Eucalypts (*Eucalyptus camaldulensis* Dehnh. and *Eucalyptus tereticornis* Sm.)

I. Subject

These test guidelines shall apply to all clonally propagated varieties of *Eucalyptus camaldulensis* Dehnh., *Eucalyptus tereticornis* Sm. and their hybrids.

II. Materials 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 Protection of Plant Varieties and Farmers' Rights (PPV & FRA) Act, 2001.

2. 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.

3. Clonally propagated plant materialsof 60 cm height from collar to the apical tip are required for DUS testing. The plants must have fully developed root system.

4. The minimum number of planting material to be supplied by the applicant or his nominee during June-July shall be 60rooted plants. The plants should be in 250 cc root trainer with proper identificationon each individual plant.

5. The age of the plants shall be 6 months while submitting for testing.

6. The plant material should be visibly healthy, not lacking in vigour or affected by any important pests or diseases.

7. 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

Duration of test

The minimum duration of DUS tests shall normally up to two independent flowering cycles.

Testing Place

The tests shall normally be conducted attwo locations. If any essential characteristics of the candidate variety are not expressed for visual observation at these locations, the variety shall be considered for further examination at another appropriate test site or under special test protocol on expression of interest of the applicant.

Conditions for Conducting the Examination

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.

Test 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.

Test plot design

No. of rows	: one
Row to row distance	: 3 m
Plant to plant distance	: 2 m
No. of plants per replication	: 6
No. of replications	: 3

The test plot will be surrounded by one guard row. Additional test protocol for special purpose shall be established by the PPV & FR Authority.

On-site DUS testing

a. On-sitetesting shall be conducted at the places specified by the applicant.

b. The age of the trees at on-site shall be between 3 to 6 years.

c. A trial with minimum of 18 treesin 1-2 blocks planted in uniform spacing shall be considered for on-site testing.

d. The trees must be healthy and free from pest and disease and raised under standard management practices.

e. The Expert Committee constituted by the PPV & FRA in consultation with the DUS Centre shall be authorized to inspect on-site testing and recording of the appropriate characters.

IV. Methods and Observations

a. The characteristics described in the Table of characteristics shall be used for testing of varieties for their DUS (Section VII).

b. The assessment of Distinctiveness and Stability of all observations shall be made on 6 plants or parts taken each of6 plants, which will be equally divided among 3 replications (2 plants per replication).

c. The assessment of Uniformity of characteristics shall be made in 6 plants per replication, with an acceptance probability of at least 95%. The maximum number of off-type allowed would be 1 in 18 plants.

d. For the assessment of all colour characteristics, the Royal Horticultural Society (RHS) colour chart shall be used.

e. All observations of bark and stem shall be made at 1.37 meters from ground level.

f. All branch characters shall be observed in the middle of the crown.

g. All observations of leaf shall be made in mature leaves at middle of the crownin the middle third of the youngest shoots not showing signs of active growth. A sample of 10 leaves per tree shall be taken for morphometric characterization.

h. All juvenile leaf characters shall be recorded in one month old coppice shoots.

i. Observations on the inflorescences shall be made at the time of full flowering on terminalpanicles of typical shoots from the exposed regions of the tree.

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 the 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. The following characteristics shall be used for grouping of Eucalyptsvarieties:

    1. Mature leaf: Shape (Characteristic 3)
    2. Mature leaf: Waxiness of upper side (Characteristic 12)
    3. Trunk: Clear bole height (Characteristic 13)
    4. Primary branch: Scar type (Characteristic 15)
    5. Primary branch: Attitude (Characteristic 20)
    6. Bark: Colour of fresh bark (Characteristic 24)
    7. Flower:Operculum Shape (Characteristic 28)

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) 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:

i. (*) 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 is rendered impossible by the environmental conditions of the testing region. Under such exceptional situation, adequate explanation shall be provided.

ii. (+)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. A decimal code in the sixth column of Table of characteristics indicates the stage for the observation of each characteristic during the growth and development of the variety. The relevant growth stages corresponding to the decimal code number are described below.

Code	**Growth Stage**
1	Coppice stage: Coppice shoots of minimum 30 cm tall
20	Tree is minimum 4 m tall; about 10 -15 well developed 1 meter long branches; few mature leaves start falling; few flower panicles starts at the terminal
24	Tree is minimum 5 m tall; the main stem measures 18 cm girth;Bark starts peeling;fruits are set at the terminal.
32	Tree is minimum 7 m tall; the main stem measures 24 cm girth; few flower panicles starts at terminal and primary branches.
36	Tree is minimum 8 m tall; the main stem measures 28 cm girth; fruits are set at the terminal and primary branches.

5. Type of assessment of characteristics indicated in column seven of Table of characteristics is as follows,

MG: Measurement by a single observation of a group of plants or parts of plants

MS: Measurement of a number of individual plants or parts of plants

VG: Visual assessment by a single observation of a group of plants or parts of plants

VS: Visual assessment by observation of individual plant or parts of plants.

VII. Table of characteristics

S. No.	Characteristics	State	*Notes*	Example clone	Stage of observation	Type of assessment
1 +	Juvenile leaf: Shape	Lanceolate	1	C16	1	VG
		Ovate	2	C101		
2	Juvenile leaf: Anthocyanin colouration	Absent or weak	1	IFGTB-EC1	1	VG
		Medium	3	C101		
		Strong	5	-		
3 * +	Mature leaf: Shape	Narrow Lanceolate	1	C15	20, 32	VG
		Lanceolate	2	IFGTB-EC3		
		Ovate	3	C206		
4 +	Mature leaf: Base Symmetry	Symmetric	1	C3, C33, C92, C100	20, 32	VG
		Asymmetric	9	C22		
5 * +	Mature leaf:BaseShape	Obtuse	1	C15, C16, C68	20, 32	VG
		Cuneate	2	C22		
		Attenuate	3	C206		
6 * +	Mature leaf:ApexShape	Acute	1	C207, ITC10	20, 32	VG
		Obtuse	2	C278(KFRI10)		
		Subulate	3	C 206		
7	Mature leaf: Blade area	Small (<20.0 cm^2)	3	C157, C207	20, 32	MG
		Medium(20.0 to 46.0 cm^2)	5	IFGTB-EC1		
		Large (>46.0 cm^2)	7	C205		
8	Mature leaf: Length	Short (<12.0 cm)	3	C157, C207	20, 32	MG
		Medium (12.0 to 21.0 cm)	5	IFGTB-EC3		
		Long (>21.0 cm)	7	C113		
9	Mature leaf: Breadth	Narrow (<2.5 cm)	3	C15	20, 32	MG
		Medium (2.5 to 4.0 cm)	5	IFGTB-EC1		
		Wide (>4.0 cm)	7	C206, C154		
10 *	Mature leaf:Petiole length	Short (<2.0 cm)	3	C191	20, 32	MG
		Intermediate (2.0-3.0 cm)	5	IFGTB-EC2		
		Long (>3.0 cm)	7	C75		
11 *	Mature leaf: Blade ratio	Slightly elongated (<4.0 times long leaf)	3	C206	20, 32	MG
		Moderately elongated (4-6 times long leaf)	5	IFGTB-EC3		

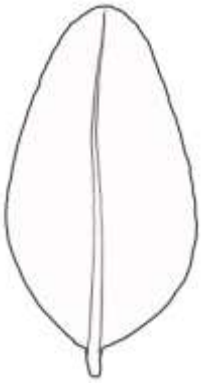
		Very elongated (>6 times long leaf)	7	C15, C22		
12 *	Mature leaf: Waxiness of upper side	Absent or weak	1	IFGTB-EC3	20, 32	VG
		Medium	3	IFGTB-EC2		
		Strong	5	IFGTB-EC4		
13 *	Trunk: Clear bole Height	Below lower 1/3rd height	3	C154	24, 36	VG
		With in middle 1/3rd height	5	IFGTB-EC1		
		Above top 1/3rd height	7	ITC3		
14 +	Crown: Shape	Lanceolate	1	-	24, 36	VG
		Conical	2	ITC3		
		Columnar	3	C154		
15 *	Primary branch: Scar type	Open	1	ITC3	24, 36	VG
		Close	9	C123		
16 +	Primary branch: Scarshape	Inverted "V"	1	C15	24, 36	VG
		Spherical	2	C100		
17 * +	Primary branch: Scar periphery projection	Downward	1	C63, C188	24, 36	VG
		Horizontal	2	C223, C187		
		Flat	3	IFGTB-EC3		
		Depressed	4	ITC285		
18	Primary branch: Self pruning	Present	1	IFGTB-EC2	24, 36	VS
		Absent	9	C154		
19 *	Primary branch: Thickness	Small (<1/8th of main stem)	3	IFGTB-EC3	24, 36	VS
		Medium (1/8th-1/4th of main stem)	5	C123, ITC 285		
		Thick (>1/4th of main stem)	7	C154, IFGTB-EC1		
20 * +	Primary branch: Attitude	Upward	1	ITC 7	24, 36	VS
		Horizontal	2	IFGTB-EC3		
		Drooping	3	ITC10		
21	Bark: Texture	Rough	1	C76, ITC3	24, 36	VG
		Smooth	9	ITC7		
22	Bark: Annual Peeling	Absent	1	C76	24, 36	VG
		Present	9	C94		
23 +	Bark: Peeling type	Strip	1	C14	24, 36	VG
		Flake	2	C94		
		Mixed	3	C198		
24 *	Bark: Colour of fresh bark	Light brown (Y-W 158, O-W 159)	1	C7, C9	24, 36	VG
		Light green(G-W 157)	2	C198		
		Light grey (W N155A)	3	C124		
25	Bark: Colour of dried bark	Light brown (Grey-O N170D & N170C)	1	IFGTB-EC1	24, 36	VG
		Brown (Grey-O 174C & 174D)	2	C14		

		Grey (Black 202C & 202D)	3	C76		
26	Bark: Colour of rhytidome bark	Light brown (Grey-Or 171D & N171C& 170C)	1	C63	24, 36	VG
		Dark brown (Grey-O 172)	2	C 94		
		Grey(Black 202C)	3	C75		
27	Trunk: Waxiness (excluding rhytidome)	Absent or weak	1	ITC10	24, 36	VG
		Medium	3	IFGTB-EC2		
		Strong	5	C191		
28 * +	Flower: Operculum shape	Hemispherical apiculate	1	C33	20, 32	VS
		Elongated	2	C209		
		Conical	3	C118,C68, C203		
29 * +	Fruit: Base shape	Conical	1	IFGTB-EC4	24, 36	VS
		Spherical	2	C6		
		Hemispherical	3	C86		
30 +	Fruit: Operculum scar	Absent	1	C20	24, 36	VS
		Present	9	C113		
31 *	Fruit: Pedicel length	Short (<4.5 mm)	3	IFGTB-EC4	24, 36	MG
		Medium (4.5 to 6.5 mm)	5	C20		
		Long (>6.5 mm)	7	C15		
32 *	Fruit: Peduncle length	Short (<1.0 cm)	3	C92	24, 36	MG
		Medium (1.0 to 1.5 cm)	5	IFGTB-EC3, C83		
		Long (>1.5 cm)	7	IFGTB-EC2		
33	Fruit: Width	Narrow (<5 mm)	3	IFGTB-EC3	24, 36	MG
		Medium (5-6 mm)	5	C113		
		Broad (>6 mm)	7	IFGTB-EC4		

VIII. Explanation for the table of characteristics

Characteristic 1: Juvenile leaf :Shape

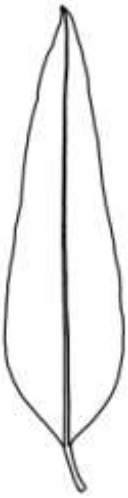
1
Lanceolate



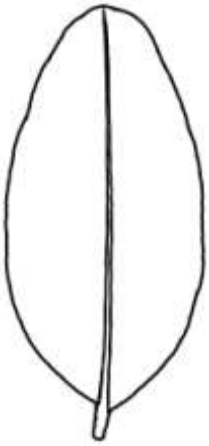
9
Ovate

Characteristic 3: Mature leaf: Shape

1
Narrow lanceolate

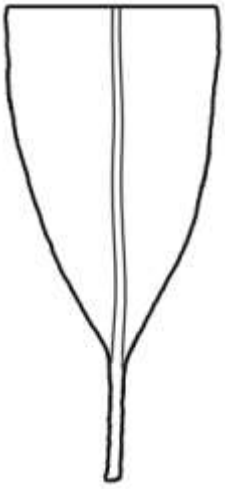


2
Lanceolate



3
Ovate

Characteristic 4: Mature Leaf:Base symmetry



1
Symmetric

9
Asymmetric

Characteristic 5:Mature leaf:Base shape

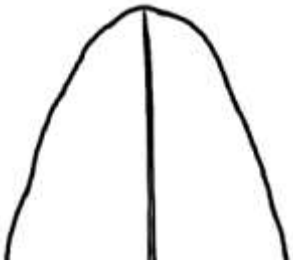
1
Obtuse

2
Cuneate

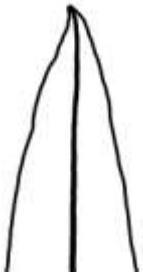
3
Attenuate

Characteristic 6:Matureleaf:Apex shape

1
Acute



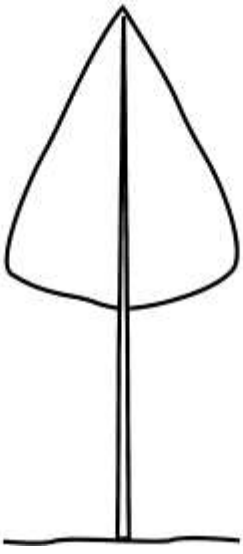
2
Obtuse



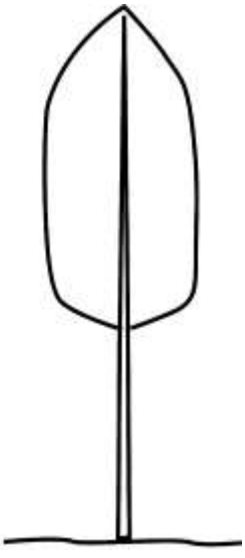
3
Subulate

Characteristic 14: Crown: shape

1
Lanceolate



2
Conical



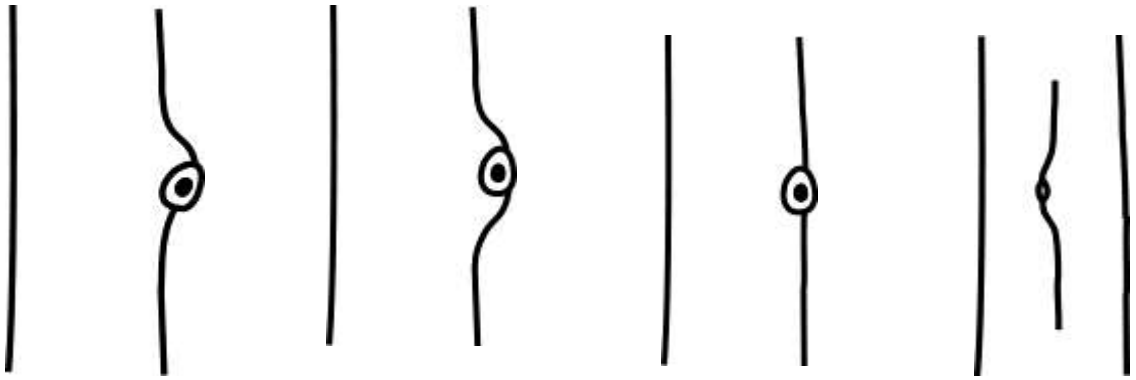
3
Columnar

Characteristic 16:Primary branch:Scar shape

1 **2**

Inverted "V" Spherical

Characteristic 17:Primary branch:Scar periphery projection

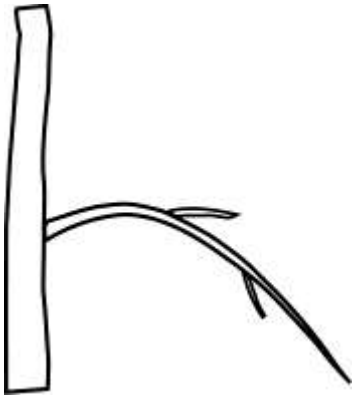


1 **2** **3** **4**
Downward **Horizontal** **Flat** **Depressed**

Characteristic 20:Primary branch:Attitude

1
Upward

2
Perpendicular



3
Drooping

Characteristic 23: Bark: Peeling type

1

Strip

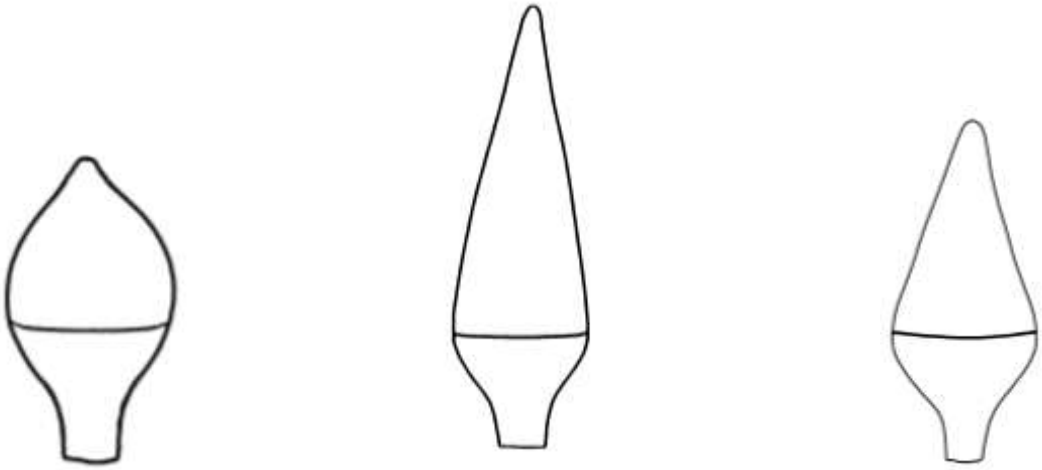
2

Flakes

3

Mixed

Characteristic 28:Flower: Operculumshape



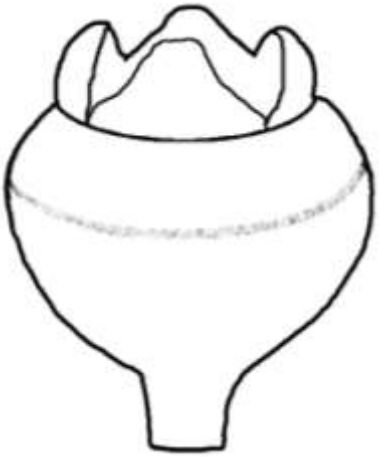
1 **2** **3**

Hemispherical apiculate ***Elongated*** ***Conical***

Characteristic 29:Fruit:Base shape

1 **2** **3**
Conical **Spherical** **Hemispherical**

Characteristic 30:Fruit: Operculum scar



1
Absent

9
Present

X. DUS testing centre

Nodal Centre	Other Centre
IFGTB Research station, Coimbatore	IFGTB Regional Field Station, Chennai, Tamil Nadu
	Forest Research Institute, Dehradun