Guidelines

For the Conduct of Test for

Distinctiveness, Uniformity and Stability

on

Olive (*Olea europaea* L.)

Protection of Plant Varieties and Farmers' Rights Authority (A Statutory Body created by an Act of Parliament)

Government of India, New Delhi

Contents

Olive (*Olea europaea* L.)

I. Subject

The DUS test guidelines shall be applicable to all varieties of Olive (*Olea europaea* L.)

II. Material required

1. The Protection of Plant Varieties and Farmers' Rights Authority (PPV&FRA) should decide when, where and in what quantity and quality of the planting material are required for testing a variety denomination applied for registration under the Protection of Plant Variety and Farmers' Rights (PPV & FR) Act, 2001. Applicants submitting such plant material from a country other than India should act in accordance with all customs and quarantine requirements stipulated under relevant national legislations and regulations. As a minimum, the applicant should submit 15 plants of olive in the form of trees (one-year old) on their roots or on one-year old trees grafted on rootstock specified by the competent authority.
2. The planting material supplied should be visibly healthy, vigorous and not affected by any important pest or disease.
3. The planting material should not have undergone any chemical and bio-physical treatment, which would affect the expression of the characteristics of the variety, unless the competent authorities permit or request such treatment. If it has been treated, complete details of the treatment shall be presented at the time of submission.

III. Conduct of tests

1. The minimum duration of the DUS tests should normally be at least two independent similar fruiting seasons spread across two consecutive years. Tests should be conducted at least at one place 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 adoption for 'on-site' DUS testing. On-site testing of farmer's varieties will be done for one season and at one location only and for two growing seasons for other varieties. To check the uniformity at least six plants of same variety should be available at the site for on-site testing.
2. The tests should be carried out under favorable conditions ensuring satisfactory growth and expression of the relevant characteristics of the variety and for the conduct of the evaluation.

3. Each test should be designed to include a total of at least 6 plants and observation should be recorded minimum of 3 plants. In particular, it is also to be ensured that the trees should bear satisfactory fruit crop in each of the two growing seasons.

Test design

The test plot design should facilitate the removal of plants or their parts for measurement or counting without prejudice to the observations to be recorded chronologically till the end of evaluation period. The additional test protocol for examining relevant characteristics may be established by PPV & FRA.

1. Location: One
2. No. of replications: Three
3. Treatment unit: Two tree per replication (total 6 trees/location)
4. Design: RBD
5. Spacing: 4 x 4 m

The design of the tests should be such that the 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.

Testing at DUS testing center

The tests shall normally be carried out at the DUS testing center's for the recommended period of years. For conduct of DUS test at DUS testing centre the minimum number of plants to be supplied to DUS centre should be 15 including the planting material for reference gene bank. However, looking into the perennial nature of the crop, provision has been made for on- site DUS testing with prior precautions as mentioned below.

Testing on- site

The applicant should have well grown bearing mother plant on- site. Since Uniformity & Stability of propagated trees cannot be tested on a single tree on- site, the Registrar for this purpose, shall stipulate the applicant to produce grafted trees/trees raised from cuttings (6 Nos.).

- The applicant or his/her nominee shall submit a request to the Authority for on-site examination prior to start of bearing season as mentioned in Test Guidelines for site examination of the candidate variety.

- On-site testing may be conducted at place(s) specified by the applicant. The age of the trees at on-site shall be minimum 5 years (Trees should be in bearing).
- All chimeric branches/infested/malformed branches have to be removed before considering the on-site tree as mother tree

Conditions for the conduct of on- site examination will be approved by the PPV and FRA, New Delhi, to ensure the site represents normal grouping structure.

IV. Methods and observations

1. The traits described in the table of characteristics (see section VII) should be used for the DUS testing of varieties.
2. All observations for the assessment of Distinctiveness and Stability should be made on at least 3 plants or parts taken from each of 3 plants with the exception of the observations on fruits which should be made on at least 20 fruits. At least two parts should be taken from each of the 3 plants in case of parts of plants.
3. For the assessment of uniformity of characteristics, a population standard of 5% with an acceptance probability of at least 95% should be permitted. In the case of a sample size of six plants, the maximum number of off-types allowed should be 1.
4. All the leaf characters should be made on fully developed leaves from the central part of one-year old shoots in full growth.
5. All observations on inflorescence should be made from middle portion of the fruiting branches.
6. All observations on the fruits should be made on fully ripened fruits when 80 % of the fruit on the tree has colored. Two positions (A and B) are used for recording different fruit characters. Position B is the position where the most developed part of the fruit is observed whereas position A is reached from position B by turning 90° along the longitudinal axis in a way where the fruit shows its largest asymmetry.
7. All observations on the stone either at A or B positions should be made on dry well-cleaned stones of the same sample used for the observations on the fruit.
8. For the assessment of colour characteristics, the latest Royal Horticultural Society (RHS) colour chart should be considered.

All observations should be made on different growth stages as per the description shown in following Table.

Table: Description and growth stages for the recording of traits

Stage	Growth Stages	Description	Time Period	Stage
1	Tree and branching	Observations on tree and branching	1st June – 31st July	S1
2	Vegetative	Leaf characters should be made on fully developed leaves from the central part of one-year old shoots in full growth	1st August to 31st August	S2
3	Inflorescence	Observations on inflorescence should be made from middle portion of the fruiting branches	1st May – 15th June	S3
4	Fruit & Stone	All observations on the fruits should be made on fully ripened fruits when 80 % of the fruit on the tree has colored. All observations on the stone either at A or B positions should be made on dry well-cleaned stones of the same sample used for the observations on the fruit.	1st October – 30th November	S4

V. Grouping of varieties

1. To facilitate the assessment of Distinctiveness for DUS testing, the reference varieties selected should be divided into various groups. Characteristics, which are identified from experience not to vary, or to vary only vaguely 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 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: (a) to select varieties of common knowledge that can be excluded from the growing trial used for examination of distinctiveness; and (b) to organize the growing trial so that similar varieties are grouped together.
3. It is recommended that the competent authorities use the following characteristics for grouping olive varieties:

   a. *Fruit: Shape in position A* : Characteristic 12
   b. *Fruit: Shape of apex in position A* : Characteristic 15
   c. *Fruit: Nipple* : Characteristic 16
   d. *Stone: Shape in position B* : Characteristic 19
   e. *Stone: Mucron* : Characteristic 26

VI. Characteristics and symbols:

1. To assess Distinctiveness, Uniformity and Stability for evaluating olive varieties, the selected characteristics and their states as given in the Table of characteristics (Section VII) should be used.
2. States of expression are given for each characteristic to define the characteristic and to harmonize descriptions. Notes (1 to 9) shall be used to describe the state of each character for the purpose of digital data processing and these notes shall be given against the states of each characteristic
3. Legend
   a. (*) Characteristics that should be observed during every growing season in all varieties and should always be included in the description of the variety. In exceptional cases, wherein the state of expression of any of these characters is rendered impossible either by the environmental vagaries, adequate elucidation should be provided.
   b. (+) 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 recorded should be given in the explanation or figure(s) for clarity on the table of characteristics in Section VII.

c. Type of assessment of characteristics indicated in column seven of Table of characteristics is as follows:

a. **MG**: Measurement by a single observation of a group of plants or parts of plants
b. **MS**: Measurement of a number of individual plants or parts of plants
c. **VG**: Visual assessment by a single observation of a group of plants or parts of plants
d. **VS**: Visual assessment by observations of individual plant or parts of plant

VII: Table of characteristics

S. No.	Characteristics	States	Notes	Example varieties	Stage of Observation	Type of Assessment
1	**2**	**3**	**4**	**5**	**6**	**7**
1. (+) QL	Tree: Growth habit	Upright	1	Zaituna	S1	VG
		Spreading	3	Coratina		
		Drooping	5	Pendolino		
2. + QL	Tree: Canopy density	Sparse	3	Zaituna	S1	VG
		Medium	5	TondaIblea		
		Dense	7	Frantoio		
3. (*) (+) QL	Leaf blade: Curvature of longitudinal axis	Incurved	1	Moraolio	S2	VS
		Straight	5	Pendolino		
		Recurved	9	Messinese		
4. QL	Leaf blade: Intensity of green color of upper side	Light (146A, 146B)	3	Coratina	S2	VG
		Medium (137A, 137B)	5	Pendolino		
		Dark (N137A, N137B)	7	Messinese		
5. (*) QL	Leaf blade: Twisting	Absent	1	Messinese	S2	VS
		Present	9	Cerignola		
6 (*) (+) QN	Inflorescence: Length (mm)	Short (<20)	3	Zaituna	S3	MS
		Medium (20-40)	5	Pendolino		
		Long (>40)	7	Moraiolo		
7. (*) (+) QN	Inflorescence: Width (mm)	Narrow (<10)	3	Belice	S3	MS
		Medium (10-20)	5	TondaIblea		
		Broad (>20)	7	Toffhoio,		
8. (*) (+) QL	Flower: Attitude of corolla lobe	Erect	1	Cerignola	S3	VG
		Horizontal	5	Messinese		
		Reflexed	9	Frantoio		
9. QN (+)	Fruit: Length (mm)	Short (<18)	3	Belice	S4	MS
		Medium (18-20)	5	Etnea		
		Long (>20)	7	Coratina		
10. (*) QN	Fruit: Width in position B (mm)	Narrow (<15)	1	Etnea, Cipressino	S4	MS
		Medium (≥15)	7	Leccino, Zaituna		
11.	Fruit: Weight (g)	Low (<2)	3	Ottobratica		

QN		Medium (2-5)	5	Itrana	S4	MG
		High (>5)	7	Zaituna		
12. (*) (+) PQ	Fruit: Shape in position A	Oblong	1	Frantoio	S4	VG
		Ovate	2	Cornicabra		
		Obovate	3	Toffhoio		
		Elliptic	4	Messinese		
		Circular	5	Zaituna		
13. (*) QL	Fruit: Over color at full maturity	Green (RHS 140A & 140B)	3	Zaituna,	S4	VG
		Purple (N186A, N186B, N186C, 187 A)	5	Messinese, Coratina		
		Black (202 A, 203 A, 203 B)	7	Pendolino, Leccino		
14. (*) (+) QL	Fruit: Symmetry in position A	Symmetric	3	Toffhoio	S4	VG
		Weakly Asymmetric	5	Messinese		
		Strongly Asymmetric	7	Etnea		
15. (*) (+) PQ	Fruit: Shape of apex in position A	Acute	5	Ottobratica	S4	VG
		Rounded	7	Cerignola		
16. (*) (+) QL	Fruit: Nipple	Absent	1	Frantoio	S4	VG
		Tenuous	2	Itrana		
		Obvious	3	Zaituna		
17 (*) QL	Fruit: Position of maximum transverse fruit diameter	Towards Base	1	Belice	S4	VG
		Towards Centre	5	Coratina		
		Towards Apex	9	Moraiolo		
18. (*) (+) PQ	Fruit: Shape of base in position A	Rounded	3	Zaituna	S4	VG
		Intermediate	5	Picholine		
		Truncate	7	TondaIblea		
19. (*) (+) PQ	Stone: Shape in position B	Oblong	1	Leccino, Ottobratica	S4	VG
		Ovate	2	Itrana		
		Obovate	3	Picholine		
		Elliptic	4	Frantoio, Coratina		
		Circular	5	Zaituna		
20. QL	Stone: Position of maximum transverse stone diameter	Towards Base	3	Coratina	S4	VG
		Towards Centre	5	TondaIblea		
		Towards Apex	7	Zaituna		
21.	Stone: Symmetry in	Symmetric	1	Coratina		

(+) QL	position A	Asymmetric	9	Toffhoio	S4	VG
22. (+) QL	Stone: Symmetry in position B	Symmetric	1	Pendolino	S4	VG
		Asymmetric	9	Messinese		
23. (+) QN	Stone: Number of grooves on basal end	Few (<7)	3	Pendolino	S4	VG
		Medium (7-10)	5	Cerignola, Fantoio		
		High (>10)	7	Leccino, Coratina		
24. (*) (+) QL	Stone: Distribution of grooves on basal end	Evenly distributed	1	Cerignola	S4	VG
		Unevenly distributed	9	Toffhoio		
25. (*) (+) PQ	Stone: Shape of apex in position A	Acute	3	Messinese, Frantoio	S4	VG
		Rounded	5	Zaituna		
		Obtuse	7	Picholine		
26. (*) (+) QL	Stone: Mucron	Absent	1	Zaituna, TondaIblea	S4	VG
		Tenuous	5	Cerignola		
		Obvious	9	Messinese, Ottobratica		
27. (*) (+) PQ	Stone: Shape of base in position A	Acute	3	Picholine, Frantoio	S4	VG
		Rounded	5	Cerignola, Coratina		
		Truncate	7	Belice		
28. (*) (+) QL	Stone: Surface	Smooth	1	Coratina, Pendolina	S4	VG
		Scabrous	9	TondaIblea, Picholine		

VIII: Explanations for the Table of Characteristics

8.1 Explanations covering several characteristics

Characteristics containing the following key in the second column of the Table of characteristics should be examined as indicated below:

(a) Leaf blade: Observations should be made on fully developed leaves from the central part of one-year-old shoots in full growth.

(b) Inflorescence: Observations should be made on inflorescence from the central part of fruiting branches.

© Fruit: Observations should be made on fully ripened fruits at time of ripening. Time of ripening is when 80% of the fruit on the tree has colored. For the fruit two positions (A and B) are used. Position A is the position in which the organ shows its largest asymmetry. Position B is reached from position A by turning 90° along the longitudinal axis in a way to present the most developed part of the organ to the observer.

		Turn fruit 90º 		
Position A **Most Asymmetric**			**Position B** **Most Symmetric**	

Immature fruit: All observations of the immature fruit should be done when 10% of the fruit on the tree has colored. The fruit to be observed should be fully developed and not yet have colored.

(e) Stone: All observations on the stone should be made on dry well-cleaned of the same sample used for the observations on the fruit. For the stone two positions (A and B) are used. Position A is the position in which the organ shows its largest asymmetry. Position B is reached from position A by turning 90º along the longitudinal axis in a way to present the most developed part of the organ to the observer.

	Turn stone 90° 	
		

Position A Most Asymmetric		Position B Most Symmetric

Explanations for individual characteristics

Characteristic 1: Tree: growth habit

The tree growth habit states the natural attitude of the branches and shoots

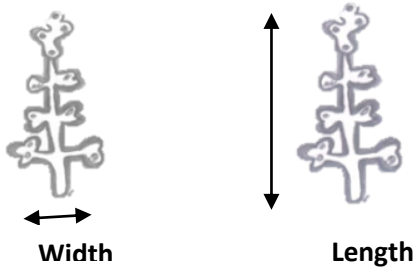
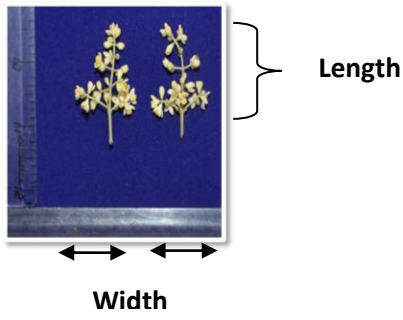
		
		
Upright (1)	**Spreading (3)**	**Drooping (5)**

Characteristic 2: Tree: canopy density. The canopy density refers to the overall abundance of canopy vegetation. The following measures should be taken into account, length of internodes, number and vigor of the shoots and the size of the leaves.

		
		
Sparse (3)	**Medium (5)**	**Dense (7)**

Characteristic 3: Leaf blade: curvature of longitudinal axis

		
		
Incurved (1)	**Straight (5)**	**Recurved (9)**

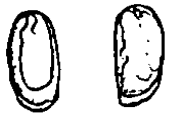
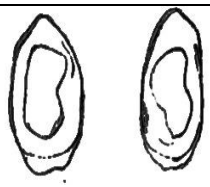
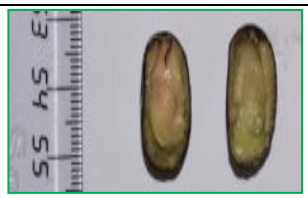
Characteristic 6: Inflorescence: length	**Characteristic 7: Inflorescence: width**
	

**Width is maximum diameter (horizontally) of the well spread flower and length is maximum vertical length of the flower including flower stalk*

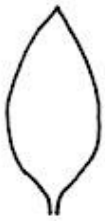
Characteristic 8: Flower: attitude of corolla lobe

		
		
Erect (1)	**Horizontal (5)**	**Reflexed (9)**

Characteristic 9: Fruit: Length (mm)

	
	
Short (1)	**Long (9)**

Characteristic 12: Fruit: shape in position A

				
Uniform diameter throughout the surface	*Higher diameter at the base and tapering towards apex*	*Higher diameter at the apex and tapering towards the base*	*Higher diameter at the centre and sharply tapering towards base and apex*	*Highest diameter at the centre and gradually tapering towards apex and base*
				
Oblong (1)	**Ovate (2)**	**Obovate (3)**	**Elliptic (4)**	**Circular (5)**

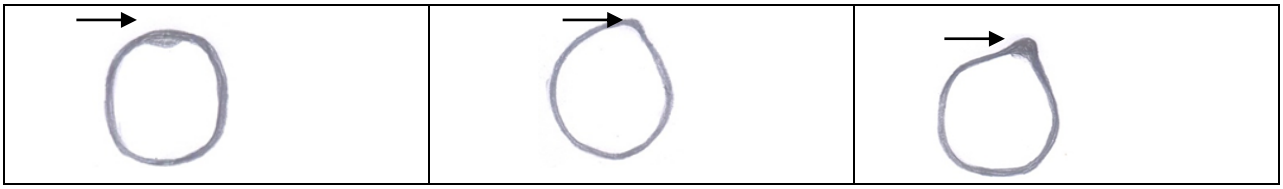
Characteristic 14: Fruit: Symmetry in position A

 	 	 
Symmetric (3)	**Weakly Asymmetric (5)**	**Strongly Asymmetric (7)**

Characteristic 15: Fruit: Shape of apex in position A

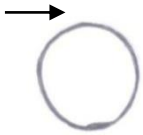
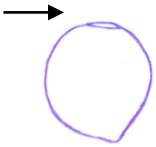
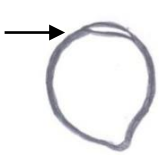
 	 
Acute (5)	**Rounded (7)**

Characteristic 16: Fruit: nipple

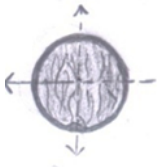


		
Absent (1)	**Tenuous (2)**	**Obvious (3)**

Characteristic 18: Fruit: shape of base in position A

		
		
Rounded (3)	**Intermediate (5)**	**Truncate (7)**

Characteristic 19: Stone: shape in position B

				
				
Oblong (1)	**Ovate (2)**	**Obovate (3)**	**Elliptic (4)**	**Circular (5)**

Characteristic 21: Stone: symmetry in position A

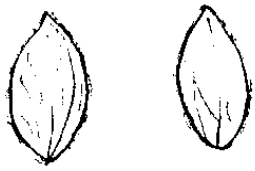
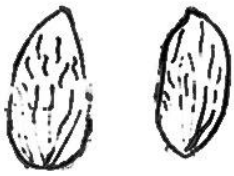
	
Symmetric (1)	**Asymmetric (9)**

Characteristic 22: Stone: symmetry in position B

	
	
Symmetric (1)	**Asymmetric (9)**

Characteristic 23: Stone: number of grooves on basal end

To count the number of grooves that can be seen from the stalk insertion point.

		
		
Few (1)	**Medium (2)**	**High (3)**

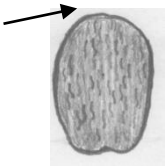
Characteristic 24: Stone: distribution of grooves on basal end

	
	
Evenly distributed (1)	**Unevenly distributed (9)**

Characteristic 25: Stone: shape of apex in position A

		
		
Acute(3)	**Rounded (5)**	**Obtuse (7)**

Characteristic 26: Stone: mucron

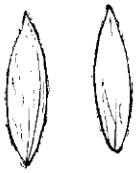
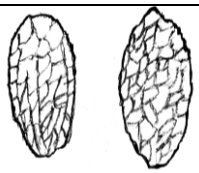
		
		
Absent (1)	**Tenuous (2)**	**Obvious (3)**

Characteristic 27: Stone: shape of base in position A

		
		
Acute (3)	**Rounded (5)**	**Truncate (7)**

Characteristic 28: Stone: Surface (Position A)

Based on the depth and abundance of fibro-vascular bundles on the surface of endocarp/stone which can be observed visually or by rubbing on the surface of the stone.

	
	
Smooth (1)	**Scabrous (9)**

IX. Working Group details

The test guidelines developed by the task force (F. No. PPV&FRA/Reg/Olive/2018-19/591-594 dated 14.06.2022) constituted by the PPV & FR Authority for Olive with consultation by Dr Om Chand Sharma, Nodal officer (PI), Dr Javid Iqbal Mir, Co-Nodal officer (Co-PI), ICAR-CITH, Srinagar and Dr Waseem Hassan Raja, Scientist, ICAR-CITH, Srinagar. The Technical inputs also provided by the PPV & FR Authority.

Technical Advisory Committee of Task Force

1	Dr Khalid Mushtaq, Professor & Head (Ex), Division of Fruit Science, SKUAST-K, Srinagar	Chairman
2	Dr Amit Jasrotia, Professor & Head, Division of Fruit Science, SKUAST-J, Jammu	Member
3	Dr D. P. Sharma, Professor & Head, Division of Fruit Science, YSPUH&F, Solan, H.P.	Member
4	Dr Vikas Tandon, Professor, School of Biotechnology, Faculty of Agriculture, SKUAST-J, Jammu	Member
5	Dr Mohd Amin, Professor, Division of Fruit Science, SKUAST-K, Srinagar	Member
6	Dr O. C. Sharma, Principal Scientist (Fruit Science) & Director (Acting), ICAR-CITH, Srinagar	PI of DUS Project
7	R. S. Sengar, Deputy Registrar, PPV&FRA, New Delhi	Member Secretary

X. Name of DUS Test Centre(s):

Nodal Centre	**Co-nodal Centre**
ICAR-Central Institute of Temperate Horticulture, Old Air Field, Rangreth, Srinagar 191132 (UT of Jammu and Kashmir).	Dr. Yashwant Singh Parmar University of Horticulture and Forestry, Solan.