

**Guidelines for the Conduct of Test for
Distinctiveness, Uniformity and
Stability
on
Litchi (*Litchi chinensis* Sonn.)**



**Protection of Plant Varieties and
Farmers' Rights Authority
(PPV & FRA)
Government of India, New Delhi**

CONTENTS

	Page
I. Subject	1
II. Material required	1
III. Conduct of tests	1
IV. Methods and observations	2
V. Grouping of varieties	2
VI. Characteristics and symbols	3
VII. Table of characteristics	3
VIII. Explanation for the Table of characteristics	9
IX. Working Group Details	
X. DUS Testing centers	

I. Subject

These test guidelines shall apply to all varieties of Litchi (*Litchi chinensis* Sonn.)

II. 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 Protection of Plant Varieties and Farmers' Rights (PPV & FRA) 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. The material is to be supplied in the form of 7 air layers for each location.
3. The plant material supplied should be visibly healthy, not lacking in vigour, nor affected by any important pest or disease.
4. 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 season in different years. Tests shall be conducted at least at two places
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 cycles.

3. 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 additional test protocol for special purpose may be established by PPV & FRA.

1. Locations: 2
2. No. of replications: 3
3. Treatment Unit: 1 plant per replication
4. Spacing: 6-8 m x 6-8 m
5. Number of plants: 4

On-site DUS testing

- The applicant or his/her nominee on his/her behalf shall submit a request to the Authority for conducting a reliable trial according to Test Guidelines and the instructions from Authority before on-site examination of the candidate variety.

- The applicant or his/her nominee shall submit a request to the Authority for on-site examination prior to start of growing cycle as mentioned in Test Guidelines for site examination of the candidate variety.
- On-site testing may be conducted at the places specified by the applicant. The age of the trees at on-site shall be minimum 3 years.
- As a minimum, 04 trees planted in uniform spacing, should be available for inspection and examination for 'on site' DUS testing. The trees must be healthy and free from pest & disease and raised under standard management practices. For farmer's variety or landraces, the authority may notify suitable guidelines on the number of plant(s) and season(s), if any.
- On-site examination shall be arranged during the fruiting season, when distinguishing characteristics of candidate variety can most easily be seen. The characteristics of the candidate variety can be examined and compared with those of the comparative varieties as per the Test guidelines.
- 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. Applicant shall supply the Expert Committee with summary of distinct characteristics supported by photographs.
- The Expert Committee shall take notes and observations on distinctness and shall confirm preliminary data and/or summary of distinctness from applicant.
- The Expert Committee shall submit examination report to the Authority.

IV. Methods and observations

The characteristics described in the Table of characteristics (see section VII) 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 4 plants or parts taken from each of 4 plants. In the case of parts of plants, the number to be taken from each of the plants should be 2.
- 2 For determination of colour of young leaf, newly emerged leaves with completely unfolded leaflet of less than 20 days old age should be selected
- 3 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.
- 4 For recording data on shape of leaflet blade, second pair of leaflets from the rachis end should be selected
- 5 For recording data on colour of inflorescence, fully developed inflorescence with visibly separated unopened flowers should be selected.
- 6 Flower disc colour should be recorded from the fully opened flowers in which anthesis has taken place not before 24 hours.
- 7 Observations on the inflorescences should be made at the time of full flowering on terminal panicles

of typical shoots from the exposed regions of the tree.

- 8 The fully ripe fruit is the fruit ready for consumption. This stage is reached when the flesh is juicy and tubercles have flattened.

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 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.

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

- | | |
|-------------------|--|
| a. Leaflet: | Leaflet margin curvature (characteristic 11) |
| b. Mature fruit: | Fruit shape index (Ratio of length:diameter) |
| c. Mature fruit: | shape of fruit (characteristic 19) |
| d. Seed: | Seed shape (characteristic 24) |
| e. Peel of fruit: | Shape of tubercles/protuberances (characteristic 23) |
| f. Fruit: | Fruit maturity group (characteristic 17) |

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 (*) 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 a preceding phenological characteristic or by the environmental conditions of the testing region. Under such exceptional situation, adequate explanation 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. 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) For determination of colour of young leaf, newly emerged leaves with completely unfolded leaflet of less than 20 days old age should be selected
- b) Observations on the leaf which should be made on mature leaves in the middle third of the youngest shoots not showing signs of active growth. For recording data on shape of leaflet blade, second pair of leaflets from the rachis end should be selected
- c) Inflorescences should be selected from terminal panicles of typical shoots from the exposed regions of the tree. For recording data on colour of inflorescence, fully developed inflorescence with visibly separated unopened flowers should be selected.
- d) Flower disc colour should be recorded from the fully opened flowers in which anthesis has taken place not before 24 hours
- e) The ripe fruit is the fruit at the stage it is fully ready for consumption. This stage is reached when the aril is juicy and tubercles on peel have flattened.
- f) Type of assessment of characteristics indicated in column seven of Table of characteristics is as follows:

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

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

VII. Table of characteristics IX. Working Group details

S. No.	Characteristics	States	Notes	Example variety	Stage of Observation	Type of Assessment MG/MS/VG/ VS
1	2	3	4	5	6	7
1.	Young leaf: Colour	Light green	1	Sarguja Selection 2	01	VG
		Reddish green	3	Rose Scented		
		Reddish brown	5	Nafarpal		
2	Mature leaf colour	Light green	1	Calcuttia	02	VG
		Green	3	Purbi, Desi, Loungia, Late Large Green, Late Seedless		
		Dark green	5	Sarguja Selection 1, Kasba		
3	Number of leaflet/leaf	<5	1	Longia	02	MG
		5-6	3	Sarguja Selection - 2		
		6-7	5	Shahi, China		
		>7	7	Late Large		
4	Rachis length (cm)	Small (<7.0)	1	Kasba, Bedana	02	MG
		Medium (7.0-10.0)	3	Shahi, Purbi		
		Large (>10.0)	5	Late Large, Mandraji		
5	Petiole length (mm)	Small (<4.0)	1	Calcuttia, Kasba	02	MG
		Medium (4.0-6.0)	3	Rose Scented, China		
		Large (>6.0)	5	Bombai		
6 (* (+)	Leaflet blade: Leaflet blade shape	Lanceolate	1	China	02	VG
		Elliptic	3	Rose Scented, Bedana		
		Oblong	5	Calcuttia		
7	Length of leaflet (cm)	Small (<10.0)	1	Mclean	02	MG
		Medium (10.0-15.0)	3	China		
		Large (>15.0 cm)	5	Kasba		
8	Width of leaflet (cm)	Narrow (<3.0)	1	Mclean	02	MG
		Medium (3.0-5.0)	3	Rose Scented		
		Broad (>5.0)	5	Kasba		
9 (*	Leaflet blade: Leaf shape index (length of leaflet:width of leaflet) (Second middle pair of leaves)	Low (< 3.5)	3	China	02	MG
		Medium (3.5-3.7)	5	Green		
		High (>3.7)	7	Late Large		
10 (*	Leaflet blade: Leaflet margin curvature	Curve upward from midrib	3	Shahi	02	VG
		Curve downward from midrib	5	China		

11 (*)	Flower: Flower disc colour of male flower	Light cream	1	Shahi	04	VG
		Pinkish	3	Trikolia		
12	Flower: Flower disc colour of hermaphrodite flower	Light cream	1	Ajhauri	04	VG
		Pinkish	3	Green		
13	Inflorescence: Length of inflorescence (cm)	Short (<15.0)	3	Swarna Roopa	03	MG
		Medium (15.0-30.0)	5	China		
		Long (>30.0)	7	Shahi		
14	Inflorescence: Width of inflorescence (cm)	Narrow (<10.0 cm)	1	Bedana	03	MG
		Medium (10.0-20.0)	3	China		
		Wide (>20.0)	5	Shahi		
15	Fruit : Fruit maturity group (days after fruit set)	Early (<50)	3	Shahi	05	VG
		Mid-maturity (50-60)	5	Bedana, China		
		Late maturity (>60)	7	Kasba		
16 (* (+)	Fruit: Fruit shape	Round	1	Bedana	05	VG
		Oblong	3	Shahi		
		Conical	5	China		
17	Fruit: Fruit colour	Dark Pink red (RHS code - N 034C)	3	China, Kasba	05	VG
		Green Brown (RHS code - 151 C)	7	Bedana, Shahi		
18 (*)	Fruit: Fruit shape index (length:width)	Low (< 1)	3	Bedana	05	MG
		High (>1)	5	Shahi		
19 (*)	Fruit:Fruit shoulders	Even	1	Shahi	05	VG
		Protruding	2	China		
20 (* (+)	Fruit: Fruit tip	Round	1	Bedana	05	VG
		Obtuse	2	Shahi		
		Acute	3	China		
22 (*)	Fruit : Fruit peel thickness	Thin	3	Shahi	05	VG
		Thick	5	Bedana		
21	Fruit: Pulp content (%)	Low (<60.0)	3	Longia	05	VG
		Medium (60.0-70.0)	5	Shahi, China		
		High (>70.0)	7	Bedana		
22 (* (+)	Fruit: Shape of tubercles	Pointed	3	Kasba	05	VG
		Round	5	Bedana		
23 (* (+)	Seed: Seed shape	Round	1	Yogada Selection	05	VG
		Oblong	3	Shahi		
		Elongated	5	China		
		Chicken tongue	7	Bedana		
24 (*)	Seed: Seed roundness index (ratio between seed thickness at both axis)	Cylindrical (≈ 1)	3	Shahi	05	MG
		Flat (<1.0)	5	Kasba		

VII. Explanations for table of characteristics

Characteristic 1: Young leaf colour



Light green (1)



Reddish Green (3)



Reddish Brown (5)

Characteristic 2: Mature leaf colour



Light Green (1)



Green (3)



Dark Green (5)

Characteristics 6: Leaflet blade: Leaflet blade shape



Lanceolate (1)



Elliptic (3)



Oblong (5)

Characteristics 10: Leaflet blade: Leaflet margin curvature



**Curve upward from midrib
(3)**



**Curve downward from midrib
(5)**

Characteristics 11: Flower: Flower disc colour of male flower



**Light cream
(1)**



**Pinkish
(3)**

Characteristics 12: Flower: Flower disc colour of hermaphrodite flower

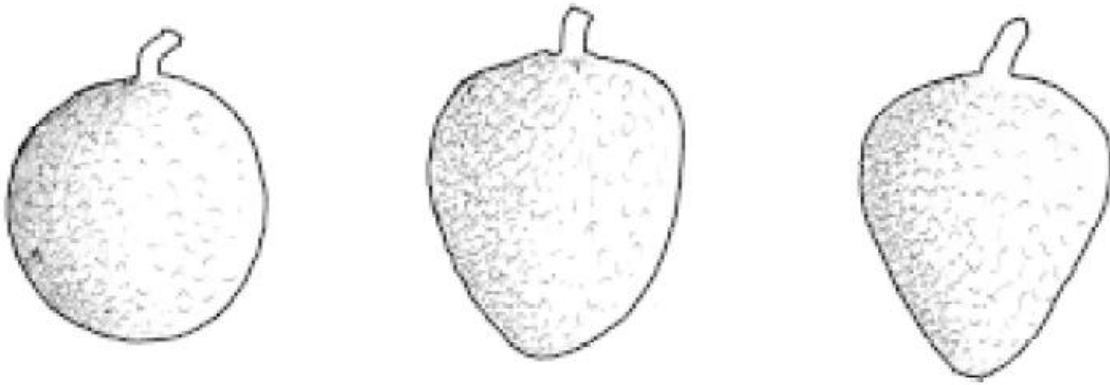


**Light cream
(1)**



**Pinkish
(3)**

Characteristics 16: Fruits: Fruit shape



Round (1)



Oblong (3)



Conical (5)

Characteristics 17: Fruit: Fruit colour



Dark Pink Red (3)



Green Brown (7)

Characteristics 19: Fruits: Fruit shoulders



**Even
(1)**



**Protruding
(2)**

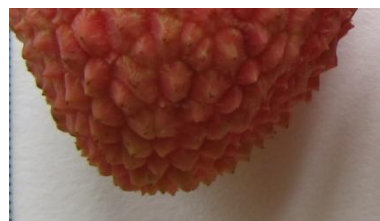
Characteristics 20: Fruit: Fruit tip



**Round
(1)**



**Obtuse
(2)**



**Acute
(3)**

Characteristics 22: Fruit: Shape of tubercles



Pointed (3)



Round (5)

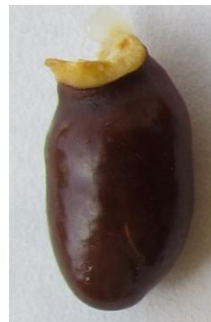
Characteristics 23: Seed: Seed shape



Round (1)



Oblong (3)



Elongated (5)



Chicken tongue (7)

Working Group details:

The test guidelines developed by the task force (**11/2014**) constituted by the PPV & FR Authority for **Litchi** with consultation by ICAR-NRC on Litchi, Muzaffarpur, Bihar & ICAR Research Complex for Eastern Region, Research Center, Ranchi, Jharkhand and Technical inputs also provided by the PPV & FR Authority and nodal officer.

The Members of the Task Force

- | | | |
|----|--|-------------------------|
| 1 | Dr. B.M.C. Reddy
Vice- Chancellor, Administrative Office,
Dr. YSR Horticulture University,
Venkataramannagudem, West Godavari-534101 AP | Chairman |
| 2 | Dr. S. B. Gurav
Principal Scientist (Horticulture) & Associate Director of
Research, MPKV, Ganeshkhind Pune- 413722 | Member |
| 3 | Dr. P. Narayan Swamy
Director of Research
University of Agricultural and Horticultural Sciences,
(UAHS), Shimoga, Karnataka -577225 | Member |
| 4 | Dr. Shailendra Rajan
Director (Acting) & Head,
ICAR- Central Institute for Subtropical Horticulture PO
Kakori, Rehmankhera, Lucknow- 227107 | Member |
| 5 | Dr. Arun Kumar Singh
Principal Scientist & Head
ICAR Research Complex for Eastern Region Research
Centre, Ranchi-834010, Jharkhand | Member |
| 6 | Dr. Vishal Nath
Director
ICAR- National Research Centre on Litchi
Ministry of Agriculture & Farmers Welfare, Govt. of
India, Mushahari, Muzaffarpur, Bihar-842002 | Special Invitee |
| 7 | Dr. D. P. Waskar
Director of Research
Vasantrao Naik Marathwada Krishi Vidyapeeth
Parbhani-431402, Maharashtra | Special Invitee |
| 8 | Dr. Vasugi Chinnaiyan,
Principal Scientist
Division of Fruit Crop, Indian Institute of Horticultural
Research, Hesaraghatta lake post, Bengaluru-560089 | Special Invitee |
| 8 | Dr. Bikash Das
Senior Scientist
ICAR Research Complex for Eastern Region , Research
Centre, Ranchi, Jharkhand 834010 | Special Invitee |
| 10 | Dr. Ravi Prakash
Registrar, PPV & FRA, New Delhi | Member Secretary |

Nodal DUS Test Centre	Other DUS Test Centre
ICAR-National Research Centre on Litchi, Muzaffarpur, Bihar	ICAR Research Complex for Eastern Region, Research Centre, Ranchi, Jharkhand