascade Fragrant B', Blc 'Hsinging Catherine', Blc 'Guanmiau City', Lc 'Manriner Far Horizon x L. ancepscoerulea	
		Blue	7	--	
		Violet	8	--	
6. (*) QL (d)	Colour pattern of lip	Uniform	1	--	VG
		Mixed	3	--	
		Spotted	5	Blc 'Guanmiau-City', Lc 'Ahmad Sheikhi'	
		Striped/ Shaded	7	Lc 'Purple Cascade Fragrant B', Blc 'Mem Ann BalmoresConvess', C. 'Queen Sirikhit', Blc 'Hsinging Catherine', Blc 'Chinese Beauty Orchid Queen', Lc 'Manriner Far Horizon x L. ancepscoerulea	
		Netted	9	--	

Catalogue of flower characteristics of some tested hybrids of Cattleya

1. Lc. Purple Cascade 'Fragrant Beauty'


General appearance of flower


Color & shape of dorsal & lateral sepals


Color & shape of petal


Color & shape of Lip


Column & anther cap

Flower size : 6.5 x 6.8 cm.
Sepal size & color : Dorsal sepal: 4.2 x 1.0 cm; Lateral sepals: 3.8 x 1.2 cm; purple (RHS- N 78C).
Petal size & color : 4.2 x 1.3 cm; purple (RHS- N 78C).
Lip size & color : 3.8 x 2.2 cm; white (RHS- 155D) at base, purple (RHS- N 78A/C & 75A) at apex & margins respectively with purple (RHS N 78A) stripes inside.
Lip callus : present (2)
Column size & color : 1.9 x 0.7 cm; purple (RHS- N 78A/D & N 78B) at base and margins respectively and greyed-green (RHS – 192D/193A) at apex.

2. Blc. Mem Ann Balmores 'Conves'

				
General appearance of flower	Color & shape of dorsal & lateral sepals	Color & shape of petal	Color & shape of Lip	Column & anther cap

Flower size : 13 x 12 cm.
Sepal size & color : Dorsal sepal: 7.7 x 3.4 cm; Lateral sepals: 7.0 x 3.4 cm; yellow-orange (RHS- 15A).
Petal size & color : 7.5 X 7.5 cm; green-yellow (RHS-1C) at base and yellow – orange (RHS- 15B) at apex & margins.
Lip size & color : 7.5 x 7.8 cm; green-yellow (RHS- 1B) at base and yellow-orange (RHS- 17C) at apex & margins with orange-red (RHS- N 34C) shades at middle and apical margins.
Lip callus : present (5)
Column size &color : 2.9 x 1.7 cm; yellow-green (RHS- 145C) at base and green-yellow (RHS- 1D) at apex & margins.

3. Cattleya 'Queen Sirikhit'

				
General appearance of flower	Color & shape of dorsal & lateral sepals	Color & shape of petal	Color & shape of Lip	Column & anther cap

Flower size : 7.3 x 7.7 cm.

Sepal size & color : Dorsal sepal: 4.7 x 1.8 cm; Lateral sepals: 4.4 x 1.9 cm; Outside: yellow-green (RHS- N 144A) Inside: yellow-green (RHS- 151A).

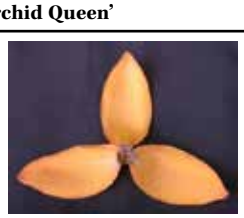
Petal size & color : 4.5 x 3.3 cm; green-yellow (RHS- 1D) at base & margins and (RHS- 1C) at apex.

Lip size & color : 4.5 x 3.8 cm; white (RHS- 155A) at base and yellow-green (RHS- 150D) at apex & margins with yellow (RHS- 9A) shade at centre of inner side.

Lip callus : present (7)

Column size &color : 2.8 x 1.5 cm; yellow-green (RHS145B/D) at base and white (RHS-155A) at apex & margins.

4. Blc. Chinese Beauty 'Orchid Queen'

				
General appearance of flower	Color & shape of dorsal & lateral sepals	Color & shape of petal	Color & shape of Lip	Column & anther cap

Flower size : 12.5 x 11.2 cm.
Sepal size & color :Dorsal sepal: 7.1 x 3.2 cm; Lateral sepals: 6.6 x 3.4 cm; yellow-orange (RHS- 21A) with yellow – green (RHS- 144B) nerves.
Petal size & color : 6.4 x 5.7 cm; yellow-orange (RHS- 17A/C).
Lip size & color : 6.7 x 6.7 cm; yellow (RHS- 11B) towards base and red-purple (RHS- 61A) towards apex.
Lip callus : absent.
Column size &color : 3.2 x 1.6 cm; yellow-green (RHS-144C) with red-purple (RHS- 61A) shades at apex & margins.

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5.LcAhmad Shiekhi

				
General appearance of flower	Color & shape of dorsal & lateral sepals	Color & shape of petal	Color & shape of Lip	Column & anther cap

Flower size : 11.5 x 11.5 cm.

Sepal size & color : Dorsal sepals: 7.3 x 2.7 cm; Lateral sepals: 6.7 x 2.7 cm; yellow-green (RHS-145C).

Petal size & color : 7.0 x 4.6 cm; yellow-green (RHS 145C).

Lip size & color : 6.4 x 5.6 cm; yellow (RHS- 2B) with purple (RHS- N 79 C) blotch at apex.

Lip callus : Present (2).

Column size &color : 3.8 x 1.4 cm; yellow-green (RHS 145C).

Explanation for individual characteristics

Fig. 1: Nature of pseudobulb

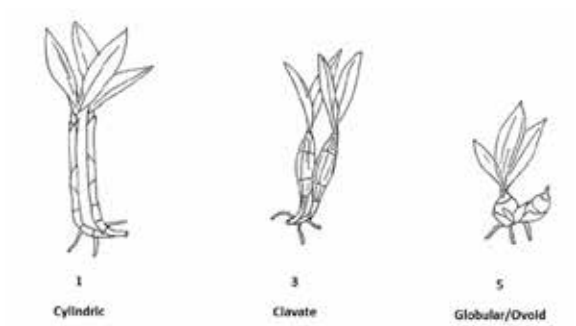


Fig.2: Leaf shape

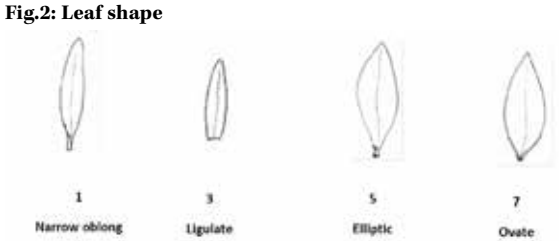


Fig.3 Dorsal sepal shape and Lateral sepal shape

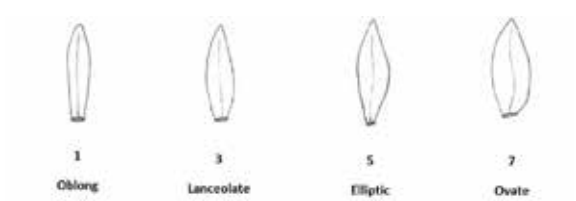


Fig.4 Dorsal sepal apex and Lateral sepal apex



Fig.5Curvature of Dorsal sepal, Lateral sepal and Petal

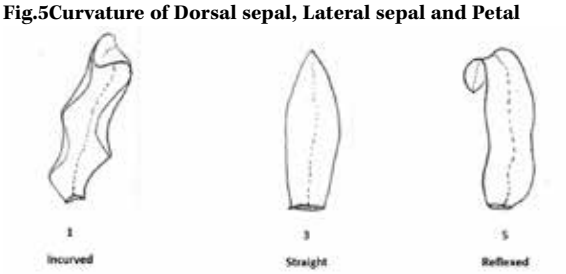


Fig.6. Shape of Petal , Lip lateral lobe and Lip mid lobe

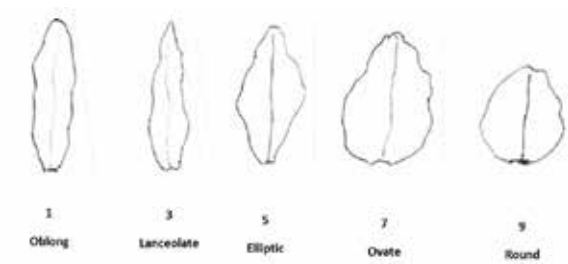
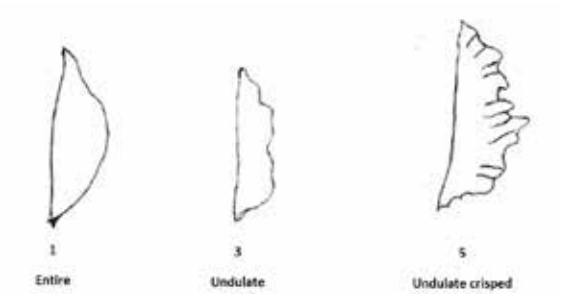


Fig.7. Margin of Petal, Lip lateral lobe and Lip mid lobe



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