

Dus Test Guidelines in Phalaenopsis Orchids



Horticulture

KEYWORDS : DUS Test, Phalaenopsis, descriptors.

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ABSTRACT

According to UPOV Convention 1961, Distinctiveness, Uniformity and Stability (DUS) testing is essential to provide and promote an effective system of plant variety protection, with the aim of encouraging the development of new varieties of plants and for the benefit of society. 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, 50 hybrids of *Phalaenopsis* were evaluated for development of DUS test guidelines using common descriptors. Out of 58 common descriptors developed, plant size, flower width in front view, petal predominant colour and colour pattern, predominant colour and colour pattern of apical lobe of lip were used for grouping of hybrids.

Introduction

The orchids are highly diverse, habitat specific and actively evolving plants, known for their beautiful and long-lasting flowers. Orchids belong to family Orchidaceae, one of the largest family of flowering plants with both terrestrial and epiphytic members. 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. In India, the orchids are represented by over 1,300 species distributed mainly in North- Western Himalayas, North- Eastern and Western Ghats and Khasi hills. Orchids flowers are known for their strange shape, longevity, beautiful looks and highly attractive colours. The orchids are cultivated as a cash crop in several countries including India (Vij and Pathak, 2012). The species of *Paphiopedilum*, *Vanda*, *Cattleya*, *Cymbidium* etc. are having highly commercial importance as ornamental plant in the global market. Beside these some other species of *Dendrobium*, *Cymbidium*, *Orchis*, *Aerides*, *Cypripedium*, *Vanilla* etc are having high ethno botanical importance. Orchids are rich source of alkaloids, flavonoids, glycosides, carbohydrates and other phytochemical contents. Medicinally orchids are rich. They are used for cardiac problem, rheumatic arthritis, respiratory problems etc. Dendrobine alkaloid of *Dendrobium sp.* is useful in the treatment of pulmonary tuberculosis, night sweats, fever and anorexia. *Vanda roxburghii* leaf paste is used as application in high fevers. Its leaf juice is used in the treatment of otitis; rheumatic and similar kind of pain; diseases of nervous system and syphilis. Its root is used as antidote against scorpion sting and remedy for bronchitis (Tandon Pramod et al). Orchids are source of incalculable aesthetic pleasure therefore conservation of orchids in Northeastern India can be closely related to the socio-economic culture of the people of this region. Being of high socio-economic and cultural importance, The Central Government on March 27, 2010 notified three genera *Cymbidium Sw.*, *Dendrobium Sw.* and *Vanda Jones ex R. Br.* for registration of their species under the Protection of Plant Varieties and Farmers' Rights Act, 2001. Guidelines of two orchid genera namely *Cattleya* and *Phalaenopsis* are finalized, published in PVJ of India and noti-

fied for registration during April, 2014 (Rao et al, 2012) and DUS test guidelines for *Oncidium* is published in PVJ of India.

Materials

In the present study, 50 hybrids of *Phalaenopsis* were evaluated for development of DUS test guidelines using common descriptors. These test guidelines apply to all vegetatively propagated varieties of *Phalaenopsis* Blume and alliance of the family Orchidaceae (Christenson, 2007; Harper 2004). For all varieties, 20 flowering size plants (10 for each Centre) were required 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 observations were 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 not applied.

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 in-

florescence 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

The varieties and hybrids of common knowledge were selected to be grown in the trial with the candidate 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, even where produced at different locations, can be used, either individually or in combination with other such characteristics: (a) by choosing varieties and hybrids of common knowledge that can be excluded from the growing trial used for examination of distinctiveness; and (b) by conducting the growing trial so that similar varieties or hybrids are grouped together.

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) were used 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 the explanations 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 (Table 1) 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 is eligible for registration under the Act 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 a matter of common knowledge in any country at the time of filing application, sufficiently uniform in expression of its essential characteristics which should re-

main unchanged even after repeated propagation. The variety should also have a single and distinct denomination (Henke, 2008).

In the present study, all total 58 common descriptors were developed for development of DUS test guidelines in *Phalaenopsis* and those are plant size, leaf length(cm), leaf width(cm), leaf shape, leaf apex, leaf anthocyanin colour, inflorescence type, rachis length(cm), number of flowers/inflorescence, peduncle length(cm), peduncle thickness(cm), anthocyanin colouration in peduncle, flower texture of the surface of sepals and petals, flower length in front view (cm), flower width in front view (cm), flower arrangement of petals, flower fragrance, dorsal sepal length (cm), dorsal sepal width (cm), dorsal sepal shape, dorsal sepal curvature of longitudinal axis, dorsal sepal undulation of margin, dorsal sepal number of colours, dorsal sepal colour pattern, dorsal sepal dominant colour, lateral sepal length (cm), lateral sepal width (cm), lateral sepal shape, lateral sepal number of colours, lateral sepal colour pattern, lateral sepal dominant colour, petal shape, petal length (cm), petal width (cm), petal curvature of longitudinal axis, petal undulation of margin, petal number of colors, petal color pattern, petal predominant colour, lip length of apical lobe (cm), lip width of apical lobe (cm), lip presence of whiskers, lip length of whiskers relative to length of apical lobe, lip shape of apical lobe, lip bump and ridge on apical lobe, lip shape of lateral lobe, lip curvature of lateral lobe, lip size of lateral lobe relative to apical lobe, lip number of colours, lip color pattern of apical lobe, lip predominant colour of apical lobe, lip colour pattern of lateral lobe, lip dominant colour of lateral lobe, lip callus, lip pubescence, column length (cm), column colour and flower longevity on the plant (days).

Out of 58 common descriptors developed, plant size, flower width in front view, petal predominant colour and colour pattern, predominant colour and colour pattern of apical lobe of lip were used for grouping of hybrids.

The following have been agreed as useful grouping characteristics (Table 1):

Plant: size

1. Flower size: width in front view
2. Petal: colour pattern
3. Petal: predominant colour
4. Lip: colour pattern of apical lobe
5. Lip: predominant colour of apical lobe

Thomas (2001) viewed the requirements for flower forms of commercial growers of *Phalaenopsis* like strong self supporting erect inflorescences, long duration of blooms, compact plant size, wide temperature tolerance, disease resistance, firm substances and consistency of colours.

Table 1: Grouping characteristics in *Phalaenopsis*

Sl. No	Characteristics	States	Notes	Example Varieties /Hybrids	Type of Assessment		
1. (*) QN	Plant: size (cm)	Very small (<3.0)	1	--	MS		
		Small (3.0 - 4.5)	3	Dtps. 'Younghome Orange Lip', Dtps. 'Acker's Sweetie', Dtps. 'Big Red Robe', Dtps. 'Mount Lip Taisuco', P. 'Amabilis', Dtps. 'Tying Shin Zebra', P. 'Luchia Pink', P. 'Jin Cheng Sun', P. 'Sin Yuan Golden Beauty', P. 'Little Gem Stripe', P. 'Surf Song', Dtps. 'Lian Her Happy', P. 'Timothy Christopher', Dtps. 'Happy UFO', P. 'Big White Pink Stripe', P. 'Medium Pink', P. 'Leodora', P. 'Magic Kiss', P. 'Goldie', P. 'Roxanne', P. 'Ivory Pearl', P. 'Lucyna', P. 'Brother Girl', Dtps. 'Ox Prince Thunder', P. 'Carlotta', Dtps. 'Leopard Princess M611', Dtps. 'Gan Lin Fairy 'GL', P. 'Shu Long Spotted Deer', P. 'Ho's Little Caroline', Dtps. 'Sogo Soft', Dtps. 'Gan Lin Beauty Hsiung,			
				Medium (4.6 - 6.0)		5	Dtps. Plum Rose x Ox Black Jack, P. Memoria Francis Hunter, Dtps. Chin Ann Diamond 'Alisun', Dtps. Gan Lin Diamond, Dtps. Shulong Sun Beauty, P. ChianXen Pearl 'Cx#1', P. Miki WataNabe, Dtps. ChianXen Magpie
				Large (>6.0 - 7.5)		7	Dtps. Shu Long Pearl, P. TaidaSalu Red, Dtps. ShihHua Long First Love
				Extra large (>7.5)		9	P. Kaleidoscope, P. Strawberry, Dtps. Hsin Yang Fortune
		Narrow (<4)	3	--			
2. (*) (+) QN (c)	Flower: width in front view (cm)	Medium (4-8)	5	Dtps. Younghome Orange Lip, Dtps. Hsin Yang Fortune, Dtps. Mount Lip Taisuco, P. Amabilis, P. Strawberry, Dtps. ShihHua Long First Love, P. TaidaSalu, Dtps. Tying Shin Zebra, Dtps. TaidaSalu Red, P. Sin Yuan Golden Beauty, Dtps. ChianXen Magpie, P. Surf Song, P. Timothy Christopher Dtps. Happy UFO, P. Medium Pink, P. Leodora, P. Magic Kiss, Goldie, P. Lucyna, P. Brother Girl, P. Carlotta, P. Ho's Little Caroline, Dtps. Shulong Sun Beauty, Dtps. Shu Long Pearl, Dtps. Leopard Princess M611	MS		
		Broad (>8)	7	Dtps. Plum Rose x Ox Black Jack, Dtps. Acker's Sweetie, Dtps. Big Red Robe, P. Miki WataNabe, P. Champion Porter, P. Kaleidoscope, P. Luchia Pink, P. Jin Cheng Sun, P. Little Gem Stripe, Dtps. Lian Her Happy, P. Big White Pink Stripe, P. Roxanne, P. Ivory Pearl, P. Memoria Francis Hunter, Dtps. Ox Prince Thunder, Dtps. Gan Lin Fairy 'GL', P. Shu Long Spotted Deer, Dtps. Sogo Soft, Dtps. Gan Lin Beauty Hsiung, Dtps. Chin Ann Diamond 'Alisun', Dtps. Gan Lin Diamond, P. ChianXen Pearl 'Cx#1'			

3. (*) QL (d)	Petal: color pattern	Uniform	1	Dtps. Younghome Orange Lip, Dtps. Mount Lip Taisuco, Dtps. Hsin Yang Fortune, P. Amabilis, P. Ivory pearl	VG
		Shaded	2	P. Miki Wata Nabe, P. Roxanne, Dtps. Ox Prince Thunder, Dtps. Leopard Princess M611, P. ChianXen Pearl 'Cx#1'	
		Edged	3	P. Strawberry, P. Carlotta	
		Striped	4	--	
		Netted	5	P. Luchia Pink, P. Sin Yuan Golden Beauty, Dtps. ChianXen Magpie	
		Spotted	6	P. Champion Porter, P. Surf Song, P. Magic Kiss, Goldie, P. Lucyna, Dtps. Shulong Sun Beauty, Dtps. Sogo Soft, Dtps. Shu Long Pearl.	
		Mixed (specify)	7	Dtps. Plum Rose x Ox Black Jack (shaded and spotted), Dtps. Acker's Sweetie (evenly colored and shaded at the base), Dtps. Big Red Robe (netted and edged), Dtps. ShihHua Long First Love (shaded and spotted at the base and evenly colored), P. TaidaSalu (netted and spotted), Dtps. Lian Her Happy (shaded and spotted), Dtps. Tying Shin Zebra (shaded and shaded at the base), Dtps. TaidaSalu Red (shaded and spotted), P. kaleidoscope (striped and netted), P. Jin Cheng Sun (shaded and spotted), P. Little Gem Stripe (netted and spotted), P. Timothy Christopher Dtps. Happy UFO (netted and spotted), P. Big White Pink Stripe (shaded and netted), P. Medium Pink (netted and edged), P. Leodora (shaded and spotted) P. Brother Girl (netted, spotted and edged), P. Memoria Francis Hunter (evenly colored and spotted) Dtps. Gan Lin Fairy 'GL' (shaded and spotted), P. Shu Long Spotted Deer (shaded and spotted), P. Ho's Little Caroline (shaded and netted), Dtps. Gan Lin Beauty Hsiung (shaded and spotted), Dtps. ChinAnn Diamond 'Alisun' (shaded and spotted), Dtps. Gan Lin Diamond (shaded and spotted),	
4. (*) QL (d)	Petal: predominant colour as per RHS colour chart	Green	1	--	VS
		White	2	P. Kaleidoscope, P. Miki Wata Nabe, P. Memoria Francis Hunter, Dtps. Ox Prince Thunder, Dtps. ChianXen Magpie	
		Pink	3	--	
		Yellow	4	Dtps. TaidaSalu Red, Dtps. Hsin Yang Fortune, Dtps. ShihHua Long First Love	
		Red	5	--	
		Purple	6	P. Strawberry, Dtps. Plum Rose x Ox Black Jack	
		Blue	7	--	
		Violet	8	--	

5. (*) QL (d)	Lip: color pattern of apical lobe	Uniform	1	Dtps. Plum Rose x Ox Black Jack, Dtps. Acker's Sweetie, P. Champion Porter, P. Strawberry, P. Big White Pink Stripe, P. Medium Pink, P. Brother Girl, P. Carlotta, Dtps. Gan Lin Fairy 'GL'	VG
		Shaded	2	Dtps. Younghome Orange Lip, Dtps. Hsin Yang Fortune, Dtps. Big Red Robe, Dtps. Mount Lip Taisuco, P. Miki WataNabe, P. Amabilis, , Dtps. ShihHua Long First Love, P. TaidaSalu, Dtps. Tying Shin Zebra, Dtps. TaidaSalu Red, P. Kaleidoscope, P. Luchia Pink, P. Jin Cheng Sun, P. Sin Yuan Golden Beauty, Dtps. ChianXen Magpie, P. Little Gem Stripe, Dtps. Lian Her Happy, P. Leodora, P. Magic Kiss, P. Roxanne, P. Ivory pearl, P. Memoria Francis Hunter, Dtps. Ox Prince Thunder, Dtps. Leopard Princess M611, P. Shu Long Spotted Deer, P. Ho's Little Caroline, Dtps. Sogo Soft, Dtps. Gan Lin Beauty Hsiung, Dtps. Shulong Sun Beauty, P. ChianXen Pearl 'Cx#1', Dtps. Shu Long Pearl	
		Edged	3	P. Timothy Christopher Dtps. Happy UFO	
		Striped	4	--	
		Netted	5	--	
		Spotted	6	P. Surf Song, Goldie, P. Lucyna, Dtps. Chin Ann Diamond 'Alisun', Dtps. Gan Lin Diamond.	
		Mixed (specify)	7	--	
		Green	1	--	
		White	2	P. Miki Wata Nabe, P. Miki Wata Nabe	
		Pink	3	--	
9. (*) QL (d)	Lip: predominant colour of apical lobe as per RHS colour chart	Yellow	4	P. Memoria Francis Hunter	VG
		Red	5	Dtps. Hsin Yang Fortune	
		Purple	6	Dtps. TaidaSalu Red, P. Kaleidoscope, P. Strawberry, Dtps. ShihHua Long First Love, Dtps. Ox Prince Thunder, Dtps. ChianXen Magpie, Dtps. Plum Rose x Ox Black Jack	
		Blue	7	--	
		Violet	8	--	
		White	2	P. Miki Wata Nabe, P. Miki Wata Nabe	
		Pink	3	--	
		Yellow	4	P. Memoria Francis Hunter	

Explanations for individual characteristics

Fig1: Leaf shape

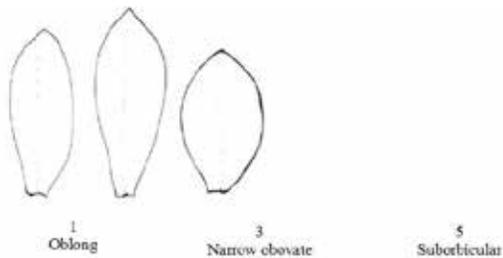


Fig 2: Leaf apex

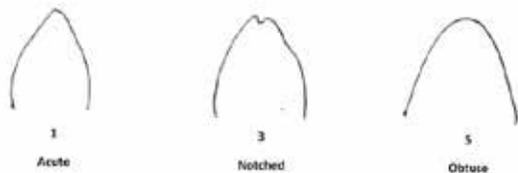


Fig 3: Inflorescence type

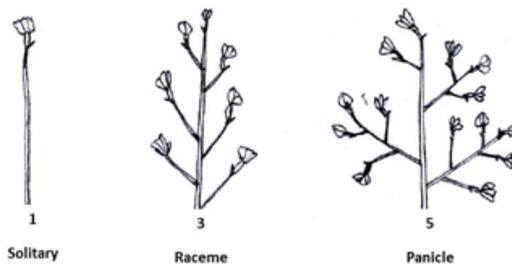


Fig 4: Flower arrangement of petals

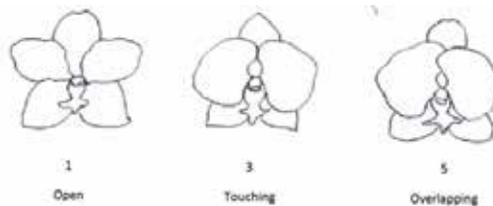


Fig 5: Shape of Dorsal sepal and Lateral sepal

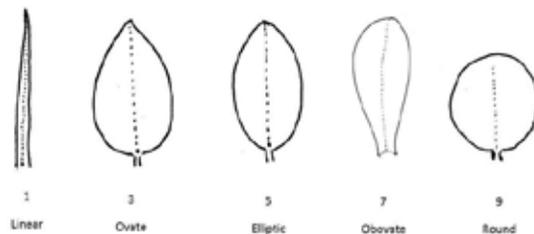


Fig 6: Curvature of Dorsal sepal and petal

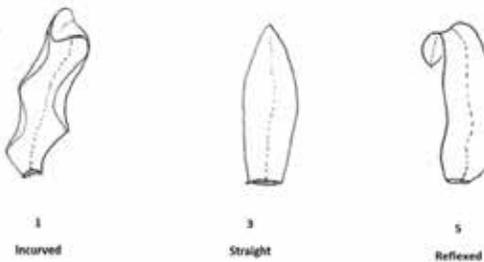


Fig 7: Petal shape

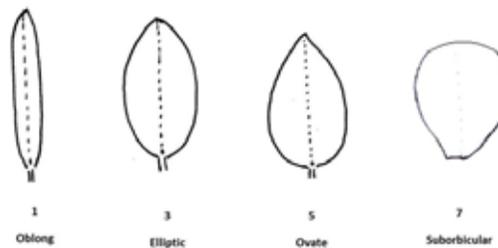


Fig 8: Lip: presence of whiskers and callus

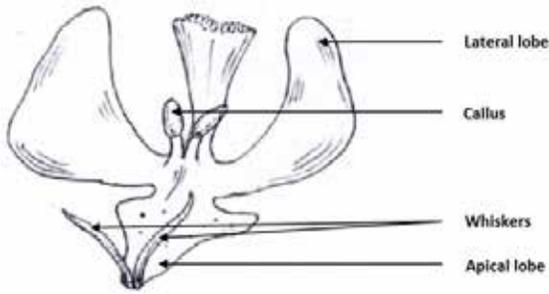


Fig 11: Lip: shape of lateral lobe

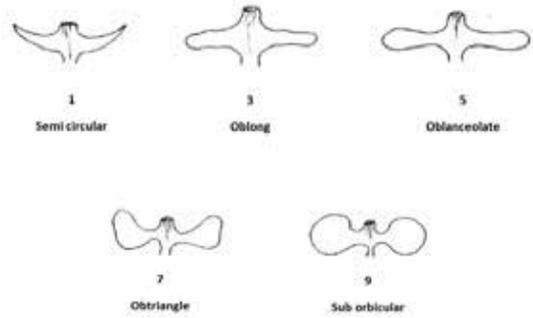


Fig 9 : Lip: shape of apical lobe

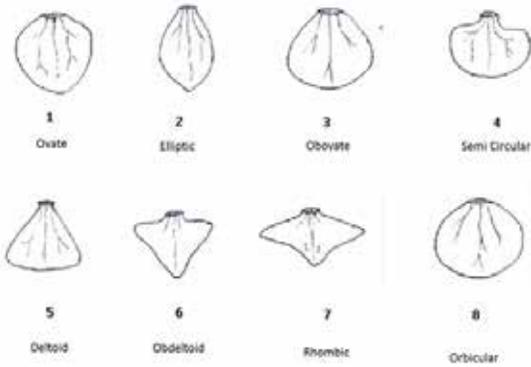


Fig 12: Lip: Curvature of lateral lobe

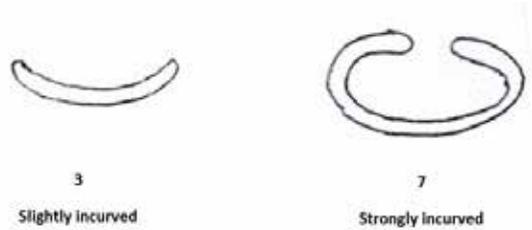
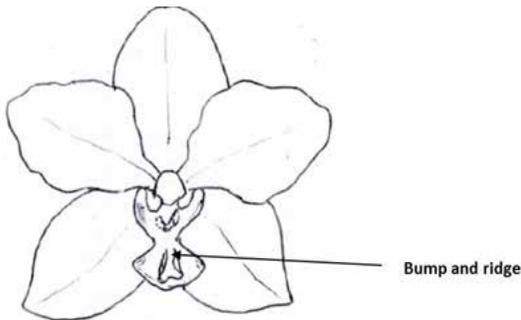


Fig 10: Lip: bump and ridge on apical lobe



REFERENCE

Eric A. Christenson (2007) Phalaenopsis: a Monograph; ISBN 0-88192-494-6 | | Harper, Tom (2004) Phalaenopsis Culture: Advice for Growing 20 Species. Orchids Magazine 73 (2), Delray Beach, FL: American Orchid Society, 2004. | | Henke de Greef (2008) Details about D.U.S. Testing for Plant Breeders Rights in Orchids in Europe. Abstracted in Taiwan International Orchid Symposium. | | Rao, A.N., Rajeevan, P.K., Srivastava, Manoj, Dhiman, S.R., Dhiman and De, L.C. (2012) Guidelines for the Conduct of Test for Distinctiveness, Uniformity and Stability on Orchid Cattleya and Phalaenopsis orchids, Protection of Plant Varieties and Farmers Rights Authority, NASC Complex, New Delhi-110012, Plant Variety Journal of India, 6 (11): 7-116. | | Tandon Pramod and Kumaria Suman (2010) Orchids resources of the North East India and their sustainable utilization. Biotechnology for sustainable Development: Achievements and Challenges, McGraw Hill Education, India. | | Thomas, F.O.H. (2001) Modern white phalaenopsis: origin and current status. Orchid Digest, 65(4): 148-154. | Vij, S.P. and Pathak Promila (2012) Orchid Diversity: Conservation and Utilization. Proc. Natl. Acad. Sect. B Biol. Sci. (November 2012) 82(S2):295-300.