Descriptors for

Avocado

(*Persea* spp.)

International Plant Genetic Resources Institute
IPGRI

ISBN 92-9043-220-9

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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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IPGRI ..
Via delle Sette Chiese 142
00145 Rome
Italy

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

★ **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

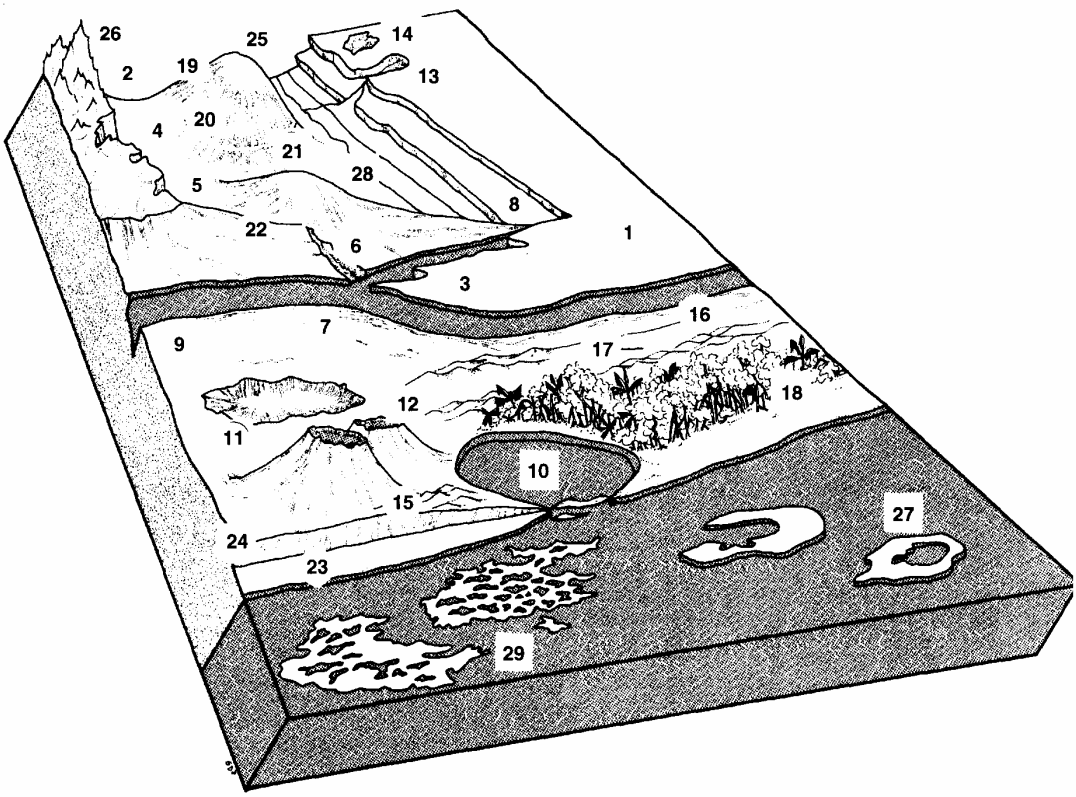

Fig. 1 Land element and position

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	*In situ* 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
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
29 Other (specify in appropriate section's **Notes)**
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
2 Red
3 Reddish
4 Yellowish red
5 Brown
6 Brownish
7 Reddish brown
8 Yellowish brown
9 Yellow
10 Reddish yellow
11 Greenish, green
12 Grey
13 Greyish
14 Blue
15 Bluish-black
16 Black

6.1.21 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

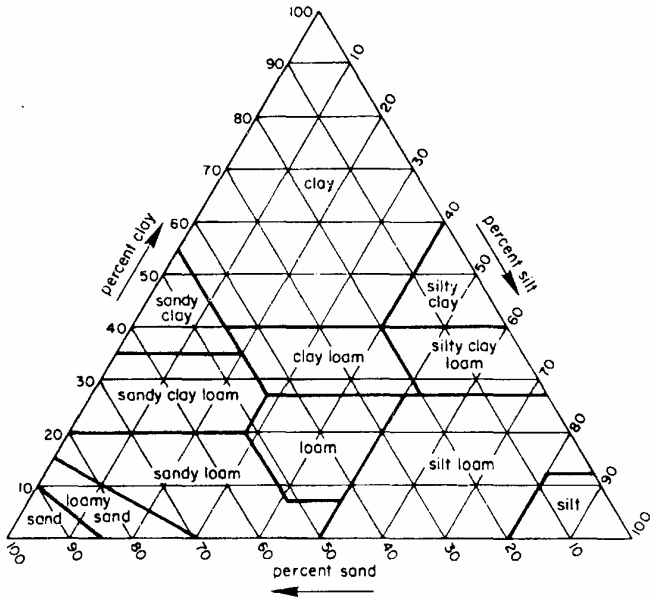

Fig. 2 Soil texture classes

★ **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 [°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**)

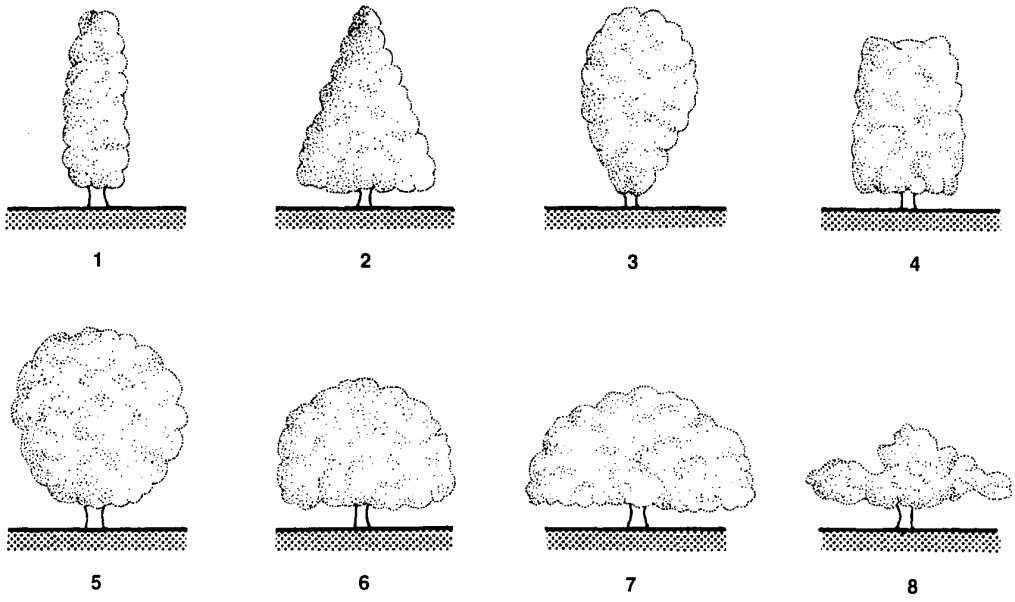

Fig. 3 Tree shape

★ **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

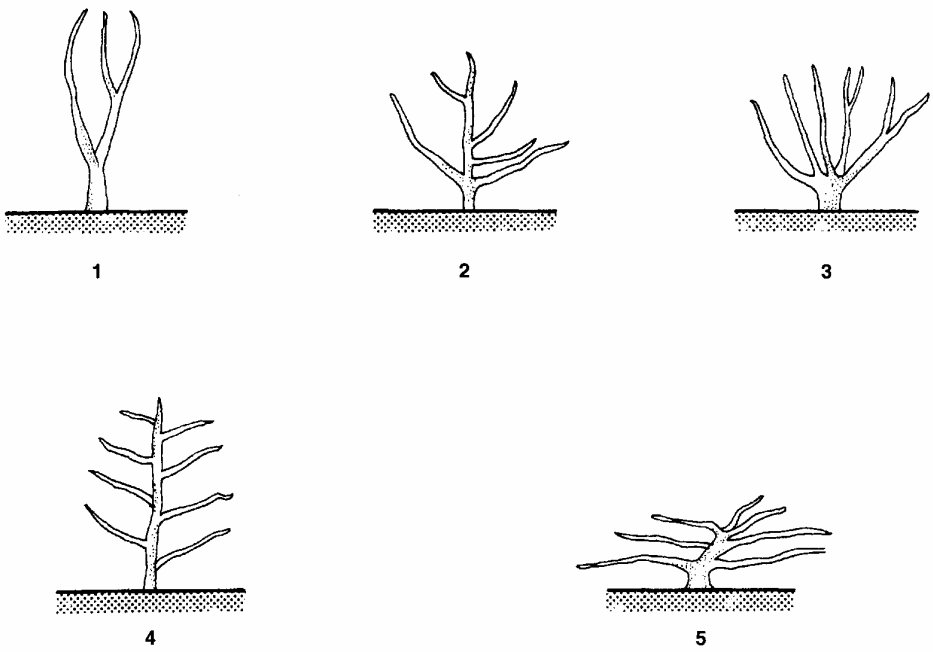

Fig. 5 Distribution of branches

7.1.11 Crotch angle of main branches

(See Fig. 6)

1 Acute (90°)
2 Obtuse (>90°)

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**)

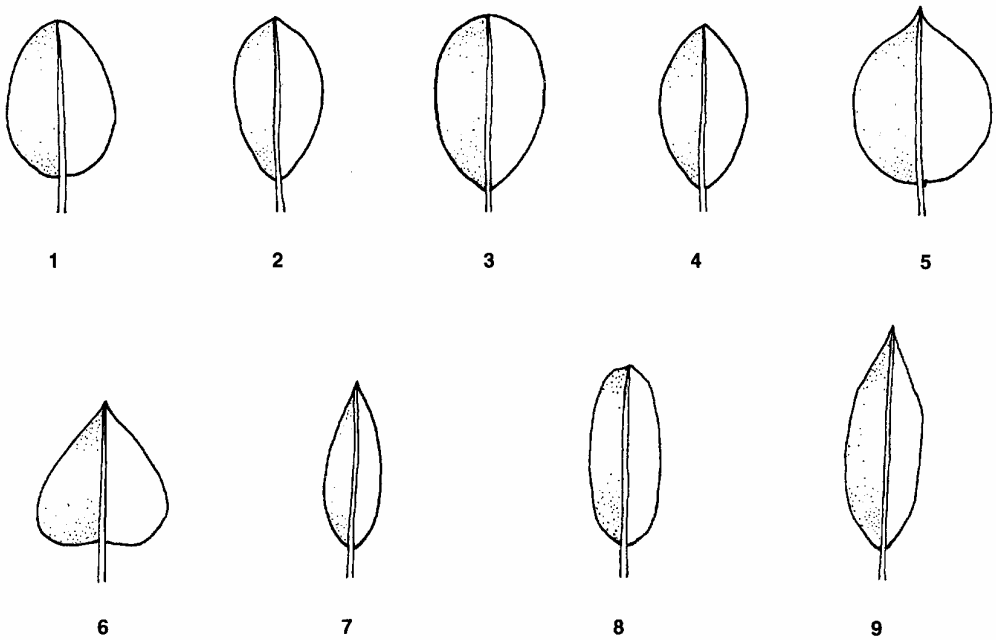

Fig. 7 Leaf shape

7.1.19 Leaf base shape

(See Fig. 8)

1 Acute
2 Obtuse
3 Truncate

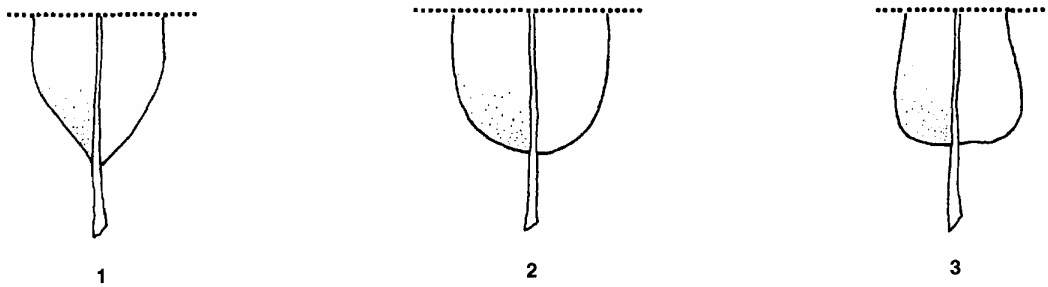

Fig. 8 Leaf base shape

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°)

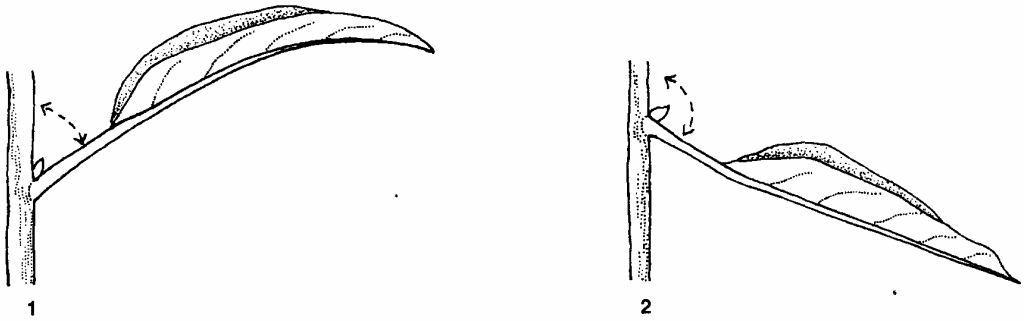

Fig. 9 Crotch angle of leaf petiole

7.1.26 Leaf margin
(See Fig. 10)

1 Entire
2 Undulate

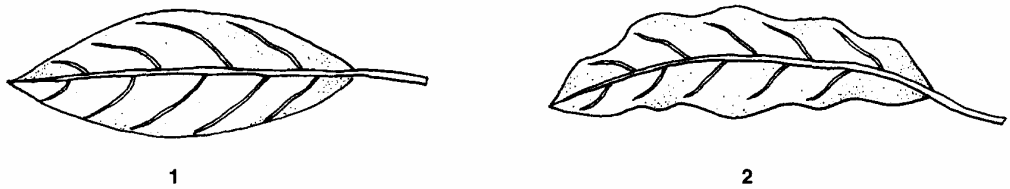

Fig. 10 Leaf margin

★ **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)

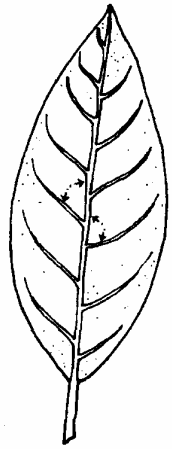

Fig. 11 Primary leaf vein divergence relative to the main vein

7.1.30 Leaf apex shape

(See Fig. 12)

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

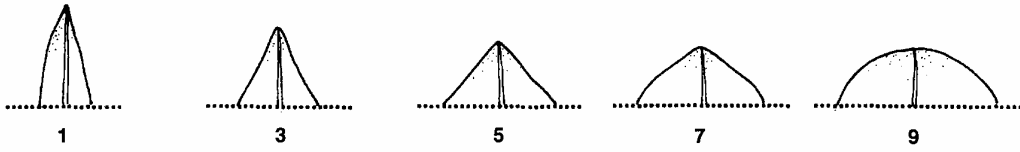

Fig. 12 Leaf apex shape

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

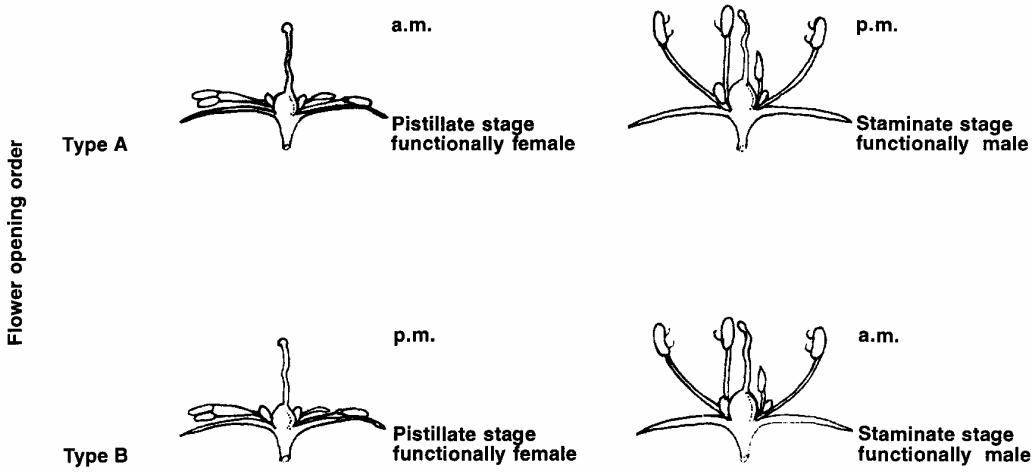

Fig. 13 Flowering type

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)

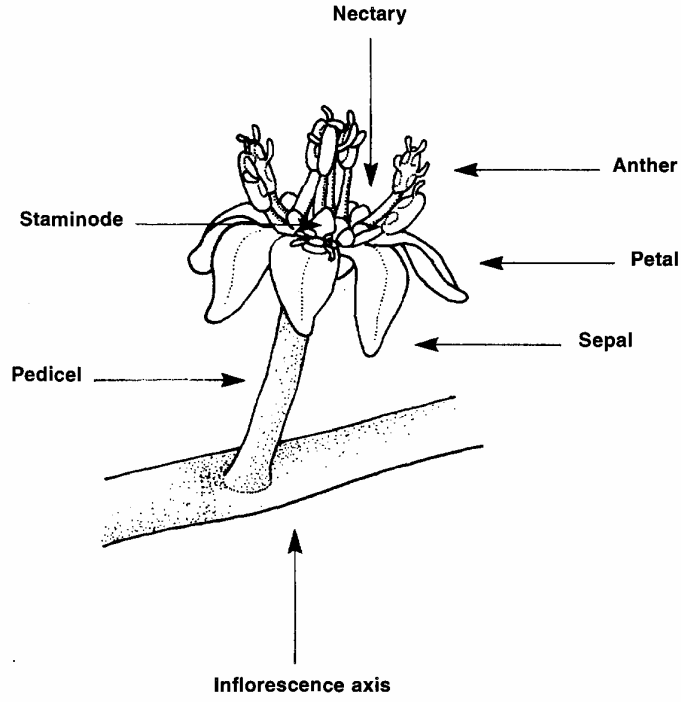

Fig. 14 Avocado flower

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**)

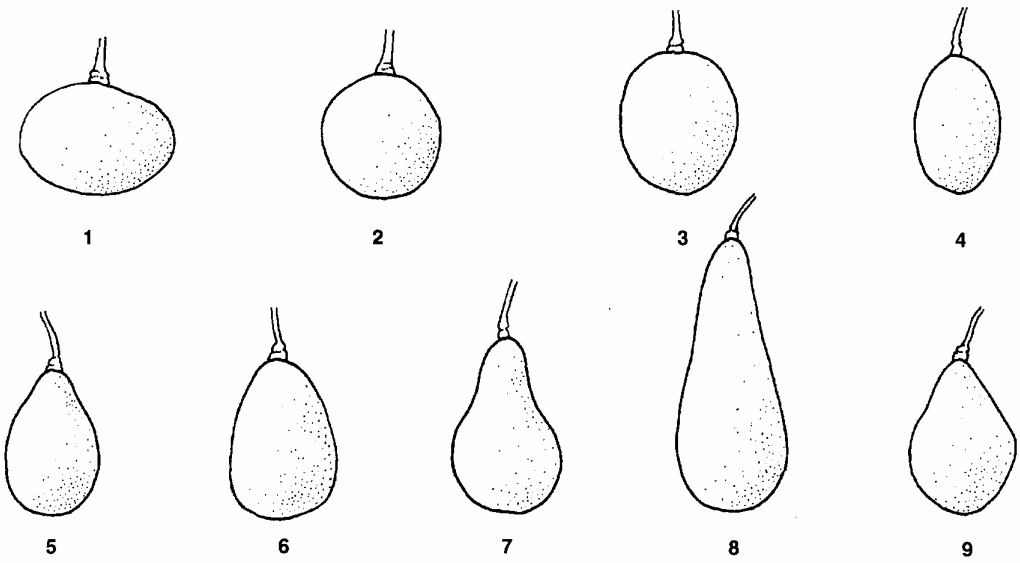

Fig. 15 Fruit shape

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

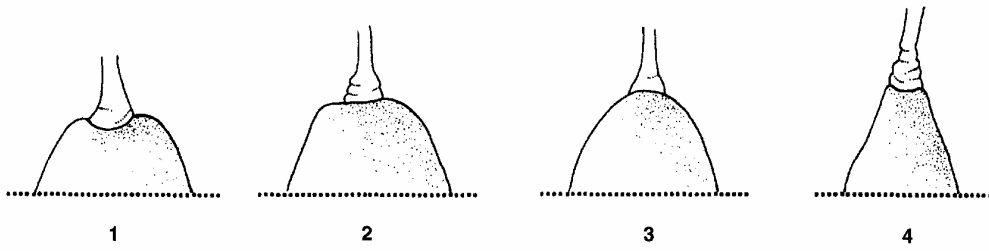

Fig. 16 Fruit base shape

7.3.11 Fruit apex shape
(See Fig. 17)

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

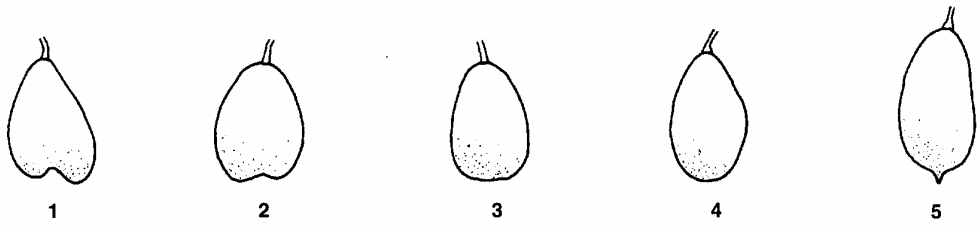

Fig. 17 Fruit apex shape

7.3.12 Fruit apex position

(See Fig. 18)

1 Central
2 Asymmetric

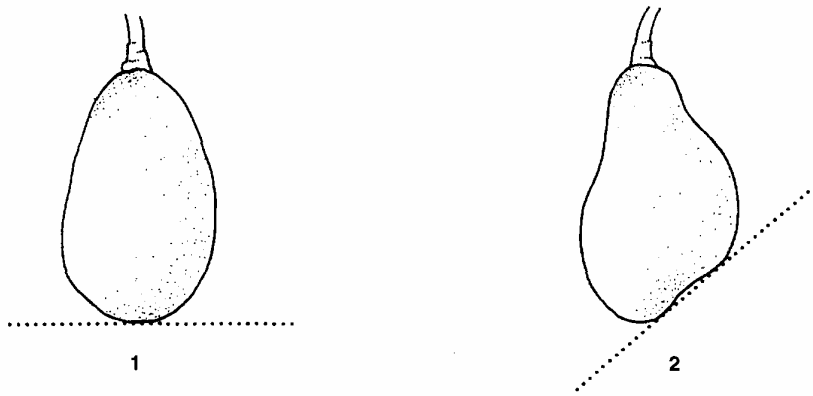

Fig. 18 Fruit apex position

7.3.13 Ridges on fruit

(See Fig. 19)

1 None (Absent)
2 Partial
3 Entire

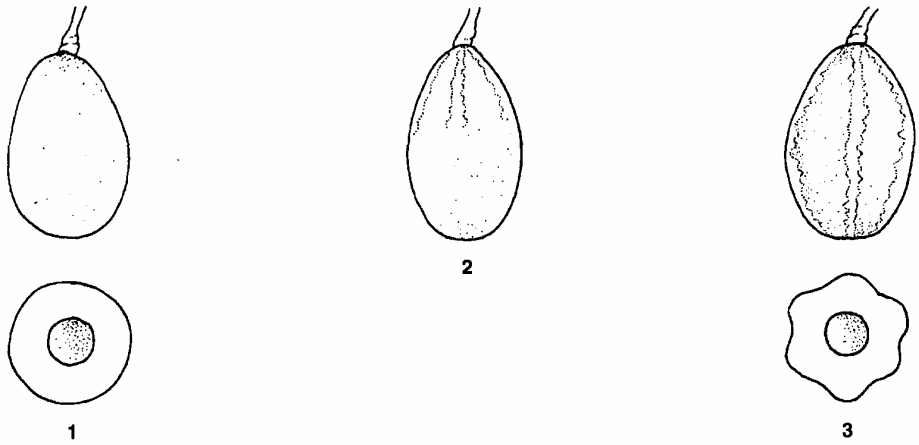

Fig. 19 Ridges on fruit

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

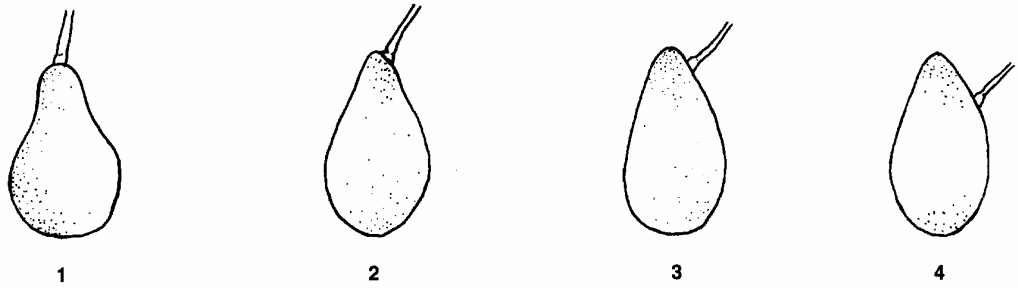

Fig. 20 Pedicel position on fruit

★ **7.3.16 Pedicel shape**
(See Fig. 21)

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

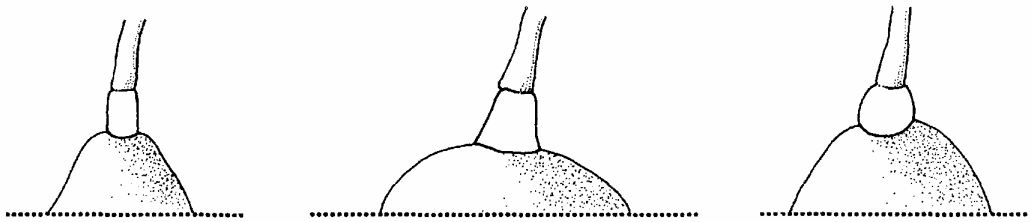

Fig. 21 Pedicel shape

7.3.17 Nailhead pedicel apex shape
(See Fig. 22)

0 Absent
1 Present

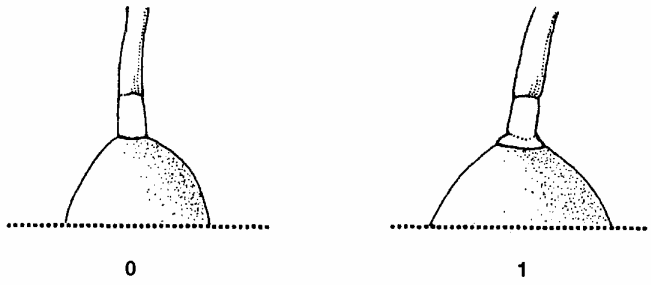

Fig. 22 Nailhead pedicel apex shape

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)

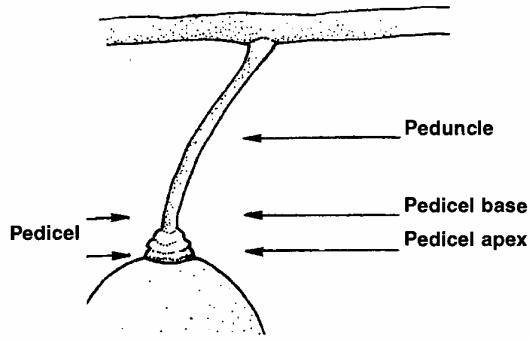

Fig. 23 Peduncle and pedicel

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**)

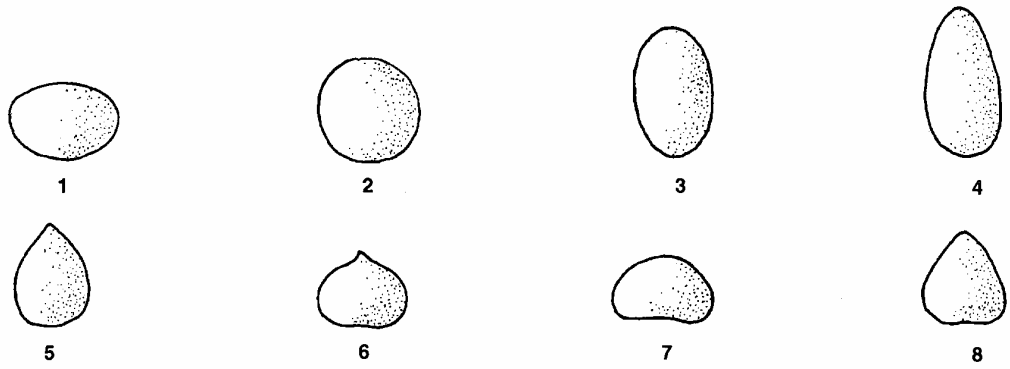

Fig. 24 Seed shape

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**)

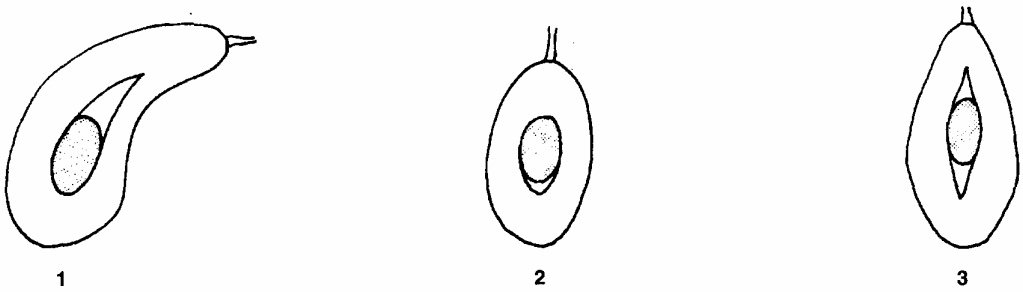

Fig. 25 Free space of seed cavity

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	*Oligonychus* spp.	Red mite
10.1.2	*Heliothrips haemorrhoidalis*	Thrips
10.1.3	*Trioza anceps*	Leaf gall
10.1.4	*Conotrachelus aguacatae*	Seed weevil
10.1.5	*Copturus aguacatae*	Branch weevil (borer)

10.2 Fungi

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

10.3 Bacteria

10.3.1 *Agrobacterium tumefaciens*	Crown gall
10.3.2 *Pseudomonas syringae*	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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CONTRIBUTORS

Dr. Alejandro F. Barrientos Priego
Professor-Researcher
Departamento de Fitotecnia
Universidad Autónoma Chapingo
Chapingo,
Estado de México C.P. 56230
Mexico

Dr. Avraham D. Ben-Ya'acov
Horticulturist
Agricultural Research Organization
The Volcani Center
Institute of Horticulture
P.O. Box 6
Bet-Dagan, 50-250
Israel

Dr. Michal W. Borys
Professor-Researcher
Departamento de Fitotecnia
Universidad Autónoma Chapingo
Chapingo
Estado de México C.P. 56230
Mexico

Dr. Gebhard Bufler
Horticulturist
Institut für Obst-, Gemüse- und Weinbau
Universität Hohenheim (370)
Postfach 700562
7000 Stuttgart 70
Germany

Dr. Eulogio de la Cruz Torres
Researcher
Fundación Salvador Sanchez Colin-
CICTAMEX, S.C.
Ignacio Zaragoza No.6
Coatepec Harinas
Estado de México C.P. 51700
Mexico

Dr. Arturo Cedeño-Maldonado
Professor and Plant Physiologist
Department of Horticulture
College of Agricultural Sciences
University of Puerto-Rico
Mayaguez, PR 00681-5000
Puerto Rico

Dr. Costas Gregoriou
Curator
Agricultural Research Institute (ARI)
Ministry of Agriculture and Natural Resources
P.O. Box 2016
Nicosia
Cyprus

Dr. P.J. Ito
Horticulturist
Hawaii Branch Station
College of Tropical Agriculture
and Human Resources
University of Hawaii
461 W. Lanikaula Street
Hilo, Hawaii 96720-4090
USA

Dr. E. Lahav
Agricultural Research Organization
The Volcani Center
Institute of Horticulture
P.O. Box 6
Bet-Dagan, 50-250
Israel

Eng. Luis López López
Researcher
Fundación Salvador Sanchez Colin-
CICTAMEX, S.C.
Ignacio Zaragoza No.6
Coatepec Harinas
Estado de México C.P. 51700
Mexico

Dr. Simón E. Malo
Director
Escuela Agrícola Panamericana
El Zamorano
P.O. Box 93
Tegucigalpa
Honduras

Eng. Salvador Montes Hernández
Inv. Programa de Recursos Genéticos
Campo Experimental Bajío
Apdo. Postal 112
Celaya, Gto.
Mexico

Dr. Martín Rubí Arriaga
Researcher
Fundación Salvador Sanchez Colin-
CICTAMEX, S.C.
Ignacio Zaragoza No.6
Coatepec Harinas
Estado de México C.P. 51700
Mexico

Dr. Rubén Vélez Colón
Project Leader
University of Puerto Rico
College of Agricultural Sciences
Agricultural Experiment Station
HC-02 - Box 7115
Juana Diaz - PR 00665-9601
Puerto Rico

Dr. D.N. Zamet
Hava Eizorit
Ministry of Agriculture
Acco
Israel

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