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

National Research Centre on Grapes,
(Indian Council of Agricultural Research)
Manjri Farm, Solapur Road,
Pune, Maharashtra

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 vigor 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 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 growing season.
   Plant to plant distance: 1.5 m
   Row to row distance: 3.0 m
   Plants per replication: 4 plants
   Number of replications: 3

IV. Methods and Observations

The required characteristics are detailed in the Table VII (Sl.Nos.1-46) 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 : microscopic examination of 3 basal buds (3^{rd} -5^{th} position) before forward pruning from 12 shoots.
   b. Shoot tip: Examination of 12 shoot tips; above the first unfolded leaf with hand lense.
   c. Woody shoot cross section: Examination of internodes from the middle third of 12 woody shoots.
3. Leaf characters :
   a. Young leaf: colour of upper side of 4^{th} distal leaf from 12 growing shoots
   b. Mature leaves :obtained from the middle third of shoot just above the position of receme attachment selected from 12 shoots at 60 days after pruning.
4. Inflorescence per shoot: On shoots developed from canes after forward pruning. Mean value of 12 shoots selected from 6 plants.
5. Fruits/berry and bunch characters:

   a. Berry: Length of pedicel ; distance from insertion to ramification, mean values of 30 berries selected from middle part of 10 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 titratable acid contents of must (%): Pooled sample in 3 replicates from the bunches on 12 shoots.

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

to overcome biotic and abiotic stress conditions under arid, semi-arid & semi-humid tropical conditions.

Further, grape varieties of both pulpy and juicy types can be grouped into the following:

1. Ch.9 & 10 for ampelometric grouping based on leaf shape & formation.
2. Ch 18: time of physiological maturity (full ripening) of the berry
3. Ch 23: Bunch shape/type
4. Maturity Period; Early, Medium and Late based on characteristics 17 &18
5. End Users ; Table, Raisin, Juice, Wine & Other Processed products, based on the characteristics 25-30, 32-34, 36-38.
6. Berry appearance & seediness; White, Red, Black further grouped into seeded, soft seeded and seedless types based on characteristics 25,27,30,34.37 &38.
7. Organoleptic qualities; Colour, Texture/Consistency & Flavour based on characteristics 27, 30, 31, 37&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 (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. Wherever necessary the legends shall be used for essential nature of characteristics, such as, (*) for characteristics to be observed during every fruiting season (from October pruning) and shall be always be included in the description of the variety and (#) for characteristics that shall be observed during every vegetative growth phase from April pruning.
4. The optimum stage for recording observations/ measurement of the characteristic is given in column 6 of the Table (Section VII).

VII. Table of characteristics

Sr. No.	Characteristics	States	Notes	Example Variety	Stage of Observation	Type of assessment
1	2	3	4	5	6	
1.#	Shoot: fertile basal buds	Very low(<1)	1	Thompson seedless	After shoot maturity or just before forward pruning	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 forward pruning)	Very Early(<6)	1	Christmas Rose	When 50 % of the buds are in green shoot tip stage	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		

Sr. No.	Characteristics	States	Notes	Example Variety	Stage of Observation	Type of assessment
1	2	3	4	5	6	
3.	Young shoot: opening of shoot tip	Closed	1	B-69 (Kober 5BB x SO4)	75 % flowering stage	VG
		Half open	5	Kober 5BB		
		Fully open	9	Red Globe		
4.*	Young leaf: colour of upper side of blade	Green	1	Perlette	75% Flowering	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	*V.flexousa*		
5.	Time of full bloom (Number of days after forward pruning)	Very early (<25)	1	Christmas Rose	When 75% flowers are open	MG
		Early(25-30)	3	Perlette		
		Medium(31-36)	5	Marroo Sls.		
		Late (37- 42)	7	Thompson Sls.		
		Very late (>42)	9	Centennial Sls.		
6.	Inflorescence: average number of inflorescences per shoot	<1	1	Superior Sls.	Between Flowering & fruitset	VG
		1 to <2	3	Thompson Sls.		
		2 to <3	5	Marroo Sls.		
		3 or more	7	Beauty Sls.		
7.	Shoot Attitude: (growth habit)	Erect	1	Mourvedre	50 days after forward pruning & before tying	
		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	60 Days After forward pruning	MS
		Small(5-8)	3	Pearl of Csaba		
		Medium (8-11)	5	Thompson Sls.		
		Large (11-14)	7	Centennial Sls.		
		Very large(>14)	9	Kishmish Chernyi		

Sr. No.	Characteristics	States	Notes	Example Variety	Stage of Observation	Type of assessment
1	2	3	4	5	6	
9. * +	Mature leaf : shape of blade	Cordate	1	Champanel	60 Days After forward Pruning	VG
		Wedge-shaped	2	Thompson seedless		
		Pentagonal	3	Marroo Sls.		
		Circular	4	*V.flexousa*		
		Reniform	5	Spin Sahebi		
10. +	Mature leaf: number of lobes	Single	1	Chardonnay	60 Days after forward pruning	MG
		Three	3	Concord		
		Five	5	Thompson Sls.		
		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	60 Days After forward pruning	VG
		Present	9	Flame Seedless		
12. *	Mature leaf: shape of teeth	Both sides concave	1	Champanel	60 Days after forward Pruning	VG
		Both sides straight (rectilinear)	2	Sirius		
		Both sides convex	3	Kishmish Chernyi		
		One side concave, one side convex	4	Black Round		
		Mixture of both sides straight and both sides convex	5	Arka Kanchan		
13. *	Mature leaf: degree of opening / overlapping of petiole sinus	Very wide open	1	Spin Sahebi	60 Days After forward Pruning	VG
		Moderately open	3	Arkavati		
		Narrowly open	5	Superior Sls.		
		Lobes overlapping	7	Jaos Belyi		
14.	Mature leaf: prostrate hairs between veins on lower side of blade	Absent	1	Perlette	60 days after forward pruning	VG
		Present	9	Isabella		
15.	Mature leaf: erect hairs between veins on lower side of blade	Absent	1	Perlette	60 Days after forward Pruning	VG
		Present	9	*V.flexousa*		
16.	Mature leaf: ratio of length of petiole compared to mid vein	Short(<1)	1	Beauty seedless	After 60 days of forward pruning	VS
		Equal(=1)	5	Walthom Cross		
		Long(>1)	7	Arka Kanchan		

Sr. No.	Characteristics	States	Notes	Example Variety	Stage of Observation	Type of assessment
1	2	3	4	5	6	
17.	Time of veraison (days after forward pruning)	Early (<70)	1	Perlette	About 50% berries in a bunch start getting soft and changing color, if any.	MG
		Medium(70-90)	5	Kishmish Chernyi		
		Late (91 and above)	7	Thompson Sls.		
18.	Physiological maturity of the berry (days after forward pruning)	Early (<110)	1	Perlette	At harvest	VS
		Medium(121-130)	3	Kishmish Chernyi		
		Late (131-140)	5	Red Globe		
19(a)	Bunch: size (weight without peduncle) of Table grapes(g)	Small (<250)	3	Red Muscat	At harvest	MG
		Medium(250-500)	5	Kishmish chernyi		
		Large(>500)	7	Red Globe		
19(b)	Bunch: size (weight without peduncle) of Wine grapes(g)	Small(<150)	3	Cabernet Sauvignon	At harvest	MG
		Medium(150-250)	5	Shiraz		
		Large(>250)	7	Ugni Blanc		
20(a)*	Bunch: length for Table grapes (mm) (without peduncle)	Short (<120)	3	Catawba	At harvest	MS
		Intermediate (120-200)	5	Thompson Sls.		
		Long (>200)	7	Red Globe		
20(b)	Bunch Length(mm) Wine grapes	Short (<90)	3	Pinot Noir	At harvest	MS
		Intermediate(90-150)	5	Shiraz		
		Long(>150)	7	Ugni Blanc		
21.	Bunch: Berry density / Compactness in table grapes	Loose	1	Red Globe	At harvest	VG
		Medium	5	Manjri Naveen		
		Compact	7	Perlette		
22. +	Bunch: Peduncle length (mm)	Short (upto 50)	3	Perlette	At harvest	MS
		Medium (51- 70)	5	Thompson Sls.		
		Long (> 70)	7	Walthom Cross		
23. * +	Bunch: shape/type	Globular	1	Katta Kurghan	At harvest	VG
		Cylindrical	2	Arkavati		
		Conical	3	Perlette		
		Winged cylindrical	4	Arka Shweta		
		Winged conical	5	Diamond jubilee		
		Poly-winged	6	Cheema Sahebi		
		Double clustered	7	Black Champa		

Sr. No.	Characteristics	States	Notes	Example Variety	Stage of Observation	Type of assessment
1	2	3	4	5	6	
24.	Bunch: uniformity of berry size	Not uniform (<70%)	3	Thompson Sls.	At harvest	VG
		Uniform (>70%)	7	Manjri Naveen		
25.	Berry diameter	Small (<14 mm)	3	Perlette	At harvest	MS
		Medium (14-18 mm)	5	Flame Seedless		
		Large (>18 mm)	7	Red Globe		
26*	Berry: shape	Oblate	1	Riesling	At harvest	VG
		Globose/Round	2	Flame seedless		
		Short elliptical	3	Crimson Seedless		
		Long elliptical	4	Manjri Naveen		
		Cylindrical	5	Sonaka		
		Ovate	6	Italia		
		Obovate	7	Fantasy Seedless		
		Arched	8	Ambe Sls.		
		Finger shaped	9	RR seedless		
27.	Berry: colour of skin (without bloom)*	Green- yellow	1	Chasselas Blanc	At harvest	VG
		Rose	2	Kishmish Rozavis		
		Red	3	Flame Seedless		
		Purple	5	Beauty Sls.		
		Blue-black	6	Kishmish Chernyi		
		Other	7	Delight		
28.	Berry: thickness of skin	Thin	3	Thompson Sls.	At harvest	VG
		Medium	5	Flame Seedless		
		Thick	7	Red Globe		
29.	Berry: anthocyanin colouration of mesocarp	Absent	1	Kishmish Chernyi	At harvest (just ripe stage)	VG
		Present	9	Rubi Red		
30.	Berry: firmness of mesocarp	Soft	3	Beauty Sls.	At harvest	VG
		Firm	7	Flame Seedless		
31.	Berry: flavour	Neutral	1	Thompson Sls.	At harvest	VG
		Muscat	3	Flame Seedless		
		Foxy	5	Catawba		
		Others	9	Manjri Naveen		

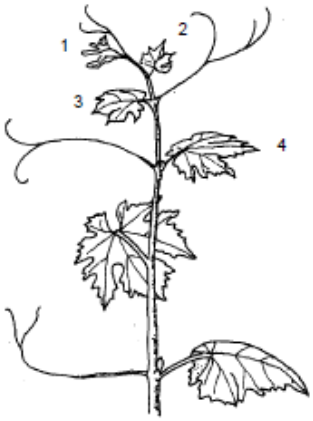
Sr. No.	Characteristics	States	Notes	Example Variety	Stage of Observation	Type of assessment
1	2	3	4	5	6	
32.	Berry:length of pedicel (mm)	Very short(≤4)	1	Concord	At harvest	MG
		Short(5-7)	3	Grenache Noir		
		Medium(8-10)	5	Cinsaut		
		Long(11-13)	7	Christmas Rose		
		Very long(≥14)	9	Red Globe		
33.	Berry: attachment with pedicel	Loose	3	Flame Seedless	At harvest	VG
		Firm	7	Thompson Seedless		
34. *	Berry: formation of seeds	Seedless (absent)	1	Thompson Sls.	At harvest	VG
		Rudimentary	3	Arkavati		
		Well developed	5	Red Globe		
35.	Berry: 100-seed weight (g)	Low (<1.5)	3	Marroo Sls.	At harvest	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	At harvest	MG
		Little (46-55)	3	Gulabi		
		Medium(56-65)	5	Isabella		
		High (66-75)	7	Concord		
		Very high(>75)	9	Pusa Urvashi		
37.	Sugar content of must (%)	Low (<16)	3	Manjri Naveen	At harvest	MG
		Medium (16-20)	5	Kismish Chernyi		
		High (>20)	7	Crimson Sls.		
38.	Total acid content of must (g/l tartaric acid)	Very low (<3)	1	Manjri Naveen	At harvest	MG
		Low (3-6)	3	Perlette		
		Medium (6-9)	5	Flame Seedless		
		High (9-12)	7	Thompson Sls.		
		Very high (>12)	9	Crimson Sls.		
39.	Woody shoot; cross section	Circular	1	Red Globe	After full cane maturity, when growth ceases	VG
		Elliptic	3	Chasselas Blanc		
		Oblate	5	Kober 5BB		
40.	Colour of Woody shoot	Yellow	1	Grenache Noir	After full cane maturity, when growth ceases	VG
		Brownish	3	Chasselas Blanc		
		Red -Violet	5	3309C		
		Grey	7	Kishmish Chernyi		

VIII. Illustrations of Grape characteristics

Bud burst : Green shoot tip stage

Characteristic. 2: Time of bud burst

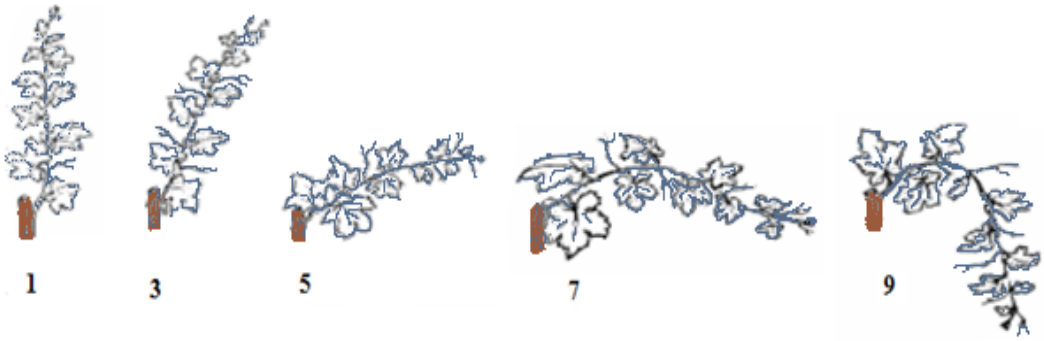
Characteristic 3: Young shoot: Form of tip



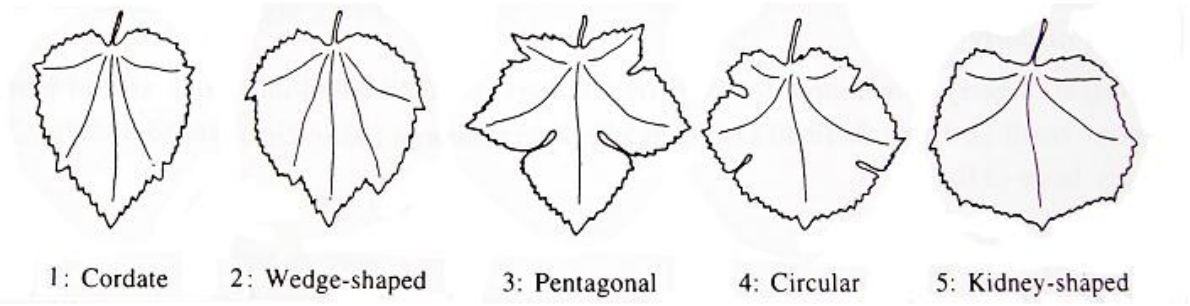
Characteristic 4: Young leaf; color of upper side of blade (4th leaf)

Characteristic 5. Time of Full bloom (75% cap fall stage)

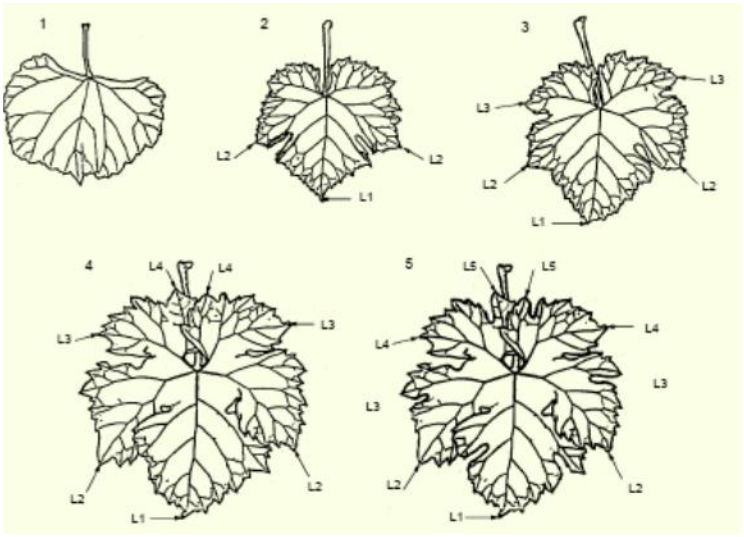
Characteristic 6: Inflorescence; number of inflorescences per shoot



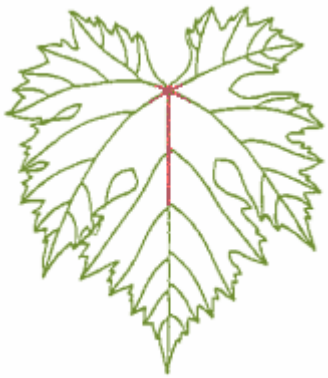
Characteristic 7: Shoot: attitude/ habit



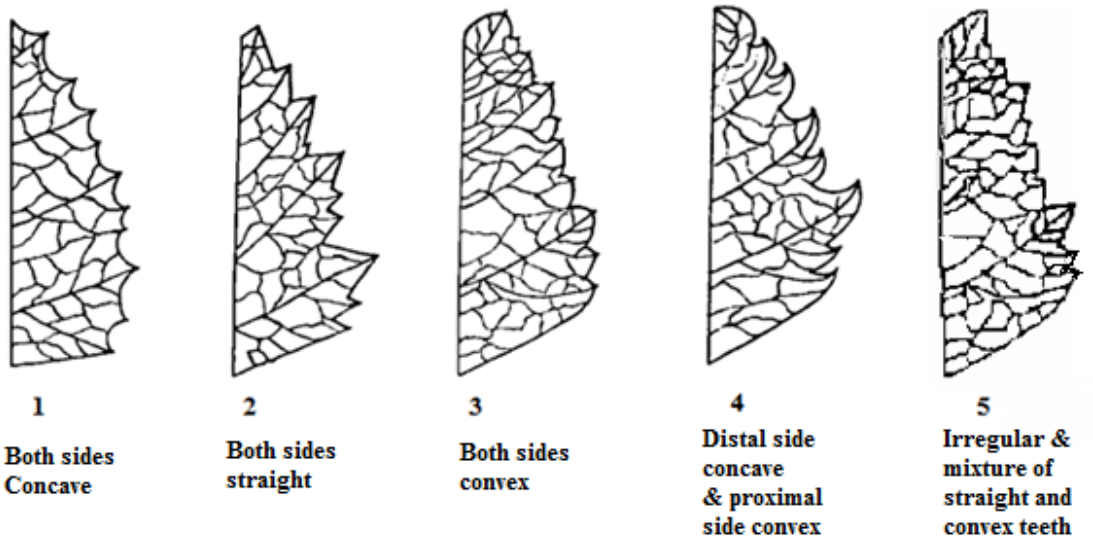
Characteristic 9: Mature leaf; shape of blade



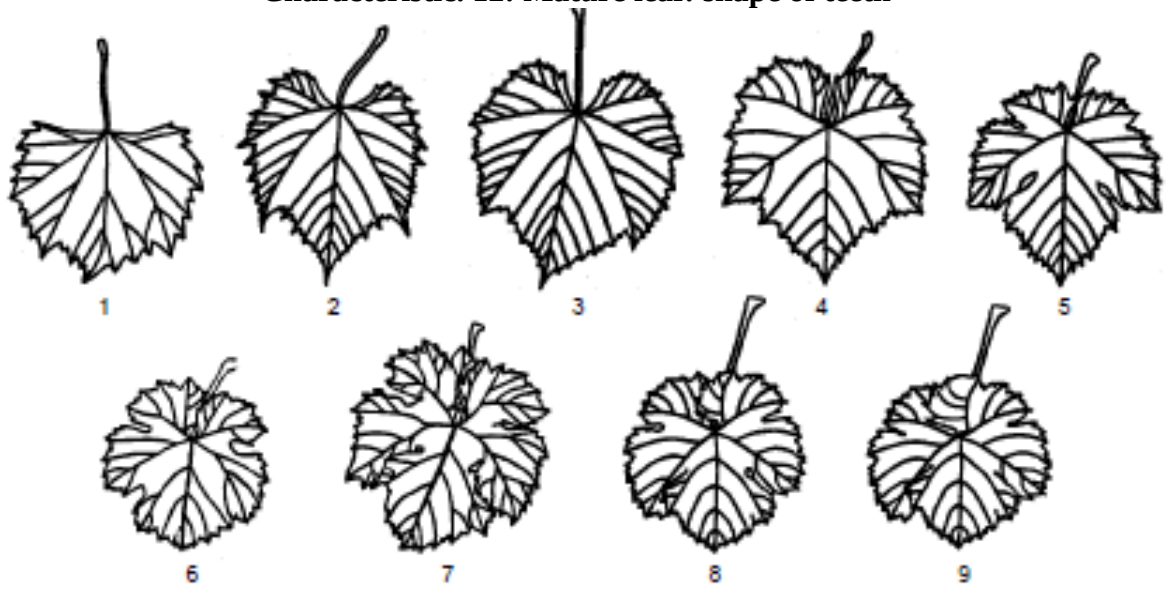
Characteristic10: Mature leaf; number of lobes



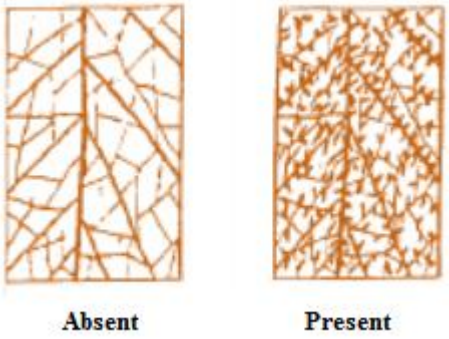
Characteristic. 11: Mature leaf: anthocyanin coloration of main vein on upper side



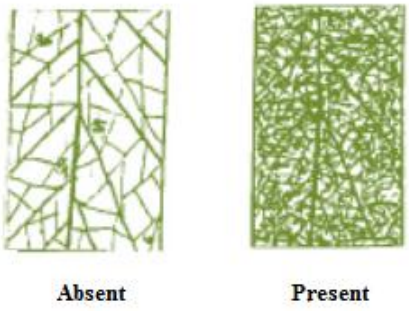
Characteristic. 12: Mature leaf: shape of teeth



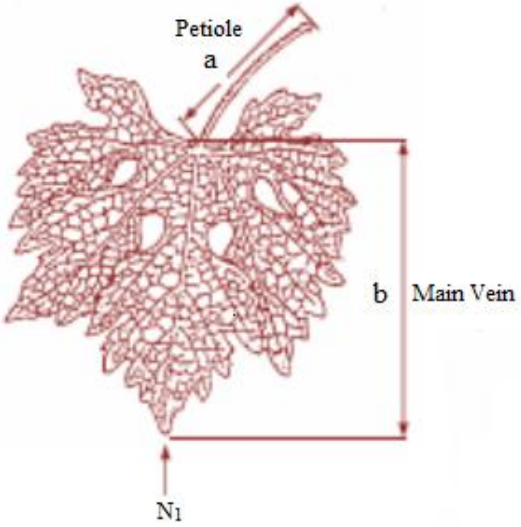
Characteristic 13: Mature leaf: shape of petiole sinus/degree of opening/overlapping



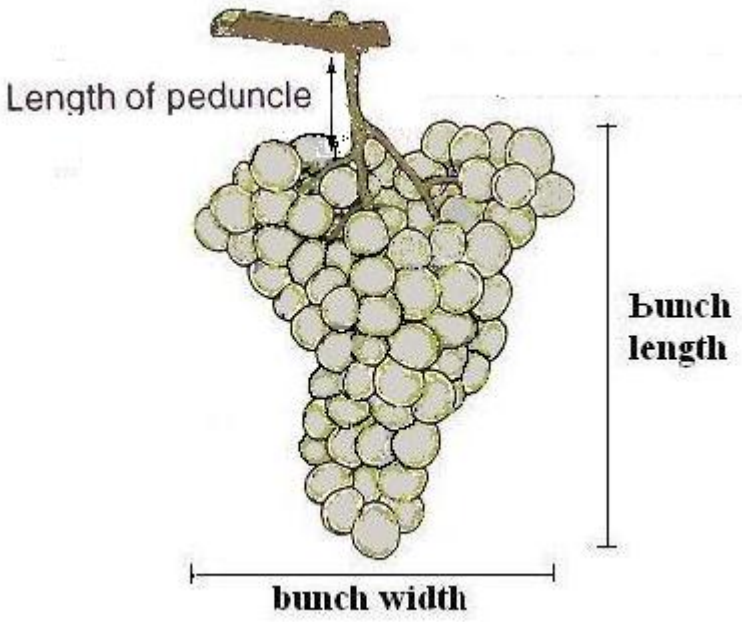
Characteristic 14: Mature leaf: prostrate hairs between veins.



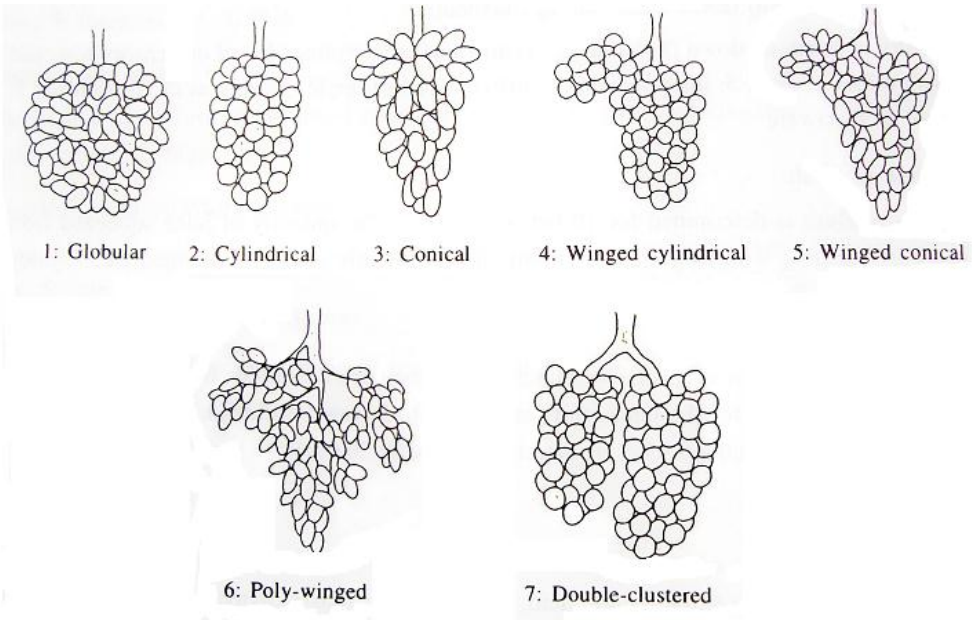
Characteristic 15: Mature leaf : erect hairs between veins



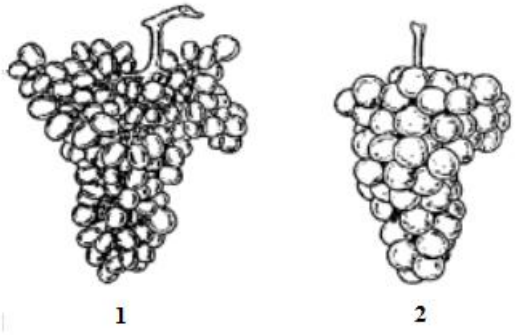
Characteristic 16: Mature leaf: length of petiole compared to middle vein



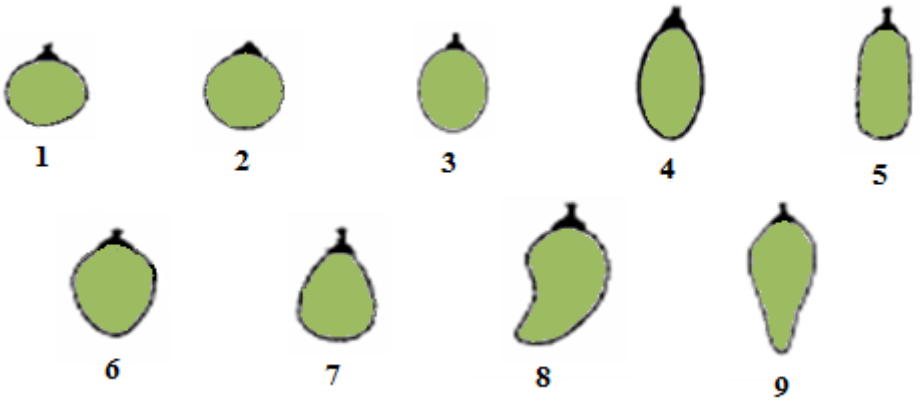
Characteristic 20 : Bunch length
Characteristic 22: Peduncle length



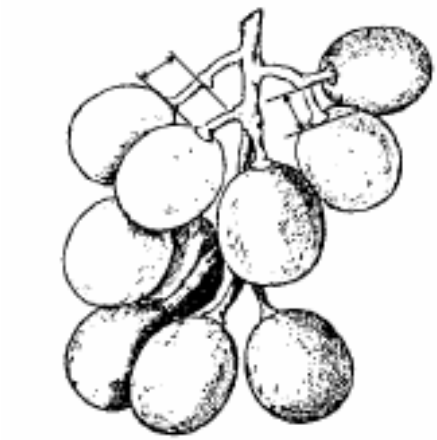
Characteristic 23: Bunch shape and type



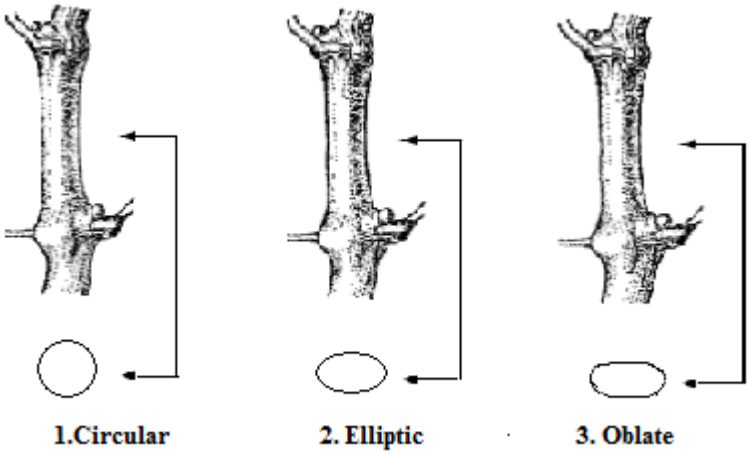
Characteristic 24: Bunch Composition Berry uniformity



Characteristic 26 : Berry Shape



Characteristic 32: Berry Pedicel length



Characteristic 39 : Woody shoot : Cross section

IX. Working Group Details :

This document on Test Guidelines is developed by the Task Force Subcommittee constituted by the PPV & FR Authority.

The Members of Task Force

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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, National Highway No.9, Pune- 412 307, Maharashtra.	A. Post Graduate Centre, College of Horticulture, Bengaluru, University of Horticultural Sciences, Bagalkot, Karnataka B. Division of Fruits & Horticultural Technology, IARI, New Delhi