

TROPICAL AND SUB TROPICAL FRUIT CHARACTERIZATION AND EVALUATION DESCRIPTORS BOOK

(Mango, Banana, Citrus, Avocado, Litchi, Coffee)

Collection of IBPGR, UPOV, IBPGR, and ECPGR Publications



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Descriptors for

Mango

(Mangifera indica)



List of Descriptors

<i>Allium</i> (E,S)	2001	Pearl millet (E/F)	1993
Almond (Revised) * (E)	1985	Pepino (E)	2004
Apple (E)	1982	<i>Phaseolus acutifolius</i> (E)	1985
Apricot * (E)	1984	<i>Phaseolus coccineus</i> * (E)	1983
Avocado (E/S)	1995	<i>Phaseolus lunatus</i> (P)	2001
Bambara groundnut (E,F)	2000	<i>Phaseolus vulgaris</i> * (E,P)	1982
Banana (E,S,F)	1996	Pigeonpea (E)	1993
Barley (E)	1994	Pineapple (E)	1991
<i>Beta</i> (E)	1991	Pistachio (A,R,E,F)	1997
Black pepper (E/S)	1995	<i>Pistacia</i> (excluding <i>Pistacia vera</i>) (E)	1998
<i>Brassica</i> and <i>Raphanus</i> (E)	1990	Plum * (E)	1985
<i>Brassica campestris</i> L. (E)	1987	Potato variety * (E)	1985
Buckwheat (E)	1994	Quinoa * (E)	1981
<i>Capsicum</i> (E/S)	1995	Rambutan (E)	2003
Cardamom (E)	1994	Rice * (E)	1980
Carrot (E,S,F)	1998	Rocket (E,I)	1999
Cashew (E)	1986	Rye and Triticale * (E)	1985
Chenopodium (S)	2005	Safflower * (E)	1983
Cherry * (E)	1985	Sesame (Revised) (E)	2004
Chickpea (E)	1993	<i>Setaria italica</i> and <i>S. pumilla</i> (E)	1985
<i>Citrus</i> (E,F,S)	1999	Shea tree (E)\	2006
Coconut (E)	1995	Sorghum (E/F)	1993
Coffee (E,S,F)	1996	Soybean * (E/C)	1984
Cotton (Revised) (E)	1985	Strawberry (E)	1986
Cowpea (E)	1983	Sunflower * (E)	1985
Cultivated potato * (E)	1977	Sweet potato (E/S/F)	1991
Date palm (F)	2005	Taro (E,F,S)	1999
<i>Echinochloa</i> millet * (E)	1983	Tea (E,S,F)	1997
Eggplant (E/F)	1990	Tomato (E,S,F)	1996
Faba bean * (E)	1985	Tropical fruits * (E)	1980
Fig (E)	2003	Ulluco (S)	2003
Finger millet (E)	1985	<i>Vigna aconitifolia</i> and <i>V. trilobata</i> (E)	1985
Forage grass * (E)	1985	<i>Vigna mungo</i> and <i>V. radiata</i> (Revised)*(E)	1985
Forage legume * (E)	1984	Walnut (E)	1994
Grapevine (E,S,F)	1997	Wheat (Revised) * (E)	1985
Groundnut (E/S/F)	1992	Wheat and <i>Aegilops</i> * (E)	1978
Jackfruit (E)	2000	White Clover (E)	1992
Kodo millet * (E)	1983	Winged Bean * (E)	1979
<i>Lathyrus</i> spp. (E)	2000	<i>Xanthosoma</i> (E)	1989
Lentil * (E)	1985	Yam (E,S,F)	1997
Lima bean * (E)	1982		
Litchi (E)	2002		
Lupin * (E/S)	1981		
Maize (E/S/F, P)	1991		
Mango (E)	1989		
Mangosteen (E)	2003		
<i>Medicago</i> (Annual) * (E/F)	1991		
Melon (E)	2003		
Mung bean * (E)	1980		
Oat * (E)	1985		
Oca * (S)	2001		
Oil palm (E)	1989		
<i>Panicum miliaceum</i> and <i>P. sumatrense</i> (E)	1985		
Papaya (E)	1988		
Peach * (E)	1985		
Pear * (E)	1983		

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Descriptors for

Mango

Mangifera indica L.

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PREFACE

Descriptors for Mango (*Mangifera indica* L.) is a revision of the original publication of the International Board for Plant Genetic Resources (IBPGR 1989). The descriptors' numbers given in the original descriptors list are given in parentheses in the present descriptors list against respective descriptors for cross referencing purposes. The revised Descriptors for Mango is based on the work of a team of experts consisting of Dr Alberto Carlos de Queiroz Pinto, Dr Richard J. Campbell, Dr (Ms) Rachel Soto, Dr S. Rajan, Dr M.R. Dinesh and Dr Bhag Mal. The development of this descriptor list was coordinated by Dr Bhag Mal. 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, however, does not 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 indicated 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 multicrop passport descriptors, not all descriptor states for a particular descriptor will be relevant to a specific crop. In Annex II, the reader will find the 'Collecting form for Mango' that will facilitate data collecting.

Any suggestions for improvement on the Descriptors for Mango 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. These types of descriptors include 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 indicated 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;

2 Mango

- (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 Lanceolate
- 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 3-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/>). If new Institutes Codes are required, they can be generated online by national WIEWS administrators.

1.2 Accession number (1.1) [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 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 (1.2)

Name of the institution or individual responsible for donating the germplasm

1.4 Donor institute code [MCPD]

Code for the donor institute. (See instructions under Institute Code, 1.1).

1.5 Donor accession number (1.3) [MCPD]

Number assigned to an accession by the donor. (See instructions under Accession Number, 1.2).

1.6 Other number(s) associated with the accession (1.4) [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.

1.7 Scientific name

1.7.1 Genus (1.5.1) [MCPD]
Genus name for taxon. Initial uppercase letter required.

1.7.2 Species (1.5.2) [MCPD]
Specific epithet portion of the scientific name in lowercase letters. The abbreviation 'sp.' is allowed.

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

1.7.3 Subtaxa [MCPD]
Subtaxa can be used to store any additional taxonomic identifier.

1.7.3.1 Rank name
The rank of the subtaxon name. The following abbreviations are allowed: 'subsp.' (for subspecies); 'convar.' (for convariety); 'var.' (for variety); 'f.' (for form).

1.7.3.2 Subtaxon name [MCPD]
The infraspecific epithet of the scientific name, i.e. the epithet following the indication of the infraspecific rank in the name string (trinomial)

1.7.3.3 Subtaxon authority [MCPD]
Provide the subtaxon authority at the most detailed taxonomic level.

1.8 Ancestral data (1.6) [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'.

1.8.1 Female parent

1.8.2 Male parent

1.9 Cultivar origin

- 1 Open pollination
- 2 Artificial pollination
- 3 Clonal selection
- 4 Seedling selection
- 5 Induced mutation
- 6 Bud sports
- 99 Other (specify in descriptor **1.13 Remarks**)

1.10 Accession

1.10.1 Accession name (1.6) [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

1.10.2 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 in English (i.e. 'malting barley', 'cauliflower' or 'white cabbage').

1.10.4 Local language

Language in which the accession name is given

1.10.5 Translation/Transliteration

Provide translation of the local accession name into English

1.11 Acquisition date [YYYYMMDD] (1.7) [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 (1.8)

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

1.13 Remarks

The remarks field is used to add notes or to elaborate on descriptors with value '99' or '999' (= Other).

2. Collecting descriptors

2.1 Collecting institute code (2.2) [MCPD]

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. (See instructions under Institute Code, 1.1).

2.2 Site number

Number assigned to the physical site by the collector

2.3 Collecting number (2.1) [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 item is essential for identifying duplicates held in different collections.

2.4 Collecting date of sample [YYYYMMDD] (2.3) [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.

2.5 Country of origin (2.4) [MCPD]

Code of the country in which the sample was originally collected. Use the three-letter abbreviation from the International Standard (ISO) Codes for the representation of names of countries. The ISO 3166-1: Code list can be obtained from IPGRI (ipgri-mcpd@cgiar.org).

2.6 Province/State (2.5)

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 Province/State) of the country in which the sample was collected

2.8 Location of collecting site (2.6) [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).

2.9 Latitude of collecting site¹ (2.7) [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).

2.10 Longitude of collecting site¹ (2.8) [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).

2.11 Elevation of collecting site [m asl] (2.9) [MCPD]

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

2.12 Collecting/acquisition source (2.10) [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
- 15 Aquatic habitat

20 Farm or cultivated habitat

- 21 Field
- 22 Orchard
- 23 Backyard, home garden (urban, peri-urban or rural)
- 24 Fallow land
- 25 Pasture

30 Market or shop

40 Institute/research organization, experimental station, genebank

50 Seed company

60 Disturbed or ruderal habitat

- 61 Roadside
- 62 Field margin

99 Other (specify in descriptor 2.24 Remarks)

¹To 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:

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

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 Breeding institute code [MCPD]

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. It follows the Institute code standard.

2.14 Collecting source environment

Use descriptors 6.1 to 6.2 in section 6

2.15 Type of sample (2.15)

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

- 1 Fruit
- 2 Seed
- 3 Seedling/sapling
- 4 Shoot/budwood/stem cutting
- 5 *In vitro* plantlet
- 99 Other (specify which part of the plant is used in descriptor 2.24 Remarks)

2.16 Number of plants sampled (2.13)**2.17 Biological status of accession** (2.11) [MCPD]

The coding scheme proposed can be used at three different levels of detail: either by using the general codes (in bold face) 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
- 200 Weedy**
- 300 Traditional cultivar/landrace**
- 400 Breeding/research material**
 - 410 Breeder's line
 - 411 Synthetic population
 - 412 Hybrid
 - 413 Foundation 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 Remarks)

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 (2.12)

Name given by farmer to the crop and cultivar/landrace/clone/wild form. State language and/or 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 Mango varietal name meaning

Does the mango name have a meaning? If yes, describe it briefly in descriptor

2.24 Remarks

- 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 Root
- 2 Trunk
- 3 Bark
- 4 Leaf
- 5 Flower
- 6 Fruit
- 7 Peel
- 8 Pericarp
- 9 Seed
- 99 Other (specify in descriptor **2.24 Remarks**)

2.18.7 Plant uses

- 1 Food (fruit, juice, pickle)
- 2 Fuel
- 3 Wood/timber
- 4 Medicine
- 5 Seed for starch extraction
- 99 Other (specify in descriptor **2.24 Remarks**)

2.18.8 Special uses, if any

- 1 Feasts
- 2 Religious purpose
- 3 Chiefs
- 4 Aesthetic
- 99 Other (specify in descriptor **2.24 Remarks**)

2.18.9 Frequency of use of the plant

- 1 Daily
- 2 Weekly
- 3 Occasional
- 99 Other (specify in descriptor **2.24 Remarks**)

2.18.10 Method of use

- 1 Table fruit
- 2 Preserved
- 3 Processed product
- 99 Other (specify in descriptor **2.24 Remarks**)

2.18.11 Cultural characteristics

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

2.18.12 Mango popularity

Is the variety popular and widely grown? If yes, describe briefly the reasons in descriptor **2.24 Remarks**

- 0 No
- 1 Yes

2.18.13 Preferred growing conditions

Is the variety adaptable? If yes, describe farmers' perceptions of the variety (hardiness adaptability to water logging, etc.) in relation to main stresses in descriptor **2.24 Remarks**

- 0 No
- 1 Yes

2.18.14 Prevailing stresses

Information on major associated stresses

- 1 Biotic (pests, diseases, weeds, parasitic plants)
- 2 Abiotic (drought, flood, salinity, calcareousness)

2.18.15 Cultural methods**2.18.15.1 Cropping system/pattern**

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

2.18.15.2 Propagation method

Method used to produce trees/planting material

- 1 Seed (monoembryonic/polyembryonic)
- 2 Grafting (specify type of grafting and the species, hybrid and/or clone used as rootstock, in descriptor **2.24 Remarks**)
- 3 Cutting
- 4 Layering
- 5 *In vitro* (specify which part of plant used, in descriptor **2.24 Remarks**)
- 99 Other (specify in descriptor **2.24 Remarks**)

2.18.15.3 Water requirement

- 1 Rainfed
- 2 Irrigated (drip, basin or flooding-specify average annual amount of water supplied per tree per year for drip and basin and per hectare for flooding)
- 99 Other (specify in descriptor **2.24 Remarks**)

2.18.15.4 Fertilizer application

- 1 Organic
- 2 Inorganic
- 99 Other (specify in descriptor **2.24 Remarks**)

2.18.15.5 Cultural situation status of plantation

- 1 Backyard (indicate number of trees)
- 2 Small orchard (<5 ha)
- 3 Mid-size orchard (5-10 ha)
- 4 Large plantation (>10 ha)
- 99 Other (specify in descriptor **2.24 Remarks**)

2.18.16 Associated flora

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

2.18.17 Seasonality/fruit availability

- 1 Available only in main season
- 2 Available in off-season
- 3 Available throughout the year
- 4 Available in alternate years

2.18.18 Market information

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

- 0 No
- 1 Yes

2.18.19 Type of market

- 1 Local (village, city, district, province/state)
- 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

Number of trees per ha (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 Remarks**

- 0 No
- 1 Yes

2.23 Photograph

(2.14)

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 Remarks**

- 0 No
- 1 Yes

2.24 Remarks

(2.16)

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 [Passport 1.2.1]

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 2.3]

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

3.3 Availability for exchange

0 No

1 Yes

3.4 Import/export and related activities

3.4.1 Import procedures

3.4.1.1 Import permit needed

0 No

1 Yes

3.4.1.2 Phytosanitary certificate needed

0 No

1 Yes

3.4.1.3 Quarantine required

0 No

1 Yes

3.4.2 Export procedures

3.4.2.1 Import permit from receiving country needed

0 No

1 Yes

3.4.2.2 Export permit needed

0 No

1 Yes

3.4.3 Pre- and post-movement activities

3.4.3.1 Treatment of sample during the transit

List all relevant information on how the sample was treated between its collection and the deposit at its destination

3.4.3.2 Destination of the accession

Indicate where the sample is sent after it has been collected. Specify the institution, the name of the collection or station, the address and country in descriptor **3.12 Notes**

- 1 Final destination of sample
- 2 Intermediate holding station

3.5 Storage address

Building, room, shelf/rack number (tissue culture material), field location where material is stored/maintained. Enter separate block designations, row numbers and tree numbers within the row for each accession

3.5.1 Block designation

3.5.2 Row number

3.5.3 Tree number within the row

3.6 Sowing/planting date [YYYYMMDD] (3.4)

Specify the date on which sowing/planting was done

3.7 Plant/propagule establishment [%]

Per cent plants/propagules established from the date of sowing/planting

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

- 11 Short-term
- 12 Medium-term
- 13 Long-term

20 Field collection

30 *In vitro* collection

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 subculture 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 (monoembryonic/polyembryonic)
- 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 Method of cryopreservation

- 1 Slow freezing
- 2 Rapid freezing
- 3 Encapsulation

3.11.7 Regeneration process

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

3.11.8 Medium used for regeneration/recovery

3.11.9 Recovery of samples

- 1 Number of samples recovered
- 2 Per cent recovery

3.11.10 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 2.3]

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 Propagation method (4.1.1)

- 1 Seed (monoembryonic/polyembryonic)
- 2 Budding
- 3 Grafting
- 4 Layering
- 5 Cutting
- 6 Tissue culture
- 99 Other (specify in descriptor 4.11 Notes)

4.7 Sowing/grafting/planting date [YYYYMMDD] (3.4/5.4)

Specify which of the above in descriptor 4.11 Notes

4.8 Cultural practices

4.8.1 Planting density

Number of trees established per hectare

4.8.2 Irrigation

Specify amount, frequency and method used

4.8.3 Fertilizer application

Specify type, dose, frequency and method of application

4.9 Previous multiplication and/or regeneration

4.9.1 Location

4.9.2 Plot number

4.9.3 Sowing/planting date [YYYYMMDD]

4.10 Number of times accession regenerated

Since the date of acquisition

4.11 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 (3.1, 5.1)
(See instructions in descriptor 2.5 Country of origin)

5.2 Site (Research Institute) (3.2, 5.2)

5.2.1 Latitude
See instructions under 2.9

5.2.2 Longitude
See instruction under 2.10

5.2.3 Elevation [m asl]

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

5.2.5 Planting site in the field
Give block, strip and/or row/plot numbers as applicable, plants/plot, replication

5.3 Evaluator's name and address (3.3, 5.3)

5.4 Sowing/grafting/budding/layering/stooling date [YYYYMMDD] (3.4, 5.4)

5.5 Harvest date [YYYYMMDD]

5.6 Evaluation environment

Environment in which characterization/evaluation/screening was carried out

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

5.7 Age of tree [y]

5.8 Seed germination [%]

5.8.1 Number of days to germination [d]
Specify number of days over which germination is measured

5.9 Number of days to planting after seed/asexual propagation [d]

5.10 Field establishment [%]

Percentage of plants established

5.11 Sowing/planting site in the field

Indicate block, strip and/or row/plot numbers as applicable, plants/plot, replication

5.12 Field spacing

5.12.1 Distance between trees in a row [m]

5.12.2 Distance between rows [m]

5.12.3 Planting system/pattern

(See descriptor 2.18.15.1)

5.13 Fertilizer

Specify fertilizer used, doses, frequency and method of application

5.14 Plant protection

Specify pesticides used, doses, frequency and method of application

5.15 Environmental characteristics of site

Use descriptors 6.1 to 6.2 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	3.0 – 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 collecting site (Adapted from FAO 1990; Fig. 1)

- | | |
|----------------------|-------------------------------------------------------------------|
| 1 Plain level | 17 Interdunal depression |
| 2 Escarpment | 18 Mangrove |
| 3 Interfluvium | 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 | |

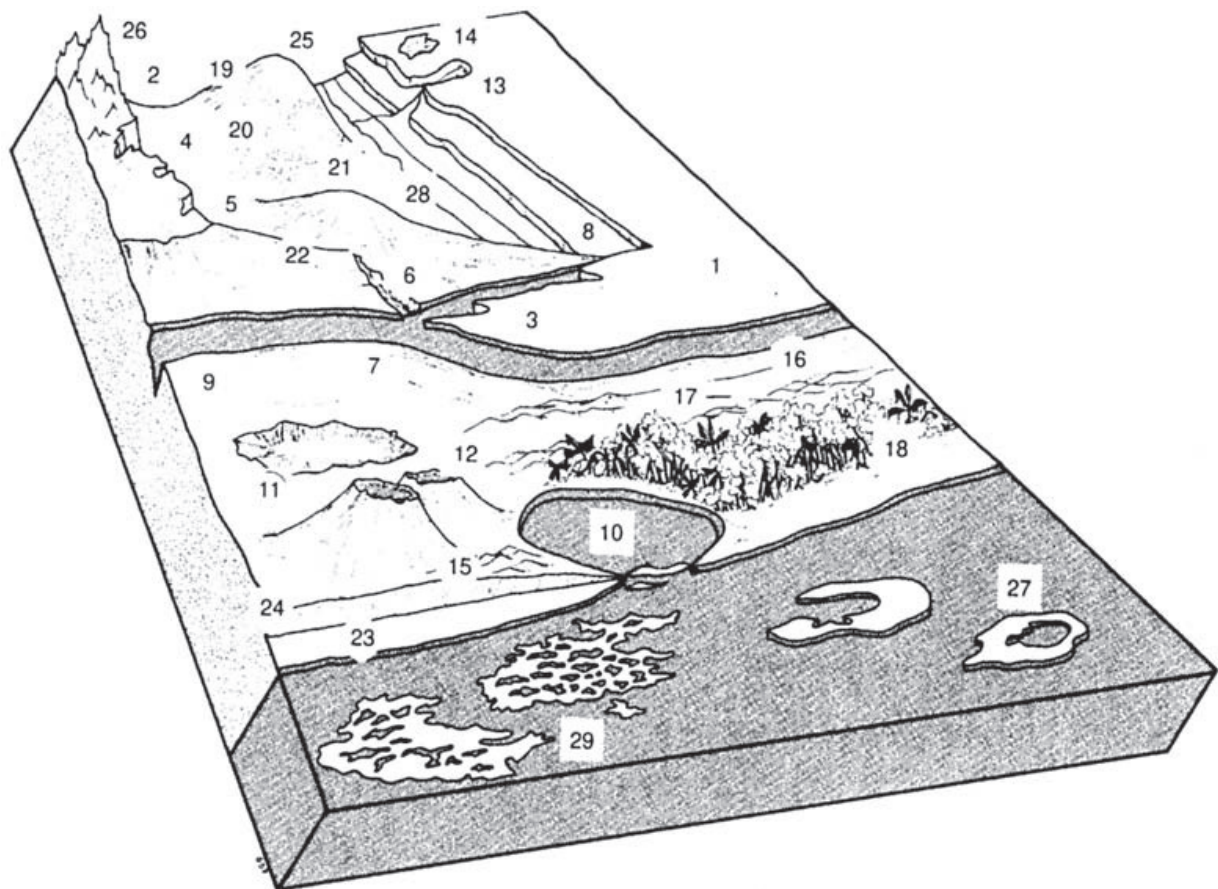


Fig. 1. Land element and position

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 Type of vegetation surrounding 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
- 7 Heavy metal containing

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

(Adapted from FAO 1990)

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.

- 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)
- 2 Low (as in long-term cultivation in a tropical setting)
- 3 Medium (as in recently cultivated but not yet much depleted)
- 4 High (as in never cultivated, and in recently cleared forest)
- 5 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:

6.1.14.1 Soil pH value**6.1.14.2 Soil depth [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 |

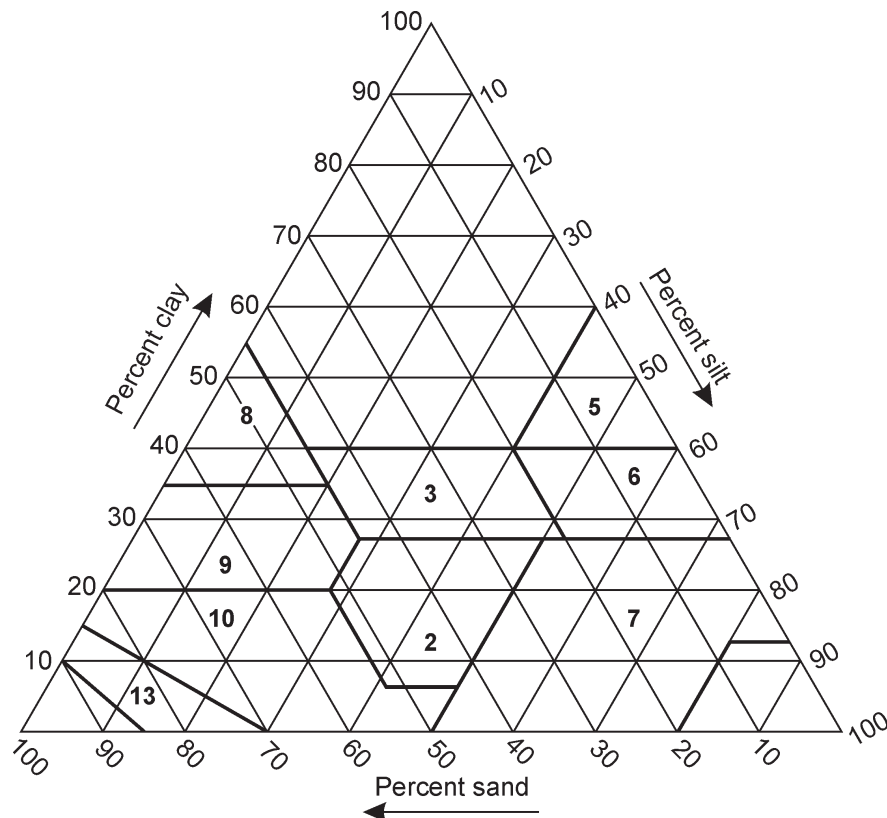


Fig. 2. Soil texture classes

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 at the site

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

6.1.20.1 Temperature [°C]

Provide either monthly or annual mean

6.1.20.2 Rainfall [mm]

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

6.1.20.3 Wind velocity

Annual average (state number of years of observations)

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)

6.2 Notes

Indicate here, any other site and environment-specific information

CHARACTERIZATION

7. Plant descriptors

Average of at least two 'on-years' (production years) data recorded on three trees, unless otherwise stated.

7.1 Tree descriptors

7.1.1 Tree age [y]

7.1.2 Tree type (4.1.1)

- 1 Seedling (monoembryonic/polyembryonic)
- 2 Grafted
- 99 Other (specify in descriptor 7.6 Notes)

7.1.3 Height of mature tree [m] (4.1.4)

Measured from ground level to the top of the tree

- 1 Short (≤ 6.0)
- 2 Medium (6.1 – 9.0)
- 3 Tall (9.1 – 12.0)
- 4 Very tall (> 12.0)

7.1.4 Trunk circumference [cm]

Measured at 50 cm above ground level in the mature tree

7.1.5 Crown diameter [m]

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

7.1.6 Crown shape

(See Fig. 3)

- 1 Oblong
- 2 Broadly pyramidal
- 3 Semi-circular
- 4 Spherical
- 99 Other (specify in descriptor 7.6 Notes)

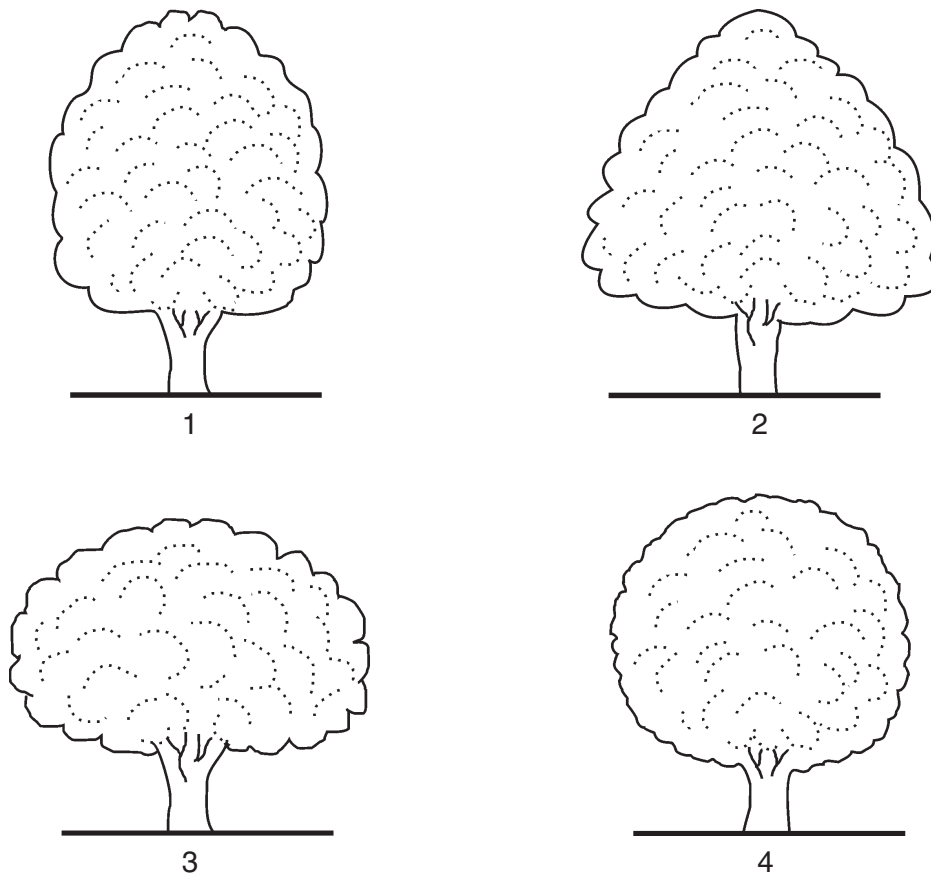


Fig. 3. Crown shape

7.1.7 Tree growth habit (4.1.3)

(See Fig. 4)

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

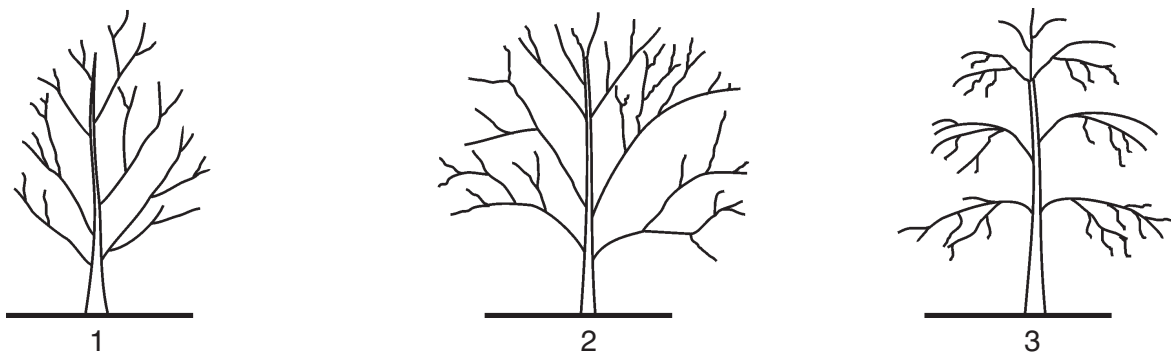


Fig. 4. Tree growth habit

7.1.8 Foliage density

- 3 Sparse
- 5 Intermediate
- 7 Dense

7.2 Leaf descriptors

7.2.1 Leaf blade shape (4.1.5)

(See Fig. 5)

- 1 Elliptic
- 2 Oblong
- 3 Ovate
- 4 Obovate
- 5 Lanceolate
- 6 Oblanceolate
- 99 Other (specify in descript 7.6 Notes)

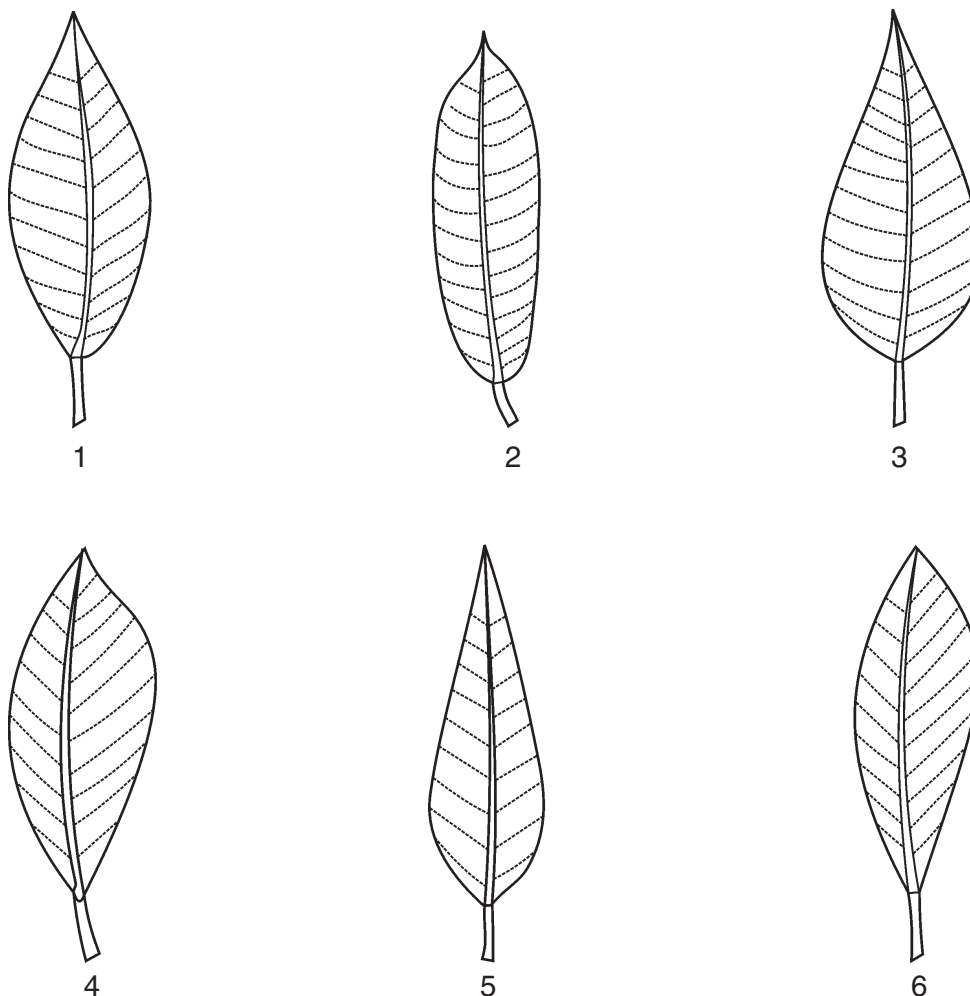


Fig. 5. Leaf blade shape

7.2.2 Leaf attitude in relation to branch

(See Fig. 6)

- 1 Semi-erect
- 2 Horizontal
- 3 Semi-drooping
- 99 Other (specify in descriptor 7.6 Notes)

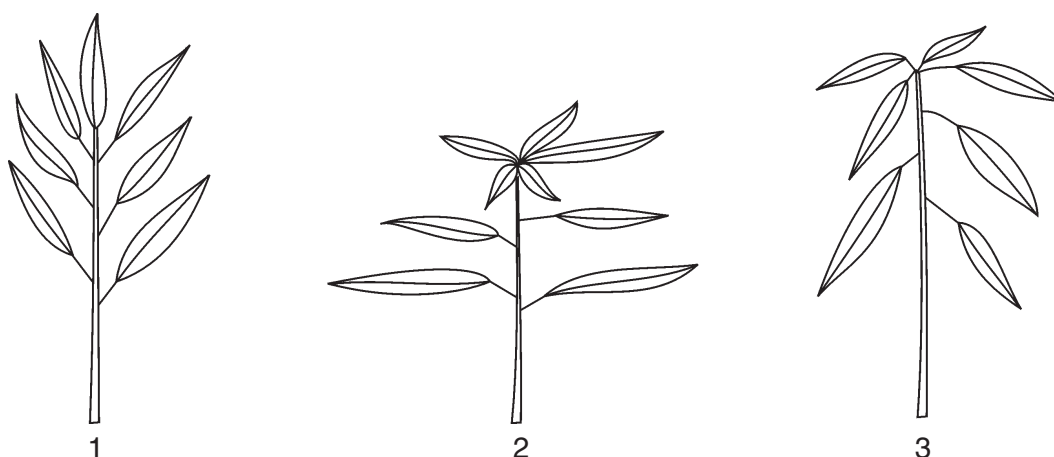


Fig. 6. Leaf attitude in relation to branch

7.2.3 Leaf blade length [cm] (4.1.6)

Average of 10 mature leaves measured from the base to the tip of the leaf blade

7.2.4 Leaf blade width [cm] (4.1.7)

Average of 10 mature leaves measured at the widest point

7.2.5 Petiole length [cm] (6.1.4)

Average length of 10 mature leaves measured from the stem to the base of leaf blade

7.2.6 Thickness of petiole

- 1 Thin
- 2 Thick and tapering

7.2.7 Leaf venation

7.2.7.1 Angle of secondary veins to the midrib

- 1 Narrow (< 45°)
- 2 Medium (45 – 60°)
- 3 Wide (> 60°)

7.2.7.2 Curvature of secondary veins

- 0 Absent
- 1 Present

7.2.8 Leaf texture (6.1.1)

- 1 Coriaceous
- 2 Chartaceous
- 3 Membranous

7.2.9 Leaf apex shape (6.1.2)

(See Fig. 7)

- 1 Obtuse
- 2 Acute
- 3 Acuminate

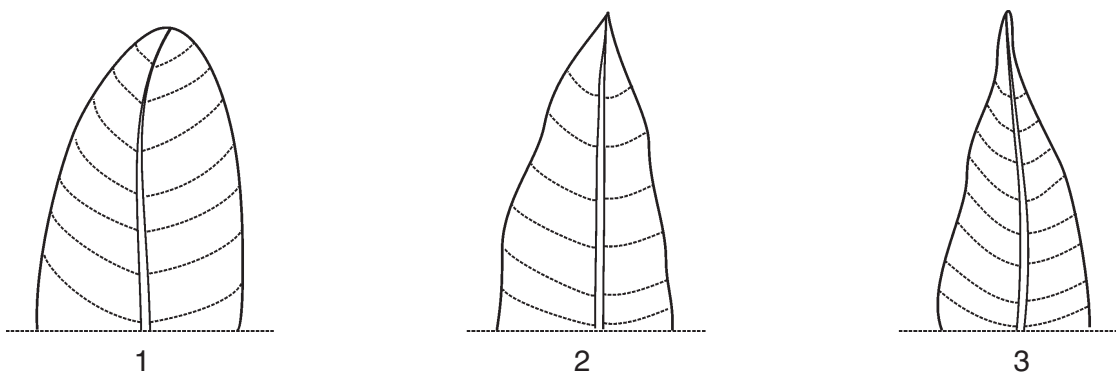


Fig. 7. Leaf apex shape

7.2.10 Leaf base shape

(See Fig. 8)

- 1 Acute
- 2 Obtuse
- 3 Round

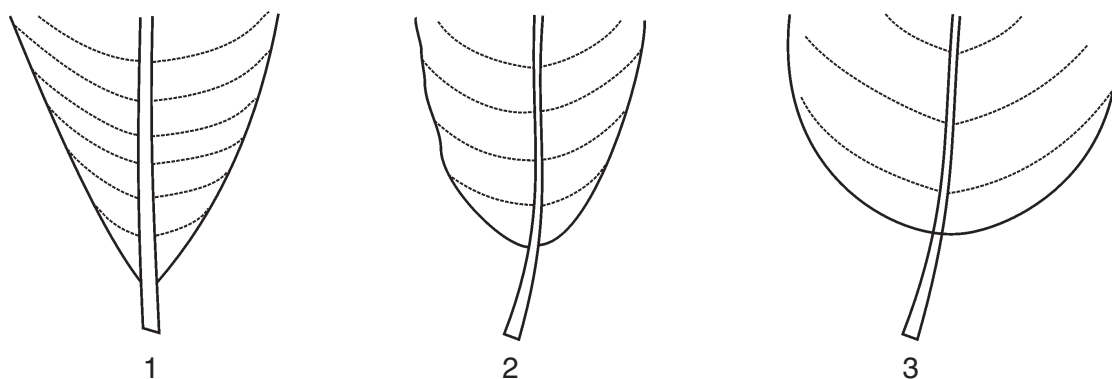


Fig. 8. Leaf base shape

7.2.11 Leaf margin (6.1.3)

(See Fig. 9)

- 1 Entire
- 2 Wavy

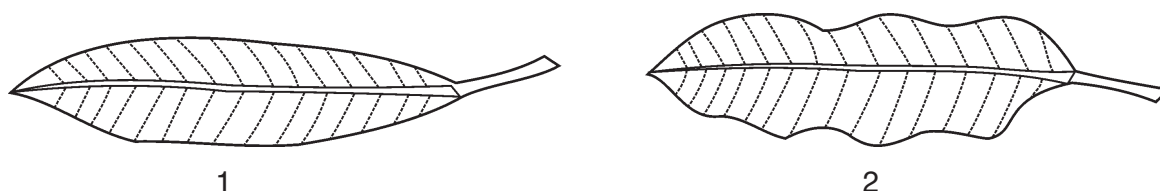


Fig. 9. Leaf margin

7.2.12 Leaf pubescence

- 0 Absent
- 1 Present

7.2.13 Colour of young leaf (4.1.8)

Recorded on 5-10 days old leaves

- 1 Light green
- 2 Light green with brownish tinge
- 3 Light brick red
- 4 Reddish brown
- 5 Deep coppery tan
- 99 Other (specify in descriptor 7.6 Notes)

7.2.14 Intensity of anthocyanin pigmentation of juvenile leaf

Measured at juvenile stage

- 3 Low
- 5 Medium
- 7 High

7.2.15 Colour of fully developed leaf

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

7.2.16 Leaf fragrance

Recorded in fully developed mature leaf when crushed

- 0 Absent
- 1 Mild
- 2 Strong

7.3 Inflorescence/flower descriptors

7.3.1 Number of years to first flowering [y]

7.3.2 Flowering duration [d] (6.2.2)

Number of days from first flower opening until end of flowering. Record the average of at least four years.

7.3.3 Secondary/off-season flowering (6.2.4)

- 0 Absent
- 1 Rare
- 2 Intermediate
- 3 Frequent

7.3.4 Regularity of flowering (6.2.3)

- 1 Regular
- 2 Biennial (alternate years)
- 3 Irregular

7.3.5 Inflorescence position (4.2.1)

- 1 Terminal
- 2 Axillary
- 99 Other (specify in descriptor 7.6 Notes)

7.3.6 Inflorescence axis growth habit

- 1 Semi-erect
- 2 Horizontal
- 3 Drooping

7.3.7 Inflorescence shape (4.2.2)

(See Fig. 10)

- 1 Conical (narrowly pyramidal)
- 2 Pyramidal
- 3 Broadly pyramidal

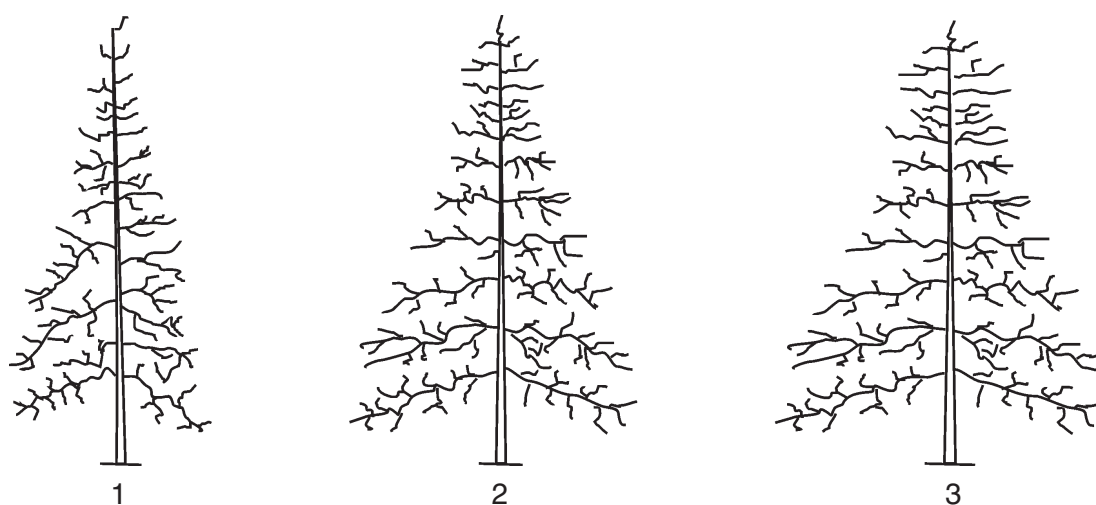


Fig. 10. Inflorescence shape

7.3.8 Inflorescence length [cm] (4.2.4)

Average of 10 inflorescences

7.3.9 Inflorescence width [cm]

Average of 10 inflorescences

7.3.10 Peduncle length [cm]

Average of 10 inflorescences

7.3.11 Peduncle width [cm]

Average of 10 inflorescences

7.3.12 Pubescence of inflorescence rachis (4.2.6)

Recorded on rachis of 10 inflorescences

- 0 Absent
- 1 Puberulous
- 2 Pubescent

7.3.13 Hermaphrodite flowers in the inflorescence [%] (4.2.8)

Average of 10 inflorescences taken from all directions and centre of tree

7.3.14 Presence of leafy bracts (4.2.7)

- 0 Absent
- 1 Present

7.3.15 Density of flowers in inflorescence (4.2.3)

- 3 Sparse
- 5 Medium
- 7 Dense

7.3.16 Type of flower (4.3.2)

- 1 Pentamerous
- 2 Tetramerous
- 3 Both

7.3.17 Inflorescence colour (4.2.5)

Recorded on main and secondary axes

- | | | | |
|---|------------------------|----|-----------------------------------------|
| 1 | Whitish | 8 | Dark pink |
| 2 | Yellowish green | 9 | Purple |
| 3 | Yellow | 10 | Light red |
| 4 | Light green | 11 | Red |
| 5 | Green with red patches | 12 | Dark red |
| 6 | Light orange | 13 | Crimson |
| 7 | Pink | 99 | Other (specify in descriptor 7.6 Notes) |

7.3.18 Length of the stamen in relation to pistil

- 1 Shorter
- 2 Equal
- 3 Longer

7.3.19 Nature of disc (4.3.3)

- 1 Swollen, broader than ovary
- 2 Narrow, reduced or absent

7.3.20 Number of stamens/staminodes (4.3.4)

- 1 10-12 (5-6 fertile)
- 2 5 (all fertile)
- 3 5 (2-3 fertile)
- 4 5 (1 fertile)

7.3.21 Intensity of anthocyanin colouration in mature flowers

- 3 Low
- 5 Medium
- 7 High

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 [y] (6.3.1)**7.4.2 Fruiting duration****7.4.2.1 Starting date** [YYYYMMDD]**7.4.2.2 Ending date** [YYYYMMDD]

7.4.3 Fruit bearing intensity

- 1 Low
- 2 Medium
- 3 High

7.4.4 Fruit length [cm] (4.4.1)

Average of 20 fruits measured from the base to the tip of the fruit

7.4.5 Fruit diameter [cm] (4.4.2)

Average of 20 fruits measured at the widest point

7.4.6 Fruit weight [g] (4.4.4)

Average of 20 fruits

7.4.7 Fruit shape (4.4.5)

(See Fig. 11)

- 1 Oblong
- 2 Elliptic
- 3 Roundish
- 4 Ovoid
- 5 Obovoid
- 99 Other (specify in descriptor 7.6 Notes)

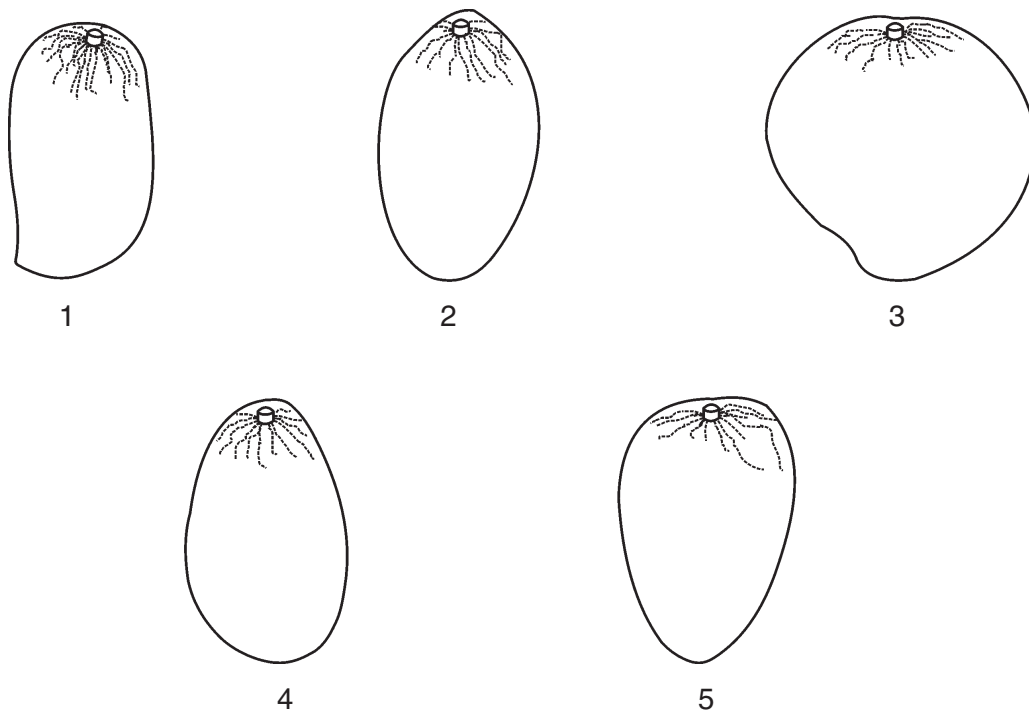


Fig. 11. Fruit shape

7.4.8 Shape of fruit apex

(See Fig. 12)

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

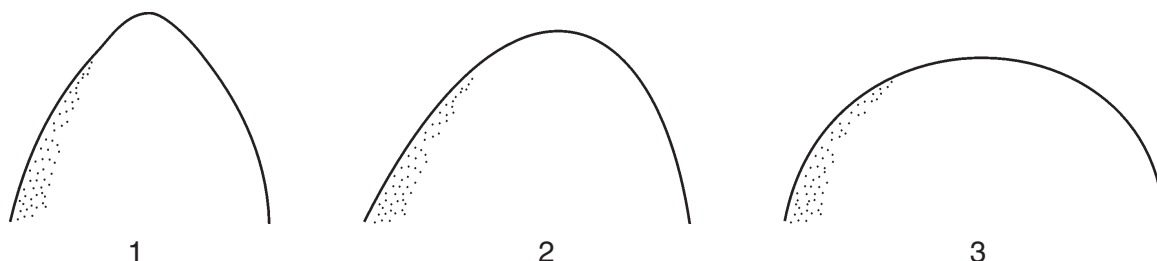


Fig. 12. Shape of fruit apex

7.4.9 Fruit attractiveness

(6.3.5)

Combined assessment of shape, size and appearance, colouration, etc.

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

7.4.10 Skin colour of ripe fruit

(4.4.6)

7.4.10.1 Fruit ground colour

- 1 Green
- 2 Yellow
- 3 Orange
- 4 Purple
- 5 Red
- 99 Other (specify in descriptor 7.6 Notes)

7.4.10.2 Fruit blush

- 1 Orange
- 2 Purple
- 3 Red
- 99 Other (specify in descriptor 7.6 Notes)

7.4.11 Fruit skin thickness [mm]

(4.4.7)

Average of 10 ripe fruits

7.4.12 Fruit skin surface texture

(4.4.8)

- 1 Smooth
- 2 Rough

7.4.13 Density of lenticels on fruit skin

- 3 Sparse
- 5 Medium
- 7 Dense

7.4.14 Fruit stalk insertion

(4.4.15)

- 1 Vertical
- 2 Oblique

7.4.15 Depth of fruit stalk cavity

(See Fig. 13)

- 0 Absent
- 1 Shallow
- 2 Medium
- 3 Deep
- 4 Very deep

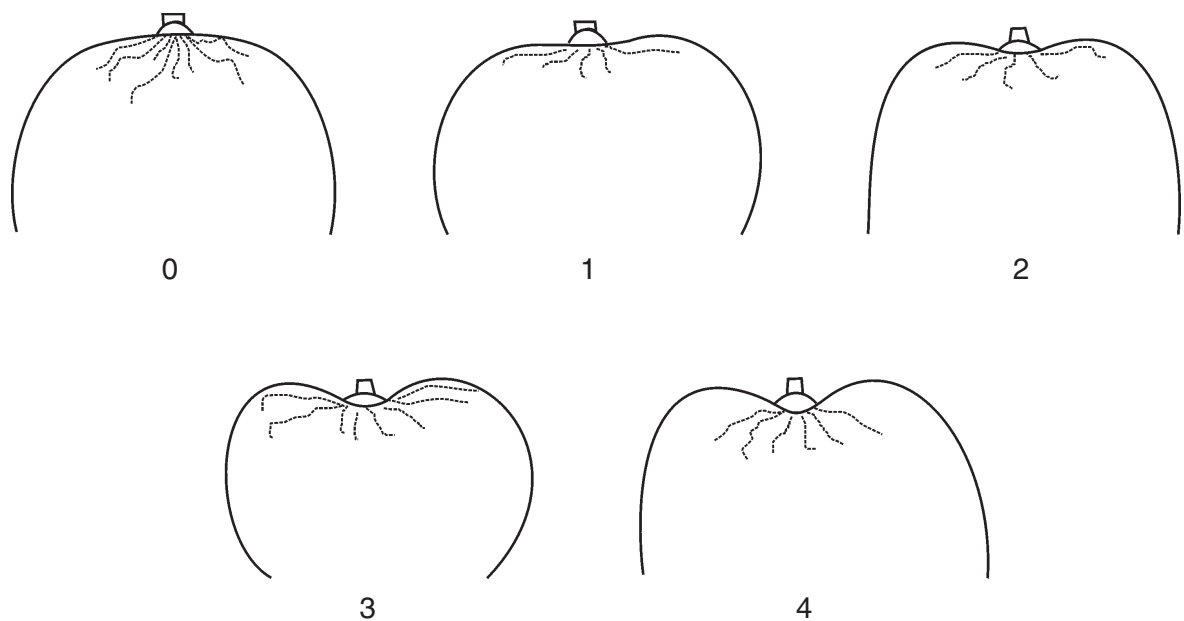


Fig. 13. Depth of fruit stalk cavity

7.4.16 Fruit stalk attachment

- 3 Weak
- 5 Intermediate
- 7 Strong

7.4.17 Fruit neck prominence

(See Fig. 14)

- 0 Absent
- 1 Slightly prominent
- 2 Prominent
- 3 Very prominent

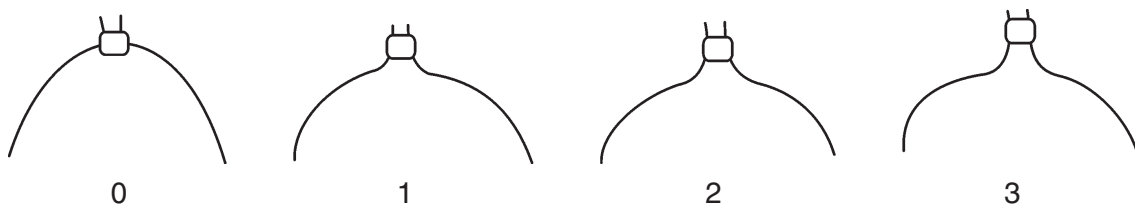


Fig. 14. Fruit neck prominence

7.4.18 Slope of fruit ventral shoulder

(6.3.14)

(See Fig. 15)

- 1 Slopping abruptly
- 2 Ending in a long curve
- 3 Rising and then rounded

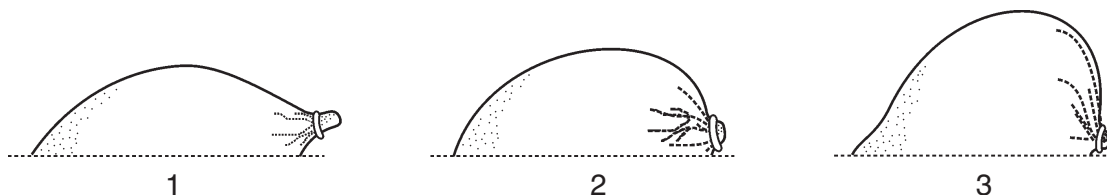


Fig. 15. Slope of fruit ventral shoulder

7.4.19 Fruit beak type

(6.3.9)

(See Fig. 16)

- 1 Perceptible
- 2 Pointed
- 3 Prominent
- 4 Mammiform

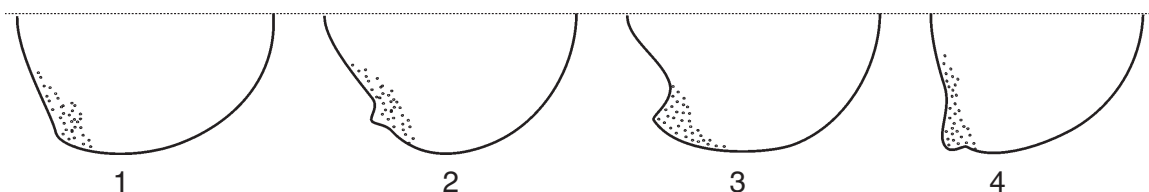


Fig. 16. Fruit beak type

7.4.20 Fruit sinus type (6.3.11)

(See Fig. 17)

- 0 Absent
- 1 Shallow
- 2 Deep

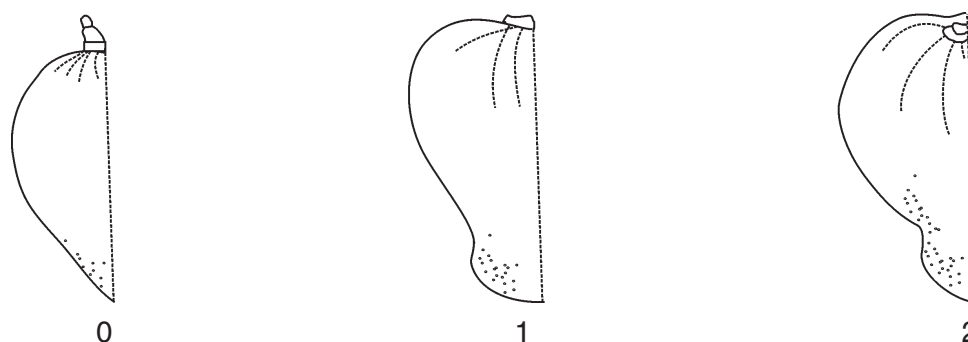


Fig. 17. Fruit sinus type

7.4.21 Fruit skin waxiness

- 1 Waxy
- 2 Non-waxy

7.4.22 Skin colour of ripe fruit

- 1 Green
- 2 Greenish yellow
- 3 Yellow
- 4 Green with red blush
- 5 Green with purple patches

7.4.23 Pulp colour of ripe fruit

- 1 Light yellow
- 2 Golden yellow
- 3 Yellow orange
- 4 Orange
- 5 Greenish yellow
- 6 Yellow
- 7 Light orange
- 8 Dark orange
- 99 Other (specify in descriptor 7.6 Notes)

7.4.24 Pulp texture of ripe fruit

(4.4.10)

Recorded on fully ripe fruits

- 3 Soft
- 5 Intermediate
- 7 Firm

- 7.4.25 Adherence of fruit skin to pulp** (4.4.11)
- 0 Absent (free)
 - 3 Weak
 - 5 Intermediate
 - 7 Strong
- 7.4.26 Quantity of latex oozing from peduncle**
- 0 Absent
 - 3 Low
 - 5 Medium
 - 7 High
- 7.4.27 Fruit pulp thickness [cm]**
Recorded as mean of three measurements per fruit taken at basal, middle and apical portion of fruit. Average of 20 fruits.
- 7.4.28 Quantity of fibre in pulp** (4.4.12)
- 0 Absent
 - 3 Low
 - 5 Intermediate
 - 7 High
- 7.4.29 Adherence of fibre to fruit skin**
- 3 Low
 - 5 Medium
 - 7 High
- 7.4.30 Fibre length in the pulp** (4.4.14)
- 3 Short
 - 5 Medium
 - 7 Long
- 7.4.31 Pulp content** (4.4.9)
Ratio of pulp to skin plus stone
- 7.4.32 Pulp juiciness**
- 1 Slightly juicy
 - 2 Juicy
 - 3 Very juicy
- 7.4.33 Pulp aroma**
- 1 Mild
 - 2 Intermediate
 - 3 Strong

7.4.34 Presence of turpentine flavour

- 0 Absent
- 1 Mild
- 2 Intermediate
- 3 Strong

7.5 Stone

Recorded on 20 healthy stones

7.5.1 Stone length [cm] (4.5.1)

7.5.2 Stone width [cm]

7.5.3 Stone thickness [cm]

7.5.4 Stone weight [g] (4.5.2)

7.5.5 Veins on stone (4.5.3)

- 1 Level with surface
- 2 Depressed
- 3 Elevated

7.5.6 Pattern of stone venation (4.5.4)

- 1 Parallel
- 2 Forked

7.5.7 Quantity of fibre on stone (4.5.5)

- 3 Low
- 5 Intermediate
- 7 High

7.5.8 Length of stone fibre [cm] (4.5.6)

- 1 Short (< 1.0)
- 2 Medium (1.0 – 1.5)
- 3 Long (> 1.5)

7.5.9 Adherence of fibre to stone

- 3 Weak
- 5 Intermediate
- 7 Strong

7.5.10 Texture of stone fibre (4.5.5)

- 1 Soft
- 2 Coarse

7.5.11 Space occupied by seed inside the stone [%]

- 1 ≤ 25
- 2 26 – 50
- 3 51 – 75
- 4 76 – 100

7.5.12 Seed length [cm]

Average of 20 seeds

7.5.13 Seed width [cm]

Average of 20 seeds at the widest point

7.5.14 Seed weight [g]

Average of 20 well developed/healthy seeds

7.5.15 Seed shape

(See Fig. 18)

- 1 Ellipsoid
- 2 Oblong
- 3 Reniform
- 99 Other (specify in descriptor 7.6 Notes)

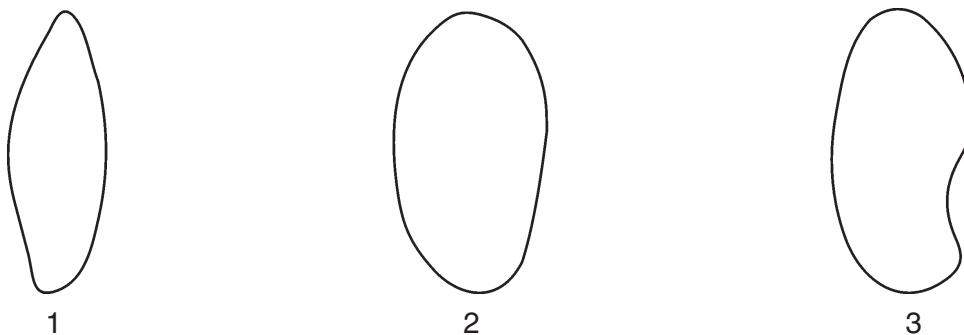


Fig. 18. Seed shape

7.5.16 Type of embryony

- 1 Monoembryony
- 2 Polyembryony

7.6 Notes

Any additional information may be specified here

EVALUATION

8. Plant descriptors

8.1 Fruit

8.1.1 Yield per tree [kg/year] (6.3.3)
Average of 3 trees per accession

8.1.2 Fruit maturity period
3 Early
5 Medium
7 Late

8.1.3 Fruit availability period [d]
Number of days from first to the last harvest date

8.1.4 Fruit storage life [d] (6.3.6)
Number of days of storage of ripe fruits under ambient conditions after harvest

8.1.5 Eating quality (6.3.4)
Combined assessment of flavour, acidity, sweetness, aroma and astringency when ripe; quantitative measurement of TSS, acidity and sugars to be made
3 Poor
5 Good
7 Very good
9 Excellent

8.1.6 Pulp total soluble solids [°Brix]
1 Very low (< 10.0)
2 Low (10.1 – 14.0)
3 Medium (14.1 – 18.0)
4 High (18.1 – 22.0)
5 Very high (> 22.0)

8.1.7 Pulp titratable acidity [%]
1 Low (< 0.20)
2 Medium (0.21 – 0.30)
3 High (0.31 – 0.40)
4 Very high (> 0.40)

8.2 Notes

Specify here any 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 Medium
- 7 High
- 9 Very high

9.1 Reaction to physiological disorders

- 1 Susceptibility to spongy tissue
- 2 Susceptibility to malformation - floral and vegetative
- 99 Other (specify in descriptor 9.8 Notes)

9.2 Reaction to salinity

- 1 Soil salinity
- 2 Water salinity

9.3 Reaction to soil calcareousness

- 0 Not susceptible
- 1 Low susceptibility
- 2 High susceptibility

9.4 Reaction to mineral toxicity

- 1 Boron
- 2 Zinc
- 3 Chloride
- 4 Copper
- 5 Calcium
- 6 Iron
- 99 Other (specify in descriptor 9.8 Notes)

9.5 Reaction to water logging (7.3)

9.6 Reaction to drought (7.1)

9.7 Reaction to wind (7.2)

9.8 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 10.5 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 Medium
- 7 High
- 9 Very high

10.1 Pests

	Causal organism	Common name	
10.1.1	<i>Idioscopus</i> spp.	Mango hopper	(8.1.1)
10.1.2	<i>Drosicha mangiferae</i>	Mealy bug	(8.1.2)
10.1.3	<i>Bactrocera dorsalis</i>	Fruit fly	(8.1.3)
10.1.4	<i>Bactrocera rufomaculata</i>	Stem/shoot borer	(8.1.4)
10.1.5	<i>Chulmetia transversa</i>	Stem/shoot borer	(8.1.4)
10.1.6	<i>Apsylla cistellata</i>	Mango psyllid	(8.1.5)
10.1.7	<i>Sternochetus mangiferae</i>	Stone weevil	(8.1.6)
10.1.8	<i>Niphonoclea albata</i> and <i>N. capito</i>	Twig cutter	
10.1.9	<i>Noorda albizonalis</i>	Mango seed borer	
10.1.10	<i>Orthaga endrusalis</i>	Leaf webber	
10.1.11	<i>Scirtothrips dorsalis</i>	Thrips	
10.1.12	<i>Megalurothrips kellyanus</i>	Thrips	
10.1.13	<i>Plocaderus ruficornis</i>	Trunk borer	
10.1.14	<i>Alcides</i> sp.	Shoot borer	
10.1.15	<i>Deporaus marginatus</i>	Leaf-cutting weevil	

10.2 Fungi

10.2.1	<i>Colletotrichum gloeosporioides</i>	Anthracnose	(8.2.1)
10.2.2	<i>Glomerella cingulata</i>	Anthracnose	(8.2.1)
10.2.3	<i>Oidium mangiferae</i>	Powdery mildew	(8.2.2)
10.2.4	<i>Botrydiplodia theobromae</i>	Stem-end rot	(8.2.3)
10.2.5	<i>Capnodium mangiferae</i>	Sooty mould	
10.2.6	<i>Elsinoe mangiferae</i>	Scab	
10.2.7	<i>Alternaria alternata</i>	Fruit rot	
10.2.8	<i>Fusarium</i> spp.	Mango malformation	(8.2.4)

10.3 Mites

10.3.1	<i>Aceria</i> spp.	Mango malformation	(8.2.4)
10.3.2	<i>Oligonychus</i> spp.	Spider mites	
10.3.3	<i>Tetranychus</i> spp.	Web forming mites/ spider mites	

10.4 Bacteria

10.4.1 *Xanthomonas campestris* Bacterial canker (8.3.1)

10.5 Notes

Specify here any other additional information

11. Biochemical markers

Specify methods used and cite reference(s). Refer to *Descriptors for Genetic Markers Technologies*, available in PDF (portable format document) from the IPGRI Web site (www.ipgri.cgiar.org) or by email request to: ipgri-publications@cgiar.org

12. Molecular markers

Refer to *Descriptors for Genetic Markers Technologies*, available in PDF (portable format document) from the IPGRI Web site (www.ipgri.cgiar.org) or by email request to: ipgri-publications@cgiar.org

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 microspore 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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Dr Bhag Mal of IPGRI-APO coordinated the development and review of this publication. Ms Adriana Alercia supervised the production of the text up to the publication stage and provided scientific and technical expertise. Ms Patrizia Tazza designed the layout and the cover.

Annex I. Basic list of highly discriminating descriptors for mango

Mango	IPGRI Descriptor Number	Name
<i>Mangifera indica</i> L.	7.1.7	Tree growth habit
	7.1.8	Foliage density
	7.2.1	Leaf blade shape
	7.2.9	Leaf apex shape
	7.2.10	Leaf base shape
	7.2.11	Leaf margin
	7.2.13	Colour of young leaf
	7.2.14	Intensity of anthocyanin pigmentation of juvenile leaf
	7.3.5	Inflorescence position
	7.3.15	Density of flowers in inflorescence
	7.3.16	Type of flower
	7.3.19	Nature of disc
	7.3.20	Number of stamens/staminodes
	7.4.7	Fruit shape
	7.4.8	Shape of fruit apex
	7.4.13	Density of lenticels on fruit skin
	7.4.15	Depth of fruit stalk cavity
	7.4.17	Fruit neck prominence
	7.4.18	Slope of fruit ventral shoulder
	7.4.19	Fruit beak type
	7.4.20	Fruit sinus type
	7.4.25	Adherence of fruit skin to pulp
	7.4.29	Adherence of fibre to fruit skin
	7.5.9	Adherence of fibre to stone
	7.5.11	Space occupied by seed inside the stone [%]
	7.5.15	Seed shape
7.5.16	Type of embryony	

ANNEX II. Collecting form for mango (*Mangifera indica* L.)

SAMPLE IDENTIFICATION

COLLECTING INSTITUTE CODE (2.1):

COLLECTING No. (2.3):

PHOTOGRAPH (2.23):

COLLECTING DATE OF SAMPLE [YYYYMMDD] (2.4):

GENUS (1.7.1):

SPECIES (1.7.2):

COLLECTING SITE LOCATION

COUNTRY OF ORIGIN (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/AQUISITION SOURCE (2.12):

10. Wild habitat

20. Farm or cultivated habitat

30. Market or shop

40. Institute/research organization, experimental station, genebank

50. Seed company

60. 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

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Monthly mean (mm):	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

TEMPERATURE (6.1.20.1):

Annual mean: °C

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Monthly mean (°C):	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>	<input type="text"/>

SAMPLE

BIOLOGICAL STATUS OF ACCESSION (2.17):

100. Wild

200. Weedy

300. Traditional cultivar/landra

400. Breeding/research material

500. Advanced/improved cultivar

999. Other (specify)

TYPE OF SAMPLE (2.15):

1. Fruit

2. Seed

3. Seedling/sapling

4. Shoot/budwood/stem cutting

5. *In vitro* plantlet

99. Other (specify)

PREVAILING STRESSES (2.18.14):

Mention the types of major stresses, i.e. abiotic (drought, flood, etc.), 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. Root | 2. Trunk | 3. Bark | 4. Leaf |
| 5. Flower | 6. Fruit | 7. Peel | 8. Pericarp |
| 9. Seed | 99. Other (specify) | | |
-

PLANT USES (2.18.7)

- | | | |
|--------------------------------|-------------------------------|---------------------|
| 1. Food (fruit, juice, pickle) | 2. Fuel | 3. Wood/timber |
| 4. Medicine | 5. Seed for starch extraction | 99. Other (specify) |
-

ASSOCIATED FLORA (2.18.16):

Mention other dominant crop/plant species including *Mangifera* species found in and around the collecting site

MANAGEMENT

ACCESSION No. (3.1)

TYPE OF GERMLASM 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 (7.1.7)	Foliage density (7.1.8)
---------------------------	-------------------------

LEAF

Leaf blade shape (7.2.1)	Leaf apex shape (7.2.9)	Leaf base shape (7.2.10)
Leaf margin (7.2.11)	Colour of young leaf (7.2.13)	Intensity of anthocyanin pigmentation (7.2.14)

INFLORESCENCE

Inflorescence position (7.3.5)	Density of flowers in inflorescence (7.3.15)	Type of flower (7.3.16)
Nature of disc (7.3.19)	No. of stamens/staminodes (7.3.20)	

FRUIT

Fruit shape (7.4.7)	Shape of fruit apex (7.4.8)	Density of lenticels on fruit skin (7.4.13)
Depth of fruit stalk cavity (7.4.15)	Fruit neck prominence (7.4.17)	Slope of fruit ventral shoulder (7.4.18)
Fruit beak type (7.4.19)	Fruit sinus type (7.4.20)	Adherence of fruit skin to pulp (7.4.25)
Adherence of fibre to fruit skin (7.4.29)		

STONE/SEED

Adherence of fibre to stone (7.5.9)	Space occupied by seed inside the stone (7.5.11)
Seed shape (7.5.15)	Type of embryony (7.5.16)

EVALUATION

FRUIT MATURITY PERIOD (8.1.2):

- | | | |
|----------|-----------|---------|
| 1. Early | 2. Medium | 3. Late |
|----------|-----------|---------|
-

PULP TOTAL SOLUBLE SOLIDS (8.1.6):

- | | | |
|-------------|--------------|-----------|
| 1. Very low | 2. Low | 3. Medium |
| 4. High | 5. Very high | |
-

PULP TITRABLE ACIDITY (8.1.7):

- | | | | |
|--------|-----------|---------|--------------|
| 1. Low | 2. Medium | 3. High | 4. Very high |
|--------|-----------|---------|--------------|
-

COLLECTOR'S NOTES

Descriptors for
Banana
(*Musa* spp.)



inibap



DEFINITIONS AND USE OF THE DESCRIPTORS

IPGRI now 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 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: Many of the descriptors in this category are susceptible to environmental differences but are generally useful in crop improvement and others may involve complex biochemical or molecular characterization. They include yield, agronomic performance, stress susceptibilities and biochemical and cytological traits.

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.

Minimum highly discriminating descriptors are marked with a star (★).

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

- (a) the *Système International d'Unités* (SI system) is used. The units to be applied are given in square brackets following the descriptor name;
- (b) standard colour charts, e.g. Royal Horticultural Society Colour Chart, Methuen Handbook of Colour, or Munsell Color 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);

4 Descriptors for Banana

- (c) 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 9 (Biotic stress susceptibility) 1 = very low susceptibility and 9 = very high susceptibility;

- (d) when a descriptor is scored using a 1-9 scale, such as in (c), '0' would be scored when (i) the character is not expressed; (ii) when 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

3	Toothed
5	Elliptic
7	Linear

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

Absence/presence of terminal leaflet

0	Absent
1 (or +)	Present

- (f) blanks are used for information not yet available;
- (g) 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 R.S. Rana *et al.* (1991), or van Hintum (1993), that clearly state a method for scoring heterogeneous accessions;
- (h) dates should be expressed numerically in the format DDMMYYYY, where

DD	- 2 digits to represent the day
MM	- 2 digits to represent the month
YYYY	- 4 digits to represent the year.

PASSPORT

1. Accession descriptors

★ 1.1 **Accession number** (1.1)

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 is still not available for re-use. 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).

1.2 **Donor name** (1.2)

Name of institution or individual responsible for donating the germplasm

1.3 **Donor number** (1.3)

Number assigned to an accession by the donor

1.4 **Other number(s) associated with the accession** (1.4)

Any other identification number known to exist in other collections for this accession, e.g. USDA Plant Inventory number (not **Collecting number**, see descriptor 2.3). Other numbers can be added as 1.4.3, etc.

1.4.1 **Other number 1** (1.4.1)

1.4.2 **Other number 2** (1.4.2)

★ 1.5 **Scientific name** (1.5)

1.5.1 **Genus** (1.5.1)

1.5.2 **Section** (1.5.2)

1.5.3 **Species/Group** (1.5.3)

Latin names should be given for wild species, e.g. *Musa acuminata*, and letters for cultivars, e.g. AA, AAA, AAB, etc.

1.5.4 **Subspecies/Subgroup** (1.5.4)

1.5.5 **Reference form/Cultivar** (1.5.5)

Either a registered or other formal designation given to the accession (e.g. 'Pisang Mas' is the reference name to be used for cultivars 'Figue sucrée', 'Amas', 'Kluai Khai', etc.)

1.6 **Pedigree** (1.6)

Parentage or nomenclature, and designations assigned to breeders' material. (In the case of an artificial hybrid only)

1.6.1 **Female parent**

1.6.2 **Male parent**

1.6.3 **Year of release/year of registration**

- ★ 1.7 **Accession**
- ★ 1.7.1 **Accession name**
Current name given to the accession in the collection
- 1.7.2 **Local language**
Language in which the accession name is given
- 1.7.3 **Translation/Transliteration**
Provide translation of the local accession name into English
- 1.7.4 **Synonyms**
Include here any previous identification other than the current name and the country. Collecting number or newly assigned station name are frequently used as identifiers.
- 1.8 **Acquisition date** [DDMMYYYY] (1.7)
Date on which the accession entered the collection
- ★ 1.9 **Type of material received**
- 1 *In vitro* plant
 - 2 Sucker
 - 3 Seed
 - 4 Bud
 - 5 Other (specify in descriptor 1.12 Notes)
- 1.10 **Accession size** (1.9)
Approximate number of plants of an accession in the genebank
- 1.11 **Previous locations**
Register other known previous locations of the accession, from the most recent to the oldest known location.
- 1.12 **Notes**
Any additional information may be specified here

2. Collecting descriptors

2.1 Collecting institute(s) (2.2)
Institute(s) and people collecting/sponsoring the sample collection

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

★ **2.3 Collecting number** (2.1)
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 item is essential for identifying duplicates held in different collections. It should be unique and always accompany subsamples wherever they are sent.

2.4 Collecting date of original sample [DDMMYYYY] (2.3)

★ **2.5 Country of collecting** (2.4)
Name of the country in which the sample was collected or bred. Use the three-letter abbreviations from the *International Standard (ISO) Codes for the representation of names of countries*, No. 3166, 4th Edition. Copies of these are available from DIN: Deutsche Institut für Normung e.V., 10772 Berlin, Germany; Tel. 30-2601-2860; Fax 30-2601-1231, Tlx. 184 273-din-d.

2.6 Province/State (2.5)
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 Province/State) of the country in which the sample was collected

2.8 Location of collecting site (2.6)
Distance in kilometers and direction from the nearest town, village or map grid reference point (e.g. CURITIBA 7S means 7 km south of Curitiba)

2.9 Latitude of collecting site (2.7)
Degrees and minutes followed by N (North) or S (South) (e.g. 1030S)

2.10 Longitude of collecting site (2.8)
Degrees and minutes followed by E (East) or W (West) (e.g. 07625W)

2.11 Elevation of collecting site [m asl] (2.9)

★ 2.12 Collecting source (2.10)

- 1 Wild habitat
 - 1.1 Forest/woodland
 - 1.2 Shrubland
 - 1.3 Grasslands
 - 1.4 Desert/tundra
- 2 Farm
 - 2.1 Field
 - 2.2 Orchard
 - 2.3 Garden
 - 2.4 Fallow
 - 2.5 Pasture
 - 2.6 Store
- 3 Market
 - 3.1 Town
 - 3.2 Village
 - 3.3 Urban area (around city)
 - 3.4 Other exchange system
- 4 Institute/Research organization
- 5 Other (specify in descriptor **2.29 Collector's notes**)

2.13 Collecting source environment

Use descriptors **5.1.1** to **5.1.22** in section 5

★ 2.14 Type of sample (2.15)

Form 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 Sucker
- 2 Seed
- 3 Bud
- 4 Other (specify in descriptor **2.29 Collector's notes**)

2.15 Status of sample (2.11)

- 1 Wild
- 2 Weedy
- 3 Primitive cultivar/Landrace
- 4 Breeders line
- 5 Advanced cultivar
- 6 Unknown
- 7 Other (specify in descriptor **2.29 Collector's notes**)

★ **2.16 Local/vernacular name** (2.12)
Name given by farmer to crop and cultivar/landrace/weed. State language and dialect if the ethnic group is not provided

2.17 Ethnic group

Name of the tribe of the farmer donating the sample or of the people living in the area of collecting

2.18 Cultural situation

2.18.1 Status of plantation

- 1 Backyard
- 2 Smallholding (<5 ha)
- 3 Midsize holding (5 - 10 ha)
- 4 Plantation (>10 ha)

2.18.2 Cropping system

2.18.2.1 Monoculture (pure banana stand)

2.18.2.2 Mixed cropping

- 1 Mostly tree crops (e.g. citrus, coconut, cocoa, mango, coffee, specify crop in descriptor **2.29 Collector's notes**)
- 2 Mostly food crops (e.g. maize, millet, tuber crops, specify crop in descriptor **2.29 Collector's notes**)

2.19 Associated flora

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

2.20 Number of plants sampled

2.21 Plant population density

- 3 Low
- 5 Intermediate
- 7 High

2.22 Uses of the fruit

- 1 Dessert
- 2 Cooking
- 3 Beer/brew/wine
- 4 Animal feed
- 5 Medicinal
- 6 Other (specify in descriptor **2.29 Collector's notes**)

2.23 Other parts of the plant used

- 1 Leaves
- 2 Pseudostem
- 3 Male bud
- 4 Flowers
- 5 Corm
- 6 Sheath
- 7 Other (specify in descriptor **2.29 Collector's notes**)

2.24 Uses of other parts of the plant

- 1 Textile
- 2 Building
- 3 Food
- 4 Ornamental
- 5 Other (specify in descriptor **2.29 Collector's notes**)

2.25 Photograph (2.14)

Was a photograph(s) taken of the accession or habitat at the time of collecting? If so, provide an identification number(s) in descriptor **2.29 Collector's notes**.

- 0 No
- 1 Yes

2.26 Herbarium specimen

Was a herbarium specimen collected? If so, provide an identification number in descriptor **2.29 Collector's notes**.

- 0 No
- 1 Yes

2.27 Prevailing stresses

Information on associated biotic and abiotic stresses and the accession's reaction. Indicate if disease indexing was done at the time of collecting in descriptor **2.29 Collector's notes**.

2.28 Post-movement activities data

Use descriptors **3.8.1** and **3.8.2** in section 3

2.29 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 1.1)

3.2 Population identification (Passport 2.3)
(Collecting number, pedigree, cultivar name, etc. depending on the population type)

★ 3.3 Type of maintenance of the accession (1.11)

- 1 *In vivo*
- 2 *In vitro*
- 3 Seed
- 4 Other (specify in descriptor 3.9 Notes)

3.4 Availability for exchange

- 0 No
- 1 Yes

3.5 Import procedures

3.5.1 Import permit needed

- 0 No
- 1 Yes

3.5.2 Phytosanitary certificate needed

- 0 No
- 1 Yes

3.5.3 Quarantine required

- 0 No
- 1 Yes

3.6 Export procedures

3.6.1 Import permit from receiving country needed

- 0 No
- 1 Yes

3.6.2 Export permit needed

- 0 No
- 1 Yes

3.6.3 Other (specify in descriptor 3.9 Notes)

3.7 Location of duplicates of this accession

3.8 Pre- and post-movement activities data

3.8.1 Treatment of sample during the mission

Note all relevant information on how the sample was treated between its collection and the deposit at its destination

3.8.2 Destination of the accession

Note where the sample is sent after it has been collected. Specify the institution, the name of the collection or station, the address and country

- 1 Collection
- 2 Intermediate holding station

3.9 Notes

Any additional information may be specified here

ENVIRONMENT AND SITE

4. Characterization and/or evaluation site descriptors

4.1 Country of characterization and/or evaluation (3.1)
(See instructions in descriptor 2.5 **Country of collecting**)

4.2 Site (research institute) (3.2)

4.2.1 Latitude
Degrees and minutes followed by N (North) or S (South) (e.g. 1030S)

4.2.2 Longitude
Degrees and minutes followed by E (East) or W (West) (e.g. 07625 W)

4.2.3 Elevation [m asl]

4.2.4 Name of farm or institute

4.3 Evaluator's name and address (3.3)

4.4 Planting date [DDMMYYYY] (3.4)

4.5 Harvest date [DDMMYYYY] (3.5)

4.6 Evaluation environment

Environment in which characterization/evaluation was carried out

- 1 Field
- 2 Screenhouse
- 3 Glasshouse
- 4 Laboratory
- 5 Other (specify in descriptor 4.13 Notes)

4.7 Planting site in the field

Give block, strip and/or row/plot numbers as applicable, plants/plot, replication

4.8 Field spacing

4.8.1 Distance between plants in a row [m]

4.8.2 Distance between rows [m]

4.9 Cropping system

(See descriptor 2.18.2)

4.10 Environmental characteristics of site

Use descriptors 5.1.1 to 5.1.22 in section 5

4.11 Fertilizer

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

4.12 Plant protection

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

4.13 Notes

Any other site-specific information

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

5.1 Site environment

★ **5.1.1 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 - 10.9%
5	Rolling	11 - 15.9%
6	Hilly	16 - 30%
7	Steeply dissected	>30%, moderate elevation range
8	Mountainous	>30%, great elevation range (>300 m)
9	Other	(specify in appropriate section's Notes)

★ **5.1.2 Higher level landform (general physiographic features)**

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

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

5.1.3 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 | 15 Dune |
| 2 Escarpment | 16 Longitudinal dune |
| 3 Interfluve | 17 Interdunal depression |
| 4 Valley | 18 Mangrove |
| 5 Valley floor | 19 Upper slope |
| 6 Channel | 20 Midslope |
| 7 Levee | 21 Lower slope |
| 8 Terrace | 22 Ridge |
| 9 Floodplain | 23 Beach |
| 10 Lagoon | 24 Beachridge |
| 11 Pan | 25 Rounded summit |
| 12 Caldera | 26 Summit |
| 13 Open depression | 27 Coral atoll |
| 14 Closed depression | 28 Drainage line (bottom position in flat or almost-flat terrain) |
| | 29 Coral reef |
| | 30 Other (specify in appropriate section's Notes) |

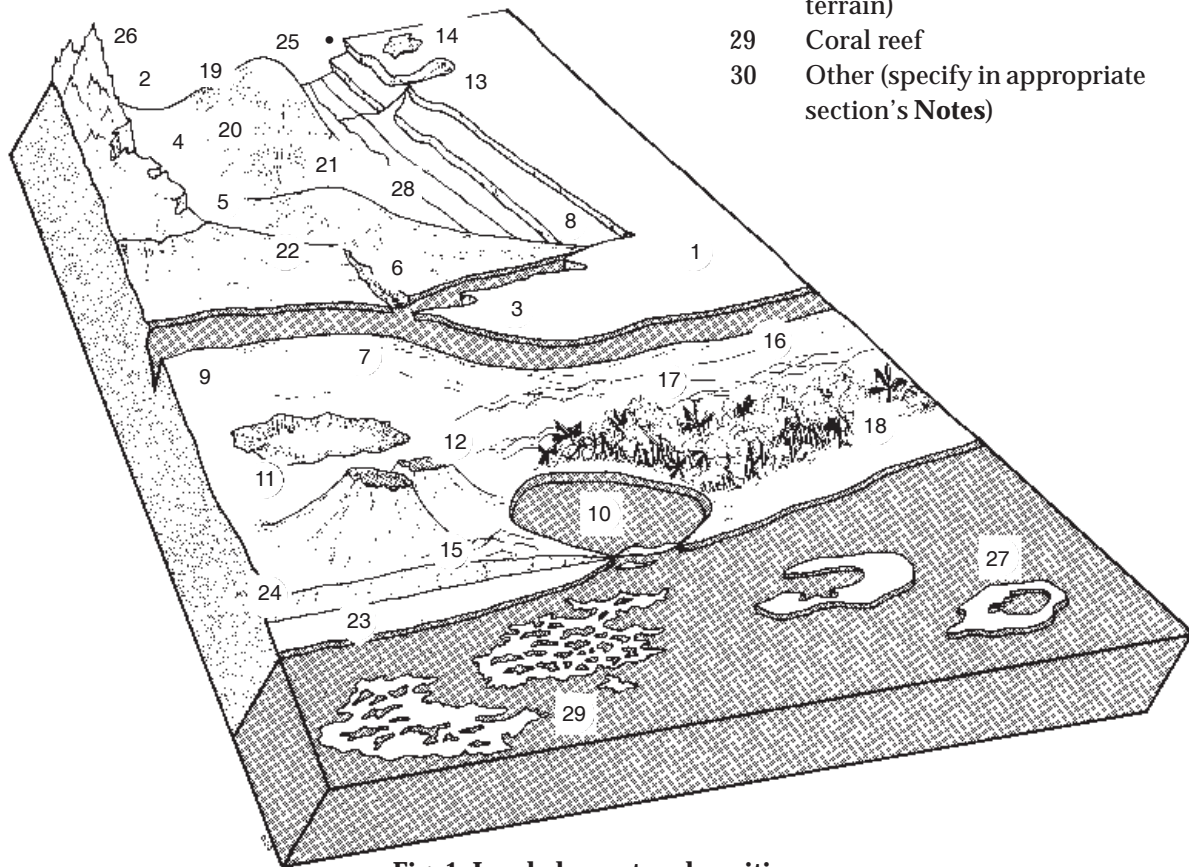


Fig. 1 Land element and position

5.1.4 Slope [°]

Estimated slope of the site

5.1.5 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 southwestern direction has an aspect of SW)

5.1.6 Crop agriculture

(From FAO 1990)

- 1 Annual field cropping
- 2 Intermediate
- 3 Perennial field cropping

5.1.6.1 Replanting rate

Provide the average number of production cycles referring to a single planting

5.1.7 Overall vegetation surrounding and at the site

(From FAO 1990)

- 1 Grassland (Grasses, subordinate forbs, no woody species)
- 2 Forbland (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 Shrubland (Continuous layer of shrubs, crowns touching)
- 6 Savanna (Grasses with a discontinuous layer of trees or shrubs)
- 7 Other (specify in appropriate section's **Notes**)

5.1.8 Soil parent 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, but still showing rock structure. Alluvial deposits and colluvium derived from a single rock type may be further specified by that rock type.

5.1.8.1 Unconsolidated material

- | | |
|----------------------------------|-----------------------|
| 1 Aeolian deposits (unspecified) | 5 Marine deposits |
| 2 Aeolian sand | 6 Lacustrine deposits |
| 3 Littoral deposits | 7 Fluvial deposits |
| 4 Lagoonal deposits | 8 Alluvial deposits |

- | | |
|--------------------------------|---------------------------------------------------|
| 9 Unconsolidated (unspecified) | 15 Colluvial deposits |
| 10 Volcanic ash | 16 <i>In situ</i> weathered |
| 11 Loess | 17 Saprolite |
| 12 Pyroclastic deposits | 18 Other (specify in appropriate section's Notes) |
| 13 Glacial deposits | |
| 14 Organic deposits | |

5.1.8.2 Rock type

- | | |
|--------------------------------------|---------------------------------------------------|
| 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 | 29 Other (specify in appropriate section's Notes) |
| 15 Sedimentary rock | 30 Not known |

5.1.9 Stoniness/rockiness/hardpan/cementation

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

5.1.10 Soil drainage

(Adapted from FAO 1990)

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

5.1.11 Soil salinity

- 1 <160 ppm dissolved salts
- 2 160 - 240 ppm
- 3 241 - 480 ppm
- 4 >480 ppm

★ **5.1.12 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

5.1.13 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 Color Charts (Munsell 1977). 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 | 7 Reddish brown | 13 Greyish |
| 2 Red | 8 Yellowish brown | 14 Blue |
| 3 Reddish | 9 Yellow | 15 Bluish-black |
| 4 Yellowish red | 10 Reddish yellow | 16 Black |
| 5 Brown | 11 Greenish, green | |
| 6 Brownish | 12 Grey | |

★ **5.1.14 Soil pH**

Actual value of the soil within the following root depths around the accession

- 5.1.14.1 pH at 10-15 cm
- 5.1.14.2 pH at 16-30 cm
- 5.1.14.3 pH at 31-60 cm
- 5.1.14.4 pH at 61-90 cm

★ **5.1.15 Soil erosion**

- 3 Low
- 5 Intermediate
- 7 High

5.1.16 Rock fragments

(Adapted from FAO 1990)

Large rock and mineral fragments (>2 mm) are described according to abundance

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

★ **5.1.17 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 fractions 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	Silty clay	16	Loamy coarse sand
6	Silty 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

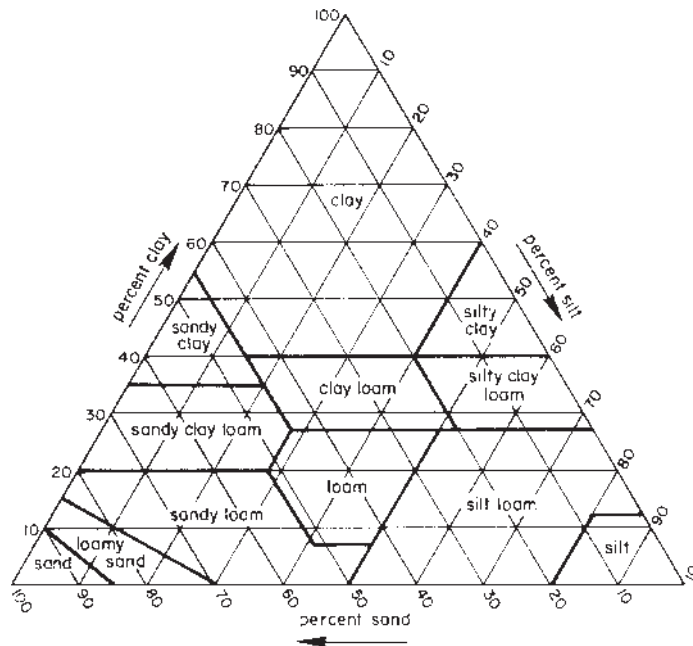


Fig. 2 Soil texture classes

5.1.17.1 Soil particle size classes

(Adapted from FAO 1990)

1	Clay	< 2 µm
2	Fine silt	2 - 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

★ **5.1.18 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.).

★ **5.1.19 Water availability**

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

★ **5.1.20 Soil fertility**

General assessment of the soil fertility based on existing vegetation

- 3 Low
- 5 Moderate
- 7 High

5.1.21 Climate of the site

Should be assessed as close to the site as possible

★ **5.1.21.1 Temperature [°C]**

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

★ **5.1.21.2 Rainfall [mm]**

Provide either annual average and seasonal rainfall distribution (state number of recorded years)

5.1.21.3 Wind [km/s]

Annual average (state number of years recorded)

5.1.21.3.1 Frequency of typhoons or hurricane force winds

5.1.21.3.2 Date of most recent typhoons or hurricane force winds
[DDMMYYYY]

5.1.21.3.3 Annual maximum wind velocity [km/s]

5.1.21.4 Frost

5.1.21.4.1 Date of most recent frost [DDMMYYYY]

5.1.21.4.2 Lowest temperature [°C]

Specify seasonal average and minimum survived

5.1.21.4.3 Duration of temperature below freezing [d]

5.1.21.5 Relative humidity

5.1.21.5.1 Relative humidity diurnal range [%]

5.1.21.5.2 Relative humidity seasonal range [%]

5.1.21.6 Light

3 Shady

7 Sunny

5.1.22 Other

Any additional information may be specified here

CHARACTERIZATION

Observations should be made ideally under standardized conditions. Most characters should be observed during the 2nd cycle of cultivation (ratoon crop), or from the plant crop if ratoon crop is not possible to obtain. Characters should be recorded when the first ripe fruit develop on the bunch unless otherwise specified. It is recommended that at least three plants growing near to each other be used in the appraisal.

Two detachable colour charts (A and B) are provided to aid decisions on colour

6. Plant descriptors

6.1 Plant general appearance

★ 6.1.1 Leaf habit (See Fig. 3)

- 1 Erect
- 2 Intermediate
- 3 Drooping
- 4 Other (e.g. very drooping, specify in descriptor Notes, 6.8)

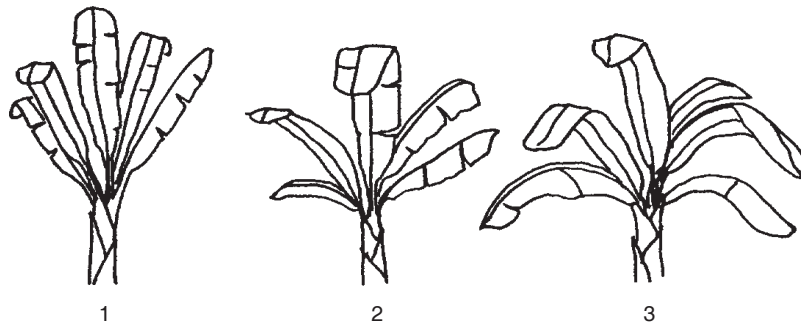


Fig. 3 Leaf habit

- ##### ★ 6.1.2 Dwarfism
- 1 Normal: leaves not overlapped and leaf ratio inferior to 2.5
 - 2 Dwarf type: leaves strongly overlapped and leaf ratio superior to 2.5

6.2 Pseudostem/suckers

(See Fig. 4)

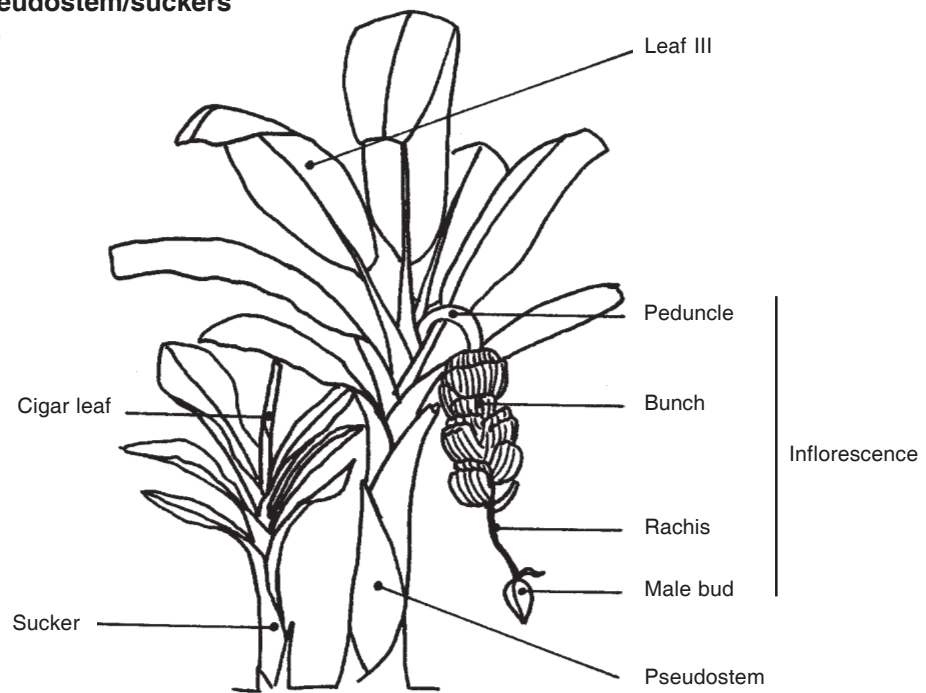


Fig. 4 Pseudostem/suckers (adapted from Champion, 1963)

- ★ **6.2.1 Pseudostem height [m]** (4.1.1)
 Recorded from the base of pseudostem to emerging point of the peduncle
 - 1 ≤2
 - 2 2.1 to 2.9
 - 3 ≥3

- ★ **6.2.2 Pseudostem aspect**
 Determined by the circumference at 100 cm
 - 1 Slender
 - 2 Normal
 - 3 Robust

- ★ **6.2.3 Pseudostem colour** (6.1.1)
 Recorded without removing the external sheaths. The colour of oldest dry sheaths should not be considered. (Chart A)

- 1 Green-yellow
- 2 Medium green
- 3 Green
- 4 Dark green
- 5 Green-red
- 6 Red
- 7 Red-purple
- 8 Blue
- 9 Chimerical
- 10 Other (specify in descriptor **Notes, 6.8**)

6.2.4 Pseudostem appearance

Recorded as in **6.2.3**

- 1 Dull (waxy)
- 2 Shiny (not waxy)

6.2.5 Predominant underlying colour of the pseudostem

Remove the outermost sheath from the pseudostem and look at the exposed surface of the underlying pseudostem. The values 5 (pink-purple), 6 (red-purple) and 7 (purple) must be chosen only if the pigmentation is uniform, and green tinges are not observed. (Chart A)

- 1 Watery green
- 2 Light green
- 3 Green
- 4 Cream
- 5 Pink-purple
- 6 Red-purple
- 7 Purple
- 8 Other (specify in descriptor **Notes, 6.8**)

- ★ **6.2.6 Pigmentation of the underlying pseudostem** (4.1.3)
 Record the tinge of pigmentation, even if it is only noticeable in places. (Chart A)

- 1 Pink-purple
- 2 Red
- 3 Purple
- 4 Other (specify in descriptor **Notes, 6.8**)

- ★ **6.2.7 Sap colour**
Cut the external sheath of pseudostem and record the characteristics of the sap. (Chart A)
- 1 Watery
 - 2 Milky
 - 3 Red-purple
 - 4 Other (specify in descriptor **Notes, 6.8**)
- 6.2.8 Wax on leaf sheaths** (4.1.4)
- 1 Very little or no visible sign of wax
 - 2 Very few wax
 - 3 Moderately waxy
 - 4 Very waxy
- ★ **6.2.9 Number of suckers** (4.1.2)
Record the number of suckers from soil level to point of emergence of the last leaf (>30 cm height). Recorded only if no desuckering has taken place
- ★ **6.2.10 Development of suckers**
In relation to the parent plant. Observed on the tallest sucker. Recorded at harvest time
- 1 Taller than parent plant
 - 2 More than 3/4 of the height of the parent plant
 - 3 Between 1/4 and 3/4 of the height of the parent plant
 - 4 Inhibited
- 6.2.11 Position of suckers**
- 1 Far from parent plant (emerging >50 cm from parent plant)
 - 2 Close to parent (vertical growth)
 - 3 Close to parent (growing at an angle)

6.3 Petiole/midrib/leaf

Recorded on the third, fully unfolded leaf counting down from the top of the plant. (See Fig. 5)

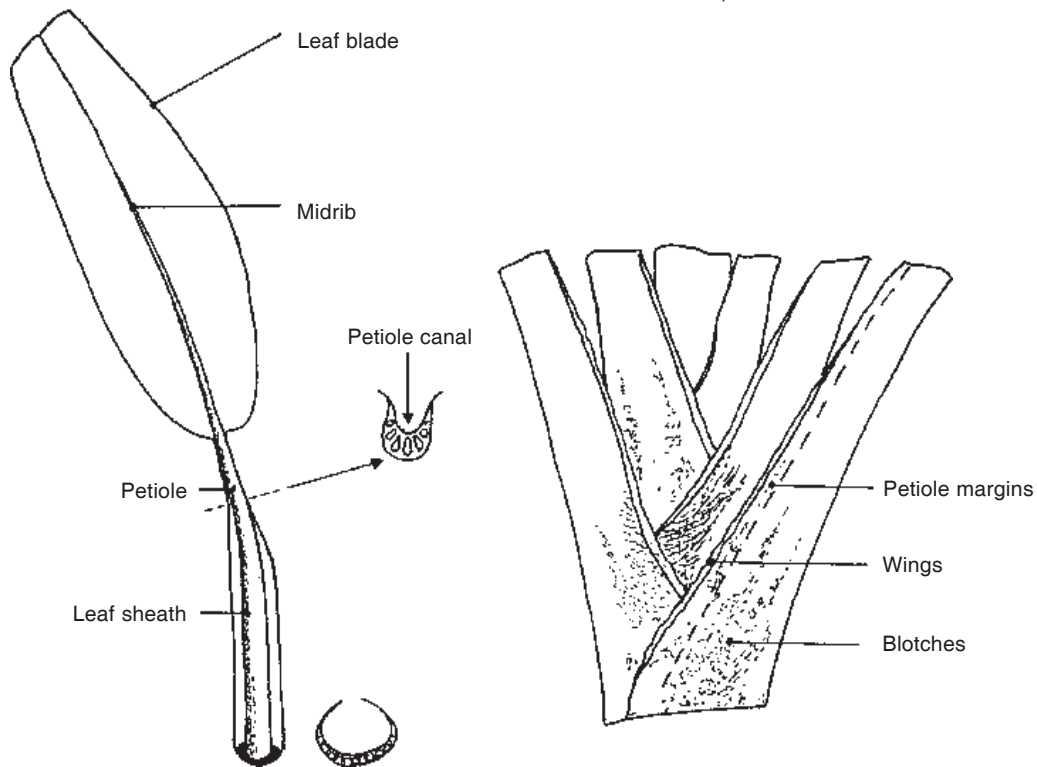


Fig. 5 Petiole/midrib/leaf (from Champion 1963 (left), De Langhe 1961 (right))

★ **6.3.1 Blotches at the petiole base**

(See Fig. 5)

- 1 Sparse blotching
- 2 Small blotches
- 3 Large blotches
- 4 Extensive pigmentation
- 5 Without pigmentation

★ **6.3.2 Blotches colour**

- 1 Brown
- 2 Dark brown
- 3 Brown-black
- 4 Black-purple
- 5 Other (specify in descriptor Notes, 6.8)

- ★ **6.3.3 Petiole canal leaf III**
 Leaf III is the third leaf counted from the last leaf (leaf I) produced before bunch emergence. Cut the petiole half way between the pseudostem and the leaf blade and examine the cross section. (See Figs. 4 and 6)

- 1 Open with margins spreading
- 2 Wide with erect margins
- 3 Straight with erect margins
- 4 Margins curved inward
- 5 Margins overlapping

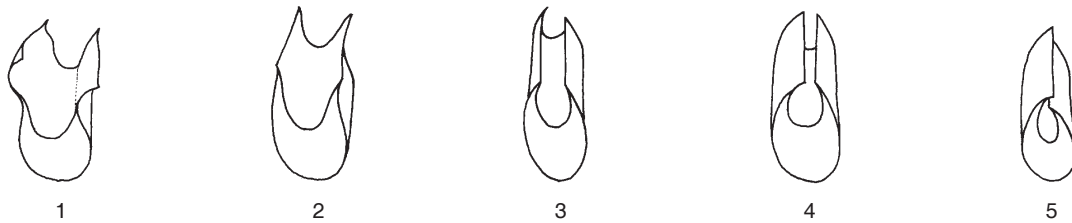


Fig. 6 Petiole canal leaf III

For descriptors **6.3.4 to 6.3.8** observations on the margins and petiole wings should be made where the petiole and pseudostem meet

- 6.3.4 Petiole margins** (4.1.5)
- 1 Winged and undulating
 - 2 Winged and not clasping the pseudostem
 - 3 Winged and clasping the pseudostem
 - 4 Not winged and clasping the pseudostem
 - 5 Not winged and not clasping the pseudostem
- 6.3.5 Wing type**
- 1 Dry
 - 2 Not dry
- 6.3.6 Petiole margin colour**
 (Chart A)
- 1 Green
 - 2 Pink-purple to red
 - 3 Purple to blue
 - 4 Other (specify in descriptor **Notes, 6.8**)

6.3.7 Edge of petiole margin

- 1 Colourless (without a colour line along)
- 2 With a colour line along

6.3.8 Petiole margin width [cm]

- 1 ≤ 1 cm
- 2 > 1 cm
- 3 Cannot be defined

6.3.9 Leaf blade length [cm]

Measured at its maximum point

- 1 ≤ 170 cm
- 2 171 to 220 cm
- 3 221 to 260 cm
- 4 ≥ 261 cm

6.3.10 Leaf blade width [cm]

Measured at its maximum point

- 1 ≤ 70 cm
- 2 71 to 80 cm
- 3 81 to 90 cm
- 4 ≥ 91 cm

6.3.10.1 Leaf ratio

- 3 ≤ 2
- 5 2.4 to 2.6
- 7 ≥ 3

6.3.11 Petiole length [cm]

Recorded from the pseudostem to the lamina

- 1 ≤ 50 cm
- 2 51 to 70 cm
- 3 ≥ 71 cm

6.3.12 Colour of leaf upper surface

(Chart A)

- 1 Green-yellow
- 2 Medium green
- 3 Green
- 4 Dark green
- 5 Dark green with red-purple (presence of large blotches of red-purple)
- 6 Blue
- 7 Other (specify in descriptor **Notes, 6.8**)

6.3.13 Appearance of leaf upper surface

- 1 Dull
- 2 Shiny

6.3.14 Colour of leaf lower surface

(Wax removed). (Chart A)

- | | |
|----------------|--------------------------------------------|
| 1 Green-yellow | 5 Blue |
| 2 Medium green | 6 Red-purple |
| 3 Green | 7 Other (specify in descriptor Notes, 6.8) |
| 4 Dark green | |

6.3.15 Appearance of leaf lower surface

- 1 Dull
- 2 Shiny

6.3.16 Wax on leaves

Recorded on the lower surface

- 1 Very little or no visible sign of wax
- 2 Few wax
- 3 Moderately waxy
- 4 Very waxy

6.3.17 Insertion point of leaf blades on petiole

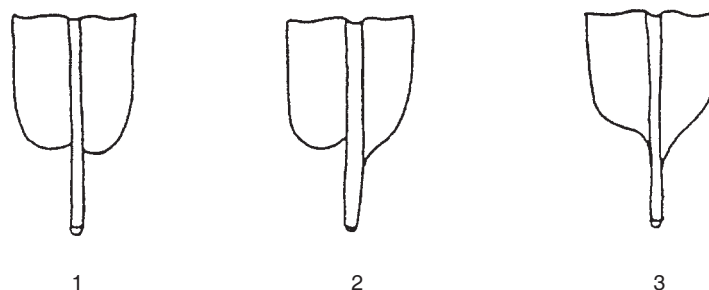
- 1 Symmetric
- 2 Asymmetric

6.3.18 Shape of leaf blade base

(4.1.6)

(See Fig. 7)

- 1 Both sides rounded
- 2 One side rounded, one pointed
- 3 Both sides pointed

**Fig. 7 Shape of leaf blade base**

6.3.19 Leaf corrugation

Presence of ridges perpendicular to the secondary ribs on the leaf upper surface

- 1 Even, smooth
- 2 Few stripes
- 3 Very corrugated

★ **6.3.20 Colour of midrib dorsal surface**

If pigmentation is seen, options are 4, 5 or 6. (Chart A)

- 1 Yellow
- 2 Light green
- 3 Green
- 4 Pink-purple
- 5 Red-purple
- 6 Purple to blue
- 7 Other (specify in descriptor **Notes, 6.8**)

6.3.21 Colour of midrib ventral surface

If pigmentation is seen, options are 4, 5 or 6. (Chart A)

- 1 Yellow
- 2 Light green
- 3 Green
- 4 Pink-purple
- 5 Red-purple
- 6 Purple to blue
- 7 Other (specify in descriptor **Notes, 6.8**)

★ **6.3.22 Colour of cigar leaf dorsal surface**

Look at the visible face (future lower face) of the cigar leaf before it is unfurled and before the plant flowers. (Chart A)

- 1 Green
- 2 Red-purple
- 3 Other (specify in descriptor **Notes, 6.8**)

★ **6.3.23 Blotches on leaves of water suckers**

Observed on young, non inhibited water suckers (if the lamina is sword shaped, it is not a water sucker)

- 1 Without blotches
- 2 Little or narrow blotches
- 3 Large purple blotches

6.4 Inflorescence / male bud

★ 6.4.1 Peduncle length [cm]

Measured from the leaf crown to the first hand of fruit

- 1 ≤30 cm
- 2 31 - 60 cm
- 3 ≥61 cm

6.4.2 Empty nodes on peduncle

Record the number of empty nodes between the last bract-leaf and first hand of fruit

6.4.3 Peduncle width [cm]

Recorded at mid-length

- 1 ≤6 cm
- 2 7 - 12 cm
- 3 ≥13 cm

6.4.4 Peduncle colour

Descriptor state 4 (red/or pink-purple) is green homogeneously tinged with red (purple green appearance). When pigmentation is scattered, use state 5. (Chart A)

- 1 Light green
- 2 Green
- 3 Dark green
- 4 Red or pink/purple
- 5 With purple-brown to blue blotches
- 6 Other (specify in descriptor **Notes, 6.8**)

★ 6.4.5 Peduncle hairiness (4.2.2)

- 1 Hairless
- 2 Slightly hairy
- 3 Very hairy, short hairs (similar to velvet touch)
- 4 Very hairy, long hairs (>2 mm)

★ 6.4.6 Bunch position

(Position of the fruit-bearing part). Angle from vertical to the general axis of the bunch

- 1 Hanging vertically
- 2 Slightly angled
- 3 Hanging at angle 45°
- 4 Horizontal
- 5 Erect

6.4.7 Bunch shape

- 1 Cylindrical
- 2 Truncated cone shape
- 3 Asymmetric - Bunch axis is nearly straight
- 4 With a curve in the bunch axis
- 5 Spiral (all fruit is attached to a unique crown coiled around the stalk)

6.4.8 Bunch appearance

- 1 Lax (one can easily place one's hand between the hands of fruit)
- 2 Compact (one can place one's finger, but not one's hand, between the hands of fruit)
- 3 Very compact (one cannot place one's finger between the hands of fruit)

6.4.9 Flowers that form the fruit

(4.2.3)

Record at flowering if the flowers of the first hands bear apparently functional stamens

- 1 Female (absence of pollen sacs or pollens)
- 2 Hermaphrodite (presence of pollen sacs and pollens)

★ **6.4.10 Fruits**

Positioning of fruits on the crown

- 1 Uniseriate
- 2 Biseriate
- 3 Biseriate and fused

For the following descriptors, observe only that part of the rachis between the last hand of fruit and the male bud

★ **6.4.11 Rachis type**

- 1 Truncated, no bract scar below the last hand of fruit
- 2 Present and male bud may be degenerated or persistent

★ **6.4.12 Rachis position**

(See Fig. 8)

- 1 Falling vertically
- 2 At an angle
- 3 With a curve
- 4 Horizontal
- 5 Erect

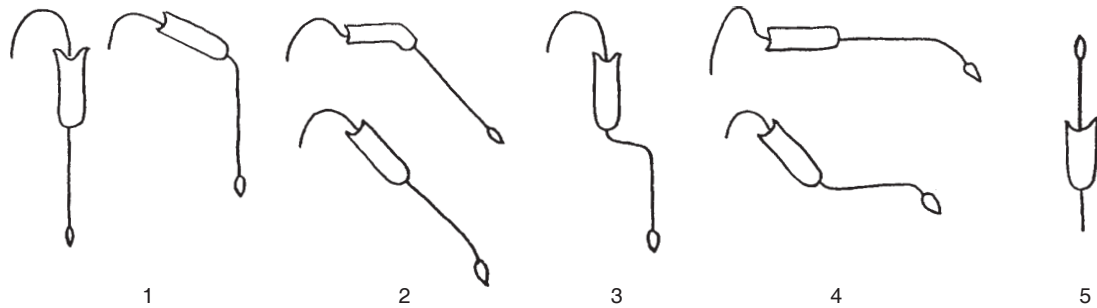


Fig. 8 Rachis position (adapted from De Langhe 1961)

- ★ **6.4.13 Rachis appearance**
- 1 Bare
 - 2 Neutral flowers (one to few hands only, stalk is bare below)
 - 3 Male flowers/bracts above the male bud (but the stalk is bare above flowers/bracts)
 - 4 Neutral/male flowers and presence of withered bracts (on the whole stalk)
 - 5 Neutral/male flowers on the whole stalk without persistent bracts (e.g. AA var. 'Tuu Gia')
 - 6 Small bunch from neutral/hermaphrodite flowers just above the male bud (e.g. ABB var. 'Monthan')
 - 7 Other (specify in descriptor **6.8, Notes**)
- ★ **6.4.14 Male bud type**
Recorded at maturity
- 1 Normal (present)
 - 2 Degenerating before maturity (like false-horn 'Plantain')
 - 3 Like true-horn 'Plantain' (absent)

★ **6.4.15 Male bud shape**

Note the general shape of the male bud at harvest. (See Fig. 9)

- | | |
|----------------|-----------|
| 1 Like a top | 4 Ovoid |
| 2 Lanceolate | 5 Rounded |
| 3 Intermediate | |

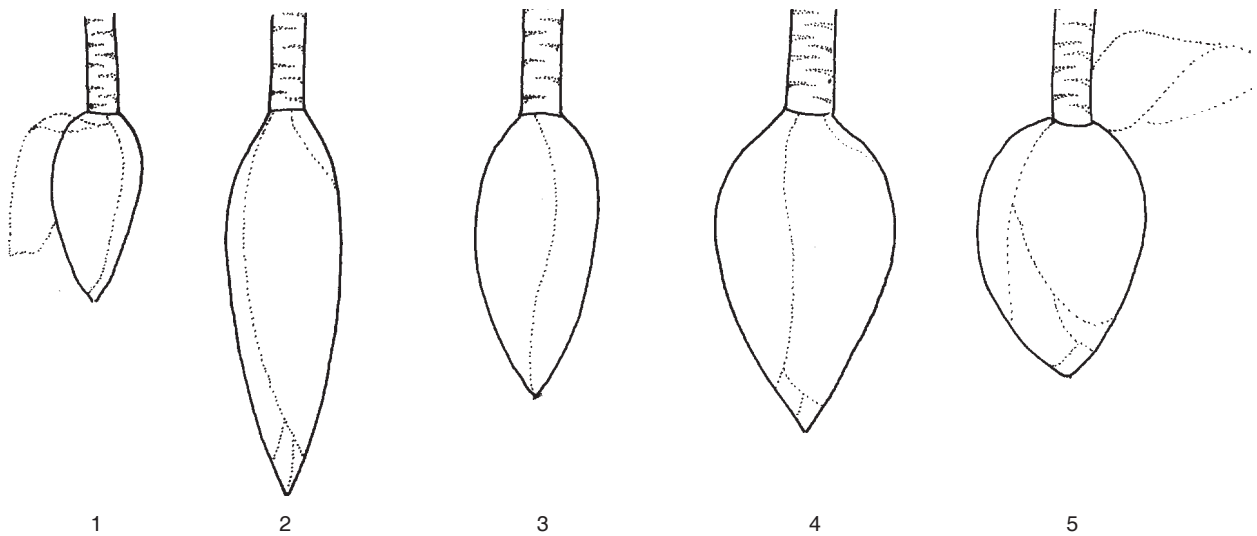


Fig. 9 Male bud shape

6.4.16 Male bud size [cm]

Length and maximum diameter of male bud at harvest

- | | |
|---|-------------|
| 1 | ≤20 cm |
| 2 | 21 to 30 cm |
| 3 | ≥31 cm |

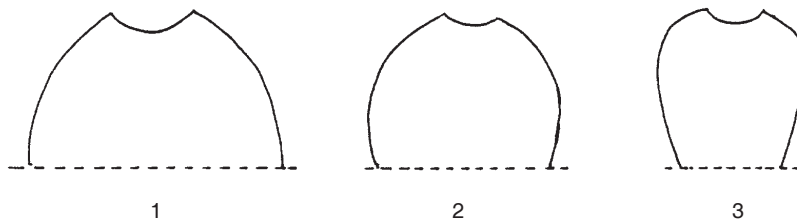
6.5 Bract

Descriptors **6.5.1** to **6.5.14** refer to the first external bract that still clings to the male bud

6.5.1 Bract base shape

(See Fig. 10)

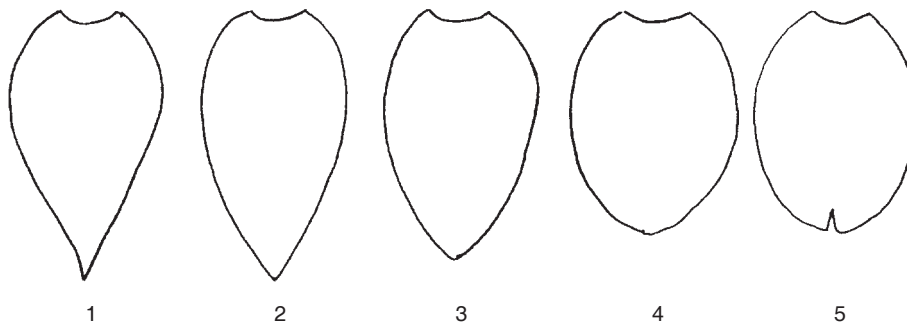
- 1 Small shoulder
- 2 Medium
- 3 Large shoulder

**Fig. 10 Bract base shape**★ **6.5.2 Bract apex shape**

(4.2.12)

Flatten the apex of the bract to observe its shape. (See Fig. 11)

- 1 Pointed
- 2 Slightly pointed
- 3 Intermediate
- 4 Obtuse
- 5 Obtuse and split

**Fig. 11 Bract apex shape**★ **6.5.3 Bract imbrication**

Note alignment of bracts at the apex of the male bud

- 1 Old bracts overlap at apex of bud (like *Musa acuminata* subsp. *malaccensis*)
- 2 Young bracts slightly overlap
- 3 Young bracts greatly overlap (like *Musa acuminata* subsp. *burmanicca*)

- ★ **6.5.4 Colour of the bract external face** (4.2.11)
(Chart A)
- | | | | |
|---|--------------|----|--------------------------------------------------|
| 1 | Yellow | 6 | Purple |
| 2 | Green | 7 | Blue |
| 3 | Red | 8 | Pink-purple |
| 4 | Red-purple | 9 | Orange-red |
| 5 | Purple-brown | 10 | Other (specify in descriptor Notes, 6.8) |
- ★ **6.5.5 Colour of the bract internal face** (4.2.13)
(Chart A)
- | | | | |
|---|-----------------|---|--------------------------------------------------|
| 1 | Whitish | 5 | Purple |
| 2 | Yellow or green | 6 | Purple brown |
| 3 | Orange red | 7 | Pink-purple |
| 4 | Red | 8 | Other (specify in descriptor Notes, 6.8) |
- 6.5.6 Colour on the bract apex**
Recorded on the external face of the bract
- 1 Tinted with yellow (discoloured)
 - 2 Not tinted with yellow (colour is uniform until apex)
- 6.5.7 Colour stripes on bract**
- 1 Without discoloured lines (not ridges) on the external face
 - 2 With discoloured lines or stripes on the external face
- ★ **6.5.8 Bract scars on rachis** (4.2.7)
Recorded on scars left after fall of bracts and flowers
- 1 Very prominent
 - 2 Not prominent
- ★ **6.5.9 Fading of colour on bract base**
Observed on the inside of the bract
- 1 Colour discontinuing towards the base (loss of pigmentation at the base)
 - 2 Colour homogenous (pigmentation is uniform and continues until the base)
- 6.5.10 Male bract shape**
(See Fig. 12)
- 1 $x/y < 0.28$ (Lanceolate)
 - 2 $0.28 < x/y < 0.30$
 - 3 $x/y > 0.30$ (Ovate)

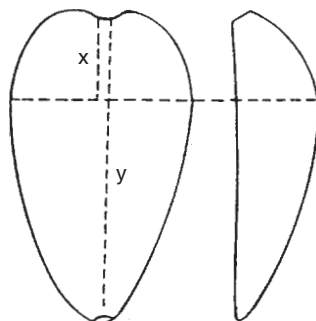


Fig. 12 Male bract shape (from Simmonds and Shepherd 1955)

6.5.11 Male bract lifting

Number of raised bracts present on the male bud

- 1 Not lifting from male bud (bracts are persistent)
- 2 Lifting one at a time
- 3 Lifting two or more at a time

★ 6.5.12 Bract behaviour before falling

(4.2.10)

(See Fig. 13)

- 1 Revolute (rolling)
- 2 Not revolute (not rolling)

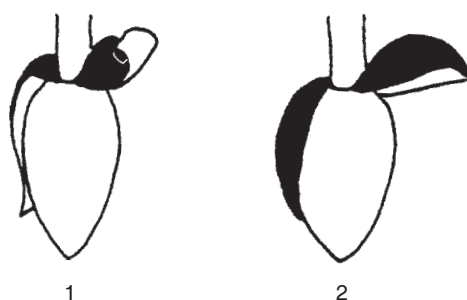


Fig. 13 Bract behaviour before falling

★ 6.5.13 Wax on the bract

Recorded on the external surface

- 1 Very little or no visible sign of wax
- 2 Very few wax
- 3 Moderately waxy
- 4 Very waxy

6.5.14 Presence of grooves on the bract

Observed on the external surface

- 1 Few grooves or not grooved (the bract is completely, or almost completely, smooth)
- 2 Moderate grooving (parallel ridges are distinguishable)
- 3 Strongly grooved (deep parallel furrows on the surface of bract)

6.6 Male flower

(See Fig. 14). Descriptors **6.6.1 to 6.6.25** refer to the flowers at the axil of the first external bract unlifted. At least 10 flowers should be observed

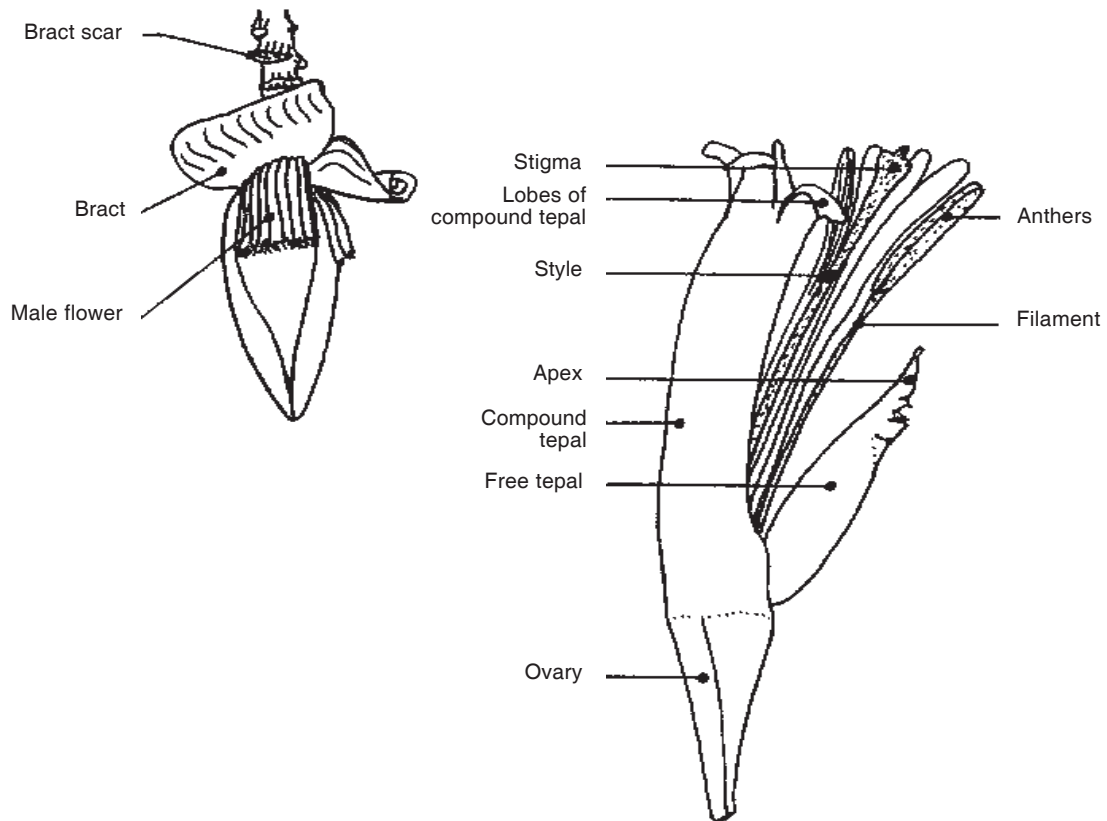


Fig. 14 Male bud and flower (adapted from Champion 1967)

6.6.1 Male flower behaviour

- 1 Falling before the bract
- 2 Falling with the bract
- 3 Falling after the bract
- 4 Neutral/male flowers persistent

- ★ **6.6.2 Compound tepal basic colour**
Without considering lobe colour. (Chart B)
 - 1 White
 - 2 Cream
 - 3 Yellow
 - 4 Orange
 - 5 Pink/pink-purple
 - 6 Other (specify in descriptor **Notes, 6.8**)

- ★ **6.6.3 Compound tepal pigmentation**
 - 1 Very few or no visible sign of pigmentation
 - 2 Rust-coloured spots
 - 3 Presence of pink

- ★ **6.6.4 Lobe colour of compound tepal**
(Chart B)
 - 1 Cream
 - 2 Yellow
 - 3 Orange
 - 4 Green
 - 5 Other (specify in descriptor **Notes, 6.8**)

- 6.6.5 Lobe development of compound tepal**
 - 1 Little or not visible sign of development
 - 2 Developed
 - 3 Very developed

- 6.6.6 Free tepal colour**
 - 1 Translucent white
 - 2 Opaque white
 - 3 Tinted with yellow
 - 4 Tinted with pink

- 6.6.7 Free tepal shape**
 - 1 Rectangular
 - 2 Oval
 - 3 Rounded
 - 4 Fan-shaped

- ★ **6.6.8 Free tepal appearance**
 - 1 Simple folding under apex
 - 2 More or less smooth
 - 3 Several folding under apex (corrugated)

6.6.9 Free tepal apex development

(See Fig. 15)

- 1 Little or no visible sign of development
- 2 Developed
- 3 Very developed

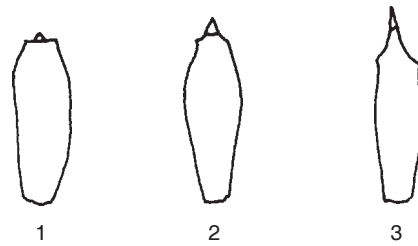


Fig. 15 Free tepal apex development

6.6.10 Free tepal apex shape

- 1 Thread-like
- 2 Triangular
- 3 Obtuse

6.6.11 Anther exertion

In relation to the base of the lobes on the compound tepal

- 1 Exserted
- 2 Same level
- 3 Inserted

6.6.12 Filament colour

(Chart B)

- 1 White
- 2 Cream
- 3 Yellow

6.6.13 Anther colour

Observed on the face opposite to the dehiscence split of the anther (dorsal face).
(Chart B)

- | | |
|----------|--------------------------------------------|
| 1 White | 5 Brown/rusty brown |
| 2 Cream | 6 Pink/pink-purple |
| 3 Yellow | 7 Black (anthers aborted) |
| 4 Grey | 8 Other (specify in descriptor Notes, 6.8) |

6.6.14 Pollen sac colour

Recorded at the line where the anther splits to release pollen. (Chart B)

- | | |
|---------------------|----------------------------------------------------|
| 1 White | 5 Pink/pink-purple |
| 2 Cream | 6 Red-purple |
| 3 Yellow | 7 Other (specify in descriptor Notes, 6.8) |
| 4 Brown/rusty brown | |

★ **6.6.15 Pollen vitality [%]**

Percentage of deformed and/or aborted grains in relation to normal grains. Use Alexander's pollen viability assessment method (See references)

6.6.16 Style basic colour

Do not refer to the minute blotches which can be present on the style (Descriptor **6.6.17**). (Chart B)

- | | |
|---------|----------------------------------------------------|
| 1 White | 3 Red-purple |
| 2 Cream | 4 Other (specify in descriptor Notes, 6.8) |

6.6.17 Pigmentation on style

- 1 Without pigmentation
- 2 Purple

6.6.18 Style exertion

In relation to the base of the lobes on the compound tepal

- 1 Exserted
- 2 Same level
- 3 Inserted

★ **6.6.19 Style shape**

(See Fig. 16)

- | | |
|-----------------------|----------------------------------------------------|
| 1 Straight | 4 Curved twice |
| 2 Curved under stigma | 5 Other (specify in descriptor Notes, 6.8) |
| 3 Curved at the base | |

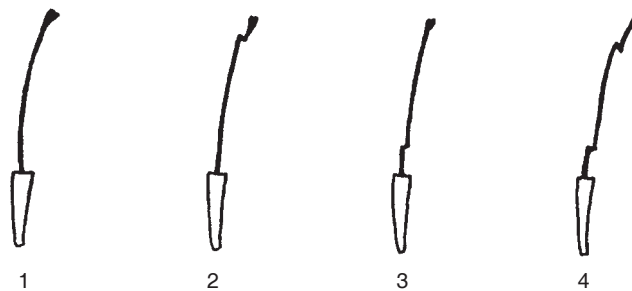


Fig. 16 Style shape

- ★ **6.6.20 Stigma colour**
(Chart B)
- 1 Cream
 - 2 Yellow
 - 3 Pink/pink-purple
 - 4 Bright yellow
 - 5 Orange
 - 6 Other (specify in descriptor **Notes, 6.8**)

- 6.6.21 Ovary shape**
(See Fig. 17)
- 1 Straight
 - 2 Arched



Fig. 17 Ovary shape

- ★ **6.6.22 Ovary basic colour**
(Chart B)
- | | |
|----------|--------------------------------|
| 1 White | 4 Green |
| 2 Cream | 5 Other (specify in descriptor |
| 3 Yellow | Notes, 6.8) |

- ★ **6.6.23 Ovary pigmentation**
- 1 Very few or no visible sign of pigmentation
 - 2 With red-purple

- 6.6.24 Dominant colour of male flower**
(Chart B)
- | | |
|----------|---------------------------------------------------|
| 1 White | 4 Pink/pink-purple |
| 2 Cream | 5 Red-purple |
| 3 Yellow | 6 Other (specify in descriptor Notes, 6.8) |

6.6.25 Irregular flowers

Record number of flowers per cluster with an abnormal number of stamens, fusion of free and compound tepal, etc.

6.6.26 Arrangement of ovules

(6.2.1)

Observed soon after flowering and before the fruit fills. Observe a cross-section of a fruit. (See Fig. 18)

- 1 Two rowed
- 2 Four-rowed (more or less)

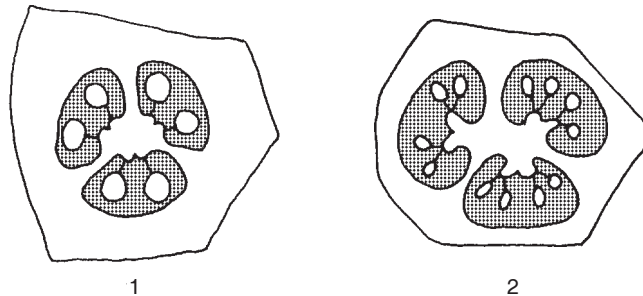


Fig. 18 Arrangement of ovules (adapted from Simmonds and Shepherd 1955)

6.7 Fruit

For the following descriptors, records should be made on the inner fruit in the middle of the mid-hand of the bunch, at harvest time (first fruit ripening on bunch)

6.7.1 Fruit position

Recorded only on fruits arranged symmetrically around the stalk

- 1 Curved towards stalk
- 2 Parallel to the stalk
- 3 Curved upward (obliquely, at a 45° angle upward)
- 4 Perpendicular to the stalk
- 5 Pendant

★ **6.7.2 Number of fruits**

(4.2.5)

Observed on the mid-hand of the bunch

- 1 ≤12
- 2 13-16
- 3 ≥17

- ★ **6.7.3 Fruit length [cm]**
 Measured as the internal arc of the fruit, without pedicel
- 1 ≤15 cm
 - 2 16- 20 cm
 - 3 21- 25 cm
 - 4 26- 30 cm
 - 5 ≥31 cm

- ★ **6.7.4 Fruit shape (longitudinal curvature)** (4.2.7)
 (See Fig. 19)
- 1 Straight (or slightly curved)
 - 2 Straight in the distal part
 - 3 Curved (sharp curve)
 - 4 Curved in 'S' shape (double curvature)
 - 5 Other (specify in descriptor **Notes, 6.8**)

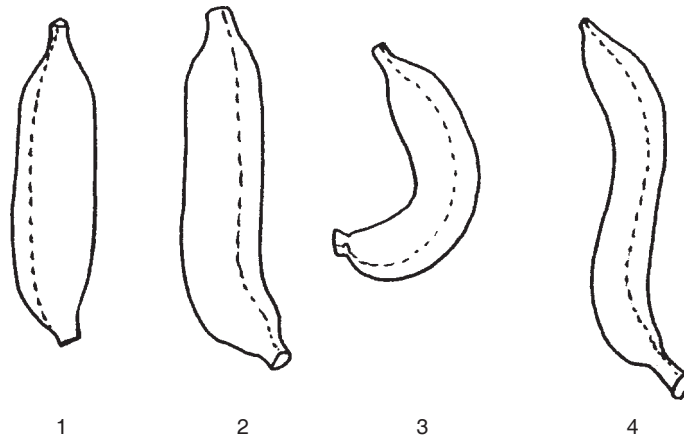


Fig. 19 Fruit shape (longitudinal curvature) (adapted from Dodds and Simmonds 1948)

- ★ **6.7.5 Transverse section of fruit** (6.2.4)
 Observed on mature fruit ('ready to eat' - ripe but not over-ripe, full yellow stage).
 (See Fig. 20)
- 1 Pronounced ridges
 - 2 Slightly ridged
 - 3 Rounded

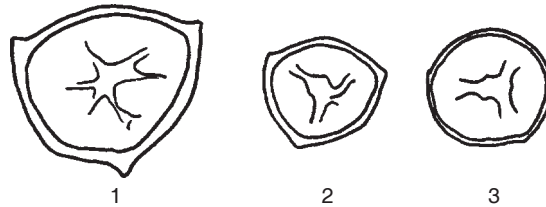


Fig. 20 Transverse section of fruit (adapted from Dodds and Simmonds 1948)

★ 6.7.6 Fruit apex (4.2.8)

Observed at the distal end of the fruit. (See Fig. 21)

- 1 Pointed
- 2 Lengthily pointed
- 3 Blunt-tipped
- 4 Bottle-necked
- 5 Rounded

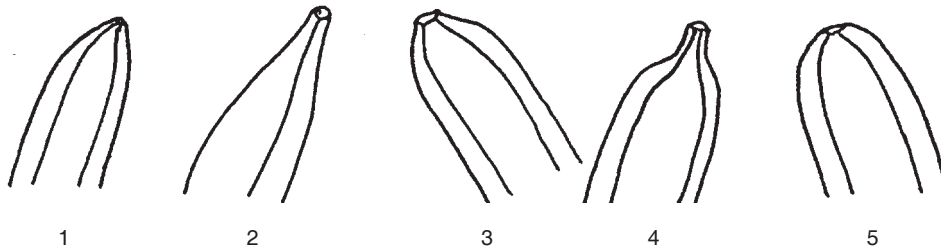


Fig. 21 Fruit apex (adapted from Champion 1967)

6.7.7 Remains of flower relicts at fruit apex

Observed at the distal end of the fruit. (See Fig. 22)

- 1 Without any floral relicts
- 2 Persistent style
- 3 Base of the style prominent

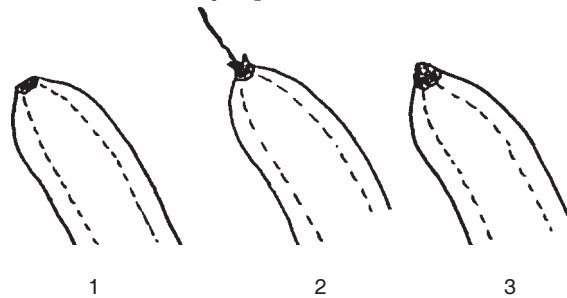


Fig. 22 Remains of flower relicts at fruit apex

6.7.8 Fruit pedicel length [mm]

- 1 ≤10 mm
- 2 11 to 20 mm
- 3 ≥21 mm

6.7.9 Fruit pedicel width [mm]

- 1 <5 mm
- 2 5 to 10 mm
- 3 >10 mm

6.7.10 Pedicel surface

- 1 Hairless
- 2 Hairy

6.7.11 Fusion of pedicels

(Before joining the crown)

- 1 Very partially or no visible sign of fusion
- 2 Partially fused
- 3 Totally fused

6.7.12 Immature fruit peel colour

(6.2.5)

Recorded on the youngest hand of the bunch, before maturity. (Chart B)

- 1 Yellow
- 2 Light green
- 3 Green
- 4 Green and pink, red or purple
- 5 Silvery
- 6 Dark green
- 7 Brown/rusty brown
- 8 Pink, red or purple
- 9 Black
- 10 Other (e.g. bluish, specify in descriptor **Notes, 6.8**)

★ **6.7.13 Mature fruit peel colour**

Recorded at fruit maturity (ripe, but not over-ripe; full yellow stage). (Chart B)

- 1 Yellow
- 2 Bright yellow
- 3 Orange
- 4 Grey spots
- 5 Brown/rusty-brown
- 6 Orange red, red or pink/pink purple
- 7 Red-purple
- 8 Black
- 9 Other (specify in the descriptor **Notes, 6.8**)

6.7.14 Fruit peel thickness [mm]

Recorded at fruit maturity ('ready to eat' ripe, but not over-ripe; full yellow stage)

- 1 Two or less
- 2 Three or more

6.7.15 Adherence of the fruit peel

Recorded at fruit maturity (ripe, but not over-ripe; full yellow stage)

- 1 Fruit peels easily
- 2 Fruit does not peel easily

6.7.16 Cracks in fruit peel

Recorded at fruit maturity if the peel splits without mechanical damage

- 1 Without cracks
- 2 Cracked

★ **6.7.17 Pulp in fruit**

- 1 Without pulp
- 2 With pulp

6.7.18 Pulp colour before maturity

Recorded on youngest hand of the bunch. (Chart B)

- 1 White
- 2 Cream
- 3 Ivory
- 4 Yellow
- 5 Orange
- 6 Beige-pink
- 7 Other (specify in descriptor **Notes, 6.8**)

★ **6.7.19 Pulp colour at maturity**

(Chart B). (Ripe, but not over-ripe; full yellow stage)

- 1 White
- 2 Cream
- 3 Ivory
- 4 Yellow
- 5 Orange
- 6 Beige-pink
- 7 Other (specify in descriptor **Notes, 6.8**)

6.7.20 Fruits fall from hands

Observed at fruit maturity

- 1 Persistent
- 2 Deciduous

6.7.21 Flesh texture

- 1 Firm
- 2 Soft

6.7.22 Predominant taste

(4.2.6)

- 1 Astringent (like cooking banana)
- 2 Mild, slightly tasty or tasteless
- 3 Sweet (like Cavendish)
- 4 Sugary (like 'Pisang Mas')
- 5 Sweet and acidic (apple like)
- 6 Other (specify in descriptor **Notes, 6.8**)

★ **6.7.23 Presence of seed with source of pollen**

Record the number of seeds only if there exists in the vicinity of the plant a population of wild relatives, or male fertile hybrids (pollen sources), or if the female flowers are artificially pollinated

- 1 <5
- 2 5-20
- 3 >20

6.7.24 Seed surface

- 1 Smooth
- 2 Wrinkled

★ **6.7.25 Seed shape**

(4.3.1)

- 1 Flat
- 2 Angular (more or less pyramidal)
- 3 Globular (spherical)
- 4 Rounded (but not completely spherical)

6.8 Notes

Any additional information, especially in the category of 'other' under various descriptors above, may be specified here

EVALUATION

7. Plant descriptors

Observations should be made at harvest, when the first ripe fruit develops on the bunch.
Record mean and standard deviation

★ **7.1 Cycle under evaluation**

Specify which cycle is observed for the next characters

- 1 Cycle 1
- 2 Cycle 2 and following

★ **7.2 Number of plants evaluated**

★ **7.3 Planting to shooting [d]**

From planting until the emergence of the first bract

★ **7.4 Plant crop cycle [d]**

From planting to harvest

7.5 Ratoon crop cycle 2 [d]

Number of days between two successive harvests

★ **7.6 Pseudostem height [cm]**

From base of pseudostem to the point of bunch emergence

7.7 Pseudostem girth [cm]

Measured at 1 m from base of pseudostem

7.8 Height of following ratoon [cm]

Measured from base of pseudostem to last leaf axil

★ **7.9 Bunch weight [kg]**

Bunch stalk (peduncle) is cut above the first hand at the level of the last scar and immediately below the last hand

★ **7.10 Number of hands**

★ **7.11 Number of fruits**

7.12 Fruit length [cm]

Recorded on the central external fruit of the middle hand

7.13 Fruit diameter [mm]

Recorded on the central external fruit of the middle hand

★ **7.14 Fruit weight [g]**

Average: divide the collective weight of the hands (cut from the peduncle) by the number of fruits

★ **7.15 Number of living (functional) leaves at flowering**

★ **7.16 Number of living (functional) leaves at harvest**

7.17 Notes

Specify here any additional information

8. 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:

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

8.1 Low temperature (7.1)

8.2 Drought (7.3)

8.3 Flooding

8.4 Mineral deficiencies

8.5 Winds

8.6 Soil acidity

8.7 Manganese toxicity

8.8 High temperature

8.9 Notes

Specify here any additional information

9. Biotic stress susceptibility

In each case, it is important to state the origin of the infestation or infection, i.e. natural, field inoculation, laboratory. Record such information in descriptor **9.3 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

Asterisks (*) in sections **9.1 - 9.2** indicate the organisms considered most important by breeders or pathologists

9.1 Diseases

	Causal organism	Common name
9.1.1	* <i>Mycosphaerella musicola</i>	Sigatoka/yellow Sigatoka
9.1.2	* <i>Mycosphaerella fijiensis</i>	Black leaf streak/black Sigatoka
9.1.3	* <i>Fusarium oxysporum</i> f.sp. <i>cubense</i> Specify VCG group if known	Fusarium wilt/ Panama Disease (8.2.1)
9.1.4	* <i>Pseudomonas solanacearum</i>	Moko, Bugtok (8.3.1) Blood disease
9.1.5	<i>Cylindrocadium</i> sp.	

9.2 Pests

9.2.1	* <i>Radopholus similis</i>	Burrowing nematode (8.1.2)
9.2.2	* <i>Pratylenchus coffeae</i>	Root lesion nematode
9.2.3	* <i>Pratylenchus goodeyi</i>	Root lesion nematode
9.2.4	* <i>Cosmopolites sordidus</i>	Weevil borer (8.1.1)
9.2.5	<i>Meloidogyne</i> sp.	
9.2.6	<i>Helicotylenchus multicinctus</i>	

9.3 Notes

Specify here any additional information, such as fruit diseases

10. Biochemical markers

10.1 Isozyme

For each enzyme, indicate the tissue analyzed and the zymogram type. A particular enzyme can be recorded as 10.1.1; 10.1.2, etc.

10.2 Other biochemical markers

(e.g. Flavonoid and polyphenol profiles)

11. Molecular markers

Describe any specific discriminating or useful trait for this accession. Report probe-enzyme combination analyzed.

11.1 Restriction Fragment Length Polymorphism (RFLP)

11.2 Random Amplified Polymorphic DNA (RAPD)

11.3 Specific Amplicon Polymorphism (SAP)

11.4 Microsatellites

11.5 Other molecular markers

12. Cytological characters

★ 12.1 Somatic chromosome number

★ 12.2 Ploidy level

(2x, 3x, 4x)

12.3 Other cytological characters

(e.g. trisomics, monosomics, B chromosomes)

13. Identified genes

Refers to any gene identified for any of the morphological and biochemical characters. List all identified genes.

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Ms Adriana Alercia coordinated and supervised the text up to the pre-publication stage and provided technical advice. Ms Linda Sears edited the text and Ms Patrizia Tazza drew the cover, some illustrations, and prepared the layout. Scientific direction was provided by Dr Jean-Pierre Horry. Mr Paul Stapleton managed the production of the publication.

LIST OF DESCRIPTORS

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

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Descriptors for

Citrus



List of Descriptors

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

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IPGRI

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PREFACE

Descriptors for Citrus is a revision of the original IBPGR publication **Descriptors for Citrus** (1988). The descriptor numbers of the original list are given in parentheses beside the present descriptors for cross-referencing purposes. This descriptor list has been devised to cover members of the tribe Citreae of the Family Rutaceae and subfamily Aurantioideae, all of which have a type of fruit-bearing, juice-filled vesicle known as a hesperidium. Of about 13 genera involved, the most important are *Citrus* (16 species including 10 cultivated, according to Swingle's classification), *Fortunella* and *Poncirus* and their hybrids. This revised descriptor list is based on the work of a team of SRA INRA-CIRAD¹ in Corsica, France and inputs from the EGID¹-Citrus Network coordinated by Roland Cottin. It also covers Asian crop diversity through contributions provided by UTFANET¹ (coordinated by Dr Nazmul Haq). The UPOV¹ Technical Guidelines for Citrus have been examined and where possible a standardized approach has been considered. A draft version prepared in the internationally accepted IPGRI format for descriptor lists was subsequently sent to a number of experts for their comments and amendments. A full list of the names and addresses of those involved is given in 'Contributors'.

IPGRI encourages the collecting 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 crop's description. Descriptors listed under *Evaluation* allow for a more extensive description of the 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 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 curators will characterize accessions of their collection utilizing all descriptors given. Descriptors should be used when they are useful to the curator for the

¹ EGID=Evaluer, Gérer, Informatiser, Diffuser; SRA INRA-CIRAD = Institut National de la Recherche Agronomique-Centre de Coopération Internationale en Recherche Agronomique pour le Développement; UPOV=International Union for the Protection of New Varieties of plants; UTFANET=Underutilized Fruits in Asia Network.

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.

Multicrop passport descriptors (see Annex I) 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 genetic nature of the multicrop 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 citrus that will facilitate data collecting.

Any suggestions for improvement on the Descriptors for Citrus 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 experimental designs and techniques are needed to assess them. Their assessment may also require complex biochemical or molecular characterization methods. These types of descriptors include 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 with **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 Color 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* is 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; (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 (1.1) [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).

1.2 Donor name (1.2) [MCPD]

Name of institution or individual responsible for donating the germplasm

1.3 Donor number (1.3) [MCPD]

Number assigned to an accession by the donor

1.4 Other number(s) associated with the accession (1.4) [MCPD]

Any other identification number known to exist in other collections for this accession, e.g. USDA Plant Inventory number (not Collecting number, see descriptor 2.2). Other numbers can be added as 1.4.3, etc.

1.4.1 Other number 1 (1.4.1)

1.4.2 Other number 2 (1.4.2)

1.5 Scientific name (1.5)

1.5.1 Genus² (1.5.1) [MCPD]

1.5.2 Species (1.5.2) [MCPD]

1.5.3 Subspecies (1.5.3) [MCPD]

1.5.4 Cultivar group (1.5.4)

² The taxonomy of citrus crops is still not finally resolved. The classification systems of Swingle, Reece and Tanaka are the most commonly used. A list containing the Citrinae Subtribe Classification (Tanaka's and Swingle's names) is available from the EGID-Citrus Network – see address in the 'Contributors' section.

1.6 Pedigree (1.6)

Parentage or nomenclature, and designations assigned to breeders' material

1.6.1 Variety origin

- 1 Somatic fusion
- 2 Artificial mutation
- 3 Natural mutation
- 4 Somaclonal variation
- 5 Hybridization
- 6 Nucellar selection
- 7 Open-pollinated seedling
- 8 Old line
- 99 Other (specify in descriptor **1.11 Notes**)

1.6.2 Female parent (1.6.1)**1.6.3 Male parent** (1.6.2)**1.6.4 Male parent if backcrossed** (1.6.3)**1.6.5 Original cultivar name if from a bud mutation** (1.6.4)**1.6.6 Original cultivar name if from a nucellar seedling** (1.6.5)**1.6.7 Original cultivar name of protoplasts of callus and leaf if from somatic hybridization****1.6.8 Clonal selection****1.7 Accession****1.7.1 Accession name** [MCPD]

Either a registered or other formal designation given to the accession

1.7.2 Synonyms

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

1.8 Acquisition date [YYYYMMDD] (1.7)

Date on which the accession entered the collection

1.9 Accession size (1.9)

Approximate number or weight of seeds or plants of an accession in the genebank

1.10 Type of material received

- 1 Pollen
- 2 Seed
- 3 Shoot/budwood/stem cutting/layer
- 4 *In vitro* culture
- 5 Plant
- 99 Other (specify in descriptor **1.11 Notes**)

1.11 Notes

Any additional information may be specified here

2. Collecting descriptors**2.1 Collecting institute(s)** (2.2) [MCPD]

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

2.2 Collecting number (2.1) [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 item is essential for identifying duplicates held in different collections. It should be unique and always accompany subsamples wherever they are sent.

2.3 Collecting date of original sample [YYYYMMDD] (2.3) [MCPD]**2.4 Country of collecting** (2.4) [MCPD]

Name of the country in which the sample was collected. Use the three-letter abbreviations from the *International Standard (ISO) Codes for the representation of names of countries*, No. 3166, 4th Edition. Copies of these are available from DIN: Deutsches Institut für Normung e.V., 10772 Berlin, Germany; Tel. +30-2601-369; Fax +30-2601-1231, Tlx. 184 273-din-d; Web site URL: <<http://www.din.de/set/de/DIN>>.

2.5 Province/State (2.5)

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

2.6 Department/County

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

2.7 Location of collecting site (2.6) [MCPD]

Distance in kilometres and direction from the nearest town, village or map grid reference point (e.g. CURITIBA 7S means 7 km south of Curitiba)

2.8 Latitude of collecting site (2.7) [MCPD]

Degrees and minutes followed by N (North) or S (South) (e.g. 1030S). Missing data (minutes) should be indicated with hyphen (e.g. 10—S).

2.9 Longitude of collecting site (2.8) [MCPD]

Degrees and minutes followed by E (East) or W (West) (e.g. 07625W). Missing data (minutes) should be indicated with hyphen (e.g. 076—W).

2.10 Elevation of collecting site [m asl] (2.9) [MCPD]**2.11 Collecting source** (2.10) [MCPD]

The coding scheme proposed can be used at two different levels of detail: either by using the global codes such as 1, 2, 3, 4, or by using the more detailed coding such as 1.1, 1.2, 1.3, etc.

- 0 Unknown
- 1 Wild habitat
 - 1.1 Forest/woodland
 - 1.2 Shrubland
 - 1.3 Grasslands
 - 1.4 Desert/tundra
- 2 Farm
 - 2.1 Field
 - 2.2 Orchard
 - 2.3 Garden
 - 2.4 Fallow
 - 2.5 Pasture
 - 2.6 Store
- 3 Market
 - 3.1 Town
 - 3.2 Village
 - 3.3 Urban area (around city)
 - 3.4 Other exchange system
- 4 Institute/Research organization
- 99 Other (specify in descriptor **2.18 Collector's notes**)

2.12 Collecting source environment

Use descriptors **6.1.1** to **6.1.22** in section 6

2.13 Status of sample (2.11) [MCPD]

- 0 Unknown
- 1 Wild
- 2 Weedy
- 3 Traditional cultivar/Landrace
- 4 Breeder's line
- 5 Advanced cultivar
- 99 Other (specify in descriptor **2.18 Collector's notes**)

2.14 Type of sample (2.15)

Type of plant material 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
- 3 Budwood
- 4 Graft
- 5 Rooted cutting
- 6 Layer
- 7 Vitroplant
- 8 Fruit
- 99 Other (specify which part of the plant in descriptor **2.18 Collector's notes**)

2.15 Number of plants sampled (2.13)**2.16 Ethnobotanical data****2.16.1 Ethnic group** (2.16)

Name of the ethnic group of the donor of the sample or of the people living in the area of collecting

2.16.2 Local vernacular name (2.12)

Name given by farmer to crop and cultivar/landrace/clone/wild form. State local language and/or dialect if the ethnic group is not provided

2.16.3 Translation

Provide translation of the local accession name into English, if possible

2.16.4 Citrus varietal name meaning

Does the citrus name have a meaning? If yes, describe it briefly in descriptor **2.18 Collector's notes**

- 0 No
- 1 Yes

2.16.5 History of plant use

- 1 Ancestral/indigenous (always associated with the place and community)
- 2 Introduced (but in unknown distant past)
- 3 Introduced (time and introduction known)

2.16.6 Parts of the plant used

- 1 Seed
- 2 Root
- 3 Trunk
- 4 Leaf
- 5 Flower/inflorescence
- 6 Fruit
- 99 Other (specify in descriptor 2.18 **Collector's notes**)

2.16.7 Plant uses

- 1 Fresh fruit consumption
- 2 Juice
- 3 Cooking
- 4 Rootstock
- 5 Distillation/fermentation
- 6 Essential oils
- 7 Ornamental
- 8 Medicinal
- 99 Other (specify in descriptor 2.18 **Collector's notes**)

2.16.8 Frequency of use of the plant

- 1 Daily
- 2 Weekly
- 3 Occasional
- 99 Other (specify in descriptor 2.18 **Collector's notes**)

2.16.9 Main cooking methods

- 1 Boiling
- 2 Baking
- 3 Frying
- 4 Preserving
- 99 Other (specify in descriptor 2.18 **Collector's notes**)

2.16.9.1 Cooking time [min]

Record the number of minutes for each descriptor state of 2.16.9, as available

2.16.10 Special uses

- 1 Children
- 2 Older person
- 3 Feasts
- 4 Religious purpose
- 5 Chiefs
- 99 Other (specify in descriptor 2.18 **Collector's notes**)

2.16.11 Cultural characteristics

Is there folklore associated with the collected citrus type? (e.g. taboos, stories and/or superstitions). If so, describe it briefly in descriptor 2.18 **Collector's notes**

- 0 No
- 1 Yes

2.16.12 Juice taste

(4.8.3)

According to local preference

- 1 Insipid
- 2 Acid
- 3 Sweet
- 4 Bitter
- 99 Other (specify in descriptor 2.18 **Collector's notes**)

2.16.12.1 Juice taste evaluation

According to evaluator

- 1 Unpleasant
- 2 Fair
- 3 Pleasant
- 4 Very good

2.16.13 Pulp consistency

- 1 Sticky
- 2 Firm
- 3 Soft
- 4 Mealy
- 99 Other (specify in descriptor 2.18 **Collector's notes**)

2.16.14 Fruit aroma

- 1 Weak
- 2 Average
- 3 Strong

- 2.16.15 Juice aroma** (4.8.4)
- 1 Weak
 - 2 Average
 - 3 Strong
 - 4 Resinous
 - 99 Other (e.g. onion/stale, specify in descriptor **2.18 Collector's notes**)
- 2.16.16 Leaf aroma** (6.2.3)
- 1 Weak
 - 2 Medium
 - 3 Strong
- 2.16.17 Flower aroma**
- 1 Weak
 - 2 Average
 - 3 Strong
- 2.16.18 Citrus popularity**
- Is the variety popular and widely grown? If yes, describe briefly why in descriptor **2.18 Collector's notes**
- 0 No
 - 1 Yes
- 2.16.19 Preferred growing conditions**
- If yes, describe farmer's perceptions on hardiness of the variety in relation to main stresses in descriptor **2.18 Collector's notes**
- 0 No
 - 1 Yes
- 2.16.20 Prevailing stresses**
- Information on main associated biotic (pests and diseases) and abiotic (drought) stresses
- 2.16.21 Cultural practices**
- 2.16.21.1 Planting date** [YYYYMMDD]
 - 2.16.21.2 First harvest date** [YYYYMMDD]
 - 2.16.21.3 Last harvest date** [YYYYMMDD]

2.16.22 Cropping system

- 1 Monoculture
- 2 Intercropped (specify crop in descriptor 2.18 Collector's notes)

2.16.23 Associated flora

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

2.16.24 Seasonality

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

2.16.25 Market information

Specify if any premium price was assigned to the type of *Citrus*

- 0 No
- 1 Yes

2.16.26 Type of market

- 1 Local
- 2 National
- 3 International

2.17 Photograph (2.14)

Was a photograph(s) taken of the accession or habitat at the time of collecting? If so, provide an identification number(s) in descriptor 2.18 Collector's notes

- 0 No
- 1 Yes

2.18 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 1.1)

3.2 Population identification (Passport 2.2)
Collecting number, pedigree, cultivar name, etc., depending on the population type

3.3 Storage address
(Building, room, shelf number/location in medium-term and/or long-term storage)

3.4 Type of maintenance

- 1 Field collection (living plants)
- 2 Screenhouse
- 3 Greenhouse
- 4 Seed
- 5 Tissue culture
- 6 Cryogenic storage
- 99 Other (specify in descriptor 3.10 Notes)

3.5 Amount of stored plant material [g or number] (Passport 1.9)

3.6 Duplication at other location(s) (Passport 1.4)

- 0 No
- 1 Yes

3.7 Propagation method

- 1 Seed
- 2 Grafting
- 3 Cutting
- 4 Layering
- 5 Top grafting
- 6 Tissue culture
- 99 Other (specify in descriptor 3.10 Notes)

3.8 *In vitro* conservation

3.8.1 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 3.10 Notes)

3.8.2 Date of introduction *in vitro* [YYYYMMDD]

3.8.3 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 3.10 Notes)

3.8.4 Regeneration process

- 1 Organogenesis
- 2 Somatic embryogenesis
- 99 Other (specify in descriptor 3.10 Notes)

3.8.5 Number of genotypes introduced *in vitro*

3.8.6 Number of replicates per genotype

3.8.7 Last subculture date [YYYYMMDD]

3.8.8 Medium used at the last subculture

3.8.9 Number of plants at the last subculture

3.8.10 Location after the last subculture

3.8.11 Next subculture date [YYYYMMDD]

3.9 Cryopreservation

3.9.1 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 3.10 Notes)

3.9.2 Introduction date in liquid nitrogen [YYYYMMDD]

3.9.3 Number of samples introduced in liquid nitrogen

3.9.4 End of storage period [YYYYMMDD]

3.9.5 Number of samples taken from liquid nitrogen

3.9.6 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 3.10 Notes)

3.9.7 Regeneration process

- 1 Organogenesis
- 2 Somatic embryogenesis
- 99 Other (specify in descriptor 3.10 Notes)

3.9.8 Number of recovered samples

3.9.9 Location after the last subculture

3.10 Notes

Any additional information may be specified here

4. Multiplication/regeneration descriptors

4.1 Accession number (Passport 1.1)

4.2 Population identification (Passport 2.3)
Collecting number, pedigree, cultivar name, etc., depending on the population type

4.3 Field plot number

4.4 Multiplication/regeneration site location

4.5 Collaborator

4.6 Planting date [YYYYMMDD]

4.7 Cultural practices

4.7.1 Field spacing

4.7.1.1 Distance between plants [cm]

4.7.1.2 Distance between rows [cm]

4.7.1.3 Fertilizer application

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

4.8 Plant/seedling vigour

3 Low

5 Medium

7 High

4.9 Number of plants established

4.10 Previous multiplication and/or regeneration

4.10.1 Location

4.10.2 Sowing/planting date [YYYYMMDD]

4.10.3 Plot number

4.11 Number of times accession regenerated (1.11)

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 (3.1)
(See instructions in descriptor 2.4 Country of collecting)

5.2 Site (research institute) (3.2)

5.2.1 Latitude

Degrees and minutes followed by N (North) or S (South) (e.g. 1030S). Missing data (minutes) should be indicated with hyphen (e.g. 10—S).

5.2.2 Longitude

Degrees and minutes followed by E (East) or W (West) (e.g. 07625 W). Missing data (minutes) should be indicated with hyphen (e.g. 076—W).

5.2.3 Elevation [m asl]

5.2.4 Name and address of farm or institute

5.3 Evaluator's name and address (3.3)

5.4 Planting date [YYYYMMDD]

5.5 Harvest date [YYYYMMDD]

5.6 Evaluation environment

Environment in which characterization/evaluation was carried out

- 1 Field
- 2 Screenhouse
- 3 Greenhouse
- 4 Laboratory
- 99 Other (specify in descriptor 5.12 Notes)

5.7 Field establishment [%]

Percentage of plants established

5.7.1 Propagation method

Use descriptors as for 3.7

5.7.2 Days to establishment [d]

Specify number of days from planting after which establishment is measured

5.8 Planting site in the field

Give block, strip and/or row/plot numbers as applicable, plants/plot, replication

5.9 Environmental characteristics of site

Use descriptors 6.1.1 to 6.1.22 in section 6

5.10 Fertilizer

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

5.11 Plant protection

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

5.12 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. (From FAO 1990)

1	Flat	0 - 0.5%
2	Almost flat	0.6 - 2.9%
3	Gently undulating	3 - 5.9%
4	Undulating	6 - 10.9%
5	Rolling	11 - 15.9%
6	Hilly	16 - 30%
7	Steeply dissected	>30%, moderate elevation range
8	Mountainous	>30%, great elevation range (>300 m)
99	Other	(specify in 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 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 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 Midslope |
| 5 Valley floor | 21 Lower slope |
| 6 Channel | 22 Ridge |
| 7 Levee | 23 Beach |
| 8 Terrace | 24 Beachridge |
| 9 Floodplain | 25 Rounded summit |
| 10 Lagoon | 26 Summit |
| 11 Pan </td <td>27 Coral atoll</td> | 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 | |

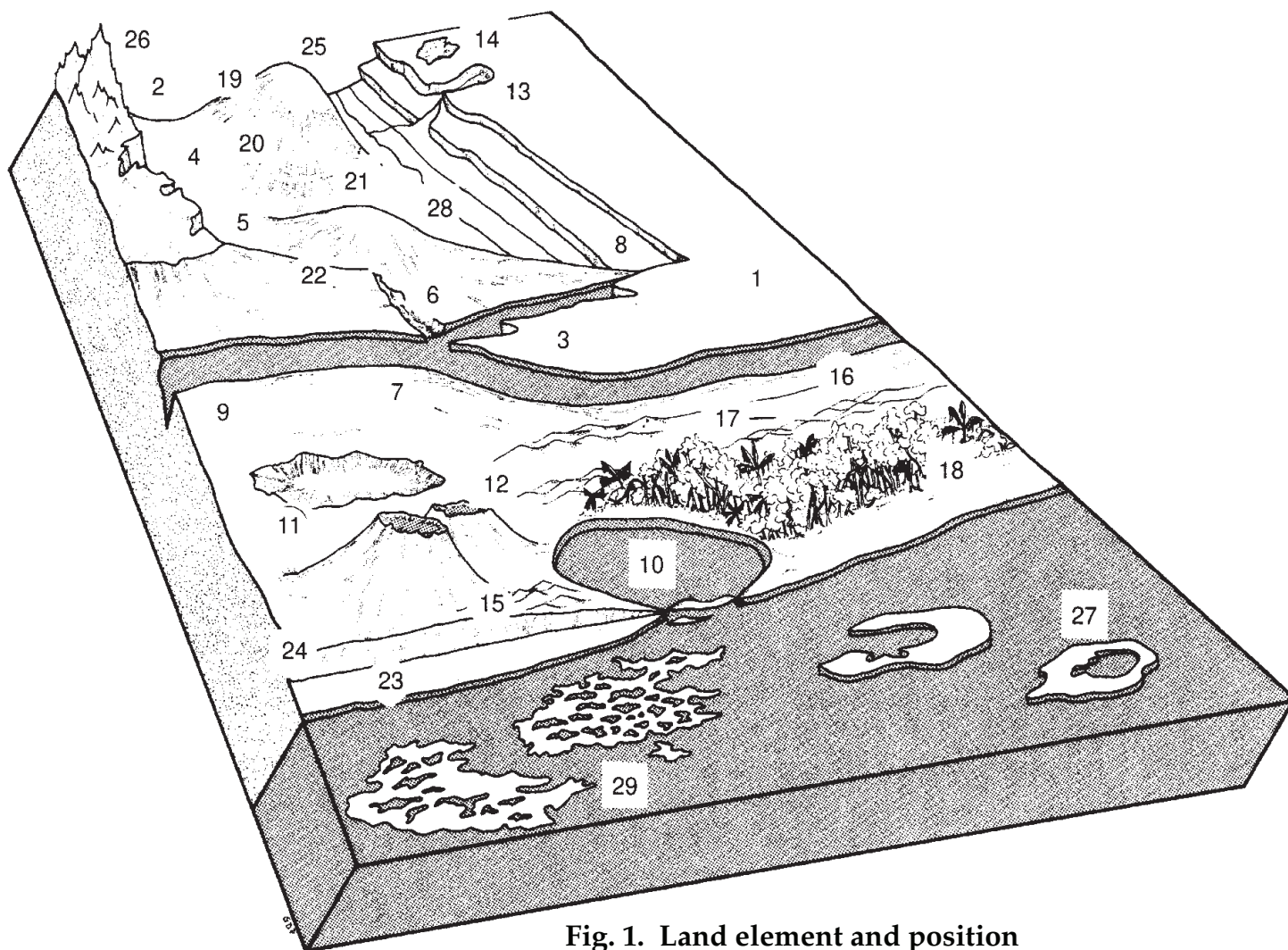


Fig. 1. Land element and position

6.1.4 Slope [°]

Estimated slope of the site

6.1.5 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 southwestern direction has an aspect of SW)

6.1.6 Crop agriculture

(From FAO 1990)

- 1 Annual field cropping
- 2 Perennial field cropping

6.1.6.1 Annual/perennial crops

Provide crops grown in appropriate section's Notes

6.1.7 Overall vegetation surrounding and at the site

(Adapted from FAO 1990)

- 1 Grassland (Grasses, subordinate forbs, no woody species)
- 2 Forbland (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 Shrubland (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)

6.1.8 Soil parent 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.

6.1.8.1 Unconsolidated material

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

6.1.8.2 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

6.1.9 Stoniness/rockiness/hardpan/cementation

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

6.1.10 Soil drainage

(Adapted from FAO 1990)

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

6.1.11 Soil salinity

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

6.1.12 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

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

6.1.14 Soil pH

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

6.1.14.1 pH at 0-15 cm

6.1.14.2 pH at 16-60 cm

6.1.14.3 pH at 61-90 cm

6.1.14.4 pH at 91-120 cm

6.1.15 Soil erosion

- 3 Low
- 5 Intermediate
- 7 High

6.1.16 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%

6.1.17 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 fractions 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 Silty clay | 16 Loamy coarse sand |
| 6 Silty 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 |

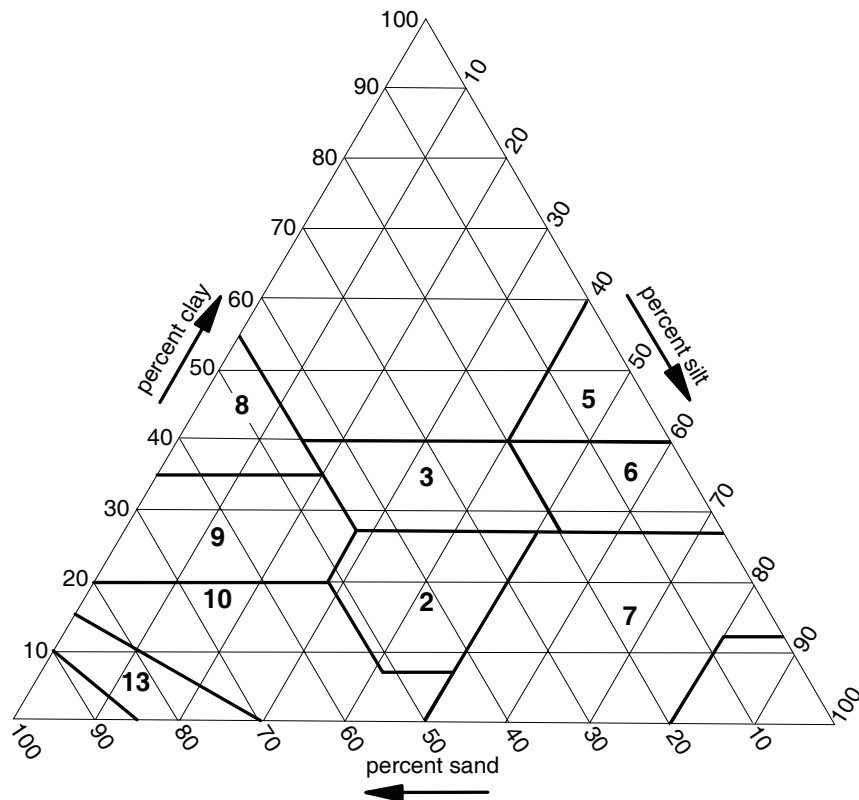


Fig. 2. Soil texture classes

6.1.17.1 Soil particle size classes

(Adapted from FAO 1990)

1	Clay	< 2 µm
2	Fine silt	2 - 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 Soil organic matter content

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

6.1.19 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.).

6.1.20 Water availability

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

6.1.21 Soil fertility

General assessment of the soil fertility based on existing vegetation

- 3 Low
- 5 Moderate
- 7 High

6.1.22 Climate of the site

Should be assessed as close to the site as possible

6.1.22.1 Temperature [°C]

Provide either the monthly or the annual mean

6.1.22.2 Dry season length [d]**6.1.22.3 Rainfall [mm]**

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

6.1.22.4 Wind

Annual average (state number of years recorded)

6.1.22.4.1 Frequency of typhoons or hurricane force winds

- 3 Low
- 5 Intermediate
- 7 High

6.1.22.4.2 Date of most recent typhoons or hurricane force winds [YYYYMMDD]**6.1.22.4.3 Annual maximum wind velocity [m/s]**

6.1.22.5 Frost**6.1.22.5.1** Date of most recent frost [YYYYMMDD]**6.1.22.5.2** Minimum temperature [°C]

Specify seasonal average and minimum survival temperature

6.1.22.5.3 Duration of temperature below 0°C [d]**6.1.22.6 Relative humidity****6.1.22.6.1** Relative humidity diurnal range [%]**6.1.22.6.2** Relative humidity seasonal range [%]**6.1.22.7 Light**

1 Shady

2 Sunny

6.1.22.8 Daylength [h]

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

CHARACTERIZATION

7. PLANT DESCRIPTORS

All observations should be made on plants of the same age (not less than 3 years old)

7.1 Vegetative

7.1.1 Rootstock³ (4.1.2)

If appropriate

- 0 None
- 1 Sour orange
- 2 Trifoliolate orange
- 3 Trifoliolate hybrids
- 4 Rough lemon
- 5 Rangpur lime
- 6 Cleopatra mandarin
- 7 *Citrus volkameriana*
- 8 Sweet orange
- 9 Sweet lime
- 99 Other (specify in descriptor 7.8 Notes)

7.1.2 Ratio trunk/rootstock diameter

Recorded at 20 cm above and under grafting line

- 1 Smaller (<1)
- 2 Same (1)
- 3 Larger (>1)

7.1.3 Scion trunk surface (4.1.8)

- 1 Smooth
- 2 Grooved and ridged

7.1.4 Tree shape (4.1.4)

Recorded in the natural state. See Fig. 3

- 1 Ellipsoid
- 2 Spheroid
- 3 Obloid
- 99 Other (specify in descriptor 7.8 Notes)

³ A list of all rootstocks recorded in publications can be obtained through the EGID-Citrus Network – See address in the 'Contributors' section

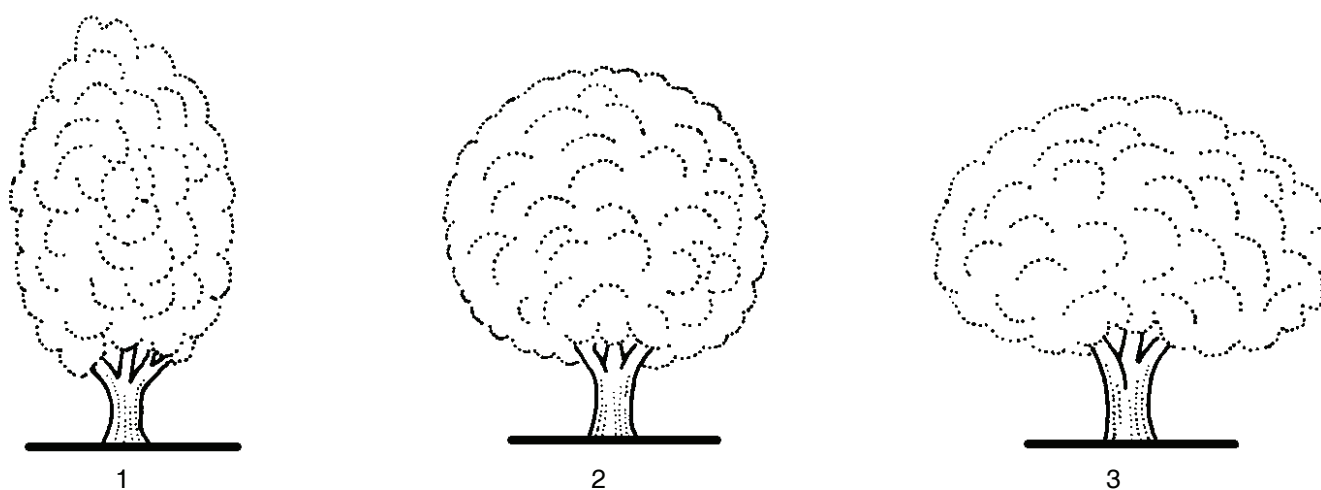


Fig. 3. Tree shape

7.1.5 Tree growth habit (4.1.5)

Recorded in the natural state, immediately after harvest

- 1 Erect
- 2 Spreading
- 3 Drooping
- 99 Other (specify in descriptor 7.8 Notes)

7.1.6 Density of branches (4.1.7)

- 3 Sparse
- 5 Medium
- 7 Dense

7.1.7 Branch angle

Attachment to main trunk

- 3 Narrow
- 5 Medium
- 7 Wide

7.1.8 Spine density on adult tree (not on suckers)

- 0 Absent
- 3 Low
- 5 Medium
- 7 High

7.1.9 Spine length on adult tree (not on suckers) (4.2.11)

Average of 10 spines at leaf axil

- 1 ≤ 5 mm
- 2 6 - 15 mm
- 3 16 - 40 mm
- 4 >40 mm

7.1.10 Spine shape (4.2.12)

- 1 Curved
- 2 Straight

7.1.11 Shoot tip colour (4.1.10)

- 1 Green
- 2 Purple
- 99 Other (specify in descriptor 7.8 Notes)

7.1.12 Shoot tip surface (4.1.11)

- 1 Glabrous
- 2 Intermediate
- 3 Pubescent

7.2 Leaf

Use 30 mature leaves per adult tree with three replications unless otherwise indicated

7.2.1 Vegetative life cycle (4.2.1)

- 1 Evergreen
- 2 Deciduous
- 3 Semi-persistent

7.2.2 Leaf division (4.2.2)

- 1 Simple
- 2 Bifoliate
- 3 Trifoliate
- 4 Pentafoliate
- 99 Other (specify in descriptor 7.8 Notes)

7.2.3 Intensity of green colour of leaf blade (4.2.3)

Recorded on fully developed leaves

- 1 Light
- 2 Medium (green)
- 3 Dark

7.2.3.1 Leaf colour variegation

- 0 Absent
- 1 Present

7.2.4 Leaf lamina attachment

(4.2.4)

Length of petiole relative to length of leaf lamina. See Fig. 4

- 1 Sessile (petiole absent)
- 2 Brevipetiolate (petiole shorter than leaf lamina)
- 3 Longipetiolate (petiole longer than or same length as leaf lamina)

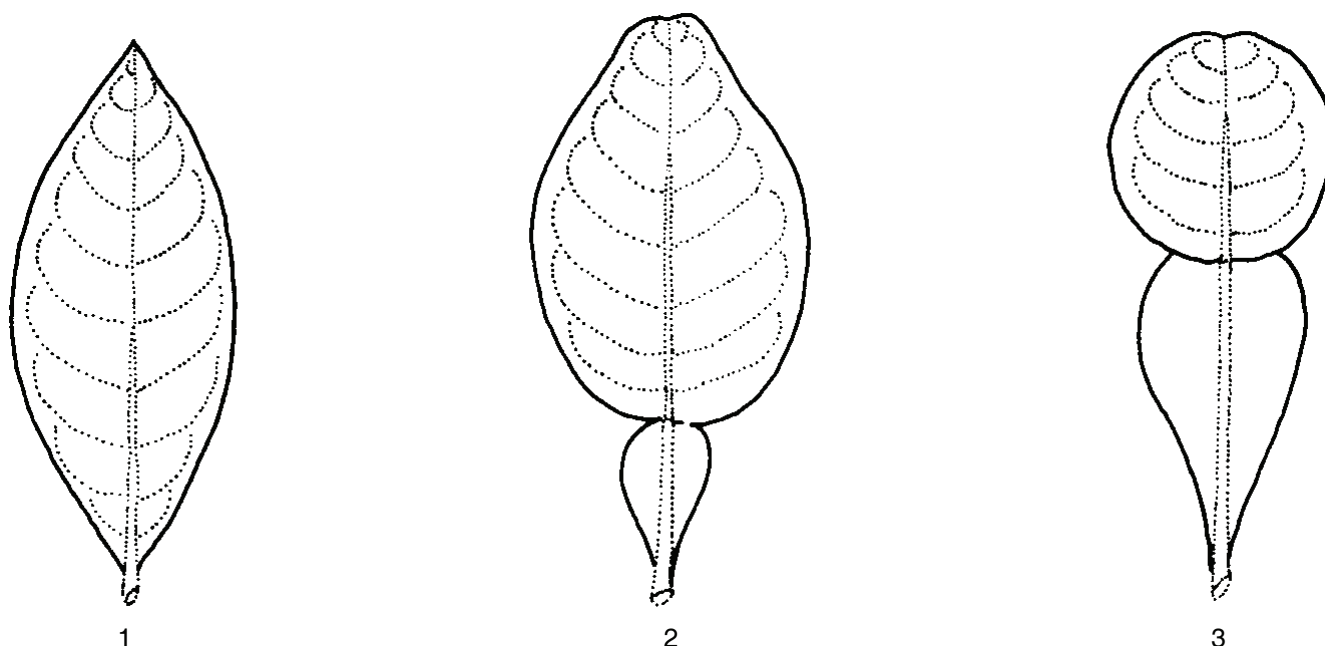


Fig. 4. Leaf lamina attachment

7.2.5 Leaf lamina length [mm]

(4.2.8)

Recorded from petiole base to lamina tip. Average of 10 fully developed leaves taken from three different adult trees (not taken from suckers). Use apical leaflet in the case of compound leaf.

7.2.6 Leaf lamina width [mm]

(4.2.9)

Recorded at the widest point. Average of 10 fully developed leaves taken from three different adult trees. Use apical leaflet in the case of compound leaf.

7.2.7 Ratio leaf lamina length/width

Calculated as a mean of 10 fully developed leaves taken from three different adult trees.

7.2.8 Leaf thickness [mm]

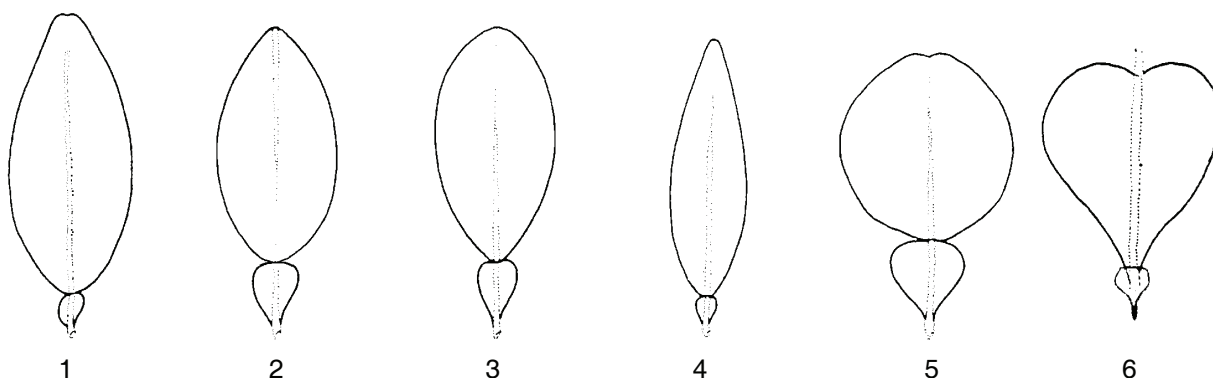
Recorded at the thickest point. Average of 10 fully developed leaves taken from three different adult trees. Use apical leaflet in the case of compound leaf.

7.2.9 Leaf lamina shape

(4.2.7)

See Fig. 5

- 1 Elliptic
- 2 Ovate
- 3 Obovate
- 4 Lanceolate
- 5 Orbicular
- 6 Obcordate
- 99 Other (specify in descriptor 7.8 Notes)

**Fig. 5. Leaf lamina shape****7.2.10 Leaf lamina margin**

(4.2.10)

See Fig. 6

- 1 Crenate
- 2 Dentate
- 3 Entire
- 4 Sinuate
- 99 Other (specify in descriptor 7.8 Notes)

7.2.11 Leaf apex

- 1 Attenuate
- 2 Acuminate
- 3 Acute
- 4 Obtuse
- 5 Rounded
- 6 Emarginate
- 99 Other (specify in descriptor 7.8 Notes)

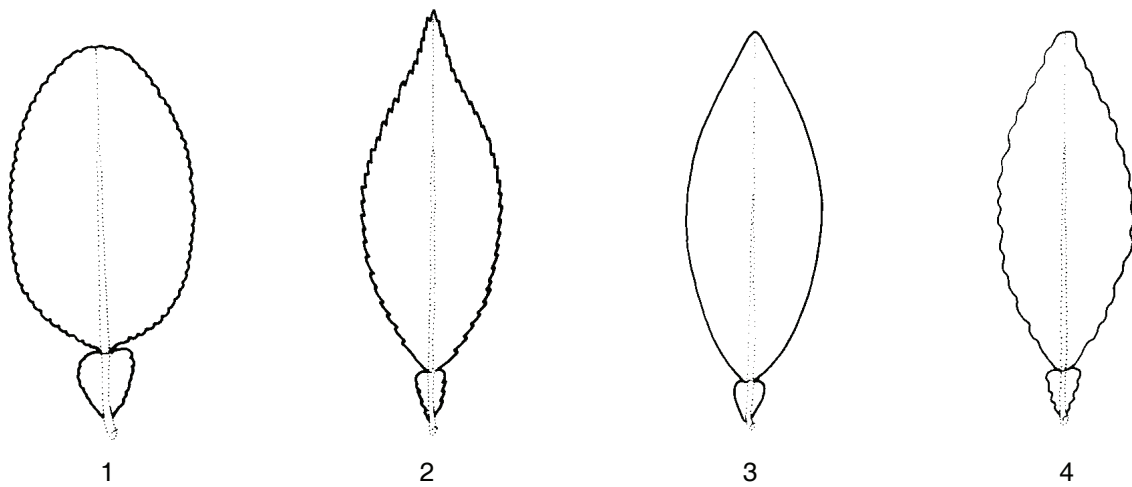


Fig. 6. Leaf lamina margin

7.2.12 Absence/presence of petiole wings

- 0 Absent
- 1 Present

7.2.13 Petiole wing width

(4.2.5)

Recorded on fully developed leaf

- 3 Narrow
- 5 Medium
- 7 Broad

7.2.14 Petiole wing shape

(4.2.6)

See Fig. 7

- 1 Obcordate
- 2 Obdeltate
- 3 Obovate
- 4 Linear (not illustrated)
- 99 Other (specify in descriptor 7.8 Notes)

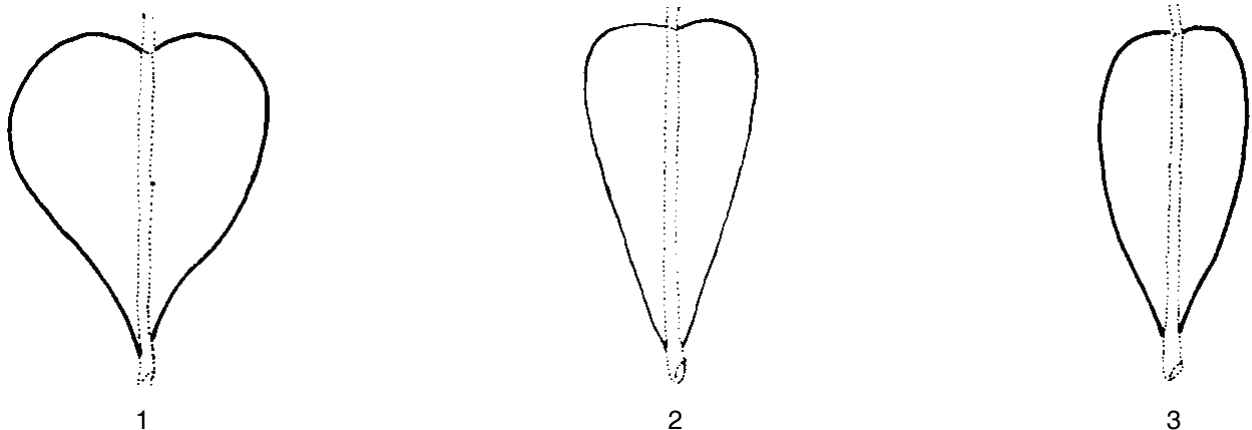


Fig. 7. Petiole wing shape

7.2.15 Junction between petiole and lamina

- 1 Fused
- 2 Articulate

7.3 Flower

Data recorded from ten flowers or inflorescences per tree replicated three times. Recorded at full flowering. See Fig. 8

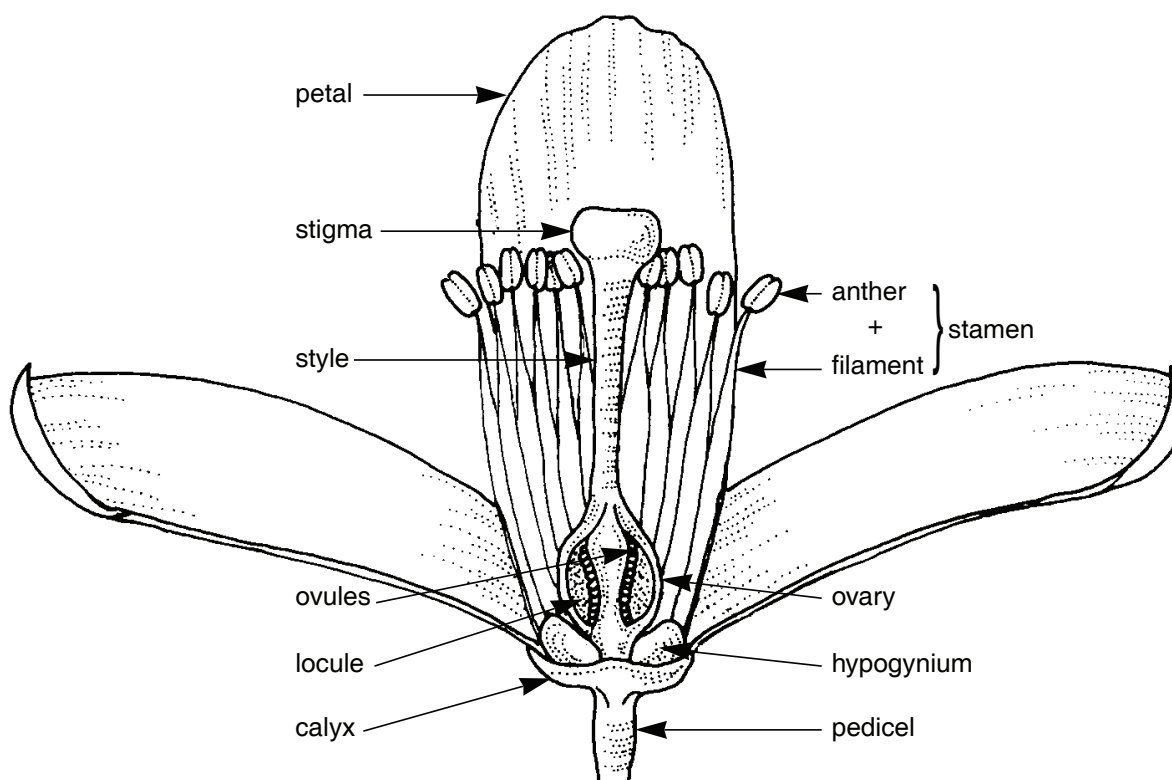


Fig. 8. Vertical cross-section of a flower

7.3.1 Pedicel length [mm]

(4.4.6)

See Fig. 8

7.3.2 Calyx diameter

- 3 Small
- 5 Medium
- 7 Large

7.3.3 Length of anthers relative to stigma

- 3 Shorter
- 5 Medium
- 7 Longer

- 7.3.4 Flower type**
- 1 Hermaphrodite
 - 2 Male
 - 3 Female
 - 99 Other (specify in descriptor 7.8 Notes)
- 7.3.5 Colour of open flower** (4.4.8)
- 1 White
 - 2 Light yellow
 - 3 Yellow
 - 4 Purple
 - 99 Other (specify in descriptor 7.8 Notes)
- 7.3.6 Colour of anthers**
- 1 White
 - 2 Pale yellow
 - 3 Yellow
 - 99 Other (specify in descriptor 7.8 Notes)
- 7.3.7 Number of petals per flower**
- 7.3.8 Petal length [mm]** (4.4.9)
- 7.3.9 Petal width [mm]** (4.4.10)
- 7.3.10 Number of stamens** (4.4.11)
- 1 < 4 per petal
 - 2 4 per petal
 - 3 > 4 per petal
- 7.3.11 Viable pollen** (6.3.1)
- Visual observation, *in vitro* after Alexander dying
- 0 Pollen sterile
 - 3 Sparse pollen (Imperial mandarin)
 - 5 Normal pollen (Valencia orange)
 - 7 Abundant pollen (Pummelo or W.I. Lime)

7.3.12 Flowering month (6.3.2)

- 1 January
- 2 February
- 3 March
- 4 April
- 5 May
- 6 June
- 7 July
- 8 August
- 9 September
- 10 October
- 11 November
- 12 December

7.3.12.1 Latitude

Degrees and minutes followed by N (North) or S (South) (e.g. 1030S). Missing data (minutes) should be indicated with hyphen (e.g. 10—S).

7.3.12.2 Start date of flowering season [YYYYMMDD]**7.3.12.3 End date of flowering season** [YYYYMMDD]**7.4 Fruit**

All observations on the fruit should be made at the stage of optimum ripeness (ratio total soluble solids/acid content of juice). Data observed on 10 typical fruits per tree replicated three times

7.4.1 Fruiting season (6.4.2)

Compared with some common standard midseason variety for each family of *Citrus* (orange, lemon, etc.)

- 1 Early
- 2 Midseason
- 3 Late

7.4.2 Fruiting season dates**7.4.2.1 Start of fruiting season** [YYYYMMDD]**7.4.2.2 End of fruiting season** [YYYYMMDD]**7.4.3 Fruit weight** [g]

Record the average

7.4.4 Fruit diameter [mm]

Record the average

7.4.5 Fruit length [mm]

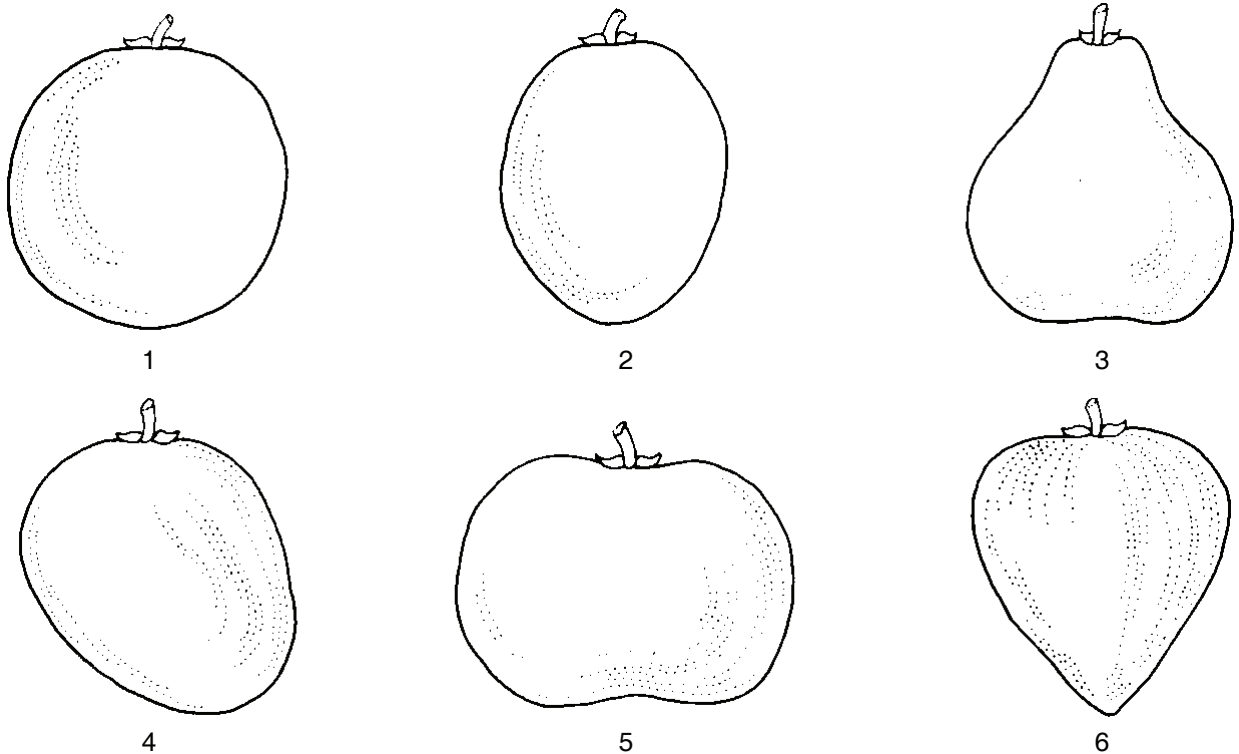
Record the average

7.4.6 Fruit shape

(4.5.1)

See Fig. 9

- 1 Spheroid
- 2 Ellipsoid
- 3 Pyriform
- 4 Oblique (asymmetric)
- 5 Obloid
- 6 Ovoid
- 99 Other (specify in descriptor 7.8 Notes)

**Fig. 9. Fruit shape**

7.4.7 Shape of fruit base (4.5.2)

(Stalk end). See Fig. 10

- 1 Necked
- 2 Convex
- 3 Truncate
- 4 Concave
- 5 Concave collared
- 6 Collared with neck
- 99 Other (specify in descriptor 7.8 Notes)

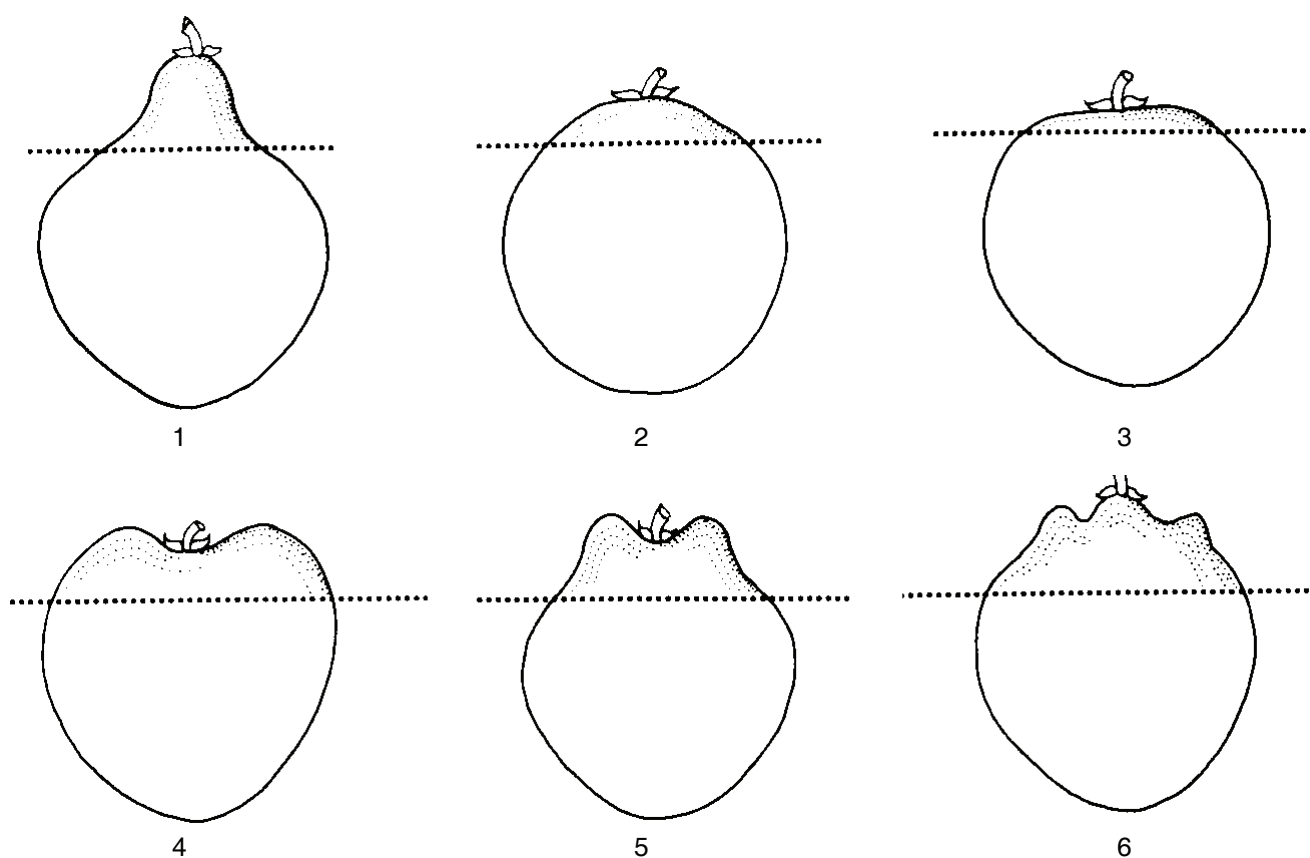


Fig. 10. Shape of fruit base

7.4.8 Shape of fruit apex (4.5.3)

(Stylar end). See Fig. 11

- 1 Mammiform
- 2 Acute
- 3 Rounded
- 4 Truncate
- 5 Depressed
- 99 Other (specify in descriptor 7.8 Notes)

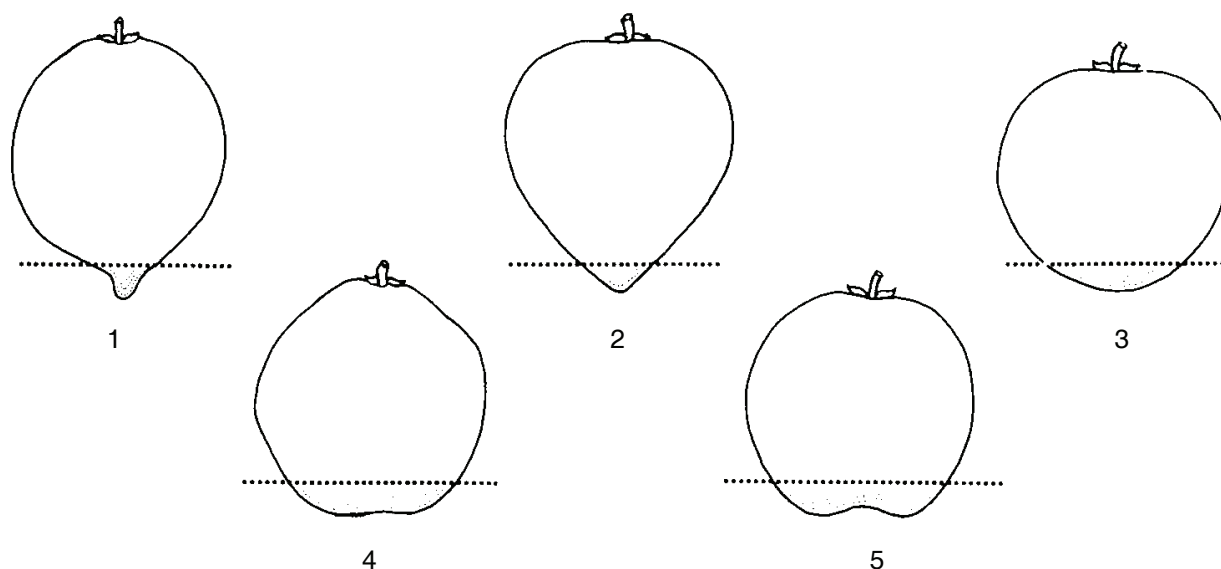


Fig. 11. Shape of fruit apex

7.4.9 Fruit skin (epicarp) colour

(4.5.4)

Observe the main colour

- 1 Green
- 2 Green-yellow
- 3 Light yellow
- 4 Yellow
- 5 Dark yellow
- 6 Light orange
- 7 Orange
- 8 Dark orange
- 9 Pink-yellow
- 10 Pink-orange
- 11 Red
- 12 Red-orange
- 99 Other (specify in descriptor 7.8 Notes)

7.4.10 Epicarp C.C.I.

(See Jimenez *et al.* 1981)

Citrus Colour Index = $1000 \times a / (L \times b)$. With:

a = green/red component under Hunter Lab colorimetric system

b = blue/yellow

L = Luminosity

Negative value of CCI means dark green/green colour

Value around zero means green-yellow colour (intermediate)

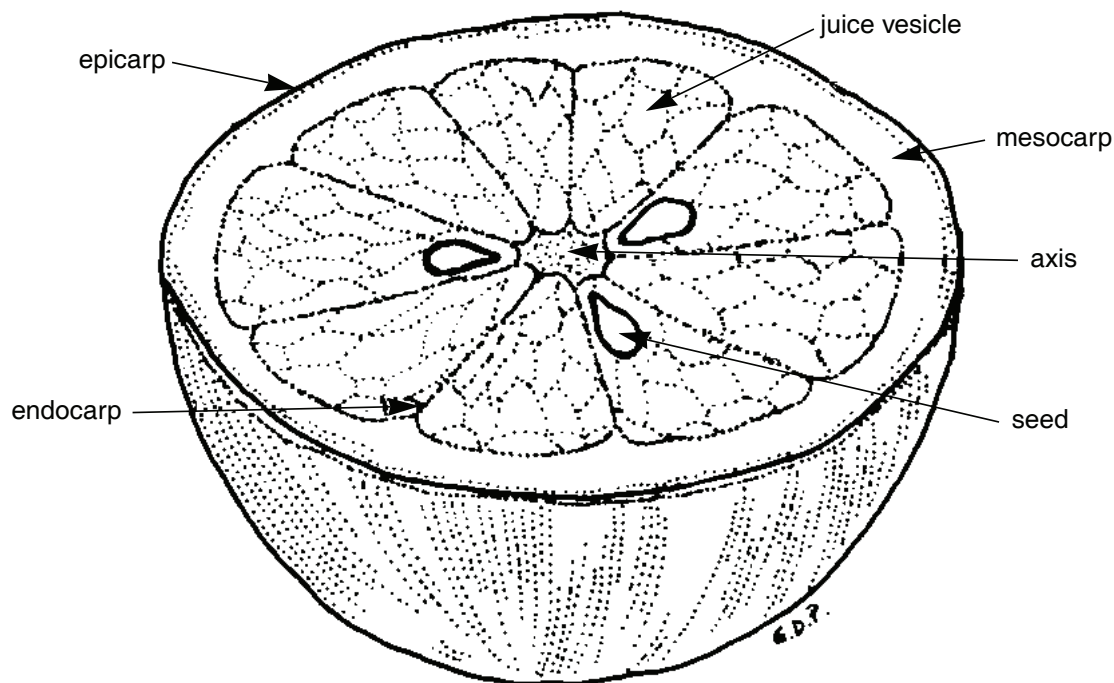
Small positive value means yellow colour

High positive value means red-orange colour

7.4.11 Width of epicarp at equatorial area [mm]

(4.5.5)

See Fig. 12

**Fig. 12. Cross-section of citrus fruit****7.4.12 Fruit surface texture**

(4.5.6)

- 1 Smooth
- 2 Rough
- 3 Papillate
- 4 Pitted
- 5 Bumpy
- 6 Grooved
- 99 Other (specify in descriptor 7.8 Notes)

7.4.13 Adherence of albedo (mesocarp) to pulp (endocarp)

(4.5.7)

- 3 Weak
- 5 Medium
- 7 Strong

7.4.14 Nature (conspicuousness) of oil glands

(4.5.8)

- 1 Inconspicuous or very weakly conspicuous
- 2 Conspicuous
- 3 Strongly conspicuous

- 7.4.15 Density of oil gland on fruit surface**
- 3 Low (<40/cm²)
 - 5 Intermediate (45–65/cm²)
 - 7 High (>70/cm²)
- 7.4.16 Oil gland size on fruit surface**
- 3 Small (<0.8 mm)
 - 7 Large (≥1.2 mm)
- 7.4.17 Fruit rind (mesocarp) thickness [mm]** (4.5.10)
Measured in the equatorial area. See Fig. 12
- 7.4.18 Albedo colour** (4.5.11)
- 1 Greenish
 - 2 White
 - 3 Yellow
 - 4 Pink
 - 5 Orange
 - 6 Reddish
 - 99 Other (specify in descriptor 7.8 Notes)
- 7.4.19 Absence/presence of areola** (6.4.6)
- 0 Absent
 - 1 Present
- 7.4.20 Areola diameter [mm]** (6.4.7)
- 7.4.21 Fruit styler end** (6.4.8)
Observe fruits that ripened on the tree
- 1 Closed
 - 2 Open
 - 3 Persistent style
 - 99 Other (specify in descriptor 7.8 Notes)
- 7.4.22 Fruit attachment to stalk** (4.8.5)
- 3 Weak
 - 5 Medium
 - 7 Strong

7.5 Segments

Average of well-developed segments observed on 30 fruits taken from three adult trees

- | | | |
|--------------|-------------------------------------------------|---------|
| 7.5.1 | Number of segments per fruit | (4.6.1) |
| | 1 < 5 | |
| | 2 5–9 | |
| | 3 10–14 | |
| | 4 15–18 | |
| | 5 >18 | |
| 7.5.2 | Adherence of segment walls to each other | (4.6.2) |
| | 3 Weak | |
| | 5 Medium | |
| | 7 Strong | |
| 7.5.3 | Segment shape uniformity | |
| | 0 No | |
| | 1 Yes | |
| 7.5.4 | Thickness of segment walls | (4.6.3) |
| | Nature of segment membrane | |
| | 3 Thin | |
| | 5 Medium | |
| | 7 Thick | |
| 7.5.5 | Fruit axis | (4.6.4) |
| | See Fig. 12 | |
| | 1 Solid | |
| | 2 Semi-hollow | |
| | 3 Hollow | |
| 7.5.6 | Cross-section shape of axis | (4.6.5) |
| | 1 Round | |
| | 2 Irregular | |
| 7.5.7 | Diameter of fruit axis [mm] | (4.6.6) |

7.6 Pulp

7.6.1 Pulp (flesh) colour (4.7.1)

- 1 White
- 2 Green
- 3 Yellow
- 4 Orange
- 5 Pink
- 6 Light red
- 7 Orange-red
- 8 Red
- 9 Purple
- 99 Other (specify in descriptor 7.8 Notes)

7.6.1.1 Pulp colour intensity

- 3 Light
- 7 Dark

7.6.2 Pulp colour uniformity (4.7.2)

- 0 No (streaked)
- 1 Yes

7.6.3 Pulp C.C.I.

Same as for descriptor 7.4.10

7.6.4 Pulp firmness (4.7.3)

- 3 Soft
- 5 Intermediate
- 7 Firm

7.6.4.1 Pulp texture

- 1 Crispy
- 2 Fibrous
- 3 Fleshy
- 99 Other (specify in descriptor 7.8 Notes)

7.6.5 Vesicle length (4.7.4)

Indicate location of determination (stem end, stylar end or centre of segment), in descriptor 7.8

- Notes**
- 3 Short
 - 5 Medium
 - 7 Long

7.6.6 Vesicle thickness (4.7.5)

- 3 Thin
- 5 Medium
- 7 Thick

7.6.7 Juice content in endocarp (4.8.1)

Quantity related to total fruit weight

- 3 Low
- 5 Medium
- 7 High

7.6.8 Juice C.C.I.

Same as for descriptor 7.4.10

7.7 Seed

Fully developed seeds extracted from 30 full ripe fruits (unless otherwise specified), taken from three trees randomly selected in solid blocks

7.7.1 Average number of seeds per fruit (4.9.1)

Observe only fully developed seeds taken on trees in open pollination

- 0 None
- 1 1 - 4
- 2 5 - 9
- 3 10 - 19
- 4 20 - 50
- 5 > 50

7.7.2 Seedless test

Number of seeds present in fruits under self-pollination conditions (solid blocks)

- 0 None
- 1 1 - 4
- 2 5 - 9
- 3 10 - 19
- 4 20 - 50
- 5 >50

7.7.3 Seed shape

(4.9.5)

Observed on 20 seeds. See Fig. 13

- 1 Fusiform
- 2 Clavate
- 3 Cuneiform
- 4 Ovoid
- 5 Semi-deltoid
- 6 Spheroid
- 7 Semi-spheroid
- 99 Other (specify in descriptor 7.8 Notes)

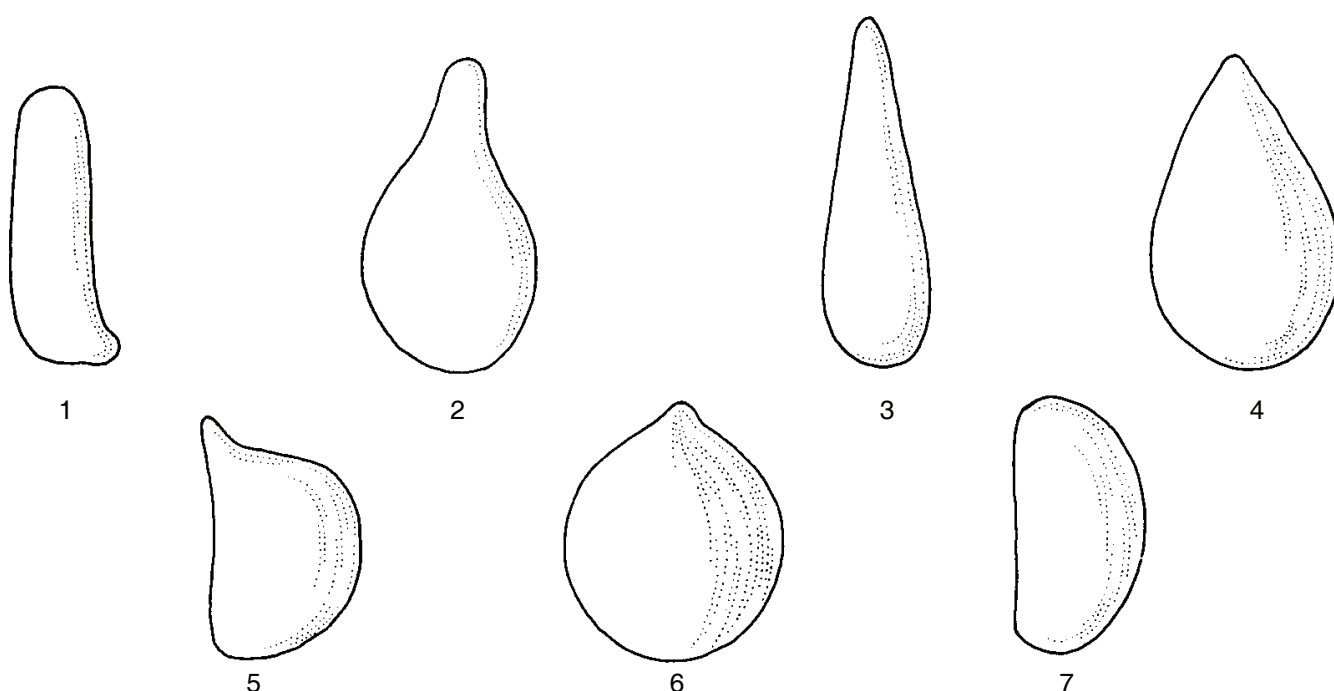


Fig. 13. Seed shape

7.7.4 Seed surface

(4.9.6)

Observed on 20 fresh seeds

- 1 Smooth
- 2 Wrinkled
- 3 Hairy
- 99 Other (specify in descriptor 7.8 Notes)

7.7.5 Seed colour

(4.9.7)

Observed on 20 fresh seeds. Visual observation through the seed testa

- 1 White
- 2 Cream
- 3 Yellowish
- 4 Green
- 5 Brown
- 99 Other (specify in descriptor 7.8 Notes)

7.7.6 Cotyledon colour (4.9.8)

- 1 White
- 2 Light yellow–cream
- 3 Light green
- 4 White and green
- 5 Green (medium)
- 6 Dark green
- 7 Purple
- 8 Pinkish
- 99 Other (specify in descriptor 7.8 Notes)

7.7.7 Chalazal spot colour (4.9.9)

- 1 White
- 2 Cream
- 3 Yellow
- 4 Light brown (beige)
- 5 Brown
- 6 Reddish
- 7 Purple
- 99 Other (specify in descriptor 7.8 Notes)

7.7.8 Seed embryony (4.9.10)

Number of embryos per seed observed using a stereoscope. Average number of 30 seeds

- 1 Monoembryonic
- 2 Polyembryonic
- 3 Mixture of both

7.8 Notes

Any additional information, especially in the category of 'other' under various descriptors above, may be specified here

EVALUATION

8. PLANT DESCRIPTORS

8.1 VEGETATIVE

8.1.1 Tree age [y] (4.1.3)
State age of tree at the time of evaluating

8.1.2 Scion/rootstock compatibility (6.1.1)

- 0 Absent
- 1 Poor
- 2 Intermediate
- 3 Good
- 4 Bud-union ring

8.1.3 Tree vigour (6.1.2)
Against tree grafted on *Citrus aurantium* "comun"

- 3 Low
- 5 Intermediate
- 7 High

8.1.4 Tree height [m] (4.1.6)
Recorded from ground level up to highest point of canopy measured with material or optical tool (e.g. forestry tools)

8.1.5 Canopy diameter [m]
Recorded at the widest point

8.2 Leaf

Record the average of ten fully developed leaves taken from three trees, unless otherwise specified

8.2.1 Number of oil glands (6.2.2)
Number per cm², observed on the leaf lower surface under stereoscope, in a 0.5 x 0.5 cm window

8.2.2 Oil gland size on fruit surface

- 1 Small (≤ 0.8 mm)
- 2 Intermediate (0.9 – 1 mm)
- 3 Large (>1 mm)

8.2.3 Colour of leaf upper/lower surface

- 1 Same
- 2 Lighter (upper surface lighter than lower surface)
- 3 Darker (upper surface darker than lower surface)

8.2.4 Nerves on leaf upper surface

- 1 Protuberant
- 2 Flat

8.2.5 Angle of leaf bases

- 1 Acute
- 2 Obtuse

8.2.6 Angle of leaf apex

- 1 Acute
- 2 Obtuse

8.2.7 Petiole attachment to twigs

- 1 Straight
- 2 Curved

8.2.8 Petiole length

Average of ten fully developed leaves taken from three trees

- 1 0 - 10 mm
- 2 11 - 15 mm
- 3 > 15 mm

8.3 Flower**8.3.1 Arrangement of flowers**

(4.4.1)

- 1 Solitary
- 2 Inflorescence
- 3 Both

8.3.2 Flower/inflorescence position

(4.4.2)

- 1 Axillary
- 2 Terminal
- 3 Both

8.3.3 Inflorescence type

(4.4.3)

- 1 Panicle
- 2 Raceme
- 3 Corymb

99 Other (specify in descriptor 8.7 Notes)

-
- 8.3.4** **Number of flower buds per inflorescence** (4.4.4)
- 8.3.5** **Stamina length**
3 Short
5 Medium
7 Long
- 8.3.6** **Separation of filament**
1 Separated
2 Partially united
3 United
- 8.3.7** **Anther length [mm]** (4.4.12)
- 8.3.8** **Anther dehiscence**
3 Poor
5 Moderate
7 Good
- 8.3.9** **Style shape**
1 Straight
2 Arched
3 Crooked
- 8.3.10** **Flowering regularity** (6.3.5)
0 No
1 Yes
- 8.3.11** **Flowering abundance** (6.3.6)
0 No
1 Poor
2 Abundant
- 8.3.12** **Secondary flowering** (6.3.7)
0 Absent
1 Present
- 8.3.13** **Number of days to secondary flowering [d]**
- 8.4** **Fruit**

- 8.4.1 Bearing cycle [d]** (6.4.1)
Number of days from flowering to ripening
- 8.4.2 Bearing habit**
- 1 Inside canopy
 - 2 Outside
 - 3 Both
- 8.4.3 Yield behaviour** (6.4.5)
- 1 Regular
 - 2 Irregular
- 8.4.4 Alternation**
- 0 Absent
 - 1 Regular
 - 2 Irregular
- 8.4.5 Amount of essential oil in fruit skin [ml/kg]** (6.4.10)
Amount of oil extracted from epicarp per fruit by mechanical tools at room temperature
- 8.4.6 Oil Brix** (6.4.11)
Evaluated by optical density (oil refractometer) at 20°C
- 8.4.7 Yield per tree [kg/tree]** (6.4.4)
- 8.4.8 Yield efficiency**
- 0 No
 - 1 Yes

8.5 Juice

8.5.1 Titratable acids content (6.5.1)

Expressed in meq of citric acid / 100 ml juice. Define protocol (i.e. soluble solids and acidity)

8.5.2 pH

Real value of pH as given by pH meter—with one digit after decimal separator (##.#)

8.5.3 Sugar content [%] (6.5.2)

Refractometer

8.5.4 Ratio of soluble solids to titratable acids (6.5.3)

8.5.5 Ascorbic acid content [mg/100 g FW]

8.6 Seeds

Average of 20 seeds

8.6.1 Seed length [mm] (4.9.2)

8.6.2 Seed width [mm] (4.9.3)

8.6.3 Seed weight [g] (4.9.4)

8.7 Notes

Specify here any other additional information

9. Abiotic stress susceptibility

(Only for varieties used as rootstock). 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 low temperature (7.1)

Scored under natural conditions during the cold season

9.2 Reaction to high temperature (7.2)

Scored under natural conditions during the hot season

9.3 Reaction to drought (7.4)

Scored under natural conditions during daytime for at least four weeks

9.4 Reaction to wet soil (7.5)

9.5 Reaction to soil alkalinity (7.3)

9.6 Reaction to salinity

9.7 Reaction to frost

9.8 Reaction to constant winds**9.9 Notes**

Specify any additional information here

10. Biotic stress susceptibility

In each case, it is important to state the origin of the infestation or infection, i.e. natural, field inoculation, laboratory. Record such information in descriptor **10.18 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 Scales

	Causal organism	Common name
10.1.1	<i>Aonidiella aurantii</i>	California red scale
10.1.2	<i>Aonidiella citrina</i>	Citrus yellow scale
10.1.3	<i>Ceroplastes sinensis</i>	Chinese wax scale
10.1.4	<i>Ceroplastes destructor</i>	Soft wax scale
10.1.5	<i>Coccus hesperidum</i>	Scale
10.1.6	<i>Saissetia oleae</i>	Black scale
10.1.7	<i>Aspidiotus nerii</i>	White scale
10.1.8	<i>Chrysomphalus aonidum</i>	Citrus black scale
10.1.9	<i>Chrysomphalus dictyospermi</i>	Spanish red scale
10.1.10	<i>Lepidosaphes beckii</i>	Purple scale
10.1.11	<i>Lepidosaphes gloveri</i>	Glover scale
10.1.12	<i>Parlatoria pergandei</i>	Chaff scale
10.1.13	<i>Parlatoria ziziphi</i>	Black scale
10.1.14	<i>Selenaspidus articulatus</i>	Brown scale
10.1.15	<i>Unaspis citri</i>	Snow scale
10.1.16	<i>Unaspis yanonensis</i>	Arrowhead scale
10.1.17	<i>Icerya purchasi</i>	Cottony cushion scale

10.2 Mealybugs

10.2.1	<i>Planococcus citri</i>	Citrus mealybug
10.2.2	<i>Pseudococcus longispinus</i>	Long-tailed mealybug

10.3	Aphids	
10.3.1	<i>Aphis citricola</i>	Green citrus aphid
10.3.2	<i>Aphis gossypi</i>	Cotton aphid
10.3.3	<i>Myzus persicae</i>	Green peach aphid
10.3.4	<i>Toxoptera aurantii</i>	Black citrus aphid
10.3.5	<i>Toxoptera citricidus</i>	Brown citrus aphid
10.4	Whiteflies	
10.4.1	<i>Aleurocanthus woglumi</i>	Citrus blackfly
10.4.2	<i>Aleurothrixus floccosus</i>	Woolly whitefly
10.4.3	<i>Dialeurodes citri</i>	Citrus whitefly
10.4.4	<i>Dialeurodes citrifolii</i>	Cloudy-winged whitefly
10.5	Leafhoppers	
10.5.1	<i>Empoasca smithi</i>	Australian leafhopper
10.5.2	<i>Neoliturus haematoceps</i>	Leafhopper
10.5.3	<i>Neoliturus tenellus</i>	Beet leafhopper
10.6	Fruit flies	
10.6.1	<i>Ceratitis capitata</i>	Mediterranean fruit fly
10.6.2	<i>Anastrepha fraterculus</i>	South American fruit fly
10.6.3	<i>Dacus dorsalis</i>	Oriental fruit fly
10.7	Lepidoptera	
10.7.1	<i>Phyllocnistis citrella</i>	Citrus leaf miner
10.7.2	<i>Prays citri</i>	Citrus flower moth
10.8	Thrips	
10.8.1	<i>Scirtothrips citri</i>	Citrus thrip
10.8.2	<i>Scirtothrips aurantiii</i>	South African citrus thrip
10.8.3	<i>Heliothrips haemorrhoidalis</i>	Black tea thrip
10.9	Psyllids	
10.9.1	<i>Diaphorina citri</i>	Citrus psylla
10.9.2	<i>Trioza erytrea</i>	Citrus psylla
10.10	Mites	
10.10.1	<i>Phyllocoptrupta oleivora</i>	Citrus rust mite
10.10.2	<i>Panonychus citri</i>	Citrus red mite
10.10.3	<i>Aceria sheldoni</i>	Citrus bud mite
10.10.4	<i>Brevipalpus lewisi</i>	Citrus flat mite
10.10.5	<i>Brevipalpus californicus</i>	Citrus red flat mite
10.10.6	<i>Eutetranychus orientalis</i>	Citrus brown mite
10.10.7	<i>Polyphagotarsonemus latus</i>	Citrus silver mite

10.11 Nematodes

10.11.1	<i>Pratylenchus</i> spp.	Lesion nematode/citrus slump
10.11.2	<i>Tylenchulus semipenetrans</i>	Slow decline/ root nematode
10.11.3	<i>Radopholus similis</i> (<i>R. citrophilus</i>)	Burrowing nematode

10.12 Fungi

10.12.1	<i>Alternaria citri</i>	Stem-end rot/leaf-fruit spot
10.12.2	<i>Botrydiplodia theobromae</i>	Stem-end rot
10.12.3	<i>Botrytis cinerea</i>	Blossom and twig blight
10.12.4	<i>Colletotrichum gloeosporioides</i>	Anthracnose
10.12.5	<i>Diaporthe citri</i>	Melanose
10.12.6	<i>Geotrichum candidum</i>	Sour rot
10.12.7	<i>Mycosphaerella citri</i>	Greasy spot/rind blotch
10.12.8	<i>Penicillium digitatum</i>	Green mold
10.12.9	<i>Penicillium italicum</i>	Blue mold
10.12.10	<i>Phyllosticta citricarpa</i>	Black spot
10.12.11	<i>Phoma tracheiphila</i>	Mal secco, citrus wilt
10.12.12	<i>Phytophthora citrophthora</i>	Brown rot
10.12.13	<i>Phytophthora nicotianae</i>	Foot rot, gummosis, root rot
10.12.14	<i>Thanatephorus cucumeris</i>	Areolate leaf spot
10.12.15	<i>Thielaviopsis basicola</i>	Black root rot

10.13 Bacteria

10.13.1	<i>Pseudomonas syringae</i>	Citrus blast/black pit (fruit)
10.13.2	<i>Xanthomonas axonopodis</i> pv. <i>citri</i>	Citrus canker

10.14 Phytoplasma

10.14.1	<i>Spiroplasma citri</i>	Citrus stubborn
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10.15 Viruses

	Causal organism	Acronym
10.15.1	Citrus leaf rugose ilarvirus	CiLRV
10.15.2	Citrus leprosis rhabdovirus	CLV
10.15.3	Citrus psorosis virus	CPV
10.15.4	Citrus tatter leaf capillovirus	CTLV
10.15.5	Citrus tristeza closterovirus	CTV
10.15.6	Citrus variegation ilarvirus	CVV
10.15.7	Satsuma dwarf nepovirus	SDV

10.16 Virus-like agents

10.16.1	Cristacortis agent
10.16.2	Impietratura agent

10.17 Viroids

10.17.1	Citrus bent leaf viroid	CBLVd
10.17.2	Citrus cachexiaviroid	CCaVd
10.17.3	Citrus xyloporosis viroid	CXyVd
10.17.4	Citrus exocortis viroid	CEVd
10.17.5	Citrus viroid IV	CVd-IV

10.18 Notes

Specify here any additional information

11. Biochemical markers**11.1 Isozyme** (9.1)

For each enzyme, indicate the tissue analyzed and the electrophoresis method used related to *Citrus medica*, *Citrus reticulata*, *Citrus maxima*, *Fortunella japonica* and *Poncirus trifoliata*. Since variation occurs within species, it is suggested to nominate specific genotypes widely known and available for use as standards. A particular enzyme can be recorded as 11.1.1; 11.1.2, etc. Examples include: Acid phosphatase (ACPH); Esterases α and β (EST A and B); Glutamate oxaloacetate transaminase (GOT); Isocitrate dehydrogenase (ICD); Malate dehydrogenase (MDH); Phosphogluconate dehydrogenase (PGD); Phosphoglucose isomerase (PGI); Phosphoglucose mutase (PGM); Peroxidases (see Torres *et al.* 1978)

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 analyzed. 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 used for nuclear, chloroplast or mitochondria 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 (10.1)

13.2 Ploidy level (10.2)
(2x, 3x, 4x, etc. and aneuploidy)

13.3 Meiosis chromosome associations

Average of 50 microspore mother cells, observed during metaphase 1

13.4 Normal tetrads [%]

Record the average of 50 tetrads

13.5 Other cytological characters

14. Identified genes

Describe any known specific mutant present in the accession

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ANNEX I. Multicrop Passport Descriptors

This list of multicrop passport descriptors has been developed jointly by IPGRI and FAO to provide consistent coding schemes for common passport descriptors across crops. These descriptors aim to be compatible with future IPGRI crop descriptor lists and with the descriptors to be used for the FAO World Information and Early Warning System (WIEWS) on plant genetic resources.

The list should NOT be regarded as a minimum descriptor list, since many additional passport descriptors are essential for the description of crops and need to be recorded. This document lists an initial set of common passport descriptors at the multicrop level. At a later stage the list could be expanded with additional multicrop descriptors. For example, descriptors dealing with the use of germplasm are currently not included, but their suitability for inclusion at the multicrop level will be investigated. Future expansion could even result in the development of more specialized lists of common descriptors at the crop group level.

Printed here is the latest version of the list (1997) which contains two sections. The latter one (FAO WIEWS DESCRIPTORS) lists a number of optional descriptors used in the FAO WIEWS. The list provides descriptions of content and coding schemes, but also provides *suggested* fieldnames (in parentheses) that can assist in the computerized exchange of this type of data.

Please forward your feedback on the use of this list to:

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MULTICROP PASSPORT DESCRIPTORS	
1. Institute code	(INSTCODE)
Code of the institute where the accession is maintained. The codes consist of the 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.	
2. Accession number	(ACCENUMB)
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 reused. 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).	
3. Collecting number	(COLLNUMB)
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 item is essential for identifying duplicates held in different collections. It should be unique and always accompany subsamples wherever they are sent.	
4. Genus	(GENUS)
Genus name for taxon. Initial uppercase letter required.	
5. Species	(SPECIES)
Specific epithet portion of the scientific name in lowercase letters plus authority ¹ . Following abbreviation is allowed: "sp."	
6. Subtaxa	(SUBTAXA)
Subtaxa can be used to store any additional taxonomic identifier plus authority ¹ . Following abbreviations are allowed: "ssp." (for subspecies); "var." (for variety); "convar." (for convariety); "f." (for form).	
7. Accession name	(ACCNAME)
Either a registered or other formal designation given to the accession. First letter uppercase. Multiple names separated with semicolon.	
8. Country of origin	(ORIGCTY)
Name of the country in which the sample was originally collected or derived. Use the ISO 3166 extended codes, (i.e. current and old 3 letter ISO 3166 country codes)	
9. Location of collecting site	(COLLSITE)
Location information below the country level that describes where the accession was collected starting with the most detailed information. Might include the distance in kilometers and direction from the nearest town, village or map grid reference point, (e.g. CURITIBA 7S, PARANA means 7 km south of Curitiba in the state of Parana)	
10. Latitude of collecting site	(LATITUDE)
Degrees and minutes followed by N (North) or S (South) (e.g. 1030S). Missing data (minutes) should be indicated with hyphen (e.g. 10-S).	

¹ Authority is only provided at the most detailed taxonomic level

11. Longitude of collecting site	(LONGITUDE)		
Degrees and minutes followed by E (East) or W (West) (e.g. 07625W). Missing data (minutes) should be indicated with hyphen (e.g. 076–W).			
12. Elevation of collecting site [m asl]	(ELEVATION)		
Elevation of collecting site expressed in meters above sea level. Negative values allowed.			
13. Collecting date of original sample [YYYYMMDD]	(COLLDATE)		
Collecting date of the original sample where YYYY is the year, MM is the month and DD is the day.			
14. Status of sample	(SAMPSTAT)		
1 Wild	0 Unknown		
2 Weedy			
3 Traditional cultivar/Landrace	99 Other (Elaborate in REMARKS field)		
4 Breeder's line			
5 Advanced cultivar			
15. Collecting source	(COLLSRC)		
The coding scheme proposed can be used at 2 different levels of detail: Either by using the global codes such as 1, 2, 3, 4 or by using the more detailed coding such as 1.1, 1.2, 1.3 etc.			
1 Wild habitat	2 Farm	3 Market	4 Institute/Research organization
1.1 Forest/woodland	2.1 Field	3.1 Town	
	2.2 Orchard	3.2 Village	
1.2 Shrubland	2.3 Garden	3.3 Urban	0 Unknown
1.3 Grassland	2.4 Fallow	3.4 Other exchange system	
1.4 Desert/tundra	2.5 Pasture		99 Other (Elaborate in REMARKS field)
	2.6 Store		
16. Donor institute code	(DONORCODE)		
Code for the donor institute. The codes consist of the 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.			
17. Donor number	(DONORNUMB)		
Number assigned to an accession by the donor. 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)			
18. Other number(s) associated with the accession	(OTHERNUMB)		
Any other identification number known to exist in other collections for this accession. 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). Multiple numbers can be added and should be separated with a semicolon			
19. Remarks	(REMARKS)		
The remarks field is used to add notes or to elaborate on descriptors with value "99" (=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.			

FAO WIEWS DESCRIPTORS	
<p>1. Location of safety duplicates (DUPLSITE)</p> <p>Code of the institute where a safety duplicate of 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. Multiple numbers can be added and should be separated with a semicolon.</p>	
<p>2. Availability of passport data (PASSAVAIL)</p> <p>(i.e. in addition to what has been provided)</p> <p>0 Not available 1 Available</p>	
<p>3. Availability of characterization data (CHARAVAIL)</p> <p>0 Not available 1 Available</p>	
<p>4. Availability of evaluation data (EVALAVAIL)</p> <p>0 Not available 1 Available</p>	
<p>5. Acquisition type of the accession (ACQTYPE)</p> <p>1 Collected/bred originally by the institute 2 Collected/bred originally by joint mission/institution 3 Received as a secondary repository</p>	
<p>6. Type of storage (STORATYPE)</p> <p>Maintenance type of germplasm. If germplasm is maintained under different types of storage, multiple choices are allowed, separated by a semicolon (e.g. 2;3). (Refer to FAO/IPGRI Genebank Standards 1994 for details on storage type)</p> <p>1 Short-term 2 Medium-term 3 Long-term 4 <i>In vitro</i> collection 5 Field genebank collection 6 Cryopreserved</p> <p style="text-align: right;">99 Other (elaborate in REMARKS field)</p>	

COLLECTING FORM for citrus

=====
SAMPLE IDENTIFICATION

COLLECTING NAME(S)/INSTITUTE(S) (2.2):

COLLECTING No. (2.1)

PHOTOGRAPH No. (2.17):

COLLECTING DATE [YYYYMMDD] (2.3):

GENUS (1.5.1):

SPECIES (1.5.2):

=====
SAMPLE

STATUS OF SAMPLE (2.13):

- 0. Unknown 1. Wild 2. Weedy 3. Traditional cultivar/Landrace
4. Breeder's line 5. Advanced cultivar 99. Other (specify):

TYPE OF SAMPLE (2.14):

- 1. Seed 2. Seedling 3. Budwood 4. Graft 5. Rooted cutting
6. Layer 7. Vitroplant 8 Fruit 99. Other (specify)

NUMBER OF PLANTS SAMPLED (2.15):

PREVAILING STRESSES (2.16.20):

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

=====
ETHNOBOTANICAL DATA

LOCAL/VERNACULAR NAME (2.16.2):

ETHNIC GROUP (2.16.1):

PARTS OF PLANT USED (2.16.6):

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

PLANT USES (2.16.7)

- 1. Fresh fruit consumption 2. Juice 3. Cooking 4. Rootstock
5. Distillation/fermentation 6. Essential oils 7. Ornamental 8. Medicinal
99. Other (specify):

ASSOCIATED FLORA (2.16.23):

=====
CHARACTERIZATION

Vegetative

Rootstock (7.1.1):

- Tree growth habit (7.1.5): 1. Erect 2. Spreading 3. Drooping
99. Other (specify):
Shoot tip colour (7.1.11): 1. Green 2. Purple 99. Other (specify):

Leaf

- Vegetative life cycle (7.2.1): 1. Evergreen 2. Deciduous 3. Semi-persistent
Leaf division (7.2.2): 1. Simple 2. Bifoliate 3. Trifoliate
4. Pentafoliate 99. Other (e.g. mixture; specify):

Fruit

- Fruiting season (7.4.1): 1. Early 2. Midseason 3. Late
Fruit diameter [mm] (7.4.4):
Fruit length [mm] (7.4.5):
Fruit shape (7.4.6): 1. Spheroid 2. Ellipsoid 3. Pyriform
4. Oblique (asymmetric) 5. Obloid
6. Ovoid 99. Other (specify):
Shape of fruit base (7.4.7): 1. Necked 2. Convex 3. Truncate
4. Concave 5. Concave collared 6. Collared with neck
99. Other (specify):

Shape of fruit apex (7.4.8): 1. Mammiform 2. Acute 3. Rounded
 4. Truncate 5. Depressed 99. Other (specify):

Fruit skin (epicarp) colour (7.4.9):

Fruit surface texture (7.4.12): 1. Smooth 2. Rough 3. Papillate
 4. Pitted 5. Bumpy 6. Grooved
 99. Other (specify):

Adherence of albedo to pulp (7.4.13): 3 Weak 5. Medium 7. Strong
 Fruit styler end (7.4.21): 1. Closed 2. Open 3. Persistent style
 99. Other (specify):

Pulp

Pulp (flesh) colour (7.6.1):

Seed

Average number of seeds per fruit (7.7.1): 0. None 1. 1-4 2. 5-9
 3. 10-19 4. 20-50 5. >50

Seed embryony (7.7.8): 1. Monoembryonic 2. Polyembryonic 3. Mixture of both

Juice

Juice taste (2.16.12): 1. Insipid 2. Acid 3. Sweet 4. Bitter 99. Other (specify):

Juice aroma (2.16.15): 1. Weak 2. Average 3. Strong 4. Resinous
 99. Other (e.g. onion/stale; specify):

Juice content in endocarp (7.6.7): 3. Low 5. Medium 7. High

Juice pH (8.5.2):

Sugar content [%] (8.5.3):

=====

COLLECTING SITE LOCATION

COUNTRY (2.4):

PROVINCE/STATE (2.5):

DEPARTMENT/COUNTY (2.6):

LOCATION (2.7):

km:

direction:

from:

LATITUDE (2.8):

LONGITUDE (2.9):

ELEVATION (2.10):

m asl

=====

COLLECTING SITE ENVIRONMENT

COLLECTING SOURCE (2.11):

0. Unknown 1. Wild habitat 2. Farm 3. Market
 4. Institute/Research organization 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 (6.1.5):

(code N,S,E,W)

SOIL FERTILITY (6.1.21):

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

SOIL TEXTURE CLASSES (6.1.17):

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

SOIL TAXONOMIC CLASSIFICATION (6.1.19):

State class (e.g. Alfisols, Spodosols, Vertisols)

WATER AVAILABILITY (6.1.20):

1. Rain-fed 2. Irrigated 3. Flooded 4. River banks
 5. Sea coast 99. Other (specify):

RAINFALL (6.1.22.3):

Annual mean: mm

Monthly mean [mm]: JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

TEMPERATURE (6.1.22.1):

Seasonal mean: °C

Monthly mean [°C]: JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

Descriptors for

Avocado

(*Persea* spp.)



ISBN 92-9043-220-9

Descriptors for
Avocado
(*Persea* spp.)



The International Plant Genetic Resources Institute (IPGRI) is an autonomous international scientific organization operating under the aegis of the Consultative Group on International Agricultural Research (CGIAR). IPGRI's mandate is to advance the conservation and use of plant genetic resources for the benefit of present and future generations. IPGRI works in partnership with other organizations, undertaking research, training and the provision of scientific and technical advice and information, and has a particularly strong programme link with the Food and Agriculture Organization of the United Nations. Financial support for the agreed research agenda of IPGRI is provided by the Governments of Australia, Austria, Belgium, Canada, China, Denmark, France, Germany, India, Italy, Japan, the Republic of Korea, the Netherlands, Norway, Spain, Sweden, Switzerland, the UK and the USA, and by the Asian Development Bank, IDRC, UNDP and the World Bank.

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PREFACE

Descriptors for Avocado (*Persea spp.*) was developed by a group of scientists with the support of the GIARA Fund, under the coordination of Alejandro F. Barrientos Priego and prepared in the internationally accepted IPGRI format for descriptor lists. In this group the following scientists were included: A. Ben-Ya'acov, L. López López, G. Bufler and M.W. Borys. A draft version of the revision was subsequently sent to a number of experts for their comments and amendments. Their amendments were used to produce the definitive list. A full list of the names and addresses of those involved is given in 'Contributors'.

IPGRI encourages the collection of data for descriptors in the first four categories of this list: *Passport, Management, Environment and site* and *Characterization*; and endorses data in these categories as those that should be available for any accession. However, the number of each of the site and environment descriptor types used will depend on the crop and their importance to the crop's description. Descriptors listed under *Evaluation* allow for a more detailed description of the accession's characters, but generally require replicated site and time trials.

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 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 all curators 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. Minimum, highly discriminating descriptors are marked with a star (★).

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 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.

Any suggestions on this descriptor list will be highly appreciated by IPGRI.

DEFINITIONS AND USE OF THE DESCRIPTORS

IPGRI now 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 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. Germplasm collecting site descriptors 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: Many of the descriptors in this category are susceptible to environmental differences but are generally useful in crop improvement and others may involve complex biochemical or molecular characterization. They include yield, agronomic performance, stress susceptibilities and biochemical and cytological traits.

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.

Minimum highly discriminating descriptors are marked with a star (★).

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

- (a) the *Système International d'Unités* (SI system) is used. The units to be applied are given in square brackets following the descriptor name;
- (b) standard colour charts, e.g. Royal Horticultural Society Colour Chart, Methuen Handbook of Colour, or Munsell Color 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);

(c) 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;

(d) when a descriptor is scored using a 1-9 scale, such as in (c), '0' would be scored when (i) the character is not expressed; (ii) when 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

3	Toothed
5	Elliptic
7	Linear

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

Absence/presence of terminal leaflet

0	Absent
1 (or +)	Present

(f) blanks are used for information not yet available;

(g) 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 van Hintum (1993), that clearly state a method for scoring heterogeneous accessions;

(h) dates should be expressed numerically in the format DDMMYYYY, where

DD	-	2 digits to represent the day
MM	-	2 digits to represent the month
YYYY	-	4 digits to represent the year.

PASSPORT

1. Accession descriptors

★ 1.1 Accession number

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 is still not available for re-use. 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)

1.2 Donor name

Name of institution or individual responsible for donating the germplasm

1.3 Donor number

Number assigned to an accession by the donor

1.4 Other number(s) associated with the accession

Any other identification number known to exist in other collections for this accession, e.g. USDA Plant Inventory number (not Collecting number, see 2.3). Other numbers can be added as 1.4.3, etc.

1.4.1 Other number 1

1.4.2 Other number 2

★ 1.5 Scientific name

1.5.1 Genus

1.5.2 Species

1.5.3 Subspecies

1.5.4 Botanical variety

★ 1.6 Race

1 Mexican

2 Guatemalan

3 West Indian (Antillian)

4 Other (specify in descriptor 1.14 Notes)

1.7 Pedigree

Parentage or nomenclature, and designations assigned to breeders' material

1.8 Cultivar

1.8.1 Cultivar name

Either a registered or other formal cultivar designation given to the accession

1.8.2 Translation/Transliteration

Provide translation of the local cultivar name into English

1.8.3 Synonyms

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

1.9 Pollination group

- 1 Predominantly self-pollinated
- 2 Intermediate
- 3 Predominantly out-crossing

1.10 Acquisition date [DDMMYYYY]

Date on which the accession entered the collection

1.11 Type of material received

- 1 Zygotic embryo
- 2 Seed
- 3 Plant (including seedling)
- 4 Somatic tissue
- 5 Pollen
- 6 Other (specify in descriptor 1.14 Notes)

1.12 Accession size

Approximate number or weight of seeds, budwoods or plants of an accession in the genebank

1.13 Type of maintenance

- 1 Clonal
- 2 Grafted
- 3 Seed
- 4 Vegetative and seed
- 5 Tissue culture
- 6 Other (specify in descriptor 1.14 Notes)

1.14 Notes

Any additional information may be specified here

2. Collecting descriptors

2.1 Collecting institute(s)

Institute(s) and people collecting/sponsoring the sample collection

2.2 Site number

Number assigned to the physical site by the collector

2.3 Collecting number

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 item is essential for identifying duplicates held in different collections. It should be unique and always accompany subsamples wherever they are sent

2.4 Collecting date of original sample [DDMMYYYY]

2.5 Country of collecting

Name of the country in which the sample was collected or bred. Use the three-letter abbreviations from the *International Standard (ISO) Codes for the representation of names of countries*, No. 3166, 4th Edition. Copies of these are available from DIN: Deutsche Institut für Normung e.V., 10772 Berlin, Germany; Tel. 30-2601-2860; Fax 30-2601-1231, Tlx. 184 273-din-d

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 Province/State) of the country in which the sample was collected

2.8 Location of collecting site

Distance in kilometers and direction from the nearest town, village or map grid reference point (e.g. CURITIBA 7S means 7 km south of Curitiba)

2.9 Latitude of collecting site

Degrees and minutes followed by N (North) or S (South) (e.g. 01030S)

2.10 Longitude of collecting site

Degrees and minutes followed by E (East) or W (West) (e.g. 07625W)

★ 2.11 Elevation of collecting site [m]

2.12 Collecting source

- 1 Wild habitat
- 2 Farm land
- 3 Backyard
- 4 Market
- 5 Research organization
- 6 Other (specify in descriptor 2.27 Collector's notes)

2.13 Collecting source environment

Use descriptors 6.1.1 to 6.1.27 in section 6

2.14 Type of sample

Form 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
- 2 Seed
- 3 Pollen
- 4 Tissue culture (specify which part of the plant is used in descriptor 2.27 Collector's notes)

2.15 Status of sample

- 1 Wild
- 2 Weedy
- 3 Breeding/research material
- 4 Landrace
- 5 Advanced cultivar
- 6 Other (specify in descriptor 2.27 Collector's notes)

★ **2.16 Local/vernacular name**

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

2.17 Ethnic group

Name of the tribe of the farmer donating the sample or of the people living in the area of collecting

2.18 Population size

Number of plants sampled. If estimated, provide method used (i) row per column count; (ii) area per plant density; for both, allow for missing stands

2.19 Plant population density

- 3 Low
- 5 Intermediate
- 7 High

2.20 Genetic erosion

Estimate of the rate at which genetic erosion of the species is occurring in the region of collecting

- 3 Slow
- 5 Intermediate
- 7 Rapid

2.21 Cultural practices

2.21.1 Sowing date [DDMMYYYY]

2.21.2 Transplanting date [DDMMYYYY]

2.21.3 Harvest date [DDMMYYYY]

2.21.4 Irrigation

Specify amount, frequency, and method of application

2.22 Cropping system and associated flora

- 1 Pure stand (clean weeded)
- 2 Pure stand (with weeds)
- 3 Pure stand (with planted cover)
- 4 Intercropped (specify crop in descriptor 2.27 **Collector's notes**)

2.23 Uses of the accession

- 1 Vegetable
- 2 Food
- 3 Spice
- 4 Vitamin
- 5 Oil
- 6 Medicinal
- 7 Ornamental
- 8 Timber
- 9 Other (specify in descriptor 2.27 **Collector's notes**)

2.24 Photograph

Was a photograph(s) taken of the accession or habitat at the time of collecting? If so, provide an identification number(s) in descriptor 2.27 **Collector's notes**

- 0 No
- 1 Yes

2.25 Herbarium specimen

Was a herbarium specimen collected? If so, provide an identification number in descriptor

2.27 Collector's notes

0 No

1 Yes

2.26 Prevailing stresses

Information on associated biotic and abiotic stresses and the accession's reaction. Indicate if disease indexing was done at the time of collecting

2.27 Collector's notes

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

MANAGEMENT

3. Seed management descriptors

- 3.1 Accession number** (Passport 1.1)
- 3.2 Population identification** (Passport 2.3)
Collecting number, pedigree, cultivar name, etc. depending on the population type
- 3.3 Storage address**
(Building, room, shelf numbers/location in medium- and/or long-term storage)
- 3.4 Storage date** [DDMMYYYY]
- 3.5 Germination at storage (initial)** [%]
- 3.6 Date of last germination test** [DDMMYYYY]
- 3.7 Germination at the last test** [%]
- 3.8 Date of next test** [DDMMYYYY]
Date (estimate) when the accession should next be tested
- 3.9 Moisture content at harvest** [%]
- 3.10 Moisture content at storage (initial)** [%]
- 3.11 Amount of seed in storage(s)** [g or number] (Passport 1.12)
- 3.12 Location of duplicates of this accession**
(Within the host's programme)

4. Multiplication/Regeneration descriptors

- 4.1 Accession number** (Passport 1.1)
- 4.2 Population identification** (Passport 2.3)
Collecting number, pedigree, cultivar name, etc. depending on the population type
- 4.3 Field plot number**
- 4.4 Location**

4.5 Collaborator

4.6 Cultural practices

4.6.1 Sowing date [DDMMYYYY]

4.6.2 Grafting date [DDMMYYYY]

4.6.3 Transplanting date [DDMMYYYY]

4.6.4 Harvest date [DDMMYYYY]

4.6.5 Irrigation

Specify amount, frequency and method of application

4.7 Sowing density [%]

4.8 Fertilizer application [g m⁻²]

4.9 Germination in the nursery [%]

4.10 Germination in the field [%]

4.11 Seedling vigour

Assessed at 18 days after emergence

4.12 Number of plants established by hectare

4.13 Number of plants used as seed source for each regeneration

4.14 Pollination method

1 Self pollinated

2 Often cross-pollinated

3 Cross pollinated

4.15 Pollen viability

3 Low

5 Intermediate

7 High

4.16 Previous multiplication and/or regeneration

4.16.1 Location

4.16.2 Sowing date [DDMMYYYY]

4.16.3 Plot number

4.17 Number of times accession regenerated

Since the date of acquisition

4.18 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 2.5 Country of collecting)

5.2 Site (research institute)

5.2.1 Latitude

Degrees and minutes followed by N (North) or S (South) (e.g. 01030S)

5.2.2 Longitude

Degrees and minutes followed by E (East) or W (West) (e.g. 07625 W)

5.2.3 Elevation [m]

5.2.4 Name of farm or institute

5.3 Evaluator's name and address

5.4 Sowing date [DDMMYYYY]

5.5 Grafting date [DDMMYYYY]

5.6 Harvest date [DDMMYYYY]

5.7 Evaluation environment

Environment in which characterization/evaluation was carried out

- 1 Field
- 2 Screenhouse
- 3 Glasshouse/plastic house
- 4 Laboratory
- 5 Other (specify in descriptor 5.17 Notes)

5.8 Seed germination [%]

Specify number of days over which germination is measured

5.9 Field establishment [%]

5.10 Number of days to planting after grafting

5.11 Number of days to 50% field emergence

Emergence for each accession

5.12 Sowing/planting site in field

Give block, strip and/or row/plot numbers as applicable, plants/plot, replication

5.13 Field spacing

5.13.1 Distance between plants in a row [m]

5.13.2 Distance between rows [m]

5.14 Environmental characteristics of site

Use descriptors 6.1.1 to 6.1.27 in section 6

5.15 Fertilizer

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

5.16 Plant protection

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

5.17 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 profiles 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	-	10.9%
5	Rolling	11	-	15.9%
6	Hilly	16	-	30%
7	Steeply dissected	>30%, moderate elevation range		
8	Mountainous	>30%, great elevation range (>300 m)		
9	Other	(Specify in 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 site is located (adapted from FAO 1990)

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

6.1.3 Second level landform (Adapted from FAO 1990)

- 1 Alluvial plain (A plain formed from the deposition of alluvium usually adjacent to a river that periodically overflows (aggraded valley plain, river plain, wash plain, waste plain))
- 2 Coastal plain
- 3 Lacustrine plain
- 4 Glacial plain
- 5 Peneplain (Base-leveled plain) (Any land surface changed almost to a plain by subaerial erosion)
- 6 Pediment (A piedmont slope formed from a combination of mainly erosional processes; the surface is chiefly bare rock but may have a covering veneer of alluvium or gravel (conoplain, piedmont interstream flat))
- 7 Volcano
- 8 Dunefield
- 9 Delta
- 10 Tidal flat (A marshy, sandy, or muddy nearly horizontal coastal flatland which is alternately covered and exposed as the tide rises and falls)
- 11 Playa (A small, generally sandy land area at the mouth of a stream or along the shore of a bay)
- 12 Cay (A flat coral island)
- 13 Other (Specify in appropriate section's **Notes**)

6.1.4 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 Beachridge
9 Floodplain	25 Round 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	30 Other (specify in appropriate section's Notes)
15 Dune	
16 Longitudinal dune	

★ **6.1.5 Slope [°]**
Estimated slope of the site

★ **6.1.6 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)

★ **6.1.7 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 southwestern direction has an aspect of SW)

6.1.8 Crop agriculture

(From FAO 1990)

6.1.8.1 Annual field cropping

- 1 Shifting cultivation
- 2 Fallow system cultivation
- 3 Ley system cultivation
- 4 Rainfed arable cultivation
- 5 Wet rice cultivation
- 6 Irrigated cultivation

6.1.8.2 Perennial field cropping

- 1 Non-irrigated cultivation
- 2 Irrigated cultivation

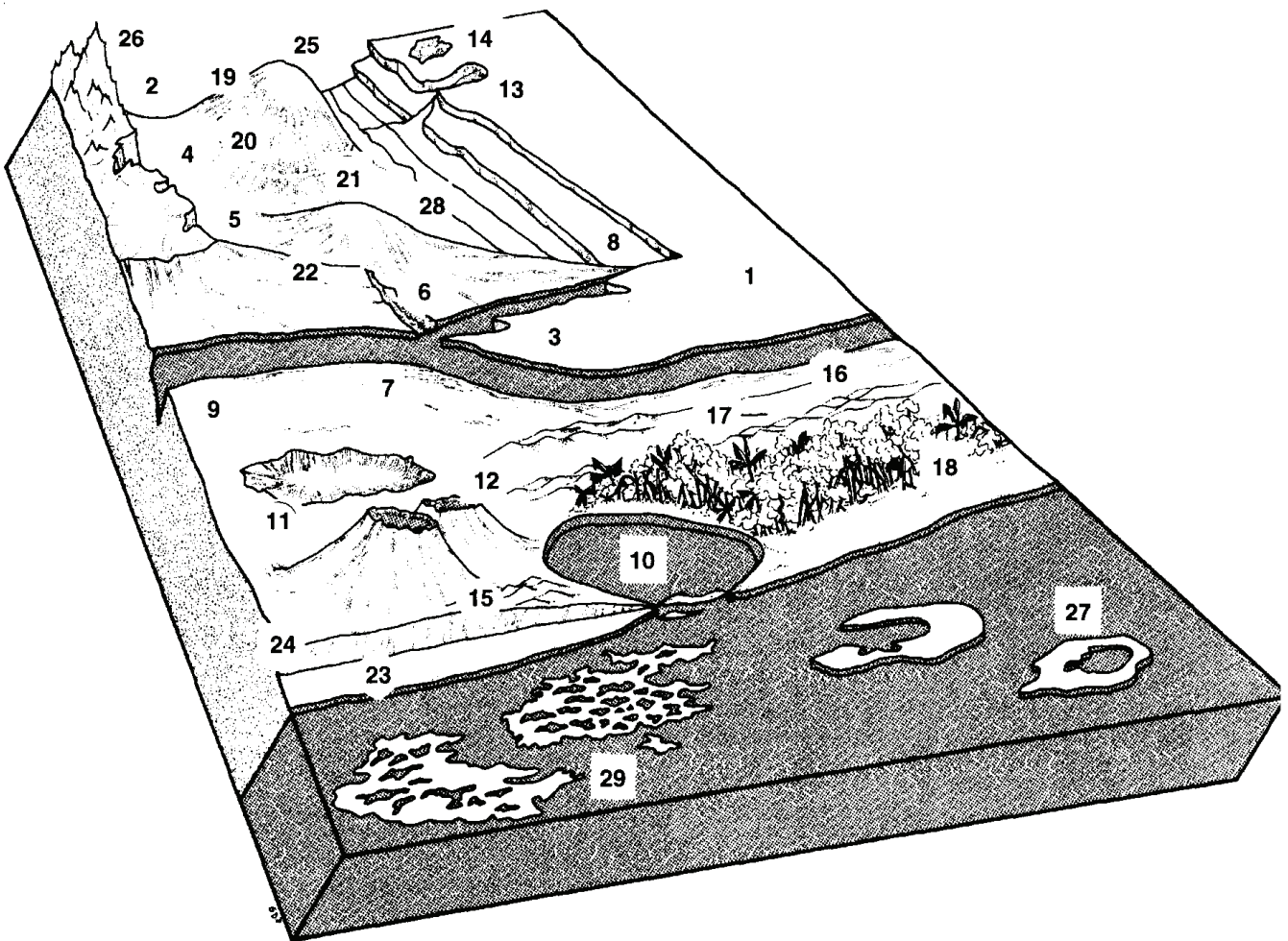


Fig. 1 Land element and position

6.1.9 Overall vegetation surrounding and at the site

(From FAO 1990)

1	Grassland	(Grasses, subordinate forbs, no woody species)
2	Forbland	(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	Shrubland	(Continuous layer of shrubs, crowns touching)
6	Savanna	(Grasses with a discontinuous layer of trees or shrubs)
7	Other	(Specify in appropriate section's Notes)

★ **6.1.10 Soil parent 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

6.1.10.1 Unconsolidated material

1	Aeolian deposits (unspecified)	10	Volcanic ash
2	Aeolian sand	11	Loess
3	Littoral deposits	12	Pyroclastic deposits
4	Lagoonal deposits	13	Glacial deposits
5	Marine deposits	14	Organic deposits
6	Lacustrine deposits	15	Colluvial deposits
7	Fluvial deposits	16	<i>In situ</i> weathered
8	Alluvial deposits	17	Saprolite
9	Unconsolidated (unspecified)	18	(Specify in appropriate section's Notes)

6.1.10.2 Rock type

- | | | | |
|----|------------------------------------|----|------------------------------------------------------|
| 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 | 29 | Other (specify in
appropriate section's
Notes) |
| 15 | Sedimentary rock | 30 | Not known |

6.1.11 Stoniness/rockiness/hardpan/cementation

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

★ **6.1.12 Soil drainage**

(Adapted from FAO 1990)

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

6.1.13 Flooding

(From FAO 1990)

Flooding or temporary inundation is described according to its estimated frequency, duration and sampling depth. Information may be obtained from records of past flooding or from local enquiry. The frequency and duration classes should give an indication of the average occurrence of inundation

★ **6.1.14 Soil salinity**

- 1 <160 ppm dissolved salts
- 2 160 - 240 ppm
- 3 241 - 480 ppm
- 4 >480 ppm

6.1.15 Quality of the groundwater

(From FAO 1990)

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

★ 6.1.16 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

6.1.17 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)

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

★ 6.1.18 Soil pH

Actual value of the soil within the following root depths around the accession

6.1.18.1 pH at 10-15 cm

6.1.18.2 pH at 30-60 cm

6.1.18.3 pH at 60-90 cm

★ 6.1.19 Soil erosion

- 3 Low
- 5 Intermediate
- 7 High

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

6.1.21 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

★ **6.1.22 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%

6.1.23 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 fractions 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 Silty clay | 16 Loamy coarse sand |
| 6 Silty 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 |

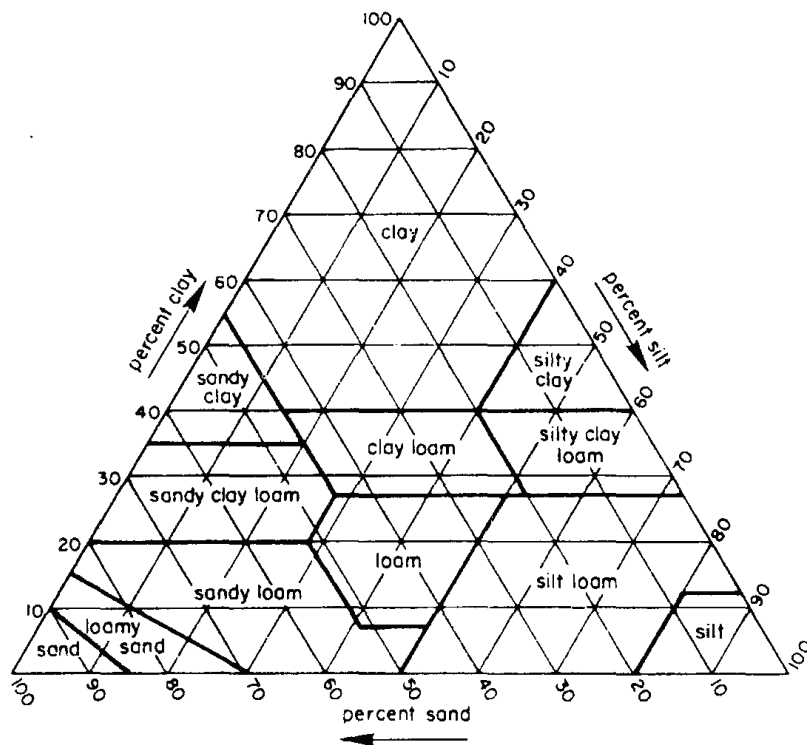


Fig. 2 Soil texture classes

★ **6.1.23.1 Soil particle size classes**

(Adapted from FAO 1990)

1	Clay	< 2 μm
2	Fine silt	2 - 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

6.1.24 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.)

★ **6.1.25 Water availability**

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

6.1.26 Soil fertility

General assessment of the soil fertility based on existing vegetation

- 3 Low
- 5 Moderate
- 7 High

6.1.27 Climate of the site

Should be assessed as close to the site as possible

6.1.27.1 Temperature [$^{\circ}\text{C}$]

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

6.1.27.2 Rainfall [mm]

Annual average (state number of recorded years)

6.1.27.3 Wind [km s^{-1}]

Annual average (state number of years recorded)

6.1.27.3.1 Frequency of typhoons or hurricane force winds

6.1.27.3.2 Date of most recent typhoons or hurricane force winds [DDMMYYYY]

6.1.27.3.3 Annual maximum wind velocity [km s⁻¹]

6.1.27.4 Frost

6.1.27.4.1 Date of most recent frost [DDMMYYYY]

6.1.27.4.2 Lowest temperature [°C]

Specify seasonal average and minimum survived

6.1.27.4.3 Duration of temperature below freezing [d]

6.1.27.5 Relative humidity

6.1.27.5.1 Relative humidity diurnal range [%]

6.1.27.5.2 Relative humidity seasonal range [%]

6.1.27.6 Light

3 Shady

7 Sunny

6.1.28 Other

(Specify in appropriate section's Notes)

CHARACTERIZATION

7. Plant descriptors

For all colour descriptors, RHS colour codes are given in parentheses beside descriptor states

7.1 Overall tree

For descriptors 7.1.1-7.1.6, specify number of trees characterized per accession

7.1.1 Tree age [y]

7.1.2 Tree type

- 1 Seedling
- 2 Grafted
- 3 Clonal

7.1.2.1 Rootstock type

(If appropriate)

- 1 Seedling
- 2 Clonal

7.1.3 Tree vigour

- 3 Weak
- 5 Intermediate
- 7 Strong

7.1.4 Tree spread [m]

Measured as the mean diameter using two directions

7.1.5 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

7.1.6 Tree shape

(See Fig. 3)

- 1 Columnar
- 2 Pyramidal
- 3 Obovate
- 4 Rectangular
- 5 Circular
- 6 Semicircular
- 7 Semielliptic
- 8 Irregular
- 9 Other (specify in descriptor 7.5 Notes)

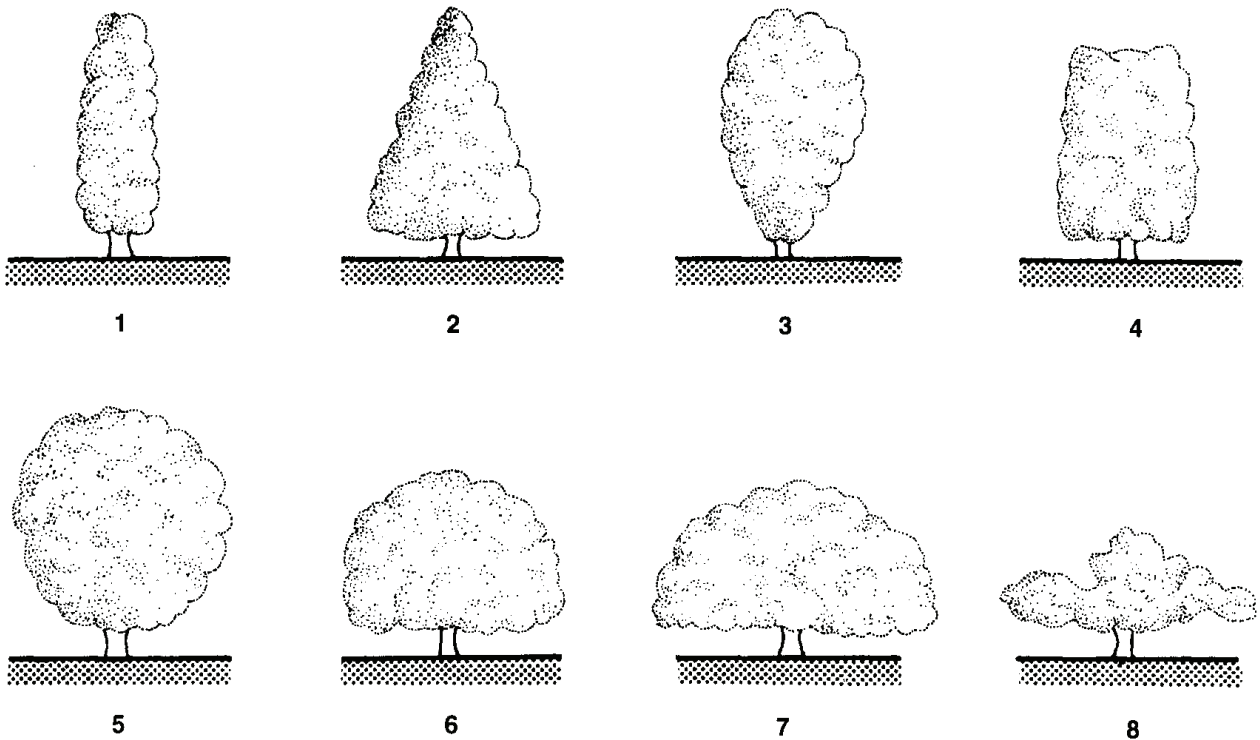


Fig. 3 Tree shape

- ★ 7.1.7 **Trunk surface**
 - 3 Smooth
 - 7 Rough
 - 9 Very rough

7.1.8 **Trunk circumference [cm]**
Recorded at 30 cm above ground level

7.1.9 **Branching pattern**

(See Fig. 4)

- 1 Extensive (one branch arises below apex of twig with each flush of growth)
- 2 Intensive (several branches arise below apex of twig with each flush of growth)
- 3 Both patterns (record prominent one)



Fig. 4 Branching pattern

7.1.10 Distribution of branches

(See Fig. 5)

- 1 Ascendant
- 2 Irregular
- 3 Verticillate
- 4 Axial
- 5 Horizontal

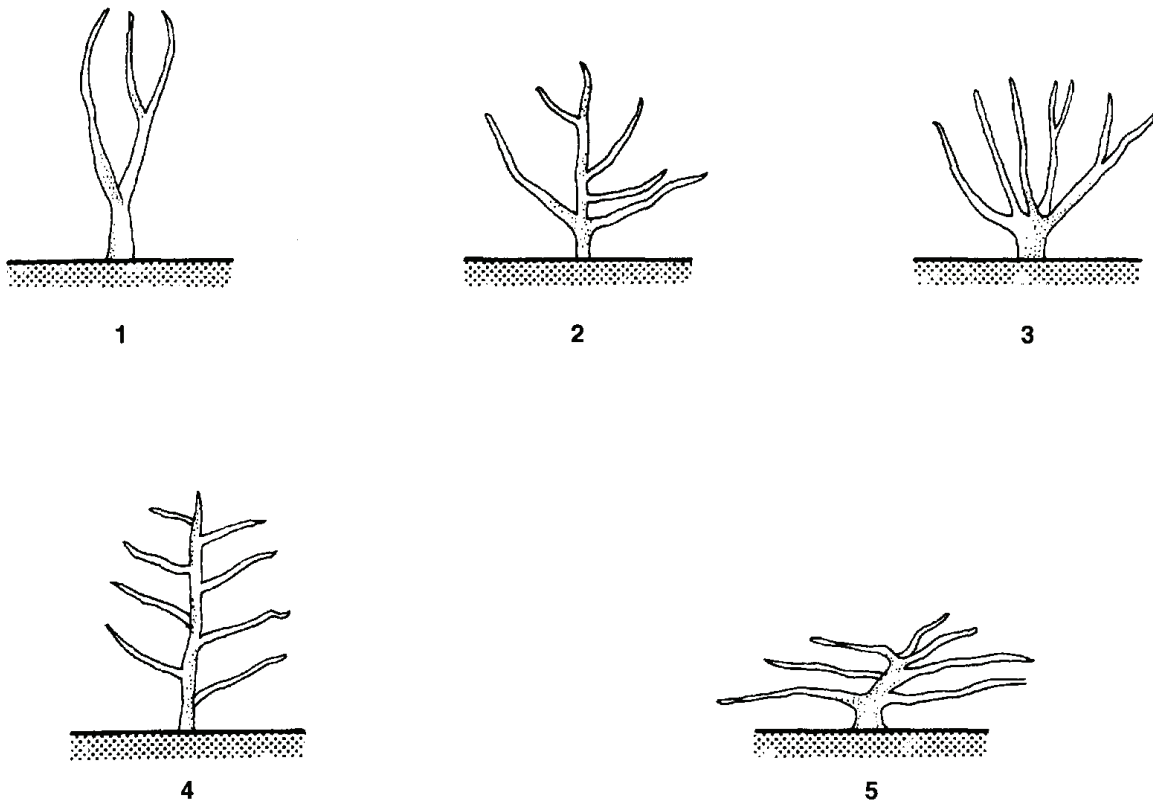


Fig. 5 Distribution of branches

7.1.11 Crotch angle of main branches

(See Fig. 6)

- 1 Acute (90°)
- 2 Obtuse ($>90^\circ$)

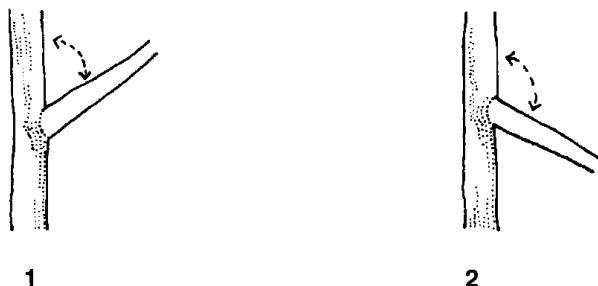


Fig. 6 Crotch angle of main branches

7.1.12 Extension growth of twigs [cm]

Measured after major growth flush following harvest. Mean of 10 randomly selected twigs

- ★ **7.1.13 Internode length of twigs [cm]**
Measured at the intermediate part of the twig, after current season's growth has ceased. Mean of 10 randomly selected twigs
- ★ **7.1.14 Twig diameter [cm]**
Of current shoot at an internode of the intermediate part of the twig, measured after current season's growth has ceased. Mean of 10 randomly selected twigs
- ★ **7.1.15 Colour of young twig**
(Including young leaves of the shoot tip)
 - 1 Yellow (yellow-orange group 14D)
 - 2 Green (green group 141A)
 - 3 Red (greyed-orange group 166A)
 - 4 Other (specify in descriptor 7.5 Notes)
- ★ **7.1.16 Surface of young twig**
 - 1 Glabrous
 - 2 Pubescent

7.1.17 Colour of lenticels of young twig

- 1 Ivory (yellow-white group 158A)
- 2 Green (green group 137A)
- 3 Brown (grey-brown group 199A)
- 4 Red (greyed-red group 180B)
- 5 Purple (purple group 79A)
- 6 Other (specify in descriptor 7.5 Notes)

★ 7.1.18 Leaf shape

Record on midspring flush leaf. (See Fig. 7)

- 1 Ovate
- 2 Narrowly obovate
- 3 Obovate
- 4 Oval
- 5 Roundish
- 6 Cordiform
- 7 Lanceolate
- 8 Oblong
- 9 Oblong-lanceolate
- 10 Other (specify in descriptor 7.5 Notes)

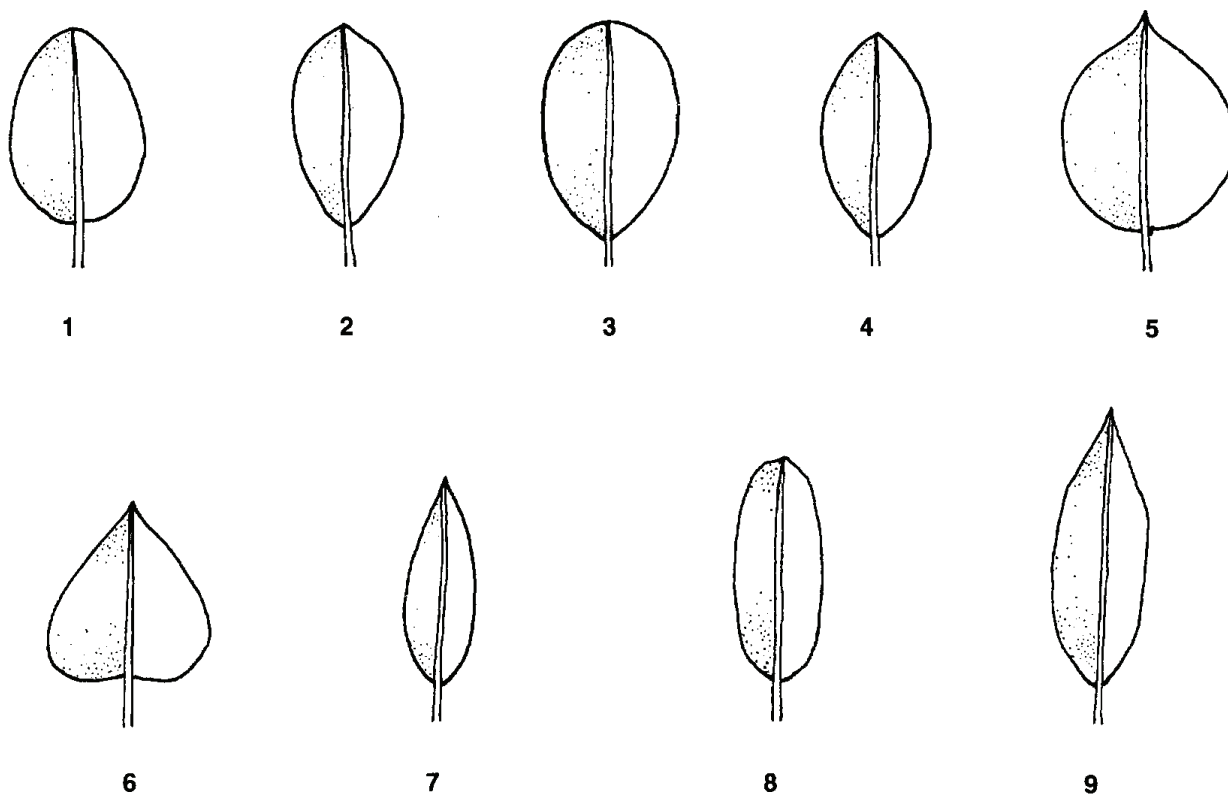


Fig. 7 Leaf shape

7.1.19 Leaf base shape

(See Fig. 8)

- 1 Acute
- 2 Obtuse
- 3 Truncate

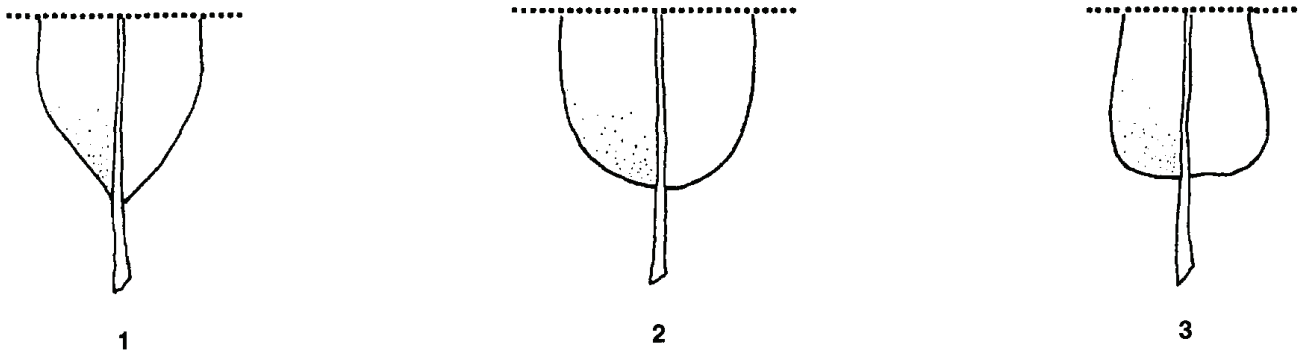


Fig. 8 Leaf base shape

7.1.20 Leaf blade length [cm]

Average of 10 mature leaves

★ **7.1.21 Pubescence of leaf under surface**

- 3 Sparse
- 5 Intermediate
- 7 Dense

7.1.22 Pubescence of leaf upper surface

- 3 Sparse
- 5 Intermediate
- 7 Dense

7.1.23 Colour of mature leaves

- 1 Light green (green group 141D)
- 2 Green (green group 141A)
- 3 Dark green (green group 139A)

7.1.24 Groove on petiole

- 0 Absent
- 1 Present

For the following descriptors all records should be taken from midspring flush leaf

7.1.25 Crotch angle of leaf petiole

(See Fig. 9)

- 1 Acute (90°)
- 2 Obtuse ($>90^\circ$)

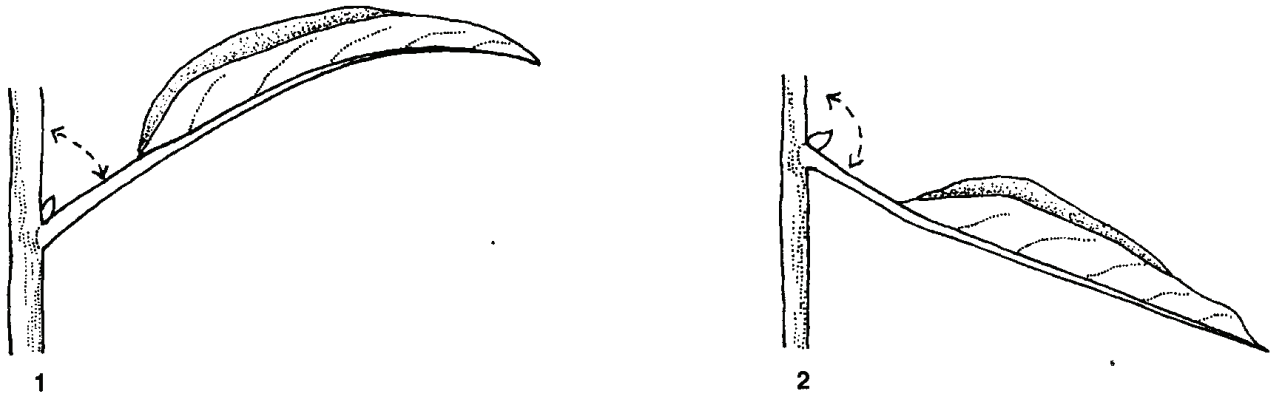


Fig. 9 Crotch angle of leaf petiole

7.1.26 Leaf margin

(See Fig. 10)

- 1 Entire
- 2 Undulate

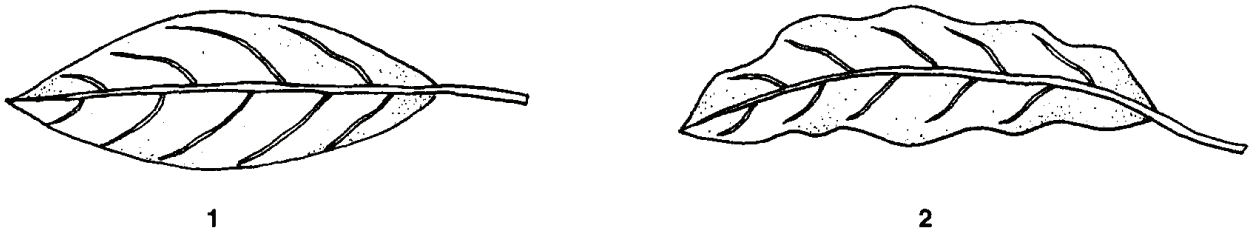


Fig. 10 Leaf margin

★ **7.1.27 Number of primary veins**

7.1.28 Relief of venation on upper surface

- 3 Sunken
- 5 Intermediate
- 7 Raised

★ **7.1.29 Primary leaf vein divergence relative to the main vein [°]**
At middle part of the leaf. (See Fig. 11)

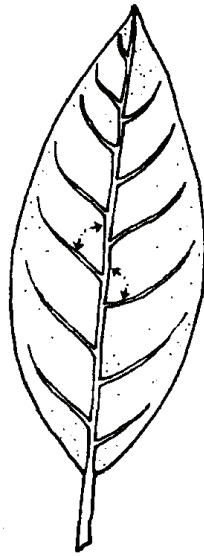


Fig. 11 Primary leaf vein divergence relative to the main vein

7.1.30 Leaf apex shape

(See Fig. 12)

- 1 Very acute
- 3 Acute
- 5 Intermediate
- 7 Obtuse
- 9 Very obtuse

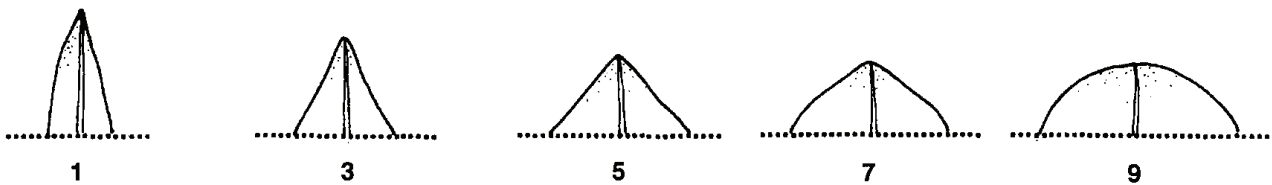


Fig. 12 Leaf apex shape

7.1.31 Leaf texture

- 3 Soft
- 5 Semihard
- 7 Hard
- 9 Very hard

7.1.32 Anise smell

(Leaf must be crushed)

- 3 Weak
- 5 Intermediate
- 7 Strong

7.2 Flower

7.2.1 Number of years to flowering after planting [y]

7.2.2 Season of flowering and duration

If possible, indicate the flowering season of a known cultivar

7.2.2.1 First sign of flower buds [DDMMYYYY]

7.2.2.2 First flowers open [DDMMYYYY]

7.2.2.3 End of flowering [DDMMYYYY]

7.2.3 Secondary flowering

0 Absent

1 Present

7.2.4 Leaf defoliation

Recorded while flowering

3 Partial

9 Full

7.2.5 Flowering type

Recorded after five observations. (See Fig. 13)

1 Type A

2 Type B

3 Unknown

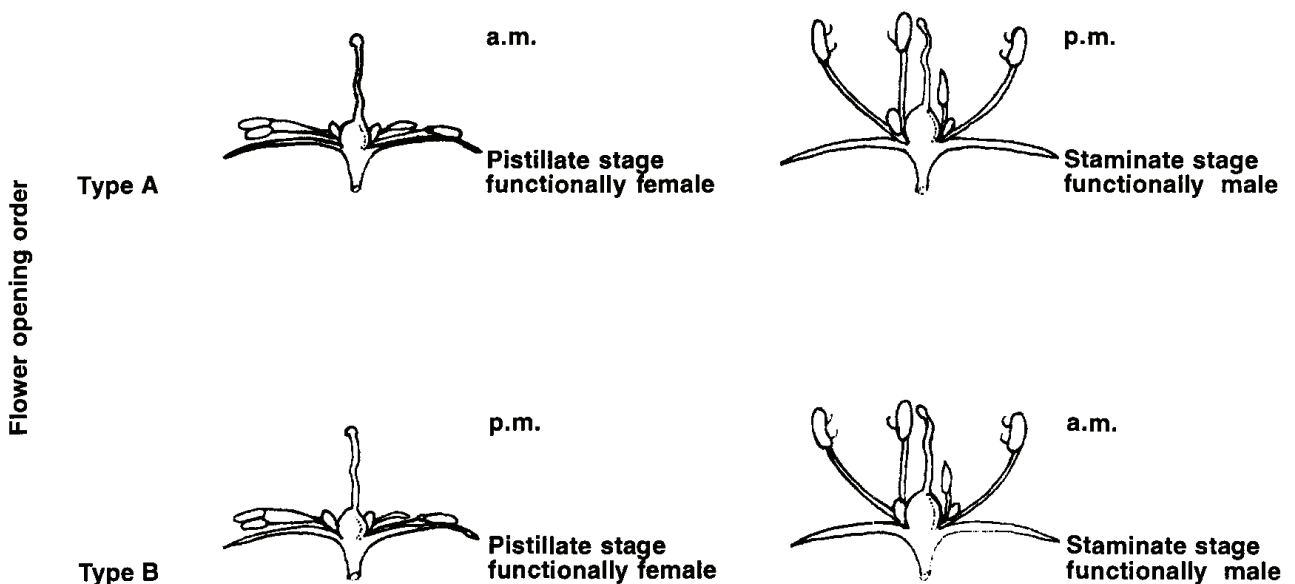


Fig. 13 Flowering type

7.2.6 Inflorescence position

- 1 Terminal
- 2 Subterminal
- 3 Axillary
- 4 Other (specify in descriptor 7.5 Notes)

7.2.7 Flower colour

- 1 Cream (yellow group 4D)
- 2 Yellow (yellow group 8B)
- 3 Green (yellow-green group 149C)
- 4 Brown (greyed-orange group 164B)
- 5 Reddish (red group 40B)
- 6 Other (specify in descriptor 7.5 Notes)

★ **7.2.8 Petal pubescence**

Specify if it is observed in the inner or outer parts

- 3 Sparse
- 5 Intermediate
- 7 Dense

★ **7.2.9 Sepal pubescence**

Specify if it is observed in the inner or outer parts

- 3 Sparse
- 5 Intermediate
- 7 Dense

For descriptors 7.2.10-7.2.15 an average of five observations per accession should be made

7.2.10 Number of flowers per inflorescence

7.2.11 Number of inflorescence ramifications

7.2.12 Length of inflorescence main axis [cm]

7.2.13 Pedicel length [mm]

(See Fig. 14)

7.2.14 Petal length [mm]

(See Fig. 14)

7.2.15 Sepal length [mm]

(See Fig. 14)

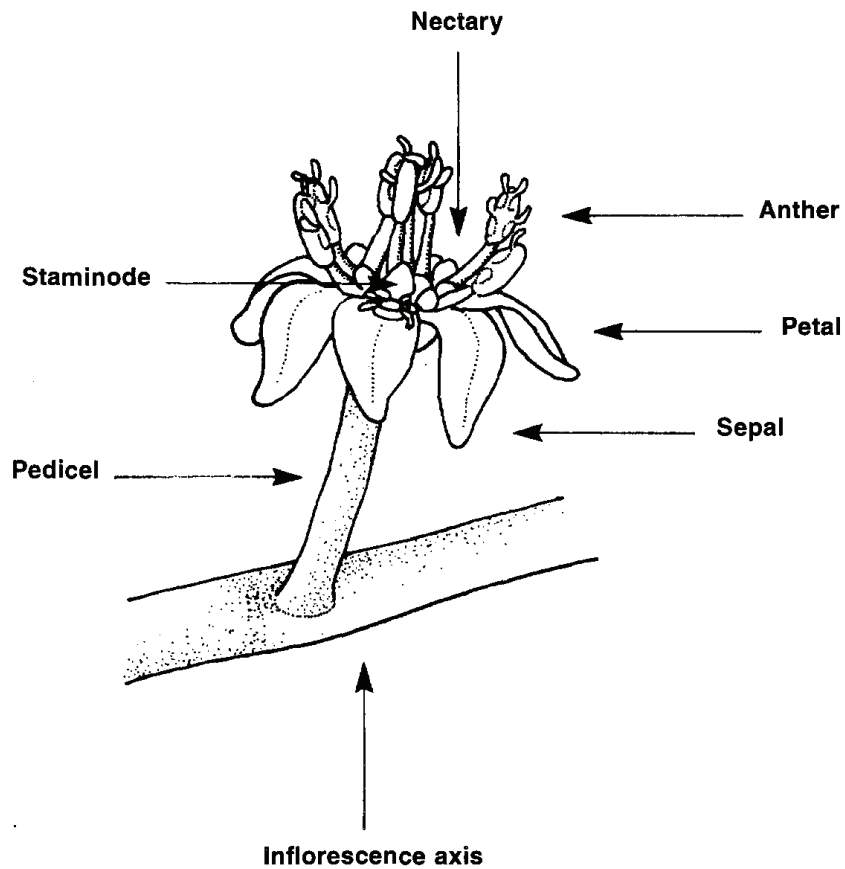


Fig. 14 Avocado flower

- 7.2.16 Flower style**
 1 Straight
 2 Kinked
 3 Other (specify in descriptor 7.5 Notes)

- 7.2.17 Absence/presence of pollen**
 0 Absent
 1 Present

- 7.2.18 Absence/presence of nectary stalks**
 0 Absent
 1 Present

7.3 Fruit

- 7.3.1 Number of years to first fruiting after planting [y]**

★ 7.3.2 Number of days from flowering to fruit maturity [d]

★ 7.3.3 Season of fruiting

If possible, indicate the fruiting season of a known cultivar

7.3.3.1 Starting date [DDMMYYYY]

7.3.3.2 Ending date [DDMMYYYY]

7.3.4 Fruiting habit

Specify number of trees evaluated per accession

1 Single isolated fruit

2 Clusters

★ 7.3.5 Fruit shape

Specify number of fruits evaluated. (See Fig. 15)

1 Oblate

2 Spheroid

3 High spheroid

4 Ellipsoid

5 Narrowly obovate

6 Obovate

7 Pyriform

8 Clavate

9 Rhomboidal

10 Other (specify in descriptor 7.5 Notes)

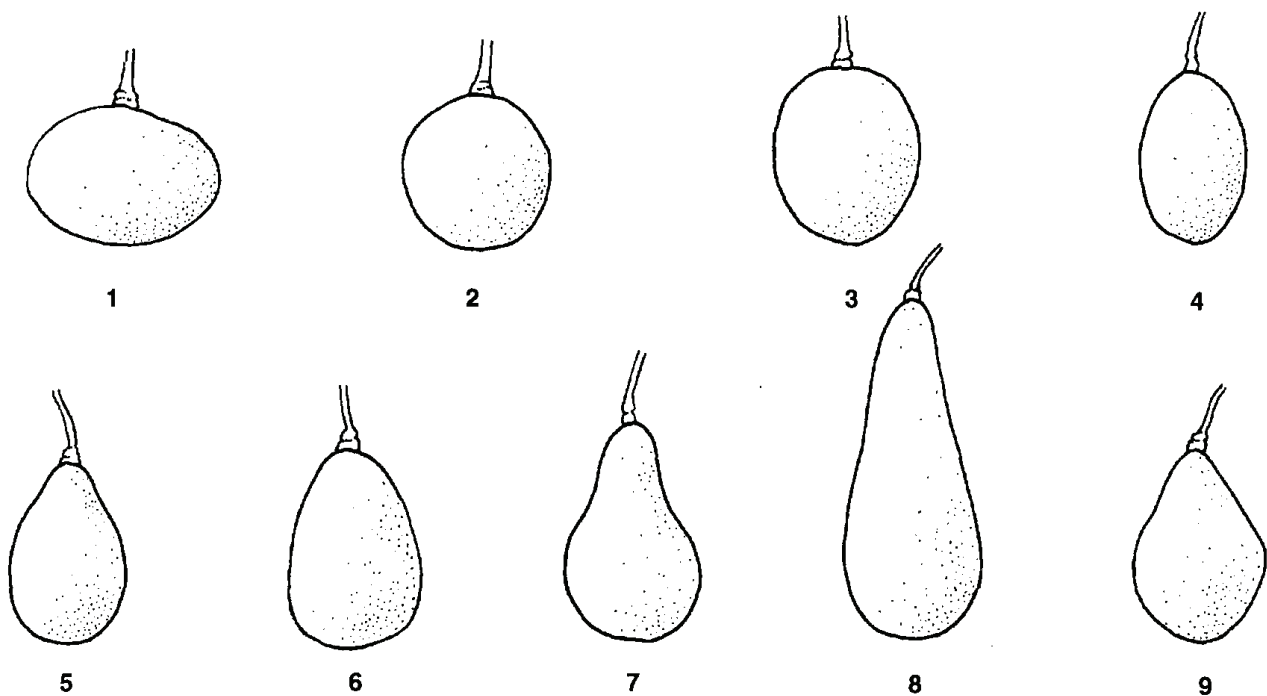


Fig. 15 Fruit shape

7.3.6 Fruit length [cm]

Average of five fruits

7.3.7 Fruit diameter [cm]

Measured at the broadest part. Average of five fruits

7.3.8 Fruit size uniformity

- 3 Low
- 5 Intermediate
- 7 High

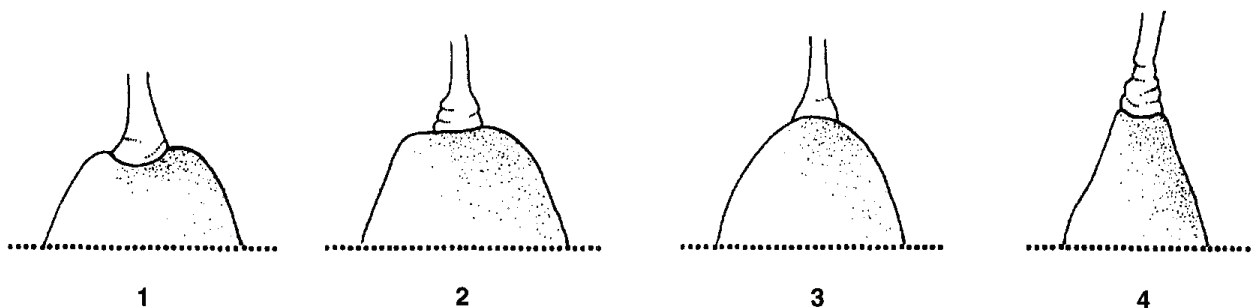
7.3.9 Fruit weight [g]

Average of five fruits

7.3.10 Fruit base shape

(See Fig. 16)

- 1 Depressed
- 2 Flattened
- 3 Inflated
- 4 Pointed

**Fig. 16 Fruit base shape****7.3.11 Fruit apex shape**

(See Fig. 17)

- 1 Deeply depressed
- 2 Slightly depressed
- 3 Flattened
- 4 Rounded
- 5 Pointed

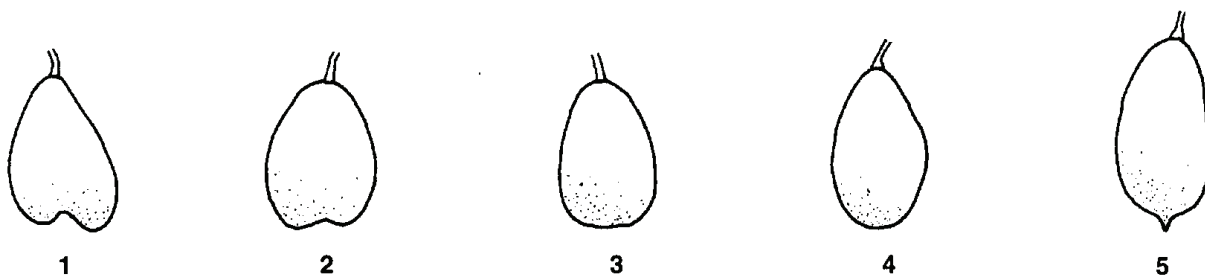


Fig. 17 Fruit apex shape

7.3.12 Fruit apex position

(See Fig. 18)

- 1 Central
- 2 Asymmetric

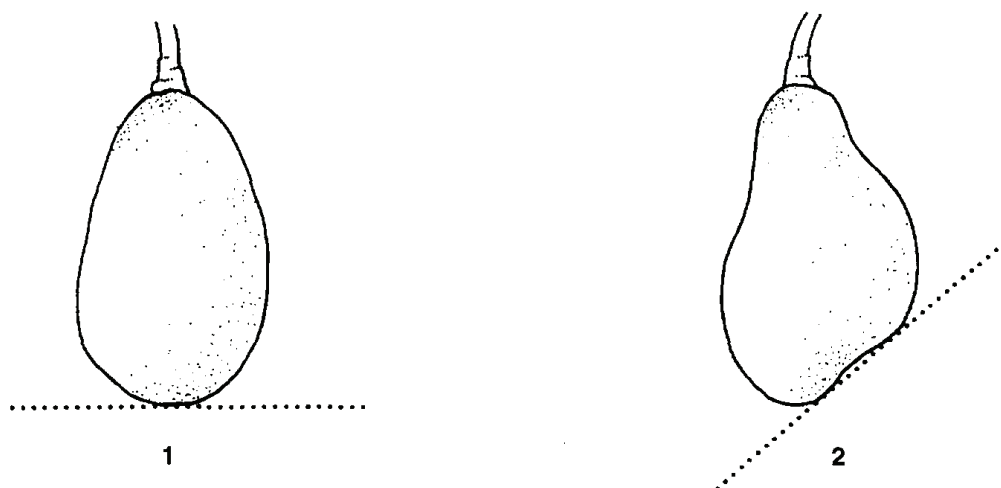


Fig. 18 Fruit apex position

7.3.13 Ridges on fruit

(See Fig. 19)

- 1 None (Absent)
- 2 Partial
- 3 Entire

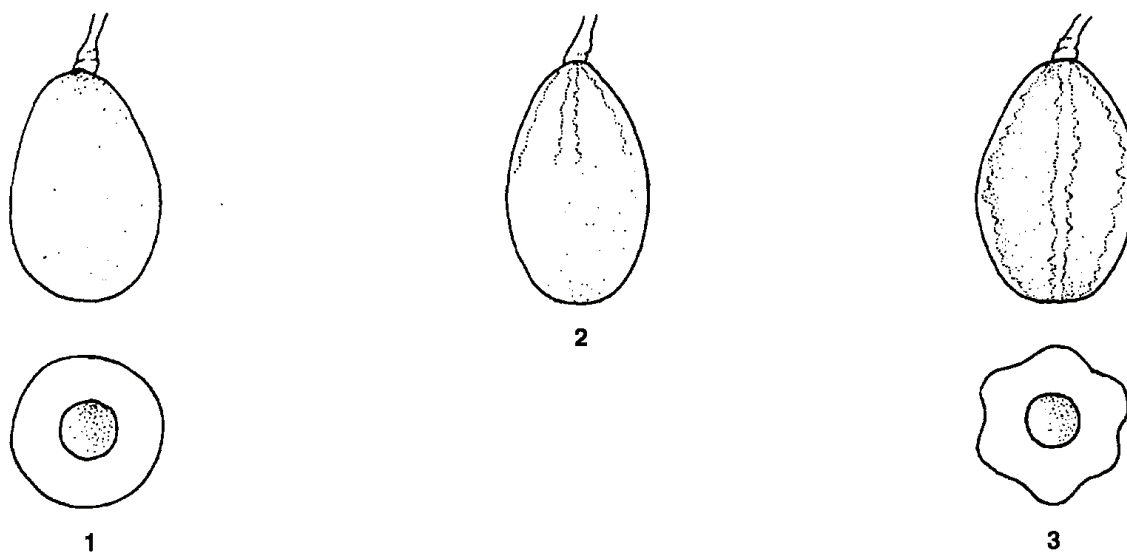


Fig. 19 Ridges on fruit

7.3.14 Gloss of fruit skin

- 3 Weak
- 5 Medium
- 7 Strong

7.3.15 Pedicel position on fruit

(See Fig. 20)

- 1 Central
- 2 Asymmetrical
- 3 Very asymmetrical
- 4 Extremely asymmetrical

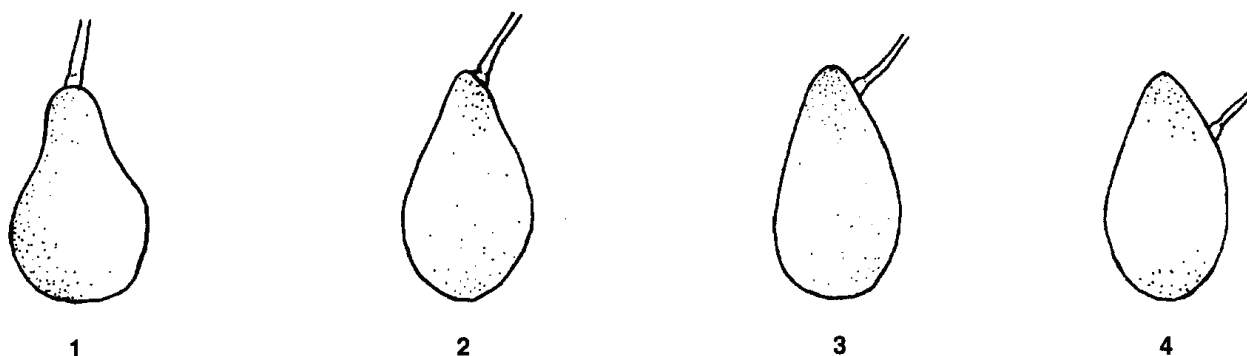


Fig. 20 Pedicel position on fruit

★ **7.3.16 Pedicel shape**

(See Fig. 21)

- 1 Cylindrical
- 2 Conical
- 3 Rounded
- 4 Other (specify in descriptor 7.5 Notes)

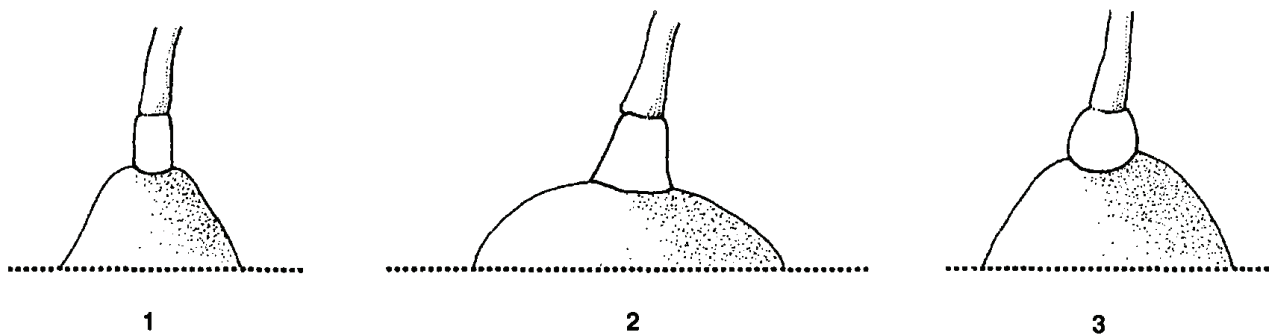


Fig. 21 Pedicel shape

7.3.17 Nailhead pedicel apex shape

(See Fig. 22)

- 0 Absent
- 1 Present

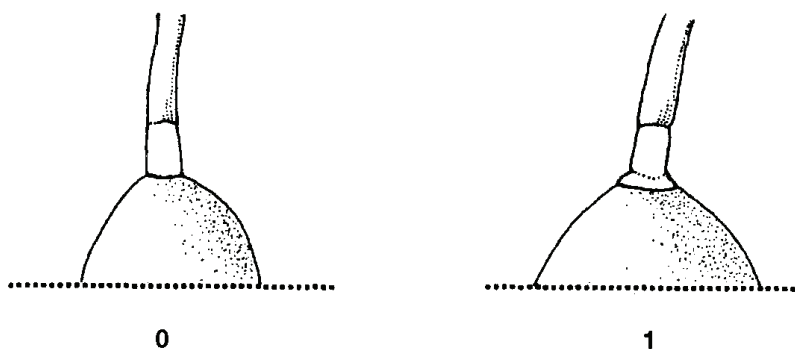


Fig. 22 Nailhead pedicel apex shape

For descriptors 7.3.18-7.3.21, five observations per accession should be taken

7.3.18 Peduncle length [cm]

Including the pedicel. (See Fig. 23)

7.3.19 Peduncle diameter [mm]

Recorded at the middle part

7.3.20 Pedicel length [cm]

(If it can be distinguished). (See Fig. 23)

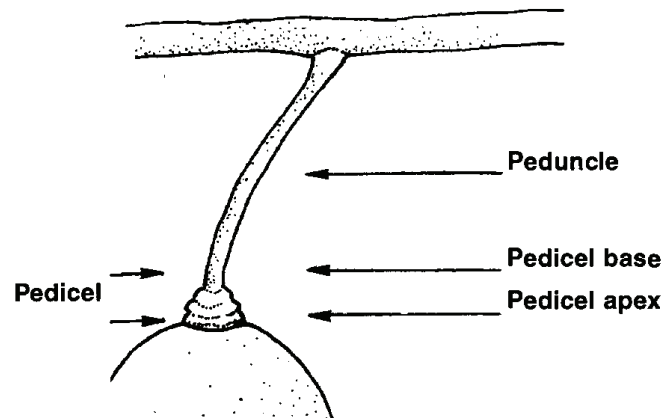


Fig. 23 Peduncle and pedicel

7.3.21 Pedicel colour

Recorded in mature fruits which grow in the shade

- 1 Yellow (yellow group 8A)
- 2 Green (yellow-green group 145A)
- 3 Orange (orange-red group 32A)
- 4 Red (red group 43A)
- 5 Brown (greyed-orange group 177B)
- 6 Other (specify in descriptor 7.5 Notes)

7.3.22 Conspicuousness of junction of pedicel with peduncle

- 1 Conspicuous
- 2 Inconspicuous

7.3.23 Absence/presence of perianth

- 0 Absent
- 1 Present

7.3.24 Fruit skin surface

- 3 Smooth
- 5 Intermediate
- 7 Rough

★ **7.3.25 Fruit skin colour**

Ripe fruits

- 1 Light green (green group 142A)
- 2 Green (green group 141B)
- 3 Dark green (green group 135A)
- 4 Yellow (yellow-green group 154A)
- 5 Red (orange-red group 30C)
- 6 Purple (purple group 79C)
- 7 Black (black group 202A)
- 8 Speckled
- 9 Other (specify in descriptor 7.5 Notes)

★ **7.3.26 Fruit skin thickness**

Average of five observations per accession

- 3 1 mm
- 5 2 mm
- 7 3 mm

7.3.27 Lenticel size on fruit

- 3 Small
- 5 Intermediate
- 7 Large

7.3.28 Density of lenticels on fruit

- 3 Sparse
- 5 Intermediate
- 7 Dense

7.3.29 Corky lenticel

- 0 Absent
- 1 Present

For descriptors 7.3.30 - 7.3.33 records should be taken using mature fruits

7.3.30 Pliability of fruit skin

- 1 Pliable
- 2 Brittle

7.3.31 Adherence of skin to flesh

- 3 Slight
- 5 Intermediate
- 7 Strong

7.3.32 Colour of flesh next to skin

Average of five ripe fruits

- 1 Ivory (yellow group 4D)
- 2 Light yellow (yellow-green group 154D)
- 3 Yellow (yellow group 6B)
- 4 Deep yellow (yellow group 7A)
- 5 Light green (yellow-green group 145A)
- 6 Green (yellow-green group 144A)
- 7 Other (specify in descriptor 7.5 Notes)

7.3.33 Colour of flesh next to seed

- 1 Ivory (yellow group 4D)
- 2 Light yellow (yellow-green group 154D)
- 3 Yellow (yellow group 6B)
- 4 Deep yellow (yellow group 7A)
- 5 Light green (yellow-green group 145A)
- 6 Green (yellow-green group 144A)
- 7 Other (specify in descriptor 7.5 Notes)

For descriptors 7.3.34 - 7.3.43 records should be taken using ripe fruits

★ 7.3.34 Flesh texture

- 1 Watery
- 2 Buttery
- 3 Pastose (doughy)
- 4 Granular
- 5 Other (specify in descriptor 7.5 Notes)

7.3.35 Sweetness of flesh

- 3 Low
- 5 Intermediate
- 7 High

7.3.36 Bitterness of flesh

- 3 Low
- 5 Intermediate
- 7 High

7.3.37 Nut taste of flesh

- 3 Low
- 5 Intermediate
- 7 High

7.3.38 Fibre in flesh

Presence of fibre in tasted flesh of ripe fruits

- 3 Low
- 5 Intermediate
- 7 High

7.3.39 General taste of flesh

- 1 Very poor
- 3 Poor
- 5 Fair
- 7 Good
- 9 Excellent

7.3.40 Degree of discolouration of open fruit after 4 h

- 3 Low
- 5 Intermediate
- 7 High

7.3.41 Colour of discolouration

- 1 Blue
- 2 Brown
- 3 Grey
- 4 Black

7.3.42 Storage days of fruit [d]

Number of days to softening (ripening) at room temperature (20°C)

7.3.43 Shelf life of fruit [d]

Number of days ripe fruit keeps at room temperature (20°C)

7.4 Seed

★ **7.4.1 Seed shape**

(See Fig. 24)

- 1 Oblate
- 2 Spheroid
- 3 Ellipsoid
- 4 Ovate
- 5 Broadly ovate
- 6 Cordiform
- 7 Base flattened, apex rounded
- 8 Base flattened, apex conical
- 9 Other (specify in descriptor 7.5 Notes)

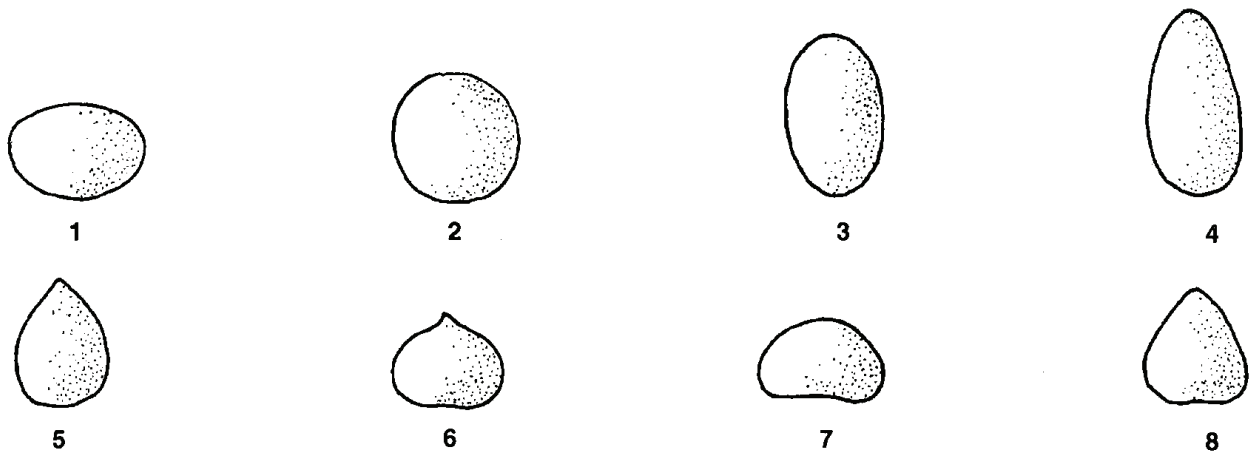


Fig. 24 Seed shape

- 7.4.2 **Seed weight [g]**

- ★ 7.4.3 **Cotyledon surface**
 - 3 Smooth
 - 5 Intermediate
 - 7 Rough

- 7.4.4 **Attachment of cotyledons**
 - 0 Not attached
 - 1 Attached

- 7.4.5 **Cotyledon colour**
 - 1 Ivory (white group 155A)
 - 2 Cream (yellow-white group 158B)
 - 3 Yellow (yellow-orange group 20B)
 - 4 Pink (red group 38B)
 - 5 Other (specify in descriptor 7.5 Notes)

For descriptors 7.4.6-7.4.9, average of five fruits per accession

- 7.4.6 **Length of seed cavity [cm]**

- 7.4.7 **Diameter of seed cavity [cm]**

- 7.4.8 **Length of seed [cm]**

- 7.4.9 **Diameter of seed [cm]**

7.4.10 Seed coat

Ripe fruits

- 1 Seed not free, coat not attached to the flesh
- 2 Seed not free, coat attached to the flesh
- 3 Seed free, coat not attached to the flesh
- 4 Seed free, coat attached to the flesh

7.4.11 Seed position in fruit

- 1 Basal
- 2 Central
- 3 To one side
- 4 Apical

7.4.12 Free space of the seed cavity

(If appropriate.) Specify time of measurement. (See Fig. 25)

- 1 Space on seed apex
- 2 Space on seed base
- 3 Space on seed apex and base
- 4 Other (specify in descriptor 7.5 Notes)

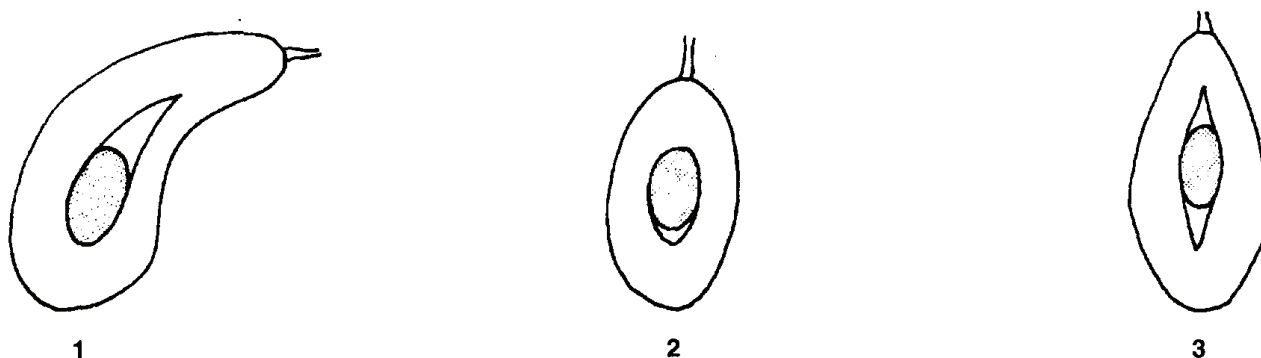


Fig. 25 Free space of seed cavity

7.4.13 Shape of seed cross-section

- 1 Circular
- 2 Elliptical

7.4.14 Embryo axis position [mm]

Relative to the cotyledon length. Indicate position from the base of the cotyledons

7.5 Notes

Any additional information, especially in the category of 'other' under various descriptors above, may be specified here

EVALUATION

8. Plant descriptors

8.1 Fruit

8.1.1 Yield per tree [kg y⁻¹]
Average of eight trees per accession

8.1.2 Yield behaviour
Average of eight trees per accession

- 1 Continuous
- 2 Alternate
- 3 Erratic

★ **8.1.3 Productivity** [kg m⁻²]
Average of eight trees per accession. Yield relative to tree canopy size calculated from length and width

8.1.4 Number of days fruit is held on tree after reaching maturity [d]

★ **8.1.5 Flesh oil** [%]
Taken from mature fruit (not ripe). Indicate method of estimation

8.1.6 Oil composition

8.2 Notes

Specify here any 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:

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

9.1 Low temperature

9.2 High temperature

- 9.3 Waterlogging
- 9.4 Drought
- 9.5 Heavy and compact soil (lack of aeration)
- 9.6 Iron chlorosis
- 9.7 Saline soil
- 9.8 Alkaline soil
- 9.9 Saline water
- 9.10 Wind
- 9.11 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, laboratory. Indicate the age of plant when damage is observed. Record such information in descriptor 10.5 Notes. These are coded on a susceptibility scale from 1 to 9:

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

10.1 Pests

Causal organism	Pest or common name
10.1.1 <i>Oligonychus</i> spp.	Red mite
10.1.2 <i>Heliothrips haemorrhoidalis</i>	Thrips
10.1.3 <i>Trioza anceps</i>	Leaf gall
10.1.4 <i>Conotrachelus aguacatae</i>	Seed weevil
10.1.5 <i>Copturus aguacatae</i>	Branch weevil (borer)

10.2 Fungi

Causal organism	Disease or common name
10.2.1 <i>Phytophthora cinnamomi</i>	Root rot
10.2.2 <i>Phytophthora citricola</i>	Collar rot
10.2.3 <i>Sphaceloma perseae</i>	Fruit scab
10.2.4 <i>Colletotrichum gloeosporioides</i> (teleomorph: <i>Glomerella cingulata</i>)	Anthracnose
10.2.5 <i>Nectria galligena</i>	Trunk canker
10.2.6 <i>Verticillium albo-atrum</i>	Wilt (Dieback)
10.2.7 <i>Diplodia phomopsis</i> (teleomorph: <i>Botryodiplodia theobromae</i>)	Stem-end rot

10.3 Bacteria

10.3.1 <i>Agrobacterium tumefaciens</i>	Crown gall
10.3.2 <i>Pseudomonas syringae</i>	Fruit blast

10.4 Viruses and virus-like agents

10.4.1 Avocado sunblotch viroid	ASBVd
10.4.2 Unknown	Black streak

10.5 Notes

Specify here any additional information

11. Biochemical markers**11.1 Isozyme**

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.

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 analyzed

12.1 Restriction Fragment Length Polymorphism (RFLP)

12.2 Other molecular markers

(e.g. Random Amplified Polymorphic DNA (RAPD); Specific Amplicon Polymorphism (SAP))

13. Cytological characters

13.1 Chromosome number

13.2 Ploidy level

(e.g. aneuploid or structural rearrangement)

13.3 Other cytological characters

14. Identified genes

Describe any known specific mutant present in the accession

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Descriptors for

Litchi

Litchi chinensis



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The geographical designations employed and the presentation of material in this publication do not imply the expression of any opinion whatsoever on the part of IPGRI or the CGIAR concerning the legal status of any country, territory, city or area or its authorities, or concerning the delimitation of its frontiers or boundaries. Similarly, the views expressed are those of the authors and do not necessarily reflect the views of these organizations.

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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	Quinoa * (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	<i>Lathyrus</i> 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	<i>Setaria italica</i> and	
Black pepper (E,S)	1995	Maize (E,S,F, P)	1991	<i>S. pumilia</i> (E)	1985
<i>Brassica</i> and <i>Raphanus</i> (E)	1990	Mango (E)	1989	Sorghum (E,F)	1993
<i>Brassica campestris</i> L. (E)	1987	Medicago (Annual) * (E,F)	1991	Soyabean * (E,C)	1984
Buckwheat (E)	1994	Mung bean * (E)	1980	Strawberry (E)	1986
<i>Capsicum</i> (E,S)	1995	Oat * (E)	1985	Sunflower * (E)	1985
Cardamom (E)	1994	Oca * (S)	2001	Sweet potato (E,S,F)	1991
Carrot (E,S,F)	1999	Oil palm (E)	1989	Taro (E,F,S)	1999
Cashew (E)	1986	<i>Panicum miliaceum</i> and		Tea (E,S,F)	1997
Cherry * (E)	1985	<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	
Coconut (E)	1992	Pear * (E)	1983	<i>V. trilobata</i> (E)	1985
Coffee (E,S,F)	1996	Pearl millet (E,F)	1993	<i>Vigna mungo</i> and	
Cotton (Revised) (E)	1985	<i>Phaseolus acutifolius</i> (E)	1985	<i>V. radiata</i> (Revised) * (E)	1985
Cowpea (E)	1983	<i>Phaseolus coccineus</i> * (E)	1983	Walnut (E)	1994
Cultivated potato * (E)	1977	<i>Phaseolus vulgaris</i> * (E,P)	1982	Wheat (Revised) * (E)	1985
Echinochloa millet * (E)	1983	Pigeonpea (E)	1993	Wheat and <i>Aegilops</i> * (E)	1978
Eggplant (E,F)	1990	Pineapple (E)	1991	White Clover (E)	1992
Faba bean * (E)	1985	<i>Pistacia</i> (excluding <i>Pistacia</i>		Winged Bean * (E)	1979
Finger millet (E)	1985	<i>vera</i>) (E)	1998	Xanthosoma (E)	1989
Forage grass * (E)	1985	Pistachio (A,R,E,F)	1997	Yam (E,S,F)	1997

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 site¹

[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.

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

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

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 hardness 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 | 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 6.1.26 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 | 5 Upland |
| 2 Basin | 6 Hill |
| 3 Valley | 7 Mountain |
| 4 Plateau | |

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 | 17 Interdunal depression |
| 2 Escarpment | 18 Mangrove |
| 3 Interfluvial | 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 | |

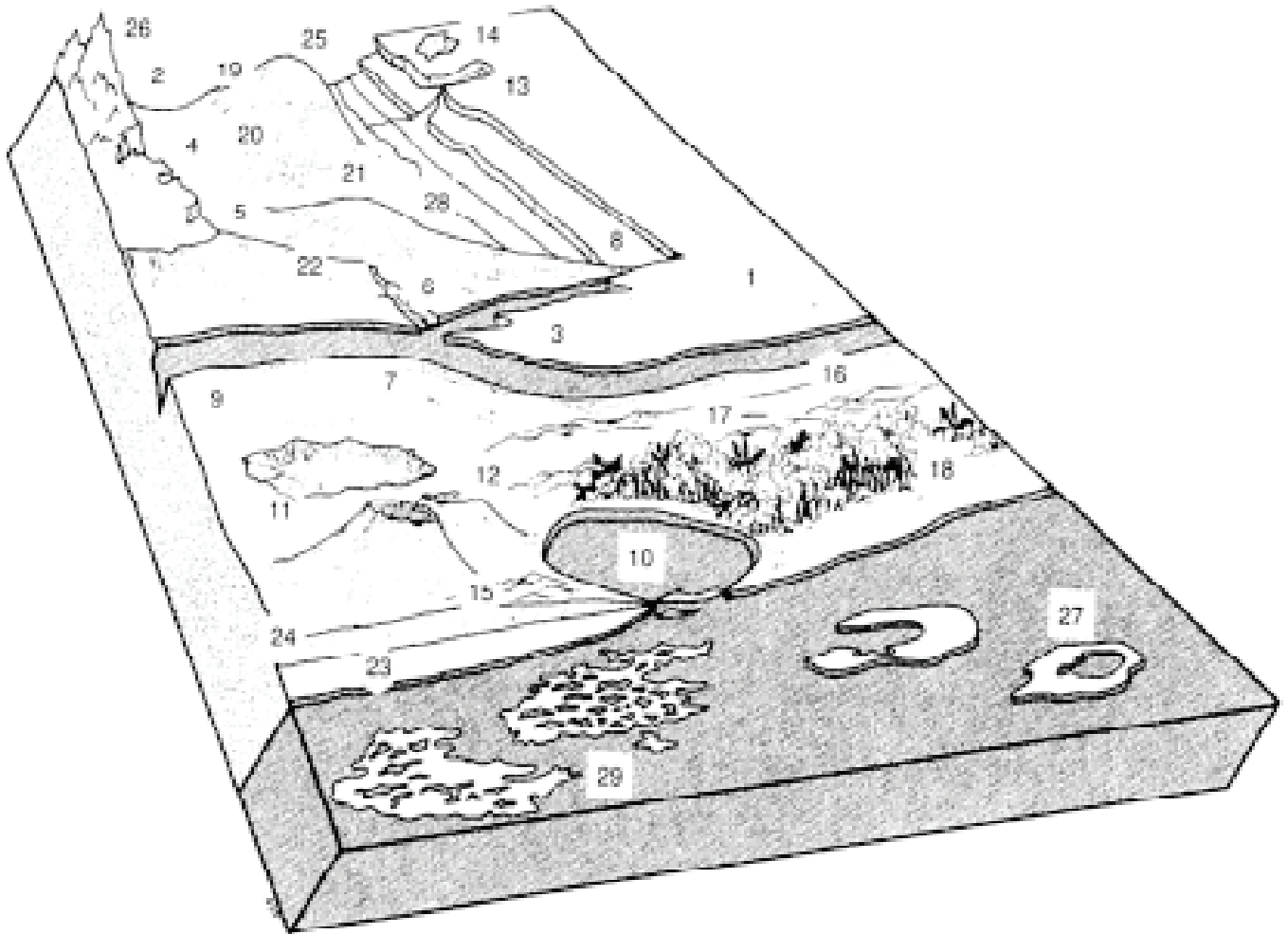


Fig. 1. Land element and position

6.1.4 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 | 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 |

6.1.17 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 | 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 |

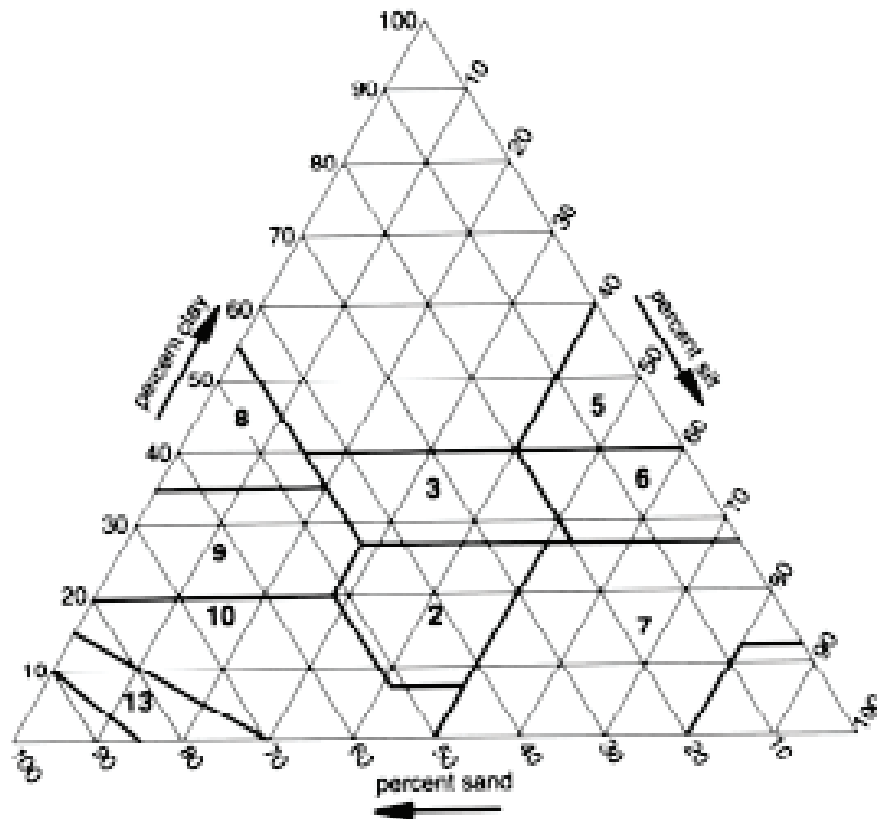


Fig. 2. Soil texture classes

6.1.22 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 0°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 [m³]

Calculated with the use of formula $\frac{4}{3} \pi a^2 b$ (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)

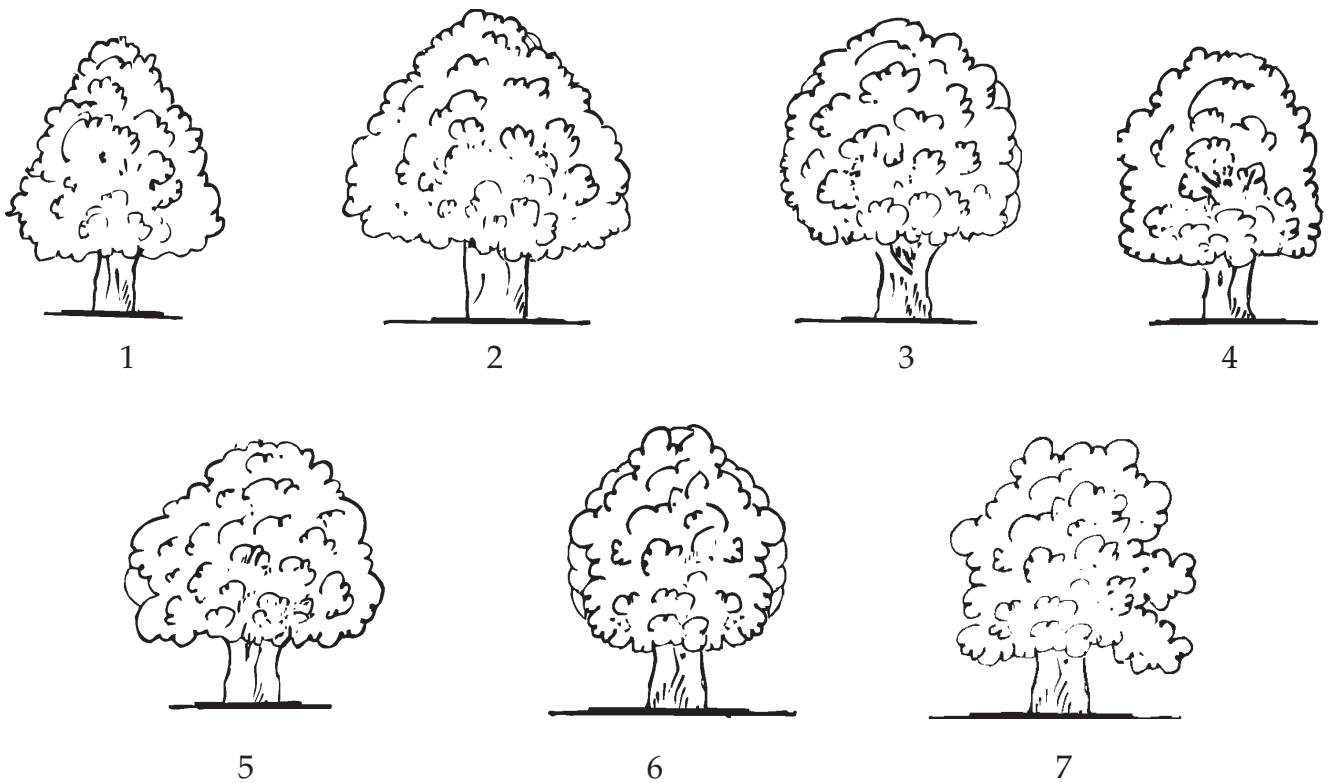


Fig. 3. Crown shape

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

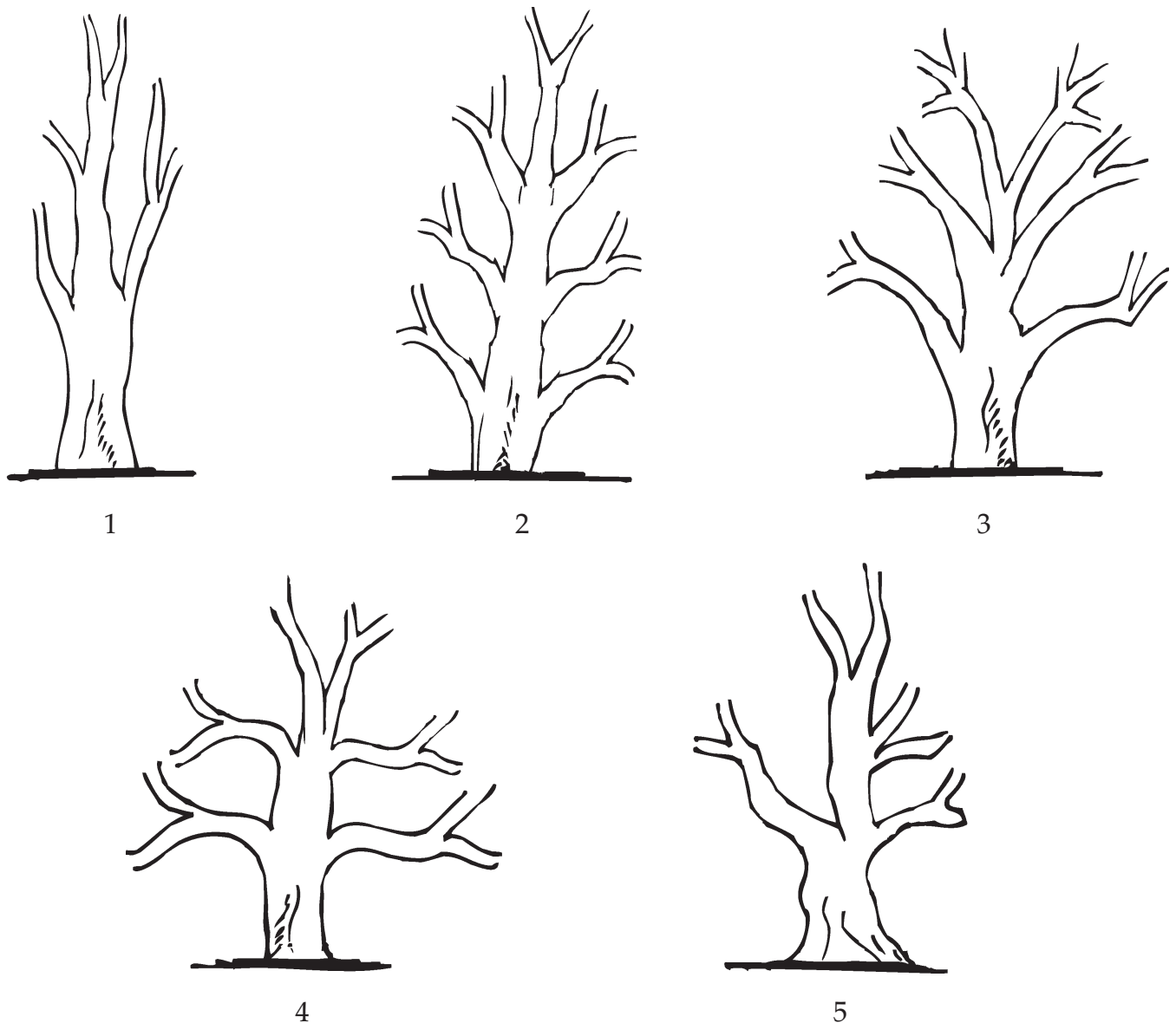


Fig. 4. Branching pattern

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

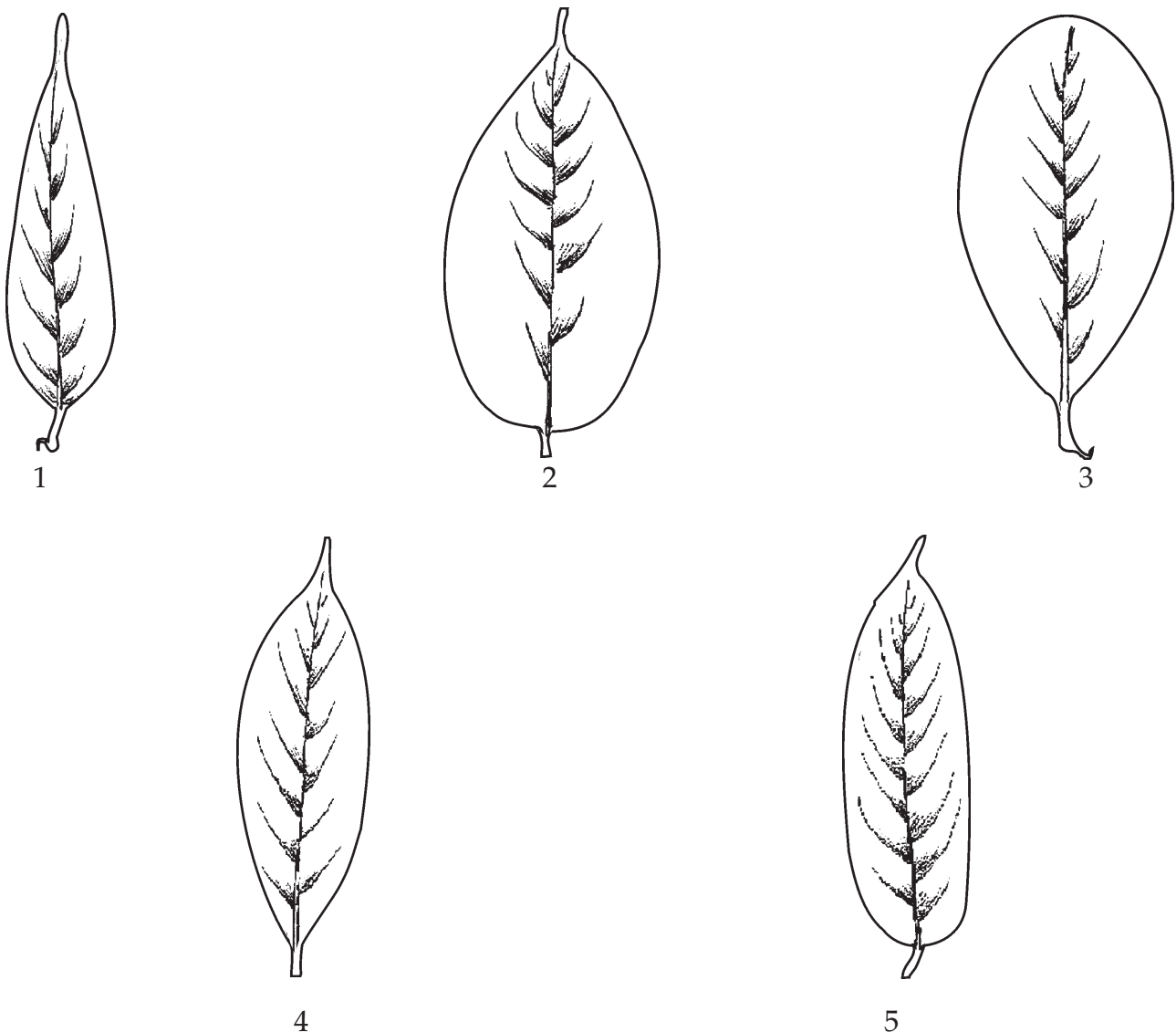
7.2.8 Leaflet blade width [cm]

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)



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)

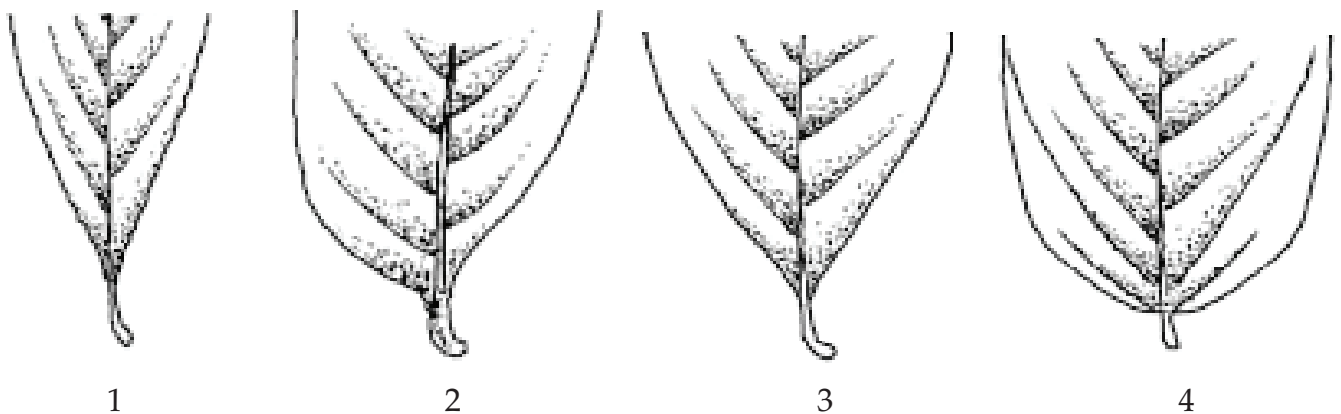


Fig. 7. Leaflet base shape

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)

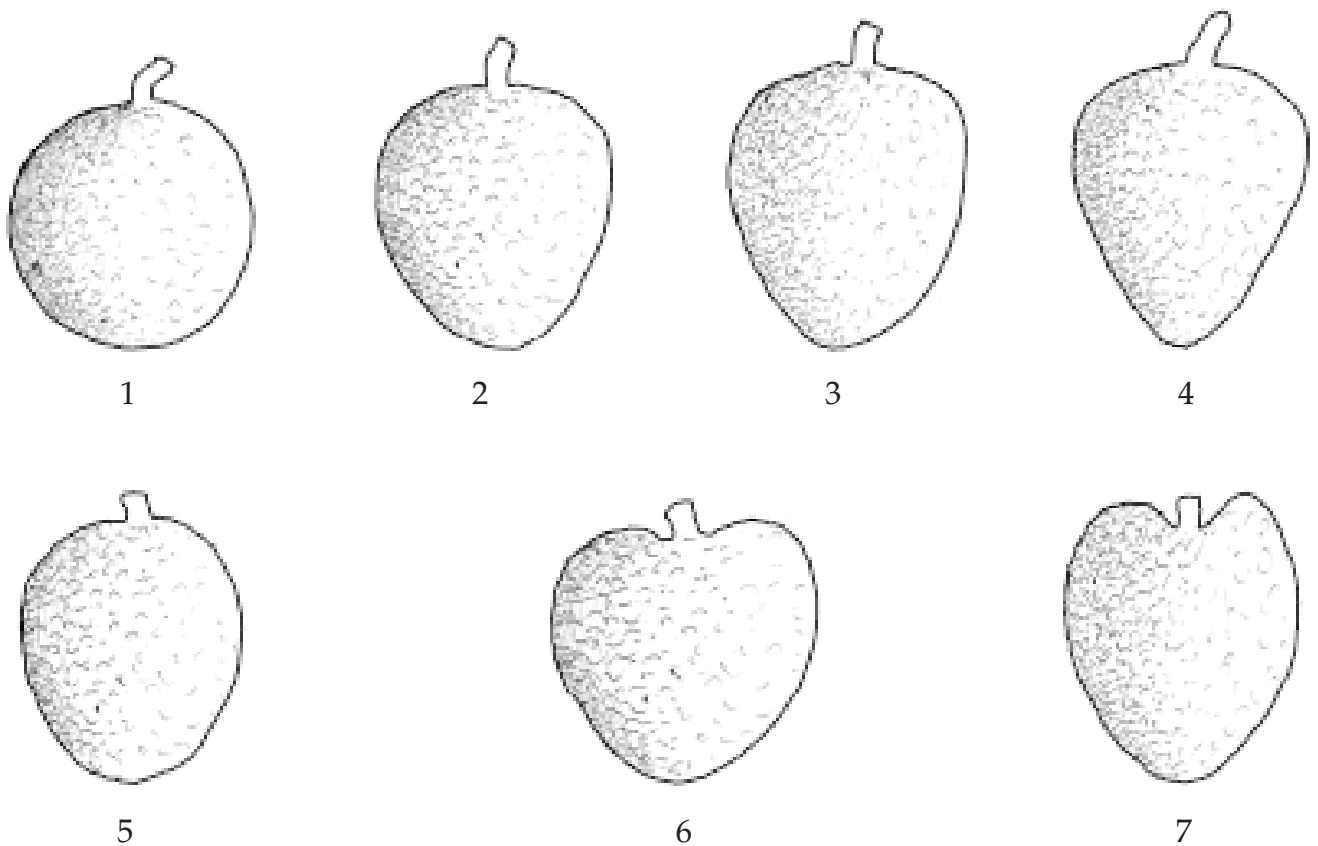


Fig. 8. Fruit shape

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

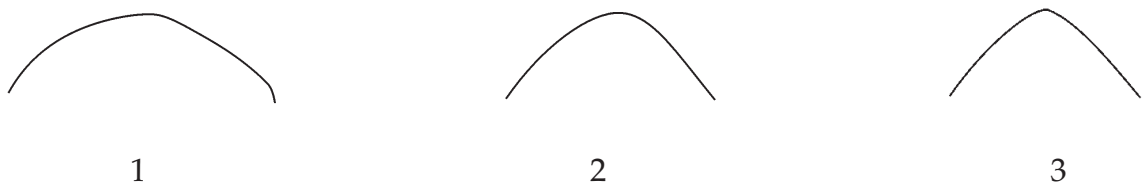


Fig. 10. Fruit tip

7.4.14 Fruit segments

(See Fig. 11)

- 1 Sharp pointed
- 2 Nipple shaped
- 3 Swelling type
- 4 Smooth

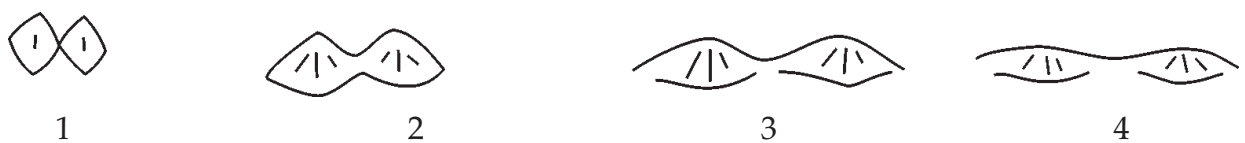


Fig. 11. Fruit segments

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

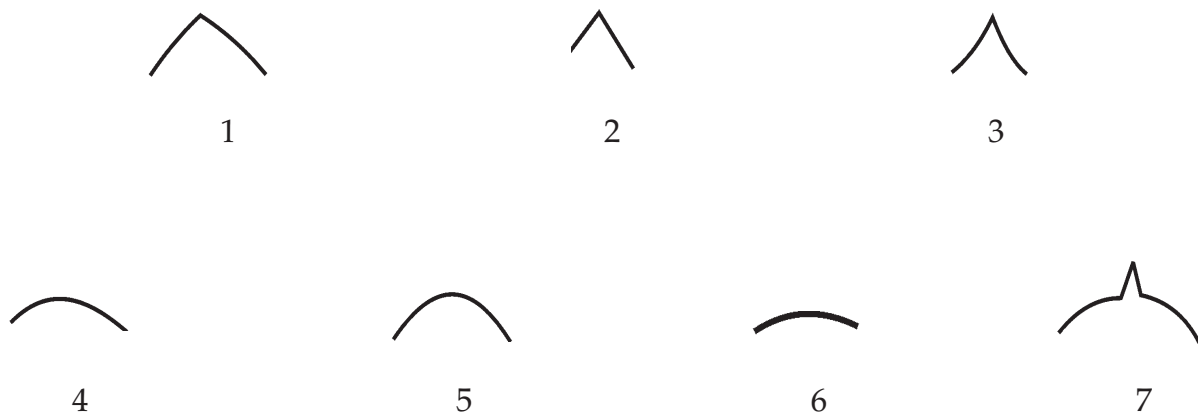


Fig. 12. Shape of tubercles/protuberances

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)

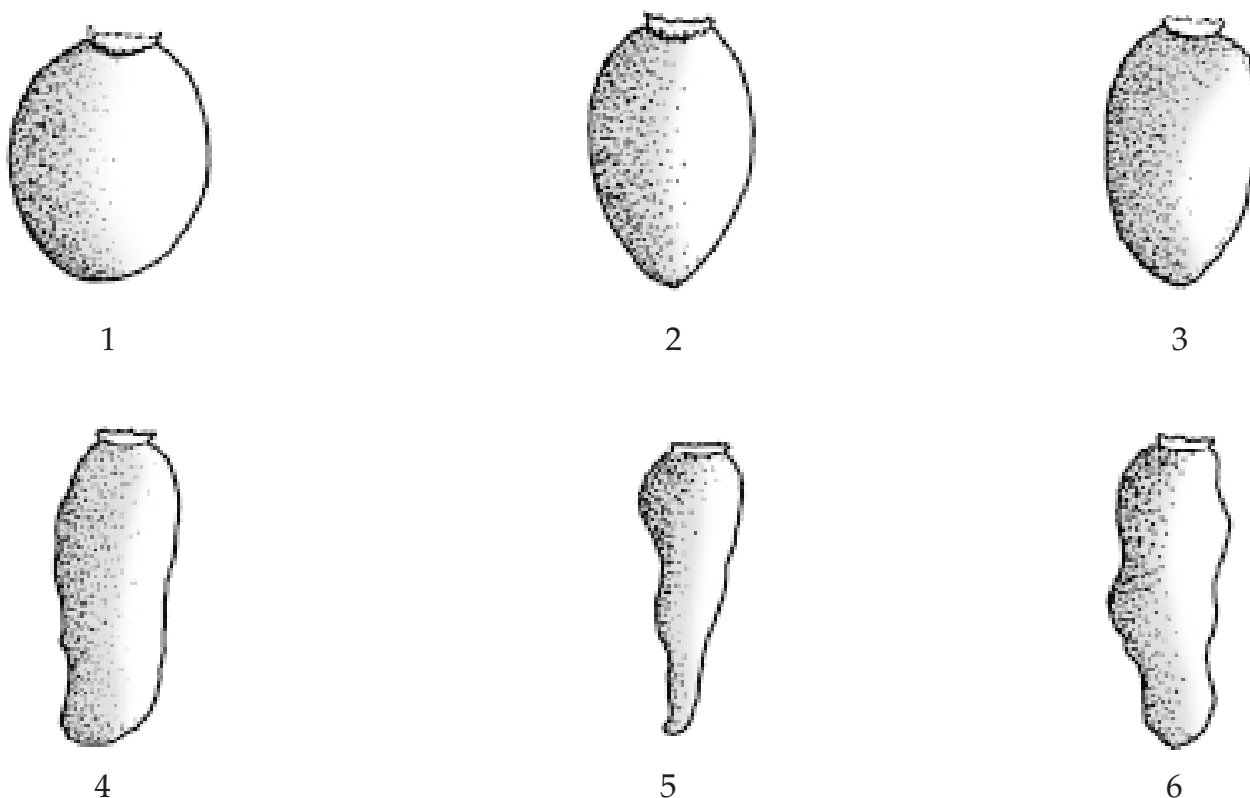


Fig. 13. Seed shape

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

10.2 Diseases

10.2.1	<i>Botryodiplodia theobromae</i>	Spot in leaf, fruit and flower
10.2.2	<i>Cephaleuros virens</i>	Leaf spot disease
10.2.3	<i>Colletotrichum gleosporioides</i>	Fruit rot
10.2.4	<i>Pestalotia pauciseta</i>	Spot on leaf and fruit
10.2.5	<i>Dictyoarthrinium</i> sp.	Twig blight
10.2.6	<i>Fusarium</i> 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 zymogram 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 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 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 composition 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

Descriptors for Coffee

(*Coffea* spp. and *Psilanthus* spp.)



DEFINITIONS AND USE OF THE DESCRIPTORS

IPGRI now 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 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: Many of the descriptors in this category are susceptible to environmental differences but are generally useful in crop improvement and others may involve complex biochemical or molecular characterization. They include yield, agronomic performance, stress susceptibilities and biochemical and cytological traits.

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.

Minimum highly discriminating descriptors are marked with a star (★).

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

- (a) the *Système International d'Unités* (SI system) is used. The units to be applied are given in square brackets following the descriptor name;
- (b) standard colour charts, e.g. Royal Horticultural Society Colour Chart, Methuen Handbook of Colour, or Munsell Color 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);

- (c) 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 9 (Biotic stress susceptibility), 1 = very low susceptibility and 9 = very high susceptibility;

- (d) when a descriptor is scored using a 1-9 scale, such as in (c), '0' would be scored when (i) the character is not expressed; (ii) when 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

3	Toothed
5	Elliptic
7	Linear

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

Absence/presence of terminal leaflet

0	Absent
1 (or +)	Present

- (f) blanks are used for information not yet available;
- (g) 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 R.S. Rana *et al.* (1991), or van Hintum (1993), that clearly state a method for scoring heterogeneous accessions;
- (h) dates should be expressed numerically in the format DDMMYYYY, where

DD	- 2 digits to represent the day
MM	- 2 digits to represent the month
YYYY	- 4 digits to represent the year.

PASSPORT

1. Accession descriptors

★ **1.1 Accession number** (2.1)

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 is still not available for re-use. 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).

1.2 Donor name

Name of institution or individual responsible for donating the germplasm

1.3 Donor number

Number assigned to an accession by the donor

★ **1.4 Other number(s) associated with the accession**

Any other identification number known to exist in other collections for this accession, e.g. USDA Plant Inventory number (not **Collecting number**, see **2.3**). Other numbers can be added as 1.4.3, etc.

1.4.1 Other number 1

1.4.2 Other number 2

★ **1.5 Scientific name**

1.5.1 Genus

1.5.2 Species

1.5.3 Subspecies

1.5.4 Botanical variety

1.6 Pedigree

Parentage or nomenclature, and designations assigned to breeders' material

1.7 Cultivar name

1.7.1 Cultivar name

Either a registered or other formal cultivar designation given to the accession

1.7.2 Translation/Transliteration

Provide translation of the local cultivar name into English

1.7.3 Synonyms

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

1.8 Acquisition date [DDMMYYYY] (2.2)

Date on which the accession entered the collection

1.9 Type of material received

- 1 Plant (including seedling)
- 2 Fruit/berry
- 3 Shoot/bud
- 4 Pollen
- 5 Other (specify in descriptor 1.11 Notes)

1.10 Accession size

Approximate number of seed progeny of an accession introduced into the genebank

1.11 Notes

Any additional information may be specified here

2. Collecting descriptors

★ **2.1 Collecting institute(s)**

Institute(s) and people collecting/sponsoring the sample collection

2.2 Site number

Number assigned to the physical site by the collector

2.3 Collecting number (1.1)

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 item is essential for identifying duplicates held in different collections. It should be unique and always accompany subsamples wherever they are sent.

2.4 Collecting date of original sample [DDMMYYYY] (1.3)

2.5 Country of collecting (1.4)

Name of the country in which the sample was collected or bred. Use the three-letter abbreviations from the *International Standard (ISO) Codes for the representation of names of countries*, No. 3166, 4th Edition. Copies of these are available from DIN: Deutsche Institut für Normung e.V., 10772 Berlin, Germany; Tel. 30-2601-2860; Fax 30-2601-1231, Tlx. 184 273-din-d.

2.6 Province/State (1.5)

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 Province/State) of the country in which the sample was collected

2.8 Location of collecting site

Distance in kilometers and direction from the nearest town, village or map grid reference point (e.g. CURITIBA 7S means 7 km south of Curitiba)

2.9 Latitude of collecting site (1.8)

Degrees and minutes followed by N (North) or S (South) (e.g. 1030S)

2.10 Longitude of collecting site (1.9)

Degrees and minutes followed by E (East) or W (West) (e.g. 07625W)

★ 2.11 Elevation of collecting site [m asl] (1.7)**2.12 Collecting source (1.6)**

1. Wild habitat
 - 1.1 Forest/woodland
 - 1.2 Shrubland
 - 1.3 Grasslands
 - 1.4 Desert/tundra
2. Farm
 - 2.1 field
 - 2.2 orchard
 - 2.3 garden
 - 2.4 fallow
 - 2.5 pasture
 - 2.6 store
3. Market
 - 3.1 Town
 - 3.2 Village
 - 3.3 Urban
 - 3.4 Other exchange system
4. Institute/Research organization
5. Other (specify in descriptor **2.30 Collector's notes**)

2.13 Collecting source environment

Use descriptors **5.1.1 to 5.1.22** in section 5

2.14 Status of sample

- 1 Wild
- 2 Weedy
- 3 Primitive cultivar/Landrace
- 4 Breeders line
- 5 Advanced cultivar
- 6 Unknown
- 7 Other (e.g. 'semi-wild', 'subsontaneous', specify in descriptor **2.30 Collector's notes**)

2.15 Type of sample

Form 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 Zygotic embryo
- 2 Seed
- 3 Vegetative
- 4 Pollen
- 5 Tissue culture (specify which part of the plant is used in descriptor **2.30 Collector's notes**)

2.16 Population size

Number of genotypes sampled. If estimated, provide method used: (i) row per column count; (ii) area per plant density; for both, allow for missing stands

2.17 Population isolation [km]

Straight line distance between two adjacent collecting sites

2.18 Number of clonal material (stem cuttings) collected [number]

2.19 Type of stem cuttings collected

- 1 Terminal shoots
- 2 Lateral shoots
- 3 Runners
- 4 Hanging shoots

2.20 Cropping system

- 1 Monoculture
- 2 Mixed (with food crops)
- 3 Ancillary crops with timber
- 4 Other (specify crop in descriptor **2.30 Collector's notes**)

2.21 Associated flora

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

2.22 Cultural practices**2.22.1 Planting date** [DDMMYYYY]**2.22.2 First harvest date** [DDMMYYYY]**2.22.3 Irrigation**

Specify amount, frequency and method of application

2.22.4 OtherSpecify in descriptor **2.30 Collector's notes****★ 2.23 Local/vernacular name** (1.2)

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

2.24 Ethnic group

Name of the tribe of the farmer donating the sample or of the people living in the area of collecting

2.25 Uses of the accession

1 Beverage

2 Medicinal

3 Other (specify in descriptor **2.30 Collector's notes**)**2.26 Photograph**Was a photograph(s) taken of the accession or habitat at the time of collecting? If so, provide an identification number(s) in descriptor **2.30 Collector's notes**.

0 No

1 Yes

2.27 Herbarium specimenWas a herbarium specimen collected? If so, provide an identification number and indicate in which place (herbarium) the coffee specimen was deposited, in descriptor **2.30 Collector's notes**.

0 No

1 Yes

2.28 Prevailing stressesInformation on associated biotic and abiotic stresses. Indicate if disease indexing was done at the time of collecting in descriptor **2.30 Collector's notes**.

2.29 Genetic erosion

Estimate of the rate at which genetic erosion of the species is occurring in the region of collecting

- 3 Slow
- 5 Intermediate
- 7 Rapid

2.30 Collector's notes

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

MANAGEMENT

3. Plant management descriptors

3.1 Accession number (Passport 1.1)

3.2 Field preservation

3.2.1 Field location

3.2.2 Planting date [DDMMYYYY]

3.2.3 Root system
(Differs if it is seedling, cutting or grafting)

3.2.4 Field duplicates
For each duplicate indicate field location, planting date and root system

3.2.4.1 Field location

3.2.4.2 Planting date [DDMMYYYY]

3.2.4.3 Root system

3.3 *In vitro* preservation

3.3.1 Type of explant

- 1 Apical or axillary meristem
- 2 Nodal cutting
- 3 Zygotic embryo
- 4 Seed
- 5 Leaf
- 6 Other (specify in descriptor 3.5 Notes)

3.3.2 Introduction date [DDMMYYYY]

3.3.3 Type of subcultured material

- 1 Axillary shoot
- 2 Callus
- 3 Cell suspension
- 4 Other (specify in descriptor 3.5 Notes)

3.3.4 Regeneration process

- 1 Organogenesis
- 2 Somatic embryogenesis
- 3 Other (specify in descriptor 3.5 Notes)

3.3.5 Number of plants at the establishment
(Number of replicates)

3.3.6 Last subculture date [DDMMYYYY]

3.3.7 Medium used at the last subculture

3.3.8 Number of plants at the last subculture

3.3.9 Location after the last subculture

3.4 Cryopreservation

3.4.1 Type of material for cryopreservation

- 1 Seed
- 2 Zygotic embryo
- 3 Apex
- 4 Somatic embryo
- 5 Callus
- 6 Cell suspension
- 7 Other (specify in descriptor 3.5 Notes)

3.4.2 Introduction date in liquid nitrogen [DDMMYYYY]

3.4.3 Number of plants introduced in liquid nitrogen

3.4.4 End of storage period [DDMMYYYY]

3.4.5 Number of plants taken from liquid nitrogen

3.4.6 Type of subcultured material for recovery

(After liquid nitrogen)

- 1 Axillary shoot
- 2 Callus
- 3 Cell suspension
- 4 Other (specify in descriptor 3.5 Notes)

3.4.7 Regeneration process

- 1 Organogenesis
- 2 Somatic embryogenesis
- 3 Other (specify in descriptor 3.5 Notes)

3.4.8 Number of recovery samples

3.4.9 Location after the last subculture

3.5 Notes

Any additional information may be specified here

ENVIRONMENT AND SITE

4. Characterization and/or evaluation site descriptors

4.1 Country of characterization and/or evaluation

(See instructions in 2.5 Country of collecting)

4.2 Site (research institute)

4.2.1 Latitude

Degrees and minutes followed by N (North) or S (South) (e.g. 1030S)

4.2.2 Longitude

Degrees and minutes followed by E (East) or W (West) (e.g. 07625 W)

4.2.3 Elevation [m asl]

4.2.4 Name of farm or institute

4.3 Evaluator's name and address

4.4 Planting or last stumping date [DDMMYYYY]

4.5 First harvest date [DDMMYYYY]

4.6 Last harvest date [DDMMYYYY]

4.7 Evaluation environment

Environment in which characterization/evaluation was carried out

- 1 Field
- 2 Screenhouse
- 3 Glasshouse/plastic house
- 4 Laboratory
- 5 Other (specify in descriptor 4.15 Notes)

4.8 Number of plants established [/ha]

4.9 Planting site in field

Give block, strip and/or row/plot numbers as applicable, plants/plot, replication

4.10 Field spacing

4.10.1 Distance between plants in a row [m]

4.10.2 Distance between rows [m]

4.11 Environmental characteristics of site

Use descriptors 5.1.1 to 5.1.22 in section 5

4.12 Fertilizer

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

4.13 Irrigation

Specify method and frequencies

4.14 Plant protection

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

4.15 Notes

Any other site-specific information

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

5.1 Site environment

★ **5.1.1 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 - 10.9%
5	Rolling	11 - 15.9%
6	Hilly	16 - 30%
7	Steeply dissected	>30%, moderate elevation range
8	Mountainous	>30%, great elevation range (>300 m)
9	Other	(specify in appropriate section's Notes)

★ **5.1.2 Higher level landform (general physiographic features)**

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

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

5.1.3 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 | 15 | Dune |
| 2 | Escarpment | 16 | Longitudinal dune |
| 3 | Interfluve | 17 | Interdunal depression |
| 4 | Valley | 18 | Mangrove |
| 5 | Valley floor | 19 | Upper slope |
| 6 | Channel | 20 | Midslope |
| 7 | Levee | 21 | Lower slope |
| 8 | Terrace | 22 | Ridge |
| 9 | Floodplain | 23 | Beach |
| 10 | Lagoon | 24 | Beachridge |
| 11 | Pan | 25 | Rounded summit |
| 12 | Caldera | 26 | Summit |
| 13 | Open depression | 27 | Coral atoll |
| 14 | Closed depression | 28 | Drainage line (bottom position in flat or almost-flat terrain) |
| | | 29 | Coral reef |
| | | 30 | Other (specify in appropriate section's Notes) |

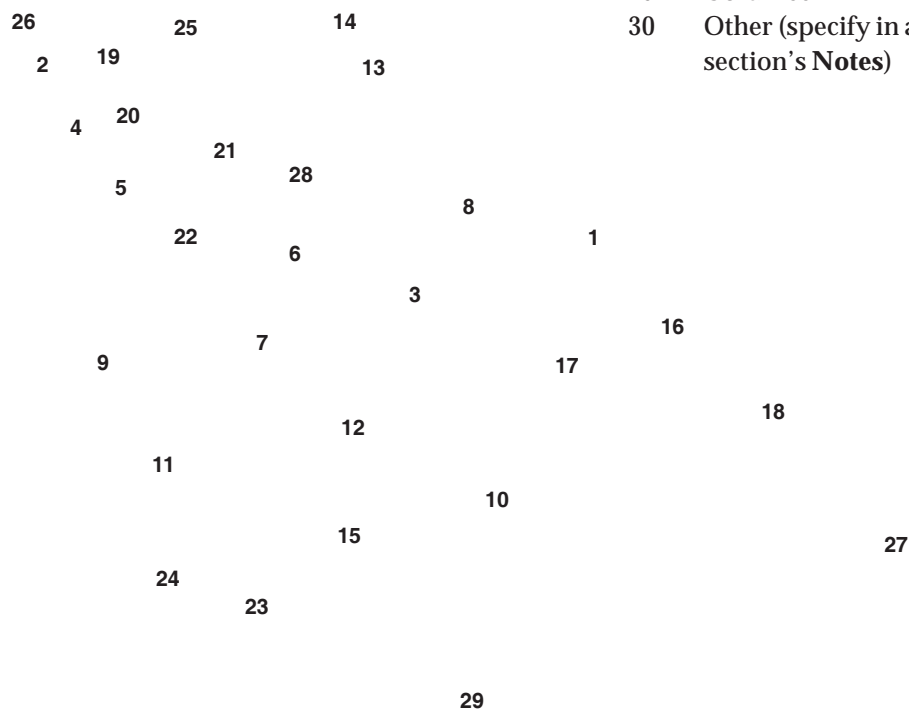


Fig. 1 Land element and position

★ **5.1.4 Slope [°]**
Estimated slope of the site

★ **5.1.5 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 southwestern direction has an aspect of SW)

5.1.6 Crop agriculture
(From FAO 1990)

- 1 Annual field cropping
- 2 Perennial field cropping

5.1.7 Overall vegetation surrounding and at the site
(From FAO 1990)

- 1 Grassland (Grasses, subordinate forbs, no woody species)
- 2 Forbland (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 Shrubland (Continuous layer of shrubs, crowns touching)
- 6 Savanna (Grasses with a discontinuous layer of trees or shrubs)
- 7 Other (specify in appropriate section's **Notes**)

5.1.8 Soil parent 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.

5.1.8.1 Unconsolidated material

- | | |
|----------------------------------|--------------------------------|
| 1 Aeolian deposits (unspecified) | 9 Unconsolidated (unspecified) |
| 2 Aeolian sand | 10 Volcanic ash |
| 3 Littoral deposits | 11 Loess |
| 4 Lagoonal deposits | 12 Pyroclastic deposits |
| 5 Marine deposits | 13 Glacial deposits |
| 6 Lacustrine deposits | 14 Organic deposits |
| 7 Fluvial deposits | 15 Colluvial deposits |
| 8 Alluvial deposits | 16 <i>In situ</i> weathered |

- 17 Saprolite
- 18 Other (specify in appropriate section's **Notes**)

5.1.8.2 Rock type

- | | | | |
|----|------------------------------------|----|--------------------------------------------------------|
| 1 | Acid igneous/
metamorphic rock | 16 | Limestone |
| | | 17 | Dolomite |
| 2 | Granite | 18 | Sandstone |
| 3 | Gneiss | 19 | Quartzitic sandstone |
| 4 | Granite/gneiss | 20 | Shale |
| 5 | Quartzite | 21 | Marl |
| 6 | Schist | 22 | Travertine |
| 7 | Andesite | 23 | Conglomerate |
| 8 | Diorite | 24 | Siltstone |
| 9 | Basic igneous/
metamorphic rock | 25 | Tuff |
| | | 26 | Pyroclastic rock |
| 10 | Ultra basic rock | 27 | Evaporite |
| 11 | Gabbro | 28 | Gypsum rock |
| 12 | Basalt | 29 | Other (specify in appropriate section's Notes) |
| 13 | Dolerite | | |
| 14 | Volcanic rock | | |
| 15 | Sedimentary rock | 30 | Not known |

5.1.9 Stoniness/rockiness/hardpan/cementation

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

★ **5.1.10 Soil drainage**

(Adapted from FAO 1990)

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

★ **5.1.11 Soil salinity**

- 1 <160 ppm dissolved salts
- 2 160 - 240 ppm
- 3 241 - 480 ppm
- 4 >480 ppm

5.1.12 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

5.1.13 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 Color Charts (Munsell 1977). 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 | 7 Reddish brown | 13 Greyish |
| 2 Red | 8 Yellowish brown | 14 Blue |
| 3 Reddish | 9 Yellow | 15 Bluish-black |
| 4 Yellowish red | 10 Reddish yellow | 16 Black |
| 5 Brown | 11 Greenish, green | |
| 6 Brownish | 12 Grey | |

★ **5.1.14 Soil pH**

Actual value of the soil within the following root depths around the accession

- 5.1.14.1 pH at 10-15 cm
- 5.1.14.2 pH at 16-30 cm
- 5.1.14.3 pH at 31-60 cm
- 5.1.14.4 pH at 61-90 cm

★ **5.1.15 Soil erosion**

- 3 Low
- 5 Intermediate
- 7 High

5.1.16 Rock fragments

(Adapted from FAO 1990)

Large rock and mineral fragments (>2 mm) are described according to abundance

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

★ **5.1.17 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 fractions 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	Silty clay	16	Loamy coarse sand
6	Silty 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

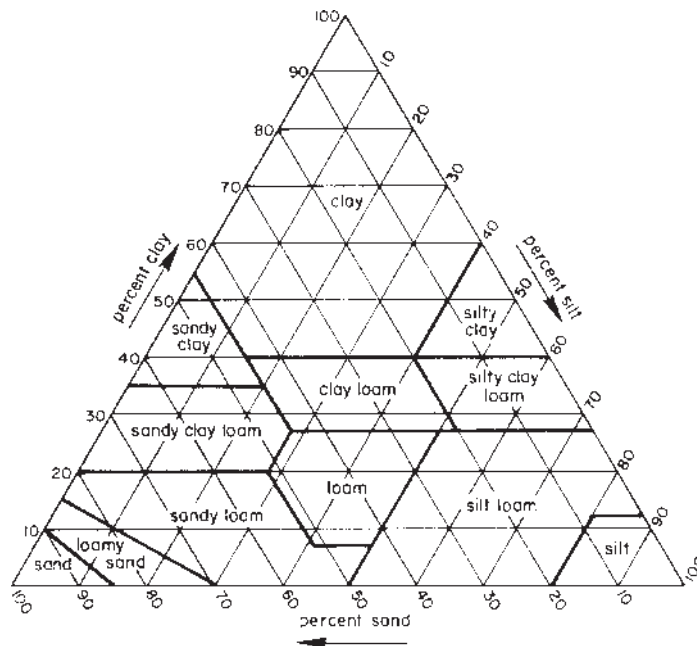


Fig. 2 Soil texture classes

- ★ **5.1.17.1 Soil particle size classes**
(Adapted from FAO 1990)
 - 1 Clay < 2 μm
 - 2 Fine silt 2 - 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

- ★ **5.1.18 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.).

- ★ **5.1.19 Water availability**
 - 1 Rainfed
 - 2 Irrigated
 - 3 Flooded
 - 4 River banks
 - 5 Sea coast
 - 6 Other (specify in appropriate section's **Notes**)

- 5.1.20 Soil fertility**
General assessment of the soil fertility based on existing vegetation
 - 3 Low
 - 5 Moderate
 - 7 High

- 5.1.21 Climate of the site**
Should be assessed as close to the site as possible

- ★ **5.1.21.1 Temperature [°C]**
Provide either the diurnal (mean, maximum, minimum) or the seasonal (mean, maximum, minimum)

- ★ **5.1.21.2 Rainfall [mm]**
Annual average (state number of recorded years)

5.1.21.3 Wind [km/s]

Annual average (state number of years recorded)

- 5.1.21.3.1 Frequency of typhoons or hurricane force winds
- 5.1.21.3.2 Date of most recent typhoons or hurricane force winds
[DDMMYYYY]
- 5.1.21.3.3 Annual maximum wind velocity [km/s]

5.1.21.4 Frost

- 5.1.21.4.1 Date of most recent frost [DDMMYYYY]
- 5.1.21.4.2 Lowest temperature [°C]
Specify seasonal average and minimum survived
- 5.1.21.4.3 Duration of temperature below freezing [d]

5.1.21.5 Relative humidity

- 5.1.21.5.1 Relative humidity diurnal range [%]
- 5.1.21.5.2 Relative humidity seasonal range [%]

5.1.21.6 Light

- 3 Shady
- 7 Sunny

5.1.22 Other

Any additional information may be specified here

CHARACTERIZATION

6. Plant descriptors

6.1 Vegetative

★ 6.1.1 Plant habit

- 1 Bush (<5 m - without distinct trunk)
- 2 Shrub or small tree (<5 m - one or more trunks)
- 3 Tree (>5 m - single trunk)

6.1.2 Plant height

Visual estimation

1	Very short	Reference variety	
3	Short	San Ramón	(SR SR)
7	Tall	Caturra	(Ct Ct)
9	Very tall	Típica	(TT NaNa)
		Maragogype	(Mg Mg)

6.1.3 Overall appearance

Specify age of plant

- 1 Elongated conical
- 2 Pyramidal
- 3 Bushy

★ 6.1.4 Vegetative development

- 1 Monopodial
- 2 Sympodial

6.1.5 Branch-ramification number

Average of ramifications scored on five well-developed branches

★ 6.1.6 Branching habit

- 1 Very few branches (primary)
- 2 Many branches (primary) with few secondary branches
- 3 Many branches (primary) with many secondary branches
- 4 Many branches (primary) with many secondary and tertiary branches

6.1.7 Angle of insertion of primary branches

(3.1)

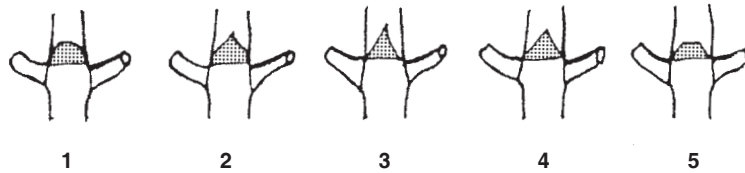
(On the main stem)

- 1 Drooping
- 2 Horizontal or spreading
- 3 Semi-erect

★ **6.1.8 Stipule shape**

(See Fig. 3)

- 1 Round
- 2 Ovate
- 3 Triangular
- 4 Deltate (equilaterally triangular)
- 5 Trapeziform
- 6 Other (specify in descriptor **6.5 Notes**)

**Fig. 3 Stipule shape**★ **6.1.9 Stipule arista length [mm]**

Average of five well-developed stipule arista

6.1.10 Young leaf colour

(3.5)

- 1 Greenish
- 2 Green
- 3 Brownish
- 4 Reddish brown
- 5 Bronze
- 6 Other (specify in descriptor **6.5 Notes**)

★ **6.1.11 Leaf shape** (3.4)
(See Fig. 4)

- 1 Obovate
- 2 Ovate
- 3 Elliptic
- 4 Lanceolate
- 5 Other (specify in descriptor 6.5 Notes)

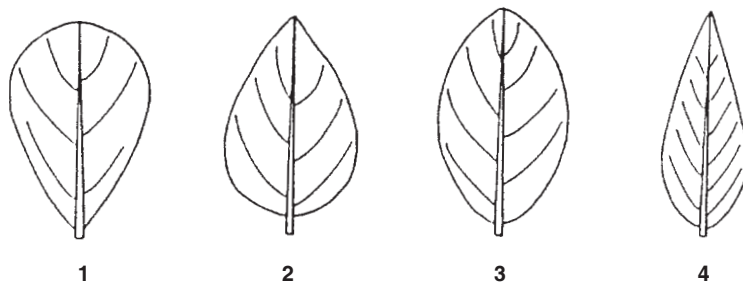


Fig. 4 Leaf shape

★ **6.1.12 Leaf apex shape**
(See Fig. 5)

- 1 Round
- 2 Obtuse
- 3 Acute
- 4 Acuminate
- 5 Apiculate
- 6 Spatulate
- 7 Other (specify in descriptor 6.5 Notes)

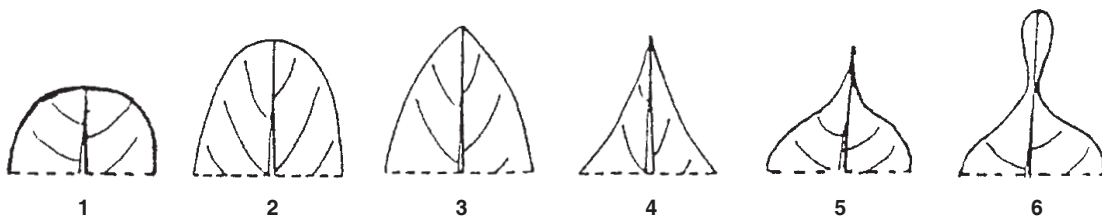


Fig. 5 Leaf apex shape

★ **6.1.13 Leaf length [mm]**
Average of five mature (> node 3 from the terminal bud) leaves, measured from petiole end to apex

- ★ **6.1.14 Leaf width [mm]**
Average of five mature (> node 3 from the terminal bud) leaves, measured at the widest part
- ★ **6.1.15 Leaf petiole length [mm]**
Average of five one-year leaves, measured from the base to the insertion with the blade
- 6.1.16 Leaf petiole colour**
 - 1 Green
 - 2 Dark brown
 - 3 Other (specify in descriptor **6.5 Notes**)
- 6.1.17 Young shoot colour**
 - 1 Green
 - 2 Dark brown
 - 3 Other (specify in descriptor **6.5 Notes**)
- 6.1.18 Mature leaf colour**
- 6.1.19 Venation pattern**
- 6.1.20 Bud wax colour**
- 6.1.21 Bud wax thickness**
 - 3 Thin
 - 7 Thick
- ★ **6.1.22 Domatia pilosity**
Observed with portable lens or binocular lens
 - 3 Sparse
 - 5 Intermediate
 - 7 Dense
- 6.1.23 Shape of the domatia**
- 6.1.24 Shape of the aperture**
- 6.1.25 Position of the domatia**
 - 1 Axillary
 - 2 Extra-axillary
- 6.2 Inflorescence and flowering**
- ★ **6.2.1 Number of days from rainfall to flowering [d]**
- ★ **6.2.2 Inflorescence position**
 - 1 Axillary
 - 2 Terminal

- 6.2.3 Inflorescence on old wood**
0 Absent
1 Present
- ★ **6.2.4 Number of flowers per axil**
Average of 10 axils, randomly selected from different nodes
- ★ **6.2.5 Number of flowers per fascicle**
Average of 10 fascicles, randomly selected from different nodes
- ★ **6.2.6 Number of fascicles per node**
Average of 10 nodes, randomly selected from different branches
- ★ **6.2.7 Inflorescence stalk length [mm]**
Average of five inflorescences, randomly selected from different nodes
- ★ **6.2.8 Corolla tube length [mm]**
Average of five flowers, randomly selected from different nodes
- ★ **6.2.9 Number of petals per flower**
Average of 10 flowers, randomly selected from different nodes
- ★ **6.2.10 Anther insertion**
1 Excluded
2 Included
- 6.2.11 Number of stamens per flower**
Average of 10 flowers, randomly selected from different nodes

6.3 Fruit

For recording fruit descriptors, five observations should be made

- 6.3.1 Fructification duration [d]** (3.22)
Number of days between bloom and first harvest. Record the bloom date because, in certain conditions, fructification duration depends on bloom period
- ★ **6.3.2 Fruit colour** (3.11)
Observed on mature fruits
- | | | | |
|---|---------------|----|-----------------------------------------|
| 1 | Yellow | 7 | Purple |
| 2 | Yellow-orange | 8 | Purple-violet |
| 3 | Orange | 9 | Violet |
| 4 | Orange-red | 10 | Black |
| 5 | Red | 11 | Other (specify in descriptor 6.5 Notes) |
| 6 | Red-purple | | |

★ **6.3.3 Fruit shape** (3.8)

Average of five normal (not caracoli) mature fruits. (See Fig. 6)

- 1 Roundish
- 2 Obovate
- 3 Ovate
- 4 Elliptic
- 5 Oblong
- 6 Other (specify in descriptor 6.5 Notes)



Fig. 6 Fruit shape

★ **6.3.4 Absence/presence of fruit ribs**

- 0 Absent
- 1 Present

6.3.5 Endocarp texture

- 1 Coriaceous
- 2 Subcoriaceous
- 3 Other (specify in descriptor 6.5 Notes)

★ **6.3.6 Fruit-disc shape**

The fruit-disc shape is positioned at the end of the coffee cherry

- 1 Not marked
- 2 Marked but not prominent
- 3 Prominent (cylindrical)
- 4 Beaked (apex constricted into bottleneck shape)

★ **6.3.7 Calyx limb persistence**

- 0 No
- 1 Yes

★ **6.3.8 Fruit length [mm]** (3.9)

Average of five normal mature green fruits, measured at the largest part

- ★ **6.3.9 Fruit width** [mm]
Average of five normal mature green fruits, measured at the widest part
- ★ **6.3.10 Fruit thickness** [mm]
Average of five normal mature green fruits, measured at the thickest part
- 6.3.11 Pulp thickness**
In relation to berry/bean
 - 3 Thin
 - 5 Intermediate
 - 7 Thick
- 6.3.12 Harvest duration** [d]
- 6.4 Seed**
- ★ **6.4.1 Seed length** [mm]
Maximum length average of five normal mature seeds
- ★ **6.4.2 Seed width** [mm]
Average of five normal mature seeds, measured at the widest part
- ★ **6.4.3 Seed thickness** [mm]
Average of five normal mature seeds, measured at the thickest part
- 6.4.4 Seed colour**
(At 11% humidity)
 - 1 Yellow
 - 2 Brown-purple
 - 3 Other (specify in descriptors **6.5 Notes**)
- 6.4.5 Seed shape** (3.13)
 - 1 Round
 - 2 Obovate
 - 3 Ovate
 - 4 Elliptic
 - 5 Oblong
 - 6 Other (specify in descriptor **6.5 Notes**)

6.5 Notes

Any additional information, especially in the category of 'other' under various descriptors above, may be specified here

EVALUATION

7. Plant descriptors

7.1 Vegetative

7.1.1 Trunk diameter [cm]

Measured at 5 cm above ground level in seedling and cutting trees, or 10 cm above graft union in grafted tree. Specify approximate tree age

7.1.2 Trunk height [cm]

Measured on the highest trunk, from ground level to top. Specify approximate tree age

7.2 Yield characteristics

For the following descriptors specify the age of tree

7.2.1 Berry weight per tree [kg]

Record on harvested mature berries

7.2.2 Estimated yield

Rate in relation to age and volume of tree

3 Very few fruits

5 Few fruits on nearly all branches

7 Many fruits on all branches

7.3 Fruit and bean characteristics

Record on at least 200 mature fruits

7.3.1 Empty-fruit rate [%]

Scored by floating fruits

7.3.2 100-bean weight [g]

(3.20)

Calculated at (11% moisture) content as follows: ("Bean weight at 0% moisture content" x 100) / ("Bean number" x 0.89)

7.3.3 Out-turn [%]

Ratio of trade coffee (at 11% moisture content) weight over mature cherry weight, calculated as follows: ("Bean weight at 0% moisture content" x 100) / ("Mature cherry weight" x 0.89)

7.3.4 Fruit-filling coefficient

Ratio of bean number over cherry number. As almost all cherries contain two locules, the fruit-filling coefficient varies between 0 (sterility) and 2 (complete fertility)

7.3.5 Caracoli-bean rate [%] (3.17)
 Percentage of caracoli (peaberry) beans (rounded beans form) in the sample

7.3.6 Empty locules [%]

7.4 Biochemical composition

7.4.1 Caffeine content [% DM]

7.4.2 Oil content [% DM]

7.4.3 Sugar content [% DM]

7.4.4 Absence/presence of methylxanthines

7.4.4.1 Theobromine

- 0 Absent
- 1 Present

7.4.4.2 Theophylline

- 0 Absent
- 1 Present

7.4.4.3 Theacrine

- 0 Absent
- 1 Present

7.4.5 Chlorogenic acid content

Refer to the IUPAC numbering system (IUPAC 1976)

7.4.5.1 Caffeoylquinic acid content [% DM]

7.4.5.2 Dicafeoylquinic acid content [% DM]

7.4.5.3 Feruloylquinic acid content [% DM]

7.5 Organoleptic value

7.5.1 Acidity

- 3 Low
- 5 Intermediate
- 7 High

7.5.2 Bitterness

- 3 Low
- 5 Intermediate
- 7 High

7.5.3 Astringency

- 3 Low
- 5 Intermediate
- 7 High

7.5.4 Beverage-test value

- 3 Bad
- 5 Intermediate
- 7 Good

7.5.5 Degree of torrefaction**7.6 Notes**

Specify here any additional information

8. 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

8.1 Drought**8.2 Mineral deficiencies****8.3 Mineral toxicity****8.4 Low temperature****8.5 High temperature****8.6 Waterlogging****8.7 Lodging****8.8 Notes**

Specify here any additional information

9. Biotic stress susceptibility

In each case, it is important to state the origin of the infestation or infection, i.e. natural, field inoculation, laboratory. Record such information in descriptor 9.5 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

9.1 Insects

	Causal organism	Common name
9.1.1	<i>Dysmicoccus cryptus</i>	Mealy bug
9.1.2	<i>Hypothenemus hampei</i> (syn. <i>Stephanoderes hampei</i>)	Coffee berry borer
9.1.3	<i>Leucoptera coffeella</i>	White coffee leaf miner
9.1.4	<i>Xyleborus morstatti</i>	Black coffee twig borer
9.1.5	<i>Xylotrechus quadripes</i>	White stem borer
9.1.6	<i>Xylosandrus compactus</i>	Shot hole borer
9.1.7	<i>Planococcus</i> spp.	Mealy bug
9.1.8	<i>Coccus viridis</i>	Green scale

9.2 Nematodes

9.2.1	<i>Meloidogyne</i> spp.	Root knot nematode
9.2.2	<i>Pratylenchus</i> spp.	Root lesion nematode
9.2.3	<i>Hemicriconemoides</i> spp.	

9.3 Fungi

9.3.1	<i>Botrytis cinerea</i>	Warty berry
9.3.2	<i>Ceratocystis fimbriata</i>	Woodstain disease, 'llaga macana'
9.3.3	<i>Cercospora coffeicola</i>	Brown eye spot
9.3.4	<i>Colletotrichum</i> spp.	Coffee berry disease
9.3.5	<i>Corticium salmonicolor</i>	Pink disease
9.3.6	<i>Fusarium oxysporum</i>	Santavery root disease
9.3.7	<i>Fusarium stilboides</i>	Fusarium bark disease
9.3.8	<i>Gibberella xylarioides</i> (anamorph: <i>Fusarium xylarioides</i>)	Tracheomycosis
9.3.9	<i>Hemileia coffeicola</i>	Powdery rust
9.3.10	<i>Hemileia vastatrix</i>	Coffee leaf rust, orange rust
9.3.11	<i>Koleroga noxia</i>	Blackrot disease
9.3.12	<i>Mycena citricolor</i>	Leaf spot
9.3.13	<i>Pellicularia koleroga</i>	Koleroga
9.3.14	<i>Phoma costarricensis</i>	Phoma
9.3.15	<i>Poria hypolateritia</i>	Red root disease

9.3.16	<i>Rhizoctonia solani</i>	Collar rot disease
9.3.17	<i>Rosellinia</i> spp.	Black root disease

9.4 Bacteria

9.4.1	<i>Pseudomonas syringae</i> pv. <i>garcae</i>	Bacterial blight of coffee
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9.5 Notes

Specify here any additional information

10. Biochemical markers

10.1 Isozyme

For each enzyme, indicate the tissue analysed and the zymogram type. A particular enzyme can be recorded as 10.1.1; 10.1.2, etc. Examples include: Acid phosphatase (ACPH); Esterases α and β (EST A and B); Isocitrate dehydrogenase (ICD); Malate dehydrogenase (MDH); Phosphogluconate dehydrogenase (PGD); Phosphoglucose isomerase (PGI); Phosphoglucose mutase (PGM)

10.2 Other biochemical markers

(e.g. Polyphenol profile)

11. Molecular markers

Describe any specific discriminating or useful trait for this accession. Report probe-enzyme combination analyzed

11.1 Restriction Fragment Length Polymorphism (RFLP)

Record the method (used restriction enzyme-probe and analyzed DNA origin, i.e. genomic, chloroplastic or mitochondrial) and the fragment weights

11.2 Random Amplified Polymorphic DNA (RAPD)

Record the experiment conditions (solution compositions, amplifying program), the user primer sequence and the amplified fragment weights

11.3 Other molecular markers

(e.g. Specific Amplicon Polymorphism (SAP))

12. Cytological characters

12.1 Chromosome number

12.2 Ploidy level

(e.g. aneuploid or structural rearrangement)

12.3 Pollen viability

Specify the method, i.e. germination in a solution or grain staining

12.4 Meiosis chromosome associations

Average of 50 microspore mother cells, observed during metaphase 1

12.4.1 Univalent number per microspore mother cell

12.4.2 Bivalent number per microspore mother cell

12.4.3 Trivalent number per microspore mother cell

12.4.4 Quadrivalent number per microspore mother cell

12.5 Incompatibility alleles

Specify the method used and record the allelic group

12.6 Other cytological characters

(e.g. Stomate density and size)

13. Identified genes

Describe any known specific mutant present in the accession

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The following IPGRI Staff provided substantial technical advice: Drs M. Diekman, F. Engelmann and T. Hodgkin.

List of Descriptors

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

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