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

On

Rice

(*Oryza sativa* L.)

**Protection of Plant Varieties and Farmers' Rights Authority
(PPV & FRA)**

Government of India

CONTENTS

CONTENTS

I.   Subject

These test guidelines shall apply to all varieties, hybrids, transgenics and parental lines of Rice (*Oryza sativa* L.)

II.   Seed material required

1. The Protection of Plant Varieties and Farmers' Rights Authority (PPV & FRA) shall decide when, where and in what quantity and quality of the seed material are required for testing a variety denomination applied for registration under the Protection of Plant Varieties and Farmers' Rights (PPV & FR) Act, 2001. Applicants submitting such seed 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. The minimum quantity of the seed to be provided by the applicant shall be 3000 grams in case of the candidate variety or hybrid and 1500 grams for each of the parental line of the hybrid. Each of these seed lots shall be packed, sealed and properly labeled with details, in ten equal weighing packets and submitted in one lot. Wherever, individual panicles are to be supplied, such panicles shall be individually packed and submitted along with the said seed lot, with proper labeling of the denomination, harvest year and such related details.

2. At least 100 panicles each representing the normal ear size and drawn from the main tiller of the candidate variety shall be submitted.

3. The seed and ears submitted shall have at least 80% germination, 98% physical purity, highest genetic purity, uniformity, sanitary and phyto-sanitary standards. In addition the moisture content of the seed shall not exceed 11-12% to meet the safe storage requirement. The applicant shall also submit along with the seed a certified data on germination test made not more than one month prior to the date of submission.

4. The seed material submitted shall not have been subjected to any chemical or bio-physical treatment.

III. Conduct of tests

1. The minimum duration of DUS tests shall normally be at least two independent similar growing seasons.

2. The tests shall normally be conducted at two test 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 expressed request of the applicant.

3. The field test shall be carried out under conditions favouring normal growth and expression of all test characteristics. The size of the plots shall be such that parts of plants could be removed for measurement and observation without prejudicing the observations on the standing plants until the end of the growing period. Each test shall include about 2500 plants, in the plot size and planting space specified below across three replications. Separate plots for observation and

for measurement can only be used if they have been subjected to similar environmental conditions. All the replications shall be sharing similar environmental conditions of the test location.

4. **Test plot design**

Number of rows	:	30
Row length	:	6 m
Row to row distance	:	30 cm
Plant to plant distance	:	20 cm
Expected plants / replications	:	900
Number of replications	:	3 for irrigated and shallow lowland tests
	:	5 for upland, saline-alkaline, semi-deep water and deep water tests.

5. Observations shall not be recorded on plants in border rows.

6. Additional test protocol for special purpose shall be established by the PPV & FR Authority.

IV. Methods and observations

1. The characteristics described in the Table of characteristics (see section VII) shall be used for the testing of varieties, inbred lines and hybrids for their DUS.

2. For the assessment of Distinctiveness and Stability observations shall be made on 30 plants or parts of 30 plants, which shall be equally divided among 3 replications (10 plants per replication).

3. For the assessment of Uniformity of characteristics on the plot as a whole (visual assessment by a single observation of a group of plants or parts of plants), a population standard of 0.1% with an acceptance probability of at least 95% shall be applied. In the case of a sample size of 1500 plants the number of off-types shall not exceed 4.

4. For the assessment of Uniformity of characteristics on single panicle-rows, plants or parts of plants (visual assessment by observations of a number of individual panicle-rows, plants or parts of plants) the number of aberrant panicle-rows, plants or parts of plants shall not exceed 2 in 50.

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

6. Unless otherwise indicated, all observations on the leaf shall be made on the penultimate leaf.

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 proposed to be used for grouping rice varieties:

    a)   Basal leaf: Sheath colour (Characteristic 2)

    b)   Time of heading (50% of plants with panicles) (Characteristic 20)

    c)   Stem: Length (excluding panicle; excluding floating rice) (Characteristic 29)

    d)   Decorticated grain: Length (Characteristic 54)

    e)   Decorticated grain: Shape (in lateral view) (Characteristic 56)

    f)   Decorticated grain: Colour (Characteristic 57)

    g)   Endosperm: Content of amylose (Characteristic 59)

    h)   Decorticated grain: Aroma (Characteristic 62)

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. Note (1 to 9) shall be used to describe the state of each character for the purpose of digital 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 decimal 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 decimal code numbers are described below:

Decimal Code for the Growth Stage

Code	Growth stage
10	After germination, emergence of first leaf through coleoptile / second leaf visible (less than 1 cm)
40	Booting : the increase in the size of the young panicle and its inward extension inside the upper leaf sheaths detectable as a bulge in the rapidly elongating culm
50	1st spikelet of inflorescence just visible
55	½ of inflorescence emerged
60	Beginning of anthesis : it begins with the protrusion of the first dehiscing anthers in the terminal spikelets on the panicle branches
65	Anthesis half way
70	Milk development stage: formation of white milky sap within the spikelets.
80	Dough development (spikelets become hard)
90	Ripening (terminal spikelets ripened)
92	Caryopsis hard (can be no longer be dented by thumb nail and over 90% spikelets ripened)

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	States	Note	Example variety/line	Stage of observation	Type of assessment
1	2	3	4	5	6	7
1. (+)	Coleoptile: Colour	Colourless Green Purple	1 2 3	Krishna Hamsa, Prasad --- ---	10	VS
2. (*)	Basal leaf: Sheath colour	Green Light purple Purple lines Uniform purple	1 2 3 4	Rasi, Heera Annada, Bhogali Mahamaya IR 24, Aruna	40	VS
3.	Leaf: Intensity of green colour	Light Medium Dark	3 5 7	Rasi, Vandana Heera, Sugandha IR 24, Swarna	40	VG
4.	Leaf: Anthocyanin colouration	Absent Present	1 9	Sugandha IR 24, Aruna	40	VG
5.	Leaf: Distribution of anthocyanin colouration	On tips only On margins only In blotches only Uniform	1 2 3 4	Vivek Dhan 62, CSR 10 Aruna, IR 24 --- Shyamala	40	VG
6. (+)	Leaf Sheath: anthocyanin colouration	Absent Present	1 9	Prasad, Govind IR 24, Aruna	40	VG
7.	Leaf sheath: Intensity of anthocyanin colouration	Very weak Weak Medium Strong Very strong	1 3 5 7 9	--- Rongilee Aruna, IR 24 --- Shyamala	40	VG
8. (*)	Leaf: Pubescence of blade surface	Absent Weak Medium Strong Very strong	1 3 5 7 9	Sneha, Sugandha Nagarjana, Vibhava IR 24, Aruna Jaya, Pantdhan 10 Govind, Jaishree	40	VS
9. (*) (+)	Leaf: Auricles	Absent Present	1 9	Vikramarya Jaya, Bas. 370	40	VS
10. (*)	Leaf: Anthocyanin colouration of auricles	Colourless Light purple Purple	1 2 3	IR 24 Aruna, Amulya Hemavathi, Janaki	40	VS

11. (+)	Leaf: Collar	Absent Present	1 9	--- Rasi, IR 24	40	VS
12.	Leaf: Anthocyanin colouration of collar	Absent Present	1 9	Rasi, IR 24 Hemavathi, Aruna	40	VS
13. (+)	Leaf: Ligule	Absent Present	1 9	--- Triguna, IR 24	40	VS
14. (*) (+)	Leaf: Shape of ligule	Truncate Acute Split	1 2 3	--- --- Vijetha, IR 24	40	VS
15. (*)	Leaf: Colour of ligule	White Light purple Purple	1 2 3	Rasi, Pantdhan 10 Aruna, Jitendra IR 24, Shyamala	40	VS
16.	Leaf: Length of blade	Short (<30 cm) Medium (30-45 cm) Long (>45 cm)	3 5 7	VL Dhan 221, CSR 10 Bas.385, Bas.386 Bas. 370, Dubraj	40	MS
17.	Leaf: Width of blade	Narrow (<1 cm) Medium (1-2 cm) Broad (>2 cm)	3 5 7	Bas. 386, Bas. 370 Pant Dhan 4, Vajram PTB 56	40	MS
18.	Culm: Attitude (for floating rice only)	Non procumbent Procumbent	1 9	--- ---	40	VS
19. (+)	Culm: attitude	Erect Semi-erect Open Spreading	1 3 5 7	Pantdhan 11, IR 24 IR8,VL Dhan 206 Janaki, Prasad ---	40	VS
20. (*)	Time of heading (50% of plants with panicles)	Very early (<71 days) Early (71-90 days) Medium (91-110 days) Late (111-130 days) Very late (> 131 days)	1 3 5 7 9	Heera Rasi, Ravi Vikas, Triguna Bas. 370 Kushal, Sabita	55	VG
21. (*) (+)	Flag leaf: Attitude of blade (early observation)	Erect Semi-erect Horizontal Drooping	1 3 5 7	IR 24, Indira VL Dhan 81, Jawahar --- ---	60	VG

22. (*)	Spikelet: Density of pubescence of lemma	Absent Weak Medium Strong Very strong	1 3 5 7 9	--- Krishna Hamsa Rasi, NDR 359 Vasumati, Vandana K 429	60-80	VS
23.	Male sterility	Absent Present	1 9	IR 24 IR 580 25A	65	VG
24. (+)	Lemma: Anthocyanin colouration of keel	Absent or very weak Weak Medium Strong Very strong	1 3 5 7 9	IR 24, Swarnadhan Bhadra, Remya Aruna Makom, Janaki Malaviyadhan	65	VS
25. (+)	Lemma: Anthocyanin colouration of area below apex	Absent Weak Medium Strong Very strong	1 3 5 7 9	IR 24,VL Dhan 81 Remya, Mandya Vijaya Bhadra, Aruna Bhogali, Makom Janaki, Malaviyadhan	65	VS
26. (*) (+)	Lemma: Anthocyanin colouration of apex	Absent Weak Medium Strong Very strong	1 3 5 7 9	Phalguna Mandya Vijaya, Jalpriya Anjali, Shyamala RasiJanaki	65	VS
27. (*) (+)	Spikelet: Colour of stigma	White Light green Yellow Light purple Purple	1 2 3 4 5	Jaya, Bas. 370 --- Mahi Sugandha IR 24, Poornima Rasi, Mahamaya	65	VS
28.	Stem: Thickness	Thin (<0.40 cm) Medium (0.40-0.55 cm) Thick (>0.55 cm)	3 5 7	Sneha, K 429 Lachit, Govind NDR 359, Janaki	70	MS
29. (*)	Stem: Length (excluding panicle; excluding floating rice)	Very short (<91 cm) Short (91-110 cm) Medium (111-130 cm) Long (131-150 cm) Very long (>150 cm)	1 3 5 7 9	Heera PR 106, Vajram Sabita Niraja ---	70	MS
30. (*)	Stem: Anthocyanin colouration of nodes	Absent Present	1 9	Chaitanya, IR 24 Amulya, Hemavathi	70	VS

31.	Stem: Intensity of anthocyanin coloration of nodes	Weak	3	CSR 27, RCM 5	70	VS
		Medium	5	Shaymala, Rongilee		
		Strong	7	Amulya, Saraswati		
32.	Stem: Anthocyanin colouration of internodes	Absent	1	IR24, Krishnaveni	70	VS
		Present	9	Prasanna, Janaki		
33. (*) (+)	Panicle: Length of main axis	Very short (<16 cm)	1	K 429, Sneha	70-90	MS
		Short (16-20 cm)	3	VL Dhan 221, Poornima		
		Medium (21-25 cm)	5	NDR 359, Shyamala		
		Long (26-30 cm)	7	Bas. 370, Rongilee		
		Very long (>30 cm)	9	---		
34. (*) (+)	Flag leaf: Attitude of blade (late observation)	Erect	1	IR 24	90	VG
		Semi-erect	3	Prasanna, VL dhan 81		
		Horizontal	5	VL Dhan 206		
		Deflexed	7	---		
35. (*) (+)	Panicle: Curvature of main axis	Straight	1	---	90	VG
		Semi-straight	3	Barh-avarodhi, Lachit		
		Deflexed	5	Govind, ADT 37		
		Dropping	7	Poornima, Bas. 386		
36.	Panicle: Number per plant	Few (<11)	3	Kranti, Heera	80-90	MS
		Medium (11-20)	5	Tulasi, Krishna Hamsa		
		Many (>20)	7	---		
37. (*)	Spikelet: Colour of tip of lemma	White	1	Aditya, Pantdhan 6	80-90	VS
		Yellowish	2	Prasanna, Pantdhan 12		
		Brown	3	Madya Vijaya, Bas. 385		
		Red	4	---		
		Purple	5	Rasi, Hemavathi		
		Black	6	---		
38. (+)	Lemma and Palea: Colour	Straw	1	Aditya, Chaitanya	80-90	VG
		Gold and gold furrows on straw background	2	Vibhava, Pant Dhan 11		
		Brown spots on straw	3	CTH 3		

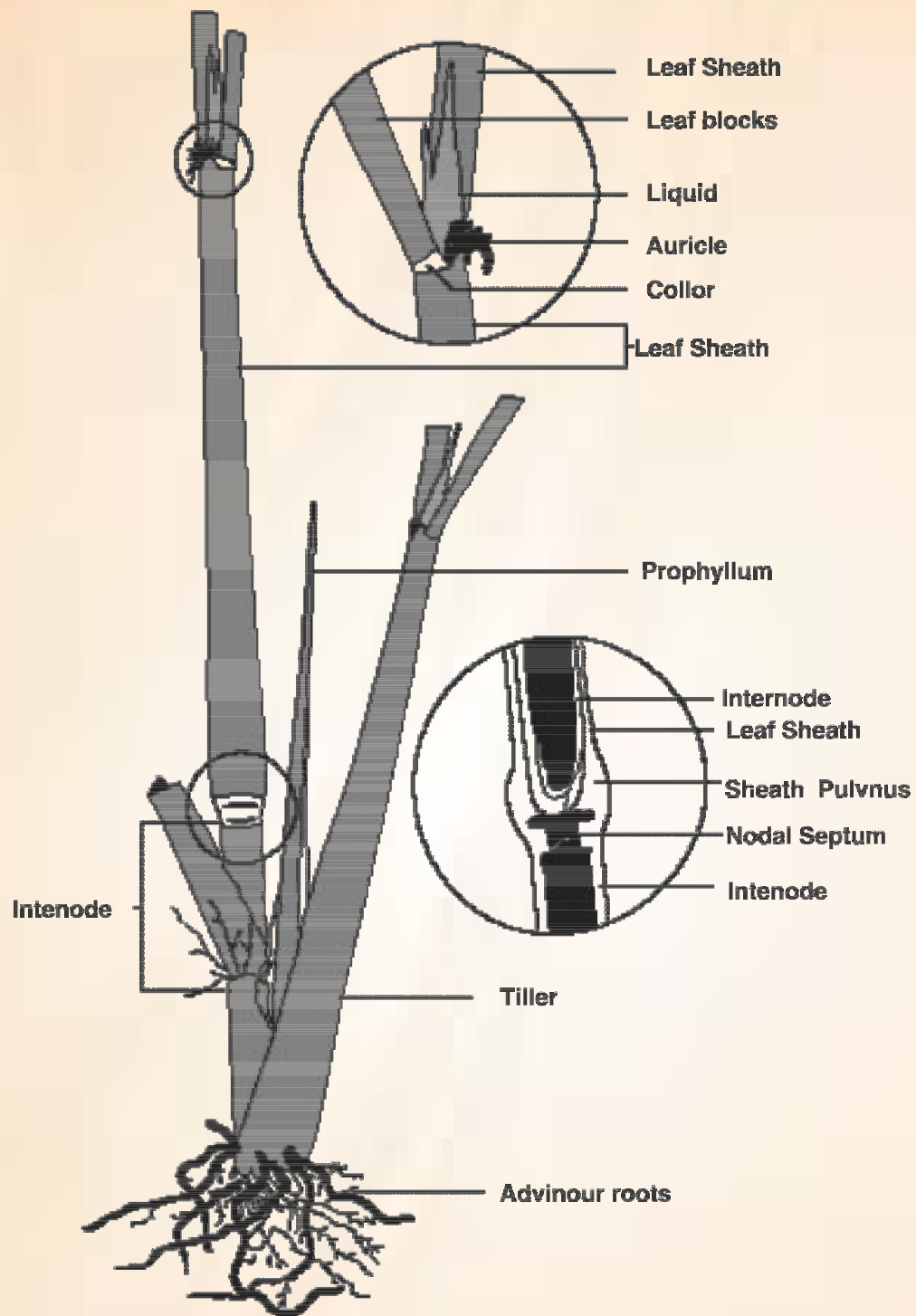|						
		Brown furrows on straw	4	---		
			5	---		
		Brown (tawny)	6	Bhogali		
		Reddish to light purple	7	Shyamala		
		Purple spots / furrows on straw	8	---		
		Purple	9	---		
		Black				
39. (*) (+)	Panicle: Awns	Absent	1	Jaya,Krishnaveni	90	VG
		Present	9	Pusa Bas.1		
40. (*)	Panicle: Colour of awns (late observation)	Yellowish White	1	Nidhi, Pantdhan 11	90	VS
		Yellowsh Brown	2	Nagarjuna, Bas. 370		
		Brown	3	-		
		Reddish brown	4	Bas. 385		
		Light red	5	---		
		Red	6	---		
		Light purple	7	---		
		Purple	8	---		
		Black	9	Bhogali		
41.	Panicle: Length of longest awn	Very short	1	Nidhi, Pantdhan 11	90	VG-MS
		Short	3	Shamyala		
		Medium	5	Bas. 385		
		Long	7	Kasturi, Bas. 386		
		Very long	9	---		
42. (*)	Panicle: Distribution of awns	Tip only	1	Jawahar, Pantdhan 11	90	VS
		Upper half only	3	Bas. 370, ASD 20		
		Whole length	5	Pusa Bas. 1, Bas. 385		
43. (+)	Panicle : Presence of secondary branching	Absent	1	---	90	VG
		Present	9	Rasi, Bas. 370		
44. (+)	Panicle: Secondary branching	Weak	1	Pantdhan 10, Bas. 386	90	VG
		Strong	2	Annada, Pantdhan 11		
		Clustered	3	---		
45. (*) (+)	Panicle: Attitude of branches	Erect	1	---	90	VG
		Erect to semi-Erect	3	Sasyasree		
		Semi-erect	5	Mangal		
		Semi-erect to spreading	7	Pantdhan 10		
		Spreading	9	Pantdhan 4		

46. (*) (+)	Panicle: Exertion	Partly exerted Mostly exerted Well exerted	3 5 7	Suraksha, Vibhava Chaitanaya, Pantdhan 4 VL Dhan 221	90	VG
47.	Time maturity (days)	Very early (<100) Early (101-120) Medium (121-140) Late (141-160) Very late (>160)	1 3 5 7 9	Heera Rasi, Ravi Vikas, Triguna Bas. 370 Kushal, Sabita	90	VG
48.	Leaf: Senescence	Early Medium Late	3 5 7	VL Dhan 81, K 429 IR 8, Bas. 385 Bas. 370	92	VG
49. (*) (+)	Sterile lemma: Colour	Straw Gold Red Purple	1 2 3 4	Tulasi, Pantdhan 11 Vibhava, Shanti Ambemohar 157 Bhogali	92	VS
50.	Grain: Weight of 1000 fully developed grains	Very low (<15 g) Low (15-20 g) Medium (21-25 g) High (26-30) Very high (>30 g)	1 3 5 7 9	PKV HMT, Sugandha Dubraj, Sita Bas. 370, Bas. 386 Mahamaya, PR 113 Pant Dhan 4	92	MG
51. (+)	Grain: Length	Very short (<6.0 mm) Short (6.1-8.5 mm) Medium (8.6-10.5 mm) Long (10.6-12.5 mm) Very long (>12.5 mm)	1 3 5 7 9	Tarunbhog Vajram, CSR 10 Pant Dhan 4, CSR 13 Sabita, Bas. 386 IET 18004, IET 18006	92	MS
52.	Grain: Width	Very narrow (<2.0 mm) Narrow (2.1-2.5 mm) Medium (2.6-3.0 mm) Broad (3.1-3.5 mm) Very broad (>3.5 mm)	1 3 5 7 9	Sugandha Dubraj, Bas. 370 Pant Dhan 4, Sabita Kranthi, Matangini ---	92	MS

53. (+)	Grain: Phenol reaction of lemma	Absent Present	1 9	--- ---	92	VG
54. (*) (+)	Decorticated grain: Length	Short Medium Long Long* (Long for Basmati type) Extra long	1 3 5 7 9	Kushal Samba Mahsuri Ratna, Triguna Kasturi, Bas. 370 ---	92	MS
55. (*) (+)	Decorticated grain: Width	Narrow (<2.0 mm) Medium (2.0-2.5 mm) Broad (>2.5 mm)	3 5 7	Shanti Heera ---	92	MS
56. (*) (+)	Decorticated grain: Shape (in lateral view)	Short slender Short bold Medium slender Long bold Long slender Long slender* (For Basmati type) Extra long slender	1 2 3 4 5 5 6	Dubraj Salivahana Samba Mahsuri Vikramarya Krishna Hamsa Kasturi ---	92	MS
57. (*)	Decorticated grain: Colour	White Light brown Variegated brown Dark brown Light red Red Variegated purple Purple Dark purple	1 2 3 4 5 6 7 8 9	Sugandhamati --- --- --- Jyothi Red Triveni --- --- ---	92	VG
58. (+)	Endosperm: Presence of amylose	Absent Present	1 9	--- Vasumati	92	MG
59. (*) (+)	Endosperm: Content of amylose	Very low (<10%) Low (10-19%) Medium (20-25%) High (26-30%) Very high (>30%)	1 3 5 7 9	Hiyokumochi Norin 18 Taroari Basmati Jaya ---	92	MG

60. (+)	Varieties with endosperm of amylose absent only Polished grain: Expression of white core	Absent or very small Small Medium Large Fully chalky	1 3 5 7 9	---- ---- ---- ---- ----	90	MG
61. (+)	Gelatinization temperature through alkali spreading value	Low Medium High medium High	1 3 5 7	Pusa Basmati 1 Taroari Basmati Kasturi ---	92	MG
62. (*) (+)	Decorticated grain: Aroma	Absent Present	1 9	Jaya Bas. 370	92	MG

VIII. Explanation for the Table of characteristics:

Second leaf

Primary leaf

Coleoptile

Radicle

Leaf Sheath
Leaf blocks
Liquid
Auricle
Collor
Leaf Sheath

Prophyllum

Internode
Leaf Sheath
Sheath Pulvnus
Nodal Septum
Intenode

Intenode

Tiller

Advinour roots
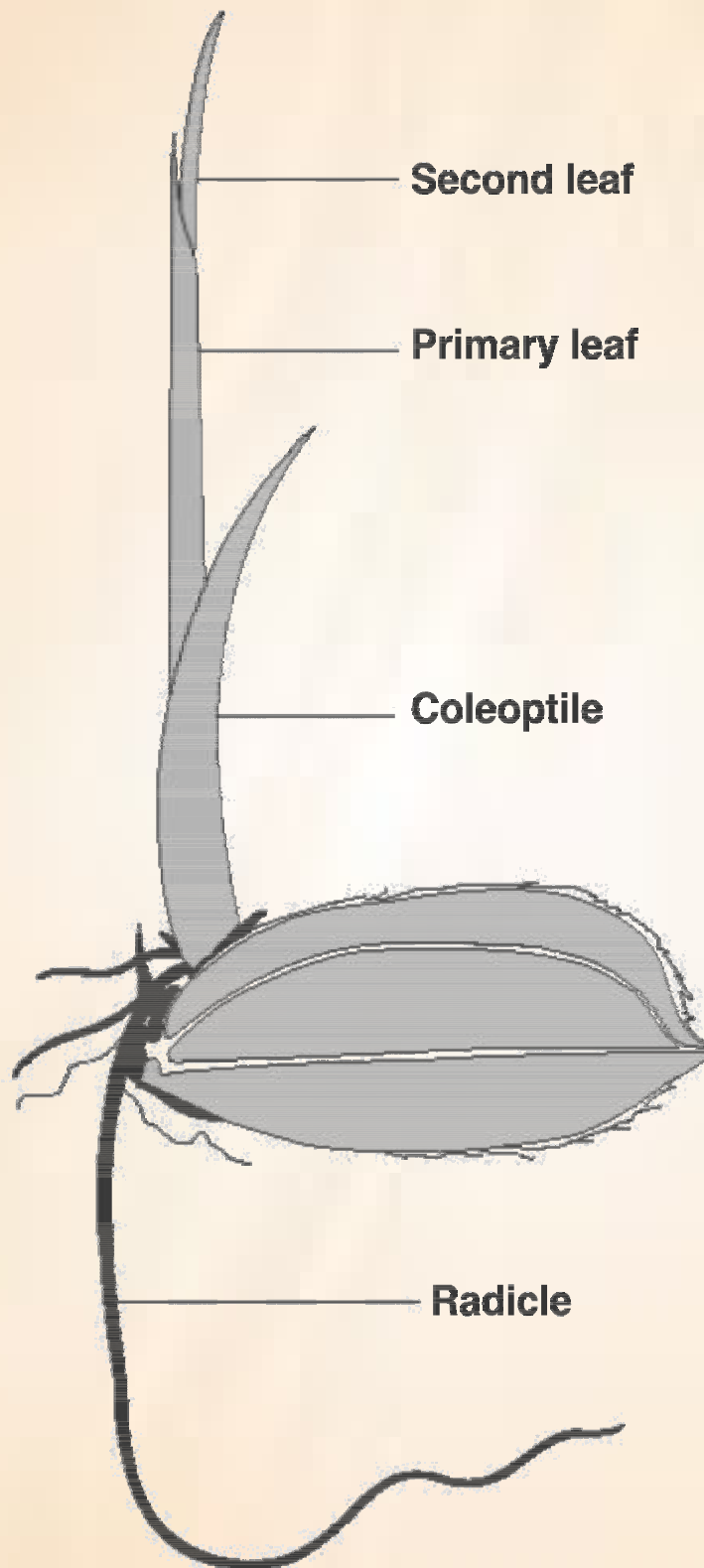
Characteristic 6. Leaf Sheath: Anthocyanin colouration
Characteristic 9. Leaf: Auricle
Characteristic 11. Leaf: Collar
Characteristic 13. Leaf: Ligule
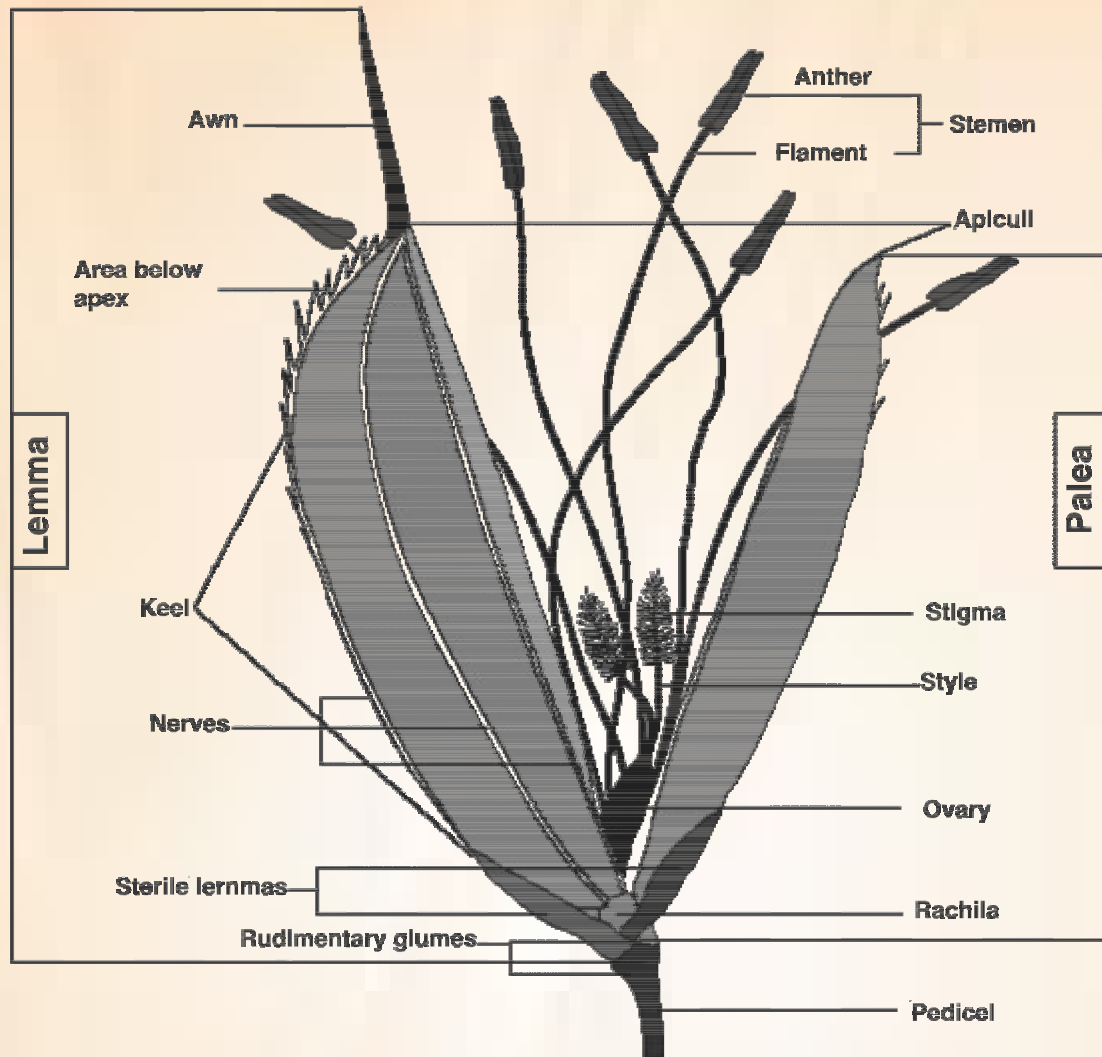
Characteristic 24. Lemma: Anthocyanin colouration of keel
Characteristic 25. Lemma: Anthocyanin colouration of area below apex
Characteristic 26. Lemma: Anthocyanin colouration of apex
Characteristic 27. Spikelet: Colour of stigma
Characteristic 38. Lemma and Palea: Colour
Characteristic 39. Panicle: Awns
Characteristic 49. Sterile lemma: Colour

Characteristic 14. Leaf : Shape of ligule
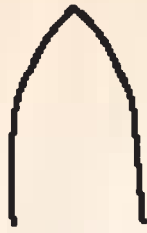
Truncate	Actute	Split
1	2	3

Characteristic 19. Culm : attitude
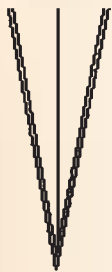
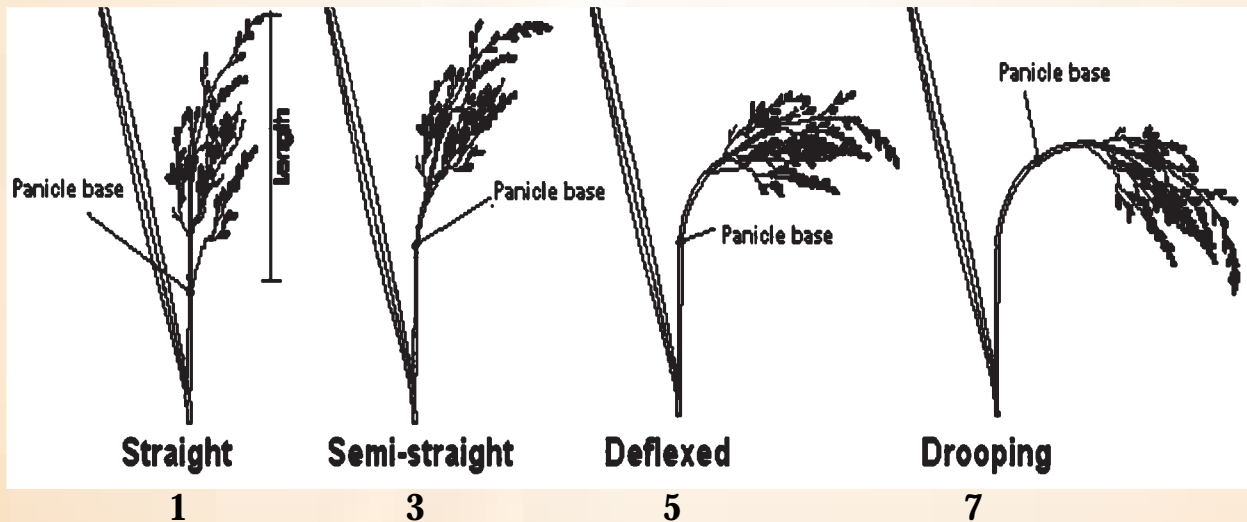| Erect	Semi-erect	Open	Spreading
1	3	5	7
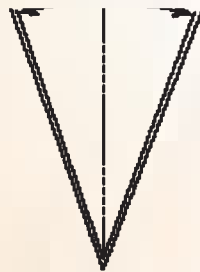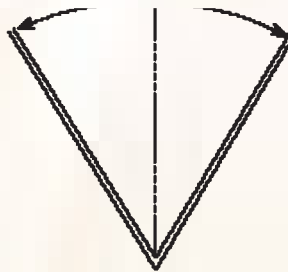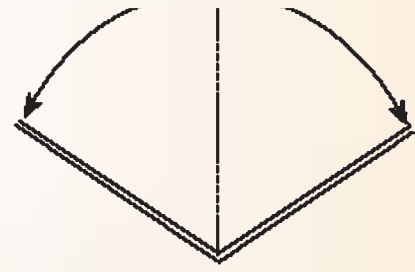
Characteristic 33. Panicle : Length of main axis

Pedicel

Spikelet

Length of main axis

Secondary branch

Panicle axis

Primary branch

Flag leaf

Panicle base

Uppermost internode

Part of Panicle
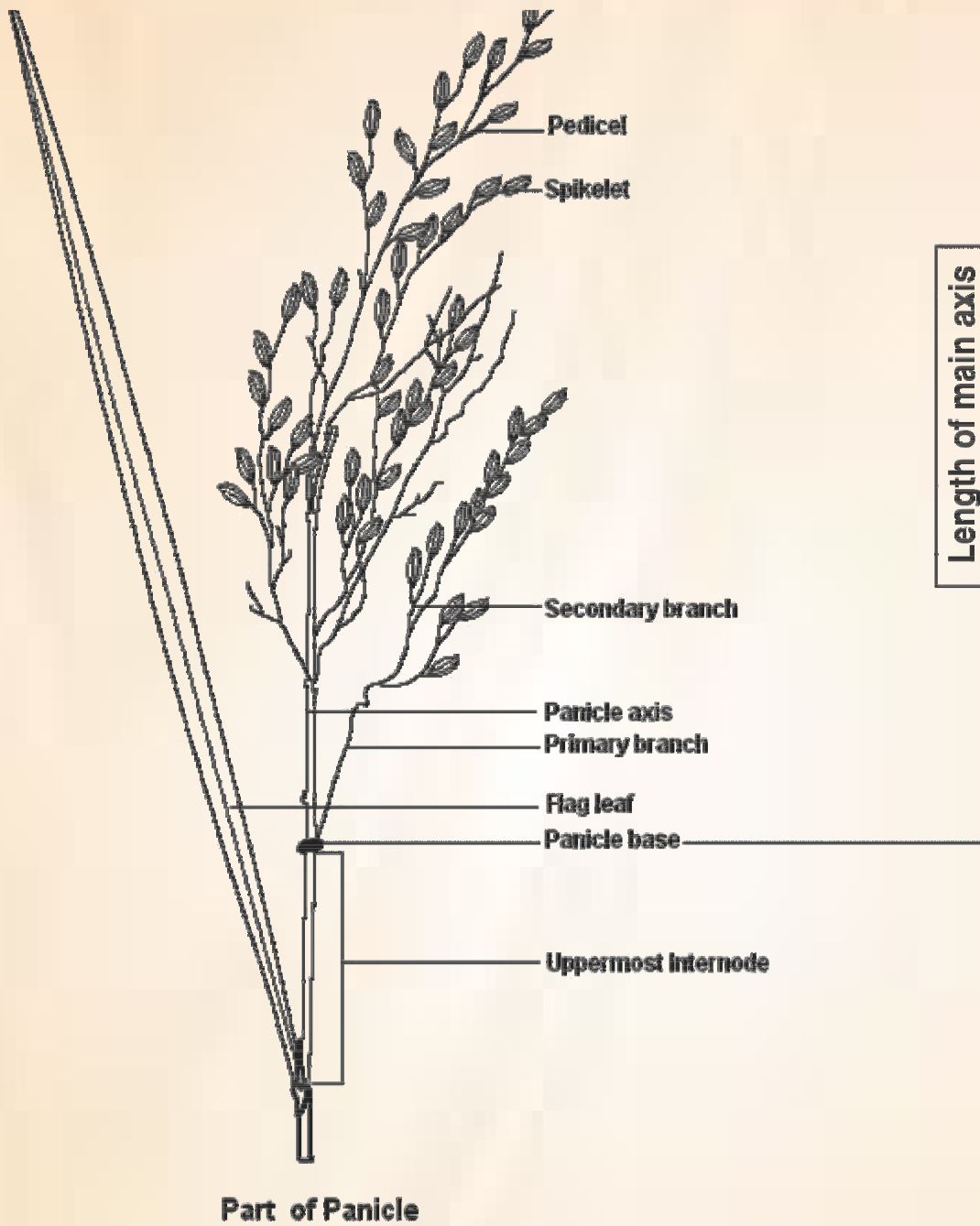
Characteristic 21 and 34. Flag leaf : attitude of blade (early observation (21), late observation (34))

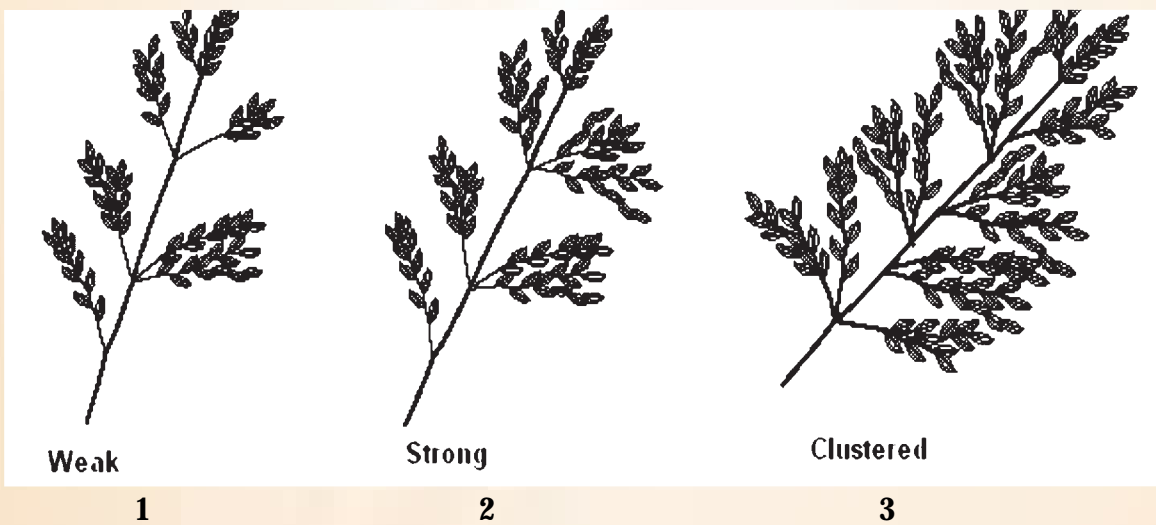| Erect	Semi-erect	Horizontal	Deflexed
1	3	5	7
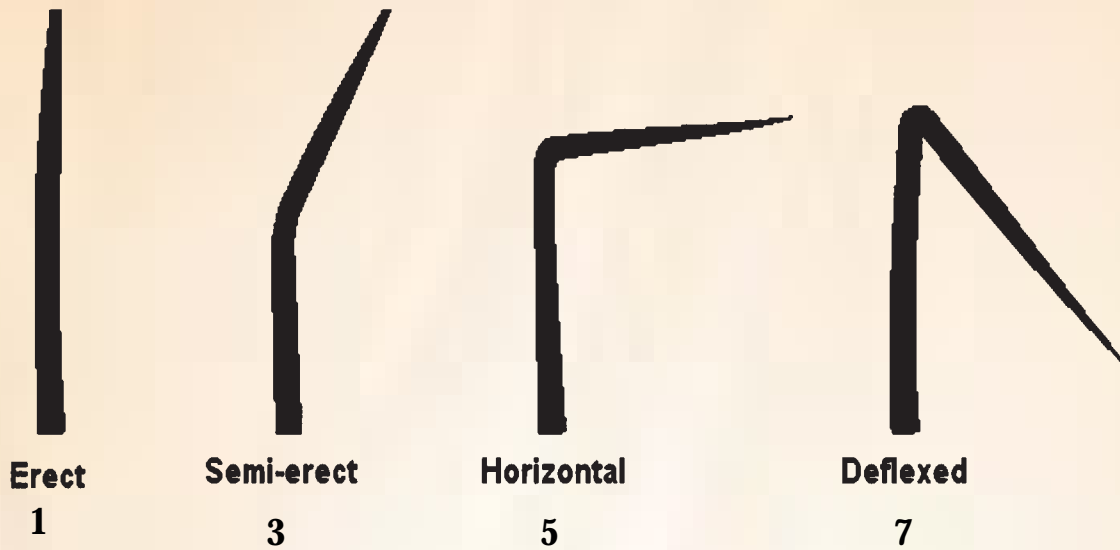
Characteristic 35. Panicle : Curvature of main axis

Straight	Semi-straight	Deflexed	Drooping
1	3	5	7

Characteristic 43. Panicle : Presence of secondary branching

Absent

1

Present

9

Characteristic 44. Panicle : Secondary branching

Weak

1

Strong

2

Clustered

3

Characteristic 45. Panicle : Attitude of branches

Erect	Erect to Semi-erect	Semi-erect
1	3	5

Semi-erect to spreading	Spreading
7	9
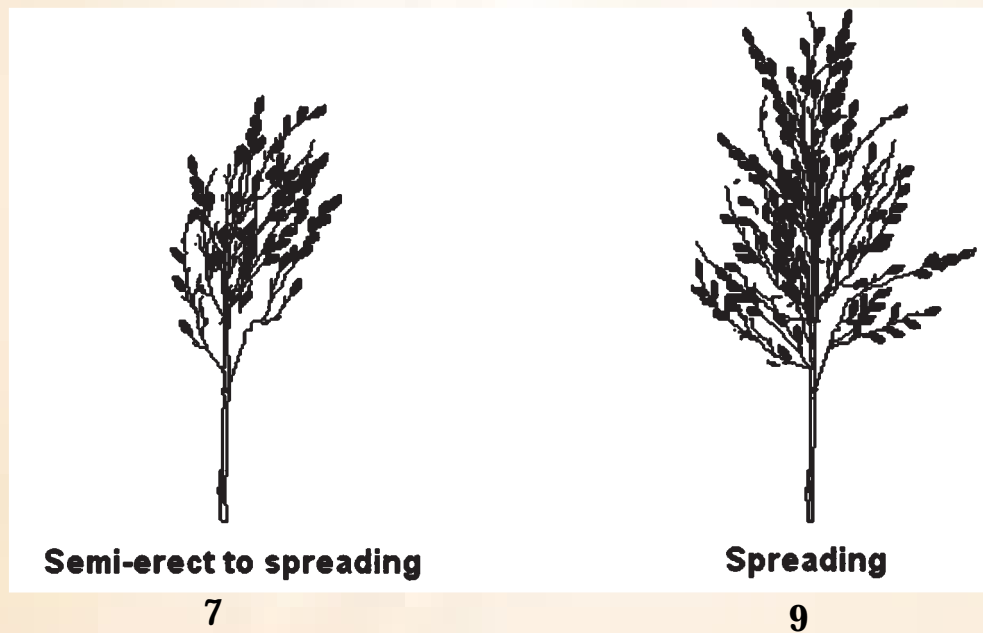
Characteristic 46. Panicle : Exsertion

Partly exserted <80%	Mostly exserted 81-99%	Well exserted 100%
3	**5**	**7**
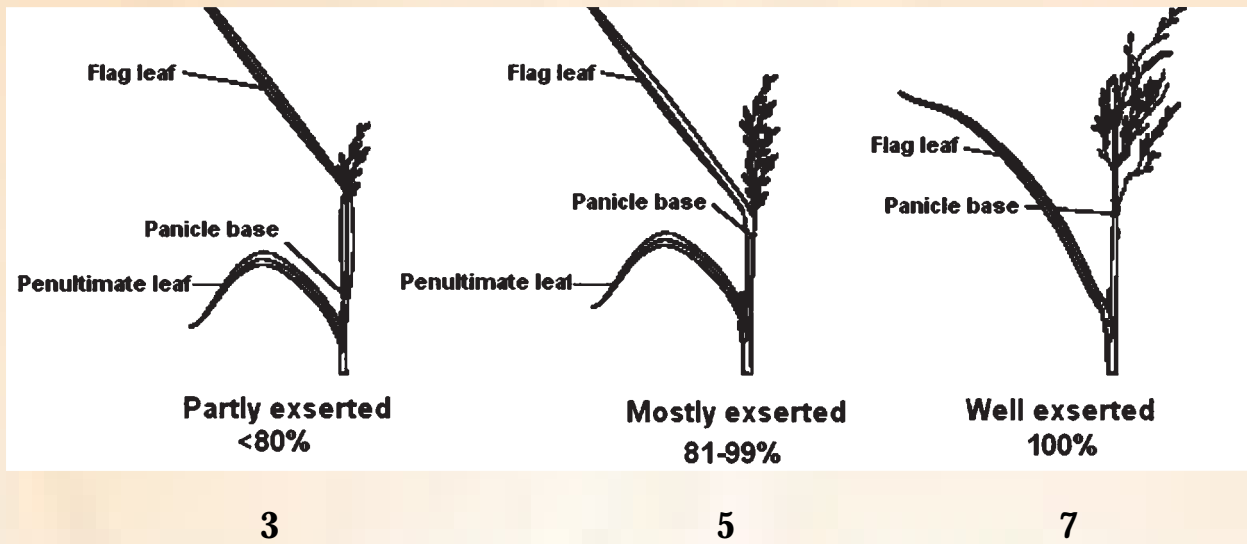
Characteristic 51 : Grain : Length

1. Very short
3. Short
5. Medium
7. Long
9. Very long
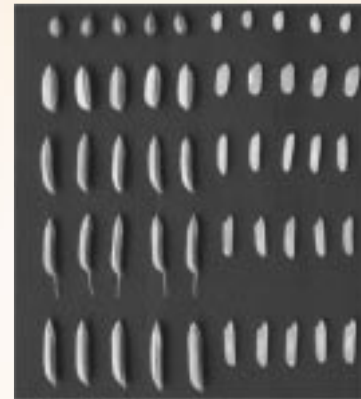
Characteristic 53: Grain: phenol reaction of lemma

Grains are soaked in 1.5 percent aqueous phenol solution for 24 hours, drained and air-dried. Hull color is then recorded unstained and stained (Chang, T.T. and E.A. Bardenas, 1965).

## Characteristic 54: Decorticated grain: Length (mm)

Please see the diagram "length and width measures of the grain".

Characteristic 55: Decorticated grain: Width (mm)

Please see the diagram "Length and width measures of the grain".

Characteristic 56: Decorticated grain: Shape (in lateral view)

After dehusking (brown rice) or after milling (polished rice) the length and breadth of the grains are measured for computing the shape and size. Select minimum 10 full grains per replication with both the ends intact
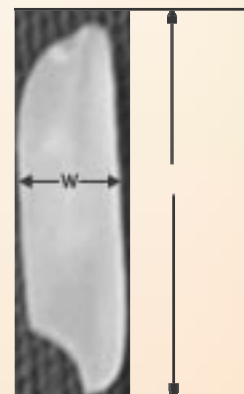
Length and width measures of the grain

and measure the length and breath by using Grain Shape Tester or Dial Micrometer. Average of length and breadth measurements are taken in millimeters and length/breadth ratio is calculated. Ramaiah, 1969, classification is used to assign the grain shape based on length and length / breadth ratio.

As referred in Rice Research in India: ICAR Publication, 1985.

State	Kernel length (mm)	Length/breadth ratio	Note
Short Slender	< 6.0	> 3.0	1
Short Bold	< 6.0	< 2.5	2
Medium Slender	< 6.0	2.5-3.0	3
Long Slender	> 6.0	> 3.0	4
Long Bold	> 6.0	< 3.0	5
Basmati type	> 6.61	> 3.0	5
Extra Long Slender	> 7.5	> 3.0	6

Note : The classification of extra long slender grain is done according to SES, IRRI 1996; for Basmati type long slender grain length shall be more than 6.61 mm as per the proceedings of Annual Rice Workshop, 1998.

Characteristic 58: Endosperm: Presence of amylose

By observation glutinous rice has waxy grains and non-glutinous rice has non-waxy to transparent with various grades according to the amylose content of the endosperm. When it is necessary glutinous rice and rice with various grades of amylose content, chemical analysis is needed.

Characteristic 59: Endosperm: Content of amylose

The simplified procedure of Juliano (1971) is used for the amylose content analysis. Twenty whole-grain milled rice is ground in a UDY cyclone mill (sieve mesh size 60). 100 mg of rice powder is put into a 100 ml volumetric flask and 1 ml of 95% ethanol and 9 ml of 1N Sodium hydroxide are added. The contents are heated on a boiling water bath to gelatinize the starch. After cooling for one hour, distilled water is added and contents are mixed well. For each set of samples run, low, intermediate and high amylose standard varieties are included to serve as checks. Five ml of the starch solution is put in a 100 ml volumetric flask with a pipette. One ml of 1 N acetic acid, 2 ml of iodine solution (0.2 g iodine and 2.0 g potassium iodide in 100 ml of aqueous solution) is added and volume is made up with distilled water. Contents are shaken well and let stand for 20 minutes. Absorbance of the solution is measured at 620 nm with a spectrophotometer of standard make. Amylose content is determined by using a conversion factor and the results are expressed on a dry weight basis. The moisture content of the sample is essentially constant and need not be determined if the relative humidity and temperature of the laboratory is controlled.

State	Content of amylose	Note
Very low	3-9%	1
Low	10-19%	3
Medium	20-25%	5
High	26-30%	7
Very high	> 30%	9

Characteristic 60: Polished grain: Expression of white core (Varieties with endosperm of amylose absent only)

Degree of chalkiness describes the milled sample rice with respect to (a) white core (b) white belly and (c) white back. Chalky white spots often appear in the starchy endosperm. A white chalky region extending to the edge of the ventral side and towards the centre of the endosperm is called a white core. Soft textured, white spots occurring in the middle part on the ventral side (side on which the embryo lies) are called abdominal white or white belly. A long white streak on the dorsal side is called the white back.

State	Kernel (%)	Note
Absent or very small	None	1
Small	<25%	3
Medium	26-50%	5
Large	51-75%	7
Fully chalky	>75%	9

Characteristic 61: Gelatinization temperature

Gelatinization temperature through alkali spreading and clearing test (Little et. al., 1958)

Duplicate sets of six whole milled grains are spaced evenly in transparent plastic boxes (50 mm x 42 mm x 22 mm) containing 10 ml of 1.7% Potassium Hydroxide. The dishes are kept at 27-30oC for 23 hours undisturbed in an incubator. Standard varieties must be used as checks for high, intermediate and low gelatinization temperature. The spreading of kernels noted on a 7 point scale is expressed as average of six values. Scoring is done of follows:

Alkali spreading Value / Scale

1. Kernel not affected
2. Kernel swollen
3. Kernel swollen, collar incomplete and narrow
4. Kernel swollen, collar complete and wide
5. Kernel split or segmented, collar complete
6. Kernel dispersed, merging with collar
7. All kernel dispersed and intermingled

Alkali spreading Value / Scale	Classification	Gelatinization Temperature	Note
6-7	High	Low	1
4-5	Medium	Medium	3
3	Low, Medium	High, Medium	5
1-2	Low	High	7

Characteristic 62: Decorticated grain: Aroma

The method consists of adding about 15 ml of water to 5g of rice sample in a test tube (200 mm x 35 mm), soak for 10 minutes. Cook the sample in the water bath for 15 minutes. Transfer the cooked rice in to a petri dish. After cooling keep it in the refrigerator for 20 minutes. Then the petri plates are opened and the contents are smelled. The samples possessing the scent, as one could easily feel, produce a sharp and readily recognizable aroma. (DRR, unpublished).

SS   :   Strongly Scented

MS   :   Mild Scented

NS   :   Non Scented

IX. Literature

1. ". Matsuo T (Eds.) (1993-97) : "Science of the Rice Plant (Volumes 1-3)" Rural culture Association, Tokyo, Japan.

    Vol.1 Morphology (1993)

    Vol.2 Physiology (1995)

    Vol.3 Genetics (1997), Indices (1997)

2. Chang T.T. and E. A. Bardenas 1965. The morphology and varietal characters of the rice plant. Technical Bulletin 4, IRRI, Philippines, 40 p

3. Ramaiah K., 1969. Grain Classification page No. 629 - Rice Research in India, ICAR Publication, 1985.

4. Juliano B.O., 1971. A simplified assay for milled rice amylose. Cereal Sci. Today 16: 334-339.

5. Little RR, G.B. Hilder and E.H. Dawson 1958. Differential effect of dilute alkali on 25 Varieties of milled white rice. Cereal Chem. 35: 111-126.

6. Singh R.K., U.S. Singh and G.S. Khush (Eds.) (2000)

    Aromatic Rices. Oxford and IBH Pub. Pvt. Ltd., New Delhi, India.

X. Working Group details:

The Test Guideline developed by the National Core Committee in consultation with the Project co-ordinator (Rice), the Nodal Officer, DUS Testing, DRR, Hyderabad and the Task Force (1/2005) constituted by the PPV&FR Authority

The Members of the Task Force (1/2005)

Dr. M. V. Rao (Chairman)

Dr. S. Bala Ravi

Dr. A. Seetharam

Dr. O. P. Makhija

Dr. S. P. Sharma

Dr. B. S. Dhillon

Dr. R. V. Singh

Dr. J. L. Tikkoo

Dr. (Mrs.) Malathi Laxmi Kumaran

Dr. (Mrs.) Roshini Nair

Dr. S. K. Chakrabarty

Nodal Person

Dr. (Mrs.) N. Shobha Rani

Dr. L. V. Subba Rao