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INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS

Geneva

CASSAVA

UPOV Code: MANIH_ESC

Manihot esculenta Crantz.

GUIDELINES

FOR THE CONDUCT OF TESTS

FOR DISTINCTNESS, UNIFORMITY AND STABILITY

Alternative Names:*

<i>Botanical name</i>	<i>English</i>	<i>French</i>	<i>German</i>	<i>Spanish</i>
<i>Manihot esculenta</i> Crantz	Cassava	Manioc	Maniok	Mandioca, Yuca

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.]

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1. Subject of these Test Guidelines

These Test Guidelines apply to all varieties of *Manihot esculenta* Crantz.

In the case of ornamental varieties, in particular, it may be necessary to use additional characteristics or additional states of expression to those included in the Table of Characteristics in order to examine Distinctness, Uniformity and Stability.

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 cuttings.

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

30 cuttings, each one with a length of 20cm with 5 to 8 buds.

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*

The minimum duration of tests should normally be a single growing cycle.

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 20 plants, which should be divided between two or more replicates.

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.

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

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.

4.1.5 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 These Test Guidelines have been developed for the examination of vegetatively propagated varieties. For varieties with other types of propagation the recommendations in the General Introduction and document TGP/13 "Guidance for new types and species", Section 4.5 "Testing Uniformity" should be followed.

4.2.3 For the assessment of uniformity, a population standard of 1% and an acceptance probability of at least 95% should be applied. In the case of a sample size of 20 plants, 1 off-type is allowed.

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 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) Apical leaf: pubescence (characteristic 2)
- (b) Leaf: shape of central lobe (characteristic 3)
- (c) Leaf: variegation (characteristic 5)
- (d) Stem: color of cortex (characteristic 13)
- (e) Stem: zigzag (characteristic 16)
- (f) Root: color of flesh (characteristic 24)

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 (*)	Apical leaf: color	Feuille apicale : couleur	Apikales Blatt: Farbe	Hoja apical: color		
PQ (a)	light green	vert clair	hellgrün	verde claro	Manjari	1
	dark green	vert foncé	dunkelgrün	verde oscuro	Clone 2005/0034	2
	purplish green	vert violacé	purpurgrün	verde purpúreo	Clone 82/001, Taquara Amarela	3
	purple	pourpre	purpurn	púrpura	Mandioca Batata	4
2. VG (*) (+)	Apical leaf: pubescence	Feuille apicale : pubescence	Apikales Blatt: Behaarung	Hoja apical: pubescencia		
QL (a)	absent	absente	fehlend	ausente	Clone 2005/0034, IAC 576-70	1
	present	présente	vorhanden	presente	Clone 82/0058, Taquara Amarela	9
3. VG (*) (+)	Leaf: shape of central lobe	Feuille : forme du lobe central	Blatt: Form des mittleren Lappens	Hoja: forma del lóbulo central		
PQ (b)	linear	linéaire	linear	lineal	Clone 990072	1
	elliptic	elliptique	elliptisch	elíptico	Clone 08/0142, Siri	2
	obovate	obovale	verkehrt eiförmig	oboval	Clone 0132	3
4. VG	Leaf: color	Feuille : couleur	Blatt: Farbe	Hoja: color		
PQ (b)	light green	vert clair	hellgrün	verde claro	Japonesa, Kibandameno, Nguzo	1
	dark green	vert foncé	dunkelgrün	verde oscuro	Taquara Amarela	2
	purplish green	vert violacé	purpurgrün	verde purpúreo	Mandioca Batata	3
	purple	pourpre	purpurn	púrpura		4
5. VG (*)	Leaf: variegation	Feuille : panachure	Blatt: Panaschierung	Hoja: variegación		
QL (b)	absent	absente	fehlend	ausente	Taquara Amarela	1
	present	présente	vorhanden	presente	Brasileirinha	9
6. VG/MS (+)	Leaf: length of central lobe	Feuille : longueur du lobe central	Blatt: Länge des mittleren Lappens	Hoja: longitud del lóbulo central		
QN (b)	short	courte	kurz	corto	Clone 2021	3
	medium	moyenne	mittel	medio	Nzalauka, Siri	5
	long	longue	lang	largo	Kibandameno, Tajirika	7
7. VG/MS (+)	Leaf: width of central lobe	Feuille : largeur du lobe central	Blatt: Breite des mittleren Lappens	Hoja: anchura del lóbulo central		
QN (b)	narrow	étroite	schmal	estrecho	Clone 2021	3
	medium	moyenne	mittel	medio	Siri	5
	broad	large	breit	ancho	Kibandameno	7

	English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
8.	VG	Leaf: color of veins	Feuille : couleur des nervures	Blatt: Farbe der Adern	Hoja: color de los nervios	
PQ	(b)	white	blanches	weiß	blanco	1
		green	vertes	grün	verde	Siri, IAC 576-70
		reddish green	vert rougeâtre	rötlichgrün	verde rojizo	Branca de Santa Catarina, Kibandameno
		red	rouges	rot	rojo	Vermelhinha das Cacimbas
		purple	pourpres	purpurn	púrpura	5
9.	VG	Petiole: attitude in relation to stem	Pétiole : port par rapport à la tige	Blattstiel: Haltung im Verhältnis zum Stamm	Pecíolo: porte en relación con el tallo	
PQ	(b)	semi erect	demi-dressé	halbaufrecht	semierecto	Karembo, Tajirika, Xingu
		horizontal	horizontal	waagerecht	horizontal	Nguzo, Siri, IAC 576-70
		drooping	retombant	hängend	colgante	BGMC 1117, Clone 1380, Kibandameno
10.	VG	Petiole: color	Pétiole : couleur	Blattstiel: Farbe	Pecíolo: color	
PQ	(b)	yellowish green	vert jaunâtre	gelblichgrün	verde amarillento	Cacau Amarela, Nzalauka, Shibe, Siri
		green	vert	grün	verde	Engana Ladrão, Karibuni
		reddish green	vert rougeâtre	rötlichgrün	verde rojizo	Clone 517, Karembo, Tajirika, Taquara Amarela
		red	rouge	rot	rojo	Amarela entre Rios, Clone 2021, Kibandameno, Nguzo
		purple	pourpre	purpurn	púrpura	Clone 1366, Klaisasik
11.	VG/MS	Stipule: length	Stipule : longueur	Nebenblatt: Länge	Estípula: longitud	
QN	(b)	short	courte	kurz	corta	Karibuni
		medium	moyenne	mittel	media	Karembo
		long	longue	lang	larga	Clone 517, Nguzo
12.	VG	Stipule: division	Stipule: division	Nebenblatt: Teilung	Estípula: división	
QL	(b)	entire	entière	ganz	entera	1
		divided	divisée	geteilt	dividida	2
13.	VG	Stem: color of cortex	Tige : couleur du cortex	Stamm: Farbe des Kortex	Tallo: color del córtex	
PQ	(c)	yellowish	jaunâtre	gelblich	amarillento	BGMC 1426, Mfaransa
		light green	vert clair	hellgrün	verde claro	B2C20-65, EAB 182
		dark green	vert foncé	dunkelgrün	verde oscuro	IAPAR 19
		purplish	pourpre	purpurn	purpúreo	Mandioca Batata

	English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
14. VG (*) (+)	Stem: color of bark	Tige : couleur de l'écorce	Stamm: Farbe der Rinde	Tallo: color de la corteza		
PQ (c)	greyish yellow	jaune grisâtre	graugelb	amarillo grisáceo	Kibandameno	1
	greenish yellow	jaune verdâtre	grünlichgelb	amarillo verdoso	Clone 2021, Siri	2
	brownish yellow	jaune brunâtre	bräunlichgelb	amarillo amarronado		3
	orange	orange	orange	naranja		4
	light brown	brun clair	hellbraun	marrón claro	Clone 1380	5
	dark brown	brun foncé	dunkelbraun	marrón oscuro	Kiroba	6
	grey	gris	grau	gris	Karibuni, Nguzo	7
15. VG (+)	Stem: color of inner side of bark	Tige : couleur de la face interne de l'écorce	Stamm: Farbe der Innenseite der Rinde	Tallo: color de la cara interna de la corteza		
PQ (c)	yellowish	jaunâtre	gelblich	amarillento	IAC 177-66, Karembó, Kibandameno	1
	orange	orange	orange	naranja	EAB 675	2
	purple	pourpre	purpurn	púrpura	Mandioca Batata	3
	light brown	brun clair	hellbraun	marrón claro	Shibe, Tajirika, Taquara Amarela	4
	dark brown	brun foncé	dunkelbraun	marrón oscuro	IAPAR 19	5
16. VG (*) (+)	Stem: zigzag	Tige : zigzag	Stamm: Zickzack	Tallo: zigzag		
QL (c)	absent	absent	fehlend	ausente		1
	present	présent	vorhanden	presente		9
17. VG (+)	Stem: prominence of leaf scars	Tige : importance des cicatrices foliaires	Stamm: Ausprägung von Blattnarben	Tallo: prominencia de las cicatrices foliares		
QN (c)	weak	faible	schwach	débil	IAC 105-66, Kibandameno, Nguzo	3
	medium	moyenne	mittel	media	IAC 576-70, Karembó, Karibuni	5
	strong	forte	stark	fuerte	BGMC 1117	7
18. VG/MS (+)	Stem: distance between leaf scars	Tige : espacement entre les cicatrices foliaires	Stamm: Abstand zwischen Blattnarben	Tallo: distancia entre las cicatrices foliares		
QN (c)	short	petit	kurz	corta	Taquara Amarela	3
	medium	moyen	mittel	media	IAC 576-70	5
	long	grand	lang	larga	EAB 321	7

	English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
19. VG (+)	Stem: color of end of branches	Tige : couleur de l'extrémité des ramifications	Stamm: Farbe der Zweigenden	Tallo: color del extremo de las ramas		
PQ (c)	green	vert	grün	verde	Karemba, Karibuni	1
	reddish green	vert rougeâtre	rötlichgrün	verde rojizo	Kibandameno	2
	purplish green	vert violacé	purpurgrün	verde purpúreo	Nguzo, Nzalauka	3
	greenish purple	pourpre verdâtre	grünlichpurpurn	púrpura verdoso		4
	purple	pourpre	purpurn	púrpura		5
	red	rouge	rot	rojo	Clone 2021	6
20. VG (+)	Root: stipe	Racine : stipe	Knolle: Stiel	Raíz: estípite		
QN (c)	absent or short	absent ou court	fehlend oder kurz	ausente o muy corto	Clone 08/0170, Clone 1366, IAC 352-7, Nzalauka	1
	medium	moyen	mittel	mediano		2
	long	long	lang	largo	Clone 99005, IAC 576-70, Karemba, Nguzo, Tajirika	3
21. VG (*) (+)	Root: color of epidermis	Racine : couleur de l'épiderme	Knolle: Farbe der Haut	Raíz: color de la epidermis		
(c)	whitish	blanchâtre	weißlich	blanquecino	Karemba, Kibandameno, Tajirika	1
PQ	light brown	brun clair	hellbraun	marrón claro	Karibuni, Nguzo, Siri, Taquara Amarela	2
	dark brown	brun foncé	dunkelbraun	marrón oscuro	Clone 1380, Mandioca Batata	3
22. VG (*)	Root: texture of epidermis	Racine : texture de l'épiderme	Knolle: Beschaffenheit der Haut	Raíz: textura de la epidermis		
QL (c)	smooth	lisse	glatt	suave	Branca de Santa Catarina, Clone 2021, Karemba	1
	rough	rugueuse	rauh	áspera	Mantiqueira, Nguzo, Nzalauka	2
23. VG (*) (+)	Root: color of cortex	Racine : couleur du cortex	Knolle: Farbe des Kortex	Raíz: color del córtex		
PQ (c)	white	blanc	weiß	blanco	Branca de Santa Catarina	1
	yellowish	jaunâtre	gelblich	amarillento	IAC 576-70	2
	yellow	jaune	gelb	amarillo	Xingu	3
	pink	rose	rosa	rosa	EAB 182	4
	purple	pourpre	purpurn	púrpura	Mandioca Batata	5

	English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
24. VG (*) (+)	Root: color of flesh	Racine : couleur de la chair	Knolle: Farbe des Fleisches	Raíz: color de la pulpa		
PQ	(c) white	blanc	weiß	blanco	BRS Tapioqueira	1
	yellowish	jaunâtre	gelblich	amarillento	IAC 756-70	2
	light yellow	jaune clair	hellgelb	amarillo claro	BRS Dourado, BRS Gema de Ouro	3
	dark yellow	jaune foncé	dunkelgelb	amarillo oscuro	Xingu	4
	pink	rose	rosa	rosa	BRS Rosada	5
25. VG (+)	Root: shape	Racine : forme	Knolle: Form	Raíz: forma		
QN	(c) conical	conique	konisch	cónica	Karibuni, Nguzo, Nzalauka	1
	conical to cylindrical	conique à cylindrique	konisch bis zylindrisch	cónica a cilíndrica	Clone 2021, Kibandameno	2
	cylindrical	cylindrique	zylindrisch	cilíndrica	Clone 1380, Clone 2095	3
26. VG (+)	Root: adherence of cortex to flesh	Racine : adhérence du cortex à la chair	Knolle: Anhaften des Kortex am Fleisch	Raíz: adherencia del córtex a la pulpa		
QN	(c) weak	faible	schwach	débil	Karembo, Karibuni, Kibandameno	1
	medium	moyenne	mittel	media	Clone 1380, Clone 2021, Nguzo	3
	strong	forte	stark	fuerte	Clone 1366	5

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 about 5 months after planting.
- (b) Observations should be made about 6-9 months after planting and at the middle third of the plant unless otherwise specified.
- (c) Observations should be made about 12 months after planting.

8.2 *Explanations for individual characteristics*

Ad. 2: Apical leaf: pubescence

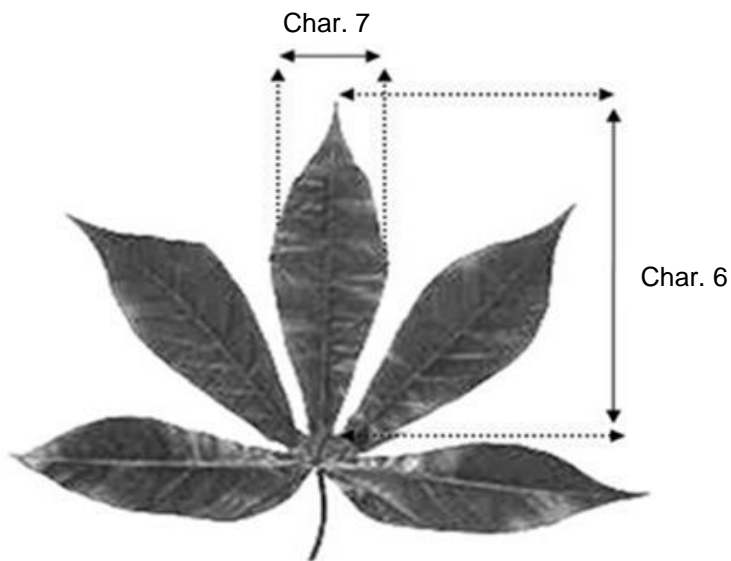
Observations should be made on the upper and lower sides of the apical leaves.

Ad. 3: Leaf: shape of central lobe

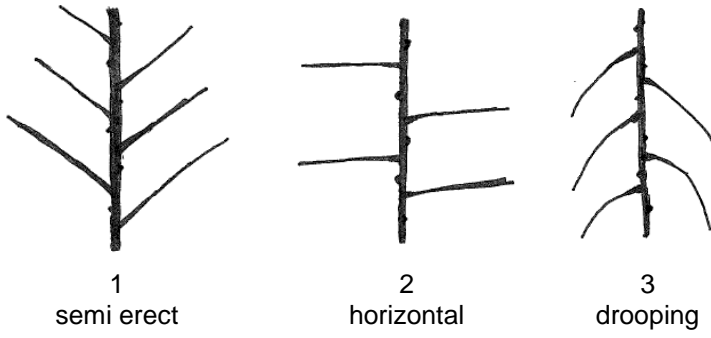


Ad. 6: Leaf: length of central lobe

Ad. 7: Leaf: width of central lobe



Ad. 9: Petiole: attitude in relation to stem



Ad. 11: Stipule: length

To be observed on the upper third of the plant.



Ad. 12: Stipule: division

To be observed on the upper third of the plant



1
entire

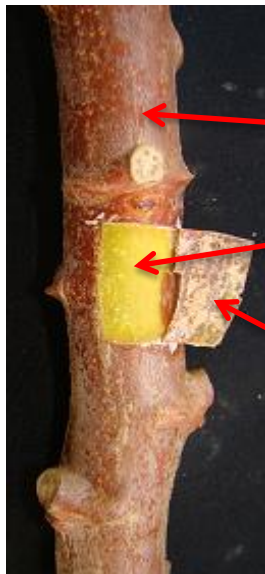


2
divided

Ad. 13: Stem: color of cortex

Ad. 14: Stem: color of bark

Ad. 15: Stem: color of inner side of bark



Char. 14

Char. 13

Char. 15

Ad. 16: Stem: zigzag



1
absent

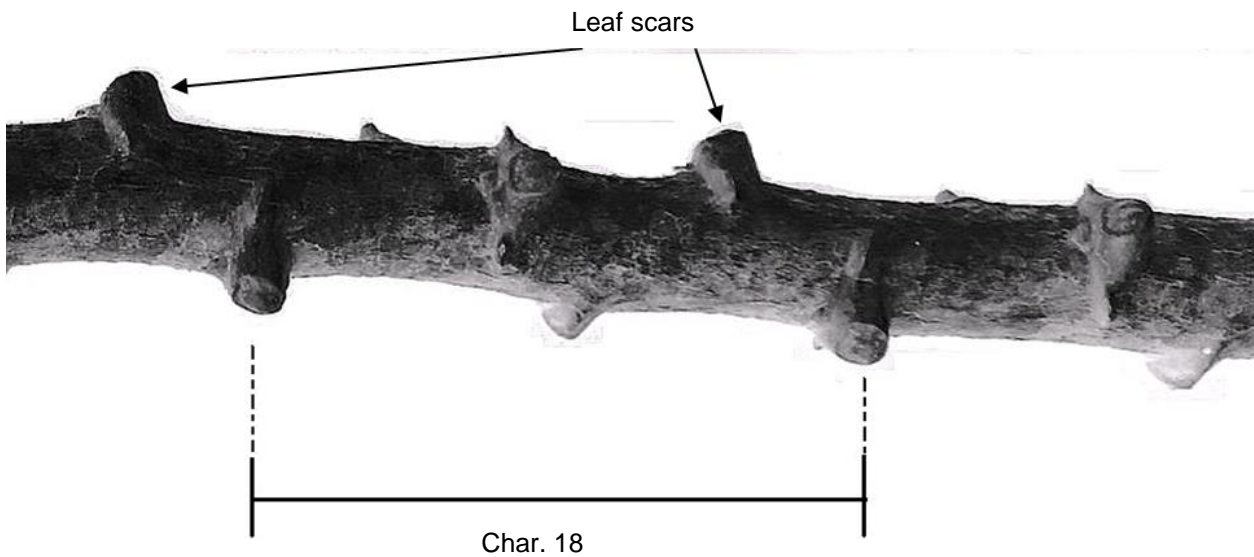


9
present

Ad. 17: Stem: prominence of leaf scars

Ad. 18: Stem: distance between leaf scars

The characteristic should be observed at the middle third of the plant. The distance between leaf scars should be observed between two scars in the same alignment.



Ad. 19: Stem: color of end of branches

To be observed on upper third of the central part of the plant.

Ad. 20: Root: stipe



1
absent or short

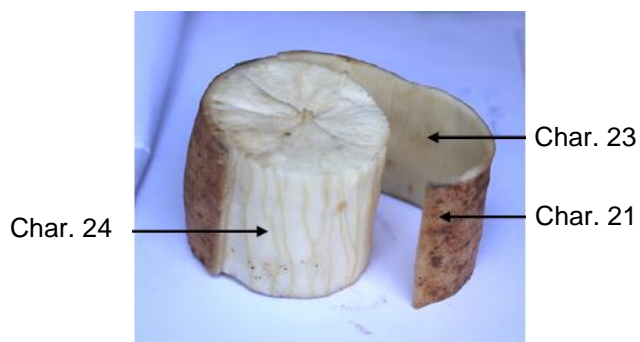


3
long

Ad. 21: Root: color of epidermis

Ad. 23: Root: color of cortex

Ad. 24: Root: color of flesh



Ad. 25: Root: shape



1
conical



2
conical to cylindrical



3
cylindrical

Ad. 26: Root: adherence of cortex to flesh

The adherence should be assessed by removing the cortex by hand from the middle third of freshly harvested root tubers.

Weak adherence = without any breakage of cortex

Medium adherence = minimal breakage of cortex

Strong adherence = a lot of breakage of cortex

9. Literature

Allem, A.C., 2002: The origin and taxonomy of cassava. CABI, pp. 1-16.

Alves, A.A.C., 2002: Cassava botany and physiology. CABI, pp. 67-89.

Fukuda, W.M.G., Guevara, C. L., 1998 : *Descritores morfológicos e agronômicos para a caracterização de mandioca (Manihot esculenta Crantz)*. Documentos 78, EMBRAPA-CNPMP, 38 pp. ISSN 0101 – 5171

Kenya Agricultural Research Institute (*KARI*) 2008/2009 National cassava breeding & improvement program.

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	<input type="text" value="Manihot esculenta Crantz."/>	
1.2 Common name	<input type="text" value="Cassava"/>	
2. Applicant		
Name	<input type="text"/>	
Address	<input type="text"/>	
Telephone No.	<input type="text"/>	
Fax No.	<input type="text"/>	
E-mail address	<input type="text"/>	
Breeder (if different from applicant)	<input type="text"/>	
3. Proposed denomination and breeder's reference		
Proposed denomination (if available)	<input type="text"/>	
Breeder's reference	<input type="text"/>	

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:
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#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:
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4.2 Method of propagating the variety

4.2.1 Vegetative propagation

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

[]

4.2.2 Seed []

4.2.3 Other []
(please provide details)

[]

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:
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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 Apical leaf: pubescence (2)		
absent	Clone 2005/0034, IAC 576-70	1[]
present	Clone 82/0058, Taquara Amarela	9[]
5.2 Leaf: shape of central lobe (3)		
linear	Clone 990072	1[]
elliptic	Clone 08/0142, Siri	2[]
obovate	Clone 0132	3[]
5.3 Leaf: variegation (5)		
absent	Taquara Amarela	1[]
present	Brasileirinha	9[]
5.4 Stem: color of cortex (13)		
yellowish	BGMC 1426, Mfaransa	1[]
light green	B2C20-65, EAB 182	2[]
dark green	IAPAR 19	3[]
purplish	Mandioca Batata	4[]
5.5 Stem: zigzag (16)		
absent		1[]
present		9[]
5.6 Root: color of flesh (24)		
white	BRS Tapioqueira	1[]
yellowish	IAC 756-70	2[]
light yellow	BRS Dourado, BRS Gema de Ouro	3[]
dark yellow	Xingu	4[]
pink	BRS Rosada	5[]

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:
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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 the characteristic(s) for your candidate variety
<i>Example</i>	<i>Stem: color of cortex</i>	<i>light green</i>	<i>dark green</i>

Comments:

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

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:
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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".

.....

9.3 Has the plant material to be examined been tested for the presence of virus or other pathogens?

Yes []

(please provide details as specified by the Authority)

No []

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]