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

Pear

(*Pyrus communis*)

Protection of Plant varieties and Farmer's Rights Authority
(PPV & FRA)
MOA, Government of India, New Delhi

CONTENTS

Pear (*Pyrus communis* L.)

I. Subject of these Guidelines

Test Guidelines shall apply to all cultivated varieties of *Pyrus communis*.

II. Material Required

1 The Protection of Plant Varieties and Farmers Rights Authority shall decide on the quantity and quality of planting material required for DUS testing of the candidate variety/ varieties when and where to be delivered for registration under the Protection of Plant Varieties and Farmers Rights. (PPV & FRA) Act, 2001. Applicant submitting such plant material for a country other than India shall make sure that all customs and quarantine requirements stipulated under relevant national legislations and regulations are compiled with. As a minimum the applicant need to submit 06 grafted or budded plants of pear on seedling root stock for each centre.

2 The planting material supplied should be visibly healthy, not lacking in vigour, nor affected by any important pest or diseases.

3 The plant material should not have undergone any treatment, which would affect the expression of the characteristics of the variety, unless the competent authorities allow or request such treatment. If it has been treated, full details of the treatment must be given.

III. Conduct of tests

1. The minimum duration of the DUS tests shall normally be at least two fruiting seasons in different years.
2. The tests should be carried out under conditions ensuring satisfactory growth for the expression of the relevant characteristics of the variety and for the conduct of the examination. In particular, it is essential that the trees produce a satisfactory crop of fruit in each of the two growing seasons.

Test plot design

The design of the tests should be such that plants or parts of plants may be removed for measurement or counting without prejudice to the observations which must be made up to the end of the growing cycle. The addition test protocol for special purpose if any may be established by PPV & FRA.

1. Locations : Two
2. No. of replications : Three
3. Treatment unit : Two trees per replication (total 6 plants /location)
4. Spacing : 3.0 x 3.0m

IV. Methods and observations

The characteristics described in the Table of characteristics (see section VII) table shall be used for the testing varieties and hybrid for their DUS.

1. For the assessment of Distinctiveness and Stability observation shall be made on 6 plants or parts taken from each of 6 plants. In the case of parts of plants, the number to be taken from each of the plants should be 2.
2. Mature leaves in the middle third of the youngest shoots not showing signs of active growth should be selected for the observations on the leaf.
3. Observations on the flowers should be made at the time of full bloom.
4. Observations on the mature fruit should be recorded when fruit is ready for harvesting.

a) ***MG****: Measurement by a single observation of a group of plants or parts of plants*
b) ***MS****: Measurement by a single observation of individual plants or parts of plant*
c) ***VG****: Visual assessments by a single observation of a group of plants or parts of plants*
d) ***VS****: Visual assessments by a single observation of individual plants or parts of plant*

V. Grouping of varieties

1. The candidate varieties for DUS testing shall be divided into groups to facilitate the assessment of Distinctiveness. Characteristics, which are known from experience not to vary, or to vary only 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.
2. The following characteristics are recommended for grouping of varieties

   a. Fruit: Position of maximum diameter
   b. Fruit: Size
   c. Fruit: ground color of skin
   d. Fruit: symmetry (in longitudinal section)
   e. Fruit: texture of flesh
   f. Fruit: days of maturity (DAFB)

V. Characteristics and symbols

1. To assess Distinctiveness, Uniformity and Stability, the characteristics and their states as given in the Table of characteristics (Section VII) shall be used.
2. Notes (1-9) shall be given for each state of expression of characters for different characteristics for the purpose of electronic data processing.
3. Legend

(*) Characteristics that shall be observed during every growing season on all varieties and shall always be included in the description of the variety, except when the state of expression of any of these characters are rendered impossible by a preceding phenological characteristics or by the environmental conditions of the testing region, under such exceptional situation, adequate explanation shall be provided.

(+) Characteristics with plus (+) sign**:** See Explanation on the Table of characteristics in Section VIII. It is to be noted that for certain characteristics, the plant parts on which observations are to be taken are given in the explanation or figure(s) for clarity and not the colour variation.

4. A Code number in the sixth column of Table of characteristics indicates the optimum stage for the observation of each characteristic during the growth and development of plant. The relevant growth stages corresponding to these code numbers are described below:

   a. Tree: Type and habit: Observation should be made on dormant stage.

b. One year old shoot: Observations on one year old shoots should be made on lateral dormant shoot on the tree which have completed at least one growing season at the testing centre.

c. Tree vigour, leaf, petiole:- Observations should be recorded when the tree is in peak vegetative growth. The observations on the leaf blade petiole should be recorded on fully developed leaves from the middle third of vigorous current seasons shoots at the periphery.

d. Flower:- Observations on the flower should be made at the full bloom stage.

e. Type flower bearing: Bearing pattern should be recorded at pink bud stage.

f. Fruit: Observations on the fruits should be made on 10 typical fruits taken from a minimum sample of 10 fruits after 15 days from fruit set for recording the anthocyanin colour and for fruit characters it should be taken at the time of maturity. The terminal fruits should not be taken for recording the observations.

VI. Table of characteristics

S. No	Characteristics	States	Notes	Example Variety	Stages of observation	Type of assessment
1	2	3	4	5	6	7
1	**Tree: vigor**	weak	3	-----	c	VG
		medium	5	Doyenne Burrah, Fertility, Beurre- de- Amanlis		
		strong	7	Moon Glow, Monarch, Wikar of Wink Field , Flemish Beauty , Doyenne du Comice		
2 * +	**Tree: branching**				c	VS
		weak	3	Severenta		
		medium	5	Conference		
		strong	7	Pyasua Behapa		
3 * +	**Tree: habit**				c	VG
		upright	3	Doyenne-du-Comice, Wikar of Wink Field		
		semi upright	5	Hayward, Doyenne Burrah, Fertility		
		spreading	7	Beurr'e Hardy, Jargonelle		
		drooping	9	-----		
4 * +	**One year old shoot: growth**				c	VG
		straight	3	Bar Battira Giffard, Doyenne Burrah		
		wavy	5	Coscia-F, Jargonelle, Moon Glow , Monarch, Winkar Wink Fied		
		zig zag	7	Beurr'e Hardy, Fertility		
5 *	**One year old shoot: apex of vegetative bud**				c	VG
		acute	1	Max Red Bartlett		
		obtuse	9	Doyenne-du- Comice		
6 * +	**One year old shoot: Position of vegetative bud in relation to shoot**				c	VG
		adpressed	3	Max Red Bartlett, Jargonelle		
		straightly held out	5	Santya Braskaya		
		markedly held out	7	Conference, Doyenne Burrah, Moon Glow , Beurre de Amanlis, Wikar of Wink Field		
7 +	**One year old shoot : size of bud support**				c	VS
		small(0.3-0.7cm)	3	Starkrimson		
		medium(0.7-1.1cm)	5	Gent Drouard		

		large(>1.1cm)	7	Pyasua Behapa		
8	**Days to full bloom**				d	VG
		Early (<95)	3	Bar Battira Giffard		
		Med (95-100)	5	Max Red Bartlett		
		Late (>100)	7	Doyenne-du-Comice		
9 *	**Flower: orientation of sepal in relation to corolla**				d	VS
		adpressed	5	William Bon Brighten, Hayward , Cosia –C, Max Red Bartlett		
		spreading	7	Doyenne-du-Comice, Conference , Cosia.F, Severenta , Starkrimson		
		recurved	9	Pyasua Behapa, Bar Barttira Giffard, Beurre Hardy, Santya Braskaya		
10 * +	**Flower: position of margins of petals**				d	VG
		apart	3	Bar Battira Giffard, Beurre Bosc		
		touching	5	Max Red Bartlett, Doyenne du Comice , Santya Braskaya , Hayward		
		overlapping	7	Conference, Pyasua Behapa, Zypaceac Hypacea Copeace , Cosia F		
11 * +	**Flower: position of stigma in relation to stamens**				d	VG
		below	3	Conference, Hayward, Max Red Bartlette, Cosia F		
		same level	5	Badshah Nakh, Bar Battira Giffard, Gent Drouard, William Bon Brighten, Severenta		
		above	7	Beurre-de- Amanlis, Pyasua Behapa, Doyenne du Comice, Santya Braskaya, Starkrimson		
12	**Leaf blade: length**				c	MS
		short(<6cm)	3	Max Red Bartlett, Gent Drouard		
		Medium (6-8cm)	5	Hayward, Bar Battira Giffard, Santya Braskaya		
		long(>8cm)	7	Pyasua Behapa, , Doyenne du Comice, Chinese Sandy Pear		
13	**Leaf blade: width (** cm)				c	MS
		narrow (2-4)	3	Doyenne-du-Comice, Starkrimson		
		medium(4-6cm)	5	Zypacea Hypacea Copeace, William Bon Brighten, Gent Drouard		

		broad(>6cm)	7	Pyasua Behapa, Hayward, Chinese Sandy Pear		
14 * +	**Petiole: presence of stipules**				c	VG
		absent	1	Coscia-F		
		present	9	William Bon Brighten,Bar Battira Giffard, Doyenne du Comice		
15	**Petiole: length**				c	MS
		short(1.0-2.5cm)	3	William Bon Brighten, Max Red Bartlett, Jorgonelle		
		medium(2.5-4.0cm)	5	Conference, Coscia C		
		long(>4.0cm)	7	Chinese Sandy Pear, Anjou, Willium Bon Brighten		
16 * +	**Leaf blade: attitude in relation to shoot**				c	VG
		upwards	3	Max Red Bartlett, Starkrimson, Severenta		
		outwards	5	Gent Drouard, Bar Battira Giffard, Doyenne du Comice		
		downwards	7	Santya Braskaya, Hayward		
17 * +	**Leaf blade: shape of base**				c	VG
		acute	1	Doyenne-du-Comice, Bar Battira Giffard		
		obtuse	2	Santya Braskaya, Max Red Bartlett, Hayward, Willium Bon Brighten		
		right angled	3	Pyasua Behapa, Starkrimson, Gent Drouard		
		truncate	4	Coscia C		
		cordate	5	-----		
18 * +	**Leaf blade: incisions of margin (upper half)**				c	VG
		smooth	1	Coscia C		
		crenate	3	Gent Drourad, Chinese Sandy Pear, Zypacea Hypacea Copeace		
		bluntly serrate	5	William Bon Brighten		

		serrate	7	Santya Braskaya, Severenta, Max Red Bartlett		
		sharply serrate	9	Pyasua Behapa, Hayward, Starkrimson		
19 + *	**Petiole: distance of stipules from basal attachment of petiole**				c	VG
		short	3	Doynne-du-Comice		
		medium	5	Coscia F		
		long	7	Pyasua Behapa		
20 + *	**Fruit: length**				f	MG
		short (<60mm)	1	Bar Battira Giffard, Fertility		
		medium (60-80mm)	2	Max Red Bartlett, Pyasua Behapa, Hayward, Zypacea Hypacea Copeace		
		long (>80mm)	3	Jargonelle, Doyenne du Comice, Santya Braskaya		
21 * +	**Fruit: diameter**				f	VG
		small (<50mm)	1	Jorgonelle, Coscia C, Coscia F		
		medium (50-70mm)	2	Max Red Bartlett, Bar Battira Giffard, Pyasua Behapa, Hayward, Zypacea Hypacea Copeace		
		large (> 70mm)	3	William Bartlett, Doyenne du Comice, Santya Braskaya, Gent Drouard, William Bon Brighten		
22 * +	**Fruit: position of maximum diameter**				f	VG
		in middle	1	Santya Braskaya, Hayward, Starkrimson, Zypacea , Hypacea Copeace , Severenta		
		slightly towards calyx	2	Bar Battra Giffard, Pyasua Behapa, Coscia C, Jargonelle		
		clearly towards calyx	3	Gent Drouard, Doyenne du Comice, Coscia F, Beurre Hardy		
23 * +	**Fruit: symmetry (in longitudinal section)**				f	VG
		asymmetric	1	Hayward, Beurre Hardy		
		slightly symmetrical	2	Bihe, Bar Battira Giffard, Doyenne du Comice, Zypacea Hypacea Copeace, Severenta, Coscia C, Coscia F,		
		symmetrical	3	Gent Drouard, Pyasua Behapa, Starkrimson,		

24 *	**Fruit: ground color of skin**				f	VG
		green	1	Behi , Chinese Sandy Pear		
		yellow green	2	Bar Battira Giffard,Sevrenta,		
		yellow	3	William Bon Brighten, Gent Drouard,		
		Red	4	Starkrimson, Max Red Bartlett		
25	**Fruit: relative area of over color**				f	VG
		very small	1	------		
		small	3	Coscia C		
		medium	5	Doyenne-du-Comice		
		large	7	Hayward, Max Red Bartlett		
26	**Fruit: hue of over color**	green	5	Bihe	f	VG
		yellowish green	4	Coscia F		
		light red	2	Doyenne-du-Comice, Bar Battira Giffard, Santya Braskaya		
		red	1	Starkrimson, Pyasua Behapa, Severenta		
27	**Fruit: relative area of russet on cheeks**				f	VS
		absent	1	Pyasua Behapa, Zypacea Hypacea Copeace , Santya Braskaya , Severenta, Coscia F		
		Small (<30%)	3	Bar Battira Giffard, Doyenne du Comice , Hayward		
		Medium (30-50%)	5	Red Bartlette, Gent Drouard, Max Red Bartlette, Bihe, Beurre Hardy		
		Large (>50%)	7	Fertility		
28 *	**Fruit: length of stalk (cm)**				f	MS
		short (<1)	3	Bar Battira Giffard, Pyasua Behapa, Doyenne du Comice, Starkrimson		
		medium (1-3)	5	Beurre Hardy,		
		long(>3)	7	Beurre Bosc,		
29 *	**Fruit: thickness of stalk**				f	MS
		thin (<1mm)	1	Gent Drouard, William Bon Brighten, Starkrimson, Zypacea Hypacea Copeace		
		medium(1.1 -2.0 mm)	2	Bar Battira Giffard, Pyasua Behapa, Doyenne du Comice, Santya Braskaya, Hayward,		
		thick (>2.0mm)	3	Chinese Sandy Pear		

30 *	**Fruit: depth of stalk cavity**				f	MS
		very shallow (<0.6cm)	1	Zypacea Hypacea Copeace, Bihe, Conference		
		shallow(0.6-1.0cm)	2	Bar Battira Giffard, Santya Braskaya, Gent Drouard, Starkrimson		
		medium(1.0 -1.5cm)	3	Pyasua Behapa, Doyenne du Comice, Coscia C, Coscia F, Beurre Hardy		
		deep(>1.5)	4	Hayward		
31 * +	**Fruit: orientation of sepals (at harvest)**				f	VS
		converging	3	Pyasua Behapa, Max Red Bartlette, Conference		
		erect	5	Santya Braskaya, Hayward, Gent Drouard, Starkrimson, Coscia F, Bihe, Beurre Hardy, Jargonelle		
		spreading	7	Bar Battira Giffard, Doyenne du Comoice, Zypacea Hypacea Copeace, Severenta, Coscia C		
32 * +	**Fruit: eye basin (at harvest)**				f	VS
		absent	1	Gent Drouard, Santya Braskaya, William Bon Brighten		
		present	9	Bar Battira Giffard, Pyasua Behapa, Doyenne du Comice, Hayward, Starkrimson, Zypacea Hypacea Copeace,		
33 * +	**Fruit: depth of eye basin (at harvest)**				f	MS
		shallow(<0.5 cm)	1	Bar Battira Giffard, Pyasua Behapa, Doyenne du Comice, Hayward, Zypacea Hypacea Copeace		
		medium(0.5 -0.1cm)	2	Beurre Hardy, Max Red Bartlett		
		deep(>0.1cm)	3	Doyenne-du-Comice, Santya Braskaya, Gent Drouard, William Bon Brighten, Starkrimson		
34 *	**Fruit: texture of flesh**				f	VS
		fine	3	Bar Battira Giffard, Santya Braskaya, Max Red Bartlett, Hayward, Gent Drouard, Zypacea Hypacea Copeace,		
		medium	5	Doyenne-du-Comice, Pyasua Behapa, William Bon Brighten, Starkrimson, Coscia C, Coscia F, Bihe, Beurre Hardy, Conference,		

				Jargonelle		
		coarse (Girty)	7	-		
35 *	**Fruit: firmness of flesh**				f	MS
		soft(<30 lb/inch)	3	Bar Battira Giffard, Pyasua Behapa, Zypacea Hypacea Copeace		
		medium(30-50 lb/inch)	5	Beurre Hardy, Doyenne du Comice, Hayward, William Bon Brrighten, Coscia C, Coscia F, Bihe, Conference, Jargonelle		
		firm(>50 lb/inch)	7	Santya Braskaya, Max Red Bartlett, Gent Drouard, Starkrimson, Severenta		
36 *	**Seed: shape**				f	VG
		round	3	Starkrimson		
		ovate	5	Bar Battira Giffard, Pyasua Behapa, Santya Braskaya, Gent Drouard, Severenta, Coscia C, Coscia F, Bihe, Conference		
		eliptic	7	Max Red Bartlett, Zypacea Hypacea Copeace , Beurre Hardy		
		narrow elliptic	9	Doyenne-du-Comice, Hayward, Jargonelle		
37	**Days to maturity (DAFB)**				f	VG
		very early (<l00)	1	Bar Battira Giffard		
		Early (100-120)	3	Pyasua Behapa		
		Medium (120-140)	5	Doyenne-du-Comice, Santya Braskaya , Max Red Bartlett, Hayward, Gent Drouard, Starkrimson, Coscia C, Coscia F		
		Late	7	Beurre Hardy, Zypacea Hypacea Copeace, Severenta		

VII. Explanations on the table of characteristics

Characteristics 1: Tree habit

fastigiate

Upright

Semi upright

Spreading

Drooping

Weeping

Characteristics 4: One year old shoot growth

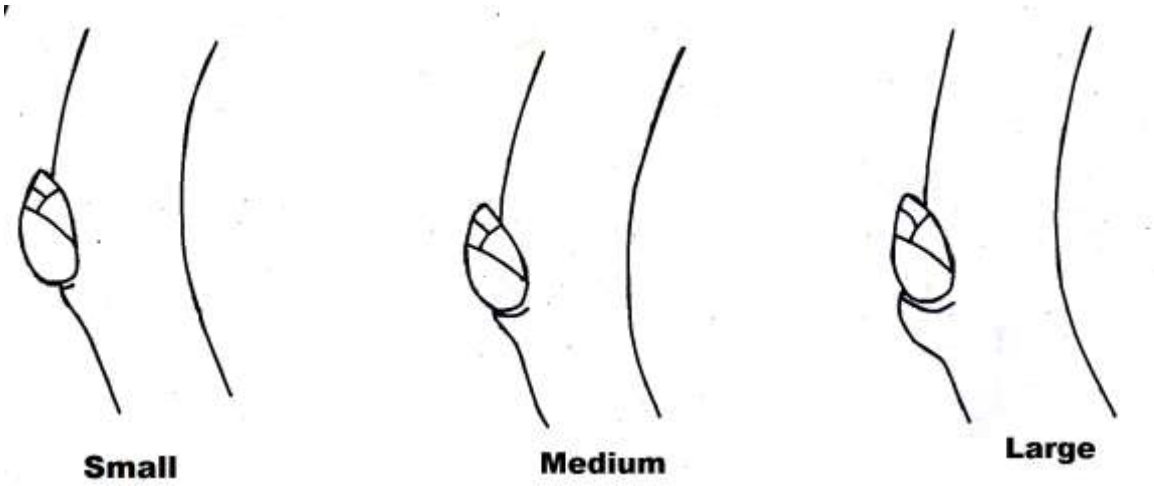
Straight

Wavy

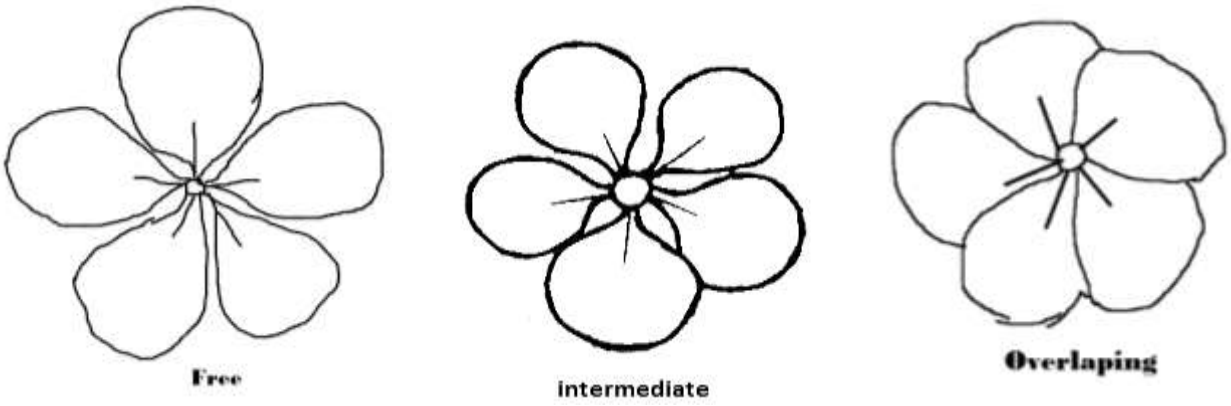
Zig Zag

Characteristics 6: One year old shoot position of vegetative bud in relation to shoot

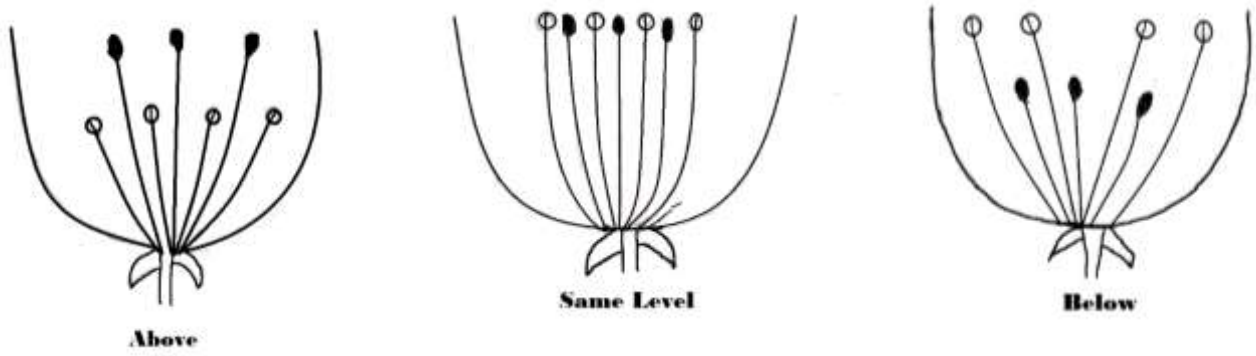
Characteristics 7: One-year-old shoot size of bud support



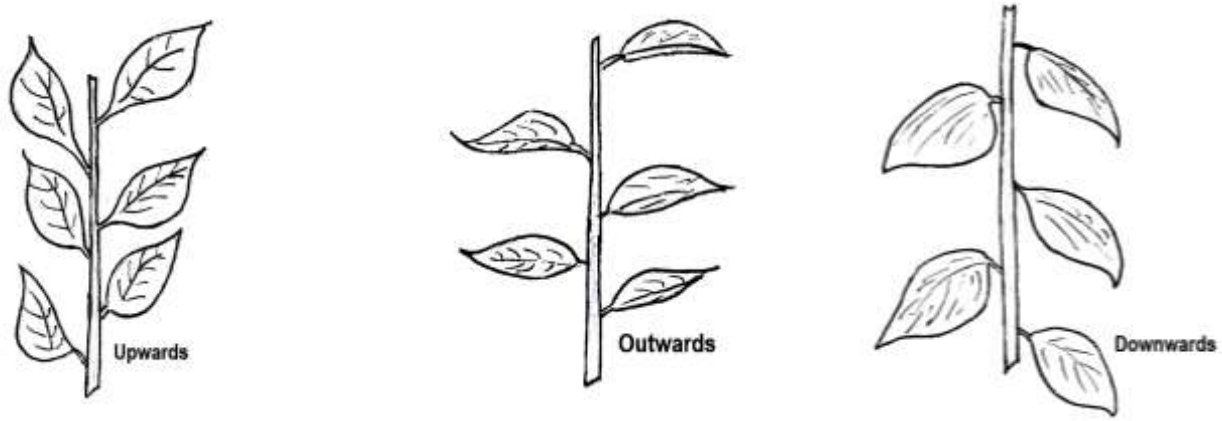
Characteristics 11: Flower position of margins of petals



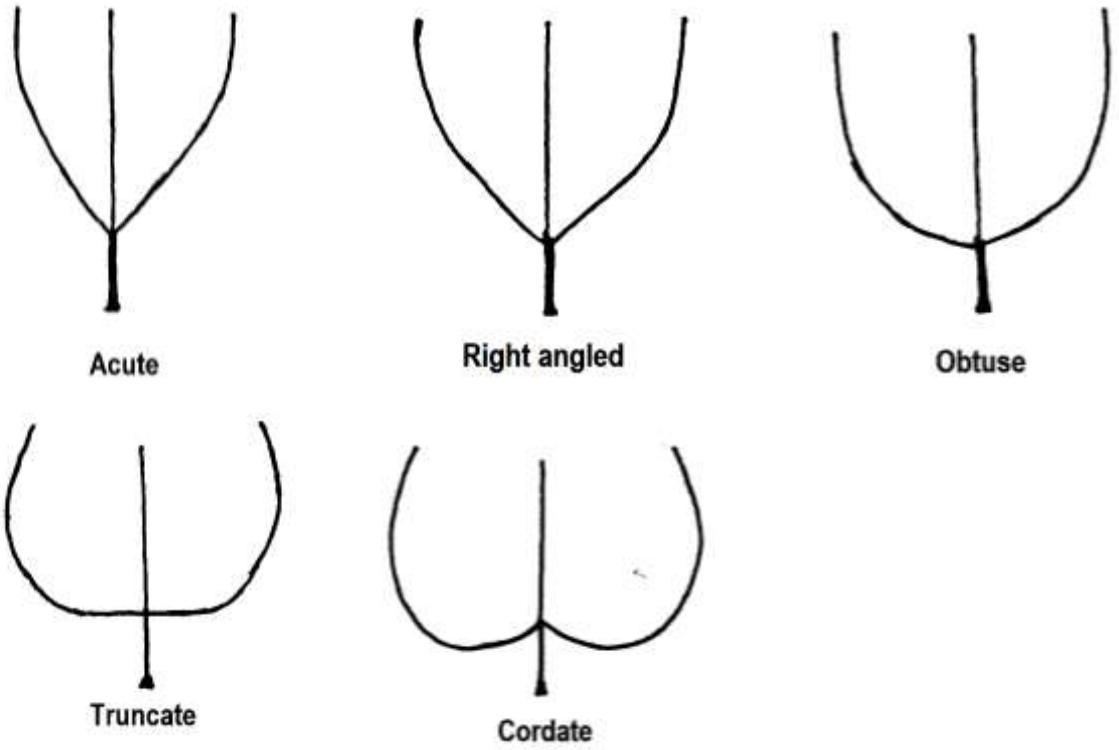
Characteristics 12: Position of stigma in relation to stamens



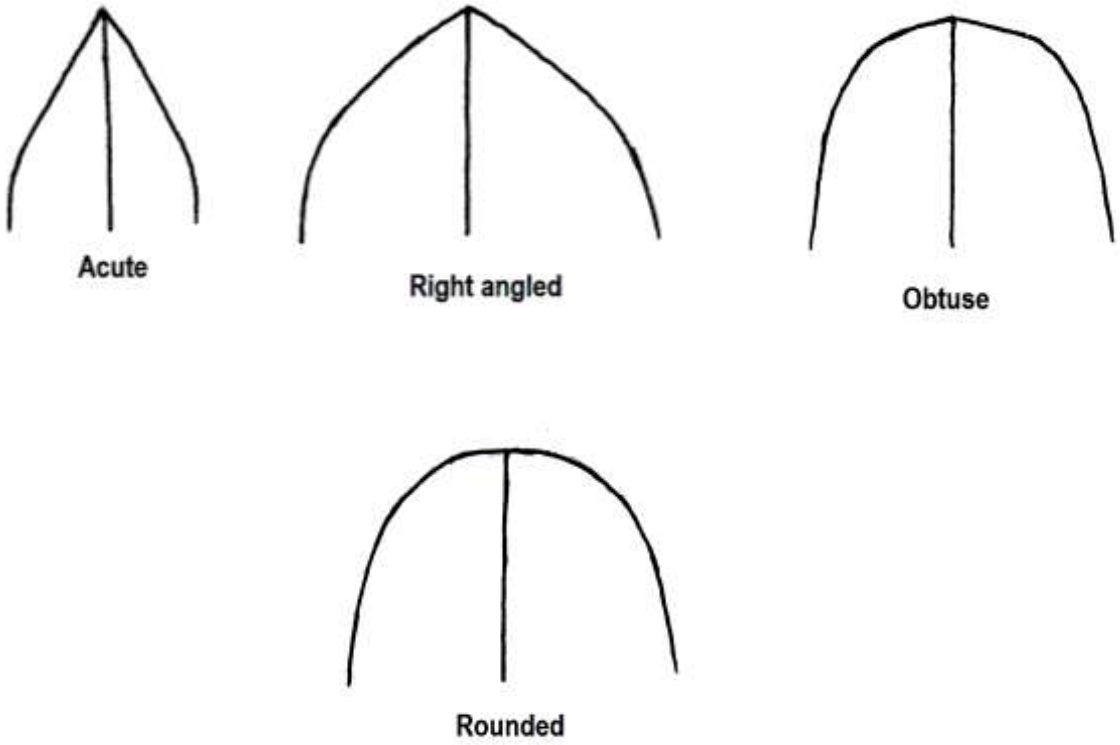
Characteristics 21: Leaf blade altitude in relation to shoot



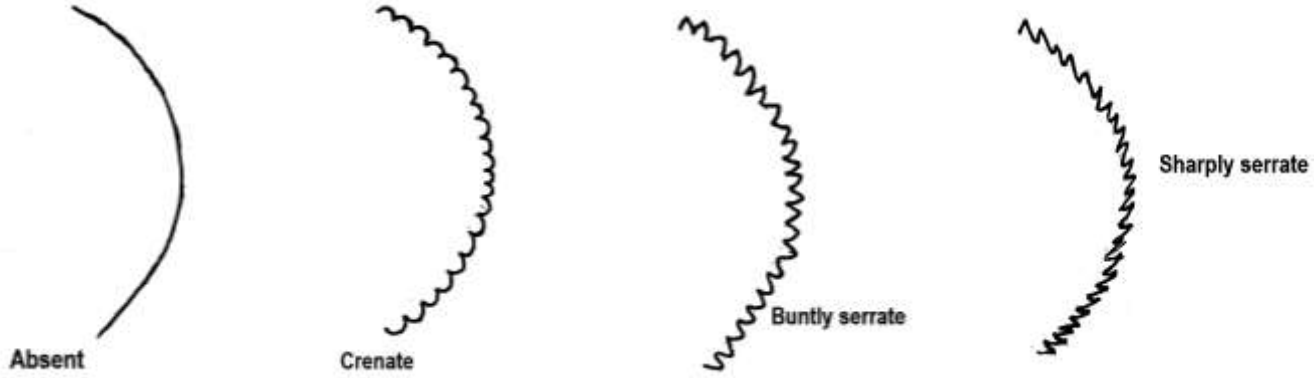
Characteristics 22: Leaf blade shape of base



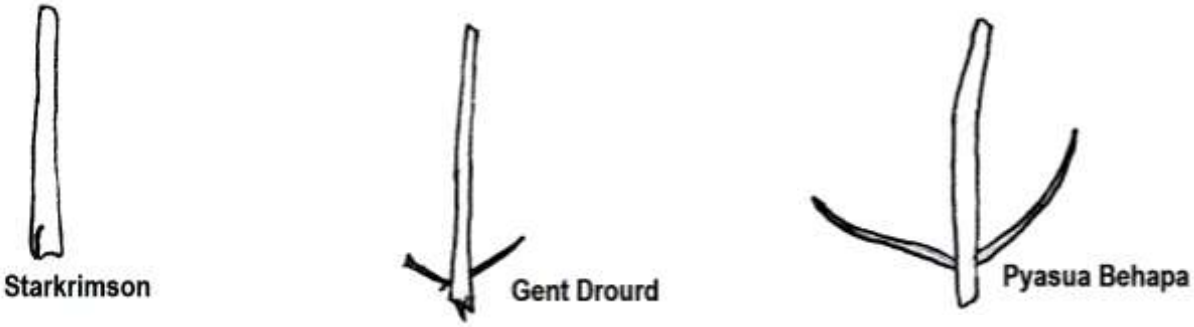
Characteristics 23: Leaf blade shape of apex



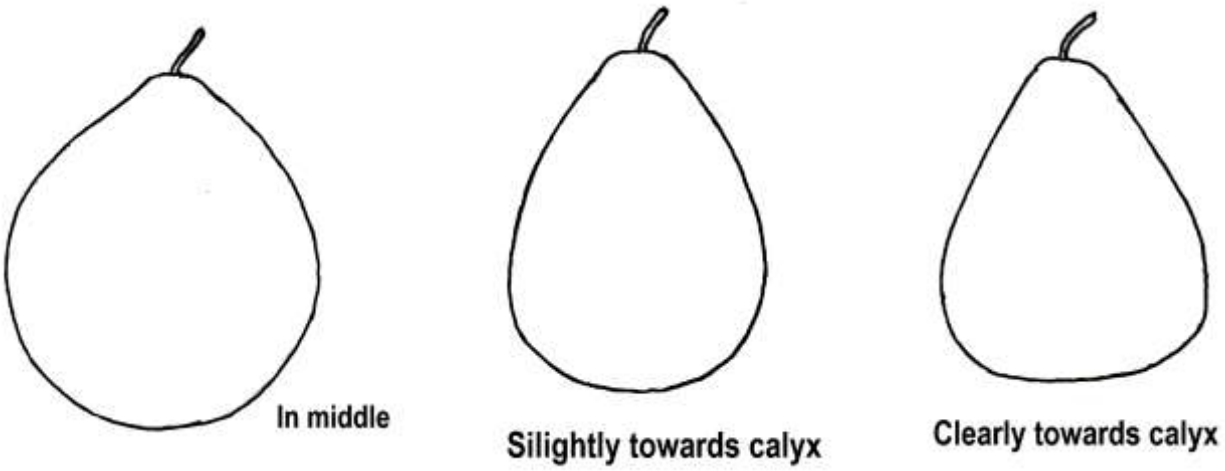
Characteristics 24: Leaf blade incision of margin (upper half)



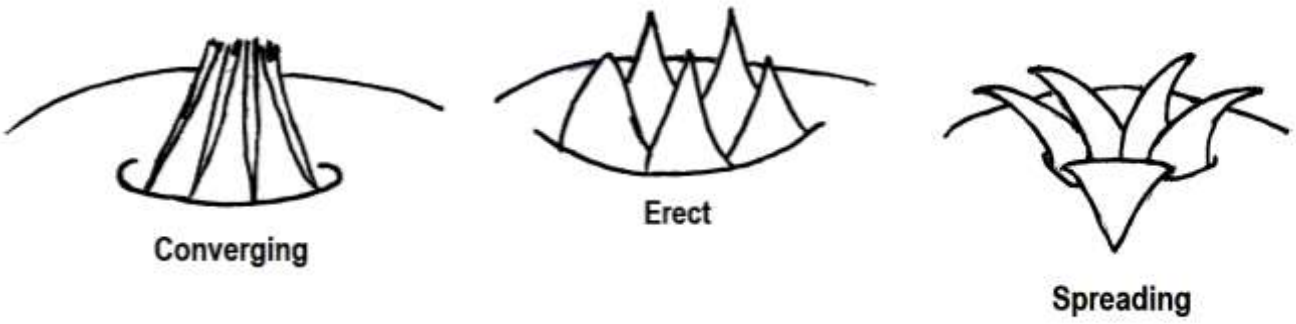
Characteristics 28: Petiole distance of stipules from basal attachment of petiole



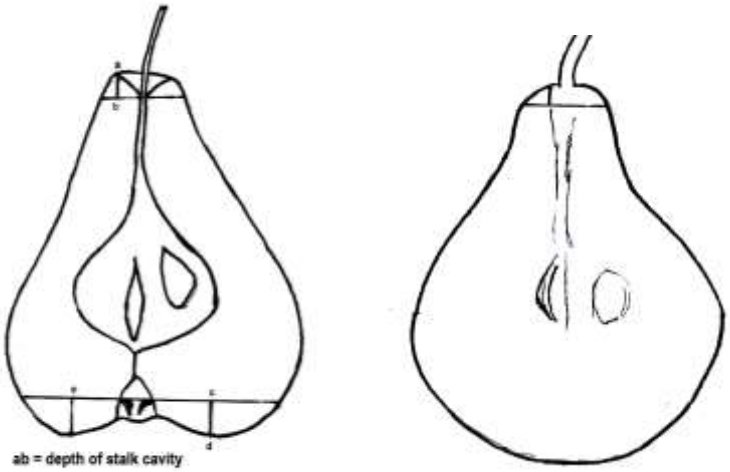
Characteristics 32: Fruit position of the maximum diameter



Characteristics 42: Fruit orientation of sepals (at harvest)



Characteristics 41:
Fruit: depth of stalk cavity
Fruit: depth of eye basin (at harvest)
Fruit: width of eye basin (at harvest)



ab = depth of stalk cavity

cd = depth of eye basin

ce = width of eye basin

Working Group details:

The Test Guidelines were developed at Central Institute of Temperate Horticulture, Srinagar, J&K. Under the supervision of Dr. K.K. Srivastava, Senior Scientist as PI and Assisted by Dr. B. Das, Sr. Scientist, Dr. J. I. Mir, Scientist and Research Associates Mr. J.A. Rather, Dr. S.M. Razvi and Dr. Tejbir Singh, Registrar, PPV&FRA New Delhi. The suggestions and technical inputs were provided by the following task force (4/2012) constituted by the PPV&FR Authority in development and finalization of this DUS test guidelines.

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Nodal DUS Test Centre	Other DUS Test Centre
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