

**Guidelines
for the Conduct of Test for
Distinctiveness, Uniformity and Stability**

On

**Grapes
(*Vitis* spp.)**

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

Grapes (*Vitis* spp.)

I. Subject

The guidelines presented in this document shall be meant to apply to all varieties of grapes (*Vitis* spp.)

II. Plant material required

1. The PPV & FRA shall decide the quantity and quality of the plant material required for testing the variety, when and where the material to be delivered for registration under the PPV& FR, Act 2001 (Govt. of India). Applicants submitting such plant material from a country other than India shall ensure that all customs and quarantine requirement(s) as stipulated under national legislation and regulations are fully complied.
2. The clonally propagated material is to be supplied in the form of 12 grafted plants on a suitable rootstock for each location. The planting material should be at least one year old at the time of supply.
3. The plant material supplied should be healthy, not lacking in vigour or unduly stressed nor affected by any pest or disease.
4. The plant material should be natural & not undergone by any treatment that affects the expression of the characteristics of the variety, unless the PPV&FRA may allow /demand such treatment. If the material is pre-treated, the full details of treatment must be presented at the time of submission.

III. Conduct of tests

1. The minimum duration of the DUS tests shall normally be at least two fruiting seasons spread across two consecutive years after planting. Tests shall be conducted at least at two places that shall be decided by the Protection of Plant Varieties and Farmers' Rights Authority (PPV &FRA) or may be notified or identified by the Authority including an option for 'on-site' DUS testing.
2. The tests should be carried out under favourable conditions ensuring satisfactory growth and expression of the relevant characteristics of the variety and for the conduct of the examination. It is also to be ensured that the vines should bear satisfactory number of fruit clusters (5 or more) in each of the two growing cycles.
3. Test Plot Design

A field lay out is required in a simple RBD (randomized block design) with sufficient number of replicates, that has at least 4 vines/replication. Finally the design shall facilitate the removal of plants or their parts for measurement/counting without prejudice to the observations to be recorded chronologically till the end of evaluation period.

- i) Plant to plant distance: 1.5 m
- ii) Row to row distance: 3.0 m
- iii) Row length: 6.0 m
- iv) Number of replications: 3
- v) Plants per replication: 4 plants

IV. Methods and Observations

The required characteristics are detailed in the Table VII (Sl.Nos.1-40) shall be used for testing of grape varieties for their Distinctiveness, Uniformity and Stability.

1. For the assessment of distinctiveness and stability, observations shall be made on 6 representative vines and 2 vines selected respectively from each of the 3 replications.
2. Shoot characters
 - a. Fertile Buds: Examination of 3 scooped/excised buds under stereomicroscope (40x) (3rd-5th basal position) before fruit pruning (October) from 4 shoots for each replication.
 - b. Shoot tip: Examination of 4 healthy shoot tips with hand lens for each replication.
 - c. Woody shoot cross section: Examination of internodes from the middle third of 4 woody shoots for each replication.
3. Leaf characters :
 - a. Young leaf: colour of upper side of 4th leaf from distal end on located 4 growing shoots for each replication.
 - b. Mature leaves: obtained from the middle third of shoot just above the position of raceme attachment selected from 4 shoots per replication at pre-veraison stage when berries still hard and green (approx. 60 days after fruit pruning under Pune conditions).
4. Inflorescence per shoot: On shoots developed from canes after fruit pruning. Observations shall be recorded on 4 shoots selected from each replication.
5. Berry and bunch characters: Observations shall be recorded on 4 shoots selected from each replication.
 - a. Berry: Length of pedicel; distance from insertion to ramification, mean values of 36 berries selected from middle part of 12 bunches.
 - b. Berry: Formation of seeds: 36 berries taken from the middle part of 12 bunches.
 - c. Berry: Per cent must recovery (v/w); crush 100 g fully ripe, healthy berries without pedicels and centrifuge at 3000 rpm.
 - d. Sugar and titra table acid contents of must (%): Pooled sample from the bunches on 4 shoots selected from each replication.
6. Stages of observations (Column 6 of Table of Characteristics, Section VII)

Sl. No.	Stage of observation	Decimal coding
1.	After shoot maturity or just before fruit pruning	10
2.	When 50 % of the buds are in green shoot tip stage	20
3.	75 % flowering	30
4.	Between flowering and fruit set	40
5.	Pre-veraison stage when berries still hard and green	50
6.	About 50% berries in a bunch start getting soft and changing color, if any.	60

7.	At harvest	70
8.	After full cane maturity when growth ceases	80

V. Grouping of Varieties

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

Under Indian conditions, the grapes are broadly classified into 2 groups based on their suitability to end use which is dependent on berry characteristics, such as a) Pulpy and b) Juicy types. Again juicy types may be classified into i) Adherent skin (mostly *vinifera* types) and ii) Slip skin (mostly *labrusca* types). The third group may comprise only the rootstocks which are used extensively in viticulture for their compatibility to major scion varieties and also to overcome biotic and abiotic stress conditions under arid, semi-arid and semi-humid tropical conditions.

Following characteristics as per the table in Section VII shall be used for grouping of grape varieties:

1. Mature leaf shape and number of lobes (Characteristics 9 and 10).
2. Physiological maturity of the berry (Characteristic 18)
3. Bunch peduncle length (Characteristic 22)
4. Bunch shape/type (Characteristic 23)
5. Berry shape (Characteristic 26)
6. Berry skin colour after removal of bloom (Characteristic 27)
7. Berry flavour (Characteristic 31)
8. Formation of seeds (Characteristic 34)
9. Sugar content of must (Characteristic 37)
10. Total acid content of must (Characteristic 38)

VI. Characteristics and Symbols

1. To assess Distinctiveness, Uniformity and Stability for evaluating grapevine varieties under tropical Indian conditions, the selected characteristics and their states, as given in the Table of characteristics in Section VII shall be used.
2. Notes (1 to 9) shall be assigned for each state of expression of all the listed characteristics for the purpose of electronic/digital data processing.
3. Legend: (*) Characteristics to be observed during every fruiting season (from October pruning) and shall be always be included in the description of the variety
4. Legend (+): See section VIII. It is to be noted that certain characteristics and the plant parts on which observations to be taken are given in the explanations or figures for clarity on the table of characteristics in Section VII.
5. The optimum stage for recording observations/ measurement of each characteristic is given in sixth column of the Table of Characteristics (Decimal coding as given in IV(6)).
6. Type of assessment of characteristics indicated in column seven of Table of Characteristics is as follows :-
MG: Measurement by single observation of a group of plants or parts of plants.
MS: Measurement of unit number/scale from individual plants or parts of plants.
VG: Visual assessment by a single observation of group plants or parts of plants.

VS: Visual assessment by observations of individual plants or parts of plants.

VII. Table of Characteristics

Sr. No.	Characteristics	States	Notes	Example variety	Stage of observation	Type of assessment
1	2	3	4	5	6	7
1.	Shoot: fertile basalbuds (Mean of 3 buds)	Very low(<1)	1	Thompson Seedless	10	VG
		Medium(1-2 per cane)	5	Sharad Seedless		
		Very high (more than 2 per cane)	9	Flame Seedless		
2. +	Time of bud burst (Days after fruit pruning)	Very early(<6)	1	Christmas Rose	20	VG
		Early (6-8)	3	Marroo Seedless		
		Medium (9-11)	5	Red Globe		
		Late (12-14)	7	Merbein Seedless		
		Very late (>14)	9	Centennial Seedless		
3. +	Young shoot: form of shoot tip	Closed	1	B-69 (Kober 5BB x SO4)	30	VG
		Half open	5	Kober 5BB		
		Fully open	9	Red Globe		
4. *	Young leaf: colour of upper side of blade	Green	1	Perlette	30	VG
		Green with bronze spots	2	Golden Queen		
		Yellow	3	Thompson Seedless		
		Yellow with bronze spots	4	Red Prince		
		Copper yellow	5	Beauty Seedless		
		Copper	6	Angoor Kalon		
		Reddish	7	Convent Large Black		
		Other	9	<i>V. flexouosa</i>		
5.	Time of full bloom (Number of days after fruit pruning)	Very early (<25)	1	Christmas Rose	30	MG
		Early(25-30)	3	Perlette		
		Medium(31-36)	5	Marroo Seedless		
		Late (37- 42)	7	Thompson Seedless		
		Very late (>42)	9	Centennial Seedless		
6.	Inflorescence: average number of	<1	1	Superior Seedless	40	
		1 to <2	3	Thompson Seedless		
		2 to <3	5	Marroo Seedless		

Sr. No.	Characteristics	States	Notes	Example variety	Stage of observation	Type of assessment
1	2	3	4	5	6	7
	inflorescences per shoot	3 or more	7	Beauty Seedless		VG
7. +	Shoot: growth habit	Erect	1	Mourvedre	50	
		Semi erect	3	Sauvignon Blanc		
		Horizontal	5	Pinot Noir		
		Semi-drooping	7	Walthom Cross		
		Drooping	9	Kober 5BB		
8.	Mature leaf:width of blade (cm)	Very small (<5)	1	Pinot Noir	50	MS
		Small(5-8)	3	Pearl of Csaba		
		Medium (9-11)	5	Thompson Seedless		
		Large (12-14)	7	Centennial Seedless		
		Very large(>14)	9	Kishmish Chernyi		
9. * +	Mature leaf: shape of blade	Cordate	1	Champanel	50	VG
		Wedge-shaped	2	Thompson Seedless		
		Pentagonal	3	Marroo Seedless		
		Circular	4	<i>V. flexousa</i>		
		Kidney shaped	5	Spin Sahebi		
10. * +	Mature leaf: number of lobes	Single	1	Chardonnay	50	MG
		Three	3	Concord		
		Five	5	Thompson Seedless		
		Seven	7	Cabernet Sauvignon		
		More than seven	9	NRCG - A8-3		
11.	Mature leaf: anthocyanin coloration of main vein on lower side of blade	Absent	1	Thompson Seedless	50	VG
		Present	9	Flame Seedless		
12. +	Mature leaf: shape of teeth	Both sides concave	1	Champanel	50	VG
		Both sides straight (rectilinear)	2	Sirius		
		Both sides convex	3	Kishmish Chernyi		
		One side concave, one side convex	4	Black Round		

Sr. No.	Characteristics	States	Notes	Example variety	Stage of observation	Type of assessment
1	2	3	4	5	6	7
		Mixture of both sides straight and both sides convex	5	Arka Kanchan		
13. * +	Mature leaf: shape of petiole sinus / degree of opening / overlapping	Very wide open	1	Spin Sahebi	50	VG
		Moderately open	3	Arkavati		
		Narrowly open	5	Superior Seedless		
		Lobes overlapping	7	Jaos Belyi		
14.	Mature leaf: prostrate hairs between veins on lower side of blade	Absent	1	Perlette	50	VG
		Present	9	Isabella		
15.	Mature leaf: erect hairs between veins on lower side of blade	Absent	1	Perlette	50	VG
		Present	9	<i>V. flexouosa</i>		
16. +	Mature leaf: length of petiole compared to mid vein	Short(<1)	1	Beauty Seedless	50	VS
		Equal(=1)	5	Walthom Cross		
		Long(>1)	7	Arka Kanchan		
17.	Time of veraison(days after fruit pruning)	Early (<70)	1	Perlette	60	MG
		Medium(70-90)	5	Kishmish Chernyi		
		Late (91 and above)	7	Thompson Seedless		
18. *	Physiological maturity of the berry (days after fruit pruning)	Early (<110)	1	Perlette	70	VS
		Medium(121-130)	3	Kishmish Chernyi		
		Late (131-140)	5	Red Globe		
19(a)	Bunch: weight (g) without peduncle of table grapes	Small (<250)	3	Red Muscat	70	MG
		Medium(250-500)	5	Kishmish Chernyi		
		Large(>500)	7	Red Globe		
19(b)	Bunch: weight (g) without peduncle of wine grapes	Small(<150)	3	Cabernet Sauvignon	70	MG
		Medium(150-250)	5	Shiraz		

Sr. No.	Characteristics	States	Notes	Example variety	Stage of observation	Type of assessment
1	2	3	4	5	6	7
		Large(>250)	7	Ugni Blanc		
20(a) * +	Bunch: length (mm) of table grapes (without peduncle)	Short (<120)	3	Catawba	70	MS
		Intermediate (120-200)	5	Thompson Seedless		
		Long (>200)	7	Red Globe		
20(b) * +	Bunch:length(mm) of wine grapes(without peduncle)	Short (<90)	3	Pinot Noir	70	MS
		Intermediate(90-150)	5	Shiraz		
		Long(>150)	7	Ugni Blanc		
21.	Bunch: berry density / compactness in table grapes	Loose	1	Red Globe	70	VG
		Medium	5	Manjri Naveen		
		Compact	7	Perlette		
22.* +	Bunch: peduncle length (mm)	Short (upto50)	3	Perlette	70	MS
		Medium (51- 70)	5	Thompson Seedless		
		Long (> 70)	7	Walthom Cross		
23.* +	Bunch: shape/type	Globular	1	Katta Kurghan	70	VG
		Cylindrical	2	Arkavati		
		Conical	3	Perlette		
		Winged cylindrical	4	ArkaShweta		
		Winged conical	5	Diamond Jubilee		
		Poly-winged	6	CheemaSahebi		
		Double clustered	7	Black Champa		
24. +	Bunch: uniformity of berry size	Non uniform (<70%)	3	Thompson Seedless	70	VG
		Uniform (>70%)	7	Manjri Naveen		
25.	Berry diameter	Small (<14 mm)	3	Perlette	70	MS
		Medium (14-18 mm)	5	Flame Seedless		
		Large (>18 mm)	7	Red Globe		
26. * +	Berry: shape	Oblate	1	Riesling	70	
		Globose/Round	2	Flame seedless		
		Short elliptical	3	Crimson Seedless		

Sr. No.	Characteristics	States	Notes	Example variety	Stage of observation	Type of assessment
1	2	3	4	5	6	7
		Long elliptical	4	Manjri Naveen	70	VG
		Cylindrical	5	Sonaka		
		Ovate	6	Italia		
		Obovate	7	Fantasy Seedless		
		Arched	8	AmbeSeedless		
		Finger shaped	9	RR Seedless		
27. *	Berry: skin colour after removal of bloom	Green- yellow	1	Chasselas Blanc	70	VG
		Rose	2	KishmishRozavis		
		Red	3	Flame Seedless		
		Purple	5	Beauty Sls.		
		Blue-black	6	KishmishChernyi		
		Other	7	Delight		
28.	Berry: thickness of skin	Thin	3	Thompson Seedless	70	VG
		Medium	5	Flame Seedless		
		Thick	7	Red Globe		
29.	Berry: anthocyanin colouration of mesocarp	Absent	1	KishmishChernyi	70	VG
		Present	9	Rubi Red		
30.	Berry: firmness of mesocarp	Soft	3	Beauty Seedless	70	VG
		Firm	7	Flame Seedless		
31. *	Berry: flavour	Neutral	1	Thompson Seedless	70	VG
		Muscat	3	Flame Seedless		
		Foxy	5	Catawba		
		Others	9	Manjri Naveen		
32. +	Berry:length of pedicel (mm)	Very short(≤ 4)	1	Concord	70	MG
		Short(5-7)	3	Grenache Noir		
		Medium(8-10)	5	Cinsaut		
		Long(11-13)	7	Christmas Rose		
		Very long(≥ 14)	9	Red Globe		
33.	Berry: attachment with pedicel	Loose	3	Flame Seedless	70	VG
		Firm	7	Thompson Seedless		

Sr. No.	Characteristics	States	Notes	Example variety	Stage of observation	Type of assessment
1	2	3	4	5	6	7
34. *	Berry: formation of seeds	Seedless (absent)	1	Thompson Seedless	70	VG
		Rudimentary	3	Arkavati		
		Well developed	5	Red Globe		
35.	Berry: 100-seed weight (g)	Low (<1.5)	3	MarrooSeedless	70	MG
		Medium (1.5-3.0)	5	Arkavati		
		High (>3.0)	7	Red Globe		
36.	Berry: Must Recovery (V/W %)	Very little (≤ 45)	1	Red Globe	70	MG
		Little (46-55)	3	Gulabi		
		Medium(56-65)	5	Isabella		
		High (66-75)	7	Concord		
		Very high(>75)	9	PusaUrvashi		
37. *	Sugar content of must (%)	Low (<16)	3	Manjri Naveen	70	MG
		Medium (16-20)	5	KismishChernyi		
		High (>20)	7	Crimson Seedless		
38. *	Total acid content of must (g/l tartaric acid)	Very low(<3)	1	Manjri Naveen	70	MG
		Low (3-6)	3	Perlette		
		Medium (6-9)	5	Flame Seedless		
		High (9-12)	7	Thompson Seedless		
		Very high (>12)	9	Crimson Seedless		
39. +	Woody shoot; cross section	Circular	1	Red Globe	80	VG
		Elliptic	3	Chasselas Blanc		
		Oblate	5	Kober 5BB		
40.	Colour of Woody shoot	Yellow	1	Grenache Noir	80	VG
		Brownish	3	Chasselas Blanc		
		Red –Violet	5	3309C		
		Grey	7	KishmishChernyi		

VIII. Explanation for Table of Characteristics



Green shoot tip stage

Characteristic. 2: Time of bud burst



1
Closed



5
Half open



9
Fully open

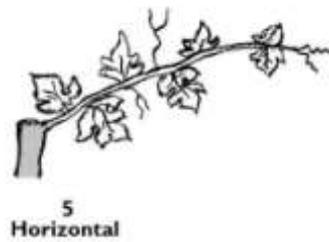
Characteristic 3 : Young shoot: Form of tip



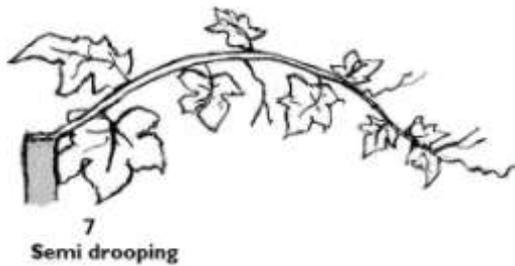
1
Erect



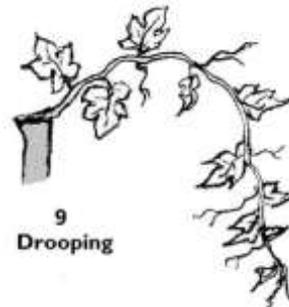
3
Semi Erect



5
Horizontal



7
Semi drooping



9
Drooping

Characteristic 7: Shoot: growth habit



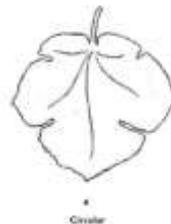
1
Cordate



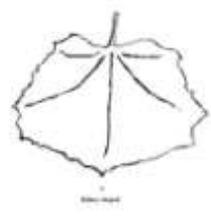
2
Wedge shaped



3
Pentagonal

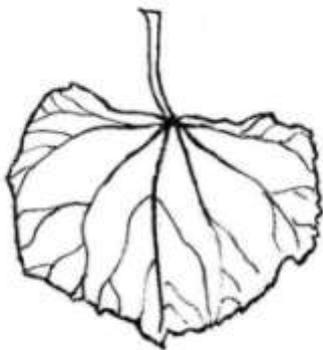


4
Circular

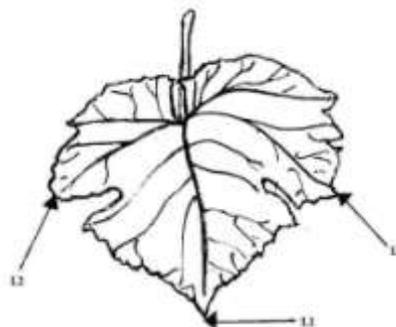


5
Kidney shaped

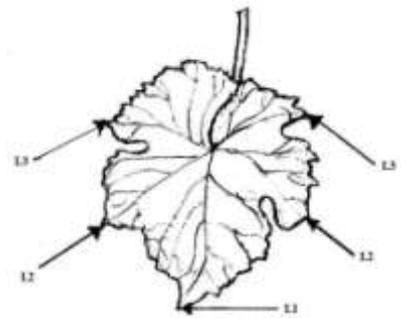
Characteristic 9: Mature leaf: shape of blade



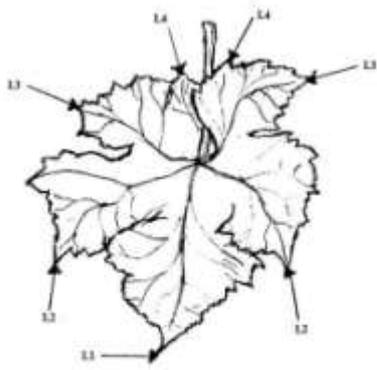
1
Single lobe



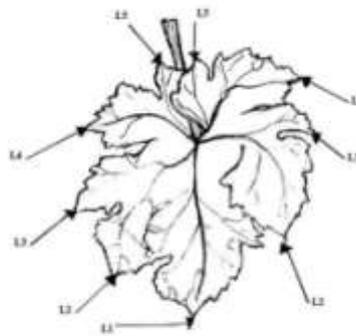
3
Three lobes



5
Five lobes

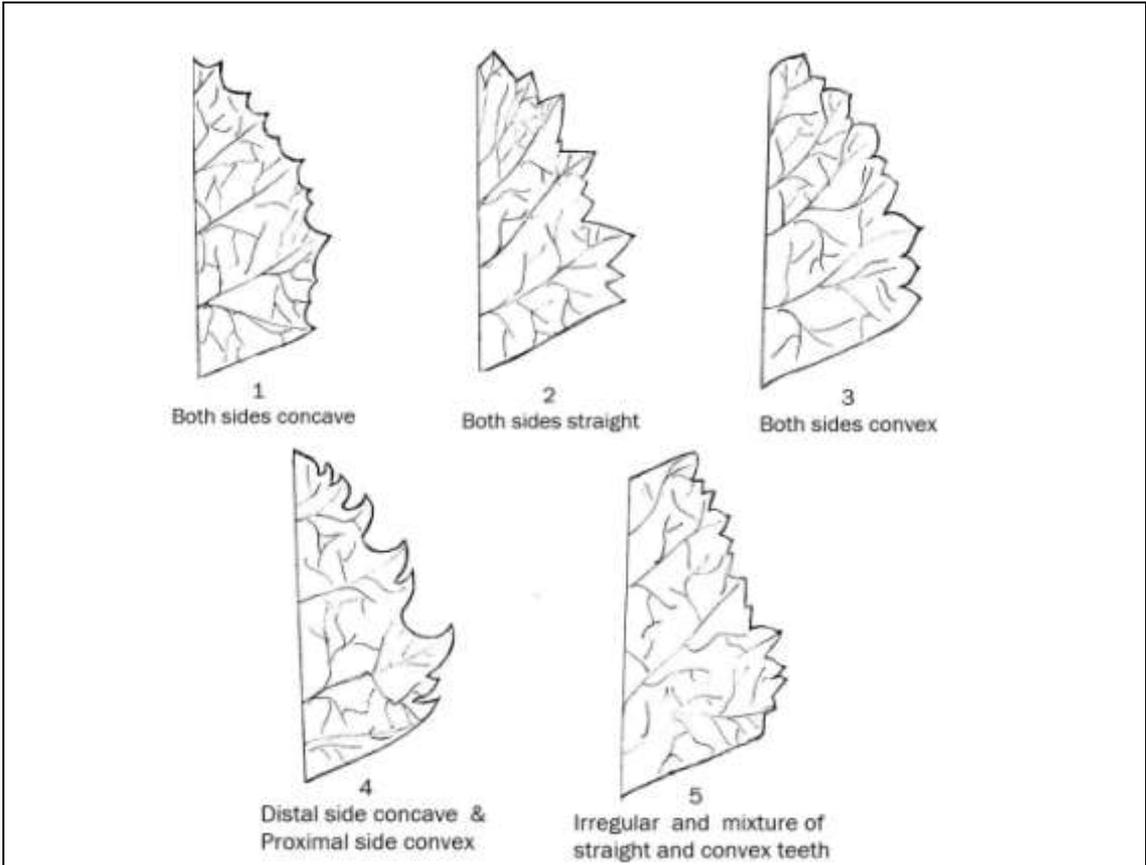


7
Seven lobes

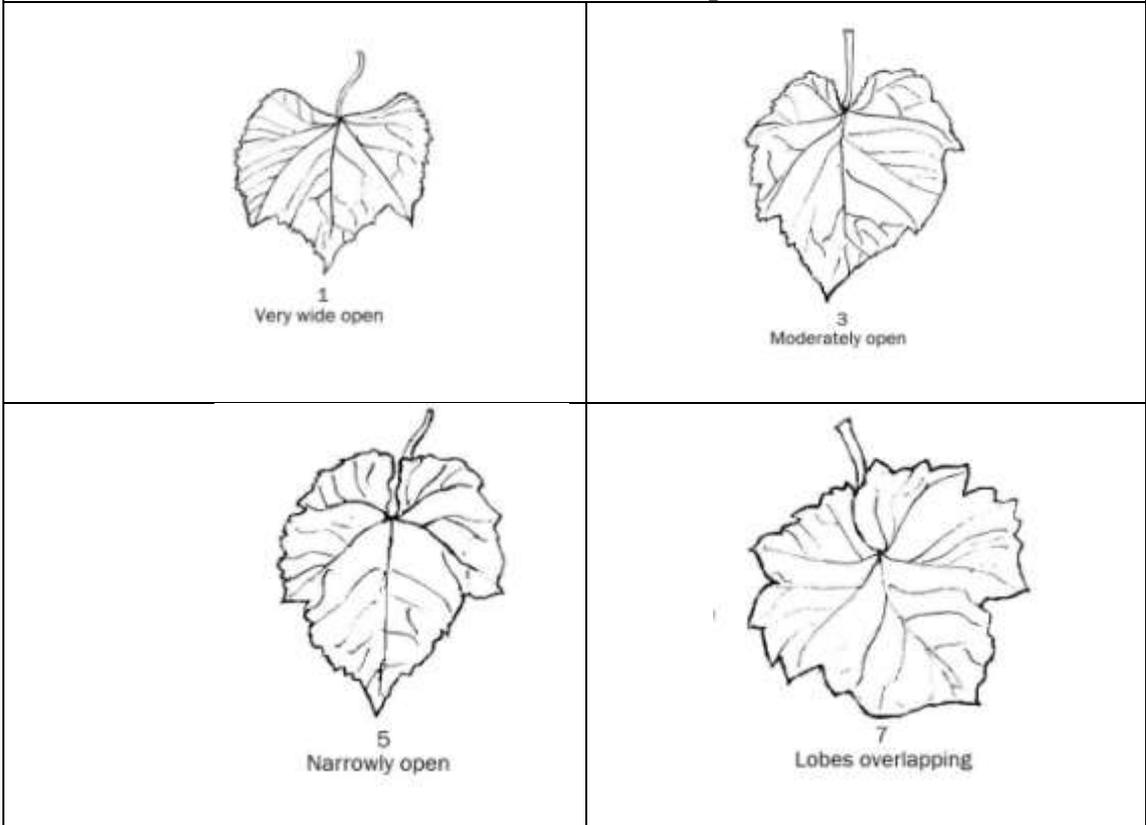


9
More than seven lobes

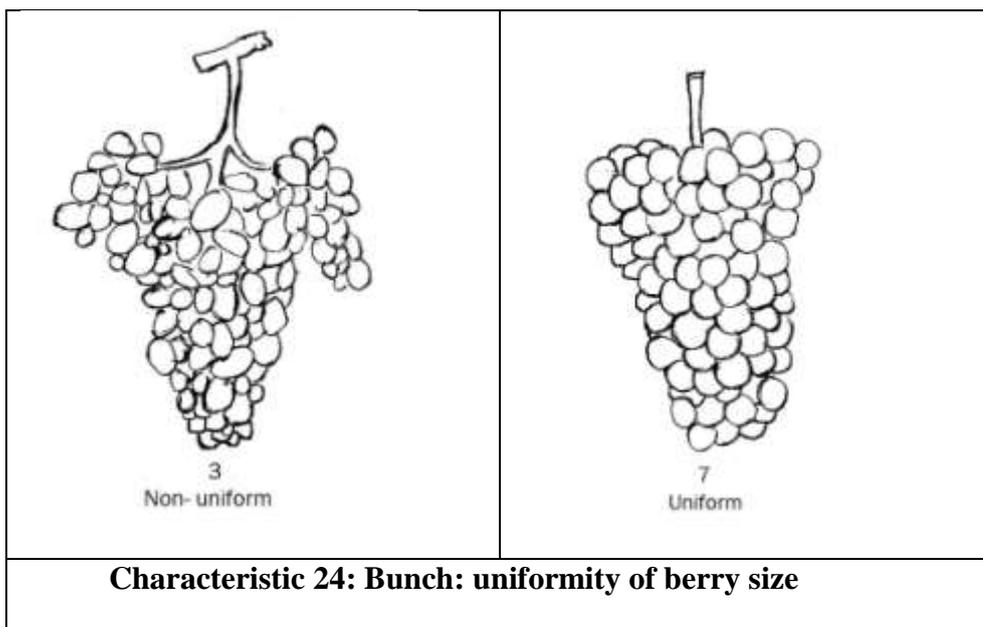
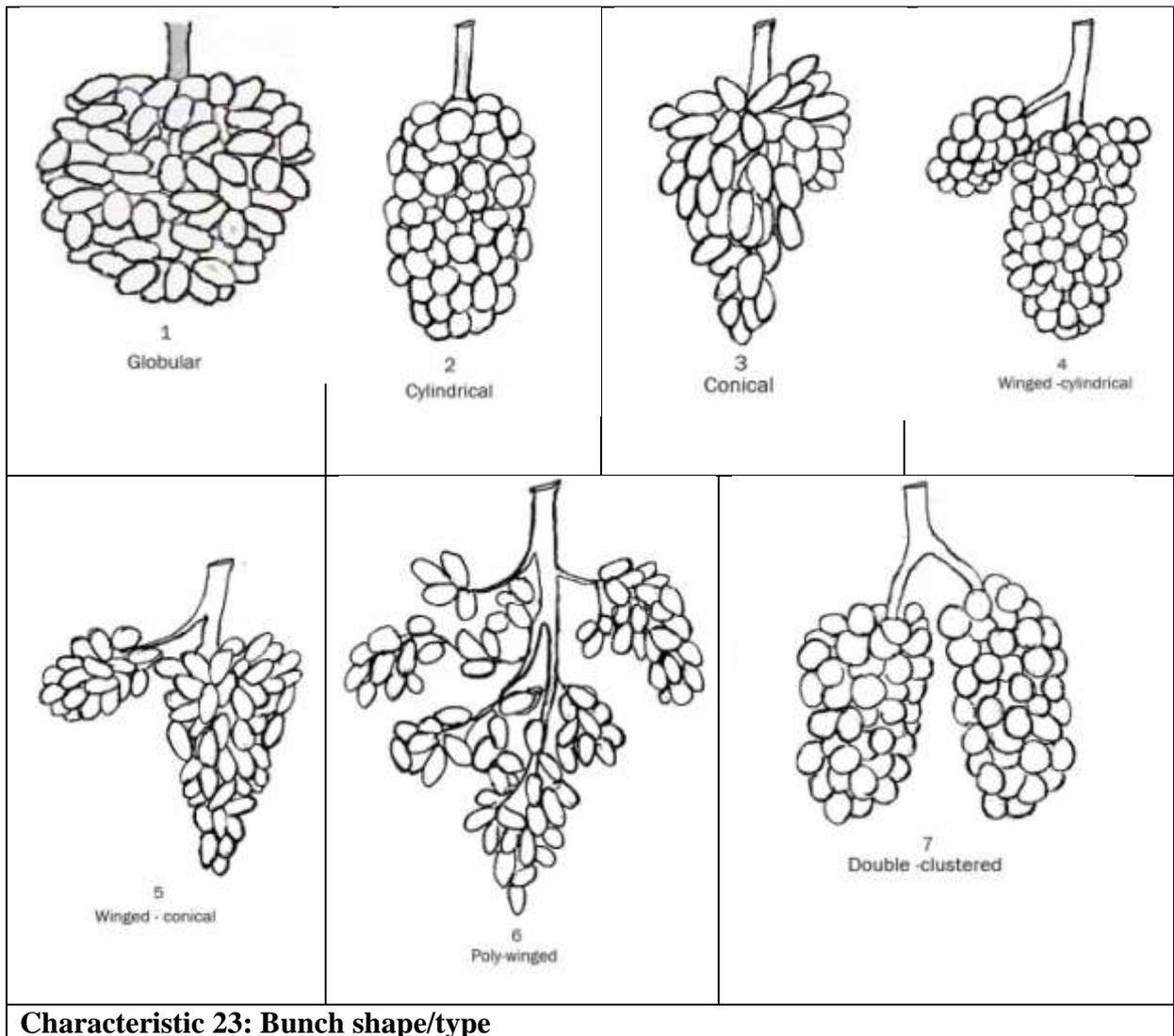
Characteristic10: Mature leaf: number of lobes

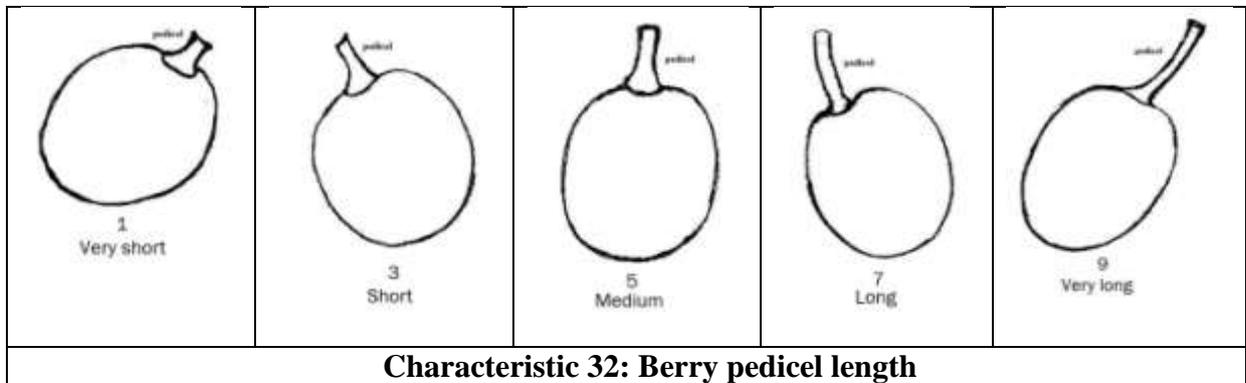
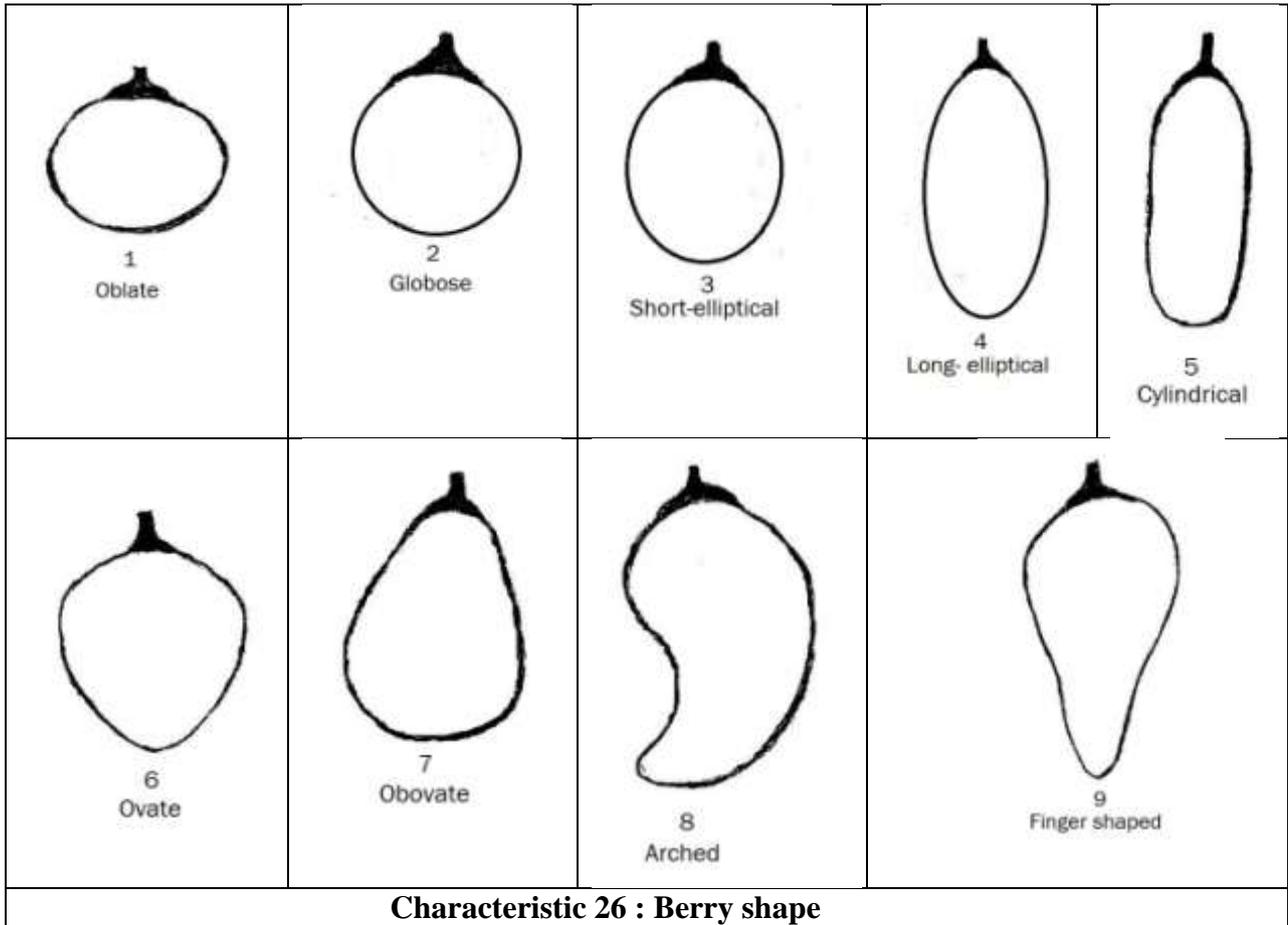


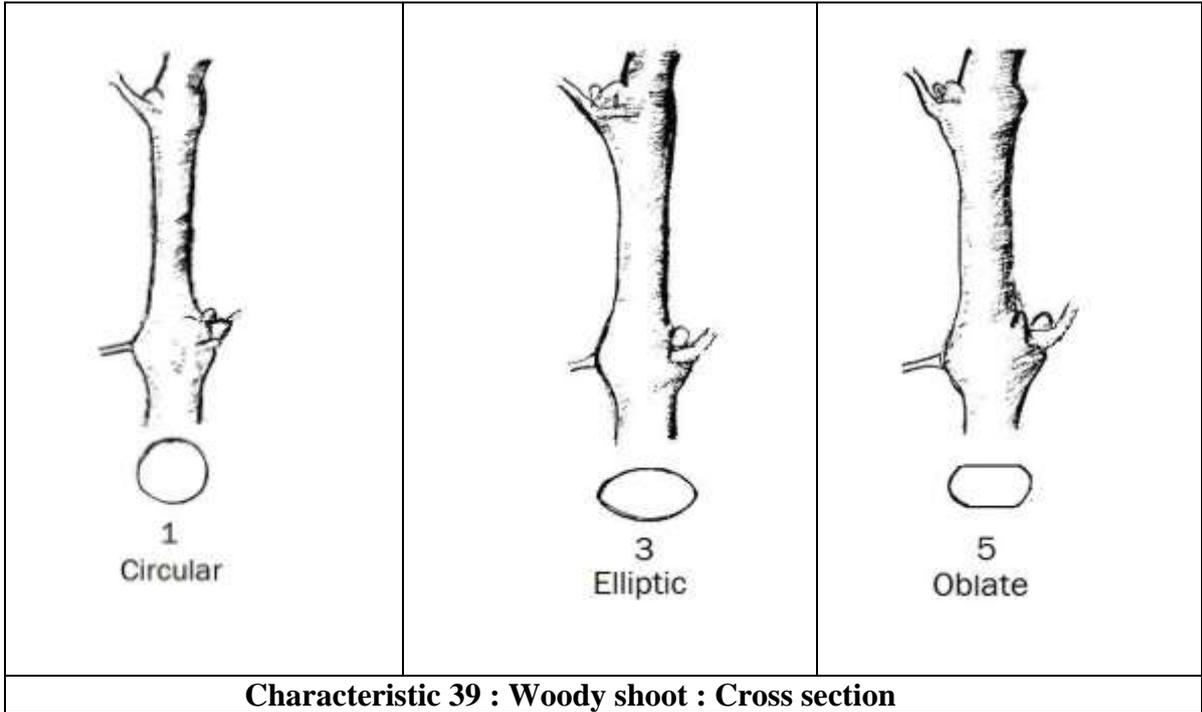
Characteristic. 12: Mature leaf: shape of teeth



Characteristic. 13: Mature leaf: shape of petiole sinus/degree of opening







IX. Working Group Details:

These Test Guidelines have been developed by the Director, National Research Centre for Grapes, Pune in consultation with the Task Force Committee (4/2011) constituted by the PPV & FR Authority.

The Members of Task Force Committee (4/2011)

Dr.J.P.Tiwari Former Dean Agriculture G.B. Pant University of Agriculture and Technology, Pantnagar.	Chairman
Dr.B.M.C.Reddy National Project Coordinator UNAPGEF Project IIHR, Hesarghatta, Bangalore	Member
Dr.G.S.Karibasappa Principal Scientist (Horticulture) National Research Centre for Grapes Pune	Member
Dr. Manoj Srivastava Registrar, PPV & FRA New Delhi	Member Secretary

Nodal Officer

Dr.G.S. Karibasappa
Principal Scientist (Horticulture)
National Research Centre on Grapes
Pune.

X. DUS Testing Centres for Grapes

Nodal DUS Test Centre	Proposed Cooperative DUS Test Centres
National Research Centre on Grapes, Manjri Farm,P.B. No. 3., Solapur Road, Pune- 412 307, Maharashtra.	A. Post Graduate Centre, College of Horticulture, Bengaluru, University of Horticultural Sciences, Bagalkot, Karnataka B. Department of Horticulture Punjab Agriculture University Ludhiana, Punjab