International Rice Research Institute
and
International Board for Plant Genetic Resources

DESCRIPTORS FOR RICE ORYZA SATIVA L.

by
IBPGR-IRRI Rice Advisory Committee

The International Rice Research Institute
P. O. Box 933, Manila, Philippines
1980

PREFACE

THE NEED IN CROP RESEARCH for uniform descriptors and descriptor-states on a decimal basis has long been recognized. During 1964-67, T. T. Chang of IRRI collaborated with the staff of the FAO-IAEA Joint Division on Food and Agriculture (Vienna) in developing standard records. The IRRI rice variety catalog (IRRI 1970), made from a computer print-out, represents the outcome of such an endeavor.

Since its inception in 1974, the International Board for Plant Genetic Resources (IBPGR) has advocated the development and adoption of uniform descriptors and descriptor-states in crop germplasm work. This bulletin stems from discussions initially held at IRRI among a group of interested rice researchers during the 1977 IRRI-IBPGR Workshop on the Genetic Conservation of Rice (IRRI 1978). The descriptors and descriptor-states were finalized at the second meeting of the IBPGR-IRRI Rice Advisory Committee held at the Beltsville Agricultural Research Center of the USDA, Beltsville, Maryland, in late 1978. A preliminary version of the bulletin appeared in Plant Genetic Resources Newsletter 38, 1979. Contributors to this list of descriptors and descriptor-states are enumerated in the last section of the bulletin.

The IBPGR and IRRI recommend this list for use by the world community of rice workers.

Comments and suggestions on this bulletin will be welcomed by IBPGR and IRRI. Communications may be sent to T. T. Chang, IRRI, P.O. Box 933, Manila, Philippines.

N. C. Brady
Director-General, IRRI

I. Minimum list of descriptors and descriptor-states for characterizing the cultivars of rice (*Oryza sativa* L.)

Descriptor[1]	Code	Guide	Growth stage
1. Accession number			
2. Name			
3. Former designation			
4. Seed source			
5. Country of origin			
6. Variety group	1	indica	
	2	sinica (japonica)	
	3	javanica	
	4	intermediates (hybrids)	
7. Seedling height	2		5-leaf stage
LEAF (below the flag leaf)			
8. Length	2		late vegetative stage
9. Width	2		late vegetative stage
10. Blade pubescence[3]	1	glabrous	late vegetative stage
	2	intermediate	
	3	pubescent	
11. Blade color[3]	1	pale green	late vegetarive stage
	2	green	
	3	dark green	
	4	purple tips	
	5	purple margins	
	6	purple blotch	
	7	purple	
12. Basal leaf sheath color[3]	1	green	early to late vegetative stage
	2	purple lines	
	3	light purple	
	4	purple	
13. Angle[3]	1	erect	prior to heading
	5	horizontal	
	9	drooping	
14. Flag leaf angle[3] (see Fig. 1)	I	erect	after heading
	3	intermediate	
	5	horizontal	
	7	descending	
LIGULE			
15. Length	1		late vegetative stage
16. Color[3]	1	white	late vegetative stage
	2	purple lines	
	3	purple	
17. Shape[3] (see Fig. 2)	1	acute to acuminate	late vegetative stage
	2	2-cleft	
	3	truncate	

[1] The capitalized words will serve as the main heading for the various descriptors following its when arranged in a tabular form.
[2] Enter actual measurements (in metric units) or counts.
[3] Use X for a mixture of different types.

Descriptor	Code	Guide	Growth stage
18. Collar color[3]	1	pale green	late vegetative stage
	2	green	
	3	purple	
19. Auricle color[3]	1	pale green	late vegetative stage
	2	purple	
DAYS TO HEADING			
20. Number of days from effective seeding date to 50% heading.			
CULM			
21. Length	2		after flowering
22. Number	2		after flowering
23. Angle[3] (see Fig. 3)	1	erect	after flowering
	3	intermediate	
	5	open	
	7	spreading	
	9	procumbent	
24. Culm diameter	2		after flowering
25. Internode color[3]	1	green	after flowering
	2	light gold	
	3	purple lines	
	4	purple	
26. Strength (lodging resistance)	1	strong (no lodging)	after flowering up to maturity
	3	moderately strong (most plants leaning)	
	5	intermediate (most plants moderately lodged)	
	7	weak (most plants nearly flat)	
	9	very weak (all plants flat)	
PANICLE			
27. Length	2		near maturity
28. Type[3] (see Fig. 4)	1	compact	near maturity
	5	intermediate	
	9	open	
29. Secondary branching[3] (see Fig. 5)	0	absent	near maturity
	1	light	
	2	heavy	
	3	clustering	
30. Exsertion[3] (see Fig. 6)	1	well exserted	near maturity
	3	moderately well exserted	
	5	just exserted	
	7	partly exserted	
	9	enclosed	
31. Axis[3]	1	straight	at maturity
	2	droopy	
32. Shattering	1	very low (less than 1%) at maturity	
	3	low (1-5%)	
	5	moderate (6-25%)	
	7	moderately high (26-50%)	
	9	high (more than 50%)	
33. Threshability	1	difficult	at maturity
	5	intermediate	
	9	easy	

Descriptor[1]	Code	Guide	Growth stage
GRAIN (Spikelet)			
34. Awning[3]	0	absent	flowering to maturity
	1	short and partly awned	
	5	short and fully awned	
	7	long and partly awned	
	9	long and fully awned	
35. Awn color[3]	1	straw	at maturity
	2	gold	
	3	brown (tawny)	
	4	red	
	5	purple	
	6	black	
36. Apiculus color[3]	1	white	at maturity
	2	straw	
	3	brown (tawny)	
	4	red	
	5	red apex	
	6	purple	
	7	purple apex	
37. Stigma color[3]	1	white	at flowering
	2	light green	
	3	yellow	
	4	light purple	
	5	purple	
38. Lemma and palea color[3]	0	straw	at maturity
	1	gold and/or gold furrows on straw background	
	2	brown spots on straw	
	3	brown furrows on straw	
	4	brown (tawny)	
	5	reddish to light purple	
	6	purple spots on straw	
	7	purple furrows on straw	
	8	purple	
	9	black	
	W	white	
39. Lemma and palea pubescence[3]	1	glabrous	flowering to maturity
	2	hairs on lemma keel	
	3	hairs on upper portion	
	4	short hairs	
	5	long hairs (velvety)	
40. Sterile lemma color[3]	1	straw (yellow)	at maturity
	2	gold	
	3	red	
	4	purple	
41. Sterile lemma length[3]	1	short (not longer than 1.5 mm)	at maturity
	3	medium (1.6-2.5 mm)	
	5	long (longer than 2.5 mm but shorter than the lemma)	
	7	extra long (equal to or longer than the lemma)	
	9	asymmetrical	

II. Explanations of descriptors and descriptor-states

1. ACCESSION NUMBER: An accession number is assigned to each variety or selection as its seed is received and registered. The accession number, once assigned, is never re-assigned to another accession, regardless of the seed viability of the accession during storage.
2. NAME: The variety or selection name given in the varietal catalog is that provided by the cooperating agency supplying the seed. In the case of a purified or selected strain of a farmer's variety, the official name given by the breeding station is preferred to the vernacular name. Example: SLO 17 (IRRI Acc. 6012) was derived from Gutti Kitchili, but it would be desirable to enter both designations with the vernacular name given in parentheses.

   The entry of duplicate names under one accession should be avoided except (1) when it is difficult to distinguish between compound or duplicate names — for example, IRRI Acc. 7164 is entered as Nang Quot (Lua Giang); (2) when a line under its pedigree name was widely distributed and utilized before it was released — for example, IR579-48-1 (Nilo 11, Palman 579, Sakha 1); and (3) when a traditional variety has two or more morphologic variants — for example, Kabiray (red) and Kabiray (white).

   For selections that did not reach the stage of official release, the pedigree name (example: B588OA 1-15) is preferred to the cross (example: CP231/SLO17), except in cases where the pedigree name was not provided.

   Synonyms of selections (abbr. Sel. or S. or Seln.) are strain, line, yu, or iku.

   The words "rice," (or its equivalent) and "Number" (No. or its equivalent) should be deleted from the names.

   In the case of the unusually long names of varieties from the Mountain Provinces of the Philippines, the word common to these names could be abbreviated (example: Paley or Pagen is shortened to P) in several instances, to provide space in the punch card for the other words that make up the variety name.

   Accessions with identical names from the same or from different sources are considered as different biotypes or eco-strains. In some cases, the origin or morphologic difference is indicated in the name in parentheses following the variety name, for example, Mereke (Cameroon) and Dou-u-lan (red stem).

   The arrangement of accessions in the varietal catalog is in two parts; the named varieties or pedigreed selections are followed by the numbered selections. The named accessions are arranged alphabetically and then numerically by serial number. Selections beginning with a Roman numeral are arranged as pedigreed selections.

   Numbers designated as P.I. and C.I. refer to the Plant Introductions and Cereal Investigations series, respectively, of the U.S. Department of Agriculture.
3. FORMER DESIGNATION: For the sake of continuity in identification, the designation given by the donor of seed should be recorded. It could be an accession number, genetic stock (G.S.) number, Plant Introductions number (P.I.), or Cereal Investigations number (C.I.) of the USDA, the pedigree name of a line, or a synonym.
4. SEED SOURCE: Seed source refers to the country (or region or territory) and the station from which the seed was received. The coded country and station numbers are connected by a hyphen.
5. COUNTRY OF ORIGIN: Origin refers to the country, region, or territory where the accession is known to have originated. The information on origin is generally provided by the agency supplying the seed and is given in code

numbers. A blank indicates that no information was given.

6. VARIETY GROUP: Classification of accessions into variety groups is based mainly on the morphologic features of the adult plant, and, to a certain extent. on grain appearance. Four major groups are recognized: (1) indica, (2) sinica (japonica). (3) javanica and (4) intermediates (hybrids). Since the variation in morphological features among varieties is continuous, it is sometimes difficult to make an accurate classification. [4]
7. SEEDLING HEIGHT: Seedlings (n[5] = 10) are measured for height at the 5-leafstage.[6] Height is recorded in cm from the base of the shoot to the tip of the tallest leaf blade.
8. LEAF LENGTH: Leaf length is measured in centimeters from the topmost leaf blade below the flag leaf on the main culm ($n = 5$). Time: late vegetative stage.
9. LEAF WIDTH: Width is measured at the widest portion of the blade on the leaf below the flag leaf ($n = 5$). Time: late vegetative stage.
10. BLADE PUBESCENCE: Blade surfaces are classified as (1) glabrous (smooth) including ciliated margins, (2) intermediate. or (3) pubescent. Time: late vegetative stage.
11. BLADE COLOR: Seven broad classes of blade color are recognized: (1) pale green, (2) green, (3) cark green, (4) purple tips, (5) purple margins. (6) purple blotch (purple mixed with green), and (7) purple (full). Time: late vegetative stage.
12. BASAL LEAF SHEATH COLOR: Color of the outer surface of the leaf sheath is classified as (1) green, (2) purple lines. (3) light purple, and (4) purple. Time: early to late vegetative stage.
13. LEAF ANGLE: The angle of openness of the blade tip is measured against the culm on the leaf below the flag leaf: (1) erect, (5) horizontal, (9) drooping. Time: prior to heading.
14. FLAG LEAF ANGLE: Leaf angle is measured near he collar as the angle of attachment between the flag leaf blade and the main panicle axis ($n = 5$). Four classes are recognized: (1) erect, (3) intermediate, (5) horizontal. and (7) descending. Time: after heading. See Figure 1.
15. LIGULE LENGTH: Ligule length is measured in millimeters from the base of the collar to the tip ($n = 5$). Its absence is denoted by a blank. Time: late vegetative stage.
16. LIGULE COLOR: Three classes of ligule colors are recognized: (1) white, (2) purple lines. and (3) purple. Time: late vegetative stage.
17. LIGULE SHAPE: Three classes are given: (1) acute to acuminate, (2) 2-cleft. and (3) truncate. Time: late vegetative stage. See Figure 2.
18. COLLAR COLOR: Collar color is (1) pale green, (2) green, or (3) purple. Time: late vegetative stage.
19. AURICLE COLOR: Auricles are (1) pale green, or (2) purple. Time: late vegetative stage.
20. NUMBER OF DAYS FROM EFFECTIVE SEEDING DATE TO 50% HEADING: For wetland culture, use the date on which sowing on a wet seedbed or waking of seed was made. For direct-seeded rice. use the effective seeding date to indicate the date when rain or other moisture became available to the seed for germination.
21. CULM LENGTH: Culm length is measured in centimeters from ground level to the base of the panicle ($n = 5$). Time: after heading.
22. CULM NUMBER: Culm number is recorded after full heading as the total number of grain-bearing and non-bearing tillers ($n = 5$). Time: after heading.
23. CULM ANGLE: Culm angle readings are based on plants grown in the entire plot. Five broad classes are recognized:
    - (1) Erect — the angle is less than 30° from the perpendicular.
    - (3) Intermediate — the angle is about 45°.
    - (5) Open — the angle is about 60°.
    - (7) Spreading — the angle is more than 60° but the culms do not rest on the ground.
    - (9) Procumbent — the culm or its lower part rests on ground surface.

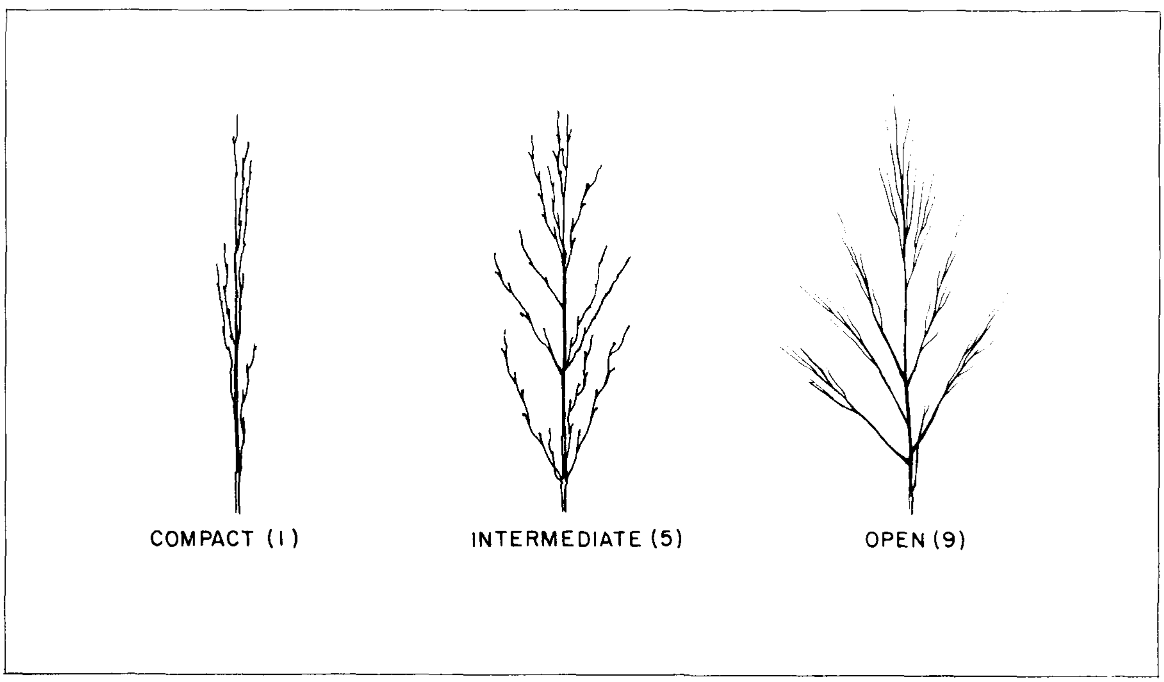
    Time: after flowering. See Figure 3.
24. CULM DIAMETER: Data are taken in millimeters from the outer diameter of the culms ($n = 3$) measured at the midportion of the culm. Time: around flowering period.
25. INTERNODE COLOR: The outer surface of the internodes on the culm ($n = 3$) is recorded as (1) green, (2) light gold, (3) purple lines, and (4) purple. Time: after flowering.
26. CULM STRENGTH (lodging resistance): Culm strength is first rated after panicle emergence by gently pushing the tillers back and forth a

[4] See Lu and Chang (1980), p.10-11.
n = sample size.
[6] See Chang and Bardenas (1965). p. 5-7.

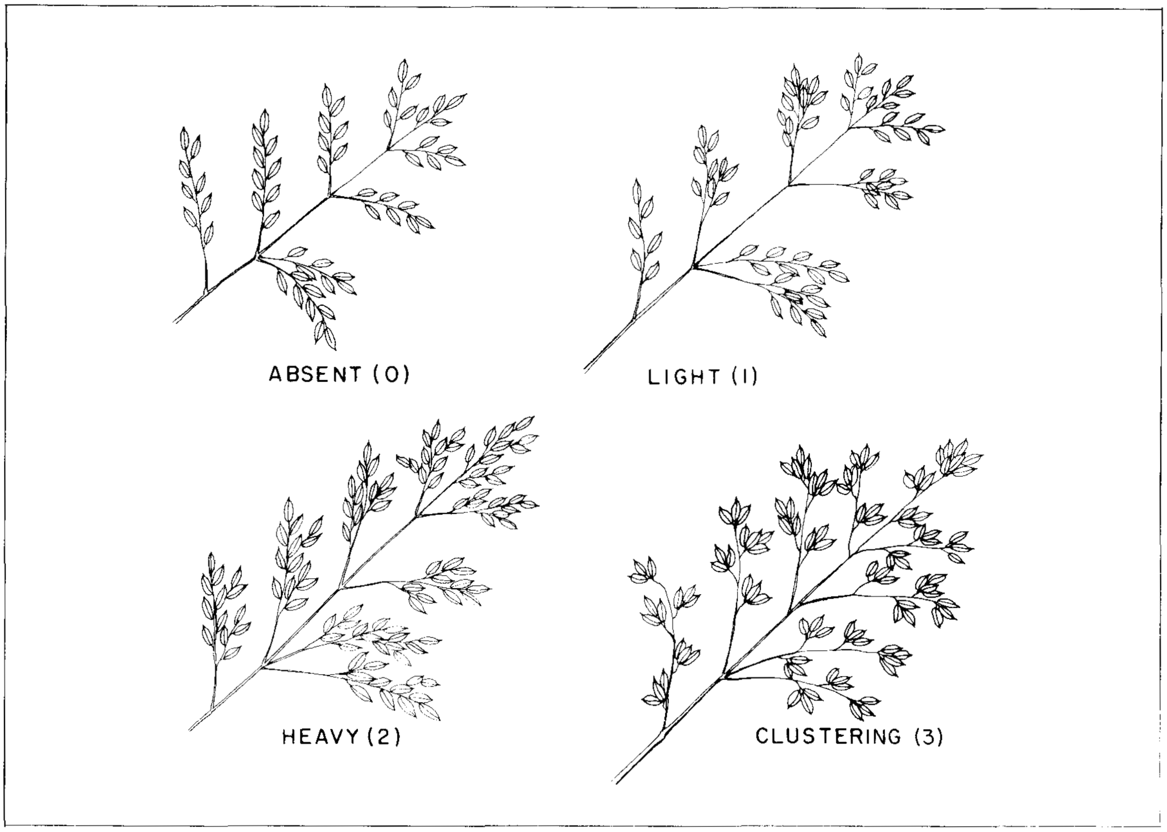
few times. This test gives some indication of culm stiffness and resilience. Final observation at maturity is made to record standing position of plants. Plants in the plots are classified as (1) strong (no lodging), (3) moderately strong (most plants leaning), (5) intermediate (most plants moderately lodged), (7) weak (most plants nearly flat), and (9) very weak (all plants flat).

27. PANICLE LENGTH of panicles (n = 5) is measured in centimeters from the base to the tip of the panicle. Time: near maturity.
28. PANICLE TYPE: Panicles are classified according to their mode of branching, angle of primary branches, and spikelet density: (1) compact, (5) intermediate, and (9) open. Time: near maturity. See Figure 4.
29. SECONDARY BRANCHING: Secondary branches bearing the spikelets may be (0) absent, (1) light, (2) heavy, and (3) clustering. See Figure 5.
30. PANICLE EXSERTION: The exsertion of the panicle above the flag leaf sheath after anthesis is classified as:
    - (1) well exserted — the panicle base appears way above the collar of the flag leaf blade.
    - (3) moderately well exserted — the panicle base is above the collar of the flag leaf.
    - (5) just exserted — the panicle base coincides with the collar of the flag leaf.
    - (7) partly exserted — the panicle base is slightly beneath the collar of the flag leaf blade.
    - (9) enclosed — the panicle is partly or entirely enclosed within the leaf sheath of the flag leaf. Rating is based on the majority of plants in the plot.

    See Figure 6.
31. PANICLE AXIS: the panicle axis can be (1) straight, or (2) droopy at maturity.
33. PANICLE SHATTERING: The extent to which grains have shattered from the panicle at maturity is described as (1) very low (less than 1%), (3) low (l-5%), (5) moderate (6-25%), (7) moderately high (26-50%), and (9) high (more than 50%).
33. PANICLE THRESHABILITY: The matured panicle is grasped by the hand and a slight rolling pressure is applied with the palm and the fingers. Based on the extent of grain removal, three categories are recognized:
    - (1) difficult — few or no grains removed.
    - (2) intermediate — 25-50% of grains removed.
    - (3) easy — more than 50% of grains removed.
34. AWN PRESENCE: The awning character is recorded after full heading as: (0) absent, (1) short and partly awned, (5) short and fully



4. Panicle type.



5. Secondary branching.

awned, (7) long and partly awned, and (9) long and fully awned.

35. AWN COLOR: The color of awns is recorded at maturity as: (1) straw, (2) gold, (3) brown (tawny), (4) red, (5) purple, or (6) black.
36. APICULUS COLOR: Apiculus color is classified at maturity into 7 classes: (1) white, (2) straw, (3) brown or tawny, (4) red, (5) red apex,[7] (6) purple, and (7) purple apex.
37. STIGMA COLOR: Color of stigma is classified as: (1) white, (2) light green, (3) yellow, (4) light purple, and (5) purple. Stigma color is determined from blooming spikelets (between 9 a.m. and 2 p.m.) with the aid of a hand lens.
38. LEMMA AND PALEA COLOR: When the terminal spikelets are ripened, the color of lemma and palea is classified into 11 classes: (0) straw, (1) gold and/or gold furrows on straw background, (2) brown spots on straw, (3) brown furrows on straw, (4) brown (tawny), (5) reddish to light purple, (6) purple spots on straw, (7) purple furrows on straw, (8) purple, (9) black, and (W) white.
39. LEMMA AND PALEA PUBESCENCE: Pubescence of the hull is classified as: (1) glabrous, (2) hairs on lemma keel, (3) hairs on upper portion, (4) short hairs, and (5) long hairs (velvety).
40. STERILE LEMMA COLOR: When the terminal spikelets are approaching maturity, the color of sterile lemmas (n = 5) is classified into four classes: (1) straw (yellow), (2) gold, (3) red, and (4) purple.
41. STERILE LEMMA LENGTH: Measurement is made on each of the two sterile lemmas. Five classes are recognized on the basis of 5-grain samples:
    (1) short (not longer than 1.5 mm)
    (3) medium (1.6-2.5 mm)
    (5) long (longer than 2.5 mm but shorter than the lemma)
    (7) extra long (equal to or longer than the lemma)
    (9) asymmetrical

[7]Colored portion extending from the apiculus into the upper portion of the lemma.

42. SPIKELET STERILITY: Spikelet sterility readings are obtained from counts of well-developed spikelets in proportion to total number of spikelets on five panicles. Five classes are recognized:
(1) highly fertile (>90%)
(3) fertile (75-90%)
(5) partly sterile (50-74%)
(7) highly sterile (<50% to trace)
(9) completely sterile (0%)

43. 100-GRAIN WEIGHT: A random sample of 100 well-developed, whole grains dried to 13% moisture content is weighed on a precision balance to give the 100-grain weight.

44. GRAIN LENGTH: Grain length (n = 10) is measured in millimeters as the distance from the base of the lowermost sterile lemma to the tip (apiculus) of the fertile lemma or palea, whichever is longer.[8] In the case of awned varieties, the grain is measured to a point comparable to the tip of the apiculus.

45. GRAIN WIDTH: Width of grain (n = 10) is measured in millimeters as the distance across the fertile lemma and the palea at the widest point.[8] A modified photo-enlarger is used for measuring grain dimensions.

46. SEED COAT (bran) COLOR: Brown rice (dehulled grains) is classified into:
(1) white
(2) light brown
(3) speckled brown
(4) brown
(5) red
(6) variable purple
(7) purple

47. ENDOSPERM TYPE: The starchy endosperm is classified as: (1) nonglutinous or common (nonwaxy), or (2) glutinous (waxy). (3) indeterminate, and (X) mixed.

Classification is based on the staining reaction of the cut surface of endosperm (n = 5) to weak KI-I solution. Waxy starch stains brown; nonwaxy, blue black.

48. SCENT (aroma): Scent can be detected at flowering time, or determined from cooked kernel. Three classes are recognized: (0) nonscented. (1) lightly scented. and (2) scented.

49. LEAF SENESCENCE: The leaves below the flag leaf are observed at the time of harvest for their retention of greenness. Three classes are recognized: (1) late and slow senescence — two or more leaves retain their green color at maturity, (5) intermediate, and (9) early and fast senescence — leaves are dead when the grains have become fully ripened.

50. MATURITY: Maturity is recorded as the duration in days from seeding to the time when more than 80% of the grains on the panicles are fully ripened. When that information is not available, maturity is estimated by adding 30 days to the duration from seeding to full heading.

[8] See Chang and Bardenas (1965), p. 21.

REACTION TO BIOTIC FACTORS

Varietal reactions to diseases and insect pests may be recorded by a decimal scale. The general scale for biotic stresses, eco-edaphic stresses, and agronomic desirability follows:

		Stress		
Scale	**Desirability**	**Descriptive code**	**Disease severity**	**Insect damage**
Blank	No information		No incidence or missing plot	No incidence or missing plot
0		Immune	Absent	Absent
1	Satisfactory (high or good)	HR or VR	Less than 1%	Very slight damage, or 1-20% infestation
2		R		
3		MR	1-5%	Parts of plants damaged, or 21-40% infestation
4	Acceptable (intermediate or fair)	HI		
5		I	6-25%	Marked damage, or 41-60% infestation
6		LI		
7	Unsatisfactory (low or poor)	MS	26-50%	More than 50% plants dead and the remainder damaged, or 61-80% infestation
8		S	51-80%	
9		HS or VS	More than 80%	All plants dead, or 81-100% infestation

Additional notes:
R/S (Resistant/susceptible = segregation or seed mixture)
X (Mixture)

Scales for individual diseases and pests may be found in Standard Evaluation System for Rice,, 2d ed. (IRRI 1980). This booklet also contains scales for eco-edaphic stress factors such as problem soils, low temperature, high temperature, and submergence.

A detailed decimal scale for varietal resistance to drought and for recovery ability may be found in Loresto and Chang (1980).

GRAIN CHARACTERISTICS

1. Dimensions and shape (of grain, brown rice, or milled rice). Give measurements of length, width, and thickness in millimeters. Shape can be expressed by the length-width ratio.

   Three descriptive scales are widely used.

	FAO scale (mm) for milled rice	**USDA worker's scale (mm) for brown rice**	**IRTP-IRRI scale (mm) for brown rice**
Length class (80% of sample or more)			
Extra long	7.0 and over	—	Over 7.50
Long	6.0-6.99	6.6-7.5	6.61-7.50
Medium	5.0-5.99	5.5-6.6	5.51-6.60
Short	less than 5.0	less than 5.5	less than 5.51
Shape class (80% of sample or more)			
Slender (long)	over 3.0	over 3.0	over 3.0
Medium	—	2.1-3.0	2.1-3.0
Bold	2.0-3.0	less than 2.1	1.1-2.0
Round (short)	less than 2.0	—	less than 1.1

2. 100-grain weight — enter measurement in grams.
3. Seed coat color — (see 1.46)
4. Endosperm type — (see 1.47)
5. Scent — (see 1.48)
6. Amylose content.

Scale	Percent	Class
0	less than 3.0	waxy (glutinous)
1	3.1-10.0	very low
3	10.1-15.0	low
5	15.1-20.0	intermediate
7	20.1-25.0	intermediate-high
9	25.1-30.0	high

7. Translucency

Scale	Descriptive
1	Clear
5	Intermediate
9	Opaque

8. Chalkiness (white belly, white center or white back).

Scale	Descriptive
0	None
1	Small (less than 10% of kernel areal)
5	Medium (10.20% of kernel areal)
9	Large (more than 20% of kernel areal)

9. Milling yield - enter as percentage of total milled rice to rough rice (grain).
10. Gelatinization temperature or alkalidigestion value.

Scale	Descriptive	Alkali digestion	Gelatinization temperature
1	Not affected but chalky]	Low	High
2	Swollen		
3	Swollen with collar incomplete and narrow	Low-intermediate	High-intermediate
4	Swollen with collar complete and wide]		
5	Split or segmented with collar complete and wide	Intermediate	Intermediate
6	Dispersed, merging with collar]	High	Low
7	Completely dispersed and cleared		

11. Gel consistency.

Scale	Gel length	Gel consistency type
1	81-100 mm]	Soft
3	61-80 mm	
5	41-60 mm	Medium
7	36-40 mm	Medium-hard
9	26-35 mm	Hard

12. Brown rice protein — enter in percent.
13. Lysine content — enter in percent.
14. Parboiling loss (see Webb 1979)
15. Elongation ratio — ratio of cooked rice length to milled rice length.
16. Sensory factors other than scent (aroma) (see Del Mundo 1979).
    a. Flavor
    b. Off-flavor
    c. Tenderness
    d. Cohesiveness
    e. Whiteness
    f. Gloss

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