Cacao descriptors, their states and **modus operandi** *1/

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COMPENDIO

Para estandarizar la descripción de los clones y poblaciones de cacao, se presenta una lista de descriptores y sus respectivas clases. También se dan instrucciones cortas para su uso, incluyendo el tamaño de la muestra mínima para las características cuantitativas.

Introduction

THE reasons to compile an extensive list of cacao descriptors are many. First of all is the standardization of the descriptive terminology to permit an exchange of information between scientists working with cacao genetic resources. Secondly, to facilitate an inventory of what is available worldwide in existing cacao collections and, consequently, determine what valuable accessions should be duplicated in other places. Thirdly, to help the breeder in selecting better material, not present in his breeding programmes. Fourthly, the methods of computer-assisted data processing need information about individual accessions related to descriptors (descriptive terms, in general of plant characteristics) and their states (gradation in the expression of a descriptor). This ensures a quick and adequate transfer of the collected data into machine-readable form, and its efficient storage and retrieval. Fifthly, to enable efficient management and maintenance of the collection. Since the latter is not uniformly handled, an additional set of descriptors should be developed locally. This set should also include descriptors for germplasm distribution and use. A final but important aspect is that the development and standardization of crop specific descriptors is the basis for a systematic description of germplasm collections. Chang (1) listed some of the advantages of such a systematic description:

a) characterization of cultivars or breeding lines of national and international interest;

b) differentiation between accessions with identical or similar names;

c) identification of accessions with desired characteristics;

d) classification of cultivars based on reliable data;

e) development of interrelationships between characteristics and also between geographical groups of cultivars; and

f) estimation of the variation available within the collection.

Most descriptors presented here are based on an unpublished revision of the literature (2), and an evaluation of the selected descriptors in the Genetic Resources Project at CATIE, Costa Rica

Methodology

In so far as the descriptors are not self-explanatory, short instructions or comments are given to facilitate their use and to make them unequivocal. The mean and stardard deviation of the measured sample should be given for quantitative characteristics of a clone, which are expressed on a continous scale. The minimum

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sample size 'r' is indicated after descriptors of quantitative characteristics. Values for 'r' have been calculated in a preliminary study so that the sample mean would fall within five percent of the population mean ninety five times in a hundred; using the formula (3):

$$r \geq 0.16 \left[\frac{(S) \quad (100)}{\bar{x}} \right]^2$$

in which 'r' represents the "minimum sample size", 0.16 a constant, S the standard deviation, and $\bar{x}$ the mean of a sample. If the calculated minimum sample size (r) is large for practical purposes, a smaller sample size, a fraction of r may be chosen arbitrarily. When according to the circunstances and the authors experience, this arbitrary value is used, the notation n is employed.

In the preliminary study (2) differences for fruit and flower characteristics between trees of the same clone, grown at the same site, did not reach statistical significance. Thus the fruits and flowers of all the trees of one clone can be used and mixed without indicating the number of trees. In spite of this, it is recommended to study fruits and flowers of several trees of one clone to ensure the determination of possible mixtures within an accession.

If a particular accession represents a population, the ranges of the phenotypic expression of the characteristics should be given, if possible, with a note on the frequency distribution.

Three types of descriptor states will be found. The first type is an open one, such as 'accession number' or 'leaf length in cm'. The second type consists of fixed state descriptors which do not have a continuous expression. These are arbitrarily coded, generally commencing with '1'. Examples of this type are 'population state', 'collecting source' and 'leaf base shape'. If the descriptor states of characteristics with a continuous expression are classified, the third type, a scale from 1 to 9 is used. Class '1' always represents the lowest, smallest, etc., expression, and '9' the highest, greatest, etc. In general, only some classes of the whole scale are given, e.g. 3 = weak, 5 = intermediate and 7 = vigorous, from the scale ranking from 1 = very weak to 9 = very vigorous, for the descriptor 'vigour'. This does not imply that those not mentioned cannot be used. The presence of an unclassified characteristic is indicated by '+'. When the expression of a characteristic is not measured, or the information is lacking, a dash '—' should be used.

Some of the descriptors are marked 'optional'. Further investigation is needed on the correct use and classification of their states.

Instruments and apparatus indispensable for a systematic description are: stereo microscope (for flower characteristics), magnifying glass, different sizes of vernier calipers, tweezers, dissecting needles, scalpels and glycerine. A camera can be very useful for the recording and determination of shapes and colour patterns: a scale must be included in each photograph.

To increase the information content of data garthered under determined environmental conditions, the use of at least one world-wide accepted standard clone is strongly recommended. The results of the description of this (these) clone(s) should be used to adjust, if necessary, the classes of these descriptors, whose expressions are strongly influenced by the environment. For purpose of comparison, detailed information on the climatic and soil conditions of the germplasm collection site should be added to the descriptive data.

List of descriptors

1. Accession identifier

This identifier is recorded when an accession enters a genetic resources centre or germplasm collection. It consists of three descriptors: the first is a unique number, the second and third represents the country and locality of the genetic resources centre or collection, respectively. The combination of these three descriptors is unique world-wide.

1.1 *Accession number*

This is a number intended to serve as a unique identifier for each accession. This number once assigned can never be reassigned, even when an accession becomes extinct.

1.2 *Country genetic resource centre*

If the complete name is not used, one of the following abbreviations should be given:

ANG = Angola
BEL = Belize
BOL = Bolivia
BRZ = Brazil
CAM = Cameroon
CAR = Caribbean islands (not specified)
CDR = Congo
CIV = Ivory Coast
CLB = Colombia
CRI = Costa Rica
CUB = Cuba
DOM = Dominican Republic
ECD = Ecuador
EGU = Equatorial Guinea
ELS = El Salvador
GHA = Ghana
GRE = Grenada
GUA = Guatemala
GUI = Guiana
HAI = Haiti
HON = Honduras
IND = India
JAM = Jamaica
MAI = Malawi
MAL = Malaysia
MEX = Mexico

NIC = Nicaragua
NIG = Nigeria
OCA = Oceania Islands (not specified)
PAN = Panama
PER = Perú
PNG = Papua, New Guinea
PRI = Puerto Rico
RIN = Rep. of Indonesia
STP = St. Tomé & Principe
SUR = Surinam
TRT = Trinidad & Tobago
USA = United States of America
VEN = Venezuela

2. Nomenclature

Since all the descriptors refer to cacao *(Theobroma cacao* L.) the genus and species name can be disregarded. However, the clonal name and its synonyms are very important for the identification of cacao cultivars.

2.1 *Accession name*

The current name for clone, cultivar, population, etc., is given by the 'original' experimental station. These names are generally alpha-numeric or alphabetic identifiers.

2.2 *Synonyms*

These include any previous identification other than the current name, collection number, newly assigned station name or number and/or vernacular name(s) are frequently used as identifier.

3. Origin

A set of data that specifies the genetic origin of the accession, including the techniques used in breeding work.

3.1 *Population state*

The 'breeding' state of a population from where an accession was taken can be: 1) spontaneous –a population not cultivated and which is unexploited by man; 2) primitive, but cultivated-- the original, spontaneous population is unknown; 3) derived –the original population from which it is derived is known. This group includes all types of breeding material. The code is expressed as:

1 = spontaneous
2 = primitive cultivated
3 = derived

3.2 *Descent*

This code refers to the way an accession is derived from an ancestral population. This can be by natural or open pollination or by artificial pollination.

1 = natural pollination
2 = artificial pollination

3.3 *Breeding method*

Represented by a coded specification describing the way in which the artificial pollination was conducted in a breeding programme, expressed as:

1 = selfing (S)
2 = hybridization (F)
3 = backcross (BC)

3.4 *Generation*

The actual generation of an accession in a breeding programme. The generation number should be preceded by a corresponding abbreviation given in 3.3.

3.5 *Pedigree*

A register recording a line of ancestors. As much information as possible should be given; when the male parent is unknown, information on the female can be very useful.

3.6 *Utilization data*

Descriptor attemps to classify accession in accordance with use of the clone in respect to commercial planting or breeding properties; information on previous or present use.

1 = cultivar
2 = foundation parent
3 = disease resistant source
4 = mutation

4. Geographical origin

A set of data which specifies the geographic origin and precise site from where a certain accession was collected, selected or bred.

4.1 *Country*

The full name or an abbreviation — as given under 1.2 — for the country in which a particular germplasm accession was collected, selected or bred.

4.2 *Political subdivision*

The name representing the political or administrative subdivision of the country in which a particular accession was collected. Examples are the names of a state, province, county, etc

4.3 *Locality*

The specific name of the town, village or, if relevant, area in which the germplasm accession was collected. If necessary a short description of the exact site should be given, for instance 10 km north of . . ., along river . . . An alternative is the geographical coordinates of the collection site.

4.4 *Collecting source*

Self-explanatory. In case '4' is used as code, this should be specified.

1 = natural habitat
2 = farm
3 = experimental station
4 = other

4.5 *Name of source*

The name of owner of the farm, experimental station or 'other' should be given.

5. Donor identifier

A set of data which identifies the donor of an accession.

5.1 *Donor name*

The name of the person or institution responsible for donating germplasm to a collector

5.2 *Donor number*

A number or an alpha-numeric identifier assigned to an accession by the donor.

6. Taxonomic and morphological data

Data of plant characteristics which are mainly collected for the characterization and identification of a population or clone, which are usually not directly related to the yield of the crop. However, relevant information for breeders is also included.

6.1 Plant characteristics

Data which describe the vegetative parts of the cacao tree.

6.1.1 *Architecture*

An average observation of several trees of a clone or a population should be given. The observations can be made by estimating the vertical angle between two opposite main branches. If the angle(s) is $\leq 90°$, the type is called erect; between 91 and 135°, intermediate; and $\geq 136°$, pendulous. The code is the following:

1 = erect
2 = intermediate
3 = pendulous

(If the angle refers to the trunk of the tree, appropriate adjustment should be done).

6.1.2 *Branch Formation*

The classification is based on the existence of a single main branch and three or more branches (= verticillate) per ramification at the same height of the trunk

1 = single
2 = intermediate
3 = verticillate

6.1.3 *Vigour*

Code refers to the general appearance (growth) of an accession, and should be based on observations of several trees.

3 = weak
5 = intermediate
7 = vigorous

6.2 Leaf characteristics

6.2.1 Leaf shape

Numeric data are used to describe leaf shape. The minimal sample size for these descriptors has to be calculated; the mean and standard deviation should be given.

6.2.1.1 *Length from base, in cm* (L), $\bar{x}$ and S ($n = 15$)*

6.2.1.2 *Width at widest point, in cm* (W), $\bar{x}$ and S ($n = 15$).

6.2.1.3 *Length/width ratio* (L/W), $\bar{x}$ and S ($n = 15$).

6.2.1.4 *Length from base to widest point, in cm* (LBW), $\bar{x}$ and S ($n = 15$).

* n is the recommended 'sample size'; however, the calculated 'minimum sample size' (r) is larger.

6.2.1.5 *Ratio length/length from base to widest point* (L/LBW), $\bar{x}$ and S (n = 15). Sample as 6.2.1.1 and 6.2.1.4.

3 = ratio L/LBW < 2, shape is ovate

5 = ratio L/LBW = 2, shape is elliptic

7 = ratio L/LBW > 2, shape is obovate

6.2.2 *Leaf base*

The shape of base can be expressed in terms of the angles which the margins form with the central vein at its point of insertion. If the total angle is $\leq$ 90°, the leaf base is 'acute;' $\geq$ 90° 'obtuse' and $\pm$ 180°, 'rounded.' If leaf base is embayed in a sinus whose sides are straight or convex, 'cordate' is used. This observation should be based on several mature leaves of a tree and the code is expressed as:

1 = acute
2 = obtuse
3 = rounded
4 = cordate

6.2.3 *Leaf apex*

The shape of that portion of the leaf which is bounded by approximately the upper 15% of leaf margin. If the angle of the margins is $\leq$ 90°, both with straight and convex margins, the apex is 'acute'. If the tip is with margins markedly concave, the apex is acuminate. The tip can be short or long. This observations should be based on several leaves of a tree.

1 = acute
2 = short acuminate
3 = long acuminate

6.2.4 *Leaf petiole*

Petioles of some clones do not have very distinct pulvini or thickening, other clones have noticeable pulvini.

0 = without noticeable pulvini
1 = with noticeable pulvini

6.2.5 *Leaf texture*

If the appearance of mature leaves is opaque, like writing paper, the term chartaceous is used; when leathery, thick and stiff, the leaves are coriaceous. In case of 'other' observations, details should be given.

1 = chartaceous
2 = coriaceous
3 = other

6.2.6 *Young leaf colour*

Data which describe the absence or presence of anthocyanin in the young flush.

6.2.6.1 *Anthocyanin absent*

3 = light green
5 = intermediate
7 = intense green

6.2.6.2 *Anthocyanin present*

3 = light reddish
5 = intermediate
7 = intense reddish

6.3 Flowering characteristics

The flowering habit of cultivars can be described in terms of:

6.3.1 *Flowering intensity* (optional)

The number of flowers per cushion and the number of cushions per tree are involved in this descriptor.

6.3.1.1 Number of flowers per cushion, $\bar{x}$ and S (n = 35).

6.3.1.2 Number of cushions per tree, $\bar{x}$ and S (n = 10).

6.3.2 *Flowering pattern* (optional)

This refers to the distribution of the flowering activity during the year; it may be continuous or with one or more peaks per year.

6.4 Flower characteristics

Data are taken from two to four recently opened flowers of each of five trees.

6.4.1 *Peduncle colour*

Because there is much variation within trees, depending on light conditions, only three classes are established:

1 = green
2 = green with reddish
3 = reddish

6.4.2 *Anthocyanin in outer sepal*

Several flowers of different trees should be observed:

0 = absent
3 = slight
5 = intermediate
7 = intense

6.4.3 *Sepal length, in mm,* $\bar{x}$ *and S* (r = 20)

6.4.4 *Sepal width at widest point, in mm,* $\bar{x}$ and S (r = 20)

6.4.5 *Sepal length/width ratio,* $\underline{x}$ and S (n = 20)

6.4.6 *Orientation of sepals*

Several flowers should be observed due to variation Only two classes are distinguished: 'reflexed' with sepals bent backward, and with sepals more or less 'horizontal';

1 = reflexed
2 = horizontal

6.4.7 *Length of petal ligule, in mm,* $\underline{x}$ and S (r = 20).

Distance between point of insertion of isthmus in hood and apex of ligule.

6.4.8 *Width of petal ligule at widest point, in mm,* $\bar{x}$ and S (r = 20)

6.4.9 *Petal ligule length/width ratio,* $\bar{x}$ and S (r = 20)

6.4.10 *Anthocyanin in petal ligule*

0 = absent
1 = present

6.4.11 *Anthocyanin in stamen filament*

0 = absent
3 = slight
5 = intermediate
7 = intense

6.4.12 *Staminode length, in mm,* $\bar{x}$ and S (r = 10)

6.4.13 *Anthocyanin in staminode*

0 = absent
3 = slight
5 = intermediate
7 = intense

6.4.14 *Ovary length, in mm,* $\bar{x}$ and S (r = 15)

6.4.15 *Ovary width at widest point, in mm,* $\bar{x}$ and S (r = 10)

6.4.16 *Anthocyanin in upper part of ovary*

0 = absent
3 = slight
5 = intermediate
7 = intense

6.4.17 *Anthocyanin in lower part of ovary*

0 = absent
3 = slight
5 = intermediate
7 = intense

6.4.18 *Maximum ovule number per ovary* (r = 5).

Since the ovary has five loculi, 40, 45, 50, etc. ovules will generaly be found with only slight deviation within each clone Complete counts should be taken of at least 5 ovaries.

6.4.19 *Anther disposition*

In some clones anthers are missing, in others the anthers are not covered by the hood as in the cultivar 'P-11', this fact should be noted under 'other'.

0 = anthers absent
3 = normal
7 = other types

6.4.20 *Style length, in mm,* $\bar{x}$ and S (r = 10)

6.4.21 *Anthocyanin in lower half of style*

0 = absent
3 = slight
5 = intermediate
7 = intense

6.4.22 *Self-incompatibility*

0 = absent
1 = present

6.5 Fruit characteristics

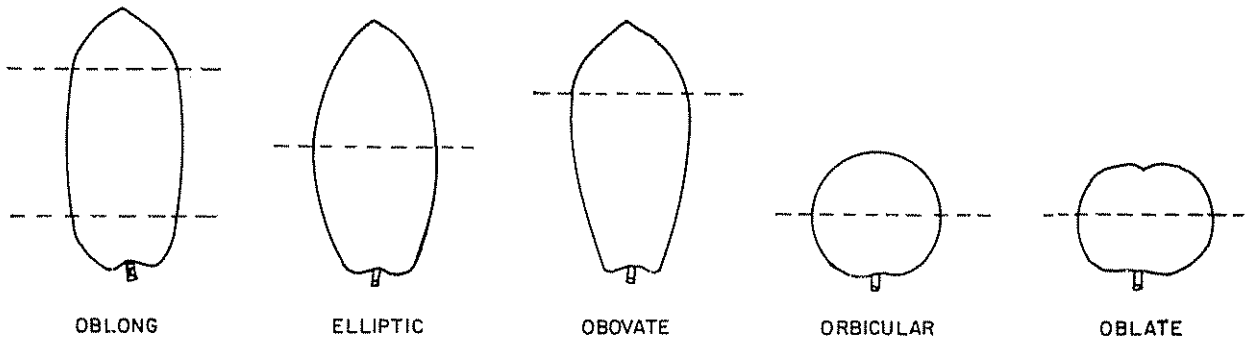
Qualitative and quantitative characteristics of unripe (4 months) and ripe cacao fruits or pods are described here.

6.5.1 *Fruit shape*

This coded information is based on several observations of mature fruits For 'oblong' fruits the margins of the middle part of the fruit are parallel or nearly so with the long axis. If the perpendicular axis of the greatest width is close to the midpoint of the fruits axis and the margins are convex, the shape is 'elliptic'. If the axis

of greatest width cuts the long axis of the fruit apical to the midpoint, the shape is 'obovate'. More or less round fruits are called 'orbicular' and if the fruit width exceeds the length, 'oblate'.

1 = oblong
2 = elliptic
3 = obovate
4 = orbicular
5 = oblate



6.5.2 *Basal constriction*

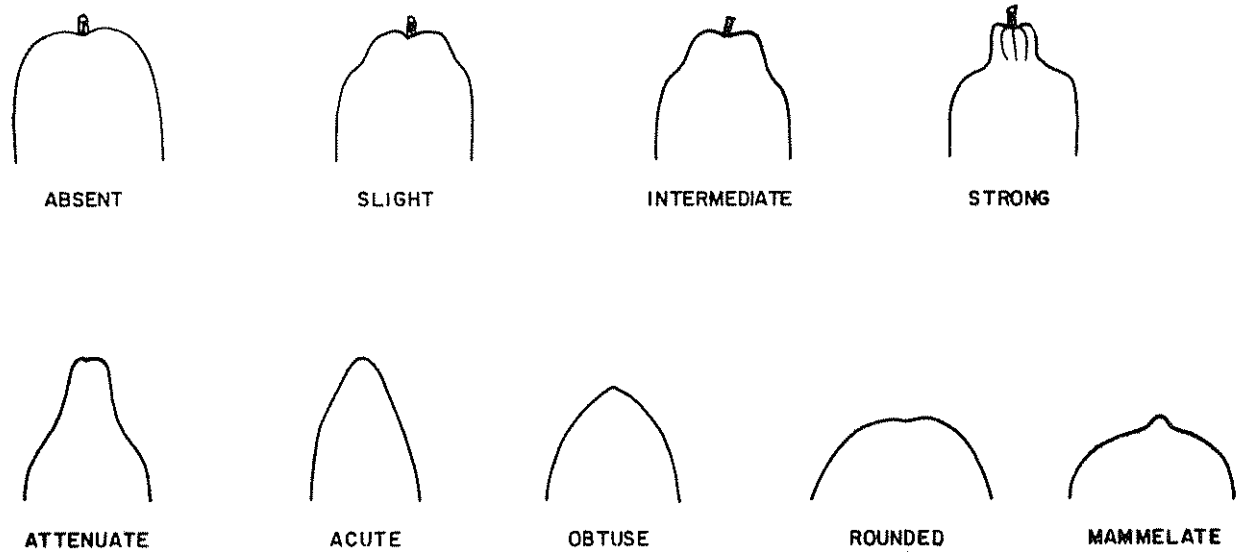
The code representing the constriction or 'bottle neck' of the basal part of the mature fruit is expresed as:

0 = absent
3 = slight
5 = intermediate
7 = strong

6.5.3 *Apex form*

The code representing the form of the apical part of the mature fruit is expressed as:

1 = attenuate
2 = acute
3 = obtuse
4 = rounded
5 = mammelate



6.5.4 *Fruit length from base, in cm,* $\bar{x}$ and S (r = 35)

6.5.5 *Fruit width at widest part, in cm,* $\bar{x}$ and S (r = 35)

6.5.6 *Fruit length/width ratio,* $\bar{x}$ and S (r = 35)

6.5.7 *Distance base to widest part, in cm,* $\bar{x}$ and S (r = 20)

6.5.8 *Length/distance base to widest part ratio,* $\bar{x}$ and S (r = 10)

6.5.9 *Weight of whole fruit in g,* $\bar{x}$ and S (n = 35)

6.5.10 *Fruit surface rugosity*

This codes refers to the visual observation of the absence or presence of protuberances on fruit surface

0 = absent
3 = slight
5 = intermediate
7 = intense

6.5.11 *Ridge pair appearance*

A code for the degree of separation of a pair of ridges. Extremes are fused pairs (e.g. 'Pentagona') and equidistant ones (e.g. 'Laranja,). A pair of ridges is always situated above a carpel

0 = fused
3 = slightly separated
5 = intermediate
7 = well separated
9 = equidistant (individually)

6.5.12 *Primary furrow depth*

A code for the depth of the furrow between a pair of ridges is expressed as:

3 = superficial
5 = intermediate
7 = deep

6.5.13 *Fruit wall thickness*

Fruit wall is defined as comprising both the exocarp and mesocarp. The endocarp should not be considered.

6.5.13.1 *Thickness at ridge, in mm,* $\bar{x}$ and S (n = 35)

6.5.13.2 *Thickness at primary furrow, in mm,* $\bar{x}$ and S (n = 35)

6.5.13.3 *Thickness at secondary furrow, in mm,* x and S (n = 35)

(The furrow within a pair of ridges is defined as secondary furrow).

6.5.14 *Mesocarp hardiness*

A code representing the hardiness of mesocarp of fruits at least four months old. An objective method of measurement is recommended.

3 = soft
5 = intermediate
7 = hard

6.5.15 *Basic surface colour*

Only green exists as basic colour in unripe fruits, although the intensity can vary

3 = light
5 = intermediate
7 = dark

6.5.16 *Anthocyanin intensity of ridges*

The intensity of anthocyanin of the ridges of unripe fruits can be expressed as:

0 = absent
3 = slight
5 = intermediate
7 = intense

6.5.17 *Anthocyanin intensity in primary furrows*

The intensity of anthocyanin in the furrows of unripe fruits can be expressed as:

0 = absent
3 = slight
5 = intermediate
7 = intense

6.5.18 *Anthocyanin in ripe fruits*

The code representing absense (=yellow fruit) or presence (= reddish fruit) in different intensities of the anthocyanin in ripe fruits can be expressed as:

0 = absent
3 = slight
5 = intermediate
7 = intense

6.6 Seed characteristics

Data are taken from peeled seeds. The seeds should be taken at random.

6.6.1 *Wet weight of seed, in g,* $\bar{x}$ and S (r = 100)

Five seeds from each of 20 pods are used

6.6.2 *Dry weight of seed, in g,* $\bar{x}$ and S (r = 100)

Five seeds from each of 20 pods are used.

6.6.3 *Seed length in mm,* $\bar{x}$ and S (r = 100)
Five seeds from each of 20 pods are used

6.6.4 *Seed width, in mm,* $\bar{x}$ and S (r = 100)
Sample as 6.6.3

6.6.5 *Seed thickness, in mm,* $\bar{x}$ and S (r = 100)
Sample as 6.6.3

6.6.6 *Seed form in longitudinal section*

Although the form of seeds can vary highly within a pod, the average form should be selected by using several seeds per pod with the embryo as the reference point. The code consists of the three following classes:

1 = oblong
2 = elliptic
3 = ovate

6.6.7 *Cotyledon colour, as a percentage* (r = 10)

Since the cotyledon colour depends also on the genotype of the male parent, controlled crosses (either selfing or a test cross) should be used to determine the coloration of the seeds. The code representing the colour or combination of colours (e.g. spotted) of the cotyledon is marked by giving the percentage of a colour class from the whole.

1 = ... % white
2 = ... % grayish-white
3 = ... % light purple
4 = ... % intermediate purple
5 = ... % dark purple
6 = ... % spotted

6.6.8 *Pulp colour*

The code representing the colour of fresh pulp is expressed as:

1 = white
2 = yellowish

6.6.9 *Fat content of cotyledons, as a percentage* (r = 3)

Only pods resulting from selfing or crosses with a standard clone should be used.
Content should be determined with a standard method and expressed as a percentage of the fresh seed weight.

7. Agronomic evaluation data

The information contained in this section summarizes the data obtained during the evaluation of the agronomic characteristics of the item, either with respect to its perfomance as a clone or to the seed-derived progenies. Since the data obtained refer to specific locations, it is necessary to specify the location and the conditions under which the evaluation was conducted. In view of the volume of information which could be ascribed to individual items and the fact that much of the information is relative in nature, the data should be supplemented by reference to appropriate publications.

7.1 Location of evaluation

7.1.1 *Name of country*

Alphabetic code or complete name (see 1.2)

7.1.2 *Name of institution*

7.1.3 *Period of report*

Specifies time or period during which evaluation was conducted.

7.2 Propagation characteristics

Includes information about the relative ease by which the accession may be multiplied vegetatively. Expressed on basis of the percentage of cuttings rooted or buddings taken

7.2.1 *Cuttings*

1 = very difficult	< 30%
3 = difficult	31-40%
5 = intermediate	41-50%
7 = easy	51-60%
9 = very easy	> 61%

7.2.2 *Buddings*

3 = difficult	< 60%
5 = intermediate	61-80%
7 = easy	> 81%

7.3 *Period to fruit maturity*

Expressed as the number of days between flower fertilization and the physiological ripening of the fruit during normal cropping periods.

3 = short (< 154 days)
5 = intermediate (154 to 170 days)
7 = long (> 170 days)

7.4 Production as clones

Summary of the data relative to production of the accession as clone during defined and specified periods for the trials in which the clone has been evaluated, according to the way of establishing the plantation by:

7.4.1 *Cuttings*
7.4.2 *Buddings*
7.4.3 *Marcottings*

7.5 Production of progenies

Summary of the performance of the progenies of the accession obtained by sexual methods. The type of population, period of evaluation and location of the trial should be specified.

8. Environmental adaptability

8.1 *Reaction to drought*

Coded for observations about relative behaviour under unfavourable moisture (drought) regimes. Observations will include survival, production, speed of recuperation and leaf retention characteristics.

3 = tolerant
5 = intermediate
7 = susceptible

8.2 *Reaction to excessive soil moisture*

Coded for observations about relative behaviour under unfavourable moisture (excessive rainfall) regimes. Observations will include survival, production, speed of recuperation.

3 = tolerant
5 = intermediate
7 = susceptible

9. Disease and pest reaction data

Data of the reaction to particular organisms are recorded during evaluation at the site where the collection is maintained. Because of the variation in races of pathogens from country to country and even between locations, careful registration of reaction pattern and, if available, the source of information should be ensured. This category can be divided into subgroups: reaction to fungi, bacteria, viruses, nemotodes, insects, etc. In the following, only an example is given. Each germplasm centre should decide which are the locally important diseases and pests.

9.1 Reaction to fungal disease

This code describes the degree of reaction of an accession to a particular fungal pathogen, recorded by the reaction of a plant organ infected, and expressed as:

1 = very susceptible
3 = moderately susceptible
5 = moderately resistant
7 = very resistant
9 = extremely resistant

9.1.1 *Phytophthora palmivora*

9.1.2 *Crinipellis perniciosus*

9.1.3 etc

9.2 Reaction to bacterial diseases

9.3 Reaction to virus diseases

9.4 etc.

Summary

In order to standardize the description of cacao clones and populations, a list of descriptors with their respective states is presented. Short instructions are given for their use, including the minimum sample size for the quantitative characteristics.

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