Bioversity International

Descriptors for

Cherimoya

(*Annona cherimola* Mill.)

CHERLO

List of Descriptors

Allium (E, S) 2001
Almond (Revised) * (E) 1985
Apple (E) 1982
Apricot * (E) 1984
Avocado (E/S) 1995
Bambara groundnut (E, F) 2000
Banana (E, S, F) 1996
Barley (E) 1994
Beta (E) 1991
Black pepper (E/S) 1995
Brassica and *Raphanus* (E) 1990
Brassica campestris L. (E) 1987
Buckwheat (E) 1994
Capsicum (E/S) 1995
Cardamom (E) 1994
Carrot (E, S, F) 1998
Cashew (E) 1986
Chenopodium (S) 2005
Cherry * (E) 1985
Chickpea (E) 1993
Citrus (E, F, S) 1999
Coconut (E) 1995
Coffee (E, S, F) 1996
Cotton (Revised) (E) 1985
Cowpea (E, P) 1983
Cultivated potato * (E) 1977
Date palm (F) 2005
Durian (E) 2007
Echinochloa millet * (E) 1983
Eggplant (E/F) 1990
Faba bean * (E) 1985
Fig (E) 2003
Finger millet (E) 1985
Forage grass * (E) 1985
Forage legume * (E) 1984
Grapevine (E, S, F) 1997
Groundnut (E/S/F) 1992
Hazelnut (E) 2008
Jackfruit (E) 2000
Kodo millet * (E) 1983
Lathyrus spp. (E) 2000
Lentil * (E) 1985
Lima bean * (E) 1982
Litchi (E) 2002
Lupin * (E/S) 1981
Maize (E/S/F, P) 1991
Mango (Revised) (E) 2006
Mangosteen (E) 2003
Medicago (Annual) * (E/F) 1991
Melon (E) 2003
Mung bean * (E) 1980
Oat * (E) 1985
Oca * (S) 2001
Oil palm (E) 1989
Panicum miliaceum and *P. sumatrense* (E) 1985
Papaya (E) 1988
Peach * (E) 1985
Pear * (E) 1983
Pearl millet (E/F) 1993
Pepino (E) 2004
Phaseolus acutifolius (E) 1985
Phaseolus coccineus * (E) 1983
Phaseolus lunatus (P) 2001
Phaseolus vulgaris * (E, P) 1982
Pigeonpea (E) 1993
Pineapple (E) 1991
Pistachio (A, R, E, F) 1997
Pistacia (excluding *Pistacia vera*) (E) 1998
Plum * (E) 1985
Potato variety * (E) 1985
Quinua * (E) 1981
Rambutan (E) 2003
Rice * (E) 2007
Rocket (E, I) 1999
Rye and Triticale * (E) 1985
Safflower * (E) 1983
Sesame (Revised) (E) 2004
Setaria italica and *S. pumilla* (E) 1985
Shea tree (E) 2006
Sorghum (E/F) 1993
Soybean * (E/C) 1984
Strawberry (E) 1986
Sunflower * (E) 1985
Sweet potato (E/S/F) 1991
Taro (E, F, S) 1999
Tea (E, S, F) 1997
Tomato (E, S, F) 1996
Tropical fruits * (E) 1980
Ulluco (S) 2003
Vigna aconitifolia and *V. trilobata* (E) 1985
Vigna mungo and *V. radiata* (Revised)*(E) 1985
Walnut (E) 1994
Wheat (Revised) * (E) 1985
Wheat and *Aegilops* * (E) 1978
White Clover (E) 1992
Winged Bean * (E) 1979
Xanthosoma (E) 1989
Yam (E, S, F) 1997

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Cherimoya

(Annona cherimola Mill.)

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CONTENTS

PREFACE

Descriptors for cherimoya (*Annona cherimola* Mill.) is an original publication of Bioversity International. The Descriptor list was developed by experts from three Latin American countries (Ecuador, Peru and Bolivia) and three European countries (Spain, Belgium and Austria), partners of the EU-funded project 'Promotion of sustainable cherimoya production systems in Latin America through the characterization, conservation and use of local germplasm diversity' (CHERLA) (FP6-2003-INCO-DEV-2), coordinated by Ir. Wouter Vanhove (Ghent University, Belgium). A draft of the document was harmonized as much as possible with descriptor lists developed by UPOV (International Union for the Protection of New Varieties of Plants) and INIEA (National Institute of Agrarian Research and Extension), a Peruvian CHERLA project partner. After validating the List in germplasm collections in Ecuador, Peru and Bolivia, a revised version, prepared in the Bioversity internationally accepted format for descriptor lists, was sent to a number of international experts for their comments. A full list of the names and addresses of those involved is provided in the 'Contributors' section.

This new list of descriptors is the result of extensive collaboration between Bioversity's Regional Office for the Americas and the CHERLA project, through Dr Xavier Scheldeman and Ir. Wouter Vanhove respectively.

Bioversity International (formerly known as IPGRI) encourages the collecting of data for all five types of descriptors (see Definitions and use of Descriptors). However, 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, often several growing seasons.

Although the suggested coding system should not be regarded as final, this format represents an important tool for a standardized characterization system and it is promoted by Bioversity 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 systems into the Bioversity 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. Bioversity, 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 management and maintenance of the collection or to the users of the plant genetic resources, or both. To this end, highly discriminating descriptors are listed at the beginning of the characterization chapter and are highlighted in the text to facilitate selection of descriptors.

The List of Multi-crop Passport Descriptors (FAO/IPGRI 2001) was developed to provide consistent coding schemes for common passport descriptors across crops. They are marked in the text as [MCPD]. 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.

Any suggestions for improvement on the Descriptors for Cherimoya will be highly appreciated by Bioversity.

INTRODUCTION

Cherimoya (*Annona cherimola* Mill.) is one of the many edible fruit species in the *Annona* genus (Annonaceae family). In Latin America, the fruit is known as 'chirimoya', a name allegedly derived from the Quechua 'chirimuya', meaning 'cold seed', referring to the relatively colder Andean areas where it thrives, compared to other *Annona* species.

The centre of origin of cherimoya is still under discussion. Many authors agree that the mountainous area between southern Ecuador and northern Peru is a hotspot for cherimoya diversity and that the species consequently originated in this area. Others, however, claim that cherimoya originated in Mexico and was brought to southern Ecuador/northern Peru by pre-Inca traders, where it further diversified.

Currently, cherimoya occurs in natural stands or semi-domesticated homegardens in the Andean valleys of Ecuador, Peru and Bolivia. Nevertheless, with a cultivation area of around 3000 ha, Spain is the world's largest cherimoya producer. Other important production countries are Peru, Chile, Bolivia, Ecuador, Mexico and the USA. Commercially, however, cherimoya is a minor crop in these countries compared to other fruit species. Furthermore, in Andean countries, where cherimoya is considered an underutilized species, the agronomic and commercial use of its germplasm diversity is limited.

Cherimoya grows best in subtropical areas where the average annual rainfall oscillates between 600 and 1700 mm, where seasonal and interannual temperature fluctuations are low and mean annual temperatures vary between 17° and 22 °C. Soil texture preferences are variable, but cherimoya generally prefers well-drained sandy to sandy loamy soils, with a pH between 6.5 and 7.6 and 1.7 to 2.7 % organic matter content.

Cherimoya is a good source of vitamins B_1, B_2 and B_3 as well as iron, calcium and phosphorous. Its fruit is considered among the finest in the world. It is mostly consumed fresh. Exposure of the pulp to air produces enzymatic oxidation, affecting both its colour and delicate aroma. The fruit is also used for making ice cream, milk shakes or sorbets and is processed into yoghurt, flans, fruit juice and wine. Small quantities of cherimoya pulp are frozen in Latin American fruit processing companies and exported to the USA and the European Union for use in confectionery. Crushed cherimoya seeds can be used as a bio-insecticide and acetogenins from its seeds possess a number of pharmacological properties.

In Andean countries, the economic potential of cherimoya diversity is underestimated due to the fruit's short shelf life (around 14 days), high yield losses due to pest susceptibility, high sensitivity to bruising and production in poorly accessible areas characterized by poor road, irrigation and storage infrastructure.

Within the EU-funded CHERLA project 'Promotion of Sustainable Cherimoya Production Systems in Latin America through the Characterisation, Conservation and Use of Local Germplasm Diversity', European and Andean experts have joined efforts to further explore cherimoya diversity as a tool for boosting its commercial use and enhancing the conservation of its genetic resources.

DEFINITIONS AND USE OF THE DESCRIPTORS

In working with genetic resources, the word 'descriptor' is used to define a characteristic or attribute which is observed in accessions of a germplasm collection. Descriptors are coded in so-called 'descriptor states'.

Bioversity 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 and evaluation 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 **highlighted** in the 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 (RHS 1966, 1986, 1995), Methuen Handbook of Colour (Kornerup and Wanscher, 1984), or Munsell Colour Chart for Plant Tissues (Munsell Color 1977), are strongly recommended for all 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 (http://unstats.un.org/unsd/methods/m49/m49alpha.htm);

(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; or (ii) when a descriptor is not applicable. In the following example, '0' will be recorded if an accession does not have a central leaf lobe:

Shape of central leaf lobe

1 Oval
2 Elliptic
3 Round

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

Absence/presence of central leaf lobe

0 Absent
1 Present

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

(i) for accessions that 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 multi-crop passport descriptors category, are indicated in the text as [MCPD].

1. Accession descriptors

1.1 Institute code [MCPD]

Code of the institute where the accession is maintained. The codes consist of the three-letter ISO 3166 code of the country where the institute is located, plus a number. The current set of institute codes is available from the FAO Web site (http://apps3.fao.org/wiews/institute_query.htm?i_l=EN).

1.1.1 Name of the institute

Name of the institute where the accession is maintained.

1.2 Accession number [MCPD]

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

1.2.1 Local plant number

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

1.3 Donor institute code [MCPD]

Code for the donor institute (see instructions under **1.1 Institute code**).

1.3.1 Donor name

Name of the institution or individual responsible for donating the germplasm.

1.4 Donor accession number [MCPD]

Number assigned to an accession by the donor (see instructions under **1.2 Accession number**).

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

Any other identification (numbers) known to exist in other collections for this accession. Use the following system: INSTCODE:ACCENUMB;INSTCODE:ACCENUMB;… INSTCODE and ACCENUMB follow the standard described above and are separated by a colon. Pairs of INSTCODE and ACCENUMB are separated by a semicolon without space. When the institute is not known, the number should be preceded by a colon.

1.6 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.

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. The abbreviation 'sp.' is used if the species is unknown.

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 botanical variety); 'f.' (for form)

1.7.3.2 Subtaxon name

The infraspecific epithet of the scientific name (i.e the epithet following the indication of the infraspecific rank in the name string; e.g. '*occidentalis*')

1.7.3.3 Subtaxon authority [MCPD]

Provide the subtaxon authority at the most detailed taxonomic level.

1.8 Common crop name [MCPD]

Name of the crop in colloquial language, preferably in English.

1.9 Ancestral data [MCPD]

Information about pedigree or other description of ancestral nature (e.g. parent cultivar in case of mutant or selection).

1.10 Accession

1.10.1 Accession name [MCPD]

Either a registered or other formal designation given to the accession. First letter in uppercase. Multiple names are separated by a semicolon without space.

1.10.2 Synonyms

Include here any previous identification other than the current name.

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 approximate weight of seeds, explants (tissue culture) or plants of an accession in the genebank.

1.13 Type of material received

1 Pollen
2 Seed
3 Graft
4 Shoot/sucker/segment/cutting
5 Explant (*in vitro* culture)
6 Plant (including seedlings)
99 Other (specify in descriptor **1.14 Remarks**)

1.14 Remarks

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

2. Collecting descriptors

2.1 Collecting institute(s)

Name and address of institute(s) and/or persons that collected the original sample.

2.2 Collecting institute code [MCPD]

Code of the institute collecting the sample. If the holding institute has collected the material, the collecting institute code should be the same as the holding institute code (see instructions under **1.1 Institute code**).

2.3 Collecting number [MCPD]

Original number assigned by the collector(s) of the sample, normally composed of the name or initials of the collector(s) followed by a number. This 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 [YYYYMMDD] [MCPD]

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

2.5 Country of origin [MCPD]

Code of the country in which the sample was originally collected. Use the three-letter ISO abbreviations for countries (e.g. BOL, PER, ECU). The ISO 3166-1 Code List can be found at http://unstats.un.org/unsd/methods/m49/m49alpha.htm. Country or area numerical codes added or changed are available on-line at http://unstats.un.org/unsd/methods/m49/m49chang.htm.

2.6 Department/Province/State

Name of the primary administrative subdivision of the country (Department/Province/State) in which the sample was collected [e.g. La Paz (in Bolivia), Puno (in Peru) or Pará (in Brazil)].

2.7 District/Municipality

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

2.8 Location of collection site [MCPD]

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

2.8.1 Name of the nearest place

Name of the nearest place to the collection site. This also refers to places that may not have proper names (e.g. road junctions).

2.8.2 Distance [km]

Distance from the nearest named place to the collection site.

2.8.3 Direction from the nearest place

Direction of the site from the nearest named place in degrees relative to north.

2.9 Latitude of collecting site[1] [MCPD]

Degrees (2 digits), minutes (2 digits), and seconds (2 digits) followed by N (North) or S (South) (e.g. 103020S). Missing data (minutes and/or seconds) should be indicated with hyphens. Leading zeros are required (e.g. 10----S; 011530N; 4531--S).

2.10 Longitude of collecting site[1] [MCPD]

Degrees (3 digits), minutes (2 digits), and seconds (2 digits) followed by W (West) or E (East) (e.g. 0762510W). Missing data (minutes and/or seconds) should be indicated with hyphens. Leading zeros are required (e.g. 076----W).

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

The elevation (or altitude) of the collecting site is expressed in meters above sea level.

2.12 Collecting or acquisition source [MCPD]

The suggested code system can be used at two distinct levels of detail: by means of general codes, like 10, 20, etc., or using a more detailed codification system such as 11, 12, 13, etc.

- 10 Wild habitat
  - 11 Forest/Woodland
  - 12 Shrubland
  - 13 Grassland
- 20 Farm or cultivated habitat
  - 21 Field
  - 22 Orchard
  - 23 Kitchen or home garden (urban, periurban or rural)
  - 24 Fallow land
  - 25 Pasture
  - 26 Farm store
  - 27 Threshing floor
  - 28 Park
- 30 Market or shop
  - 31 Town
  - 32 Village
- 40 Institute, research station, research organization, genebank
- 50 Seed company
- 60 Weedy, disturbed or ruderal habitat
  - 61 Roadside
  - 62 Field margin
- 99 Other (specify in descriptor **2.20 Collector's notes**)

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

d° m' s'' = h * (d + m/60 + s/3600)

where h = 1 for the Northern and Eastern hemispheres and -1 for the Southern and Western hemispheres. E.g. 30º30'0'' S = -30.5 and 30º15'55'' N = 30.265.

2.13 Biological status of accession [MCPD]

100 Wild
200 Weedy (or spontaneous)
300 Traditional cultivar/landrace
400 Breeding/research material
500 Advanced/improved cultivar
999 Other (specify in descriptor **2.20 Collector's notes**)

2.14 Cropping system

1 Monoculture
2 Intercropped (specify the crop in descriptor **2.20 Collector's notes**)
3 Mixed (various crops grown in the same field, but following no specific order)

2.15 Ethnobotanical data

Information on traditional qualities of the sample in the collection area (community): use, forms of preparation, local names, medicinal properties, sociocultural beliefs and other.

2.15.1 Ethnic group

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

2.15.2 Local or vernacular name

Name given by farmer to cultivar/landrace/clone/wild form.

2.15.3 History of plant use

1 Ancestral/indigenous (always associated with the place and community)
2 Introduced (in unknown past)
3 Introduced (time and introduction known, specify in descriptor **2.20 Collector's notes**).

2.15.4 Parts of the plant used

1 Seed
2 Root
3 Bark
4 Trunk
5 Leaf
6 Flower/inflorescence
7 Fruit
99 Other (specify in descriptor **2.20 Collector's notes**)

2.15.5 Plant use

1 Fresh fruit
2 Culinary use
3 Juice
4 Ice-cream
5 Flour
6 Medicinal use
99 Other (specify in descriptor **2.20 Collector's notes**)

2.15.6 Frequency of plant use

1 Daily
2 Weekly
3 Occasionally
99 Other (specify in descriptor **2.20 Collector's notes**)

2.15.7 Use on special occasions

0 None
1 Festivities
2 Religious purposes
99 Other (specify in descriptor **2.20 Collector's notes**)

2.15.8 Specific consumers

0 None
1 Children
2 Elderly people
3 Chiefs
99 Other (specify in descriptor **2.20 Collector's notes**)

2.15.9 Seasonality

Harvest months, according to the farmer (1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11 and/or 12).

2.16 Collecting source environment

Use the descriptors in section **6,** from **6.1.1** to **6.1.21.**

2.17 Photographs

Were photographs of the sample or its habitat taken at time of collecting? If so, specify the photographs' identification numbers.

0 No
1 Yes

2.17.1 Photograph identification number(s)

2.18 Prevailing stresses

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

2.19 Herbarium specimens

Was a herbarium specimen collected? If so, provide an identification number and indicate in which place (herbarium) the cherimoya specimen was deposited.

0 No
1 Yes

2.19.1 Specimen identification number

2.19.2 Herbarium name

2.20 Collector's notes

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

MANAGEMENT

3. Management descriptors

3.1 Accession number (Passport 1.2)

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

3.3 Storage address
Storage and building location, room number, shelf used for medium and/or long-term storage.

3.4 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. Available at: http://www.bioversityinternational.org/fileadmin/bioversity/publications/pdfs/424.pdf)

10 Seed collection
- 11 Short term
- 12 Medium term
- 13 Long term

20 Field collection
30 *In vitro* collection (slow growth)
40 Cryopreserved collection
99 Other (specify in **3.9 Remarks**)

3.5 Date germplasm was deposited in genebank [YYYYMMDD]

3.6 Location of safety duplicates [MCPD]
Code of the institute(s) where a safety duplicate of the accession is maintained. It follows the institute code standard. (See instructions under **1.1 Institute code**.)

3.7 Pruning
Are trees pruned?

0 Never
1 Less than once a year
2 Once a year
3 Several times per year

3.8 Manual pollination

Are flowers manually pollinated?

0 No
1 Yes

3.9 Remarks

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

4.3 Plot number in the field

4.4 Multiplication/regeneration site location

4.5 Collaborator's name

4.6 Regeneration method

1 Seed
2 Graft
3 Cutting
4 Layer
5 Tissue culture
99 Other (specify in descriptor **4.12 Remarks**)

4.7 Regeneration date [YYYYMMDD]

4.8 Seedling vigour

Evaluate in the nursery 6 months after grafting until two years in the field.

3 Low
5 Intermediate
7 High

4.9 Number of plants established from this accession

4.10 Previous multiplication and/or regeneration

4.10.1 Location

4.10.2 Date of planting [YYYYMMDD]

4.10.3 Plot number

4.11 Number of regenerations
Since date of acquisition.

4.12 Remarks
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
Town, community or research institute where characterization and/or evaluation was carried out

5.2.1 Latitude
(See instructions in descriptor **2.9**)

5.2.2 Longitude
(See instructions in descriptor **2.10**)

5.2.3 Elevation [m asl]
Expressed in meters above sea level.

5.3 Evaluator's name and address

5.4 Planting or grafting date [YYYYMMDD]

5.5 Planting site in the field
Specify block, strip and/or row/plot numbers as applicable, plants per plot and replication.

5.6 Distance between plants [cm]

5.7 Distance between rows [cm]

5.8 Environmental characteristics of site
Use descriptors from **6.1.1** to **6.1.21** in section **6.**

5.9 Fertilizers
Specify type, doses, frequency of each and method of application.

5.10 Plant protection

Specify pesticides and/or herbicides used, doses, frequency of each and method of application.

5.11 Remarks

Any additional site-specific information may be specified here.

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 (adapted from 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%
7	Steeply dissected	>30%, moderate elevation range
8	Mountainous	>30%, great elevation range (> 300 m)
99	Other (specify in descriptor **6.2 Remarks**)	

6.1.2 Higher-level landform (general physiographic features)

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

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

6.1.3 Land element and position

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

1	Plain, level	17	Interdunal depression
2	Escarpment	18	Mangrove
3	Interfluve	19	Upper slope
4	Valley	20	Mid-slope
5	Valley floor	21	Lower slope
6	Channel	22	Ridge
7	Levee	23	Beach
8	Terrace	24	Beach ridge
9	Flood plain	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 descriptor **6.2 Remarks**)
15	Dune		
16	Longitudinal dune		

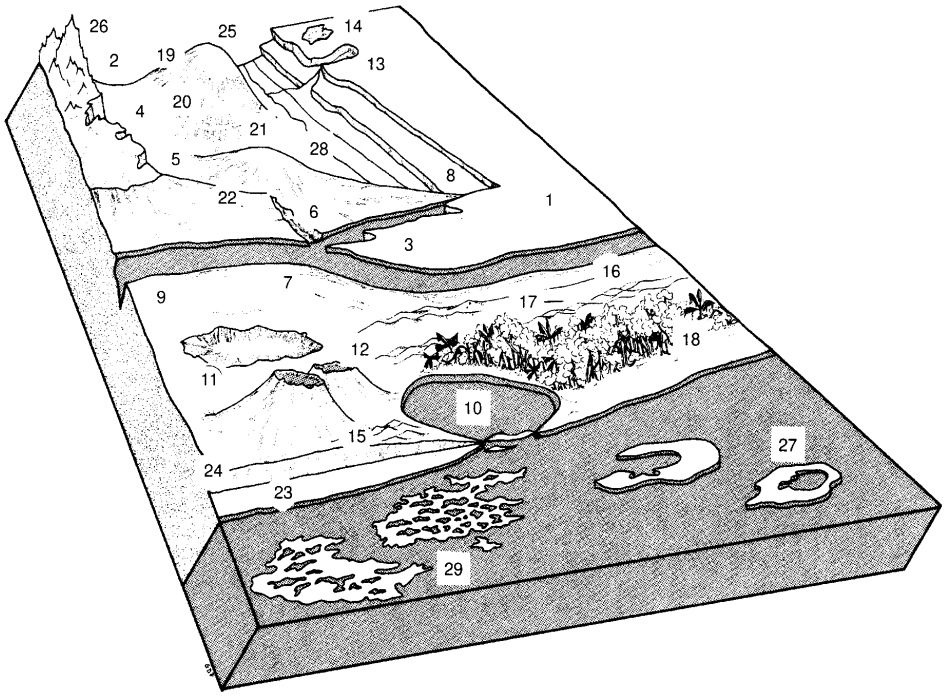

Fig. 1. Land element and position

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 south-western direction has an aspect of SW).

6.1.6 Crop agriculture

(Adapted from FAO, 1990)

1 Annual field cropping
2 Perennial field cropping
3 Tree and shrub cropping

6.1.6.1 Annual/perennial crops

Specify crop names in descriptor **6.2 Remarks**.

6.1.7 Overall vegetation surrounding the collecting site

(Adapted from FAO 1990)

10 Herbaceous
  11 Grassland
  12 Forb land
20 Closed forest (continuous tree layer, crowns overlapping, large number of tree and shrub species in distinct layers)
30 Woodland (continuous tree layer, crowns usually not touching, understorey may be present)
40 Scrubland
50 Dwarf shrubs
99 Other (specify in descriptor **6.2 Remarks**)

6.1.8 Soil parent material

(Adapted from FAO 1990.) Two lists of examples of rock parent material are given below. The reliability of geological information and knowledge of local lithology will determine whether a general or a specific definition of the parent material can be provided. 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
2 Aeolian sand
3 Litoral 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 descriptor **6.2 Remarks**)

6.1.8.2 Rock type

(Adapted from FAO 1990)

1 Acid igneous metamorphic rock
2 Granite
3 Gneiss
4 Granite/gneiss
5 Quartzite
6 Schist
7 Andesite
8 Diorite
9 Basic igneous/ metamorphic rock
10 Ultra basic rock
11 Gabbro
12 Basalt
13 Dolerite
14 Volcanic rock
15 Sedimentary rock
16 Limestone
17 Dolomite
18 Sandstone
19 Quartzitic sandstone
20 Shale
21 Marl
22 Travertine
23 Conglomerate
24 Siltstone
25 Tuff
26 Pyroclastic rock
27 Evaporite
28 Gypsum rock
99 Other (specify in descriptor **6.2 Remarks**)
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

Dissolved salts determined in saturated extract

1 <160 ppm
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 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	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 pH value of the soil around the accession.

6.1.14.1 Root depth [cm]

Indicate the root depth at which soil pH is being measured.

6.1.15 Soil erosion

3 Low
5 Intermediate
7 High

6.1.16 Rock fragments

(Adapted from FAO 1990.) Rocks and large mineral fragments (>2 mm) are described according to their 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 2006.) For convenience in determining the texture classes of the following list, particle size classes are given for each of the fine earth fractions listed below (See Fig. 2).

1 Clay
2 Loam
3 Clay loam
4 Silt
5 Silt clay
6 Silt clay loam
7 Silt loam
8 Sandy clay
9 Sandy clay loam
10 Sandy loam
  10.1 Fine sandy loam
  10.2 Coarse sandy loam
11 Loamy sand
  11.1 Loamy very fine sand
  11.2 Loamy fine sand
  11.3 Loamy coarse sand
12 Sand (unspecified)
  12.1 Very fine sand
  12.2 Fine sand
  12.3 Medium sand
  12.4 Coarse sand

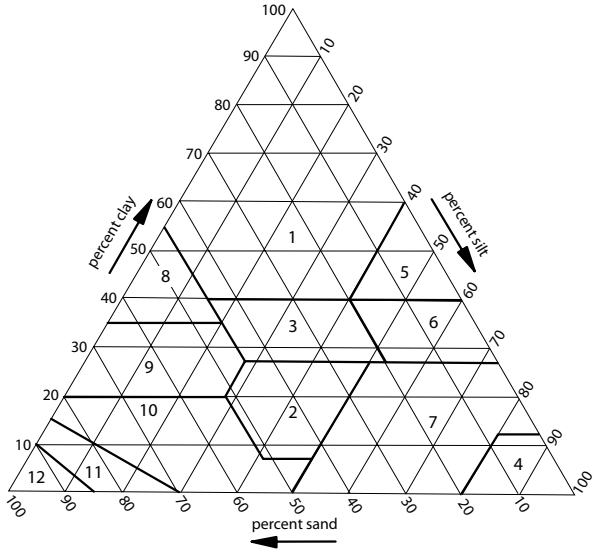

Fig. 2. Soil texture classes (adapted from FAO 2006)

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 or recently cleared 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 soil class (e.g. Andosols, Alfisols, Spodosols, Vertisols, etc.).

6.1.20 Water availability

1 Rainfed
2 Irrigated
3 Flooded
4 River banks
5 Sea coast
99 Other (specify in descriptor **6.2 Remarks**)

6.1.21 Climate of the site

Should be assessed as close to the site as possible.

6.1.21.1 **Temperature** [°C]

Provide either the monthly or the annual mean.

6.1.21.1.1 Number of recorded years

6.1.21.2 **Rainfall** [mm]

Provide either the monthly or the annual mean.

6.1.21.2.1 Number of recorded years

6.1.21.3 **Duration of the dry season** [d]

6.1.21.4 **Relative humidity** [%]

6.1.21.4.1 **Relative humidity diurnal range** [%]

6.1.21.4.2 **Relative humidity seasonal range** [%]

6.1.21.5 **Wind** [m/s]

Annual average (state number of recorded years).

6.2 Remarks

Any additional site-specific information may be specified here.

CHARACTERIZATION

7. Plant descriptors

Preferably characterize (i) at two years after establishment in the field (sapling, only at tree, leaf and, if possible, flower level), (ii) at five years (adult plant, at plant, leaf, flower and, if possible, fruit level), and (iii) at eight years (fully mature plant, at full fructification stage). The use of the Royal Horticultural Society (RHS) Colour Chart codes is recommended, if available, for all colour descriptors. Observations should be recorded only on well developed trees that have not been pruned.

List of minimum highly discriminating descriptors for cherimoya

Number	Name
7.2.1	Leaf blade shape
7.2.4	Leaf length
7.2.5	Leaf width
7.3.6	Petal length
7.3.7	Petal width
7.4.6	Weight of ripe fruit
7.4.10	Exocarp type
7.4.11	Exocarp weight
7.4.16	Weight of all fresh seeds per fruit
7.4.17	Number of seeds
7.4.23	Contents of soluble solids in the pulp
7.4.24	Titrated acidity
7.5.5	Seed tenacity within its epithelium

7.1 Tree

7.1.1 **Tree age** [y]

7.1.2 **Crown diameter** [cm]

Only in trees that have not been pruned. Measure the radius in two perpendicular directions and add up values to obtain the diameter.

7.1.3 **Tree height** [cm]

Measure from ground level to tree top.

7.1.4 Trunk colour

If possible, use the colour codes from the Royal Horticultural Society. If these are not available, use the following colour codes:

1 Light grey
2 Grey
3 Dark grey
99 Other (specify in descriptor **7.6 Remarks**)

7.1.5 Trunk ramification

Observe two-year old saplings prior to pruning. Ramification can start from ground level up to a maximum of 50 cm. See Fig. 3.

1 One branch
2 Two branches
3 Three or more branches

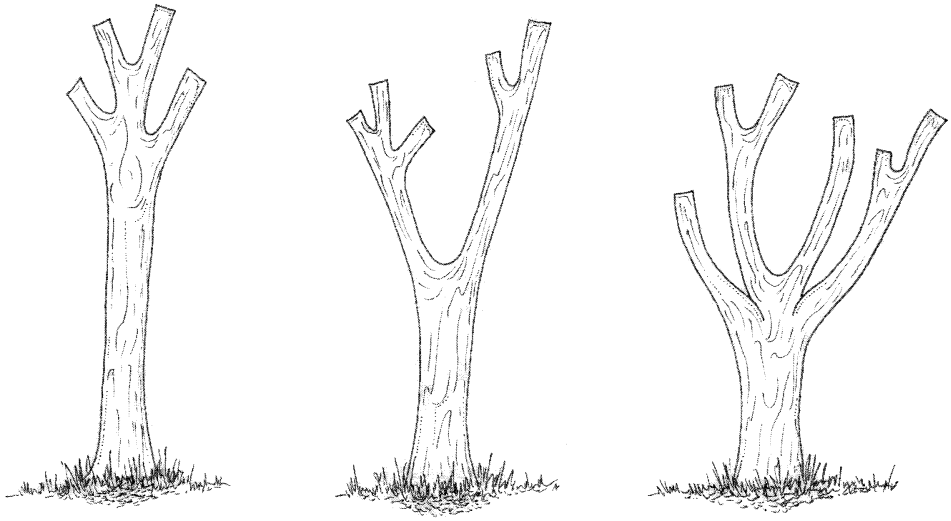

Fig. 3. Trunk ramification

7.1.6 Suckering tendency: number of suckers

See Fig. 4

0 Absent
1 ≤5 suckers
2 >5 suckers

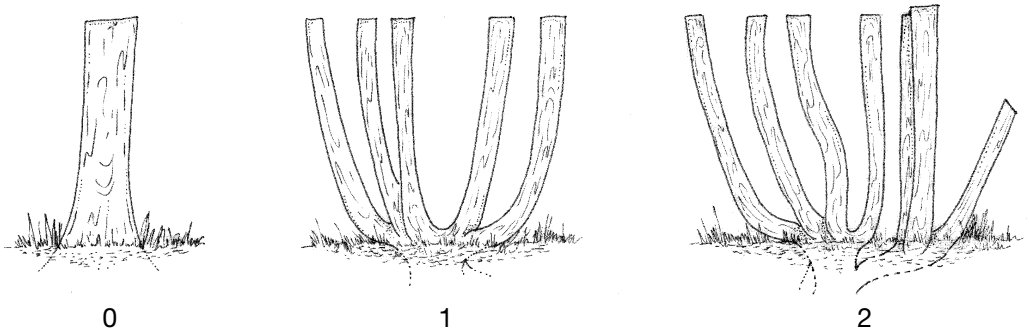

Fig. 4. Suckering tendency

7.1.7 Colour of young branches

If possible, use colour codes from the Royal Horticultural Society. If these are not available, use the following colour codes:

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

7.1.8 Pubescence of young branches

0 Absent
1 Present

7.1.9 Number of nodes per meter of branch

Measure the average number of nodes on five branches.

7.1.10 Number of flowers per meter on the branch of the previous year

Measure the average number of flowers on five branches, 15 days after beginning of flowering.

7.1.10.1 Percentage of buds on branch of the current year [%]

Average of five branches, 15 days after beginning of flowering.

7.1.11 Defoliation at the end of the fructification phase

0 Absent
1 Partial
2 Complete

7.2 Leaf

Record average of 10 fully expanded and healthy leaves, collected half-way along the shoot from 5 trees.

7.2.1 Leaf blade shape

See Fig. 5.

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

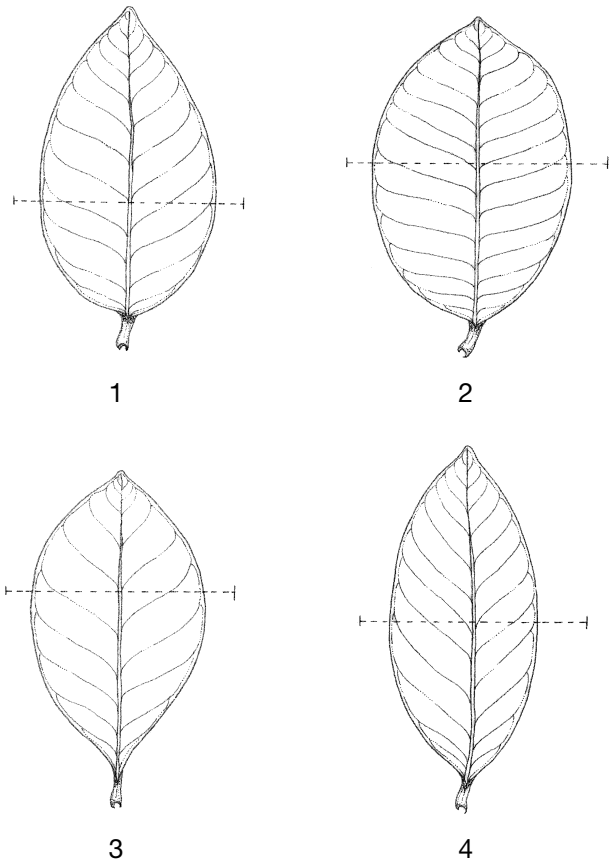

Fig. 5. Leaf blade shape

7.2.2 Shape of leaf base

See Fig. 6.

1 Acute
2 Rounded
3 Obtuse
4 Cordate

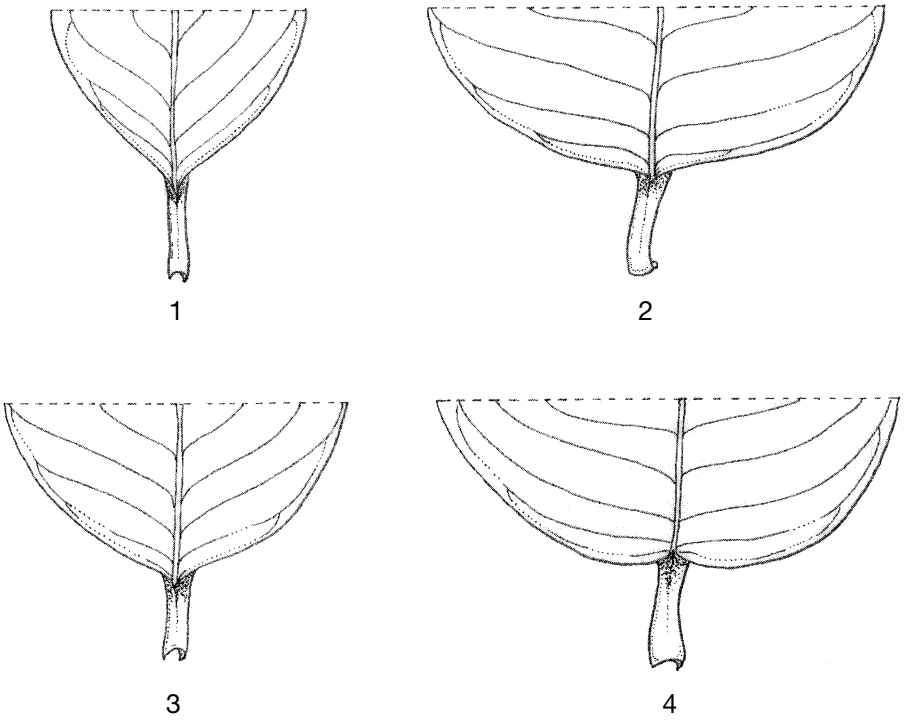

Fig. 6. Shape of leaf base

7.2.3 Shape of leaf apex

See Fig. 7.

1 Acute
2 Rounded
3 Acuminate

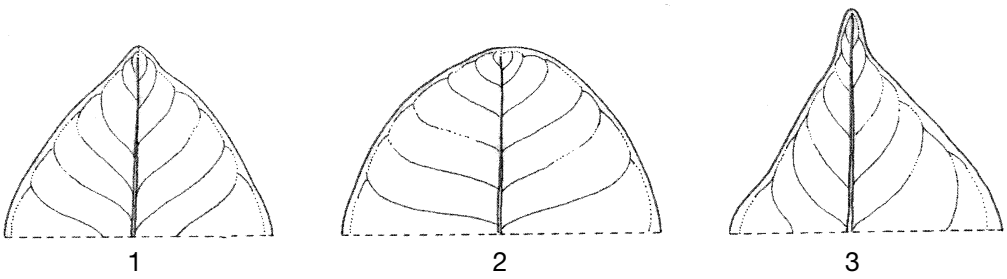

Fig. 7. Shape of leaf apex

7.2.4 Leaf length [mm]
Measure from the petiole base up to the leaf tip in fully developed leaves.

7.2.5 Leaf width [mm]
Measure in the widest part of fully developed leaves.

7.2.6 Leaf thickness [mm]
Measure in completely developed leaves.

7.2.7 Petiole length [mm]
Measure from the base of petiole to the base of leaf blade.

7.2.8 Petiole thickness [mm]
Measure at the thickest point.

7.2.9 Pubescence of leaf upper surface
0 Absent
1 Present

7.2.10 Pubescence of leaf lower surface
0 Absent
1 Present

7.2.11 Colour of mature leaves
If possible, use colour codes from the Royal Horticultural Society. If these are not available, use the following colour codes:
1 Light green
2 Green
3 Greyish green
4 Dark green
99 Other (specify in descriptor **7.6 Remarks**)

7.2.12 Colour of young leaves

If possible, use colour codes from the Royal Horticultural Society. If these are not available, use the following colour codes:

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

7.2.13 Leaf margin

See Fig. 8.

1 Entire
2 Undulate

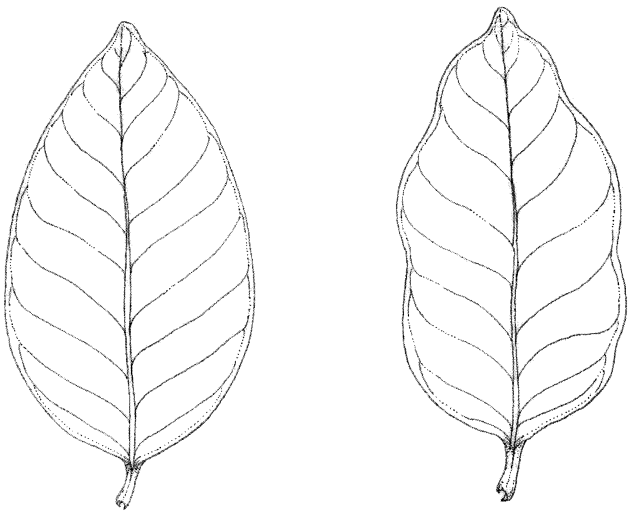

Fig. 8. Leaf margin

7.2.14 Number of primary veins in the leaf blade

7.2.15 Leaf blade venation

3 Submerged
5 Intermediate
7 Raised

7.3 Inflorescence

Average measurements from 10 flowers collected from five trees at bloom period.

7.3.1 Petal outer colour

If possible, use colour codes from the Royal Horticultural Society. If these are not available, use the following colour codes:

1 Cream
2 Yellow
3 Green
4 Brown
99 Other (specify in descriptor **7.6 Remarks**)

7.3.2 Colour of the internal petal base

If possible, use colour codes from the Royal Horticultural Society. If these are not available, use the following colour codes:

1 Pink
2 Light red
3 Dark red
99 Other (specify in descriptor **7.6 Remarks**)

7.3.3 Petal pubescence

0 Absent
1 Present

7.3.4 Sepal pubescence

0 Absent
1 Present

7.3.5 Flower weight [g]

7.3.6 Petal length [mm]

Average petal length of 10 flowers.

7.3.7 Petal width [mm]

Average petal width of 10 flowers.

7.3.8 Petal weight [g]

Average weight of petals of 10 flowers.

7.3.9 Length of flower peduncle [mm]

Average of 10 flowers.

7.3.10 Weight of the stigmatic cone [g]

Measurements should be taken in the female phase, with no sepals or petals, but with stamens. Average of 10 flowers.

7.3.11 Presence of reddish colour in the stigma

Determine in the female phase.

0 No
1 Yes

7.4 Fruit

All observations should be recorded when fruit are fully ripened, unless otherwise specified. Measurements should be made on 10 well developed representative fruits at harvest time.

7.4.1 Location of fructification

1 Base of the crown
2 Middle of the crown
3 Top of the crown

7.4.2 Fruit shape

See Fig. 9.

1 Round
2 Oblate
3 Cordate
4 Broadly cordate
5 Oval
99 Other (specify in descriptor **7.6 Remarks**)

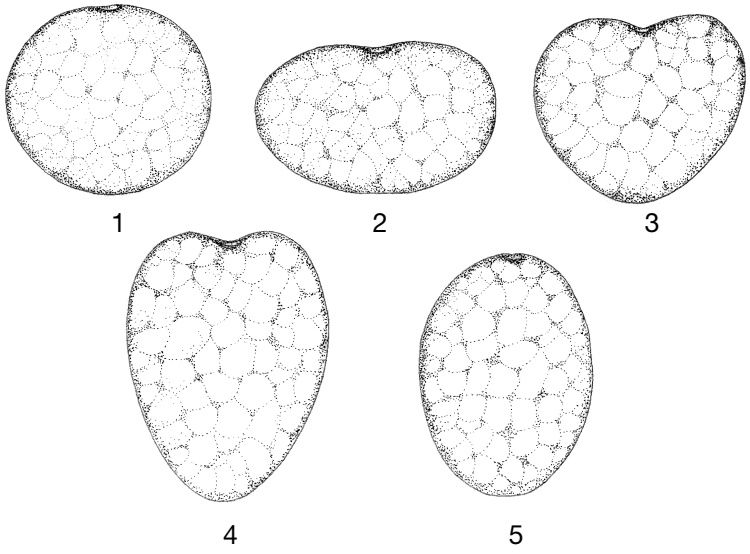

Fig. 9. Fruit shape

7.4.3 Fruit length [mm]

7.4.4 Fruit diameter [mm]

Measure at the broadest point of the fruit.

7.4.5 Uniformity in fruit size

0 No
1 Yes

7.4.6 Weight of ripe fruit [g]

7.4.7 Fruit symmetry

See Fig. 10.

0 No
1 Yes

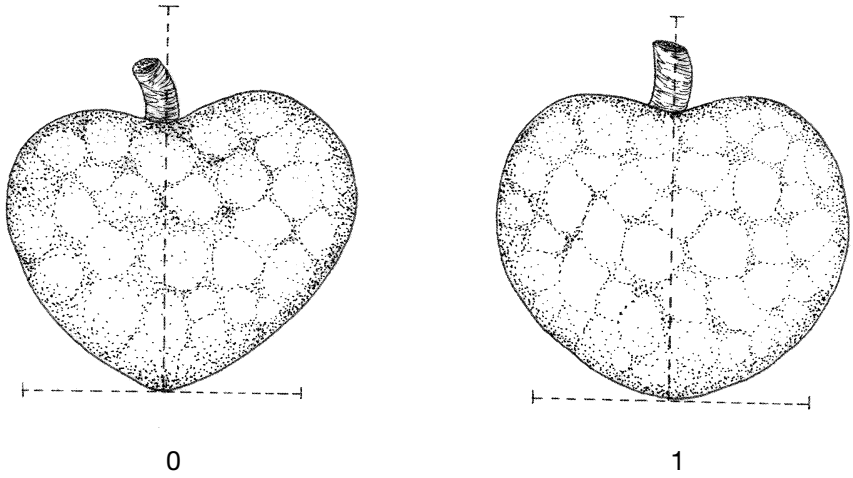

Fig. 10. Fruit symmetry

7.4.8 Peduncle length [mm]

7.4.9 Peduncle diameter [mm]

7.4.10 Exocarp type

See Fig. 11 (Schroeder 1945).

1	*Laevis*	(smooth)
2	*Impressa*	(slight depressions)
3	*Umbonata*	(small protrusions)
4	*Tuberculata*	(medium protrusions)
5	*Mamillata*	(large protrusions)
99	Other type	(specify in descriptor **7.6 Remarks**)

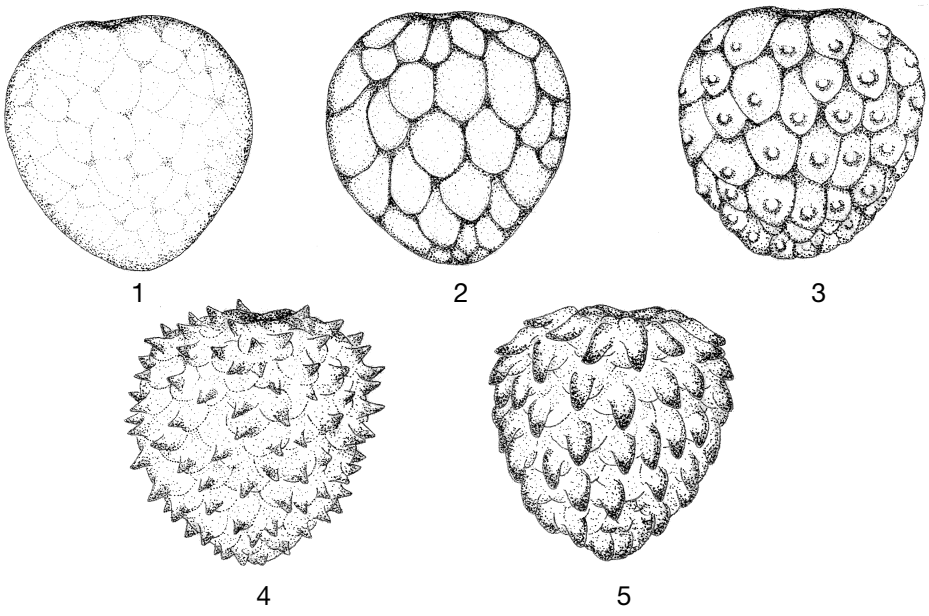

Fig. 11. Exocarp type

7.4.11 Exocarp weight [g]

Peel weight of the fully ripened fruit.

7.4.12 Exocarp colour

If possible, use colour codes from the Royal Horticultural Society. If these are not available, use the following colour codes:

1 Light green
2 Green
3 Dark green
4 Yellowish green
5 Yellow
6 Brownish green
7 Brown
99 Other (specify in descriptor **7.6 Remarks**)

7.4.13 Thickness of the exocarp [mm]

7.4.14 Resistance to penetrometer [N/cm^2]

Measure in fully ripened fruits, at four points of the equator and on the apex.

7.4.15 Resistance to abrasion

Record the resistance of fruit peel to abrasion, by thumb friction.

1 Mild
2 Moderate
3 Strong

7.4.16 Weight of all fresh seeds per fruit [g]

Measure at extraction from the fruit.

7.4.17 Number of seeds

Number of seeds per fruit.

7.4.18 Pulp colour

If possible, use colour codes from the Royal Horticultural Society. If these are not available, use the following colour codes:

1 White
2 Cream
99 Other (specify in descriptor **7.6 Remarks**)

7.4.19 Pulp texture

1 Watery
2 Creamy
3 Granular
4 Hard
5 Hard areas in the pulp
99 Other (specify in descriptor **7.6 Remarks**)

7.4.20 Pulp fibre content

0 Absent
1 Low
2 High

7.4.21 Pulp taste

3 Bad
5 Average
7 Good

7.4.22 Pulp oxidation

Observe five minutes after cutting the fruit.

0 No oxidation
1 Poorly oxidized
2 Oxidized
3 Very oxidized

7.4.23 Contents of soluble solids in the pulp [° Brix]

Measure at full production and at the moment of consumption ripeness. Average of 10 healthy, representative fruits.

7.4.24 Titrated acidity [meq / 100 g]

Measure at full production and at the time of consumption ripeness. Measured in milliequivalents/100 g pulp, titrated with NaOH, 0.1N and phenolphthalein.

7.5 Seed

Recorded on five healthy seeds per fruit in 10 healthy, representative fruits.

7.5.1 Weight of fresh seed [g]

Measure at extraction from the fruit.

7.5.2 Seed coat colour

If possible, use colour codes from the Royal Horticultural Society. If these are not available, use the following colour codes:

1 Grey
2 Dark brown
3 Black
99 Other (specify in descriptor **7.6 Remarks**)

7.5.3 Seed length [mm]

7.5.4 Seed width [mm]

Recorded at the seed's widest point.

7.5.5 Tenacity of the seed in its epithelium

1 Cloaked
2 Semi-cloaked
3 Loose

7.6 Remarks

Any additional information, particularly in the 'Other' category, may be specified here.

EVALUATION

8. Plant descriptors

8.1 Tree

8.1.1 **Tree height** [m]
Recorded from ground level to the tree top.

8.1.2 **Stem diameter**

8.1.2.1 **Diameter of the main stem** [mm]
Measure at 50 cm above ground level.

8.1.2.2 **Diameter of the rootstock** [mm]
Measure at the widest point between ground level and rootstock- scion junction

8.2 Inflorescence

8.2.1 **Number of years between planting and first flowering** [y]

8.2.2 **Number of years between grafting and first flowering** [y]

8.2.3 **Flowering period**

8.2.3.1 **Start of the flowering season** [YYYYMMDD]

8.2.3.2 **End of the flowering season** [YYYYMMDD]

8.3 Fruit

8.3.1 **Number of years from planting to first fructification** [y]

8.3.2 **Number of years from grafting to first fructification** [y]

8.3.3 **Number of days from flowering to fruit set** [d]

8.3.4 **Number of days from flowering to fruit ripeness** [d]

8.3.5 Harvest period

8.3.5.1 Start of the harvest season [YYYYMMDD]

8.3.5.2 End of the harvest season [YYYYMMDD]

8.3.6 Yield [kg/tree]

Average yield of five trees.

8.3.7 Regularity of production

0 No
1 Yes

9. Abiotic stress susceptibility

Scored under artificial and/or natural conditions (to be clearly specified). Use a susceptibility scale from 1 to 9:

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

9.1 Reaction to low temperature

Score in natural conditions in the cold season.

9.2 Reaction to high temperature

Score in natural conditions in the warm season.

9.3 Reaction to drought

Score in natural conditions at daytime, over at least 4 weeks.

9.4 Reaction to high soil moisture

9.5 Reaction to soil alkalinity

9.6 Reaction to soil salinity

9.7 Reaction to constant winds

9.8 Remarks

Specify any additional information concerning abiotic stress susceptibility.

10. Biotic stress susceptibility

In each case, it is important to specify the origin of the infestation or infection, i.e. natural, inoculated, in the field or laboratory. Record this information in descriptor **10.13 Remarks.** Biotic stress susceptibility is scored on a numeric scale from 1 to 9:

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

10.1 Scale insects

10.1.1	*Aspidiotus* spp.	Coconut scale
10.1.2	*Ceropute yuccae*	Coccid
10.1.3	*Icerya purchasi*	Cottony cushion scale
10.1.4	*Lepidosaphes beckii*	Purple scale
10.1.5	*Parasaissetia nigra*	Nigra scale
10.1.6	*Parthenolecanium corni*	European fruit lecanium
10.1.7	*Pinnaspis aspidistrae*	Fern scale
10.1.8	*Planococcus citri*	Citrus mealybug
10.1.9	*Pseudococcus filamentosus*	Citrus mite
10.1.10	*Saissetia* spp.	Scale
10.1.11	*Selenaspidus articulatus*	Rufous scale
10.1.12	*Unaspis citri*	White louse scale

10.2 Whiteflies

10.2.1	*Aleurotrachelus trachoides*	Whitefly

10.3 Aphids

10.3.1	*Aphis gossypii*	Cotton aphid

10.4 Fruit flies

10.4.1	*Anastrepha* spp.	Fruit fly
10.4.2	*Bactrocera tryoni*	Queensland fruit fly
10.4.3	*Ceratitis capitata*	Mediterranean fruit fly

10.5 Coleoptera

10.5.1	*Apate monachus*	Black borer
10.5.2	*Conoderus* spp.	
10.5.3	*Diabrotica* spp.	Corn rootworm

10.6 Lepidoptera

10.6.1	*Cerconota anonella*	*Annona* fruit borer
10.6.2	*Cocytius antaeus*	Giant sphinx

	10.6.3	*Graphium* spp.	
	10.6.4	*Lyonetia* sp.	Leaf miner
	10.6.5	*Talponia batesi*	Seed borer
	10.6.6	*Thecla* sp.	
10.7	**Wasps**		
	10.7.1	*Bephrata maculicollis*	Soursop wasp
	10.7.2	*Bephratelloides* spp.	Annona seed wasp
10.8	**Thrips**		
	10.8.1	*Thrips tabaci*	Thrips
10.9	**Mites**		
	10.9.1	*Brevipalpus californicus*	False spider mite
	10.9.2	*Brevipalpus chilensis*	Chilean false red mite
	10.9.3	*Tetranychus urticae*	Two-spotted spider mite
10.10	**Nematodes**		
	10.10.1	*Helicotylenchus* spp.	Spiral nematode
	10.10.2	*Meloidogyne incognita*	Root-knot nematode
	10.10.3	*Pratylenchus* spp.	Lesion nematode
	10.10.4	*Tylenchorhynchus* spp.	Stunt nematode
	10.10.5	*Xiphinema americanum*	American dagger nematode
10.11	**Fungi**		
	10.11.1	*Botrytis* spp.	Botrytis
	10.11.2	*Cercospora annonaceae*	
	10.11.3	*Colletotrichum* spp.	Anthracnose
	10.11.4	*Fusarium* sp.	Wilt disease
	10.11.5	*Isariopsis anonarum*	
	10.11.6	*Lasiodiplodia theobromae*	Fruit rot
	10.11.7	*Monilia* spp.	Monilia
	10.11.8	*Phakopsora cherimolae*	Rust fungus
	10.11.9	*Phomopsis* spp.	
	10.11.10	*Phyllosticta* spp.	
	10.11.11	*Phytophtora* spp.	
	10.11.12	*Pythium* spp.	
	10.11.13	*Rhizoctonia* spp.	
	10.11.14	*Rhizopus nigricans* (syn. *R. stolonifer*)	Black mould
	10.11.15	*Sclerotium rolfsii*	
	10.11.16	*Uredo cherimola*	
	10.11.17	*Verticillium* spp.	

10.12 Bacteria

10.12.1 *Ralstonia solanacearum* Southern wilt

10.13 Remarks

Specify any additional information concerning biotic stress susceptibility.

11. Biochemical markers

Refer to *Descriptors for Genetic Markers Technologies*, available in PDF from the Bioversity International Web site (www.bioversityinternational.org) or by email request to: bioversityinternational-publications@cgiar.org.

12. Molecular markers

Refer to *Descriptors for Genetic Markers Technologies*, available in PDF from the Bioversity International Web site (www.bioversityinternational.org) or by email request to: bioversityinternational-publications@cgiar.org.

13. Cytological characters

13.1 Chromosome number

13.2 Ploidy level

(2x, 3x, 4x, etc.).

13.3 Other cytological characters

14. Identified genes

Describe any known specific mutant present in the accession.

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