TG/CACAO(proj.4)
ORIGINAL: English
DATE: 2011-04-02

UPOV

INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS

GENEVA

DRAFT

CACAO

UPOV Code: THEOB_CAC

Theobroma cacao L.

[*]

GUIDELINES

FOR THE CONDUCT OF TESTS

FOR DISTINCTNESS, UNIFORMITY AND STABILITY

prepared by experts from Mexico

to be considered by the

Technical Committee at its forty-seventh session,
to be held in Geneva from April 4 to 6, 2011

Alternative Names:[*]

Botanical name	*English*	*French*	*German*	*Spanish*
Theobroma cacao L.	Cacao	Cacaoyer	Kakao	Cacao

The purpose of these guidelines ("Test Guidelines") is to elaborate the principles contained in the General Introduction (document TG/1/3), and its associated TGP documents, into detailed practical guidance for the harmonized examination of distinctness, uniformity and stability (DUS) and, in particular, to identify appropriate characteristics for the examination of DUS and production of harmonized variety descriptions.

ASSOCIATED DOCUMENTS

These Test Guidelines should be read in conjunction with the General Introduction and its associated TGP documents.

[*] These names were correct at the time of the introduction of these Test Guidelines but may be revised or updated. [Readers are advised to consult the UPOV Code, which can be found on the UPOV Website (www.upov.int), for the latest information.]

TABLE OF CONTENTS PAGE

1. Subject of these Test Guidelines

These Test Guidelines apply to all varieties of *Theobroma cacao* L.

2. Material Required

2.1 The competent authorities decide on the quantity and quality of the plant material required for testing the variety and when and where it is to be delivered. Applicants submitting material from a State other than that in which the testing takes place must ensure that all customs formalities and phytosanitary requirements are complied with.

2.2 The material is to be supplied in the form of seed or plants.

2.3 The minimum quantity of plant material, to be supplied by the applicant, should be:

seed-propagated varieties: 20 fresh seeds
vegetatively propagated varieties: 5 plants

In the case of seed, the seed should meet the minimum requirements for germination, species and analytical purity, health and moisture content, specified by the competent authority.

2.4 The plant material supplied should be visibly healthy, not lacking in vigor, nor affected by any important pest or disease.

2.5 The plant material should not have undergone any treatment which would affect the expression of the characteristics of the variety, unless the competent authorities allow or request such treatment. If it has been treated, full details of the treatment must be given.

3. Method of Examination

3.1 Number of Growing Cycles

3.1.1 The minimum duration of tests should normally be two independent growing cycles. In particular, it is essential that the trees produce a satisfactory crop of fruit in each of the two growing cycles.

3.1.2 The growing cycle is considered to be the duration of a single growing season, beginning with vegetative growth, followed by flowering and fruit harvest.

3.2 Testing Place

Tests are normally conducted at one place. In the case of tests conducted at more than one place, guidance is provided in TGP/9 “Examining Distinctness”.

3.3 Conditions for Conducting the Examination

The tests should be carried out under conditions ensuring satisfactory growth for the expression of the relevant characteristics of the variety and for the conduct of the examination.

3.4 Test Design

3.4.1 Each test should be designed to result in a total of at least 10 plants in the case of seed-propagated plants or, in the case of vegetatively propagated varieties, in a total of at least 5 plants.

3.4.2 The design of the tests should be such that plants or parts of plants may be removed for measurement or counting without prejudice to the observations which must be made up to the end of the growing cycle.

3.5 Additional Tests

Additional tests, for examining relevant characteristics, may be established.

4. Assessment of Distinctness, Uniformity and Stability

4.1 Distinctness

4.1.1 General Recommendations

It is of particular importance for users of these Test Guidelines to consult the General Introduction prior to making decisions regarding distinctness. However, the following points are provided for elaboration or emphasis in these Test Guidelines.

Further guidance is provided in documents TGP/9 “Examining Distinctness” and TGP/8 “Trial Design and Techniques Used in the Examination of Distinctness, Uniformity and Stability”.

4.1.2 Consistent Differences

The differences observed between varieties may be so clear that more than one growing cycle is not necessary. In addition, in some circumstances, the influence of the environment is not such that more than a single growing cycle is required to provide assurance that the differences observed between varieties are sufficiently consistent. One means of ensuring that a difference in a characteristic, observed in a growing trial, is sufficiently consistent is to examine the characteristic in at least two independent growing cycles.

4.1.3 Clear Differences

Determining whether a difference between two varieties is clear depends on many factors, and should consider, in particular, the type of expression of the characteristic being examined, i.e. whether it is expressed in a qualitative, quantitative, or pseudo-qualitative manner. Therefore, it is important that users of these Test Guidelines are familiar with the recommendations contained in the General Introduction prior to making decisions regarding distinctness.

4.1.4 Number of Plants / Parts of Plants to be Examined

4.1.4.1 Seed-propagated varieties: Unless otherwise indicated, for the purposes of distinctness, all observations on single plants should be made on 10 plants or parts taken from each of 10 plants and any other observations made on all plants in the test, disregarding any off-type plants.

4.1.4.2 Vegetatively propagated varieties: Unless otherwise indicated, for the purposes of distinctness, all observations on single plants should be made on 5 plants or parts taken from each of 5 plants and any other observations made on all plants in the test, disregarding any off-type plants.

4.1.5 Method of Observation

The recommended method of observing the characteristic for the purposes of distinctness is indicated by the following key in the second column of the Table of Characteristics (see document TGP/9 “Examining Distinctness”, Section 4 “Observation of characteristics”):

MG: single measurement of a group of plants or parts of plants
MS: measurement of a number of individual plants or parts of plants
VG: visual assessment by a single observation of a group of plants or parts of plants
VS: visual assessment by observation of individual plants or parts of plants

Type of observation: visual (V) or measurement (M)

“Visual” observation (V) is an observation made on the basis of the expert’s judgment. For the purposes of this document, “visual” observation refers to the sensory observations of the experts and, therefore, also includes smell, taste and touch. Visual observation includes observations where the expert uses reference points (e.g. diagrams, example varieties, side-by-side comparison) or non-linear charts (e.g. color charts). Measurement (M) is an objective observation against a calibrated, linear scale e.g. using a ruler, weighing scales, colorimeter, dates, counts, etc.

Type of record: for a group of plants (G) or for single, individual plants (S)

For the purposes of distinctness, observations may be recorded as a single record for a group of plants or parts of plants (G), or may be recorded as records for a number of single, individual plants or parts of plants (S). In most cases, “G” provides a single record per variety and it is not possible or necessary to apply statistical methods in a plant-by-plant analysis for the assessment of distinctness.”

In cases where more than one method of observing the characteristic is indicated in the Table of Characteristics (e.g. VG/MG), guidance on selecting an appropriate method is provided in document TGP/9, Section 4.2.

4.2 Uniformity

4.2.1 It is of particular importance for users of these Test Guidelines to consult the General Introduction prior to making decisions regarding uniformity. However, the following points are provided for elaboration or emphasis in these Test Guidelines:

4.2.2 Vegatatively propagated varieties

For the assessment of uniformity of vegetatively propagated varieties, a population standard of 1% and an acceptance probability of 95% should be applied. In the case of a sample size of 5 plants, no off-types are allowed.

4.2.3 Cross-pollinated varieties

The assessment of uniformity for seed-propagated varieties should be according to the recommendations for cross-pollinated varieties in the General Introduction.

4.2.4 Hybrid varieties

The assessment of uniformity for hybrid varieties depends on the type of hybrid and should be according to the recommendations for hybrid varieties in the General Introduction.

4.3 Stability

4.3.1 In practice, it is not usual to perform tests of stability that produce results as certain as those of the testing of distinctness and uniformity. However, experience has demonstrated that, for many types of variety, when a variety has been shown to be uniform, it can also be considered to be stable.

4.3.2 Where appropriate, or in cases of doubt, stability may be further examined by testing a new seed or plant stock to ensure that it exhibits the same characteristics as those shown by the initial material supplied.

5. Grouping of Varieties and Organization of the Growing Trial

5.1 The selection of varieties of common knowledge to be grown in the trial with the candidate varieties and the way in which these varieties are divided into groups to facilitate the assessment of distinctness are aided by the use of grouping characteristics.

5.2 Grouping characteristics are those in which the documented states of expression, even where produced at different locations, can be used, either individually or in combination with other such characteristics: (a) to select varieties of common knowledge that can be excluded from the growing trial used for examination of distinctness; and (b) to organize the growing trial so that similar varieties are grouped together.

5.3 The following have been agreed as useful grouping characteristics:

(a) Young flush leaf: color (characteristic 5)
(b) Flower: anthocyanin on sepal (characteristic 9)
(c) Fruit: shape (characteristic 12)
(d) Fruit: basal constriction (characteristic 13)
(e) Fruit: shape of apex (characteristic 14)
(f) Fruit: color (characteristic 20)

5.4 Guidance for the use of grouping characteristics, in the process of examining distinctness, is provided through the General Introduction and document TGP/9 “Examining Distinctness”.

6. Introduction to the Table of Characteristics

6.1 Categories of Characteristics

6.1.1 Standard Test Guidelines Characteristics

Standard Test Guidelines characteristics are those which are approved by UPOV for examination of DUS and from which members of the Union can select those suitable for their particular circumstances.

6.1.2 Asterisked Characteristics

Asterisked characteristics (denoted by *) are those included in the Test Guidelines which are important for the international harmonization of variety descriptions and should always be examined for DUS and included in the variety description by all members of the Union, except when the state of expression of a preceding characteristic or regional environmental conditions render this inappropriate.

6.2 States of Expression and Corresponding Notes

6.2.1 States of expression are given for each characteristic to define the characteristic and to harmonize descriptions. Each state of expression is allocated a corresponding numerical note for ease of recording of data and for the production and exchange of the description.

6.2.2 In the case of qualitative and pseudo-qualitative characteristics (see Chapter 6.3), all relevant states of expression are presented in the characteristic. However, in the case of quantitative characteristics with 5 or more states, an abbreviated scale may be used to minimize the size of the Table of Characteristics. For example, in the case of a quantitative characteristic with 9 states, the presentation of states of expression in the Test Guidelines may be abbreviated as follows:

State	Note
small	3
medium	5
large	7

However, it should be noted that all of the following 9 states of expression exist to describe varieties and should be used as appropriate:

State	Note
very small	1
very small to small	2
small	3
small to medium	4
medium	5
medium to large	6
large	7
large to very large	8
very large	9

6.2.3 Further explanation of the presentation of states of expression and notes is provided in document TGP/7 “Development of Test Guidelines”.

6.3 Types of Expression

An explanation of the types of expression of characteristics (qualitative, quantitative and pseudo-qualitative) is provided in the General Introduction.

6.4 Example Varieties

Where appropriate, example varieties are provided to clarify the states of expression of each characteristic.

6.5 Legend

(*) Asterisked characteristic – see Chapter 6.1.2

QL Qualitative characteristic – see Chapter 6.3
QN Quantitative characteristic – see Chapter 6.3
PQ Pseudo-qualitative characteristic – see Chapter 6.3

MG, MS, VG, VS – see Chapter 4.1.5

(a)-(c) See Explanations on the Table of Characteristics in Chapter 8.1
(+) See Explanations on the Table of Characteristics in Chapter 8.2

7. Table of Characteristics/Tableau des caractères/Merkmalstabelle/Tabla de caracteres

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
1.	**VG**	**Leaf blade: size**	**Limbe : taille**	**Blattspreite: Größe**	**Limbo: tamaño**		
QN	**(a)**	small	petit	klein	pequeño	RIM-221, RIM-223	1
		medium	moyen	mittel	mediano	CHUOA-24, EET-164	2
		Large	grand	groß	grande	POUND-12, RIM-222	3
2. (*) (+)	**VG**	**Leaf blade: shape of base**	**Limbe : forme de la base**	**Blattspreite: Form der Basis**	**Limbo: forma de la base**		
PQ	**(a)**	acute	aiguë	spitz	aguda	ETT-164, ICS-6	1
		obtuse	obtuse	stumpf	obtusa	POUND-12	2
		rounded	ronde	abgerundet	redondeada	RIM-41, RIM-52	3
		cordate	cordiforme	herzförmig	cordiforme	SPA-9	4
3.	**VG**	**Leaf blade: intensity of green color**	**Limbe: intensité de la couleur verte**	**Blattspreite: Intensität der Grünfärbung**	**Limbo: intensidad del color verde**		
QN	**(a)**	light	claire	hell	claro	IQ-1	1
		medium	moyenne	mittel	medio	RIM-52, RIM-234	2
		dark	foncée	dunkel	oscuro	ETT-169, RIM-229	3
4. (*) (+)	**VG**	**Leaf blade: apex**	**Limbe : sommet**	**Blattspreite: Spitze**	**Limbo: forma del ápice**		
PQ	**(a)**	acuminate	acuminé	zugespitzt	acuminado	Diamante-800, UF-221	1
		apiculate	apiculé	fein zugespitzt	apiculado		2
		acute	aigu	spitz	agudo	IMC-67, POUND-7	3

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
5. (*)	**VG**	**Young flush leaf: color**	**Jeune feuille à la poussée foliaire : couleur**	**Junges Austriebsblatt: Farbe**	**Brote de hoja joven: color**		
PQ		light green	vert clair	hellgrün	verde claro	Carmelo, EET-400	1
		medium green	vert moyen	mittelgrün	verde medio		2
		brown	brun	braun	marrón	EET-96, RIM-24, RIM-56	3
		light red	rouge clair	hellrot	rojo claro	CC-41, EET-95, POUND-7	4
		medium red	rouge moyen	mittelrot	rojo medio	POUND-12, UF-700	5
		dark red	rouge foncé	dunkelrot	rojo oscuro	UF-273	6
6. (*)	**VG**	**Flower: anthocyanin of pedicel**	**Fleur : pigmentation anthocyanique du pédicelle**	**Blüte: Anthocyanfärbung des Blütenstiels**	**Flor: pigmentación antociánica del pedicelo**		
QN		absent or weak	absente ou faible	fehlend oder gering	ausente o débil	Catongo	1
		moderate	modérée	mäßig	moderada	IMC-67,UF-667	2
		strong	forte	stark	fuerte	CC-19	3
7.	**VG/ MS**	**Flower: length of sepal**	**Fleur : longueur du sépale**	**Blüte: Länge des Kelchblatts**	**Flor: longitud del sépalo**		
QN		short	petit	kurz	corta	CATIE-1000	3
		medium	moyen	mittel	media	NA-34, SPA-9	5
		long	long	lang	larga	0C-61, UF-273	7
8.	**VG/ MS**	**Flower: width of sepal**	**Fleur : largeur du sépale**	**Blüte: Breite des Kelchblatts**	**Flor: anchura del sépalo**		
QN		narrow	étroit	schmal	estrecho	CHUOA-24, SIAL-93	3
		medium	moyen	mittel	medio	CC-41, RIM-232	5
		broad	large	breit	ancho	POUND-7, SCA-6, UF-221	7

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
9. (*)	**VG**	**Flower: anthocyanin on sepal**	**Fleur : pigmentation anthocyanique du sépale**	**Blüte: Anthocyanfärbung des Kelchblatts**	**Flor: pigmentación antociánica del sépalo**		
QN		absent or very weak	absente ou très faible	fehlend oder sehr gering	ausente o muy débil	Catongo	1
		weak	faible	gering	débil	CC-18, SIAL-56	2
		moderate	modérée	mäßig	moderada	OC-77, UF-613, UF-668	3
		strong	forte	stark	fuerte	ICS-1, SIAL-56, UF-273	4
10. (*)	**VG**	**Flower: color of ligula**	**Fleur : couleur de la ligule**	**Blüte: Farbe der Ligula**	**Flor: color de lígula**		
PQ		cream	crème	cremefarben	crema	Carmelo, EET-376	1
		cream yellow	jaune crème	cremegelb	crema amarillo	PA-13, Porcelana-3	2
		yellow	jaune	gelb	amarillo	ICS-1, OC-77, UF-668	3
11. (*)	**VG**	**Staminode: anthocyanin coloration**	**Staminode : pigmentation anthocyanique**	**Staminodie: Anthocyanfärbung**	**Estaminodio: pigmentación antocíanica**		
QN		absent or very weak	absente ou très faible	fehlend oder sehr gering	ausente o débil	Catongo	1
		weak	faible	gering	débil	EET-95, POUND-7	2
		medium	moyenne	mittel	media	IMC-67	3
		strong	forte	stark	fuerte		4
12. (*) (+)	**VG**	**Fruit: shape**	**Fruit : forme**	**Frucht: Form**	**Fruto: forma**		
PQ		ovate	ovale	eiförmig	oval	Lacandon 17	1
		circular	circulaire	kreisförmig	circular	Carmelo, EET-80	2
		elliptic	elliptique	elliptisch	elíptica	RIM-88	3
		oblong	oblongue	rechteckig	oblonga	ETT-48	4
		obovate	obovale	verkehrt eiförmig	oboval	SIAL-407	5

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
13. (*) (+)	**VG**	**Fruit: basal constriction**	**Fruit : constriction de la base**	**Frucht: Einschnürung des basalen Teils**	**Fruto: estrangulamiento basal**		
QN	**(b)**	absent or very weak	absente ou très faible	fehlend oder sehr gering	ausente o muy débil	SIAL-407	1
		weak	faible	gering	débil	POUND-7	3
		moderate	modérée	mäßig	moderado	RIM-88	5
		strong	forte	stark	fuerte	FRIM-20, RIM-222	7
14. (*) (+)	**VG**	**Fruit: shape of apex**	**Fruit : forme du sommet**	**Frucht: Scheitelform**	**Fruto: forma del ápice**		
PQ	**(b)**	waisted	étranglée	tailliert	entallado	RIM-68	1
		acute	aiguë	spitz	agudo	EET-164, RB-41	2
		obtuse	obtuse	stumpf	obtuso	EET-400, POUND 7	3
		rounded	ronde	abgerundet	redondeado	CC-210, EET-59, PA-13	4
15. (*)	**VG/ MS**	**Fruit: length**	**Fruit : longueur**	**Frucht: Länge**	**Fruto: longitud**		
QN	**(c)**	short	court	kurz	corta	RIM-234, UF-273, UF-296	3
		medium	moyen	mittel	media	La Esmida Rojo, RIM-71	5
		long	long	lang	larga	RIM-10, RIM-68	7
16. (*)	**VG/ MS**	**Fruit: diameter**	**Fruit : diamètre**	**Frucht: Durchmesser**	**Fruto: diámetro**		
QN	**(c)**	small	petit	klein	pequeño	PA-169, RIM-230	3
		medium	moyen	mittel	medio	RIM-52, SCA-6, UF-273	5
		large	large	groß	grande	RIM-113	7
17. (*)	**VG/ MS**	**Fruit: length/ diameter ratio**	**Fruit : rapport longueur/ diamètre**	**Frucht: Verhältnis Länge/Durchmesser**	**Fruto: relación longitud/diámetro**		
QN	**(c)**	moderately compressed	modérément comprimé	mäßig zusammengedrückt	moderadamente comprimida	CC-225, RIM-24, RIM-106	3
		medium	moyen	mittel	media	EET-96, EET-162, UF-273,	5
		moderately elongated	modérément allongé	mäßig langgezogen	moderadamente alargada	SIAL-12	7

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
18. (*)	**VG**	**Fruit: surface**	**Fruit : surface**	**Frucht: Größe**	**Fruto: superficie**		
QN	**(b)**	smooth or slightly rough	lisse ou légèrement rugueuse	glatt oder leicht rauh	lisa o ligeramente rugosa	IMC-67	1
		moderately rough	modérément rugueuse	mäßig rauh	moderadamente rugosa	PA-121, RIM-105, UF-29	3
		very rough	très rugueuse	sehr rauh	muy rugosa	RIM-24, RIM-68	5
19. (+)	**VG**	**Fruit: depth between ridges**	**Fruit : profondeur entre les cannelures**	**Frucht: Tiefe zwischen den Adern**	**Fruto: profundidad entre los lomos**		
QN	**(b)**	absent or very shallow	absente ou très peu profonde	fehlend oder sehr flach	ausente o muy poco profunda	IMC-67	1
		shallow	peu profonde	flach	poco profunda	Catongo, EET-164	2
		medium	moyenne	mittel	media	POUND-7, SCA-12	3
		deep	profonde	tief	profunda	PA-169, RIM-230	4
20. (*)	**VG**	**Fruit: color**	**Fruit : couleur**	**Frucht: Farbe**	**Fruto: color**		
PQ	**(c)**	green yellow	vert jaune	grüngelb	amarillo verdoso	CC-210	1
		yellow	jaune	gelb	amarillo	EET-400, POUND-12, SCA-12	2
		orange	orange	orange	anaranjado	UF-296	3
		medium red	rouge moyen	mittelrot	rojo medio	CC-18, UF-221	4
		dark red	rouge foncé	dunkelrot	rojo oscuro	CCN-51	5
		purple	violet	purpur	púrpura	INIFAP-H16	6
21. (*) (+)	**VG/ MS**	**Fruit: exocarp thickness**	**Fruit : épaisseur de l'exocarpe**	**Frucht: Dicke des Exokarps**	**Fruto: grosor del epicarpio**		
QN	**(c)**	thin	fine	dünn	delgado	RIM-230	3
		medium	moyenne	mittel	medio	IMC-67	5
		thick	épaisse	dick	grueso	EET-164	7

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
22.	**VG**	**Fruit: color of pulp**	**Fruit : couleur de la chair**	**Frucht: Farbe des Fleisches**	**Fruto: color de la pulpa**		
PQ	**(c)**	white	blanche	weiß	blanco	PA-121, PA-169	1
		light cream	crème pâle	hell cremefarben	crema claro	CC-225, EET-80, EET-96	2
		dark cream	crème foncé	dunkel cremefarben	crema oscuro		3
23. (*) (+)	**MG**	**Fruit: sweetness of pulp**	**Fruit : goût sucré de la chair**	**Frucht: Süße des Fleisches**	**Fruto: dulzura de la pulpa**		
QN	**(c)**	low	faible	gering	débil		3
		medium	moyen	mittel	media		5
		high	élevé	hoch	fuerte		7
24. (*)	**VG/ MS**	**Fruit: number of seeds**	**Fruit : nombre de graines**	**Frucht: Anzahl Samen**	**Fruto: número de semillas**		
QN	**(c)**	few	petit	gering	bajo	EET-399, UF-676	3
		medium	moyen	mittel	medio	CC-266, RB-46, SIAL-407	5
		many	grand	groß	alto	CHUAO-120, SPA-9	7
25. (*) (+)	**VG**	**Seed: shape in longitudinal section**	**Graine : forme en section longitudinale**	**Samen: Form im Längsschnitt**	**Semilla: forma en sección longitudinal**		
PQ		oblong	oblongue	rechteckig	oblonga	PA-13, SIAL-93, SIAL-407	1
		elliptic	elliptique	elliptisch	elíptica	Catongo, POUND-7	2
		ovate	ovale	eiförmig	oval	UF-11	3
26. (*)	**VG/ MS**	**Seed: length**	**Graine : longueur**	**Samen: Länge**	**Semilla: longitud**		
QN	**(c)**	short	courte	kurz	corta	EET-376, RIM-56	3
		medium	moyenne	mittel	media	CC-225, SIAL-93	5
		long	longue	lang	larga	NA-34, RIM-233, UF-11	7

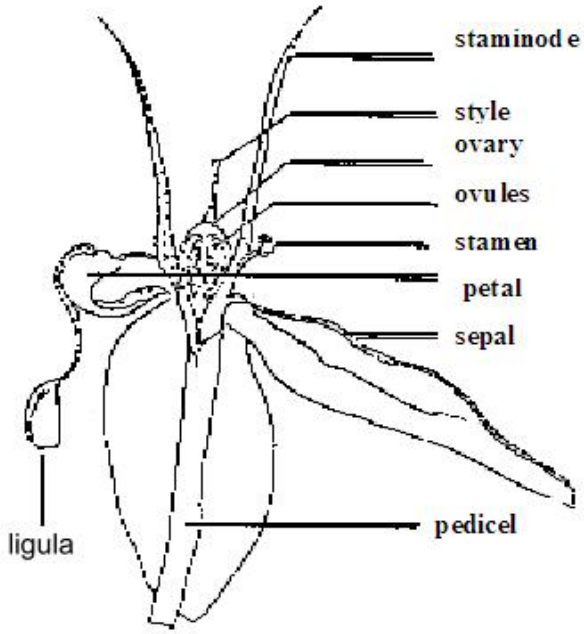
		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
27. (*)	**VG/ MS**	**Seed: width**	**Graine : largeur**	**Samen: Breite**	**Semilla: anchura**		
QN	**(c)**	narrow	étroite	schmal	estrecha	EET-376, POUND-12	3
		medium	moyenne	mittel	media	RIM-68, RIM-88	5
		broad	large	breit	ancha	EET-164, UF-705	7
28. (*)	**VG/ MS**	**Seed: ratio length/width**	**Graine : rapport longueur/largeur**	**Samen: Verhältnis Länge/Breite**	**Semilla: relación entre la longitud y la anchura**		
QN	**(c)**	moderately compressed	modérément comprimé	mäßig zusammengedrückt	moderadamente comprimida	RIM-56	3
		medium	moyen	mittel	media	RIM-229, UF-296	5
		moderately elongated	modérément allongé	mäßig langgezogen	moderadamente alargada	CC-18, IMC-67, RIM-23	7
29.	**VG/ MS**	**Seed: thickness**	**Graine : épaisseur**	**Samen: Dicke**	**Semilla: grosor**		
QN	**(c)**	thin	fine	dünn	delgado	OC-61, SIAL-93	1
		medium	moyenne	mittel	medio	PA-121, UF-273	2
		thick	épaisse	dick	grueso	RIM-41, RIM-76[a]	3
30. (*)	**VG**	**Seed: cotyledon color**	**Graine : couleur des cotylédons**	**Samen: Farbe**	**Semilla: color del cotiledón**		
PQ	**(c)**	white	blanche	weiß	blanco	Catongo	1
		cream	crème	cremefarben	crema	Caramelo, RIM-76A	2
		pink	rose	rosa	rosa		3
		dark red	rouge foncé	dunkelrot	rojo oscuro	CC-225, RIM-44	4
		dark purple	violet foncé	dunkelpurpurn	púrpura oscuro	PA-13, RIM-105	5
31. (+)	**MG**	**Seed: total fat content**	**Graine : teneur totale en lipides**	**Samen: Gesamtfettgehalt**	**Semilla: contenido total en materia grasa**		
QN	**(c)**	low	faible	gering	bajo		3
		medium	moyenne	mittel	medio		5
		high	élevée	hoch	alto		7

8. Explanations on the Table of Characteristics

8.1 Explanations covering several characteristics

Characteristics containing the following key in the second column of the Table of Characteristics should be examined as indicated below:

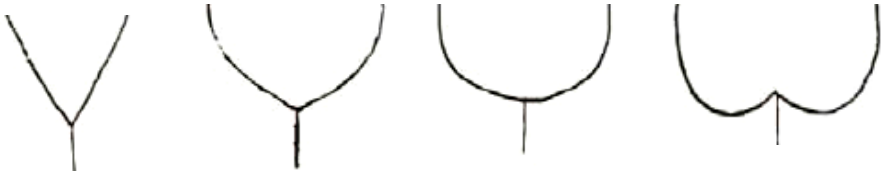
(a) Observations should be made on fully developed leaves, when the first fruit is fully developed.
(b) Observations should be made on fully developed fruit, before physiological maturity.
(c) Observations should be made on fruit at physiological maturity.



Cacao flower parts

8.2 Explanations for individual characteristics

Ad. 2: Leaf blade: shape of base



1	2	3	4
acute	obtuse	rounded	cordate

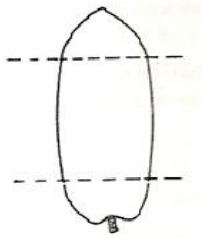
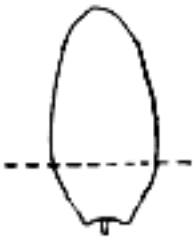
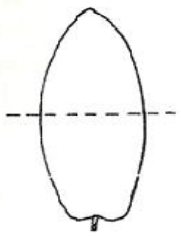
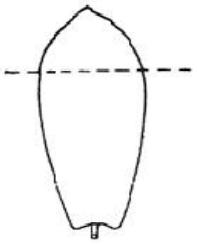
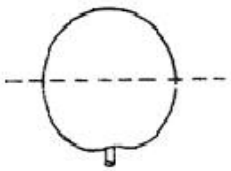
Ad. 4: Leaf blade: apex

1
acuminate

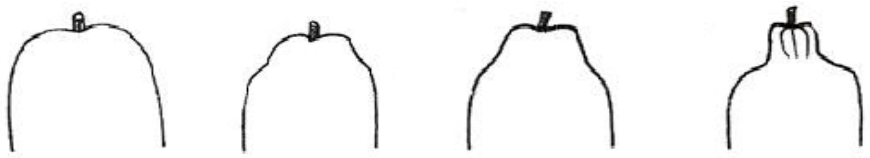
2
apiculate

3
acute

Ad. 12: Fruit: shape

		←	Position of broadest part	→
		below middle	**middle**	**above middle**
↑ **ratio length/width** ↓	**elongated**		 4 oblong	
	medium	 1 ovate	 3 elliptic	 5 obovate
	compressed		 2 circular	

Ad. 13: Fruit: basal constriction



1	3	5	7
absent or very weak	weak	moderate	strong

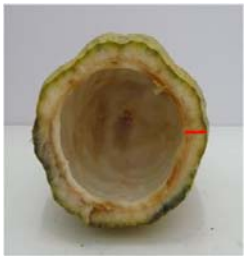
Ad. 14: Fruit: shape of apex

1	2	3	4
waisted	acute	obtuse	rounded

Ad. 19: Fruit: depth between ridges

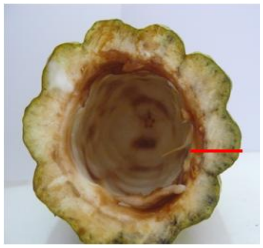
1	2	3	4
absent or very shallow	shallow	medium	deep

Ad. 21: Fruit: exocarp thickness



3
thin

5
medium

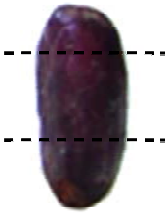


7
thick

Ad. 23: Fruit: sweetness of pulp

To be determined by refractometer

Ad. 25: Seed: shape in longitudinal section

		← Position of broadest part →		
		below middle	**middle**	**above middle**
Lateral outline ↑	**flat lateral sides**		 1 oblong	
↓	**rounded**	 3 ovate	 2 elliptic	

Ad. 31: Seed: total fat content

Determination of Total Fat in Cocoa Products

Method ICA (International Confectionary Association) 14, 1972 (formerly known as OICCC Method 8a/1972 and OICC Method 8a/1972) (HC Hydrolysis Method)

Analytical flow sheet

Step	• **Critical points**
Preparation of the reagents (6)	• Store the 0.1 mol/L silver nitrate away from light.
Preparation of test samples (7)	• Avoid fat melting • Ensure representative sampling and homogeneous test sample.
Prepare the test portion (8) - Defat the thimbles and cotton plug - Dry the 250 L flat bottomed flasks with glass beads in oven, cool for 45 mins. - Add 100 mL 4 mol/L HCI and mix (8.3)	• Report the mass of the flasks to 0.1 mg • Ensure the sample does not lump when adding the HCI.
Operating procedure (10.1) - Hydrolyze for 15 minutes	• Apply gentle boiling • Refer to 10.2 for pure or sweetened cacao powders and powders for beverages with aroma containing cacao
- Filtering and washing	• Filtering of the boiled content should be done quickly • Wash thoroughly with hot distilled water to remove chloride
- Drying of filter in thimble with cotton plug	• Dry the filter for 4 hours • 4 hour filter drying does not apply to all products (see 10.3.3)
- Extraction - Removal of solvent	• Minimum of 30 siphonings
- Drying of flasks	• Lay the flask horizontally in the oven for drying • Allow at least 45 minute of cooling in the desiccator
- Cooling and weighing	• Dry the extracted fat to constant mass
Expression of results (11.2)	• Report results for fat content in g/100g to two decimal places
Internal Control Plan (13)	• Check the maximum permitted repeatability. • Analyze reference samples monthly if the test is routinely conducted

9. Literature

Engels, J. M.M.; Bartley; B.G.D., Enriquez, G.A., 1980: Cacao descriptors, their states and modus operandi. Turrialba, 30(2), Turrialba, Costa Rica, pp. 209-218.

Engels, J.M.M., 1981: Genetic Resources of Cacao. A Catalogue of the CATIE Collection. CATIE. Plant Genetic Resources Unit. Technical series. Technical bulletin; No. 7 Turrialba, Costa Rica, 196 p.

ICA. 1972: Determination of total fat in cocoa products, HC hydrolysis method. International Confectionery Association. 8a/1972. Brussels, Belgium. 1 p.

10. Technical Questionnaire

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:

	Application date: (not to be filled in by the applicant)

TECHNICAL QUESTIONNAIRE
to be completed in connection with an application for plant breeders' rights

1. Subject of the Technical Questionnaire

1.1 Botanical name	*Theobroma cacao* L.
1.2 Common name	Cacao

2. Applicant

Name	
Address	
Telephone No.	
Fax No.	
E-mail address	
Breeder (if different from applicant)	

3. Proposed denomination and breeder's reference

Proposed denomination (if available)	
Breeder's reference	

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:

[#]4. Information on the breeding scheme and propagation of the variety

4.1 Breeding scheme

Variety resulting from:

4.1.1 Crossing

(a) controlled cross [ ]
(please state parent varieties)

(……..……..…) x (……..……..…)
female parent male parent

(b) partially known cross [ ]
(please state known parent variety(ies))

(……..……..…) x (……..……..…)
female parent male parent

(c) unknown cross [ ]

4.1.2 Mutation [ ]
(please state parent variety)

4.1.3 Discovery and development [ ]
(please state where and when discovered and how developed)

4.1.4 Other [ ]
(please provide details)

[#] Authorities may allow certain of this information to be provided in a confidential section of the Technical Questionnaire.

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:

4.2 Method of propagating the variety

4.2.1 Seed-propagated varieties

(a)	Self-pollination	[ ]
(b)	Cross-pollination	
	(i) population	[ ]
	(ii) synthetic variety	[ ]
(c)	Hybrid	[ ]
(d)	Other	[ ]
	(please provide details)	

4.2.2 Vegetative propagation

(a)	cuttings	[ ]
(b)	*in vitro* propagation	[ ]
(c)	grafting	[ ]
(d)	other (state method)	[ ]

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:

5. Characteristics of the variety to be indicated (the number in brackets refers to the corresponding characteristic in Test Guidelines; please mark the note which best corresponds).

	Characteristics	Example Varieties	Note
5.1 (5)	**Young flush leaf: color**		
	light green	Carmelo, EET-400	1[ ]
	medium green		2[ ]
	brown	EET-96, RIM-24, RIM-56	3[ ]
	light red	CC-41, EET-95, POUND-7	4[ ]
	medium red	POUND-12, UF-700	5[ ]
	dark red	UF-273	6[ ]
5.2 (9)	**Flower: anthocyanin on sepal**		
	absent or very weak	Catongo	1[ ]
	weak	CC-18, SIAL-56	2[ ]
	moderate	OC-77, UF-613, UF-668	3[ ]
	strong	ICS-1, SIAL-56, UF-273	4[ ]
5.3 (12)	**Fruit: shape**		
	ovate	Lacandon 17	1[ ]
	circular	Carmelo, EET-80	2[ ]
	elliptic	RIM-88	3[ ]
	oblog	ETT-48	4[ ]
	obovate	SIAL-407	5[ ]

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:

	Characteristics	Example Varieties	Note
5.4 (13)	**Fruit: basal constriction**		
	absent or very weak	SIAL-407	1[ ]
	very weak to weak		2[ ]
	weak	POUND-7	3[ ]
	weak to moderate		4[ ]
	moderate	RIM-88	5[ ]
	moderate to strong		6[ ]
	strong	FRIM-20, RIM-222	7[ ]
	strong to very strong		8[ ]
	very strong		9[ ]
5.5 (14)	**Fruit: shape of apex**		
	waisted	RIM-68	1[ ]
	acute	EET-164, RB-41	2[ ]
	obtuse	EET-400, POUND 7	3[ ]
	rounded	CC-210, EET-59, PA-13	4[ ]
5.6 (20)	**Fruit: color**		
	green yellow	CC-210	1[ ]
	yellow	EET-400, POUND-12, SCA-12	2[ ]
	orange	UF-296	3[ ]
	medium red	CC-18, UF-221	4[ ]
	dark red	CCN-51	5[ ]
	purple	INIFAP-H16	6[ ]

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:

6. Similar varieties and differences from these varieties

Please use the following table and box for comments to provide information on how your candidate variety differs from the variety (or varieties) which, to the best of your knowledge, is (or are) most similar. This information may help the examination authority to conduct its examination of distinctness in a more efficient way.

Denomination(s) of variety(ies) similar to your candidate variety	Characteristic(s) in which your candidate variety differs from the similar variety(ies)	Describe the expression of the characteristic(s) for the **similar** variety(ies)		Describe the expression of the characteristic(s) for **your** candidate variety	
		e.g.	*note 6*	*e.g.*	*note 3*
Example	*Fruit: color*	*e.g.*	*purple*	*e.g.*	*orange*

Comments:

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:

[#]7. Additional information which may help in the examination of the variety

7.1 In addition to the information provided in sections 5 and 6, are there any additional characteristics which may help to distinguish the variety?

Yes [ ] No [ ]

(If yes, please provide details)

7.2 Are there any special conditions for growing the variety or conducting the examination?

Yes [ ] No [ ]

(If yes, please provide details)

7.3 Other information

A representative color image of the variety should accompany the Technical Questionnaire.

8. Authorization for release

(a) Does the variety require prior authorization for release under legislation concerning the protection of the environment, human and animal health?

Yes [ ] No [ ]

(b) Has such authorization been obtained?

Yes [ ] No [ ]

If the answer to (b) is yes, please attach a copy of the authorization.

[#] Authorities may allow certain of this information to be provided in a confidential section of the Technical Questionnaire.

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:

9. Information on plant material to be examined or submitted for examination.

9.1 The expression of a characteristic or several characteristics of a variety may be affected by factors, such as pests and disease, chemical treatment (e.g. growth retardants or pesticides), effects of tissue culture, different rootstocks, scions taken from different growth phases of a tree, etc.

9.2 The plant material should not have undergone any treatment which would affect the expression of the characteristics of the variety, unless the competent authorities allow or request such treatment. If the plant material has undergone such treatment, full details of the treatment must be given. In this respect, please indicate below, to the best of your knowledge, if the plant material to be examined has been subjected to:

(a) Microorganisms (e.g. virus, bacteria, phytoplasma) Yes [ ] No [ ]

(b) Chemical treatment (e.g. growth retardant, pesticide) Yes [ ] No [ ]

(c) Tissue culture Yes [ ] No [ ]

(d) Other factors Yes [ ] No [ ]

Please provide details for where you have indicated “yes”.

……

10. I hereby declare that, to the best of my knowledge, the information provided in this form is correct:

Applicant’s name

Signature Date

[End of document]