
Descriptors for
Tomato
(*Lycopersicon* spp.)



DEFINITIONS AND USE OF THE DESCRIPTORS

IPGRI now uses the following definitions in genetic resources documentation:

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

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

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

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

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

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

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

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

- (a) the *Système International d'Unités* (SI system) is used. The units to be applied are given in square brackets following the descriptor name;
- (b) standard colour charts, e.g. Royal Horticultural Society Colour Chart, Methuen Handbook of Colour, or Munsell Color Chart for Plant Tissues, are strongly recommended for all ungraded colour characters (the precise chart used should be specified in the section where it is used);

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- (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** (1.1)

This number serves as a unique identifier for accessions and is assigned when an accession is entered into the collection. Once assigned this number should never be reassigned to another accession in the collection. Even if an accession is lost, its assigned number is still not available for re-use. Letters should be used before the number to identify the genebank or national system (e.g. IDG indicates an accession that comes from the genebank at Bari, Italy; CGN indicates an accession from the genebank at Wageningen, The Netherlands; PI indicates an accession within the USA system).

1.2 **Donor name** (1.4)

Name of institution or individual responsible for donating the germplasm

1.3 **Donor number** (1.5)

Number assigned to an accession by the donor

1.4 **Other number(s) associated with the accession** (1.6)

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

1.4.1 **Other number 1**

1.4.2 **Other number 2**

★ 1.5 **Scientific name** (1.2)

1.5.1 **Genus** (1.2.1)

1.5.2 **Species** (1.2.2)

1.5.3 **Subspecies**

1.5.4 **Botanical variety** (1.2.3)

1.6 **Pedigree**

Parentage or nomenclature, and designations assigned to breeders' material

1.6.1 **Male parent**

1.6.2 **Female parent**

1.6.3 **Other** (specify in descriptor 1.12 **Notes**)

1.7 **Cultivar**

1.7.1 **Cultivar name**

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

1.7.2 **Translation/Transliteration**

Provide translation of the local cultivar name into English

1.7.3 Synonyms

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

1.8 Breeding method

(Self)	1	Pedigree selection
	2	Bulk
	3	Single seed descent
	4	Backcross
(Outcrossing)	5	Mass selection
	6	Selection with progeny testing (includes: Ear to row; Top cross progeny test; Ear to row to ear; Full sib, and Half sib)
	7	Recurrent selection (includes: Reciprocal recurrent selection)
(Both)	8	Other (specify in descriptor 1.12 Notes)

1.9 Acquisition date [DDMMYYYY]

Date on which the accession entered the collection

1.10 Accession size

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

1.11 Type of material received

- 1 Zygotic embryo
- 2 Seed
- 3 Plant (including seedling)
- 4 Fruit/berry
- 5 Shoot/bud
- 6 Pollen
- 7 *In vitro* propagates
- 8 Other (specify in descriptor **1.12 Notes**)

1.12 Notes

Any additional information may be specified here

2. Collecting descriptors

2.1 Collecting institute(s) (2.1)

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

2.2 Site number

Number assigned to the physical site by the collector

2.3 Collecting number (2.2)

Original number assigned by the collector(s) of the sample, normally composed of the name or initials of the collector(s) followed by a number. This item is essential for identifying duplicates held in different collections. It should be unique and always accompany subsamples wherever they are sent.

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

2.5 Country of collecting (2.4)

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

2.6 Province/State (2.7)

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

2.7 Department/County

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

2.8 Location of collecting site (2.8)

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

2.9 Latitude of collecting site (2.5)

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

2.10 Longitude of collecting site (2.6)

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

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

2.12 Collecting source (2.10)

- 1 Wild habitat
 - 1.1 Forest/woodland
 - 1.2 Shrubland
 - 1.3 Grasslands
 - 1.4 Desert/tundra
- 2 Farm
 - 2.1 Field
 - 2.2 Orchard
 - 2.3 Garden
 - 2.4 Fallow
 - 2.5 Pasture
 - 2.6 Store
- 3 Market
 - 3.1 Town
 - 3.2 Village
 - 3.3 Urban
 - 3.4 Other exchange system
- 4 Institute/Research organization
- 5 Other (specify in descriptor **2.31 Collector's notes**)

2.13 Status of sample (2.11)

- 1 Wild
- 2 Weedy
- 3 Primitive cultivar/Landrace
- 4 Breeders line
- 5 Advanced cultivar
- 6 Unknown
- 7 Other (specify in descriptor **2.31 Collector's notes**)

2.14 Number of plants sampled

2.15 Local/vernacular name

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

2.16 Ethnic group

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

2.17 Number of seeds collected [number]

2.18 Plant population density

- 3 Low
- 5 Intermediate
- 7 High

2.19 General appearance of population

Provide a subjective assessment of the general appearance of the population

- 3 Poor
- 5 Medium
- 7 Good

2.20 Population isolation [km]

Straight-line distance between two adjacent collecting sites

2.21 Cropping system

- 1 Monoculture
- 2 Intercropped (specify crop in descriptor **2.31 Collector's notes**)

2.22 Cultural practices

2.22.1 Sowing date [DDMMYYYY]

2.22.2 Transplanting date [DDMMYYYY]

2.22.3 Harvest date [DDMMYYYY]

2.22.4 Irrigation

Specify amount, frequency and method of application

2.23 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

2.24 Associated flora

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

2.25 Population competition with associated flora

Specify the major floristic elements in descriptor **2.31 Collector's notes**

- 3 Low
- 5 Intermediate
- 7 High

2.26 Uses of the accession

- 1 Fresh consumption
- 2 Industrial (canning, fruit processing)
- 3 Medicinal (vitamin)
- 4 Ornamental
- 5 Other (specify in descriptor **2.31 Collector's notes**)

2.27 Collecting source environment

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

2.28 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 **2.31 Collector's notes**.

- 0 No
- 1 Yes

2.29 Herbarium specimen

Was a herbarium specimen collected? If so, provide an identification number in descriptor **2.31 Collector's notes**.

- 0 No
- 1 Yes

2.30 Prevailing stresses

Information on associated biotic and abiotic stresses and the accession's reaction. Indicate if disease indexing was done at the time of collecting in descriptor **2.31 Collector's notes**.

2.31 Collector's notes

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

GENEBANK MANAGEMENT

3. Seed storage descriptors

3.1 Accession number (Passport 1.1)

3.2 Storage address
(Location in medium- and/or long-term storage and building, room, shelf numbers)

3.3 Storage date [DDMMYYYY]

3.4 Germination at storage [%]

3.5 Date of last germination test [DDMMYYYY]

3.6 Germination at the last test [%]

3.7 Date of next test [DDMMYYYY]
Date (estimate) when the accession should next be tested

3.8 Moisture content at harvest [%]

3.9 Moisture content at storage (initial) [%]

3.10 Amount of seeds in storage(s) [g or number] (Passport 1.10)

3.11 Location of duplicates of this accession

4. Multiplication/Regeneration descriptors

- 4.1 Accession number (Passport 1.1)
- 4.2 Field plot number
- 4.3 Location
- 4.4 Collaborator
- 4.5 Cultural practices
 - 4.5.1 Sowing date [DDMMYYYY]
 - 4.5.2 Transplanting date [DDMMYYYY]
 - 4.5.3 Harvest date [DDMMYYYY]
 - 4.5.4 Irrigation
Specify amount, frequency and method of application
- 4.6 Sowing density [%]
- 4.7 Fertilizer application [g/m²]
- 4.8 Germination in the field [%]
- 4.9 Seedling vigour
Assessed at 18 days after emergence
- 4.10 Number of established plants per hectare
- 4.11 Number of plants used as seed source for each regeneration
- 4.12 Breeding method (Passport 1.8)

(Self)	1	Pedigree selection
	2	Bulk
	3	Single seed descent
	4	Backcross
(Outcrossing)	5	Mass selection
	6	Selection with progeny testing (includes: Ear to row; Top cross progeny test; Ear to row to ear; Full sib, and Half sib)
	7	Recurrent selection (includes: Reciprocal recurrent selection)
(Both)	8	Other (specify in descriptor 4.18 Notes)

★ 4.13 Pollination method

- 1 Self-pollinated
- 2 Often cross-pollinated
- 3 Cross-pollinated

4.14 Pollen viability

- 3 Low
- 5 Intermediate
- 7 High

4.15 Previous multiplication and/or regeneration

- 4.15.1 Location**
- 4.15.2 Sowing date** [DDMMYYYY]
- 4.15.3 Plot number**
- 4.15.4 Biotic stress**
 - 0 Absent
 - 1 Present

4.16 Date of last regeneration or multiplication [DDMMYYYY] (1.3)

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 descriptor 2.5 **Country of collecting**)
- 5.2 Site (research institute)** (3.1)
- 5.2.1 Latitude**
Degrees and minutes followed by N (North) or S (South) (e.g. 1030S)
- 5.2.2 Longitude**
Degrees and minutes followed by E (East) or W (West) (e.g. 07625W)
- 5.2.3 Elevation** [m asl]
- 5.2.4 Name of farm or institute**
- 5.3 Evaluator's name and address**
- 5.4 Sowing date** [DDMMYYYY]
- 5.5 Planting date** [DDMMYYYY] (3.2)
- 5.6 Modality of sowing**
- 1 Greenhouse
 - 2 Open air
 - 3 Heated bed
 - 4 Field
 - 5 Other (specify in descriptor 5.18 **Notes**)
- 5.7 Transplanting date** [DDMMYYYY]
- 5.8 First harvest date** [DDMMYYYY] (3.3)
- 5.9 Last harvest date** [DDMMYYYY]

5.10 Evaluation environment

Environment in which characterization/evaluation was carried out

- 1 Field
- 2 Screenhouse
- 3 Glasshouse
- 4 Laboratory
- 5 Other (specify in descriptor **5.18 Notes**)

5.11 Seed germination [%]

Specify number of days over which germination is measured

5.12 Field establishment [%]

5.13 Sowing/transplanting site in the field

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

5.14 Field spacing

5.14.1 Distance between plants in a row [m]

5.14.2 Distance between rows [m]

5.15 Environmental characteristics of site

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

5.16 Fertilizer

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

5.17 Plant protection

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

5.18 Notes

Any other site-specific information

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

6.1 Site environment

★ 6.1.1 Topography

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

1	Flat	0 - 0.5%
2	Almost flat	0.6 - 2.9%
3	Gently undulating	3 - 5.9%
4	Undulating	6 - 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	5	Upland
2	Basin	6	Hill
3	Valley	7	Mountain
4	Plateau		

6.1.3 Land element and position

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

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

★ 6.1.4 Slope [°]
Estimated slope of the site

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

6.1.6 Crop agriculture
(From FAO 1990)

- 1 Annual field cropping
- 2 Perennial field cropping

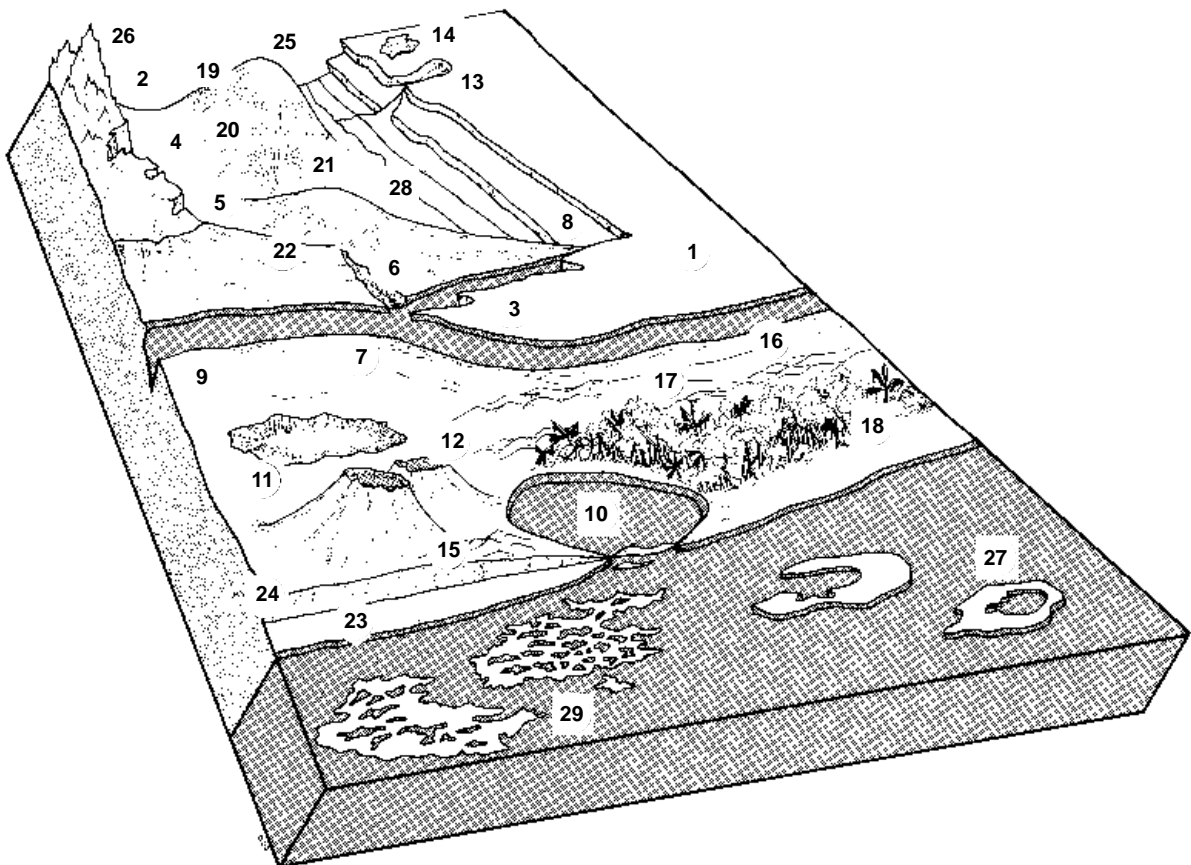


Fig. 1 Land element and position

6.1.7 Overall vegetation surrounding and at the site

(From FAO 1990)

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

6.1.8 Soil parent material

(Adapted from FAO 1990)

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

6.1.8.1 Unconsolidated material

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

6.1.8.2 Rock type

- | | | | |
|----|------------------------------------|----|--|
| 1 | Acid igneous/
metamorphic rock | 16 | Limestone |
| 2 | Granite | 17 | Dolomite |
| 3 | Gneiss | 18 | Sandstone |
| 4 | Granite/gneiss | 19 | Quartzitic sandstone |
| 5 | Quartzite | 20 | Shale |
| 6 | Schist | 21 | Marl |
| 7 | Andesite | 22 | Travertine |
| 8 | Diorite | 23 | Conglomerate |
| 9 | Basic igneous/
metamorphic rock | 24 | Siltstone |
| 10 | Ultra basic rock | 25 | Tuff |
| 11 | Gabbro | 26 | Pyroclastic rock |
| 12 | Basalt | 27 | Evaporite |
| 13 | Dolerite | 28 | Gypsum rock |
| 14 | Volcanic rock | 29 | Other (specify in
appropriate section's
Notes) |
| 15 | Sedimentary rock | 30 | Not known |

6.1.9 Stoniness/rockiness/hardpan/cementation

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

★ **6.1.10 Soil drainage**

(Adapted from FAO 1990)

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

★ **6.1.11 Soil salinity**

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

6.1.12 Soil depth to groundwater table

(Adapted from FAO 1990)

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

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

6.1.13 Soil matrix colour

Adapted from FAO 1990)

The colour of the soil matrix material in the root zone around the accession is recorded in the moist condition (or both dry and moist condition, if possible) using the notation for hue, value and chroma as given in the Munsell Soil Color Charts (Munsell 1977). If there is no dominant soil matrix colour, the horizon is described as mottled and two or more colours are given and should be registered under uniform conditions. Early morning and late evening readings are not accurate. Provide depth of measurement (cm). If colour chart is not available, the following states may be used:

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

★ 6.1.14 Soil pH

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

- 6.1.14.1 pH at 10-15 cm
- 6.1.14.2 pH at 16-30 cm
- 6.1.14.3 pH at 31-60 cm
- 6.1.14.4 pH at 61-90 cm

★ 6.1.15 Soil erosion

- 3 Low
- 5 Intermediate
- 7 High

6.1.16 Rock fragments

(Adapted from FAO 1990)

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

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

★ 6.1.17 Soil texture classes

(Adapted from FAO 1990)

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

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

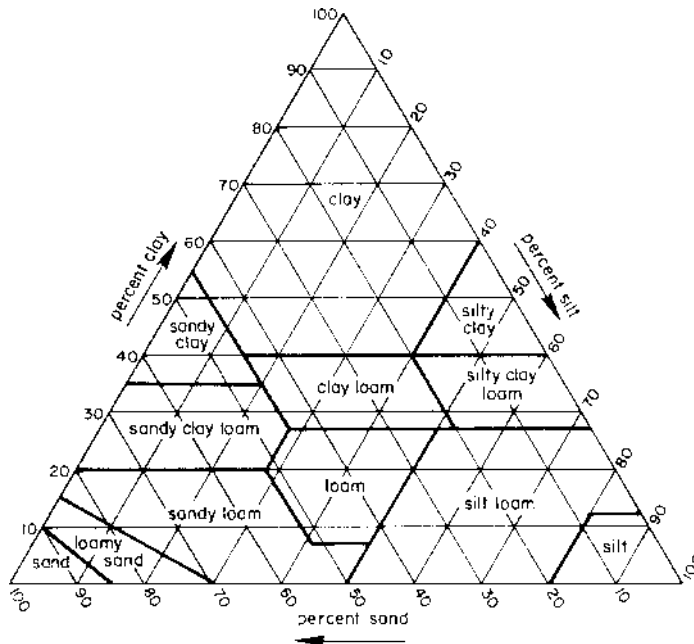


Fig. 2 Soil texture classes

- ★ **6.1.17.1 Soil particle size classes**
(Adapted from FAO 1990)

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

- ★ **6.1.18 Soil 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.).

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

- 6.1.20 Soil fertility**
General assessment of the soil fertility based on existing vegetation
 - 3 Low
 - 5 Moderate
 - 7 High

- 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 diurnal (mean, maximum, minimum) or the seasonal (mean, maximum, minimum)

 - ★ **6.1.21.2 Rainfall [mm]**
Annual average (state number of recorded years)

6.1.21.3 Wind [km/s]

Annual average (state number of years recorded)

- 6.1.21.3.1 Frequency of typhoons or hurricane force winds
- 6.1.21.3.2 Date of most recent typhoons or hurricane force winds
[DDMMYYYY]
- 6.1.21.3.3 Annual maximum wind velocity [km/s]

6.1.21.4 Frost

- 6.1.21.4.1 Date of most recent frost [DDMMYYYY]
- 6.1.21.4.2 Lowest temperature [°C]
Specify seasonal average and minimum survived
- 6.1.21.4.3 Duration of temperature below freezing [d]

6.1.21.5 Relative humidity

- 6.1.21.5.1 Relative humidity diurnal range [%]
- 6.1.21.5.2 Relative humidity seasonal range [%]

6.1.21.6 Light

- 3 Shady
- 7 Sunny

6.1.22 Other

Any additional information may be specified here

CHARACTERIZATION

7. Plant descriptors

7.1 Vegetative

7.1.1 Seedling

Records should be taken when the seedling primary leaves are fully opened and the terminal bud is around 5 mm in size

7.1.1.1 Hypocotyl colour (4.1)

- 1 Green
- 2 1/4 purple from the base
- 3 1/2 purple from the base
- 4 Purple

7.1.1.2 Hypocotyl colour intensity

- 3 Low
- 5 Intermediate
- 7 High

7.1.1.3 Hypocotyl pubescence

- 0 Absent
- 1 Present

7.1.1.4 Primary leaf length [mm] Average of 10 cotyledonous leaves

7.1.1.5 Primary leaf width [mm] Average of 10 cotyledonous leaves

7.1.2 Plant characteristics

Records should be taken when the fruits of the 2nd and 3rd truss are ripened

★ 7.1.2.1 Plant growth type (4.2)

Observed on the whole plot, after admixtures have been removed

- 1 Dwarf
- 2 Determinate
- 3 Semi-determinate
- 4 Indeterminate

7.1.2.2 Plant size (7.11)

Visual estimation of the whole plot

		Reference variety
3	Small	UC82B
5	Intermediate	many improved varieties
7	Large	many improved local varieties

7.1.2.3 Vine length [cm]

Measured on 10 randomly selected plants from the soil level to the tip of the longest stem of a plant

7.1.2.4 Stem pubescence density (7.3)

3	Sparse
5	Intermediate
7	Dense

7.1.2.5 Stem internode length

3	Short
5	Intermediate
7	Long

★

7.1.2.6 Foliage density (7.12)

3	Sparse
5	Intermediate
7	Dense

7.1.2.7 Number of leaves under 1st inflorescence (7.4)

		Reference variety
3	Few	Early North
7	Many	Saint-Pierre

7.1.2.8 Leaf attitude (7.6)

3	Semi-erect
5	Horizontal
7	Drooping

★

7.1.2.9 Leaf type (7.7)

(See Fig. 3)

1	Dwarf	5	Pimpinellifolium
2	Potato leaf type	6	Hirsutum
3	Standard	7	Other (specify in descriptor 7.4 Notes)
4	Peruvianum		

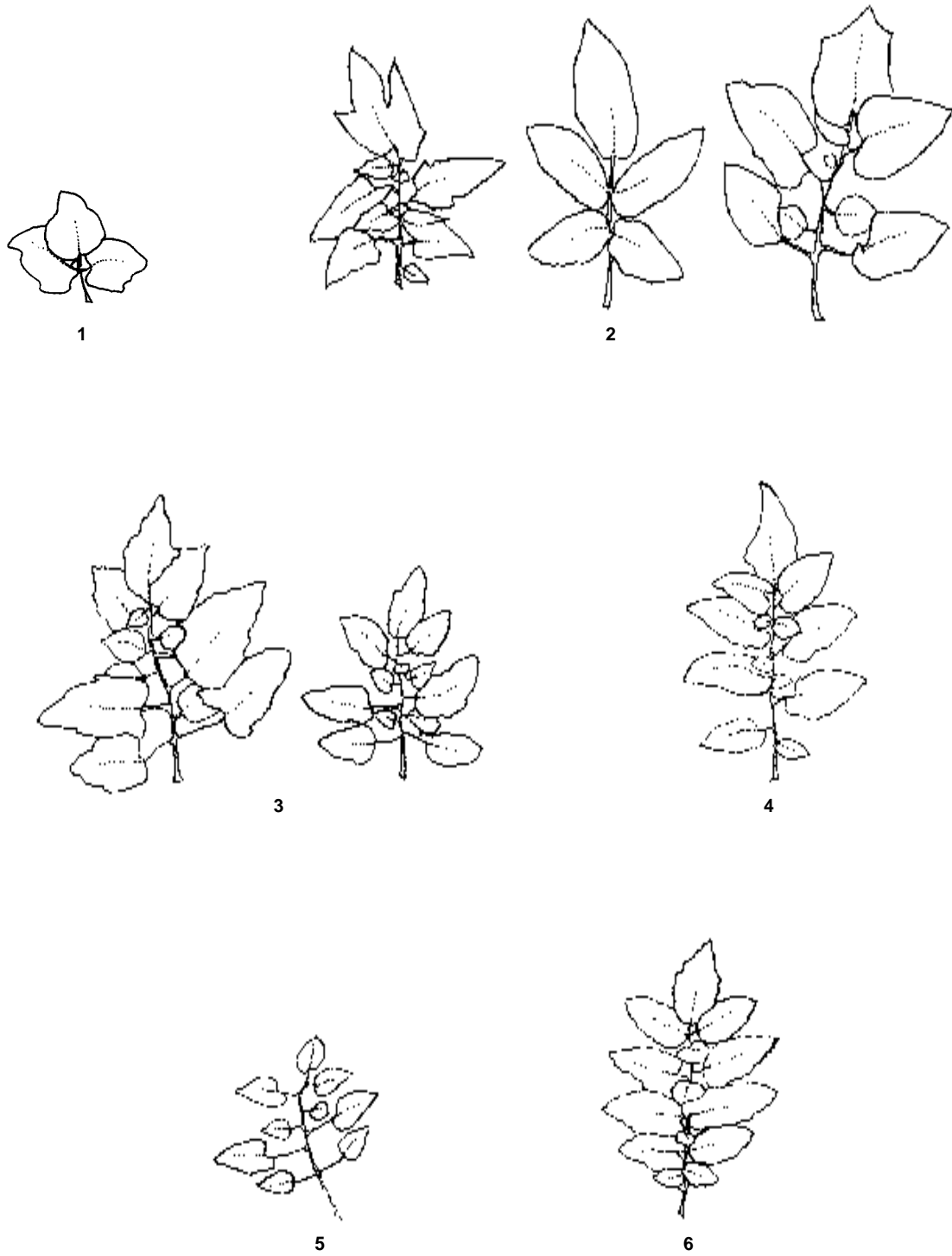


Fig. 3 Leaf type

7.1.2.10 Degree of leaf dissection

- 3 Low
- 5 Intermediate
- 7 High

7.1.2.11 Anthocyanin colouration of leaf veins (7.8)

Indicate the environmental conditions of the trial (e.g. temperature and luminous intensity)

- 1 Obscure vein
- 2 Normal (clear)

7.2 Inflorescence and fruit

Unless otherwise indicated, all observations on the fruit should be taken, when possible, on the 3rd fruit of the 2nd and/or 3rd truss at the full maturity stage, provided normal fertilization has occurred.

7.2.1 Inflorescence descriptors**★ 7.2.1.1 Inflorescence type** (7.9)

Observe the 2nd and 3rd truss of at least 10 plants

- 1 Generally uniparous
- 2 Both (partly uniparous, partly multiparous)
- 3 Generally multiparous

★ 7.2.1.2 Corolla colour

- 1 White
- 2 Yellow
- 3 Orange
- 4 Other (specify in descriptor 7.4 Notes)

7.2.1.3 Corolla blossom type

- 1 Closed
- 2 Open

7.2.1.4 Flower sterility type

- 1 Stemless
- 2 Functional
- 3 Pollen

7.2.1.5 Petal length [mm]

Average of 10 petals from different flowers of different plants

7.2.1.6 Sepal length [mm]

Average of 10 sepals from different flowers of different plants

7.2.1.7 Style position

The relative position of the style compared with the stamens. Average of 10 styles from different flowers of different plants.

- 1 Inserted
- 2 Same level as stamen
- 3 Slightly exerted
- 4 Highly exerted

7.2.1.8 Style shape

- 1 Simple
- 2 Fasciated
- 3 Divided

7.2.1.9 Style hairiness

- 0 Absent
- 1 Present

7.2.1.10 Stamen length [mm]

Average of 10 stamens from different flowers of different plants

7.2.1.11 Dehiscence

- | | |
|----------------|---------------------|
| | Reference variety |
| 1 Poricidal | <i>L. pennellii</i> |
| 2 Longitudinal | Rest of species |

7.2.2 Fruit descriptors

Unless otherwise indicated, all observations on the fruit should be taken, when possible, on the 3rd fruit of the 2nd and/or 3rd truss at the full maturity stage, provided normal fertilization has occurred. Record the average of 10 fruits from different plants.

★ 7.2.2.1 Exterior colour of immature fruit (5.3)

Recorded before maturity

- 1 Greenish-white
- 3 Light green
- 5 Green
- 7 Dark green
- 9 Very dark green

★ 7.2.2.2 Presence of green (shoulder) trips on the fruit

- 0 Absent (uniform ripening)
- 1 Present (fruit shoulders - upper part of the fruit, around calyx - are green while pistilar area of the fruit is red)

7.2.2.3 Intensity of greenback (green shoulder) (8.4)

- 3 Slight
- 5 Intermediate
- 7 Strong

7.2.2.4 Fruit pubescence

- | | |
|----------------|----------------------|
| | Reference variety |
| 3 Sparse | <i>L. esculentum</i> |
| 5 Intermediate | <i>L. pennellii</i> |
| 7 Dense | <i>L. hirsutum</i> |

★

7.2.2.5 Predominant fruit shape (5.2)

Recorded after the fruits turn colour. (See Fig. 4)

- 1 Flattened (oblate)
- 2 Slightly flattened
- 3 Rounded
- 4 High rounded
- 5 Heart-shaped
- 6 Cylindrical (long oblong)
- 7 Pyriform
- 8 Ellipsoid (plum-shaped)
- 9 Other (specify in descriptor 7.4 Notes)

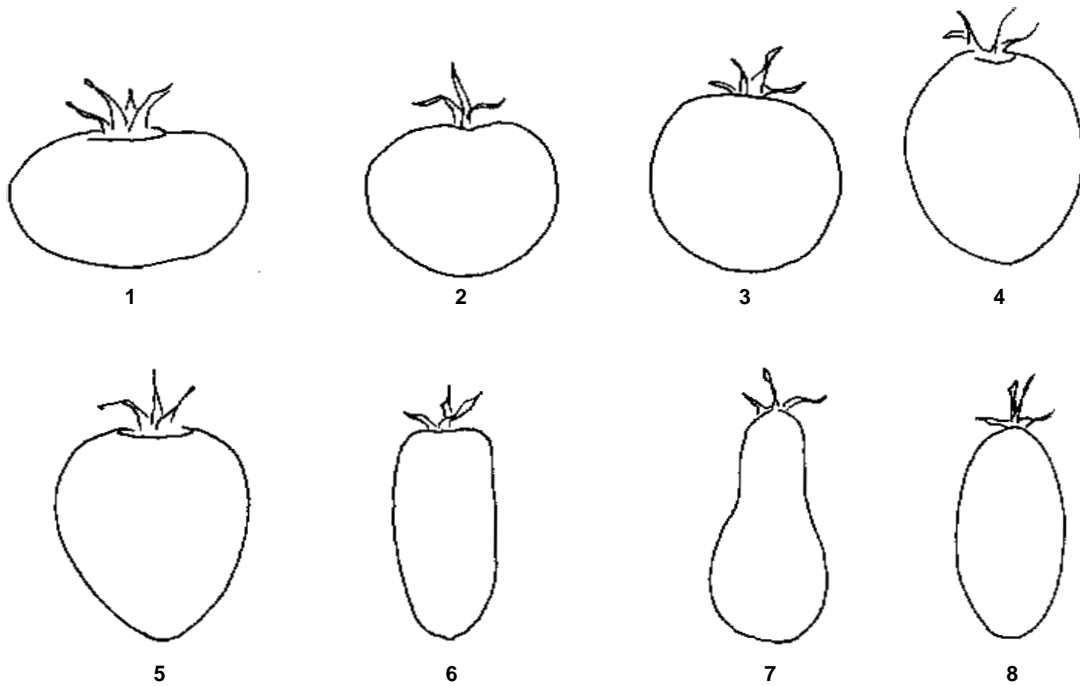


Fig. 4 Predominant fruit shape

- ★ **7.2.2.6 Fruit size** (5.1)
 At maturity
- | | | | Reference variety |
|---|--------------|---------------|-------------------|
| 1 | Very small | (<3 cm) | Cerise |
| 2 | Small | (3 - 5 cm) | Freude |
| 3 | Intermediate | (5.1 - 8 cm) | Vollendung |
| 4 | Large | (8.1 - 10 cm) | Bonset |
| 5 | Very large | (>10 cm) | Grosse rote |
- ★ **7.2.2.7 Fruit size homogeneity** (8.2)
 (Within a plant)
- 3 Low
 - 5 Intermediate
 - 7 High
- ★ **7.2.2.8 Fruit weight [g]**
- ★ **7.2.2.9 Fruit length [mm]** (8.1)
 Recorded from stem end to blossom end, to one decimal place, at maturity
- ★ **7.2.2.10 Fruit width [mm]**
 Recorded at the largest diameter of cross-sectioned fruits to one decimal place, at maturity
- ★ **7.2.2.11 Exterior colour of mature fruit** (8.6)
 Recorded at maturity
- 1 Green
 - 2 Yellow
 - 3 Orange
 - 4 Pink
 - 5 Red
 - 6 Other (specify in descriptor 7.4 Notes)
- 7.2.2.12 Intensity of exterior colour**
- 3 Light
 - 5 Intermediate
 - 7 Dark

7.2.2.13 Secondary fruit shape (8.3)

Recorded on fruits of the second and third truss, after the fruits turn colour

- 1 Flattened (oblate)
- 2 Slightly flattened
- 3 Rounded
- 4 High rounded
- 5 Heart-shaped
- 6 Cylindrical (long oblong)
- 7 Pyriform
- 8 Ellipsoid (plum-shaped)
- 9 Other (specify in descriptor 7.4 Notes)

★

7.2.2.14 Ribbing at calyx end (5.9)

- | | | |
|---|--------------|-----------------------------|
| 1 | Very weak | Reference variety
Cerise |
| 3 | Weak | Allround |
| 5 | Intermediate | Saint-Pierre |
| 7 | Strong | Supermarmande |

7.2.2.15 Easiness of fruit to detach from the pedicel

Recorded during harvesting

- 3 Easy
- 5 Intermediate
- 7 Difficult

7.2.2.16 Fruit shoulder shape

(See Fig. 5)

- | | | |
|---|----------------------|-----------------------------|
| 1 | Flat | Reference variety
Rossol |
| 3 | Slightly depressed | |
| 5 | Moderately depressed | Saint-Pierre |
| 7 | Strongly depressed | |

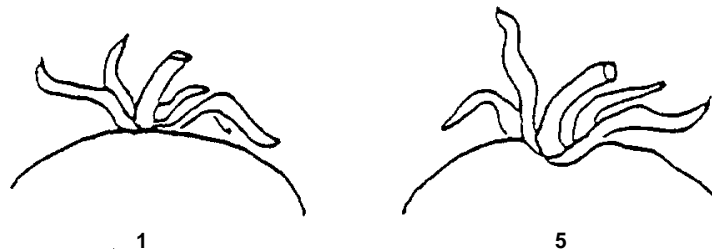


Fig. 5 Fruit shoulder shape

7.2.2.17 Pedicel length [cm]
 Measured from peduncle to calyx

- ★ **7.2.2.18 Pedicel length from abscission layer [cm]** (8.10)
 Recorded from abscission layer to calyx. Average of 10 pedicels from different plants. (See Fig. 6)

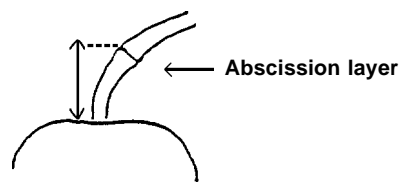


Fig. 6 Pedicel length from abscission layer

7.2.2.19 Presence/absence of jointless pedicel (5.8)
 0 Absent
 1 Present

- ★ **7.2.2.20 Width of pedicel scar [mm]**
 Recorded at the widest part on 10 randomly selected fruits from different plants
 - 3 Narrow (covered by the calyx)
 - 5 Medium (slightly apparent around the calyx)
 - 7 Wide (very apparent around the calyx)

7.2.2.21 Size of corky area around pedicel scar [mm]
 Recorded at the widest part on 10 randomly selected fruits

- 3 Small
- 5 Intermediate
- 7 Large

7.2.2.22 Easiness of fruit wall (skin) to be peeled

- 3 Easy
- 5 Intermediate
- 7 Difficult

- ★ **7.2.2.23 Skin colour of ripe fruit** (5.4)
 Observe the peeled fruit skin
 - 1 Colourless
 - 2 Yellow

7.2.2.24 Thickness of fruit wall (skin) [mm]

Measured with a dial caliper

7.2.2.25 Thickness of pericarp [mm]

(8.8)

Measured from an equatorial section of the fruits

★

7.2.2.26 Flesh colour of pericarp (interior)

(5.5)

- 1 Green
- 2 Yellow
- 3 Orange
- 4 Pink
- 5 Red
- 6 Other (specify in descriptor 7.4 Notes)

7.2.2.27 Flesh colour intensity

(5.6)

- 3 Light
- 5 Intermediate
- 7 Dark

7.2.2.28 Colour (intensity) of core

- 1 Green
- 2 White
- 3 Light
- 5 Intermediate
- 7 Dark

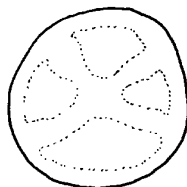
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7.2.2.29 Fruit cross-sectional shape

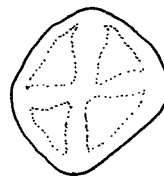
(5.7)

(See Fig. 7)

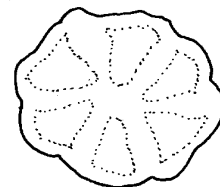
- 1 Round
- 2 Angular
- 3 Irregular



1



2



3

Fig. 7 Fruit cross-sectional shape

7.2.2.30 Size of core [cm] (8.9)
Measured on 10 cross-sectional randomly selected fruits at the widest part of the core

★ **7.2.2.31 Number of locules** (8.7)
Counted on at least 10 fruits

★ **7.2.2.32 Shape of pistil scar**
(See Fig. 8)

- 1 Dot
- 2 Stellate
- 3 Linear
- 4 Irregular

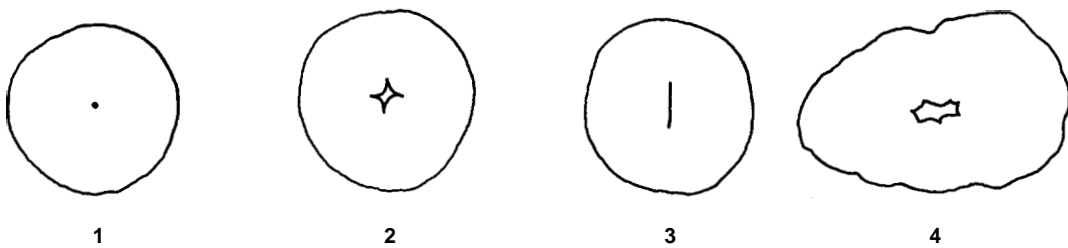


Fig. 8 Shape of pistil scar

★ **7.2.2.33 Fruit blossom end shape** (8.15)
(See Fig. 9)

- 1 Indented
- 2 Flat
- 3 Pointed

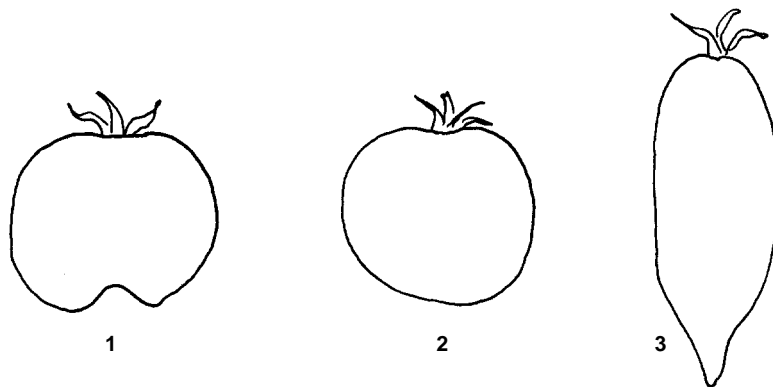


Fig. 9 Blossom end shape

7.2.2.34 Blossom end scar condition (8.16)

- 1 Open
- 2 Closed
- 3 Both

★ 7.2.2.35 Fruit firmness (after storage) (5.11)

Recorded by pressing together in the palm on the side of a fruit at its widest girth, i.e. sideways, 10 days after harvesting in full ripeness

- 3 Soft
- 5 Intermediate
- 7 Firm

7.3 Seed**7.3.1 Seed shape**

- 1 Globular
- 2 Ovate
- 3 Triangular with pointed base

7.3.2 1000-seed weight [g]**7.3.3 Seed colour**

- 1 Light yellow
- 2 Dark yellow
- 3 Grey
- 4 Brown
- 5 Dark brown

7.4 Notes

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

EVALUATION

8. Plant descriptors

8.1 Agronomic characteristics

8.1.1 Number of days to flowering [d]

From sowing until 50% of plants have at least one open flower in a uniform growing environment

- ★ **8.1.2 Number of days to maturity [d]** (6.1)
From sowing until 50% of plants have at least one fruit ripened

- 8.1.3 Ripening uniformity of the whole plot** (6.2)
3 Poor
5 Intermediate
7 Good

8.1.4 Number of inflorescences
(On the main stem). Average of 10 plants

- ★ **8.1.5 Number of flowers per inflorescence**
(Second inflorescence). Average of 10 plants

8.1.6 Number of fruit set per inflorescence
Recorded in the 2nd truss

8.2 Fruit characteristics

(Environment dependent). All quality characteristics should be evaluated in physiologically mature fruits

- 8.2.1 Blotchy ripening** (8.20)
Internal white tissue
3 Slight
5 Intermediate
7 Severe

- 8.2.2 Sun scald**
3 Slight
5 Intermediate
7 Severe

-
- ★ 8.2.3 **Radial cracking** (5.12)
 1 Corky lines
 3 Slight
 5 Intermediate
 7 Severe
- ★ 8.2.4 **Concentric cracking** (5.13)
 1 Corky lines
 3 Slight
 5 Intermediate
 7 Severe
- 8.2.5 **Fruit fasciation** (5.14)
 3 Slight
 5 Intermediate
 7 Severe
- 8.2.6 **Vascular bundle content**
 3 Slight
 5 Intermediate
 7 Severe
- 8.2.7 **Cat-face appearance**
 3 Slight
 5 Intermediate
 7 Severe
- 8.2.8 **Blossom-end rot** (8.21)
 3 Few
 5 Moderate
 7 Many
- ★ 8.2.9 **Puffiness appearance** (8.17)
 Presence of cavity
 3 Slight
 5 Intermediate
 7 Severe
- 8.3 **Chemical composition**
- ★ 8.3.1 **Soluble solids** (8.24)
 Measured in Brix unit (percent solids) from two composite raw juice samples of at least five fruits per juice sample

8.3.2 Fruit pH (8.22)
Measured from two composite raw juice samples of at least five fruits per juice sample

8.4 Notes
Specify any additional information here

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 Salinity

Specify conductivity dS/m and main salt involved (NaCl, Na_2CO_3 , CaCl_2 , etc.)

9.4 Drought (9.3)

9.5 High soil moisture

9.6 High humidity (9.4)

9.7 Aluminium sensitivity

9.8 Calcium deficiency

9.9 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. Record such information in descriptor **10.9 Notes**. These are coded on a susceptibility scale from 1 to 9, viz:

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

Asterisks (*) in sections **10.1 to 10.3** indicate the organisms considered most important by breeders or pathologists.

10.1 Fungi

	Causal organism	Common name
10.1.1	<i>Alternaria alternata</i> f.sp. <i>lycopersici</i>	Alternaria stem canker (Black mould)
10.1.2	<i>Alternaria solani</i>	Early blight
10.1.3	<i>Alternaria tomato</i>	Tomato nail head spot
10.1.4	<i>Ascochyta lycopersici</i>	Tomato gray spot
10.1.5	<i>Botrytis cinerea</i>	Grey mould
10.1.6	<i>Cercospora fujigena</i>	Tomato Cercospora mould
10.1.7	* <i>Colletotrichum</i> spp.	Anthracnose (10.2.5)
10.1.8	<i>Corynespora cassicola</i>	Target spot
10.1.9	<i>Didymella lycopersici</i>	Didymella stem rot
10.1.10	<i>Fulvia fulva</i> (syn. <i>Cladosporium fulvum</i>) (races A, B1 and B2)	Leaf mould
10.1.11	<i>Fusarium oxysporum</i> f.sp. <i>radicis-lycopersici</i>	Fusarium crown and root rot
10.1.12	* <i>Fusarium oxysporum</i> f.sp. <i>lycopersici</i> (races 0, 1 and 2)	Fusarium wilt (10.2.6-8)
10.1.13	<i>Helminthosporium carpocapsum</i>	Tomato Helminthosporium fruit rot
10.1.14	<i>Leveillula taurica</i>	Powdery mildew
	<i>Oidium lycopersicum</i>	
10.1.15	* <i>Phytophthora</i> spp.	Buckeye rot of fruit, Phytophthora root rot, Late blight (10.2.9)
10.1.16	<i>Pseudocercospora fuligena</i>	Cercospora leaf mould
10.1.17	<i>Pyrenochaeta lycopersici</i>	Corky root rot, Brown root rot
10.1.18	<i>Pythium</i> spp.	Pythium (10.2.14)
10.1.19	* <i>Rhizoctonia solani</i>	Rhizoctonia
10.1.20	* <i>Septoria lycopersici</i>	Septoria leaf spot (10.2.10)

10.1.21	* <i>Stemphylium</i> spp.	Grey leaf spot
10.1.22	<i>Verticillium dahliae</i> <i>Verticillium albo-atrum</i> (races 1 and 2)	Verticillium wilt (10.2.11-12)
10.2	Bacteria	
	Causal organism	Common name
10.2.1	<i>Clavibacter michiganensis</i> subsp. <i>michiganensis</i> syn. <i>Corynebacterium michiganense</i>	Bacterial canker (10.3.1)
10.2.2	<i>Erwinia carotovora</i> subsp. <i>carotovora</i>	Bacterial stem rot
10.2.3	<i>Pseudomonas corrugata</i>	Tomato pith necrosis
10.2.4	* <i>Pseudomonas solanacearum</i>	Bacterial wilt (10.3.2)
10.2.5	<i>Pseudomonas syringae</i> pv. <i>tomato</i>	Bacterial speck
10.2.6	* <i>Xanthomonas campestris</i> pv. <i>vesicatoria</i>	Bacterial spot (10.3.3)
10.3	Virus and mycoplasma	
	Major distribution	
10.3.1	Alfalfa mosaic virus (AMV)	
10.3.2	Cucumber mosaic virus (CMV)	(10.4.1)
10.3.3	*Curly-top virus	
10.3.4	Potato virus Y (PVY)	
10.3.5	Tobacco etch virus (TEV)	
10.3.6	Tomato bushy stunt virus (TBSV)	
10.3.7	*Tomato mosaic virus (ToMV)	(10.4.3-5)
10.3.8	Tomato spotted wilt virus (TSWV)	
10.3.9	Tomato yellow leaf curl (syn. tomato leaf curl) (TYLCV)	
10.3.10	Tomato yellow top	
10.4	Viroids	
10.4.1	Tomato apical stunt viroid (TASVd)	
10.4.2	Tomato bunchy top viroid (TBTVd)	
10.4.3	Tomato planta macho viroide (TPMVd)	
10.5	Mycoplasma-like organisms	
10.5.1	Aster yellow disease	
10.5.2	Tomato big bud	
10.6	Post-harvest diseases	
10.6.1	<i>Erwinia</i> spp. <i>Pseudomonas</i> spp. <i>Bacillus</i> spp.	Bacterial soft rot
10.6.2	<i>Alternaria alternata</i> (syn. <i>A. tennisi</i>) <i>Stemphylium botryosum</i> (teleomorph <i>Pleospora herbarum</i>) <i>Stemphylium consortiale</i>	Black mould rot

	<i>Pleospora lycopersici</i> (syn. <i>P. herbarum</i>)	
10.6.3	<i>Botrytis cinerea</i>	Gray mould rot
10.6.4	<i>Rhizopus stolonifer</i> (syn. <i>R. nigricans</i>)	Rhizopus rot
10.6.5	<i>Geotrichum candidum</i> (syns. <i>Oidium lactis</i> and <i>Oospora lactis</i> and <i>G. penicillatum</i>)	Sour rot (watery rot and Oospora rot)

10.7 Pests

	Causal organism	Pest or common name
10.7.1	<i>Acrosternum hilare</i>	Green stink bug
10.7.2	<i>Aculops lycopersici</i>	Tomato russet mite
10.7.3	<i>Agrostis ipsilon</i>	Cutworm
10.7.4	<i>Bemisia tabaci</i>	Sweet potato whitefly
10.7.5	<i>Drosophila</i> spp.	Fruit fly
10.7.6	<i>Euschistus servus</i>	Brown stink bug
10.7.7	<i>Euschistus conspersus</i>	Conspere stink bug
10.7.8	<i>Frankliniella</i> spp. <i>Heliothrips haemorrhoidalis</i> <i>Thrips</i> spp.	Thrips
10.7.9	<i>Helicoverpa armigera</i>	Tomato fruitworm
10.7.10	<i>Nezara viridula</i>	Southern green stink bug
10.7.11	<i>Tetranychus</i> spp.	Spider mites
10.7.12	<i>Thyanta accerra</i>	Red shouldered stink bug
10.7.13	<i>Trialeurodes vaporariorum</i>	Greenhouse whitefly
10.7.14	<i>Macrosiphum euphorbiae</i>	Potato aphid
10.7.15	<i>Myzus persicae</i>	Green peach aphid
10.7.16	<i>Liriomyza</i> spp.	
10.7.17	<i>Polyphagotarsonemus latus</i>	Yellow tea mite

10.8 Nematodes

	Causal organism	Pest or common name
10.8.1	<i>Belonolaimus gracilis</i>	Sting nematode
10.8.2	<i>Meloidogyne</i> spp.	Root-knot nematode
10.8.3	<i>Paratrichodorus</i> spp. <i>Trichodorus</i> spp.	Stubby-root nematode

10.9 Notes

Specify any additional information here

11. Biochemical markers

For biochemical and molecular markers refer to Plant Genome database (SolGenes for Tomato)

11.1 Isozyme

For each enzyme, indicate the tissue analyzed 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. Flavonoid and polyphenol profiles)

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 Random Amplified Polymorphic DNA (RAPD)

12.3 Specific Amplicon Polymorphism (SAP)

12.4 Microsatellites

12.5 Other molecular markers

13. Cytological characters

★ 13.1 Haploid chromosome number

13.2 Ploidy level

(4n, 6n)

13.3 Trisomics

13.4 Monosomics

13.5 B chromosomes

14. Identified genes

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

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LIST OF DESCRIPTORS

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

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