IPGRI

Descriptors for

Litchi

Litchi chinensis

ASIAN DEVELOPMENT BANK

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Litchi

Litchi chinensis

The International Plant Genetic Resources Institute (IPGRI) is an autonomous international scientific organization, supported by the Consultative Group on International Agricultural Research (CGIAR). IPGRI's mandate is to advance the conservation and use of genetic diversity for the well-being of present and future generations. IPGRI has its headquarters in Maccarese, near Rome, Italy, with offices in more than 20 other countries worldwide. The Institute operates through three programmes: (1) the Plant Genetic Resources Programme, (2) the CGIAR Genetic Resources Support Programme and (3) the International Network for the Improvement of Banana and Plantain (INIBAP).

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Science (JIRCAS), National Geographic Society, National Science Foundation (NSF), Programme on Participatory Research and Gender Analysis for Technology Development and Institutional Innovation (PGRA), Regional Fund for Agricultural Technology (FONTAGRO), Rockefeller Foundation, Taiwan Banana Research Institute (TBRI), Technical Centre for Agricultural and Rural Cooperation (CTA), Technova, United Nations Development Programme (UNDP), UNDP Global Environmental Facility (UNDP-GEF), United Nations Environment Programme (UNEP), UNEP Global Environmental Facility (UNEP-GEF), United States Department of Agriculture (USDA), United States Agency of International Development (USAID), Vlaamse Vereiniging voor Ontwikkelingssamenwerking en Technische Bijstand (VVOB), West Africa Rice Development Association (WARDA) and the World Bank.

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PREFACE

Descriptors for Litchi (*Litchi chinensis*) were developed by Drs Mathura Rai, Nguyen Thi Ngoc Hue 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 the importance of the crop's description. 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 to 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 should 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.

Multi-crop 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 I, the reader will find a Collecting form for Litchi that will facilitate data collecting.

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

List of Descriptors

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

IPGRI publications are available free of charge to the libraries of genebanks, university departments, research institutions, etc, particularly in the developing world. Organizations in the developed world and individual requesters will be asked to pay for some IPGRI publications, although specific titles may also be sent to individuals who can show that they have a particular need for a personal copy of a publication. Such requests should be made to the Head of Communications Services. A, E, F, I, R, S, C and P indicate Arabic, English, French, Italian, Russian, Spanish, Chinese, and Portuguese respectively. Titles marked with * are available only as photocopies. Various descriptor lists are available for downloading in portable document format from IPGRI's web site (URL: <http://www.ipgri.cgiar.org/>).

IPGRI publications can be ordered on-line via Earthprint @http://www.earthprint.com/

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 the registration at the gene bank 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 gene bank 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 descriptors 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 gene bank curators, while evaluation will typically be carried out elsewhere (possible by a multidisciplinary team of scientists). The evaluation data should be fed back to the gene bank 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 descriptors 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

1. Accession descriptors

1.1 Accession number [MCPD]

This number serves as a unique identifier for accessions and is assigned when an accession is entered into the 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 at Bari, Italy; CGN indicates an accession from the genebank at Wageningen, The Netherlands; PI indicates an accession within the USA system)

1.1.1 Local plant number

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

1.2 Donor name

Name of the institution or individual responsible for donating the germplasm

1.3 Donor institute code [MCPD]

Code for the donor institute (see instructions under Institute Code, 1.4)

1.4 Institute code [MCPD]

Code of the institute where the accession is maintained. The codes consist of 3-letter ISO 3166 country code of the country where the institute is located plus number or an acronym as specified in the institute database that will be made available by FAO. Preliminary codes (i.e. codes not yet incorporated in the FAO Institute database) start with an asterisk followed by a 3-letter ISO 3166 country code and an acronym.

1.5 Curator's name

Name of the officer responsible for maintaining the genetic resources material held at the institute specified in descriptor 1.4 **Institute code**

1.6 Other identification (numbers) associated with the accession

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.

1.7 Scientific name

1.7.1 Genus [MCPD]
Genus name for taxon. Initial uppercase letter required.

1.7.2 Species [MCPD]
Specific epithet portion of the scientific name in lowercase letters. Following abbreviation is allowed: "sp."

1.7.3 Species authority [MCPD]
Provide the authority for the species name.

1.7.4 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).

1.7.5 Subtaxa authority [MCPD]
Provide the subtaxa authority at the most detailed taxonomic level.

1.8 Ancestral data
Information about either pedigree or other description of ancestral information (i.e. parent variety in case of mutant or selection).

1.9 Cultivar origin
1 Open pollination
2 Artificial pollination
3 Clonal selection
4 Seedling selection

1.10 Accession

1.10.1 Accession name [MCPD]
Either a registered or other formal designation assigned to the accession

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

1.10.3 Common crop name [MCPD]
Name of the crop in colloquial language, preferably English (i.e. 'malting barley', 'cauliflower', or 'white cabbage')

1.11 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.

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

1.13 Type of material received
1 Seed/seedling
2 Vegetative/budsticks
3 Fruit
4 Pollen
5 *In vitro* culture
99 Other (e.g. more than one type, specify in descriptor **1.14 Notes**)

1.14 Notes
Any additional information may be specified here

2. Collecting descriptors [MCPD]

2.1 Collecting institute code
Code of the institute collecting the sample. If the holding institute has collected the material, the collecting institute code should be the same as the holding institute code.

2.2 Site number
Number assigned to the physical site by the collector

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

2.4 Collecting date of sample [YYYYMMDD] [MCPD]
Collecting date of the samples 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.

2.5 Country of origin [MCPD]
Code of the country in which the sample was originally collected. Use the 3 letter ISO 3166-1 extended country codes.

2.6 Province/State
Name of the primary administrative subdivision of the country in which the sample was collected

2.7 Department/County

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

2.8 Location of collecting site [MCPD]

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

2.9 Latitude of collecting site[1] [MCPD]

Degree (2 digits) minute (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)

2.10 Longitude of collecting site [MCPD]

Degree (3 digits), minutes (2 digits), and seconds (2 digits) followed by E (East) or W (West) (e.g. 07625 low). Every Missing digit (minutes or seconds) should be indicated with a hyphen. Leading zeros are required. (e.g. 076----W).

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

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

2.12 Collecting/acquisition source [MCPD]

Coding listed below follows strictly major descriptor states of the MCPD

10 Wild habitat
20 Farm or cultivated habitat
30 Market or shop
40 Institute, Experimental station, Research organization, Genebank
50 Seed company
60 Weedy, distributed or ruderal habitat
99 Other (specify in descriptor 2.24 Collector's notes)

2.13 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 should be the same as the holding institute code.

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[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°m's''=h*(d+m/60+5/3600)

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

2.14 Collecting source environment

Use descriptors **6.1.1. to 6.1.26** in section **6**

2.15 Number of plants sampled

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 Vegetative/budsticks
2 Seed/seedling
3 Fruit
4 Pollen
5 Tissue culture (specify which part of the plant is used in descriptor **2.24 Collector's notes**)
99 Other (specify which part of the plant is used in descriptor **2.24 Collector's notes**)

2.17 Biological status of accession [MCPD]

100 Wild
200 Weedy
300 Traditional cultivar/landrace
400 Breeding/research material
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 and dialect if the ethnic group is not provided

2.18.3 Translation

Provide translation of the local name into English, if possible

2.18.4 Litchi varietal name meaning

Does the litchi 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 Medicinal
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 litchi type? (e.g. taboos, stories and/or superstitions). If so, describe it briefly in descriptor **2.24 Collector's notes**)

2.18.12 Litchi 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**)

2.18.16 Associated flora

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

2.18.17 Seasonality

1 Available only in season/at particular period
2 Available throughout the year

2.18.18 Market information

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

0 No
1 Yes

2.18.19 Type of market

1 Local
2 National
3 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
44 Very high

2.22 Herbarium specimen

Was a herbarium specimen collected? If so, indicate the plant part used and 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

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 identify, row number, or tree position within the row

3.2 Population identification

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

3.3 Accession location in orchard

Each 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 Plants/propagules establishment [%]

3.8 Type of maintenance

1 Seed
2 Vegetative in the field (Field Genebank/Repository/Hortum)
3 Vegetative in tissue culture (*In vitro*)
4 Pollen
5 Cryopreservation
99 Other (e.g. more than one type, 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.

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

4.2 Population identification
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 of application

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 **2.5 Country of origin**)

5.2 Site (Research Institute)

5.2.1 Latitude

Degree (2 digits) minute (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)

5.2.2 Longitude

Degree (3 digits), minutes (2 digits), and seconds (2 digits) followed by E (East) or W (West) (e.g. 07625 low). Every Missing digit (minutes or seconds) should be indicated with a hyphen. Leading zeros are required. (e.g. 076----W).

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 Screen house
3 Glasshouse
4 Laboratory
5 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
2 Old – declining
3 Mature – diseased
4 Mature – non-vigorous
5 Mature – vigorous
6 Young (not yet bearing)
7 Healthy – cropping poorly
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 **6.1.26** 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 Higher level landform (general physiographic features)

The landform refers to the shape of the land surface in the area in which the collecting site is located (Adapted from FAO 1990)

1 Plain
2 Basin
3 Valley
4 Plateau
5 Upland
6 Hill
7 Mountain

6.1.3 Land element and position

Description of the geomorphology of the immediate surroundings of the collecting site (Adapted from FAO 1990; Fig. 1)

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

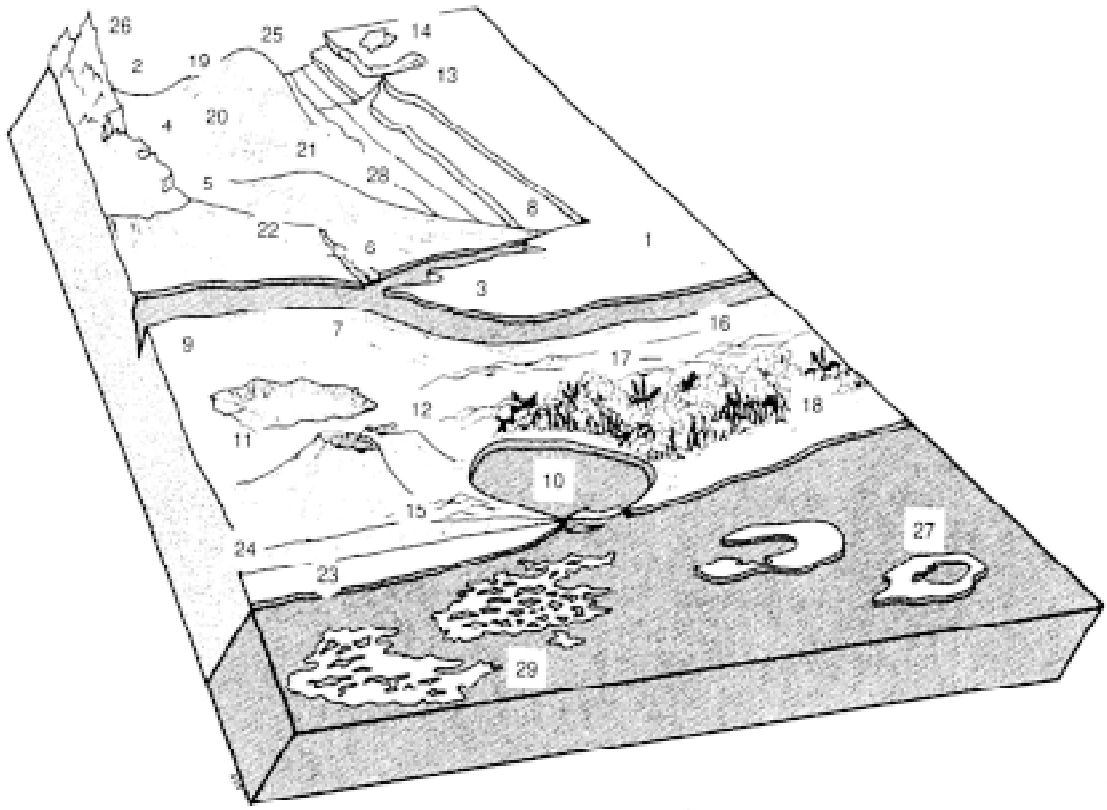


Fig. 1. Land element and position

6.1.4 Slope [°]

Estimated slope of the collecting site

6.1.5 Slope form

It refers to the general shape of the slope in both the vertical and horizontal directions (FAO 1990)

1 Straight
2 Concave
3 Convex
4 Terraced
5 Complex (irregular)

6.1.6 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)

6.1.7 Crop agriculture

(Adapted from FAO 1990)

6.1.7.1 Tree cropping

1 Non-irrigated tree crop cultivation
2 Irrigated tree crop cultivation

6.1.8 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)

6.1.9 Soil parental material

(Adapted from FAO 1990)

Two lists of examples of parent material and rock are given below. The reliability of the geological information and the knowledge of the local lithology will determine whether a general or a specific definition of the parent material can be given. Saprolite is used if the *in situ* weathered material is thoroughly decomposed, clay-rich but still showing rock structure. Alluvial deposits and colluvium derived from a single rock type may be further specified by that rock type.

6.1.9.1 Unconsolidated material

1 Aeolian deposits (unspecified)
2 Aeolian sand
3 Littoral deposits
4 Lagoonal deposits
5 Marine deposits
6 Lacustrine deposits
7 Fluvial deposits
8 Alluvial deposits
9 Unconsolidated (unspecified)
10 Volcanic ash
11 Loess
12 Pyroclastic deposits
13 Glacial deposits
14 Organic deposits
15 Colluvial deposits
16 *In situ* weathered
17 Saprolite
99 Other (specify in appropriate section's Notes)

6.1.9.2 Rock type

(Adapted from FAO 1990)

1	Acid igneous/ metamorphic rock	16	Limestone
2	Granite	17	Dolomite
3	Gneiss	18	Sandstone
4	Granite/gneiss	19	Quartzitic sandstone
5	Quartzite	20	Shale
6	Schist	21	Marl
7	Andesite	22	Travertine
8	Diorite	23	Conglomerate
9	Basic igneous/ metamorphic rock	24	Siltstone
10	Ultra basic rock	25	Tuff
11	Gabbro	26	Pyroclastic rock
12	Basalt	27	Evaporite
13	Dolerite	28	Gypsum rock
14	Volcanic rock	99	Other (specify in appropriate section's Notes)
15	Sedimentary rock	0	Not known

6.1.10 Stoniness/rockiness/hardpan/cementation

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

6.1.11 Soil drainage

(Adapted from FAO 1990)

3 Poorly drained
5 Moderately drained
7 Well drained

6.1.12 Soil salinity (dissolved salts)

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

6.1.13 Quality of the groundwater

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

6.1.14 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

6.1.15 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
5 Slightly moist
7 Moist
9 Wet

6.1.16 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
2 Red
3 Reddish
4 Yellowish red
5 Brown
6 Brownish
7 Reddish brown
8 Yellowish brown
9 Yellow
10 Reddish yellow
11 Greenish, green
12 Grey
13 Greyish
14 Blue
15 Bluish black
16 Black

6.1.17 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

6.1.18 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

6.1.19 Soil erosion

3 Low
5 Intermediate
7 High

6.1.20 Rock fragments

(Adapted from FAO 1990)
Large rock and mineral fragments (>2 mm) are described according to abundance

1 0-2%
2 2.1-5%
3 5.1-15%
4 15.1-40%
5 40.1-80%
6 >80%

6.1.21 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 (Fig. 2):

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

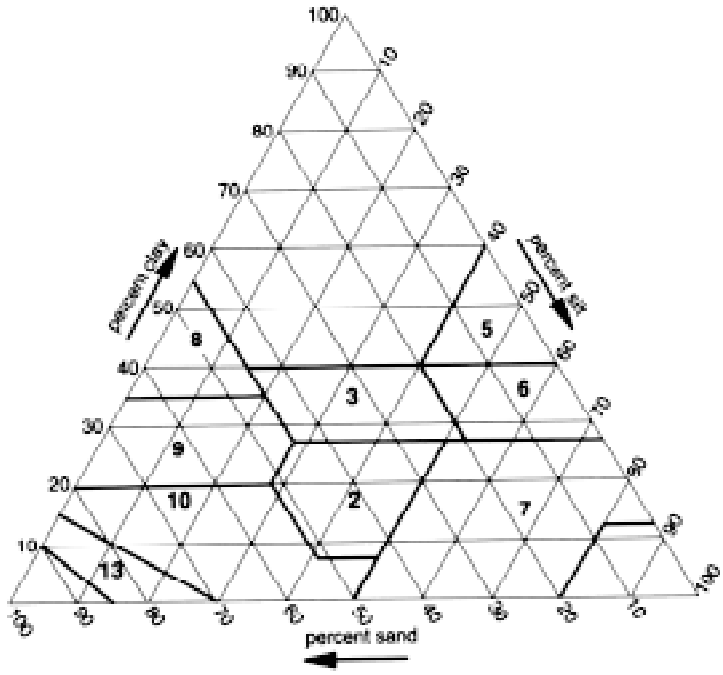


Fig. 2. Soil texture classes

6.1.22 Soil particle size classes

(Adapted from FAO 1990)

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

6.1.23 Soil taxonomic classification

As detailed a classification as possible should be given. This may be taken from a soil survey map. State class (e.g. Alfisols, Spodosols, Vertisols, etc.)

6.1.24 Water availability

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

6.1.25 Soil fertility

General assessment of the soil fertility based on existing vegetation

3 Low
5 Moderate
7 High

6.1.26 Climate of the site

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

6.1.26.1 Temperature [°C]

Provide either the monthly or the annual mean

6.1.26.2 Rainfall [mm]

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

6.1.26.3 Wind

Annual average (state number of years recorded)

6.1.26.3.1 Frequency of typhoons or hurricane force winds

3 Low
5 Intermediate
7 High

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

6.1.26.3.3 Annual maximum wind velocity [m/s]

6.1.26.4 Frost

6.1.26.4.1 Date of most recent frost [YYYYMMDD]

6.1.26.4.2 Minimum temperature [°C]

Specify seasonal average and minimum survival temperature

6.1.26.4.3 Duration of temperature below O°C [d]

6.1.26.5 Relative humidity

6.1.26.5.1 Relative humidity diurnal range [%]

6.1.26.5.2 Relative humidity seasonal range [%]

6.1.26.6 Light

1 Shady
2 Sunny

6.1.26.7 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 Tree volume [m^3]

Calculated with the use of formula $4/3\ \pi a^2 b$ (where a = half of the spread, b= half of the height)

7.1.8 Crown shape

(See Fig. 3)

1 Pyramidal
2 Broadly pyramidal
3 Spherical
4 Oblong
5 Semicircular
6 Dome shaped
7 Irregular
99 Other (specify in descriptor **7.6 Notes**)

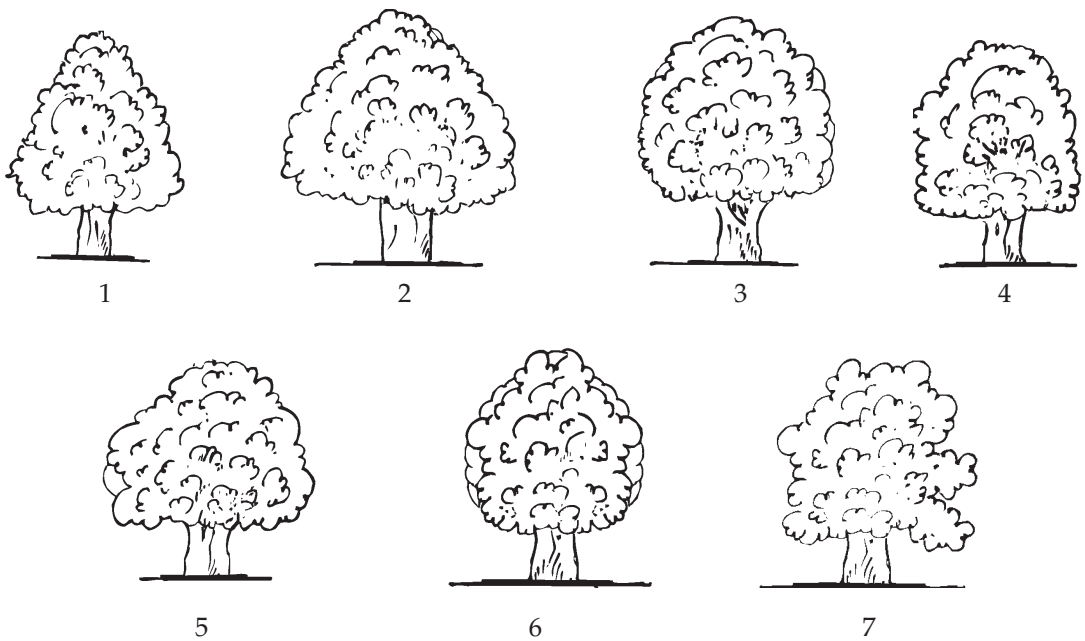


Fig. 3. Crown shape

7.1.9 Tree growth habit

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

7.1.10 Branching density

3 Sparse
4 Medium
7 Dense

7.1.11 Branching pattern

(See Fig. 4)

1 Erect
2 Opposite
3 Verticillate
4 Horizontal
5 Irregular

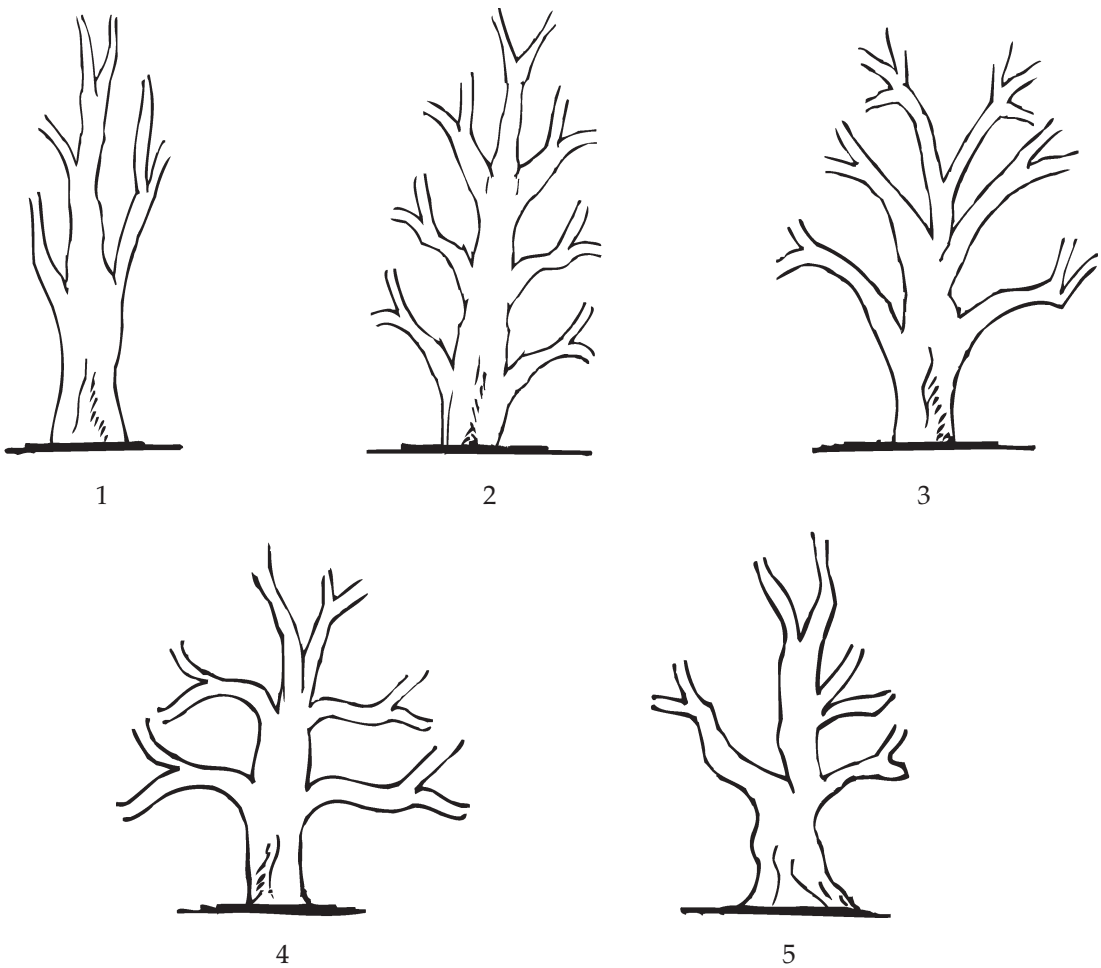


Fig. 4. Branching pattern

7.1.12 Young shoot pubescence

1 Glabrous
2 Pubescent

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.

7.2.1 Young leaf colour

Evaluated newly emerged leaf at fully expanded stage

1 Light green
2 Yellowish green
3 Green
4 Light purple
5 Purple
6 Pinkish green
7 Reddish brown
99 Other (specify in descriptor **7.6 Notes)**

7.2.2 Mature leaf colour

Evaluated at adaxial side, at fully mature stage

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

7.2.3 Number of leaflets per leaf

Average number of leaflets from 10 leaves to be recorded

7.2.4 Arrangement of leaflets (Phyllotaxy)

1 Alternate
2 Opposite

7.2.5 Rachis length [mm]

To be recorded from stem to the last leaflet

7.2.6 Length of petiole (leaflet stalk) [mm]

To be recorded from the rachis to the base of the leaflet blade

7.2.7 Leaflet blade length [cm]

Measured from the base to the tip of the leaf blade

7.2.8 Leaflet blade width [cm]
Measured at the widest point

7.2.9 Leaflet blade shape
(See Fig. 5)

1 Lanceolate
2 Ovate
3 Obovate
4 Elliptic
5 Oblong
99 Other (specify in descriptor **7.6 Notes**)

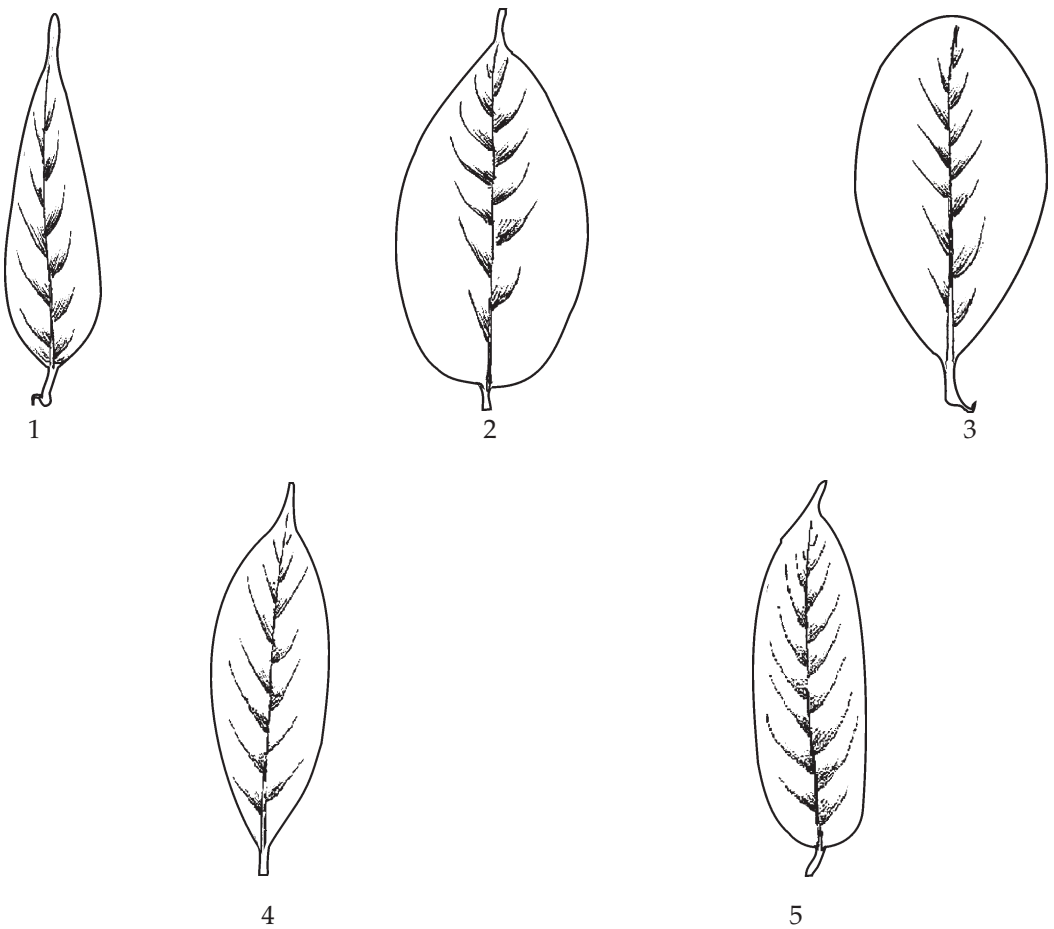


Fig. 5. Leaf blade shape

7.2.10 Leaflet apex shape

(See Fig. 6)

1 Acute
2 Acuminate
99 Other (specify in descriptor **7.6 Notes**)

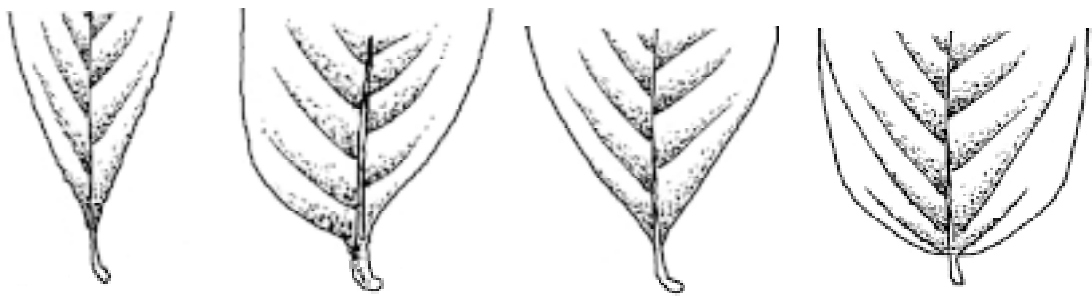
1 2

Fig. 6. Leaflet apex shape

7.2.11 Leaflet base shape

(See Fig. 7)

1 Attenuate
2 Oblique
3 Cuneate
4 Obtuse
99 Other (specify in descriptor **7.6 Notes**)



1 2 3 4

Fig. 7. Leaflet base shape

7.2.12 Leaflet upper surface pubescence

0 Absent
1 Present

7.2.13 Leaflet lower surface pubescence

0 Absent
1 Present

7.2.14 Leaflet midrib appearance

1 Not prominent
2 Slightly prominent
3 Prominent

7.2.15 Leaflet venation appearance

1 Not prominent
2 Slightly prominent
3 Prominent

7.2.16 Leaflet curvature

1 Curve upward from the midrib
2 Curve downward along the margin
3 Flat, no curve
4 Curve down slightly at the top
99 Other (specify in descriptor **7.6 Notes**)

7.2.17 Date of initiation of new flushes [YYYYMMDD]

Recorded when plant gives new extension growth

7.2.18 Protuberances on petiole

0 Absent
1 Present

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 non-functional pseudo-hermaphrodite flower (functional female) [YYYYMMDD]

7.3.6 Flower composition in inflorescence

Average of ten inflorescences to be recorded

1 Number of male flowers
2 Number of pseudo-hermaphrodite flowers
3 Number of functional hermaphrodite flowers

7.3.7 Flower disc/inflorescence colour

1 Light cream
2 Light yellow
3 Dark yellow
4 Pinkish
99 Other (specify in descriptor **7.6 Notes**)

7.3.8 Duration of flowering [d]

Calculated from days to first flower opening to days to last flower opening

7.3.9 Flower size

1 Small
2 Medium
3 Large

7.3.10 Position of inflorescence

1 Terminal
2 Axillary
3 Both

7.3.11 Length of inflorescence

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

7.3.12 Width of inflorescence

Measured at the widest point. Average of 10 inflorescence

7.3.13 Abundance of flowers

1 Profuse
2 Moderate
3 Sparse

7.4 Fruit descriptors

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

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

7.4.2 Date of initiation and end of fruit set [YYYYMMDD]

7.4.3 Number of days from fruit set to fruit maturity [d]

7.4.4 Fruit maturity

7.4.4.1 Start of fruit maturity [YYYYMMDD]

7.4.4.2 End of fruit maturity [YYYYMMDD]

7.4.4.3 Duration of fruit maturity [d]

7.4.5 Fruit maturity group

1 Early
2 Medium
3 Late

7.4.6 Fruit ripening

1 Synchronous ripening
2 Non-synchronous ripening

7.4.7 Fruit bearing habit

1 Regular
2 Alternate years
3 Irregular
99 Other (specify in descriptor **7.6 Notes**)

7.4.8 Fruit bearing intensity

1 Poor
2 Medium
3 Heavy

7.4.9 Fruit clustering habit

Specify number of trees evaluated per accession

1 Solitary
2 Clusters
99 Other (specify in descriptor **7.6 Notes**)

7.4.10 Number of fruits per cluster/inflorescence

7.4.11 Fruit shape

Specify number of fruits evaluated. (See Fig. 8)

1 Round
2 Oval
3 Oblong
4 Conical
5 Elliptic
6 Cordate
7 Long cordate
99 Other (specify in descriptor **7.6 Notes**)

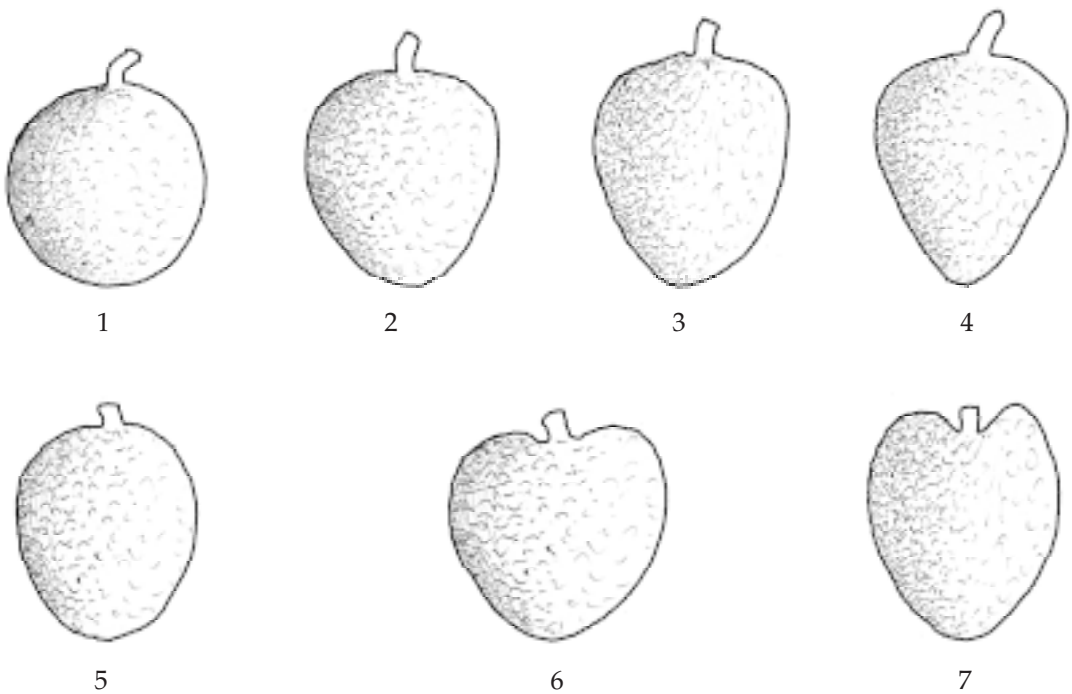


Fig. 8. Fruit shape

7.4.12 Fruit shoulders

1 Even/smooth
2 Protruding

Fig. 9. Fruit shoulders

7.4.13 Fruit tip

(See Fig. 10)

1 Round
2 Obtuse
3 Acute

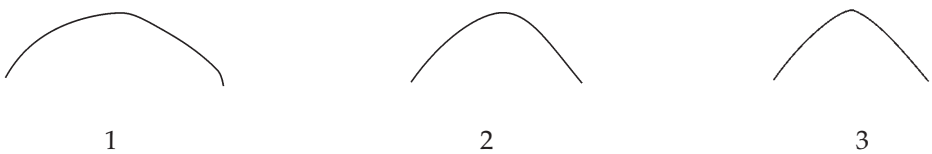


Fig. 10. Fruit tip

7.4.14 Fruit segments

(See Fig. 11)

1 Sharp pointed
2 Nipple shaped
3 Swelling type
4 Smooth

Fig. 11. Fruit segments

7.4.15 Fruit length [cm]
Average of ten fruits

7.4.16 Fruit diameter [cm]
Measured at the widest point. Average of ten fruits

7.4.17 Fruit weight [g]
Average of ten fruits

7.4.18 Cracking/splitting of fruit skin
1 Not prone to cracking
2 Prone to cracking
3 Highly prone to cracking

7.4.19 Fruit skin thickness
1 Thin
2 Medium
3 Thick
4 Very thick

7.4.20 Mature fruit colour
Recorded at maturity
1 Green
2 Greenish yellow
3 Greenish red
4 Pinkish red
5 Crimson
6 Red
7 Reddish yellow
8 Dark red
9 Purple red
10 Rosy red
11 Deep orange
12 Deep pink
99 Other (specify in descriptor **7.6 Notes**)

7.4.21 Distribution of colour on fruit surface
1 Uniform
2 Partial

7.4.22 Shape of tubercles/protuberances
(See Fig. 12) Observed on surface of mature fruit
1 Slightly pointed
2 Sharp pointed
3 Extremely sharp pointed

4 Wedge
5 Obtuse
6 Smooth
7 Cuneate

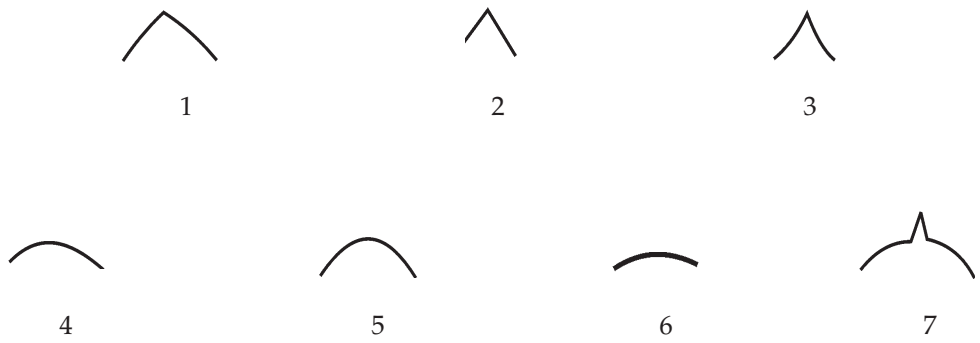


Fig. 12. Shape of tubercles/protuberances

7.4.23 Tubercle density

Recorded at fruit maturity

3 Sparse
5 Medium
7 Dense

7.4.24 Presence of suture

0 Absent
3 Weak (visible, if noticed carefully)
7 Prominent (easily visible)

7.4.25 Fruit attractiveness

Combined assessment of shape, size and appearance, etc.

1 Poor
2 Intermediate
3 Good
4 Excellent

7.4.26 Shelf life [d]
Number of days fruit remains in good condition under storage at room temperature

7.4.26.1 With colour retaining

7.4.26.2 After peel browning

7.4.27 Weight of aril [g]
Measured on ten fruits

7.4.28 Aril thickness [mm]
1 Thin
2 Medium
3 Thick

7.4.29 Aril texture
Recorded on fully ripe fruits
1 Soft (succulent/fleshy)
2 Firm
3 Coarse
4 Fibrous
5 Melting
6 Leathery
7 Crisp
8 Extremely crisp
99 Other (specify in descriptor **7.6 Notes**)

7.4.30 Aril nutritive value
Recorded on fully ripe fruits

7.4.30.1 Total sugars [%]

7.4.30.2 Total soluble solids [°Brix]

7.4.30.3 Vitamin C [mg/100 g pulp]

7.4.30.4 Acidity [%]

7.4.30.5 TSS/acidity ratio

7.4.31 Aril quality
Combined assessment of taste, flavour, juiciness and eye appeal
1 Insipid
2 Acid
3 Bitter
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 Aril colour

Recorded at the ripe stage

1 White
2 Dull white
3 Creamy white
4 Creamy yellow
5 Yellow
6 Pearl white
7 Waxy white
8 Waxy yellow
99 Other (specify in descriptor **7.6 Notes**)

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. 13)

1 Round
2 Oval
3 Oblong
4 Elongate
5 Chicken tongue
6 Irregular
99 Other (specify in descriptor **7.6 Notes**)

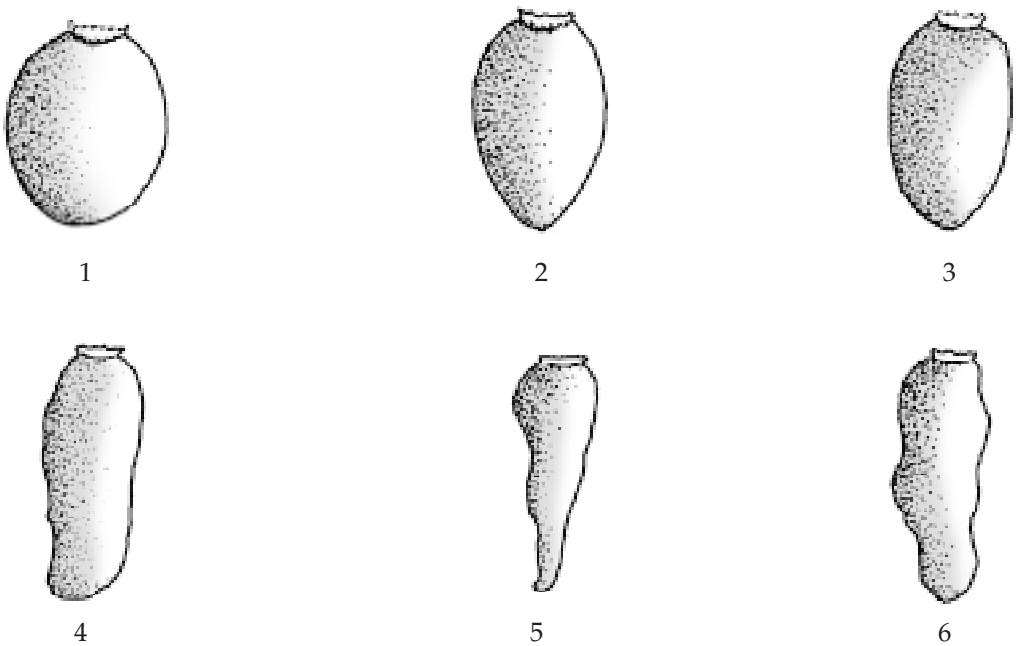


Fig. 13. Seed shape

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]

8.1.2 **Fruit availability** [d]
Number of days from the first to the last harvest date

8.1.3 **Maturity period**
1 Early
2 Intermediate
3 Late

8.1.4 **Fruit bearing**
3 Poor
5 Medium
7 Heavy

8.1.5 **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/100g pulp]

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.:

9.1 Reaction to higher temperature

9.1.1 Sunburn susceptibility of fruit

0 Not susceptible
3 Low
5 Medium
7 High
9 Very high

9.2 Reaction to soil salinity

9.3 Reaction to mineral toxicity

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

9.4 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

10.1.1	*Acrocercops hierocosma*	Leaf minor
10.1.2	*Acrocercops cramerella*	Fruit borer
10.1.3	*Indarbela tetraonis*	Bark eating caterpillar
10.1.4	*A. illipida*	Fruit borer
10.1.8	*Cocoecia epicyrta*	Leaf damaging
10.1.9	*Chlumetia transversa*	Shoot tip boring
10.1.10	*Lymantria mathura*	Leaf damaging
10.1.11	*Ephestia cautella*	Fruit borer
10.1.12	*Myllocerus* sp.	Leaf cutting weevil
10.1.13	*Anoplophora macularia*	Trunk boring
10.1.14	*Cryptocephalum* sp.	Leaf damaging
10.1.15	*Conopomorpha cramerella*	Fruit borer
10.1.16	*Megaleurothrips eusitatus*	Flower damaging
10.1.17	*Toxoptera aurantii*	Aphid
10.1.18	*Chrysocoris stolii*	Litchi bug
10.1.19	*Tessaratoma quadrata*	Litchi bug
10.1.20	*Dacus dorsalis*	Fruit borer
10.1.21	*Acerya litchi*	Leaf curling
10.1.22	*Oligonychus mangiferus*	Leaf damage

10.2 Diseases

10.2.1	*Botryodiplodia theobromae*	Spot in leaf, fruit and flower
10.2.2	*Cephaleuros virenscens*	Leaf spot disease
10.2.3	*Colletrotrichum gleosporiodes*	Fruit rot
10.2.4	*Pestatolia pauciseta*	Spot on leaf and fruit
10.2.5	*Dictyoarthrinium* sp.	Twig blight
10.2.6	*Fusarium* sp.	Flower blight

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 zymorgram type. A particular enzyme can be recorded as 11.1.1; 11.1.2, etc. Examples include: Acid phosphate (ACPH); Esterases and (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 ot 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 1

13.4 Other cytological characters

14. Identified genes
Describe any known specific mutant present in the accession

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Annex I

COLLECTING FORM for litchi (*Litchi chinensis*)

SAMPLE IDENTIFICATION

COLLECTING INSTITUTE CODE (2.1):

COLLECTING No. (2.3): PHOTOGRAPH (2.23):

COLLECTING DATE (YYYY/MM/DD) (2.4):

GENUS (1.7.1): SPECIES (1.7.2):

COLLECTING SITE LOCATION

COUNTRY (2.5):

PROVINCE/STATE (2.6): DEPARTMENT/COUNTY (2.7):

LOCATION (2.8): km: direction: from:

LATITUDE (2.9): LONGITUDE (2.10): ELEVATION (2.11): m asl

COLLECTING SITE ENVIRONMENT

COLLECTING SOURCE (2.12):
10 Wild habitat 20 Farm or cultivated habitat 30 Market or Shop
40 Institute, Experimental station, Research organization, Genebank 50 Seed company
60 Weedy, distributed or ruderal habitat 99. Other (specify):

HIGHER LEVEL LANDFORM (6.1.2):
1. Plain 2. Basin 3. Valley 4. Plateau 5. Upland 6. Hill 7. Mountain

SLOPE [°] (6.1.4): SLOPE ASPECT (6.1.6): (code N,S,E,W)

SOIL FERTILITY (6.1.25): (code: 3=Low ; 5=Moderate; 7=High)

SOIL TEXTURE CLASSES (6.1.21): State class (e.g. Clay, Loam, Silt)

SOIL TAXONOMIC CLASSIFICATION (6.1.23): State class (e.g. Alfisols, Spodosols, Vertisols)

WATER AVAILABILITY (6.1.24):
1. Rainfed 2. Irrigated 3. Flooded 4. River banks
5. Sea coast 99. Other (specify):

RAINFALL (6.1.26.2): Annual mean: mm

Monthly mean (mm):	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

TEMPERATURE (6.1.26.1): Seasonal mean: °C

Monthly mean (°C):	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

SAMPLE

BIOLOGICAL STATUS OF ACCESSIONS (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. Vegetative/budsticks 2. Seed/seedling 3. Fruit 4. Pollen 5. Tissue culture 99. Other (specify)

No. OF PLANTS SAMPLED (2.15)

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 MAINTENANCE (3.8)

1. Seed	2. Vegetative in field	3. Vegetative in tissue culture	4. Pollen
5. Cryopreservation	99. Other (specify)		

CHARACTERIZATION

GROWTH
Tree growth habit (7.1.9), Branching density (7.1.10), Branching pattern (7.1.11)

LEAF

Leaflet blade shape (7.2.9)	Leaflet blade length (7.2.7)	Leaflet blade width (7.2.8)
Leaflet surface pubescence (7.2.12, 7.2.13)	Young leaf colour (7.2.1)	Mature leaf colour (7.2.2)

INFLORESCENCE

Flowering precocity (7.3.1)	Flower compositon in inflorescence (7.3.6)
Flower disc/inflorescence colour (7.3.7)	Position of inflorescence (7.3.10)

FRUIT

Fruit shape (7.4.11)	Fruit length (7.4.15)	Fruit diameter (7.4.16)
Shape of tubercles (7.4.22)	Tubercles density (7.4.23)	Aril texture (7.4.29)

SEED

Seed shape (7.5.4)	Seed coat colour (7.5.5)	Cracking of fruit skin (7.4.18)
Seed length (7.5.1)	Seed width (7.5.2)	

EVALUATION

MATURITY PERIOD (8.1.3):
1. Early 2. Intermediate 3. Late

FRUIT BEARING (8.1.4):
3. Poor 5. Medium 7. Heavy

COLLECTOR'S NOTES

FUTURE HARVEST
<www.futureharvest.org>

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