

DESCRIPTORS FOR CITRUS

IBPGR



INTERNATIONAL
BOARD FOR
PLANT
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RESOURCES

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INTERNATIONAL BOARD FOR PLANT GENETIC RESOURCES

DESCRIPTORS FOR CITRUS

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PREFACE

This citrus descriptor list has been prepared in a standard IBPGR format by a group of Brazilian scientists from three citrus genebanks of the National Network of Genebanks, which has its headquarters at Limeira Experiment Station, Institute of Agronomy of Campinas, São Paulo State. The comments of several other citrus specialists were incorporated into the final version, all of whom are listed in Appendix I, together with the original authors.

The taxonomy of citrus crops is still not finally resolved, but a combination of the classification systems of Swingle, Reece and Tanaka is probably the easiest to use. This descriptor list has been devised to cover members of the tribe Citreae of the family Rutaceae and sub-family Aurantioideae, all of which have a type of fruit bearing juice-filled vesicles known as a hesperidium. Of about 13 genera involved, the most important are Citrus (16 species including 10 cultivated), Fortunella and Poncirus.

IBPGR encourages the collection of data on the first four categories of this list: 1. Accession; 2. Collection; 3. and 4. Characterization and preliminary evaluation. IBPGR endorses the information in categories 1-4 as the minimum that ideally should be available for any one accession. Other descriptors are given in categories 5 onwards that will enable the simple encoding of further characterization and evaluation data and which can serve as examples for the creation of additional descriptors in the IBPGR form by any user.

Although the suggested coding should not be regarded as the definitive scheme, this format has the full backing of IBPGR and is promoted worldwide. The descriptor list given here provides an international format and thereby produces a universally understood 'language' for all plant genetic resources data. The adoption of this scheme for all data encoding, or at least the production of a transformation method to convert other schemes to the IBPGR format, will produce a rapid, reliable and efficient means for information storage, retrieval and communication. This will greatly assist the utilization of germplasm throughout the international network of plant genetic resources. 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 for modifications will be welcomed by IBPGR Headquarters, Rome.

DESCRIPTOR LIST FOR CITRUS

IBPGR now uses the following definitions in genetic resources documentation:

- (i) passport (accession identifiers and information recorded by collectors);
- (ii) characterization (consists of recording those characters which are highly heritable, can be easily seen by the eye and are expressed in all environments);
- (iii) preliminary evaluation (consists of recording a limited number of additional traits thought desirable by a consensus of users of the particular crop).

Characterization and preliminary evaluation will be the responsibility of the curators, while further characterization and evaluation should be carried out by the plant breeder. The data from further evaluation should be fed back to the curator who will maintain a data file.

The following internationally accepted norms for the scoring or coding of descriptor states should be followed as indicated below:

- (a) measurements are made according to the SI system. The units to be applied are given in square brackets following the descriptor;
- (b) many descriptors which are continuously variable are recorded on a 1-9 scale. 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 8 (Pest and disease susceptibility) 1 = extremely low susceptibility and 8 = high to extremely high susceptibility;
- (c) presence/absence of characters are scored as + (present) and 0 (absent);
- (d) for descriptors which are not generally uniform throughout the accession (e.g. mixed collection, genetic segregation) mean and standard deviation could be reported where the descriptor is continuous or mean and 'x' where the descriptor is discontinuous;

- (e) when the descriptor is inapplicable, '0' is used as the descriptor value, e.g. if an accession does not form flowers, 0 would be scored for the following descriptor,

Flower colour

- | | |
|---|--------|
| 1 | White |
| 2 | Yellow |
| 3 | Red |
| 4 | Purple |

- (f) blanks are used for information not yet available;
- (g) standard colour charts, e.g. Royal Horticultural Society Colour Chart, Methuen Handbook of Colour, Munsell Color Charts for Plant Tissues, are strongly recommended for all ungraded colour characters (the precise chart used should be specified in the NOTES descriptor, 11);
- (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 DATA

1.1 ACCESSION NUMBER

This number serves as a unique identifier for accessions and is assigned by the curator when an accession is entered into his 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 occur before the number to identify the genebank or national system (e.g. MG indicates an accession comes from the genebank at Bari, Italy; 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 IDENTIFICATION NUMBER

Number assigned to accession by the donor

1.4 OTHER NUMBERS ASSOCIATED WITH THE ACCESSION

Any other identification number known to exist in other collections for this accession, e.g. USDA Plant Inventory number (not collection number, see 2.1). 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

Specify the system of citrus taxonomy followed. That of Swingle and Reece is now the most generally used, but Tanaka's system may also be given.

1.5.1 Genus

1.5.2 Species

1.5.3 Subspecies

1.5.4 Cultivar group

1.6 PEDIGREE OF CULTIVAR

- 1.6.1 Female parent
- 1.6.2 Male parent
- 1.6.3 Male parent if backcrossed
- 1.6.4 Original cultivar name if from a bud mutation
- 1.6.5 Original cultivar name if from a nucellar seedling

1.7 ACQUISITION DATE

The date in which the accession entered the collection

1.8 DATE OF LAST REGENERATION OR MULTIPLICATION

1.9 ACCESSION SIZE

Approximate number of seeds or plants of accession in collection

1.10 TYPE OF MATERIAL MAINTAINED

- 1 Living plants
- 2 Seeds
- 3 Pollen
- 4 Tissue culture
- 5 Cryogenic storage

1.11 NUMBER OF TIMES ACCESSION REGENERATED

Number of regenerations or multiplications since original collection

2. COLLECTION DATA

2.1 COLLECTOR'S NUMBER

Original number assigned by collector 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 and should always accompany sub-samples wherever they are sent

2.2 COLLECTING INSTITUTE

Institute or person collecting/sponsoring the original sample

2.3 DATE OF COLLECTION OF ORIGINAL SAMPLE

2.4 COUNTRY OF COLLECTION OR COUNTRY WHERE
CULTIVAR/VARIETY WAS BRED

Use the 3-letter abbreviations supported by the Statistical Office of the United Nations. Copies of these abbreviations are available from IBPGR Headquarters and have been published in the FAO/IBPGR Plant Genetic Resources Newsletter number 49

2.5 PROVINCE/STATE

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

2.6 LOCATION OF COLLECTION SITE

Number of kilometres and direction from nearest town, village or map grid reference (e.g. TIMBUKTU 7S means 7 km south of Timbuktu)

2.7 LATITUDE OF COLLECTION SITE

Degrees and minutes followed by N (north) or S (south), e.g. 1030S

2.8 LONGITUDE OF COLLECTION SITE

Degrees and minutes followed by E (east) or W (west), e.g. 7625W

2.9 ALTITUDE OF COLLECTION SITE [m]

Elevation above sea level

2.10 COLLECTION SOURCE

- 1 Wild
- 2 Orchard or farm land
- 3 Farm store
- 4 Backyard
- 5 Village market
- 6 Commercial market
- 7 Institute
- 8 Other (specify in the NOTES descriptor, 11)

2.11 STATUS OF SAMPLE

- 1 Wild
- 2 Weedy
- 3 Breeder's line
- 4 Breeder's population
- 5 Primitive cultivar/landrace
- 6 Advanced cultivar (bred)
- 7 Other (specify in the NOTES descriptor, 11)

2.12 LOCAL/VERNACULAR NAME

Name given by farmer to cultivar/landrace/weed

2.13 NUMBER OF PLANTS SAMPLED

Approximate number of plants collected in the field to produce this accession

2.14 PHOTOGRAPH

Was a photograph taken of the accession or environment at collection? If so, provide the identification number/system in the NOTES descriptor, 11

0 No
+ Yes

2.15 TYPE OF SAMPLE

1 Seed
2 Seedling
3 Budwood
4 Pollen
5 Tissue culture
6 Other (specify in the NOTES descriptor, 11)

2.16 ETHNIC GROUP

Name of ethnic group living in the area of collection

2.17 OTHER NOTES FROM COLLECTOR

Collectors will record ecological information. For cultivated crops, cultivation practices such as irrigation, season of sowing, etc. will be recorded

CHARACTERIZATION AND PRELIMINARY EVALUATION

3. SITE DATA

- 3.1 COUNTRY OF CHARACTERIZATION AND PRELIMINARY EVALUATION
- 3.2 SITE (RESEARCH INSTITUTE)
- 3.3 NAME OF PERSON(S) IN CHARGE OF CHARACTERIZATION

4. PLANT DATA

4.1 VEGETATIVE

4.1.1 Method of propagation

- 1 Seed
- 2 Grafting
- 3 Cutting
- 4 Layering
- 5 Micropropagation
- 6 Other (specify in the NOTES descriptor, 11)

4.1.2 Rootstock

If appropriate

- 1 Sour orange
- 2 Trifoliate orange or its hybrids
- 3 Rough lemon
- 4 Rangpur lime
- 5 Cleopatra mandarin
- 6 Citrus volkameriana
- 7 Sweet orange
- 8 Sweet lime
- 9 Other (specify in the NOTES descriptor, 11)

4.1.3 Age of tree [years]

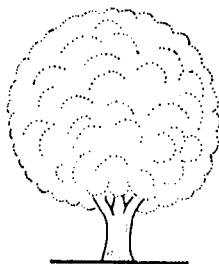
4.1.4 Shape of tree

See Fig. 1

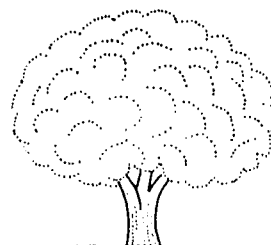
- 2 Ellipsoid
- 4 Spheroid
- 6 Ellipsoid-oblate



2 ellipsoid



4 spheroid



6 ellipsoid-oblate

Fig. 1. Shape of tree

4.1.5 Habit of tree

- 1 Upright
- 2 Spreading
- 3 Drooping
- 4 Weeping

4.1.6 Height of tree [m]

4.1.7 Density of branches

- 3 Sparse
- 7 Dense

4.1.8 Scion trunk surface

- 1 Smooth
- 2 With grooves and ridges

4.1.9 Scion trunk diameter [cm]

10 cm from bud union

4.1.10 Colour of shoot tip

- 1 Green
- 2 Purple
- 3 Other (specify in the NOTES descriptor, 11)

4.1.10 Surface of shoot tip

- 1 Glabrous
- 2 Pubescent

4.2 LEAF

Use 30 mature leaves per tree with 3 replications

4.2.1 Vegetative life cycle

- 1 Evergreen
- 2 Deciduous

4.2.2 Type of leaf

- 1 Simple
- 2 Trifoliate

4.2.3 Colour

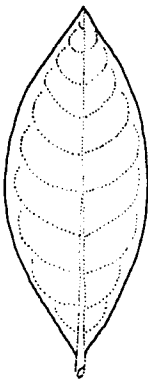
- 1 Light green
- 2 Green
- 3 Dark green
- 4 Other (specify in the NOTES descriptor, 11)

4.2.4 Leaf form

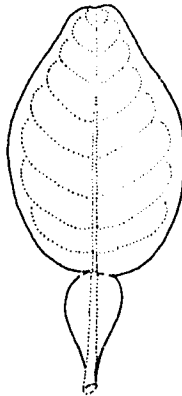
Length of petiole relative to length of leaf lamina

See Fig. 2

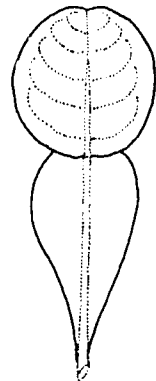
- 1 Sessile (petiole absent)
- 2 Brevipetiolate (petiole shorter than leaf lamina)
- 3 Longipetiolate (petiole longer than leaf lamina or the same length as the leaf lamina)



1 sessile



2 brevipetiolate



3 longipetiolate

Fig. 2. Leaf forms

4.2.5 Petiole wings

- 0 Absent
- 3 Narrow
- 7 Broad

4.2.6 Shape of petiole wings

See Fig. 3

- 1 Cordiform
- 2 Deltoid
- 3 Obovate

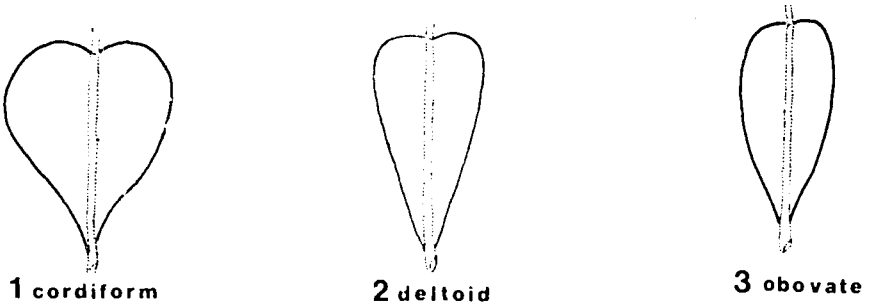


Fig. 3. Shape of petiole wings

4.2.7 Leaf or leaflet shape

See Fig. 4

- 1 Elliptic
- 2 Ovate
- 3 Obovate
- 4 Lanceolate
- 5 Orbicular

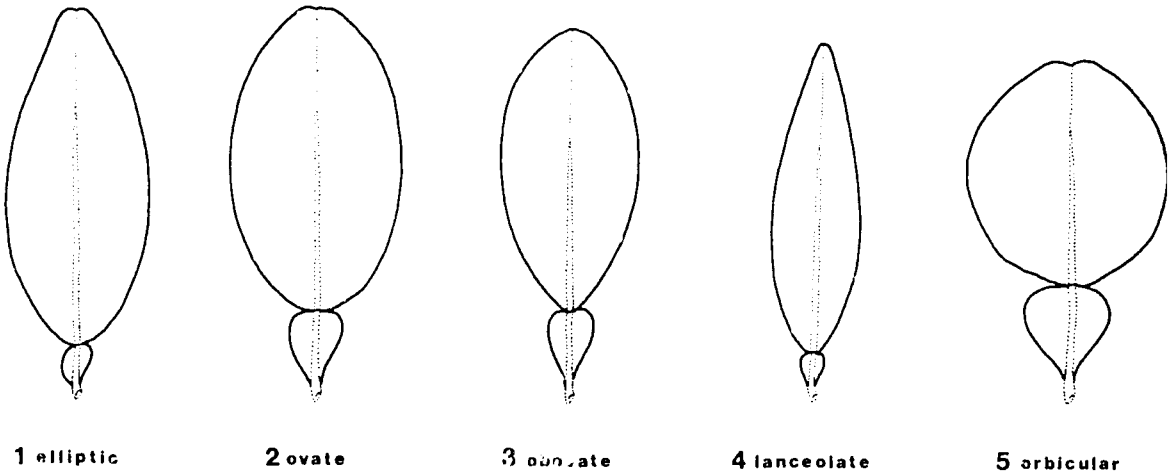


Fig. 4. Leaf or leaflet shape

4.2.8 Length of leaf [mm]

Including petiole

4.2.9 Width of leaf [mm]

Taken at widest point

4.2.10 Leaf margin

See Fig. 5

- 1 Crenate
- 2 Dentate
- 3 Entire
- 4 Wavy
- 5 Other (specify in the NOTES descriptor, 11)

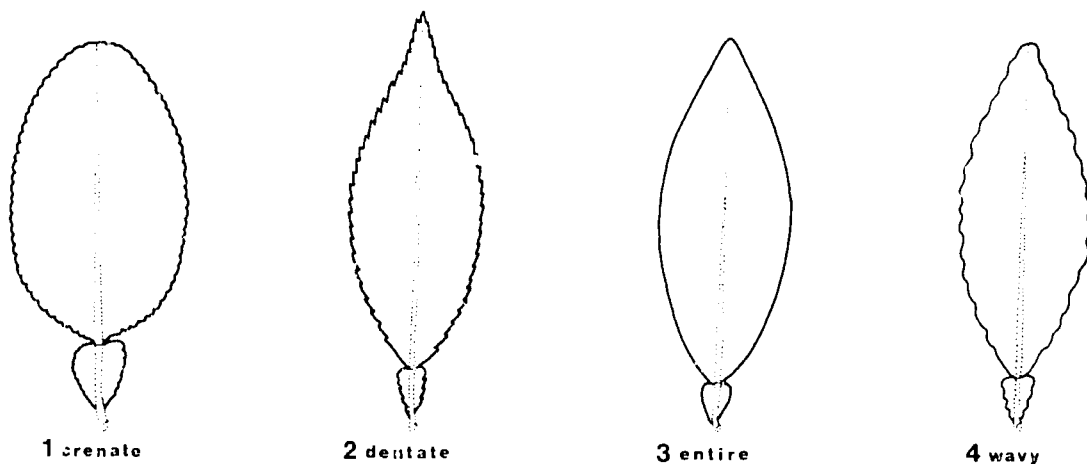


Fig. 5. Leaf or leaflet margin

4.2.11 Length of spine at leaf axil [mm]

Average of 10 spines

4.2.12 Shape of spine

- 1 Curved
- 2 Straight

4.3 LEAFLETS (if appropriate)

4.3.1 Shape of terminal leaflet

See Fig. 4

- 1 Elliptic
- 2 Ovate
- 3 Obovate
- 4 Lanceolate
- 5 Orbicular

4.3.2 Length of terminal leaflet [mm]

4.3.3 Width of terminal leaflet [mm]

Taken at widest point

4.3.4 Shape of lateral leaflet

See Fig. 4

- 1 Elliptic
- 2 Ovate
- 3 Obovate
- 4 Lanceolate
- 5 Orbicular

4.3.5 Length of lateral leaflet [mm]

4.3.6 Width of lateral leaflet [mm]

Taken at widest point

4.3.7 Leaflet margin

See Fig. 5

- 1 Crenate
- 2 Dentate
- 3 Entire
- 4 Wavy
- 5 Other (specify in the NOTES descriptor, 11)

4.4 FLOWER

Data taken from 5 flowers or inflorescences per tree replicated 3 times

4.4.1 Arrangement of flowers

- 1 Solitary
- 2 In an inflorescence

4.4.2 Position of flower or inflorescence

- 1 Axillary
- 2 Terminal

4.4.3 Type of inflorescence

- 1 Panicle
- 2 Raceme
- 3 Corymb
- 4 Other (specify in the NOTES descriptor, 11)

4.4.4 Number of flower buds per inflorescence

4.4.5 Colour of flower buds

- 1 Greenish
- 2 White
- 3 Yellow
- 4 Purple
- 5 Pink
- 6 Other (specify in the NOTES descriptor, 11)

4.4.6 Length of pedicel [mm]

See Fig. 6

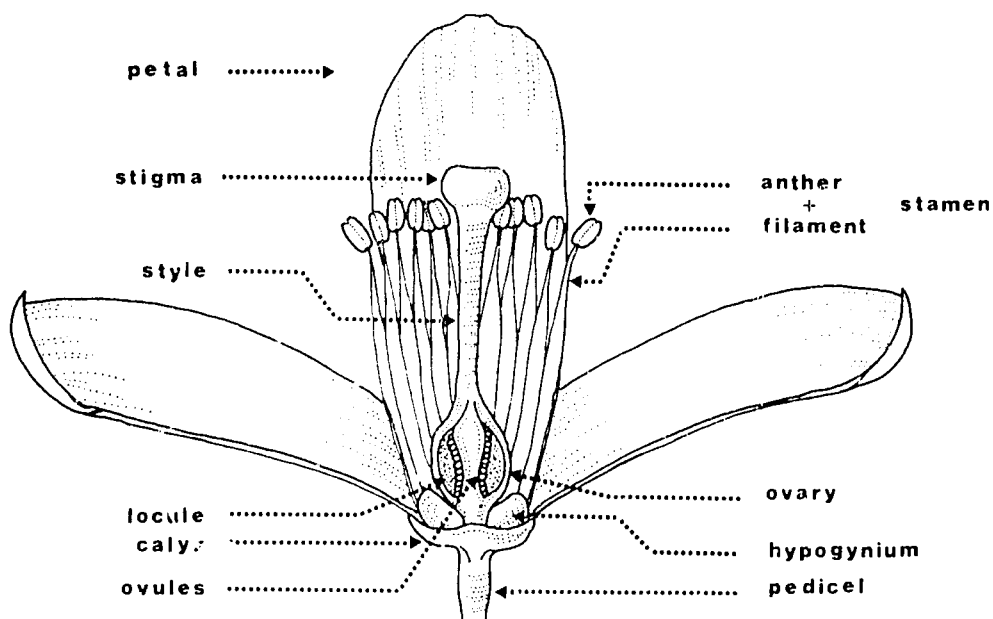


Fig. 6. Vertical cross-section of a hypogynous flower of orange

4.4.7 Length of flower bud [mm]

4.4.8 Colour of open flowers

- 1 White
- 2 Yellow
- 3 Purple
- 4 Other (specify in the NOTES descriptor, 11)

4.4.9 Length of petal [mm]

4.4.10 Width of petal [mm]

4.4.11 Number of stamens

Average of 20 flowers

See Fig. 6

4.4.12 Length of anther [mm]

See Fig. 6

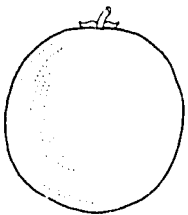
4.5 FRUIT

Descriptive data from 10 fruits per tree, replicated 3 times.
Fruits should have ripened on the tree

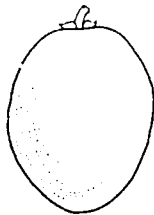
4.5.1 Fruit shape

See Fig. 7

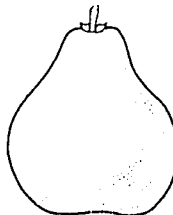
- 1 Spheroid
- 2 Ellipsoid
- 3 Piriform
- 4 Oblique
- 5 Oblate
- 6 Ovoid-oblique
- 7 Ovoid
- 8 Other (specify in the NOTES descriptor, 11)



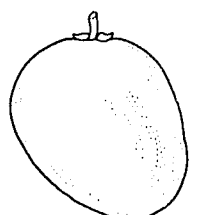
1 spheroid



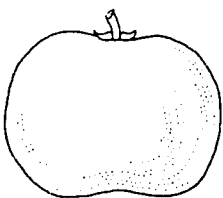
2 ellipsoid



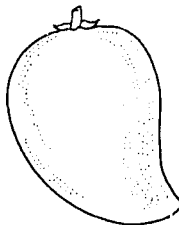
3 piriform



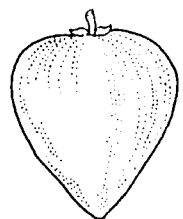
4 oblique



5 oblate



6 ovoid - oblique



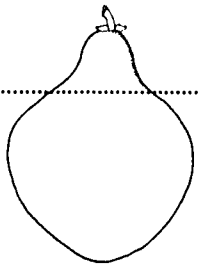
7 ovoid

Fig. 7. Fruit shapes

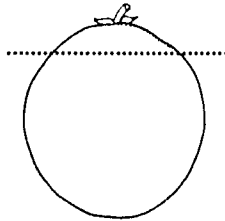
4.5.2 Shape of base of fruit

See Fig. 8

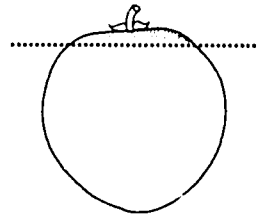
- 1 Necked
- 2 Convex
- 3 Truncate
- 4 Concave
- 5 Concave collared
- 6 Collared with neck
- 7 Other (specify in the NOTES descriptor, 11)



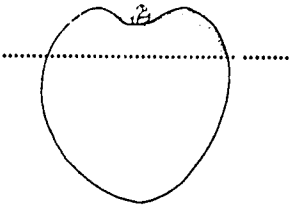
1 necked



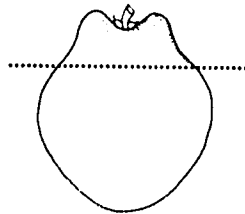
2 convex



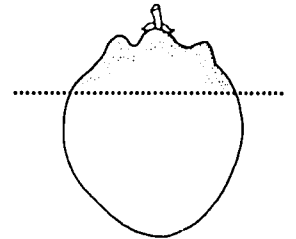
3 truncate



4 concave



5 concave collared



6 collared with neck

Fig. 8. Shape of base of fruit.

4.5.3 Shape of apex of fruit

See Fig. 9

- 1 Mammiform
- 2 Angular
- 3 Convex
- 4 Truncate
- 5 Depressed
- 6 Other (specify in the NOTES descriptor, 11)

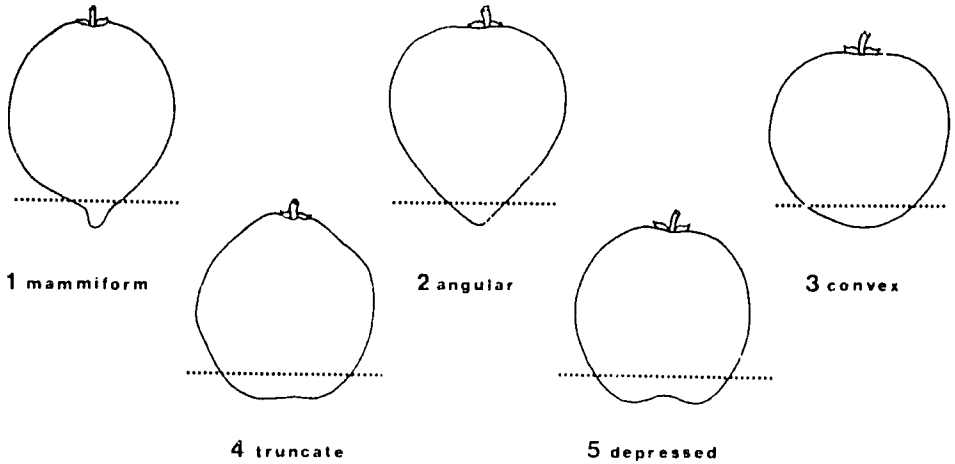


Fig. 9. Shape of apex of fruit

4.5.4 Epicarp colour

- 1 Green
- 2 Yellow
- 3 Orange

4.5.5 Width of epicarp at equatorial area [mm]

See Fig. 10

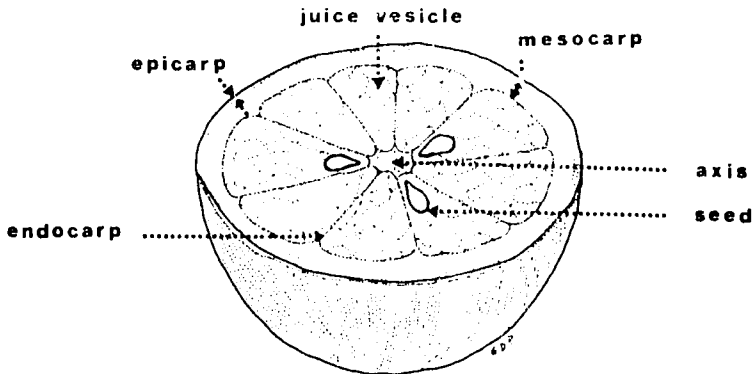


Fig. 10. Cross-section of citrus fruit

4.5.6 Surface of epicarp

- 1 Smooth
- 2 Rugose
- 3 Papillate
- 4 Pitted
- 5 Bumpy
- 6 Longitudinal grooves and ridges
- 7 Hairy
- 8 Other (specify in the NOTES descriptor, 11)

4.5.7 Adherence of epicarp to mesocarp

- 3 Slight
- 5 Moderate
- 7 Strong

4.5.8 Nature of oil glands

- 1 Inconspicuous
- 5 Conspicuous
- 9 Very conspicuous

4.5.9 Amount of oil [ml per fruit]

4.5.10 Thickness of mesocarp [mm]

See Fig. 10

4.5.11 Colour of mesocarp

- 1 White
- 2 Yellow
- 3 Other (specify in the NOTES descriptor, 11)

4.6 SEGMENTS

4.6.1 Number of segments per fruit

4.6.2 Adherence of segments to each other

- 3 Slight
- 5 Moderate
- 7 Strong

4.6.3 Toughness of skin around segments

- 3 Very delicate
- 5 Delicate
- 7 Tough

4.6.4 Fruit axis

See Fig. 10

- 1 Solid
- 2 Semi-hollow
- 3 Hollow

4.6.5 Cross-section of axis

- 1 Round
- 2 Irregular

4.6.6 Diameter of fruit axis [mm]

4.7 PULP

4.7.1 Colour of pulp

- 1 Yellow
- 4 Orange
- 3 Pink
- 4 Red
- 5 Green
- 6 Other (specify in the NOTES descriptor, 11)

4.7.2 Uniformity of colour of pulp

- 3 Uniform
- 7 Streaked

4.7.3 Texture of pulp

- 3 Tender
- 5 Firm
- 7 Tough

4.7.4 Size of vesicles

- 3 Small
- 7 Large

4.7.5 Shape of vesicles

- 3 Thin
- 7 Thick

4.8 JUICE

4.8.1 Juice in endocarp

- 3 Low
- 5 Medium
- 7 High

4.8.2 Colour of juice

- 1 Greenish
- 2 White
- 3 Pale yellow
- 4 Yellow
- 5 Orange
- 6 Reddish
- 7 Other (specify in the NOTES descriptor, 11)

4.8.3 Taste of juice

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

4.8.4 Aroma of juice

- 3 Weak
- 7 Strong

4.8.5 Attachment of fruit to tree

- 3 Weak
- 5 Average
- 7 Strong

4.9 SEED

Mean of 20 seeds

4.9.1 Average number of seeds per fruit

4.9.2 Average length of seeds [mm]

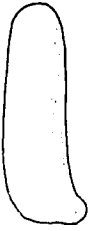
4.9.3 Average width of seeds [mm]

4.9.4 Average weight of seeds [g]

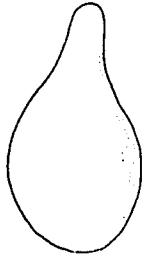
4.9.5 Shape of seeds

See Fig. 11

- 1 Fusiform
- 2 Clavate
- 3 Cuneiform
- 4 Ovoid
- 5 Deltoid
- 6 Globose
- 7 Semi-spheroid
- 8 Other (specify in the NOTES descriptor, 11)



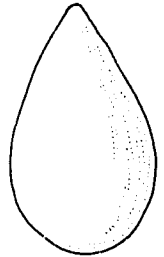
1 fusiform



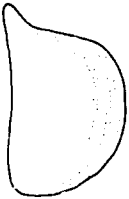
2 clavate



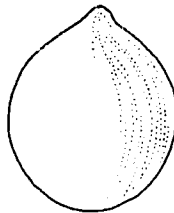
3 cuneiform



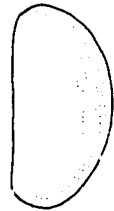
4 ovoid



5 deltoid



6 globose



7 semi-spheroid

Fig. 11. Shape of seeds

4.9.6 Texture of seed surface

- 1 Smooth
- 2 Wrinkled
- 3 Hairy

4.9.7 Seed colour

Evaluated by eye through the seed testa

- 1 White
- 2 Cream
- 3 Yellowish
- 4 Green
- 5 Brown
- 6 Other (specify in the NOTES descriptor, 11)

4.9.8 Cotyledon colour

- 1 White
- 2 Light green
- 3 Green
- 4 Other (specify in the NOTES descriptor, 11)

4.9.9 Chalazal spot colour

- 1 White
- 2 Ivory
- 3 Cream
- 4 Yellow
- 5 Beige
- 6 Brown
- 7 Reddish
- 8 Purple
- 9 Other (specify in the NOTES descriptor, 11)

4.9.10 Average number of embryos per seed

FURTHER CHARACTERIZATION AND EVALUATION

5. SITE DATA

- 5.1 COUNTRY OF FURTHER CHARACTERIZATION AND EVALUATION
- 5.2 SITE (RESEARCH INSTITUTE)
- 5.3 NAME OF PERSON(S) IN CHARGE OF CHARACTERIZATION
- 5.4 SOWING DATE

6. PLANT DATA

6.1 VEGETATIVE

6.1.1 Scion/rootstock compatibility

If appropriate

- 3 Poor
- 5 Intermediate
- 7 Good
- 9 Bud-union ring

6.1.2 Vigour of tree

- 3 Weak
- 5 Intermediate
- 7 Vigorous

6.2 LEAF

6.2.1 Number of stomata [number per mm²]

On the lower surface of the leaf

6.2.2 Oil glands [number per cm²]

6.2.3 Aroma

- 3 Mild
- 7 Strong

6.3 FLOWER

6.3.1 Percentage of viable pollen

6.3.2 Flowering season

6.3.4 Flowering duration

6.3.5 Flowering regularity

6.3.6 Flowering abundance

6.3.7 Secondary flowering

0 Absent
+ Present

6.4 FRUIT

6.4.1 Bearing cycle

Number of days from flowering to ripening

6.4.2 Fruiting season

1 Early
2 Midseason
3 Late
4 Out of season

6.4.3 Dates of fruiting season

6.4.2.1 Start of season (MMDD – month, day)
6.4.2.2 End of season (MMDD – month, day)

6.4.4 Yield per tree [kg/year]

6.4.5 Yield behaviour

1 Continuous
2 Alternate
3 Erratic

6.4.6 Presence of areola

0 Absent
+ Present

6.4.7 Diameter of areola [mm]

- 6.4.8 Stylar scar
- 1 Closed
 - 2 Open
 - 3 Persistent style
 - 4 Navel
 - 5 Other (specify in the NOTES descriptor, 11)

- 6.4.9 Oil glands on fruit surface [number per cm²]
- Without albedo, taken at equatorial area

- 6.4.10 Amount of oil [ml per fruit]

- 6.4.11 Brix

6.5 JUICE

- 6.5.1 Titratable acids [%]

- 6.5.2 Sugar [%]

- 6.5.3 Ratio of soluble solids to titratable acids

- 6.5.4 Dessert fruit quality
- 3 Poor
 - 5 Fair
 - 7 Good
 - 9 Excellent

- 6.5.5 Shipping quality

- 3 Poor
- 5 Fair
- 7 Good
- 9 Excellent

7. STRESS SUSCEPTIBILITY

Scored under artificial and/or natural conditions, which should be clearly specified

- 3 Low susceptibility
- 5 Medium susceptibility
- 7 High susceptibility

- 7.1 LOW TEMPERATURE

- 7.2 HIGH TEMPERATURE

7.3 SOIL ALKALINITY

7.4 DROUGHT

7.5 WET SOIL

8. PEST AND DISEASE SUSCEPTIBILITY

In each case, it is important to state the origin of the infection or infections, i.e. natural, field inoculation, etc. Record information in the NOTES descriptor, 11)

- 1 Extremely low susceptibility
- 3 Low susceptibility
- 5 Medium susceptibility
- 7 High susceptibility

8.1 PESTS

- 8.1.1 Tylenchulus semipenetrans Cobb Citrus nematode
- 8.1.2 Rodopholus similis (Cobb) Thorne Burrowing nematode

8.2 FUNGI

- 8.2.1 Elsinöe spp. Scab
- 8.2.2 Phytophthora spp. Foot-rot
- 8.2.3 Phoma tracheiphila (Petri) Kanc. & Ghik Mal seco
- 8.2.4 Gloeosporium spp. Anthracnose
- 8.2.5 Diaporthe citri (Faw.) Wolf Stem-end rot

8.3 BACTERIA

- 8.3.1 Xanthomonas campestris pv. Citri (Hasse 1915) Dye 1978 Citrus canker

8.4 VIRUSES AND MYCOPLASMAE

- 8.4.1 Tristeza virus
- 8.4.2 Exocortis
- 8.4.3 Xyloporosis
- 8.4.4 Greening

9. BIOCHEMICAL COMPOSITION

9.1 ISOENZYME COMPOSITION

9.2 FLAVONOID COMPOSITION

9.3 ESSENTIAL OIL COMPOSITION

9.4 RESTRICTION ANALYSIS OF ORGANELLAR DNA

This may prove useful for species and cultivar differentiation as well as for hybrid identification

10. CYTOLOGICAL CHARACTERS AND IDENTIFIED GENES

10.1 $2n$ CHROMOSOME NUMBER

10.2 PLOIDY LEVEL

11. NOTES

Give additional information where descriptor state is noted as "Other" as, for example, in descriptors 4.1.1, 4.2.3, 4.3.7, etc. Also include here any other relevant information

APPENDIX I

LIST OF CONTRIBUTORS

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