Pomegranate species (Punica granatum *L.*)

I. **Subject**

These test guidelines shall apply to all varieties of pomegranate **(*Punica granatum* L.)**

II. **Plant material required**

1. The Protection of Plant Varieties and Farmers' Rights Authority (PPV & FRA) shall decide on the quantity and quality of the plant material required for testing the variety and when and where it is to be delivered for registration under the PPV & FR Act, 2001. Applicants submitting such plant material from a country other than India shall make sure that all customs and quarantine requirements stipulated under relevant national legislations and regulations are complied with.
2. One year old plant material for testing is to be supplied in the form of 10 propagules such as air-layered plants/rooted stem cuttings (multiplied from the same tree)/ tissue culture raised plants, etc. for each location.
3. The plant material supplied should be healthy, vigorous and not affected by any important insect pests or diseases.
4. The plant material should not have undergone any treatment, which would affect the expression of the characteristics of the variety, unless the competent authority allows or directs for 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 similar fruiting seasons in different years. The tests shall be conducted at least at two locations.
2. The tests should be carried out under conditions ensuring satisfactory growth for the expression of the DUS characteristics of the variety and for the conduct of the examination.
3. The test design for the testing 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.

IV. **Methods and observations**

1. The characters described in the Table of characteristics [section VII (a)] shall be used for the testing of varieties for DUS.

2. For the assessment of distinctiveness and stability, observation shall be made on at least five plants (multiplied from the same tree) or parts taken from each of 5 plants. In the case of parts of plants, at least two parts should be taken from each of the five plants.
3. Observations on tree or one year old shoot of the tree should be taken at the end of crop season.
4. Observations on mature leaf should be taken from the one third portion of the current season's shoot from the apex emerged on middle branch.
5. Observations on the flower should be recorded on the hermaphrodite flowers when completely open.
6. Observations on the fruit should be recorded on five fruits selected randomly from all directions of the tree canopy, on fully mature/completely ripened fruits ready for consumption.
7. Observations on the peel (rind) should be recorded from the equatorial zone of the fruit.
8. Observations on the seed and arils should be recorded from the fresh seeds and arils.
9. Total soluble solids (TSS) will be recorded by hand refractometer (0-32 ^{0}Brix).
10. Acidity in fruit juice will be determined by titration against N/10 NaOH using Naphthalein blue indicator.
11. Fruit juiciness will be recorded on fresh weight basis of total fruit weight and total juice extracted from the fruit.

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. Grouping of characteristics are those in which the documented states of expression, even where produced at different locations, can be used, either individually or in combination with other such characteristics to (a) select varieties of common knowledge that can be excluded from the growing trial used for examination of distinctiveness; and (b) organize the growing trial so that similar varieties are grouped together.

The following characteristics are to be used for grouping pomegranate varieties:

a. Flower : colour of calyx (characteristic 14)
b. Fruit shape : ratio of longitudinal and lateral axes (characteristic 21)
c. Ripe fruit : colour (characteristic 22)
d. Seed : hardiness (characteristic 30)
e. Aril : colour (characteristic 27)
f. Fruit maturity : days after anthesis (characteristic 33)

VI. **Characteristics and symbols**

1. To assess distinctiveness, uniformity and stability, the characteristics and their states as given in the Table of characteristics [Section VII (a)] shall be used.
2. Notes (1 to 9) shall be given for each state of expression for different characteristics for the purpose of electronic data processing.
3. Legend

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

   (+) 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 to be taken are given in the explanation or figure(s) for clarity and not the colour variation.
4. The optimum stage of plant growth for assessment of each characteristic is given in the 6^{th} column of the table of characteristics [section VII (a)].
5. Types of assessment of characteristics indicated in column seven of table of characteristics [section VII (a)] is as follows :

   MG : Single measurement of a group of plants or their parts.

   MS : Measurement of number of individual plants or their parts.

   VG : Visual recording of single observation of a group of plants or their parts.

   VS : Visual recording by observation of individual plant or their parts.

VII (a). Table of characteristics

S. No.	Characteristics	States	Notes	Example variety	Stage of Observation	Type of assessment
1	2	3	4	5	6	7
1. (*)	Bush/tree height (m)	Small (< 1.5)	3	Nana	Fruiting	MG
		Medium (1.5-2.5)	5	Bhagawa		
		High (>2.5)	7	Daru type (IC)		
2. (*) (+)	Bush/tree growth habit	Upright	3	Gulesha Red	Vegetative	VG
		Spreading	5	Bhagawa		
		Drooping	7	Daru type (IC		
3.	Precocity (year after planting)	Early (<2)	3	Bhagawa	First flowering	VG
		Medium (2-3)	5	G-137		
		Late (> 3)	7	Daru type (IC)		
4. (*)	Shoot thorniness (number of thorns per metre shoot length)	Absent	1	--	Fruiting	MG
		Less (<5)	3	Nana		
		Medium (5-10)	5	Bhagawa, Ganesh		
		High (>10)	9	Daru type (IC)		
5.	Bush/tree foliage density	Sparse	3	Daru type (IC)	Fruiting	VG
		Medium	5	Bhagawa		
		Dense	7	Daru type (IC)		
6.	Leaf blade length (cm)	Short (<2)	3	Nana	Fruiting	MS
		Medium (2-5)	5	P-13,Phule Arakta		
		Long (>5)	7	Patna-5,Bedana Suni		
7.	Leaf blade width (cm)	Narrow (<1)	3	Nana	Fruiting	MS
		Medium (1-2)	5	Dholka, Kasuri,Bhagawa		
		Broad (>2)	7	-		
8. (+)	Leaf blade shape	Elliptic lanceolate	3	Patana-5	Fruiting	VG
		Lanceolate	5	Malta		
		Broad elliptic	7	Ruby		
9. (+)	Leaf apex shape	Acute	3	G-137	Fruiting	VG
		Obtuse	5	KRS		
		Rounded	7	Daru type (IC)		
10.	Petiole length (mm)	Medium (4-6)	5	Ruby, Chaupasini Seedless	Fruiting	MS
		Long (>6)	7	Patana-5		
		Low (<25)	3	Achikdona,		
11.	Petiole anthocyanin colouration (% part covered)	Low (<25)	3	Achikdona,	Fruiting	VG
		Medium (25-50)	5	Ruby, Patna-5		
		High (>50)	7	Malta, Kalisirin		

12. (+)	Calyx length (mm)	Short (<20)	3	Nana	Flowering	MS
		Medium (20-40)	5	Damini, Nimali.		
		Long(>40)	7	Kalisirin		
13. (+)	Calyx width (mm)	Narrow (<10)	3	Nana	Flowering	MS
		Medium(10-15)	5	Phule Arakta Bhagawa		
		Broad (>15)	7	KRS		
14. (*)	Calyx color	Yellow	3	Kabuli Yellow	Flowering	VG
		Orange	5	Ganesh		
		Red	7	Gulesha Red, Phule Arakta, Mridula		
		Other	9	-		
15.	Corolla color	White	3	Kabuli Yellow	Flowering	
		Orange	5	Yercaud, Ganesh		
		Red	7	Bhagawa, Mridula		
		Other	9	-		
16.	Corolla type	Single	1	Nana	Flowering	VS
		Double	9	IC		
17. (+)	Petal length (mm)	Short (<15)	3	Nana	Flowering	MS
		Medium (15-25)	5	Damini, Gulesha Red		
		Long (>25)	7	Jodhpur Red		
18. (+)	Petal width (mm)	Narrow (<10)	3	Nana	Flowering	MS
		Medium (10-20)	5	Kalisirin		
		Broad (>20)	7	Jodhpur Red		
19. (*) (+)	Fruit length (cm)	Short (<6.0)	3	Nana	Fruiting	MS
		Medium (6.0-8.0)	5	Yercaud		
		Long(>8.0)	7	Ganesh		
20. (*) (+)	Fruit diameter (cm)	Small (<5.0)	3	Nana	Fruiting	MS
		Medium(5.0-7.0)	5	Dholka		
		Large (>7.0)	7	Ganesh		
21. (*) (+)	Fruit shape (Ratio of longitudinal and lateral axes)	Round (1.0-1.1)	1	P-26	Fruiting	MS
		Ovate (1.1-1.2)	3	Bhagawa ,		
		Oval (1.2-1.3)	5	-		

		Elliptical (>1.3)	7	Bedana Suni		
22. (*)	Fruit colour	Yellow	3	Kabuli Yellow	Fruiting	VG
		Red	5	Bhagawa		
		Deep red	7	Mridula, Phule Arakta		
		Other	9	Ganesh		
23.	Rind thickness (mm)	Thin (<3.0)	3	Nana	Fruiting	MS
		Medium (3.0-5.0)	5	Muscat, Bhagawa		
		Thick (>5.0)	7	Patna-5		
24. (*) (+)	Nipple or fin	Absent	1	Bhagawa	Fruiting	VG
		Present	9	Ruby, Ganesh, Mridula		
25. (+)	Crown length (mm)	Short(<15)	3	Nana,Kabuli Yellow	Fruiting	VS
		Medium(15-25)	5	P-23, Muscat		
		Long (>25)	7	-		
26. (+)	Crown neck	Absent	1	P-23	Fruiting	VG
		Present	9	Ganesh, Mridula		
27. (*)	Aril colour	White	1	P-16	Fruiting	VG
		Light yellow	2	Kabuli Yellow		
		Light pink	3	Dholka		
		Pink	5	Ganesh		
		Red	7	Bhagawa		
		Dark red	8	Phule Arkta and Mridula		
		Other	9	-		
28. (+)	Aril length (mm)	Short (<10)	3	Bhagawa, Bedana Thinskin	Fruiting	MS
		Medium (10-15)	5	Ganesh,Patna-5		
		Long(>15)	7	-		
29. (+)	Aril width (mm)	Narrow (<5)	3	Nana	Fruiting	MS
		Medium (5-7.5)	5	Ganesh,P-26		
		Broad (>7.5)	7	-		
30. (*)	Seed hardiness (psi)	Soft	3	Bhagawa, Ganesh, Jyoti	Fruiting	VS
		Medium	5	Kandhari , Ruby,		
		Hard	7	Kabuli Yellow		
31. (+)	Seed length (mm)	Short(<6)	3	Nana	Fruiting	MS
		Medium (6-10	5	Kalpitiya,		

		)		Mridula		
		Long (>10)	7	-		
32. (+)	Seed width (mm)	Narrow (<2.5)	3	Nana, Khandhari	Fruiting	MS
		Medium (2.5-5.0)	5	Bedana Suni, Jyoti		
		Broad (>5.0)	7	-		
33. (*)	Fruit maturity (days after anthesis)	Medium (130-175)	5	Mridula, Ganesh	Fruiting	MG
		Late (>175)	7	Bhagawa		
34.	Total Soluble Solids (TSS) ^{0}Brix	Low(<12.5)	3	Daru type (IC), Nana	Fruiting	MS
		Medium(12.5-16)	5	Bhagawa, Mridula		
		High(>16)	7	-		
35.	Acidity (%)	Low (<0.5)	3	Ganesh, Bhagawa, Mridula, Jyoti	Fruiting	MS
		Medium(0.5-1.25)	5	-		
		High(>1.25)	7	Daru type (IC), Nana		
36.	Fruit juiciness (%)	Low (<50)	3	Yercaud	Fruiting	MS
		Medium(50-60)	5	Ganesh, Jyoti , P-13		
		High(>60)	7	Mridula		

VII (b) Special test characteristics

Under Rule 29 (b) of PPV&FR Rules, 2003, in case of failure of DUS test to establish the requirements of distinctiveness, the candidate variety shall, on request of applicant, be evaluated for under mentioned characteristics as special test.

S. No.	Characteristics	States	Notes	Example variety	Stage of Observation	Type of assessment
1	**2**	**3**	**4**	**5**	**6**	**7**
1	Tolerance against abiotic stresses	Low	3		One year old plant	MG
		Medium	5			
		High	7			
2	Tolerance against biotic stresses	Low	3	Nana, Daru type (IC)	One year old plant	MG
		Medium	5	-		
		High	7	-		

VIII. Explanation for the table of characteristics

Characteristic 2 : Bush/tree growth habit

1
Upright

2
Spreading

3
Drooping

Characteristic 8 : Leaf blade shape

3
Elliptic lanceolate

5
Lanceolate

7
Broad elliptic

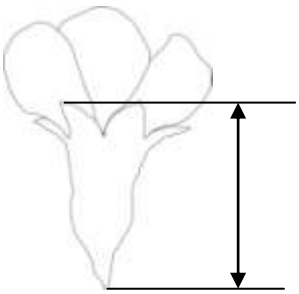
Characteristic 9 : Leaf apex shape

3
Acute

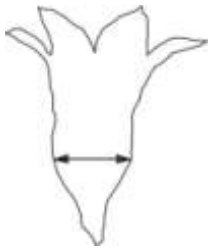
5
Obtuse

7
Rounded

Characteristic 12 : Calyx length



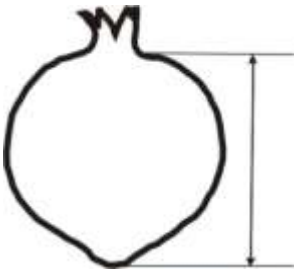
Characteristic 13 : Calyx width



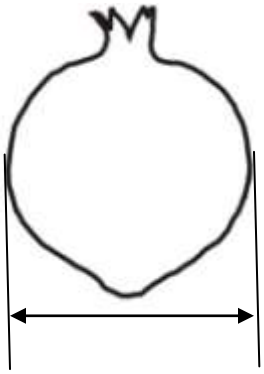
Characteristic 17 : Petal length

Characteristic 18 : Petal width

Characteristic 19 : Fruit length



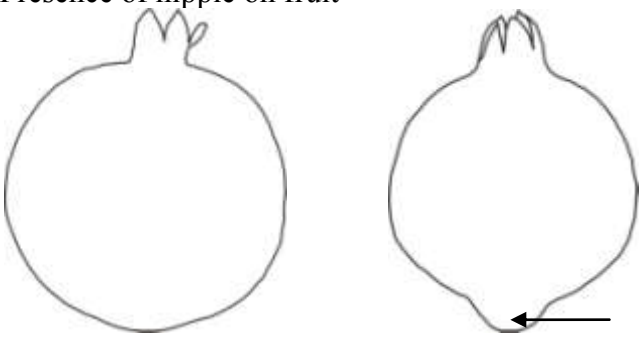
Characteristic 20 : Fruit diameter



Characteristic 21 : Fruit shape

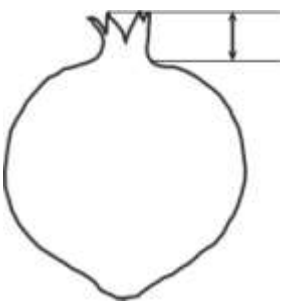
1	3	5	7
Round	Ovate	Oval	Elliptical

Characteristic 24 : Presence of nipple on fruit



1	9
Absent	Present

Characteristic 25 : Fruit crown length



Characteristic 26 : Presence of crown neck on fruit

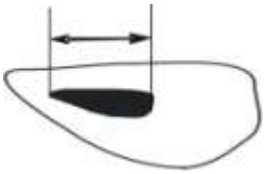
1
Absent

9
Present

Characteristic 28 : Aril length

Characteristic 29 : Aril width

Characteristic 31 : Seed length



Characteristic 32 : Seed width

IX. DUS testing centres

Nodal DUS test centre	Other DUS test centre
National Research Centre on Pomegranate, NH-9, Kegaon, Solapur-413 255 (Maharashtra).	Central Arid Zone Research Institute, Jodhpur, 342 003 (Rajasthan)