



Descriptors for

Rambutan

Nephellium lappaceum



List of Descriptors

Allium (E,S,F)	2001	Forage legumes * (E)	1984	Pistachio (A,R,E,F,)	1997
Almond (revised) * (E)	1985	Grapevine (E,S,F)	1997	Plum * (E)	1985
Apple (E)	1982	Groundnut (E,S,F)	1992	Potato variety * (E)	1985
Apricot * (E)	1984	Jackfruit (E)	2000	Quinoa * (E)	1981
Avocado (E,S)	1995	Kodo millet * (E)	1983	Rice * (E)	1980
Bambara groundnut (E,F)	2000	<i>Lathyrus</i> spp. (E)	2000	Rocket (E,I)	1999
Banana (E,S,F)	1996	Lentil * (E)	1985	Rye and Triticale * (E)	1985
Barley (E)	1994	Lima bean * (E,P)	1982	Safflower * (E)	1983
Beta (E)	1991	Litchi (E)	2002	Sesame * (E)	1981
Black pepper (E,S)	1995	Lupin * (E,S)	1981	<i>Setaria italica</i> and <i>S. pumilia</i> (E)	1985
<i>Brassica</i> and <i>Raphanus</i> (E)	1990	Maize (E,S,F, P)	1991	Sorghum (E,F)	1993
<i>Brassica campestris</i> L. (E)	1987	Mango (E)	1989	Soyabean * (E,C)	1984
Buckwheat (E)	1994	Medicago (Annual) * (E,F)	1991	Strawberry (E)	1986
<i>Capsicum</i> (E,S)	1995	Mung bean * (E)	1980	Sunflower * (E)	1985
Cardamom (E)	1994	Oat * (E)	1985	Sweet potato (E,S,F)	1991
Carrot (E,S,F)	1999	Oca * (S)	2001	Taro (E,F,S)	1999
Cashew (E)	1986	Oil palm (E)	1989	Tea (E,S,F)	1997
Cherry * (E)	1985	<i>Panicum miliaceum</i> and <i>P. sumatrense</i> (E)	1985	Tomato (E, S, F)	1996
Chickpea (E)	1993	Papaya (E)	1988	Tropical fruit * (E)	1980
<i>Citrus</i> (E,F,S)	1999	Peach * (E)	1985	<i>Vigna aconitifolia</i> and <i>V. trilobata</i> (E)	1985
Coconut (E)	1992	Pear * (E)	1983	<i>Vigna mungo</i> and <i>V. radiata</i> (Revised) * (E)	1985
Coffee (E,S,F)	1996	Pearl millet (E,F)	1993	Walnut (E)	1994
Cotton (Revised) (E)	1985	<i>Phaseolus acutifolius</i> (E)	1985	Wheat (Revised) * (E)	1985
Cowpea (E)	1983	<i>Phaseolus coccineus</i> * (E)	1983	Wheat and <i>Aegilops</i> * (E)	1978
Cultivated potato * (E)	1977	<i>Phaseolus vulgaris</i> * (E,P)	1982	White Clover (E)	1992
Echinochloa millet * (E)	1983	Pigeonpea (E)	1993	Winged Bean * (E)	1979
Eggplant (E,F)	1990	Pineapple (E)	1991	Xanthosoma (E)	1989
Faba bean * (E)	1985	<i>Pistacia</i> (excluding <i>Pistacia</i> <i>vera</i>) (E)	1998	Yam (E,S,F)	1997
Finger millet (E)	1985				
Forage grass * (E)	1985				

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PREFACE

Descriptors for Rambutan (*Nephelium lappaceum*) were developed by Drs Salma Idris, Felipe S. dela Cruz, Songpol Somsri and Bhag Mal. Dr Bhag Mal coordinated the development of this descriptor list. A draft version prepared in the internationally accepted IPGRI format for descriptor lists was subsequently sent to a number of international experts for their comments and amendments. A full list of the names and addresses of those involved is given in 'Contributors'.

IPGRI encourages the collection of data for all five types of descriptors (see **Definitions and Use of Descriptors**), whereby data from the first four categories – *Passport, Management, Environment and Site* and *Characterization* – should be available for any accession. The number of descriptors selected in each of the categories will depend on the crop and their importance to the description of the crop. Descriptors listed under *Evaluation*, allow for a more extensive description of accession, but generally require replicated trials over a period of time.

Although the suggested coding should not be regarded as the definitive scheme, this format represents an important tool for a standardized characterization system and it is promoted by IPGRI throughout the world.

This descriptor list provides an international format and thereby produces a universally understood 'language' for plant genetic resources data. The adoption of this scheme for data encoding, or at least the production of a transformation method to convert other schemes into the IPGRI format, will produce a rapid, reliable and efficient means for information storage, retrieval and communication, and will assist with the utilization of germplasm. It is recommended, therefore, that information be produced by closely following the descriptor list with regard to ordering and numbering descriptors, using the descriptors specified, and using the descriptor states recommended.

This descriptor list is intended to be comprehensive for the descriptors that it contains. This approach assists with the standardization of descriptor definitions. IPGRI does not, however, assume that each curator will characterize accessions of their collection utilizing all descriptors given. Descriptors should be used when they are useful to the curator for the management and maintenance of the collection and/or to the users of the plant genetic resources. However, highly discriminating descriptors are marked as highlighted text to facilitate selection of descriptors and are listed in Annex I.

Multicrop passport descriptors were developed jointly by IPGRI and FAO, to provide consistent coding schemes for common passport descriptors across crops. They are marked in the text as [MCPD]. Please note that owing to the generic nature of the multi-crop passport descriptors, not all descriptor states for a particular descriptor will be relevant to a specific crop. In Annex II, the reader will find a Collecting form for Rambutan that will facilitate data collecting.

Any suggestions for improvement on the Descriptors for Rambutan will be highly appreciated by IPGRI.

DEFINITIONS AND USE OF THE DESCRIPTORS

IPGRI uses the following definitions in genetic resources documentation:

Passport descriptors: These provide the basic information used for the general management of the accession (including registration at the genebank and other identification information) and describe parameters that should be observed when the accession is originally collected.

Management descriptors: These provide the basis for the management of accessions in the genebank and assist with their multiplication and regeneration.

Environment and site descriptors: These describe the environmental and site-specific parameters that are important when characterization and evaluation trials are held. They can be important for the interpretation of the results of those trials. Site descriptors for germplasm collecting are also included here.

Characterization descriptors: These enable an easy and quick discrimination between phenotypes. They are generally highly heritable, can be easily seen by the eye and are equally expressed in all environments. In addition, these may include a limited number of additional traits thought desirable by a consensus of users of the particular crop.

Evaluation descriptors: The expression of many of the descriptors in this category will depend on the environment and, consequently, special environmental designs and techniques are needed to assess them. Their assessment may also require complex biochemical or molecular characterization methods. This type of descriptor includes characters such as yield, agronomic performance, stress susceptibilities and biochemical and cytological traits. They are generally the most interesting traits in crop improvement.

Characterization will normally be the responsibility of genebank curators, while evaluation will typically be carried out elsewhere (possibly by a multidisciplinary team of scientists). The evaluation data should be fed back to the genebank, which will maintain a data file.

Highly discriminating descriptors are marked as highlighted text.

The following internationally accepted norms for the scoring, coding and recording of descriptor states should be followed:

- (a) the *Système International d'Unités* (SI) is used;

- (b) the units to be applied are given in square brackets following the descriptor name;
- (c) standard colour charts, e.g. Royal Horticultural Society Colour Chart, Methuen Handbook of Colour, or Munsell Colour Chart for Plant Tissues, are strongly recommended for all ungraded colour characters (the precise chart used should be specified in the section where it is used);
- (d) the three-letter abbreviations from the *International Standard (ISO) Codes for the representation of names of countries* are used;
- (e) many quantitative characters, which are continuously variable, are recorded on a 1-9 scale, where:

1 Very low	6 Intermediate to high
2 Very low to low	7 High
3 Low	8 High to very high
4 Low to intermediate	9 Very high
5 Intermediate	

is the expression of a character. The authors of this list have sometimes described only a selection of the states, e.g. 3, 5 and 7, for such descriptors. Where this has occurred, the full range of codes is available for use by extension of the codes given or by interpolation between them, e.g. in Section 10 (Biotic stress susceptibility), 1 = very low susceptibility and 9 = very high susceptibility;

- (f) when a descriptor is scored using a 1-9 scale, such as in (e), '0' would be scored when (i) the character is not expressed, and (ii) a descriptor is inapplicable. In the following example, '0' will be recorded if an accession does not have a central leaf lobe:

Shape of central leaf lobe

- 1 Toothed
- 2 Elliptic
- 3 Linear

- (g) absence/presence of characters is scored as in the following example:

Terminal leaflet

- 0 Absent
- 1 Present

- (h) blanks are used for information not yet available;
- (i) for accessions which are not generally uniform for a descriptor (e.g. mixed collection, genetic segregation), the mean and standard deviation could be reported where the descriptor is continuous. Where the descriptor is discontinuous, several codes in the

order of frequency could be recorded, or other publicized methods can be utilized, such as Rana *et al.* (1991), or van Hintum (1993), that clearly state a method for scoring heterogeneous accessions;

- (j) dates should be expressed numerically in the format YYYYMMDD, where
- YYYY - 4 digits to represent the year
 - MM - 2 digits to represent the month
 - DD - 2 digits to represent the day.

PASSPORT

All descriptors listed under Passport, belonging to the multicrop passport descriptors category, are indicated in the text as [MCPD]

1. Accession descriptors

1.1 Institute code

[MCPD]

Code of the institute where the accession is maintained. The codes consist of the three-letter ISO 3166 country code of the country where the institute is located plus a number. The current set of Institute Codes is available from the FAO website (<http://apps3.fao.org/wiews/>).

1.2 Accession number

[MCPD]

This number serves as a unique identifier for accessions within a genebank collection, and is assigned when a sample is entered into the genebank collection. Once assigned this number should never be reassigned to another accession in the collection. Even if an accession is lost, its assigned number should never be re-used. Letters should be used before the number to identify the genebank or national system (e.g. IDG indicates an accession that comes from the genebank in Bari, Italy; CGN indicates an accession from the genebank at Wageningen, The Netherlands; PI indicates an accession within the USA system).

1.2.1 Local plant number

This identifies a single plant within a population of plants having the same accession number. It may be any combination of plot identity, row number, or tree position within the row.

1.3 Donor name

Name of the institution or individual responsible for donating the germplasm

1.4 Donor institute code

[MCPD]

Code for the donor institute. It follows the Institute code standard.

1.5 Donor accession number

[MCPD]

Number assigned to an accession by the donor. It follows the Accession number standard.

1.6 Curator's name

Name of the officer responsible for maintaining the genetic resources material held at the institute specified in descriptor **1.1 Institute code**

1.7 Other identification (numbers) associated with the accession [MCPD]

Any other identification (numbers) known to exist in other collections for this accession. Use the following system: INSTCODE: ACCENUMB; INSTCODE:

ACCENUMB;... INSTCODE and ACCENUMB follow the standard described above and are separated by a colon. Pairs of INSTCODE and ACCENUMB are separated by a semicolon without space. When the institute is not known, the number should be preceded by a colon.

1.8 Genus

[MCPD]

Genus name for taxon. Initial uppercase letter required.

1.9 Species

[MCPD]

Specific epithet portion of the scientific name in lowercase letters. Following abbreviation is allowed: 'sp.'

1.9.1 Species authority

[MCPD]

Provide the authority for the species name.

1.10 Subtaxa

[MCPD]

Subtaxa can be used to store any additional taxonomic identifier. Following abbreviations are allowed: 'subsp.' (for subspecies); 'convar.' (for convariety); 'var.' (for variety); 'f.' (for form).

1.10.1 Subtaxa authority

[MCPD]

Provide the subtaxa authority at the most detailed taxonomic level.

1.11 Ancestral data

[MCPD]

Information about either pedigree or other description of ancestral information (i.e. parent variety in case of mutant or selection). For example a pedigree 'Hanna/7*Atlas//Turk/8*Atlas' or a description 'mutation found in Hanna', 'selection from Irene' or 'cross involving amongst others Hanna and Irene'.

1.12 Cultivar origin

- 1 Open pollination
- 2 Artificial pollination
- 3 Clonal selection
- 4 Seedling selection

1.13 Accession name

[MCPD]

Either a registered or other formal designation given to the accession. First letter uppercase. Multiple names separated with semicolon without space. For example: Rheinische Vorgebirgstrauben; Emma; Avlon

1.13.1 Synonyms

Include here any previous identification other than the current name. Collecting number or newly assigned station names are frequently used as identifiers

1.13.2 Common crop name

[MCPD]

Name of the crop in colloquial language, preferably English (i.e. 'malting barley', 'cauliflower', or 'white cabbage')

1.14 Acquisition date [YYYYMMDD]

[MCPD]

Date on which the accession entered the collection where YYYY is the year MM is the month and DD is the day. Missing data (MM or DD) should be indicated with hyphens. Leading zeros are required.

1.15 Accession size

Number or weight of seeds, seedlings, saplings, budsticks, *in vitro* plants, etc. of an accession in the genebank

1.16 Type of material received

- 1 Fruit
- 2 Seed
- 3 Shoot/budwood/stem cutting
- 4 *In vitro* culture (Plantlets)
- 5 Plant (Seedling, sapling)
- 99 Other (e.g. more than one type, specify in descriptor **1.17 Remarks**)

1.17 Remarks

The remarks field is used to add notes or to elaborate on descriptors with value 99 or 999 (=Other). Prefix remarks with the field name they refer to and a colon (e.g. COLLSRC:roadside). Separate remarks referring to different fields are separated by semicolons without space.

2. Collecting descriptors**2.1 Collecting institute(s)**

Name and address of the institute(s) and individual(s) collecting/ sponsoring the collection of the sample(s)

2.2 Collecting institute code

[MCPD]

Code of the Institute collecting the sample. If the holding institute has collected the material, the collecting institute code (COLLCODE) should be the same as the holding institute code (INSTCODE). It follows the Institute code standard.

2.3 Site number

Number assigned to the physical site by the collector

2.4 Collecting number

[MCPD]

Original number assigned by the collector(s) of the sample, normally composed of the name or initials of the collector(s) followed by a number. This number is essential for identifying duplicates held in different collections.

2.5 Collecting date of sample [YYYYMMDD] [MCPD]

Collecting date of the sample where YYYY is the year, MM is the month and DD is the day. Missing data (MM or DD) should be indicated with hyphens. Leading zeros are required.

2.6 Country of origin [MCPD]

Code of the country in which the sample was originally collected. Use the three-letter ISO 3166-1 extended country codes.

2.7 Province/State

Name of the primary administrative subdivision of the country in which the sample was collected

2.8 Department/County

Name of the secondary administrative subdivision (within a Province/State) of the country in which the sample was collected

2.9 Location of collecting site [MCPD]

Location information below the country level that describes where the accession was collected. This might include the distance in kilometres and direction from the nearest town, village or map grid reference point, (e.g. 7 km south of Curitiba in the state of Parana).

2.10 Latitude of collecting site¹ [MCPD]

Degree (2 digits) minutes (2 digits), and seconds (2 digits) followed by N (North) or S (South) (e.g. 103020S). Every missing digit (minutes or seconds) should be indicated with a hyphen. Leading zeros are required (e.g. 10---S; 011530N; 4531--S).

2.11 Longitude of collecting site¹ [MCPD]

Degree (3 digits), minutes (2 digits), and seconds (2 digits) followed by E (East) or W (West) (e.g. 0762510W). Every missing digit (minutes or seconds) should be indicated with a hyphen. Leading zeros are required (e.g. 076---W).

2.12 Elevation of collecting site [m asl] [MCPD]

Elevation of collecting site expressed in meters above sea level. Negative values are allowed.

¹ To convert from longitude and latitude in degrees (°) minutes (′), seconds (″) and a hemisphere (North or South and East or West) to decimal degrees, the following formula should be used:

$$d^{\circ}m's'' = h^{\circ}(d + m/60 + s/3600)$$

where h=1 for Northern and Eastern hemispheres and -1 for the Southern and Western hemispheres, i.e., 30°30′0″S = -30.5 and 30°15′55″N=30.265.

2.13 Collecting/acquisition source

[MCPD]

The coding scheme proposed can be used at 2 different levels of detail: either by using the general codes (in boldface) such as 10, 20, 30, 40 or by using the more specific codes such as 11, 12, etc.

10 Wild habitat

- 11 Forest/woodland
- 12 Shrubland
- 13 Grassland
- 14 Desert/tundra
- 15 Aquatic habitat

20 Farm or cultivated habitat

- 21 Field
- 22 Orchard
- 23 Backyard, kitchen or home garden (urban, peri-urban or rural)
- 24 Fallow land
- 25 Pasture
- 26 Farm store
- 27 Threshing floor
- 28 Park

30 Market or shop**40 Institute, experimental station, research organization, genebank****50 Seed company****60 Weedy, disturbed or ruderal habitat**

- 61 Roadside
- 62 Field margin

99 Other (Specify in descriptor 2.24 Collector's notes)**2.14 Breeding institute code**

[MCPD]

Institute code of the institute that has bred the material. If the holding institute has bred the material, the breeding institute code (BREDCODE) should be the same as the holding institute code (INSTCODE). It follows the Institute code standard.

2.15 Collecting source environment

Use descriptors 6.1.1. to 6.1.20.7 in section 6

2.16 Type of sample

Type of sample collected. If different types of material were collected from the same source, each sample type should be designated with a unique collecting number and a corresponding unique accession number

- 1 Seed
- 2 Seedling/sapling
- 3 Budwood
- 4 Graft
- 5 *In vitro* plantlet
- 6 Fruit
- 99 Other (specify which part of the plant is used in descriptor 2.24 Collector's notes)

2.17 Biological status of accession

[MCPD]

The coding scheme proposed can be used at three different levels of detail: either by using the general codes (in boldface) such as 100, 200, 300, 400 or by using the more specific codes such as 110, 120, etc.

- 100 Wild**
 - 110 Natural
 - 120 Semi-natural/wild
- 200 Weedy**
- 300 Traditional cultivar/landrace**
- 400 Breeding/research material**
 - 410 Breeder's line
 - 411 Synthetic population
 - 412 Hybrid
 - 413 Founder stock/base population
 - 414 Inbred line (parent of hybrid cultivar)
 - 415 Segregating population
 - 420 Mutant/genetic stock
- 500 Advanced/improved cultivar**
- 999 Other** (Specify in descriptor 2.24 Collector's notes)

2.18 Ethnobotanical data

2.18.1 Ethnic group

Name of the ethnic group/community of the farmer donating the sample or of the people living in the area of collecting

2.18.2 Local/vernacular name

Name given by farmer to the crop and cultivar/landrace. State language, dialect and the country if the ethnic group is not provided

2.18.3 Translation

Provide translation of the local name into English, if possible

2.18.4 Rambutan varietal name meaning

Does the rambutan name have a meaning? If yes, describe it briefly in descriptor **2.24 Collector's notes**

- 0 No
- 1 Yes

2.18.5 History of plant use

- 1 Ancestral/indigenous (record association with the place and community)
- 2 Introduced (but in unknown distant past)
- 3 Introduced (record time and details known about introduction)

2.18.6 Parts of the plant used

- 1 Seed
- 2 Root
- 3 Trunk
- 4 Leaf
- 5 Flower/inflorescence
- 6 Fruit
- 99 Other (specify in descriptor **2.24 Collector's notes**)

2.18.7 Plant uses

- 1 Food
- 2 Forage
- 3 Fuel
- 4 Medicine
- 5 Wood/timber
- 6 Dye
- 99 Other (specify in descriptor **2.24 Collector's notes**)

2.18.8 Frequency of use of the plant

- 1 Daily
- 2 Weekly
- 3 Occasional
- 99 Other (specify in descriptor **2.24 Collector's notes**)

2.18.9 Method of use

- 1 Table fruit
- 2 Mixed fruit
- 3 Preserved
- 4 Processed product
- 99 Other (specify in descriptor **2.24 Collector's notes**)

2.18.10 Special uses

- 1 Children
- 2 Older persons
- 3 Feasts
- 4 Religious purpose
- 5 Chiefs
- 6 Aesthetic
- 99 Other (specify in descriptor **2.24 Collector's notes**)

2.18.11 Cultural characteristics

Is there folklore associated with the collected rambutan type? (e.g. taboos, stories and/or superstitions). If so, describe it briefly in descriptor **2.24 Collector's notes**

2.18.12 Rambutan popularity

Is the variety popular and widely grown? If yes, describe briefly the reasons in descriptor **2.24 Collector's notes**

- 0 No
- 1 Yes

2.18.13 Preferred growing conditions

If yes, describe farmers' perceptions on hardiness of the variety in relation to main stresses in descriptor **2.24 Collector's notes**

- 0 No
- 1 Yes

2.18.14 Prevailing stresses

Information on main associated biotic (pests and diseases) and abiotic (drought) stresses

2.18.15 Cultural methods**2.18.15.1 Cropping system**

- 1 Monoculture (specify spacing)
- 2 Intercropping (specify spacing and type of intercrop)
- 3 Agropastoralism (specify type of animals)
- 4 Natural cropping (i.e. wild types topworked) with cultivar/self sown trees retained in homesteads)
- 99 Other (specify in descriptor **2.24 Collector's notes**)

2.18.15.2 Propagation method

Method used to produce trees

- 1 Seed
- 2 Grafting (specify type of grafting and the species, hybrid and/or clone used as rootstock, in descriptor **2.24 Collector's notes**)
- 3 Cutting
- 4 Budding
- 5 Layering
- 6 Stooling
- 7 Tissue culture (specify which part of plant used, in descriptor **2.24 Collector's notes**)
- 99 Other (specify in descriptor **2.24 Collector's notes**)

2.18.15.3 Irrigation

- 1 Rainfed
- 2 Irrigated (specify average annual amount of water supplied per hectare)
- 99 Other (specify in descriptor **2.24 Collector's notes**)

2.18.15.4 Method of irrigation

- 1 Basin
- 2 Furrow
- 3 Drip
- 99 Other (specify in descriptor **2.24 Collector's notes**)

2.18.16 Associated flora

Other dominant crop/plant species, including other *Nephelium* species, found in and around the collecting site

2.18.17 Seasonality

- 1 Available only in one season in the year
- 2 Available only in two seasons in the year
- 3 Available throughout the year

2.18.18 Market information

Specify if any premium price was assigned to the type of rambutan

- 0 No
- 1 Yes

2.18.19 Type of market

- 1 Local
- 2 National
- 3 Regional
- 4 International

2.19 Collecting site population structure**2.19.1 Number of trees sampled****2.19.2 Frequency of plants at collecting site**

- 3 Low
- 5 Intermediate
- 7 High

2.20 Plant population density

Number of trees per unit area (specify orchard or homestead)

2.21 Genetic erosion

Estimate the rate of genetic erosion of the species occurring in the region of collection

- 1 Slow
- 2 Moderate
- 3 High
- 4 Very high

2.22 Herbarium specimen

Was a herbarium specimen collected? If so, indicate the plant part used, provide an identification number and indicate in which place (Herbarium) the specimen was deposited, in descriptor **2.24 Collector's notes**

- 0 No
- 1 Yes

2.23 Photograph

Was photograph(s) taken of the accession or habitat at the time of collecting? If so, provide an identification number(s) in descriptor **2.24 Collector's notes**

- 0 No
- 1 Yes

2.24 Collector's notes

Additional information recorded by the collector or any specific information on any state in any of the above descriptors

MANAGEMENT

3. Management descriptors

3.1 Accession number [Passport 1.2]

3.1.1 Local plant number

This identifies a single plant within a population of plants having the same accession number. It may be any combination of plot identity, row number, or tree position within the row

3.2 Population identification [Passport 2.4]

Collecting number, pedigree, cultivar name, etc. depending on the population type

3.3 Accession location in orchard

Enter separate block designations, row numbers and tree numbers within the row for each duplicate tree of each accession if each tree is not identified with a unique local plant number (see descriptor 3.1.1)

3.3.1 Block designation

3.3.2 Row number

3.3.3 Tree number within the row

3.4 Storage address

Building, room, shelf number(s)/field location where stored/maintained

3.5 Storage date [YYYYMMDD]

3.6 Sowing/planting date [YYYYMMDD]

Specify the date on which sowing/planting was done

3.7 Plant/propagule establishment [%]

3.8 Type of germplasm storage [MCPD]

If germplasm is maintained under different types of storage, multiple choices are allowed, separated by a semicolon (e.g. 20;30). (Refer to FAO/IPGRI Genebank Standards 1994 for details on storage type.)

10 Seed collection

20 Field collection

30 *In vitro* collection (Slow growth)

40 Cryopreserved collection

99 Other (specify in descriptor 3.12 Notes)

3.9 Location of safety duplicates

[MCPD]

Code of the institute where a safety duplicate of the accession is maintained. It follows the Institute code standard.

3.10 *In vitro* conservation

3.10.1 Type of explant

- 1 Seed
- 2 Zygotic embryo
- 3 Apical or axillary meristem
- 4 Apical or axillary shoot tip
- 5 Somatic embryo
- 6 Callus
- 7 Cell suspension
- 99 Other (specify in descriptor 3.12 Notes)

3.10.2 Date of introduction *in vitro* [YYYYMMDD]

3.10.3 Type of subcultured material

- 1 Seed
- 2 Zygotic embryo
- 3 Apical or axillary meristem
- 4 Apical or axillary shoot tip
- 5 Somatic embryo
- 6 Callus
- 7 Cell suspension
- 99 Other (specify in descriptor 3.12 Notes)

3.10.4 Regeneration process

- 1 Organogenesis
- 2 Somatic embryogenesis
- 99 Other (specify in descriptor 3.12 Notes)

3.10.5 Number of genotypes introduced *in vitro*

3.10.6 Number of replicates per genotype

3.10.7 Last subculture date [YYYYMMDD]

3.10.8 Medium used at the last subculture

3.10.9 Number of plants at the last subculture

3.10.10 Location after the last subculture

3.10.11 Next subculture date [YYYYMMDD]

3.11 Cryopreservation

3.11.1 Type of material for cryopreservation

- 1 Seed
- 2 Zygotic embryo
- 3 Apical or axillary meristem
- 4 Apical or axillary shoot tip
- 5 Somatic embryo
- 6 Callus
- 7 Cell suspension
- 8 Ovule
- 99 Other (specify in descriptor 3.12 Notes)

3.11.2 Introduction date in liquid nitrogen [YYYYMMDD]

3.11.3 Number of samples introduced in liquid nitrogen

3.11.4 End of storage period [YYYYMMDD]

3.11.5 Number of samples taken from liquid nitrogen

3.11.6 Type of subcultured material for recovery

(After liquid nitrogen)

- 1 Seed
- 2 Zygotic embryo
- 3 Apical or axillary meristem
- 4 Apical or axillary shoot tip
- 5 Somatic embryo
- 6 Callus
- 7 Cell suspension
- 8 Ovule
- 99 Other (specify in descriptor 3.12 Notes)

3.11.7 Regeneration process

- 1 Organogenesis
- 2 Somatic embryogenesis
- 99 Other (specify in descriptor 3.12 Notes)

3.11.8 Number of recovered samples

3.11.9 Location after the last subculture

3.12 Notes

Any additional information may be specified here

4. Multiplication/regeneration descriptors

4.1 Accession number [Passport 1.2]

4.2 Population identification [Passport 2.4]
Collecting numbers, pedigree, cultivar name, etc. depending on the population type

4.3 Field plot number

4.4 Multiplication/regeneration site locations

4.5 Collaborator

4.6 Regeneration year [YYYY]
Year (estimated) when tree should be propagated for regeneration

4.7 Propagation method

Method used to produce trees

- 1 Seed
- 2 Budding
- 3 Grafting
- 4 Layering
- 5 Cutting
- 6 Stooling
- 7 Tissue culture
- 99 Other (specify in descriptor 4.12 Notes)

4.8 Sowing/planting date [YYYYMMDD]

4.9 Cultural practices

4.9.1 Planting density
Number of trees established per hectare

4.9.2 Fertilizer application
Specify type, doses, frequency of each and method of application

4.9.3 Irrigation
Specify amount, frequency and method

4.10 Previous multiplication and/or regeneration

4.10.1 Location

4.10.2 Plot number

4.10.3 Sowing/planting date [YYYYMMDD]

4.11 Number of times accession regenerated

Since the date of acquisition

4.12 Notes

Any additional information may be specified here

ENVIRONMENT AND SITE

5. Characterization and/or evaluation site descriptors

5.1 Country of characterization and/or evaluation

(See instructions in descriptor 2.6 Country of origin)

5.2 Site (Research Institute)

5.2.1 Latitude

See instructions under 2.10

5.2.2 Longitude

See instructions under 2.11

5.2.3 Elevation [m asl]

5.2.4 Name and address of farm or institute/station/centre

5.3 Evaluator's name and address

5.4 Sowing/grafting/budding/layering stooling date [YYYYMMDD]

5.5 Evaluation environment

Environment in which characterization/evaluation was carried out

- 1 Field
- 2 Screenhouse
- 3 Glasshouse
- 4 Laboratory
- 99 Other (specify in descriptor 5.16 Notes)

5.6 Condition of tree

Record the condition of the tree at the time of characterization/evaluation

- | | |
|-------------------------|-----------------------------|
| 1 Dying | 5 Mature - vigorous |
| 2 Old - declining | 6 Young - not yet bearing |
| 3 Mature - diseased | 7 Healthy - cropping poorly |
| 4 Mature - non-vigorous | 8 Healthy - cropping well |

5.7 Seed germination [%]

Specify number of days over which germination is measured

5.8 Grafting/budding/layering/stooling success percentage

Specify number of days over which the success is recorded. Indicate the rootstock

5.9 Number of days to planting after budding/layering [d]

5.10 Field establishment [%]

5.11 Sowing/planting site in the field

5.12 Field spacing

5.12.1 Distance between trees in a row [m]

5.12.2 Distance between rows [m]

5.13 Fertilizer

Specify types used, doses, frequency of each and method of application

5.14 Plant protection

Specify pesticides used, doses, frequency of each and method of application

5.15 Environmental characteristics of site

Use descriptors 6.1.1. to 6.1.20.7 in section 6

5.16 Notes

Any other site-specific information

6. Collecting and/or characterization/evaluation site environment descriptors

6.1 Site environment

6.1.1 Topography

This refers to the profile in elevation of the land surface on a broad scale.
The Reference is FAO (1990)

1	Flat	0-0.5%
2	Almost flat	0.6-2.9%
3	Gently undulating	3-5.9%
4	Undulating	6.0-10.9%
5	Rolling	11.0-15.9%
6	Hilly	16.0-30.0%
7	Steeply dissected	>30%, moderate elevation range
8	Mountainous	>30%, great elevation range (>300 m)
99	Other	(specify in the appropriate section's Notes)

6.1.2 Land element and position

Description of the geomorphology of the immediate surroundings of the site (adapted from FAO 1990). (See Fig. 1)

- | | | | |
|----|-------------------|----|--|
| 1 | Plain level | 17 | Interdunal depression |
| 2 | Escarpment | 18 | Mangrove |
| 3 | Interfluve | 19 | Upper slope |
| 4 | Valley | 20 | Mid slope |
| 5 | Valley floor | 21 | Lower slope |
| 6 | Channel | 22 | Ridge |
| 7 | Levee | 23 | Beach |
| 8 | Terrace | 24 | Beach ridge |
| 9 | Floodplain | 25 | Rounded summit |
| 10 | Lagoon | 26 | Summit |
| 11 | Pan | 27 | Coral atoll |
| 12 | Caldera | 28 | Drainage line (bottom position in flat or almost-flat terrain) |
| 13 | Open depression | 29 | Coral reef |
| 14 | Closed depression | 99 | Other (specify in appropriate section's Notes) |
| 15 | Dune | | |
| 16 | Longitudinal dune | | |

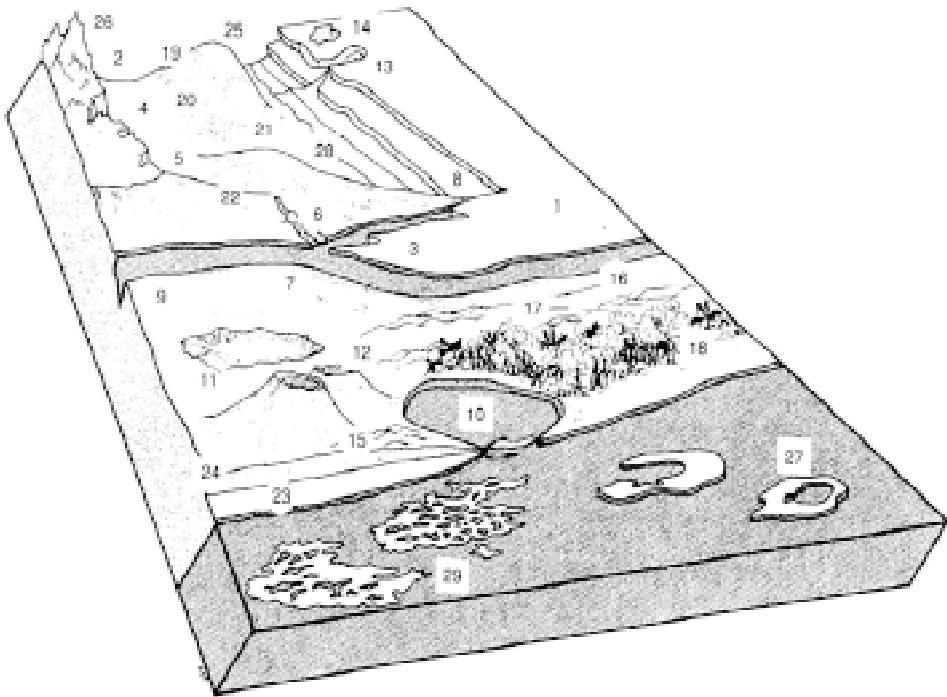


Fig. 1. Land element and position

6.1.3 Slope [°]

Estimated slope of the collecting site

6.1.4 Slope aspect

The direction that the slope on which the accession was collected faces. Describe the direction with symbols N, S, E, W (e.g. a slope that faces a south-western direction has an aspect of SW)

6.1.5 Overall vegetation surrounding and at the collecting site

(Adapted from FAO 1990)

- 1 Grassland (grasses, subordinate forbs, no woody species)
- 2 Forbs land (herbaceous plants predominant)
- 3 Forest (continuous tree layer, crowns overlapping, large number of tree and shrub species in distinct layers)
- 4 Woodland (continuous tree layer, crowns usually not touching, understorey may be present)
- 5 Shrub land (continuous layer of shrubs, crowns touching)
- 6 Savanna (grasses with a discontinuous layer of trees or shrubs)
- 99 Other (specify in appropriate section's **Notes**)

6.1.6 Stoniness/rockiness/hardpan/cementation

- 1 Tillage unaffected
- 2 Tillage affected
- 3 Tillage difficult
- 4 Tillage impossible
- 5 Essentially paved

6.1.7 Soil drainage

(Adapted from FAO 1990)

- 3 Poorly drained
- 5 Moderately drained
- 7 Well drained

6.1.8 Soil salinity (dissolved salts)

- 1 <160 ppm
- 2 161-240 ppm
- 3 241-480 ppm
- 4 481-800 ppm
- 5 >800 ppm

6.1.9 Quality of the groundwater

- 1 Saline
- 2 Brackish
- 3 Fresh
- 4 Polluted
- 5 Oxygenated
- 6 Stagnating

6.1.10 Soil depth to groundwater table

(Adapted from FAO 1990)

The depth to the groundwater table, if present, as well as an estimate of the approximate annual fluctuation, should be given. The maximum rise of the groundwater table can be inferred approximately from changes in profile colour in many, but not all, soils

- 1 0-25 cm
- 2 25.1-50 cm
- 3 50.1-100 cm
- 4 100.1-150 cm
- 5 >150 cm

6.1.11 Soil moisture

Moisture conditions prevailing in the soil at the time of collecting should be given together with the depth. Attention should be paid to unusual moisture conditions caused by unseasonal weather, prolonged exposure of the profile, flooding, etc. (from FAO 1990)

- 1 Dry
- 3 Slightly moist
- 5 Moist
- 7 Wet

6.1.12 Soil matrix colour

(Adapted from FAO 1990)

The colour of the soil matrix material in the root zone around the accession is recorded in the moist condition (or both dry and moist condition, if possible) using the notation for hue, value and chroma as given in the Munsell Soil Colour Charts (Munsell Colour 1975). If there is no dominant soil matrix colour, the horizon is described as mottled and two or more colours are given and should be registered under uniform conditions. Early morning and late evening readings are not accurate. Provide depth of measurement [cm]. If colour chart is not available, the following states may be used:

- | | |
|-------------------|--------------------|
| 1 White | 9 Yellow |
| 2 Red | 10 Reddish yellow |
| 3 Reddish | 11 Greenish, green |
| 4 Yellowish red | 12 Grey |
| 5 Brown | 13 Greyish |
| 6 Brownish | 14 Blue |
| 7 Reddish brown | 15 Bluish black |
| 8 Yellowish brown | 16 Black |

6.1.13 Soil organic matter content

- 1 Nil (as in arid zones)
- 3 Low (as in long-term cultivation in a tropical setting)
- 5 Medium (as in recently cultivated but not yet much depleted)
- 7 High (as in never cultivated, and in recently cleared forest)
- 9 Peaty

6.1.14 Soil pH

Actual value of the soil pH within the following root depths around the accession, record only at one of the following depths:

- 1 pH at 0-10 cm
- 2 pH at 11-20 cm
- 3 pH at 21-30 cm
- 4 pH at 31-60 cm
- 5 pH at 61-90 cm

6.1.15 Soil erosion

- 3 Low
- 5 Intermediate
- 7 High

6.1.16 Soil texture classes

(Adapted from FAO 1990)

For convenience in determining the texture classes of the following list, particle size classes are given for each of the fine earth fraction listed below (See Fig. 2):

- | | |
|----------------------|---------------------------|
| 1 Clay | 12 Coarse sandy loam |
| 2 Loam | 13 Loamy sand |
| 3 Clay loam | 14 Loamy very fine sand |
| 4 Silt | 15 Loamy fine sand |
| 5 Silt clay | 16 Loamy coarse sand |
| 6 Silt clay loam | 17 Very fine sand |
| 7 Silt loam | 18 Fine sand |
| 8 Sandy clay | 19 Medium sand |
| 9 Sandy clay loam | 20 Coarse sand |
| 10 Sandy loam | 21 Sand, unsorted |
| 11 Fine sandy loam | 22 Sand, unspecified |

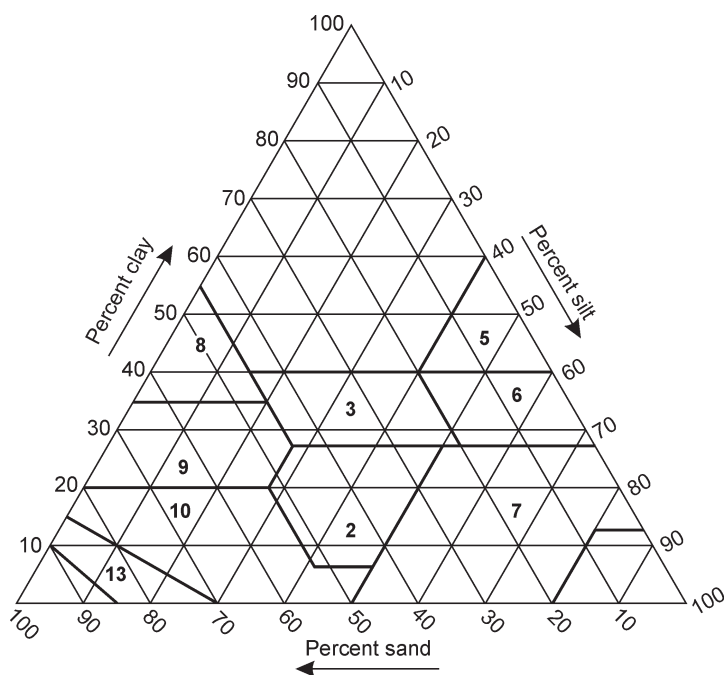


Fig. 2. Soil texture classes

6.1.17 Soil particle size classes

(Adapted from FAO 1990)

1	Clay	< 2 μm
2	Fine silt	3 - 20 μm
3	Coarse silt	21 - 63 μm
4	Very fine sand	64 - 125 μm
5	Fine sand	126 - 200 μm
6	Medium sand	201 - 630 μm
7	Coarse sand	631 - 1250 μm
8	Very coarse sand	1251 - 2000 μm

6.1.18 Water availability

- 1 Rainfed
- 2 Irrigated
- 3 Flooded
- 4 River banks
- 5 Sea coast
- 99 Other (specify in appropriate section's Notes)

6.1.19 Soil fertility

General assessment of the soil fertility based on existing vegetation

- 3 Low
- 5 Moderate
- 7 High

6.1.20 Climate of the site

Should be assessed as close to the site as possible (state number of recorded years)

6.1.20.1 Temperature [°C]

Provide the monthly and the annual mean

6.1.20.2 Rainfall [mm]

Provide the monthly and the annual mean (state number of recorded years)

6.1.20.3 Wind

Annual average (state number of years recorded)

6.1.20.3.1 Frequency of typhoons or hurricane force winds

- 3 Low
- 5 Intermediate
- 7 High

6.1.20.3.2 Date of most recent typhoons or hurricane force winds [YYYYMMDD]

6.1.20.3.3 Annual maximum wind velocity [m/s]

6.1.20.4 Frost

6.1.20.4.1 Date of most recent frost [YYYYMMDD]

6.1.20.4.2 Minimum temperature [°C]

Specify seasonal average and minimum survival temperature

6.1.20.4.3 Duration of temperature below 0°C [d]

6.1.20.5 Relative humidity

6.1.20.5.1 Relative humidity diurnal range [%]

6.1.20.5.2 Relative humidity seasonal range [%]

6.1.20.6 Light

- 1 Shady
- 2 Sunny

6.1.20.7 Day length [h]

Provide either the monthly (mean, maximum, minimum) or the seasonal (mean, maximum, minimum)

CHARACTERIZATION

7. Plant descriptors

Average of at least two ‘on-years’ (production years) data recorded on ten trees, unless otherwise stated

7.1 Growth descriptors

7.1.1 Tree age [y]

7.1.2 Tree vigour

- 3 Low
- 5 Medium
- 7 High

7.1.3 Tree height [m]

From ground level to the top of the tree (if grafted, record also height of graft union and rootstock name). Evaluate only unpruned trees

7.1.4 Trunk circumference [cm]

Recorded at 50 cm above ground level for trees raised through seedlings/air layering/grafting

7.1.5 Trunk surface

- 1 Smooth
- 2 Rough
- 3 Very rough

7.1.6 Crown diameter [m]

Measured as the mean diameter using two directions (North-South and East-West)

7.1.7 Crown shape

(See Fig. 3)

- 1 Oblong
- 2 Broadly pyramidal
- 3 Semicircular
- 4 Spherical
- 99 Other (i.e. irregular, specify in descriptor 7.6 Notes)

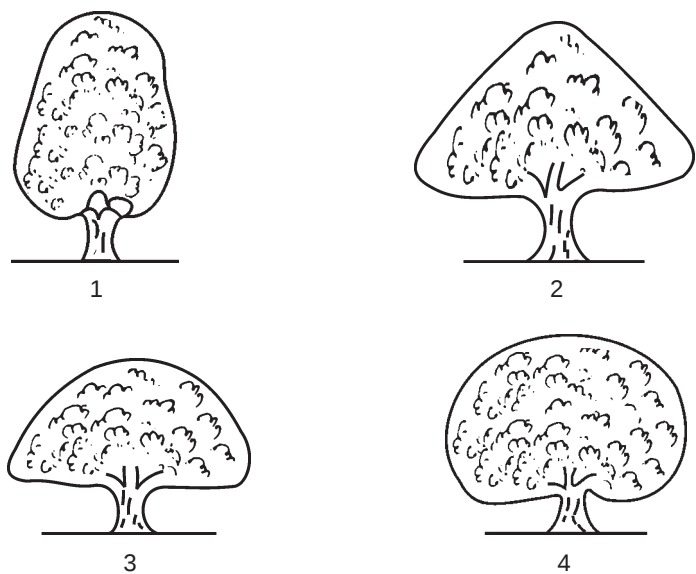


Fig. 3. Crown shape

7.1.8 Tree growth habit

- 1 Erect
- 2 Semi-erect
- 3 Spreading
- 4 Drooping
- 99 Other (specify in descriptor 7.6 Notes)

7.1.9 Branching density

- 3 Sparse
- 5 Medium
- 7 Dense

7.1.10 Branching pattern

(See Fig. 4)

- 1 Upright
- 2 Horizontal
- 3 Irregular

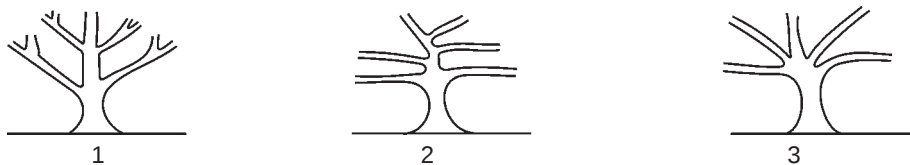


Fig. 4. Branching pattern

7.1.11 Young shoot pubescence

- 0 Absent
- 1 Present

7.2 Leaf descriptors

Average of 20 fully expanded representative leaves, collected from three trees when shoots are lignified. Do not select leaves that are abnormal due to the disease, nutritional imbalances and excessive vigour. For qualitative characteristics, indicate the predominant one. (Use the first pair of leaflets from terminal leaflet)

7.2.1 Leaf colour

Evaluated at mature stage

- 1 Light green
- 2 Green
- 3 Dark green
- 99 Other (specify in descriptor 7.6 Notes)

7.2.2 Number of leaflets per leaf

Record average number of leaflets from 10 leaves

7.2.3 Rachis length [mm]

Recorded from stem to last leaflet

7.2.4 Length of petiole (leaflet stalk) [mm]

Recorded from the rachis to the base of the leaflet

7.2.5 Leaflet length [cm]

Measured from the base to the tip of the leaflet

7.2.6 Leaflet width [cm]

Measured at the widest point

7.2.7 Leaflet shape

(See Fig. 5)

- 1 Obovate
- 2 Elliptic
- 3 Lanceolate
- 99 Other (specify in descriptor 7.6 Notes)

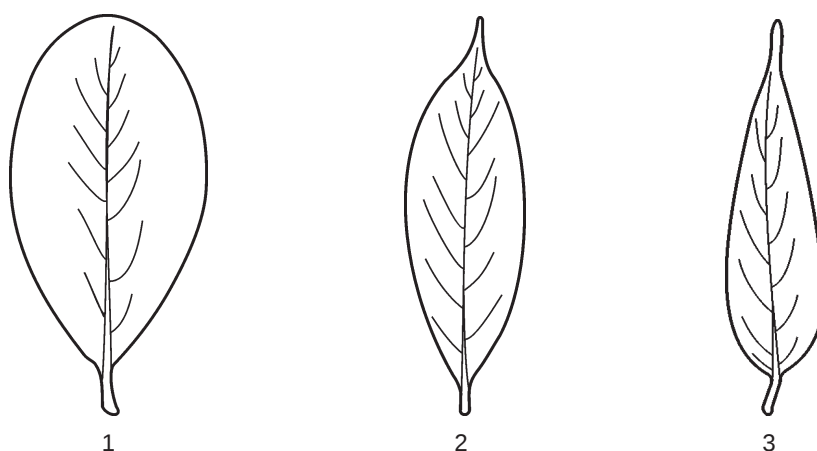


Fig. 5. Leaflet shape

7.2.8 Leaflet apex shape

(See Fig. 6)

- 1 Acute
- 2 Acuminate
- 3 Obtuse
- 99 Other (specify in descriptor 7.6 Notes)

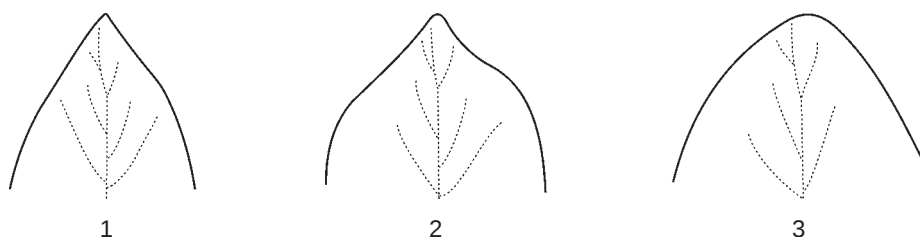


Fig. 6. Leaflet apex shape

7.2.9 Leaflet base shape

(See Fig. 7)

- 1 Acute
- 2 Cuneate
- 3 Obtuse
- 99 Other (specify in descriptor 7.6 Notes)

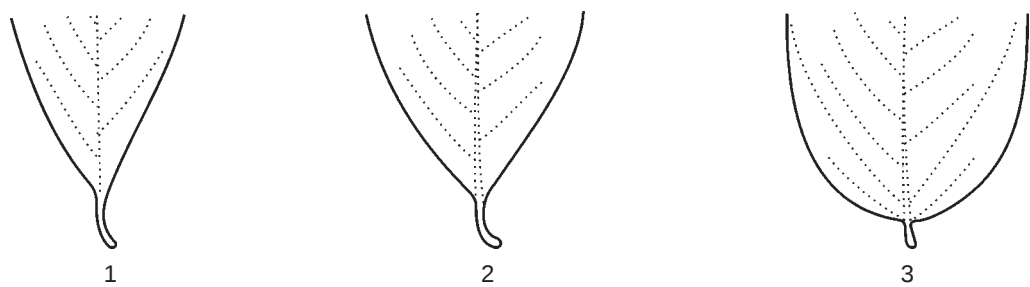


Fig. 7. Leaflet base shape

- 7.2.10 Leaf margin**
- 1 Entire
 - 2 Undulate
 - 3 Involute
 - 4 Curled

- 7.2.11 Leaflet surface**
- 1 Smooth
 - 2 Pubescent

7.3 Inflorescence descriptors

Average of at least two ‘on years’ data. Recorded at bloom period

- 7.3.1 Flowering precocity [y]**

Specify number of years from budding/layering/grafting/seed sowing to first flower (i.e. 4 B/L/G/S indicates first flower produced 4 years after field establishment from the date of budding/layering/grafting/seed sowing, respectively)
- 7.3.2 Date of first and last panicle initiation [YYYYMMDD]**
- 7.3.3 Date of opening of first and last male flower [YYYYMMDD]**
- 7.3.4 Date of opening of first and last pseudo-hermaphrodite flower (functional male) [YYYYMMDD]**
- 7.3.5 Date of opening of first and last pseudohermaphrodite flower (functional female) [YYYYMMDD]**

7.3.6 Types of flowers in the inflorescence

(See Fig. 8)

- 1 Hermaphrodite flowers functioning as female
- 2 Hermaphrodite flowers functioning as male
- 3 Male flowers
- 4 1 and 2 above
- 5 1, 2 and 3 above
- 99 other (specify in descriptor 7.6 Notes)

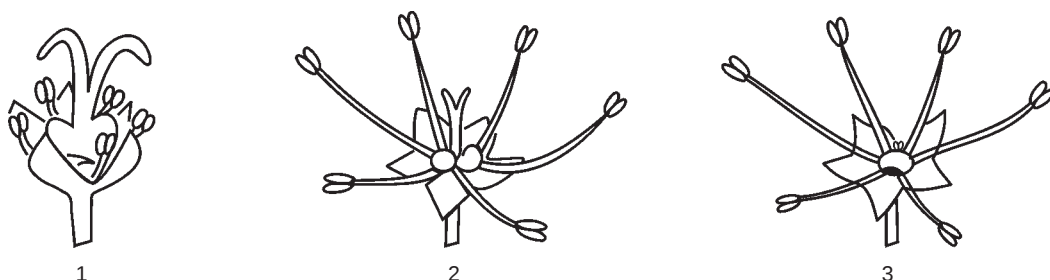


Fig. 8. Types of flowers in inflorescence

7.3.7 Flower composition in the inflorescence

Average of ten inflorescences to be recorded

- 1 Male flowers
- 2 Pseudo-hermaphrodite flowers
- 3 Functional hermaphrodite flowers

7.3.8 Duration of flowering [d]

Number of days calculated from first flower opening to last flower opening

7.3.9 Season of flowering

- 3 Early
- 5 Intermediate
- 7 Late

7.3.10 Position of inflorescence

(See Fig. 9)

- 1 Terminal
- 2 Axillary
- 3 Both terminal and axillary

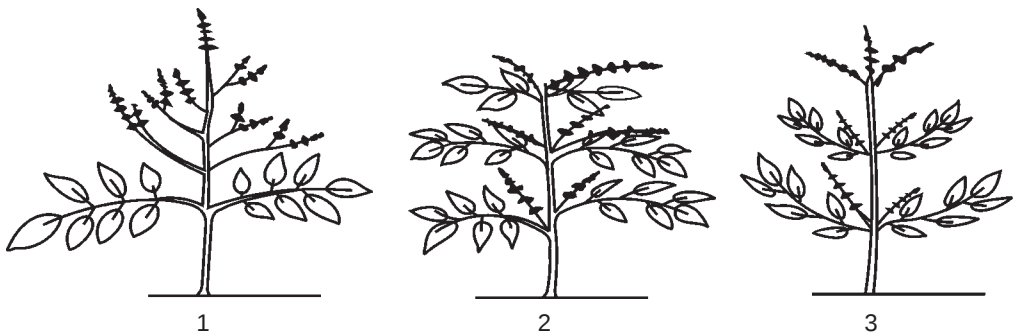


Fig. 9. Position of inflorescence

7.3.11 Length of inflorescence [cm]

Measured from the base to the tip of the inflorescence. Average of 10 inflorescences

7.3.12 Width of inflorescence [cm]

Measured at the widest point. Average of 10 inflorescences

7.3.13 Abundance of flowers in the inflorescence

- 1 Sparse
- 2 Moderate
- 3 Profuse

7.3.14 Shape of inflorescence

(See Fig. 10)

- 1 Pyramidal
- 2 Conical
- 3 Obtriangular
- 99 Other (i.e. irregular, specify in descriptors 7.6 Notes)

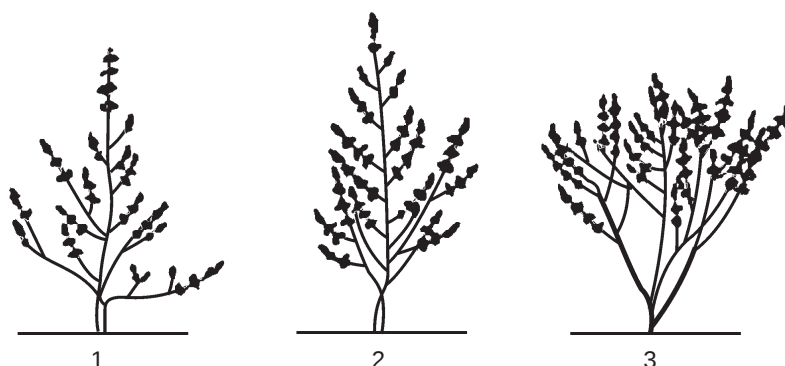


Fig. 10. Shape of inflorescence

7.3.15 Inflorescence colour

- 1 Light green
- 2 Green

7.3.16 Ratio of different types of flowers in the inflorescence

- 1 Hermaphrodite flowers functioning as female>Hermaphrodite flowers functioning as male
- 2 Hermaphrodite flowers functioning as male>Hermaphrodite flowers functioning as female

7.3.17 Length of anthers relative to stigma

- 3 Shorter
- 5 Equal
- 7 Longer

7.3.18 Style length [mm]

Measured from the base to the tip of the style

7.3.19 Sepal length [mm]

Measured from the base to the tip. Average of 10 sepals

7.3.20 Sepal width [mm]

Measured at the widest portion. Average of 10 sepals

7.4 Fruit descriptors

Recorded on 20 well-developed fruits at harvest time, unless otherwise specified

7.4.1 Number of years to first fruiting after sowing/planting [y]

7.4.2 Number of days from flowering to fruit maturity [d]

7.4.3 Fruit maturity

7.4.3.1 Start of fruit maturity [YYYYMMDD]

7.4.3.2 End of fruit maturity [YYYYMMDD]

7.4.3.3 Duration of fruit maturity [d]

7.4.4 Fruit maturity period

1 Early

2 Medium

3 Late

7.4.5 Fruit ripening

1 Synchronous

2 Non-synchronous

7.4.6 Fruit bearing habit

1 Regular

2 Alternate years

3 Irregular

99 Other (specify in descriptor 7.6 Notes)

7.4.7 Fruit clustering habit

Specify number of trees evaluated per accession

1 Loose cluster

2 Compact cluster

99 Other (specify in descriptor 7.6 Notes)

7.4.8 Length of fruit bunch [cm]

Specify number of bunches evaluated per accession

7.4.9 Number of fruits per cluster/ inflorescence

Specify number of bunches evaluated per accession

7.4.10 Fruit shape

(See Fig. 11)

1 Globose

2 Ovoid

3 Oblong

99 Other (specify in descriptor 7.6 Notes)

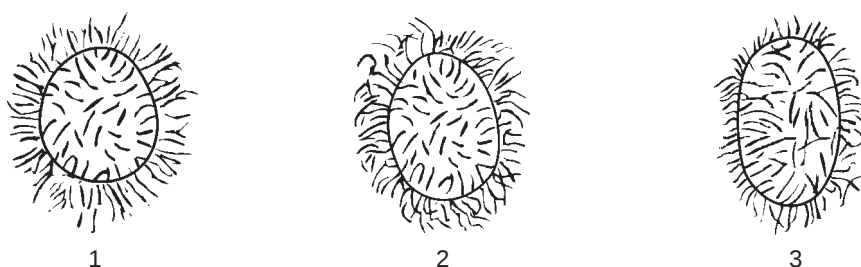


Fig. 11. Fruit shape

7.4.11 Fruit length [cm]

Average of 20 fruits

7.4.12 Fruit diameter [cm]

Measured at the widest point. Average of 20 fruits

7.4.13 Fruit weight [g]

Average of 20 fruits

7.4.14 Fruit rind thickness

- 1 Thin
- 2 Medium
- 3 Thick
- 4 Very thick

7.4.15 Fruit rind colour

Recorded at maturity

- 1 Green
- 2 Yellow
- 3 Yellowish red
- 4 Orange
- 5 Orange red
- 6 Red
- 7 Dark red
- 99 Other (specify in descriptor 7.6 Notes)

7.4.16 Fruit rind weight [g]

Average of 20 fruits

7.4.17 Uniformity of colour on fruit surface

- 0 Not uniform
- 1 Uniform

7.4.18 Fruit attractiveness

Combined assessment of shape, size and appearance, etc.

- 1 Poor
- 2 Intermediate
- 3 Good
- 4 Excellent

7.4.19 Fruit quality

Combined assessment of taste, flavour, peeling ability of the pulp and eye appeal

- 1 Poor
- 2 Moderate
- 3 Good
- 4 Excellent

7.4.20 Spine length [mm]

Average of 10 well-developed spines

7.4.21 Spine texture

- 1 Soft
- 2 Stiff

7.4.22 Spine density

Observed at 2x2 cm² area

- 1 Sparse
- 2 Medium
- 3 Dense

7.4.23 Spine colour**7.4.24 Spine strength**

- 1 Weak
- 2 Medium
- 3 Strong

7.4.25 Weight of aril [g]

Measured on 20 fruits

7.4.26 Aril colour

- 1 White
- 2 Dull white
- 3 Creamy White
- 99 other (specify in descriptors 7.6 Notes)

7.4.27 Shelf life [d]

Number of days fruit remains in good condition under storage at room temperature

7.4.27.1 With colour retaining**7.4.27.2 After peel browning****7.4.28 Aril thickness**

- 1 Thin
- 2 Medium
- 3 Thick

7.4.29 Aril texture

Recorded on fully ripe fruits

- 1 Soft
- 2 Firm
- 3 Crispy
- 99 Other (specify in descriptor 7.6 Notes)

7.4.30 Aril nutritive value

Recorded on fully ripe fruits

7.4.30.1 Total sugar content [%]**7.4.30.2 Total soluble solids content [°Brix]****7.4.30.3 Vitamin A content [IU]****7.4.30.4 Vitamin C content [IU]****7.4.31 Aril taste**

- 1 Insipid
- 2 Acid
- 3 Acid-sweet
- 4 Sweet
- 99 Other (specify in descriptor 7.6 Notes)

7.4.32 Aril flavour

Assessed at the time of opening ripe fruit

- 1 Weak
- 2 Intermediate
- 3 Strong

7.4.33 Aril juiciness

- 0 Not juicy
- 1 Juicy
- 2 Very juicy

7.4.34 Attachment of aril to seed

- 1 Poor
- 2 Medium
- 3 Good
- 4 Very good

7.4.35 Adherence of testa to aril

- 1 Poor
- 2 Intermediate
- 3 Tight

7.5 Seed descriptors

7.5.1 Seed length [cm]

Average of 20 seeds

7.5.2 Seed width [cm]

Average of 20 seeds at the widest point

7.5.3 100-Seed weight [g]

7.5.4 Seed shape

(See Fig. 12)

- 1 Roundish
- 2 Obovoid
- 3 Obovoid elongated
- 4 Oblong (cylindrical)
- 99 Other (specify in descriptor 7.6 Notes)

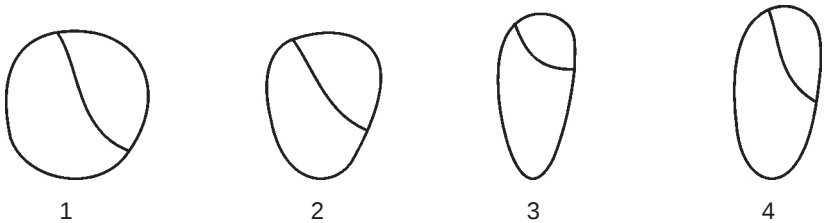


Fig. 12. Seed shape

7.5.5 Seed coat colour

- 1 Off-white
- 2 Creamish
- 3 Dull brown
- 4 Brown
- 5 Dark brown
- 99 Other (specify in descriptor **7.6 Notes**)

7.6 Notes

Any additional information may be specified here

EVALUATION

8. Plant descriptors

8.1 Fruit

8.1.1 Yield per tree [kg per year]

Average of 10 trees per accession

8.1.2 Number of fruits per tree

Average of 10 trees per accession

8.1.3 Fruit productivity [kg/m²]

Average of 10 trees per accession

8.1.4 Fruit availability [d]

Number of days from the first to the last harvest date

8.1.5 Maturity period

- 1 Early
- 2 Medium
- 3 Late

8.1.6 Fruit bearing

- 3 Poor
- 5 Medium
- 7 Heavy

8.1.7 Fruit quality at storage [d]

Number of days of storage under ambient conditions

8.2 Aril

8.2.1 Chemical composition

8.2.1.1 Aril sugar content [%]

8.2.1.2 Aril acidity content [%]

8.2.1.3 Vitamin C content [mg/100 g pulp FW]

8.3 Notes

Specify here any other additional information

9. Abiotic stress susceptibility

Scored under artificial and/or natural conditions, which should be clearly specified. These are coded on a susceptibility scale from 1 to 9, viz.:

- 1 Very low or no visible sign of susceptibility
- 3 Low
- 5 Intermediate
- 7 High
- 9 Very high

9.1 Reaction to higher temperature

9.1.1 Sunburn susceptibility

9.1.2 Susceptibility to reduced sarcotesta or loose jacket

9.2 Reaction to soil salinity

9.3 Reaction to minerals

9.3.1 Reaction to mineral toxicity

- 1 Boron
- 2 Zinc
- 3 Chloride
- 4 Copper
- 5 Calcium
- 6 Iron
- 99 Other (specify in descriptor 9.7 Notes)

9.3.2 Reaction to mineral deficiency

- 1 Nitrogen
- 2 Phosphorous
- 3 Potassium
- 4 Boron
- 5 Copper
- 6 Molybdenum
- 99 Other (Specify in descriptor 9.7 notes)

9.4 Reaction to waterlogging

9.5 Reaction to drought

9.6 Reaction to constant winds

9.7 Notes

Specify here any additional information

10. Biotic stress susceptibility

In each case, it is important to state the origin of the infestation or infection, i.e. natural, field inoculation, and laboratory. Also specify the causal organism and the corresponding symptoms. Record such information in descriptor 10.3 Notes. These are coded on a susceptibility scale from 1 to 9, viz.:

- 1 Very low or no visible sign of susceptibility
- 3 Low
- 5 Intermediate
- 7 High
- 9 Very high

10.1 Pests

	Causal organism	Common name
10.1.1	<i>Parasa lepida</i>	Leaf eating caterpillar
10.1.2	<i>Attacus atlas</i>	Leaf eating caterpillar
10.1.3	<i>Neosauropus alternus</i>	Leaf eating caterpillar
10.1.4	<i>Tessaratomya longicoma</i>	Leaf eating caterpillar
10.1.5	<i>Adoxophyes privata</i>	Leaf roller
10.1.6	<i>Hypomeces squamosus</i>	Fruit borer

10.2 Diseases

10.2.1	<i>Oidium nippulii</i>	Powdery mildew
10.2.2	<i>Meliola nippulii</i>	Sooty mould
10.2.3	<i>Gloeophthalotrichum bulbilium</i>	Fruit blight
10.2.4	<i>Xanthomonas nippuliae</i>	Leaf rim blight
10.2.5	<i>Dolabra nippuliae</i>	Stem canker

10.3 Notes

Specify here any additional information

11. Biochemical markers [specify methods used and cite reference(s)]

11.1 Isozymes

For each enzyme, indicate the tissue analysed and the zymogram type. A particular enzyme can be recorded as 11.1.1; 11.1.2, etc. Examples include: acid phosphate (ACPH); esterases α and β (EST A and B); isocitrate dehydrogenase (ICD); malate dehydrogenase (MDH); phosphogluconate dehydrogenase (PGD); phosphoglucose isomerase (PGI); phosphoglucose mutase (PGM); peroxidases

11.2 Other biochemical markers

(e.g. polyphenol profile)

12. Molecular markers

Describe any specific discriminating or useful trait for this accession. Report probe-enzyme combination analysed. Below are listed some of the basic methods most commonly used.

12.1 Restriction fragment length polymorphism (RFLP)

Report probe/enzyme combination (approach can be for nuclear, chloroplast or mitochondrial genomes)

12.2 Amplified fragment length polymorphism (AFLP)

Report primer pair combinations and accurate molecular size of products (used for nuclear genomes)

12.3 DNA amplification fingerprinting (DAF); random amplified polymorphic DNA (RAPD); AP-PCR

Accurately report experimental conditions and molecular size of products (used for nuclear genomes)

12.4 Sequence-tagged microsatellites (STMS)

Report primer sequences, and accurate product sizes (can be used for nuclear or chloroplast genomes)

12.5 PCR-sequencing

Report PCR primer sequences, and derived nucleotide sequence (can be used for single copy nuclear, chloroplast or mitochondrial genomes)

12.6 Other molecular markers

13. Cytological characters

13.1 Chromosome number

13.2 Ploidy level

($2x$, $3x$, $4x$, etc. and aneuploidy)

13.3 Meiosis chromosome associations

Average of 50 microscope mother cells (observed during metaphase)

13.4 Other cytological characters

14. Identified genes

Describe any known specific mutant present in the accession

BIBLIOGRAPHY

- Alercia, A., Diulgheroff, S. and Metz, T., 2001. Source / contributor: FAO (Food and Agriculture Organization of the United Nations), IPGRI (International Plant Genetic Resources Institute). In: List of Multicrop Passport Descriptors. <http://www.ipgri.cgiar.org>
- Aman, R. and S. Idris. 1996. Status Report on Genetic Resources of Rambutan in Malaysia, 33 p. IPGRI South Asia Office, NASC, Pusa Campus, New Delhi-110012, India
- American Phytopathological Society. 1994. Common names for plant diseases. Am. Phytopathol. Soc., St. Paul MN, USA.
- CAB International. 1999. Crop Protection Compendium. CD-ROM. CAB International, UK.
- FAO. 1990. Guidelines for Soil Profile Description, 3rd edition (revised). Food and Agriculture Organization of the United Nations, International Soil Reference Information Centre, Land and Water Development Division, FAO, Rome.
- Henderson, I.F. 1989. Henderson's Dictionary of Biological Terms. Tenth Edn., Eleanor Lowrence (ed.) Longman Scientific & Technical, Harlow, Essex, UK.
- Kornerup, A. and J.H. Wanscher. 1984. Methuen Handbook of Colour. Third edition. Methuen, London.
- Munsell Color. 1975. Munsell Soil Color Chart. Munsell Color, Baltimore, MD, USA.
- Munsell Color. 1977. Munsell Color Charts for Plant Tissues, 2nd edition, revised. Munsell Color, Macbeth Division of Kollmorgen Corporation, 2441 North Calvert Street, Baltimore, MD 21218, USA.
- Rana, R.S., R.L. Sapra, R.C. Agrawal and Rajeev Gambhir. 1991. Plant Genetic Resources. Documentation and Information Management. National Bureau of Plant Genetic Resources (Indian Council of Agricultural Research). New Delhi, India.
- Royal Horticultural Society. 1966c. 1986. R.H.S. Colour Chart (edn. 1, 2). Royal Horticultural Society, London.
- Stearn, William T. 1995. Botanical Latin. Fourth Edition. David & Charles Publishers, Newton Abbot, UK.
- Sumiasri, N. 1997. Status Report on Genetic Resources of Rambutan in Indonesia. 16 p. IPGRI South Asia Office, NASC, Pusa Campus, New Delhi-110 012, India.
- Vangnai, V. 1996. Status Report on Genetic Resources of Rambutan in Thailand. 13 p. IPGRI South Asia Office, NASC, Pusa Complex, New Delhi-110 012, India.
- van Hintum, Th.J.L. 1993. A computer compatible system for scoring heterogeneous populations. Genet. Resour. & Crop Evol. 40: 133-136.

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Annex I. Basic list of minimum discriminating descriptors for rambutan

Rambutan	IPGRI Descriptor Number	Name
<i>Nephelium lappaceum</i>	7.1.8	Tree growth habit
	7.2.7	Leaflet shape
	7.2.8	Leaflet apex shape
	7.2.9	Leaflet base shape
	7.3.1	Flowering precocity [y]
	7.3.7	Flower composition in the inflorescence
	7.3.10	Position of inflorescence
	7.4.6	Fruit bearing habit
	7.4.7	Fruit clustering habit
	7.4.10	Fruit shape
	7.4.22	Spine density
	7.4.29	Aril texture
	7.4.34	Attachment of aril to seed
	7.4.35	Adherence of testa to aril
	7.5.4	Seed shape
	7.5.5	Seed coat colour

Annex II. COLLECTING FORM for Rambutan (*Nephelium lappaceum*)

SAMPLE IDENTIFICATION

COLLECTING INSTITUTE CODE (2.2):

COLLECTING No. (2.4):

PHOTOGRAPH (2.23):

COLLECTING DATE OF SAMPLE (2.5):

GENUS (1.8):

SPECIES (1.9):

COLLECTING SITE LOCATION

COUNTRY OF ORIGIN (2.6):

PROVINCE/STATE (2.7):

DEPARTMENT/COUNTY (2.8):

LOCATION (2.9):

km:

direction:

from:

LATITUDE (2.10):

LONGITUDE (2.11):

ELEVATION (2.12):

m asl

COLLECTING SITE ENVIRONMENT

COLLECTING/ACQUISITION SOURCE (2.13):

10. Wild habitat

20. Farm or cultivated habitat

30. Market or shop

40. Institute, experimental station, research organization, genebank

50. Seed company

60. Weedy, disturbed or ruderal habitat

99. Other (specify):

SLOPE [°] (6.1.3):

SLOPE ASPECT (6.1.4):

(code N,S,E,W)

SOIL FERTILITY (6.1.19):

(code: 3 - Low; 5 - Moderate; 7 - High)

SOIL TEXTURE CLASSES (6.1.16):

State class (e.g. Clay, Loam, Silt)

WATER AVAILABILITY (6.1.18):

1. Rainfed

2. Irrigated

3. Flooded

4. River banks

5. Sea coast

99. Other (specify):

RAINFALL (6.1.20.2): Annual mean: mm

Monthly mean (mm):

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC

TEMPERATURE (6.1.20.1): Annual mean: °C

Monthly mean (°C):

JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC

SAMPLE

BIOLOGICAL STATUS OF ACCESSION (2.17):

100. Wild

200. Weedy

300. Traditional cultivar/landrace

400. Breeding/research material

500. Advanced/improved cultivar

999. Other (specify)

TYPE OF SAMPLE (2.16):

1. Seed

2. Seedling/sapling

3. Budwood

4. Graft

5. *In vitro* plantlet

6. Fruit

99. Other (specify which part of the plant is used in descriptor **2.24 Collector's notes**)

54 Rambutan

PREVAILING STRESSES (2.18.14):
Mention the types of major stresses, i.e. abiotic (drought), biotic (pests, diseases, etc.)

ETHNOBOTANICAL DATA

LOCAL/VERNACULAR NAME (2.18.2):

ETHNIC GROUP (2.18.1)

PARTS OF PLANTS USED (2.18.6)

1. Seed	2. Root	3. Trunk	4. Leaf
5. Flower/Inflorescence	6. Fruit	99. Other (specify)	

PLANT USES (2.18.7)

1. Food	2. Forage	3. Fuel	4. Medicine
5. Wood/timber	6. Dye	99. Other (specify)	

ASSOCIATED FLORA (2.18.16)

MANAGEMENT

ACCESSION No. (3.1)

TYPE OF GERMPLASM STORAGE (3.8)

10. Seed collection	20. Field collection	30. <i>In vitro</i> collection
40. Cryopreserved collection	99. Other (specify)	

CHARACTERIZATION

GROWTH

Tree growth habit (7.1.8)	Branching density (7.1.9)	Branching pattern (7.1.10)
---------------------------	---------------------------	----------------------------

LEAF

Leaflet shape (7.2.7)	Leaflet length (7.2.5)	Leaflet width (7.2.6)
Leaflet surface (7.2.11)	Leaf colour (7.2.1)	

INFLORESCENCE

Flowering precocity (7.3.1)	Flower compositon in inflorescence (7.3.7)
Position of inflorescence (7.3.10)	

FRUIT

Fruit shape (7.4.10)	Fruit length (7.4.11)	Fruit diameter (7.4.12)
Spine density (7.4.22)	Aril colour (7.4.26)	

SEED

Seed shape (7.5.4)	Seed coat colour (7.5.5)
Seed length (7.5.1)	Seed width (7.5.2)

EVALUATION

MATURITY PERIOD (8.1.5):

1. Early	2. Medium	3. Late
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FRUIT BEARING (8.1.6):

3. Poor	5. Medium	7. Heavy
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COLLECTOR'S NOTES



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