

UPOV

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INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS

GENEVA

DRAFT

GRAIN AMARANTH *

UPOV code: AMARA

(Amaranthus L.
excluding ornamental varieties)

GUIDELINES

FOR THE CONDUCT OF TESTS

FOR DISTINCTNESS, UNIFORMITY AND STABILITY

*prepared by experts from Mexico**to be considered by the
Technical Working Party for Agricultural Crops at its thirty-fifth session
to be held in Beijing, China, from July 3 to 7, 2006*

Alternative Names:*

<i>Botanical name</i>	<i>English</i>	<i>French</i>	<i>German</i>	<i>Spanish</i>
<i>Amaranthus L.</i>	Amaranth	Amarante	Amarant, Fuchsschwanz	Amaranto

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 *Amaranthus* L. excluding ornamental varieties.

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.

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

100 g

2.4 The seed should meet the minimum requirements for germination, species and analytical purity, health and moisture content, specified by the competent authority. In cases where the seed is to be stored, the germination capacity should be as high as possible and should, be stated by the applicant.

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

2.6 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 two independent growing cycles.

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

3.3.1 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.

3.3.2 Type of observation

The recommended method of observing the characteristics is indicated by the following key in the second column of the Table 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.

3.3.3 Type of plot for observation

The recommended type of plot in which to observe the characteristics is indicated by the following key in the second column of the Table of Characteristics:

A: spaced plants

C: special test

3.3.4 Visual color observation

Because daylight varies, color determinations made against a color chart should be made either in a suitable cabinet providing artificial daylight or in the middle of the day in a room without direct sunlight. The spectral distribution of the illuminant for artificial daylight should conform with the CIE Standard of Preferred Daylight D 6500 and should fall within the tolerances set out in the British Standard 950, Part I. These determinations should be made with the plant part placed against a white background.

3.4 *Test Design*

3.4.1 In the case of inbred lines, each test should be designed to result in a total of at least 50 plants, which should be divided between two or more replicates.

3.4.2 In the case of cross-pollinated varieties, each test should be designed to result in a total of at least 150 plants, which should be divided between two or more replicates.

3.4.3 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 *Number of Plants / Parts of Plants to be Examined*

Unless otherwise indicated, all observations determined by measuring should be made on 20 plants or parts taken from each of 20 plants.

3.6 *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.

4.2 *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 For the assessment of uniformity of inbred lines, a population standard of 1 % and an acceptance probability of at least 95 % should be applied. In the case of a sample size of 50 plants, two off-types are allowed.

4.2.3 The assessment of uniformity for cross-pollinated varieties should be according to the recommendations for cross-pollinated varieties and inbred lines 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.

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 is 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:

[.....]

5.4 Guidance for the use of grouping characteristics, in the process of examining distinctness, is provided through the General Introduction.

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

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.

6.3 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: single measurement of a group of plants or parts of plants – see Chapter 3.3.1

MS: measurement of a number of individual plants or parts of plants – see Chapter 3.3.1

VG: visual assessment by a single observation of a group of plants or parts of plants –see Chapter 3.3.1

VS: visual assessment by observation of individual plants or parts of plants” –see Chapter 3.3.1

A: spaced plants – see Chapter 3.3.3

C: special test see Chapter 3.3.3

(a)-(g) 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	Cotyledon:			Cotiledones:		
(*)	A	anthocyanin coloration			Pigmentación de antocianinas		
QL	(a)	absent			ausente	Eniko, Maros, Revancha	1
		present			presente	Edit, Nutrisol, Reka, Rojita	9
2.	VS	Seedling: anthocyanin coloration of hypocotyls			Plántula: Pigmentación antocianina del hipocótilo		
(*)	A						
QL	(a)	absent			ausente	Eniko, Maros, Revancha	1
		present			presente	Edit, Nutrisol, Rojita	9
3.	VS	Seedling: intensity of anthocyanin pigmentation of hypocotyls			Plántula: intensidad de la pigmentación por antocianinas del hipocótilo		
	A						
QN	(a)	weak			débil	Rojita	3
		medium			media	Edit	5
		strong			fuerte	Edit, Nutrisol, Reka	7
4.	MS	Young leaf: length			Hoja joven: longitud		
(+)	A						
QN	(b)	short			corta		3
		medium			mediana		5
		long			larga		7
5.	MS	Young leaf: width			Hoja joven: ancho		
(+)	A						
QN	(b)	narrow			estrecha		3
		medium			mediana		5
		broad			ancha		7

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
6.	VS	Young leaf:					
(+)	A	prominence of veins			Hoja joven:		
					prominencia de nervaduras		
QN	(b)	weak			débil	Rojita	3
		medium			media		5
		strong			fuerte	Nutrisol, Revancha	7
7.	VS	Young leaf: main					
(+)	A	color on the upper side			Hoja joven: color principal del haz		
PQ	(b)	light green			verde claro	Reka, Revancha	1
		medium green			verde medio	Rojita	2
		dark green			verde oscuro		3
		pink			rosa		4
		red			rojo		5
		purple			purpura		6
8.	VS	Young leaf :					
(+)	A	distribution of pigmentation of color at beginning of growth on the upper side			Hoja joven: Distribución de la pigmentación al inicio del crecimiento en el haz		
PQ	(b)	colored basal area			área basal pigmentada	Rojita	1
		central blotch			mancha central	Edit	2
		one “V” shaped stripe			una franja en forma de “V”		3
		2 “V” shaped stripes			dos franjas en forma de “V”		4
		colored on margin and veins			margen y venas pigmentadas		5
		in strip			en franja		6

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
9.	VS A	Young leaf: color on the lower side			Hoja joven: color en el envés		
(+)							
PQ	(b)	green			verde	Reka	1
		red			rojo		2
		purple			púrpura		3
10.	VS A	Leaf: type of the margin			Hoja: tipo del margen		
(+)							
PQ	(c)	entire			entero	Edit, Maros, Reka, Rojita, Roza	1
		crenate			crenado		2
		undulate			ondulado	Revancha	3
11.	VS A	Leaf: shape			Hoja: forma		
(+)							
PQ	(c)	lanceolate			lanceolada	Reka, Revancha, Roza	1
		elliptic			elíptica	Edit, Eniko, Maros	2
		ovate			aovada		3
12.	VG A	Plant: time of beginning of emergence of inflorescence			Planta: época de aparición de inflorescencia		
QN	(d)	early			precoz	Edit	3
		medium			media	Maros, Reka, Roza	5
		late			tardía	Nutrisol	7
13.	VS A	Root: color at emergence of inflorescence			Raíz: color		
(+)							
PQ	(d)	white			blanca		1
		red			roja	Edit, Reka	2

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
14.	VG A	Inflorescence: time of flowering			Inflorescencia: época de floración		
(+)							
QN	(e)	early			precoz	Edit	3
		medium			media	Maros, Reka, Roza	5
		late			tardía	Nutrisol	7
15.	VS A	Stem: color (at anthesis)			Tallo: color (en antesis)		
PQ	(e)	green			verde	Edit, Eniko, Maros, Reka Revancha	1
		orange			anaranjado		2
		pink			rosa	Roza	3
		red			rojo	Nutrisol	4
		purple			púrpura		5
16.	VS A	Stem: striped			Tallo: estriado		
PQ	(e)	green as main color and red stripe			color verde principal y estrías en rojo		1
		green as main color and purple stripe			color verde principal y estrías en púrpura		2
17.	VS A	Leaf blade: main color			Lamina de la hoja: color principal		
PQ	(e)	light green			verde claro	Maros, Revancha	1
		medium green			verde medio	Rojita, Roza	2
		dark green			verde oscuro	Edit	3
		orange			anaranjado		4
		red			rojo		5
18.	VS A	Petiole: anthocyanin coloration			Pecíolo: coloración antocianica		
QL	(e)	absent			ausente	Edit, Maros, Revancha, Rojita	1
		present			presente	Nutrisol, Reka, Roza	9

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
19.	VS A	Petiole: intensity of coloration			Pecíolo: intensidad de la coloración		
QN	(e)	very weak			muy débil		1
		weak			débil		3
		medium			media	Reka	5
		strong			fuerte	Roza	7
		very strong			muy fuerte	Nutrisol	9
20.	VS A	Leaf blade: presence of blotch			Lámina de la hoja: presencia de mancha		
QL	(e)	absent			ausente	Eniko, Maros, Reka, Revancha, Roza	1
		present			presente	Edit	9
21.	VS A	Leaf blade: size of blotch in relation to the blade			Lamina de la hoja: tamaño de la mancha con relación al limbo		
QN	(e)	small			pequeña		3
		medium			mediana	Edit	5
		large			grande		7
22.	VS A	Leaf blade: color of blotch			Lamina de la hoja: color de la mancha		
PQ	(e)	yellow			amarillo		1
		green			verde		2
		silvery			plateada		3
		red			roja	Edit	4
		purple			púrpura		5
23.	VS (* A	Leaf blade: shape distribution of blotch			Lamina de la hoja: forma de la distribución de la mancha		
QL	(e)	ovoid			ovalada	Edit	1
		“V” shaped			en forma de “V”		2

	English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
24.	VS	Inflorescence: color		Inflorescencia: color		
(*)	A					
PQ	(e)	yellow		amarillo		1
		yellowish green		amarillento verdoso		2
		yellowish brown		pardo amarillento		3
		green		verde	Eniko, Maros, Revancha	4
		pink		rosado	Roza	5
		red		rojo	Edit, Rojita,	6
		purple		púrpura	Nutrisol, Reka	7
		brown		pardo		8
25.	VS	Inflorescence: density		Inflorescencia: densidad		
(+)	A					
QN	(e)	sparse		laxa		3
		medium		media	Nutrisol, Reka, Rojita	5
		dense		densa	Edit, Eniko, Maros, Reka, Rojita Roza	7
26.	VS	Inflorescence: shape		Inflorescencia: forma		
(+)	A					
QN	(e)	compact		compacta		
		intermediate		semiabierta		
		open		abierta		
27.	VS	Inflorescence: type		Inflorescencia: tipo		
(*)	A					
(+)						
QL	(e)	amaranth form		amarantiforme	Nutrisol	1
		glomerule form		glomerulada	Reka, Revancha, Roza	2

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
28.	MS A	Inflorescence: number of female flowers per glomerule			Inflorescencia: número de flores femeninas por glomérulo		
QN	(e)	few			pocas		3
		medium			medias		5
		many			muchas	Reka	7
29. (* (+)	MS A	Inflorescence: size of bract relative to utricle			Inflorescencia: tamaño de las brácteas con relación al utrículo		
QN	(e)	smaller			más pequeñas	Reka,	1
		equal			igual	Revancha	2
		larger			más grandes	Edit, Nutrisol	3
30. (*	VG A	Inflorescence: growth type			Inflorescencia: tipo de crecimiento		
QL	(e)	determinate			determinado	Eniko, Maros, Revancha	1
		indeterminate			indeterminado	Nutrisol	2
31. (+)	VS A	Inflorescence: attitude			Inflorescencia: actitud		
QN	(e)	upright or very weakly recurved					1
		weakly recurved					3
		moderately recurved					5
		strogly recurved					7
		very strongly recurved					9
32.	VS A	Inflorescence: length			Inflorescencia: longitud		
QN	(e)	short			corta	Edit	3
		medium			media	Maros, Revancha, Roza	5
		long			larga	Nutrisol	7

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
33.	MS A	Plant: time of maturity			Planta: época de madurez		
(+)							
QN	(f)	early			precoz	Edit	3
		medium			media	Maros, Media, Revancha, Roza	5
		late			tardía		7
34.	MS A	Plant: height (at maturity)			Planta: altura (en madurez)		
(+)							
QN	(f)	short			baja	Edit	3
		medium			media	Maros, Reka, Revancha, Roza	5
		tall			alta	Nutrisol	7
35.	VS A	Stem: anthocyanin coloration of base (at maturity)			Tallo: coloración antocianica de la base (en madurez)		
(*)							
QL	(f)	absent			ausente		1
		present			presente	Nutrisol, Roza	2
36.	VS A	Stem: undulation of margin (at maturity)			Tallo: ondulación del margen (en madurez)		
(*)							
(+)							
QL	(f)	flat entire			entero	Reka	1
		undulate			ondulado	Edit, Maros, Revancha, Roza	2
37.	VG C	Seed: color			Semilla: color		
(*)							
PQ	(g)	white			blanca	Edit, Maros, Revancha, Roza	1
		yellow			amarilla		2
		brown			café		3
		pink			rosa	Reka	4
		black			negro		5

	English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
38. (*) (+)	VG C	Seed: shape		Semilla: forma		
PQ	(g)	spheroid		esferoide		1
		ellipsoid		elipsoidal	Nutrisol, Revancha	2
		discoid (flattened)		discoide (aplanada tipo lenteja)	Rojita	3
39. (*)	VS C	Seed type		Semilla: tipo		
QL	(g)	crystalline		cristalino	Nutrisol, Rojita	1
		floury		harinoso	Edit, Revancha	2
40. (+)	MS C	Seed: weight per 1000 grains at 10 % moisture		Semilla: peso de 1000 semillas al 10 % de humedad		
QN	(g)	low		bajo		3
		medium		medio		5
		high		alto		7
41. (+)	MG C	Seed: pop percent (relative increase of volume)		Semilla: porcentaje de rosetas (aumento relativo de volumen)		
QN	(g)	low		bajo		3
		medium		medio		5
		high		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 on seedling, should be made 3-6 days after to emerge
- (b) Observations on seedling, should be made 6-8 leaf
- (c) Observations at vegetative stage just before inflorescence emergence
- (d) Observations at beginning of inflorescence emergence
- (e) Observations on full flowering: (50% of the plants)
- (f) Observations on physiological maturity
- (g) Observations on harvest dry seeds time

8.2 Explanations for individual characteristics

Ad. 4: Young leaf: length

Ad. 5: Young leaf: width

To be assessed on sixth leaf

Ad. 6: Young leaf: prominence of veins

Ad. 7: Young leaf: main color on the upper side

Ad. 8: Young leaf: distribution of pigmentation of color at beginning of growth on the upper side

Ad.9: Young leaf: color on the lowerside

To be assessed at 6-8 leaf stage

Ad. 8: Young leaf: distribution of pigmentation of color at beginning of growth on the upper side



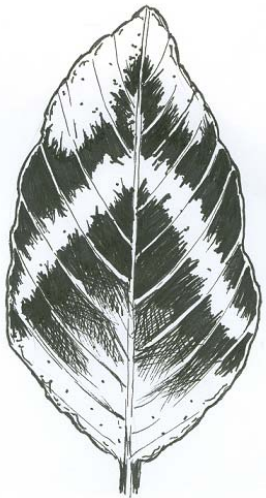
1
colored basal area



2
central blotch



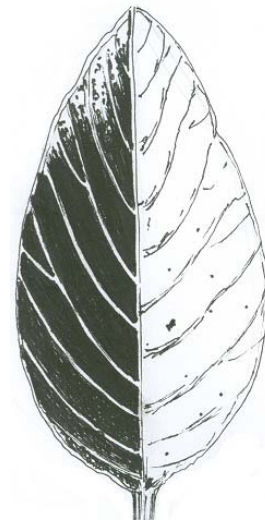
3
one "V" shaped stripe



4
2 "V" shaped stripes



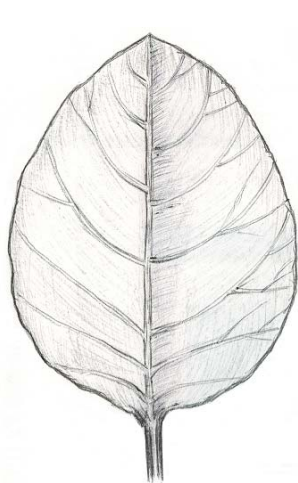
5
colored on margin and veins



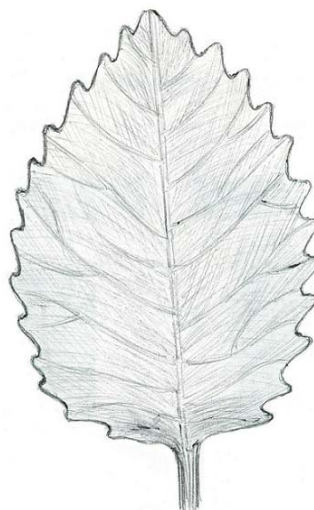
6
in strip

Ad. 10: Leaf: type of margin

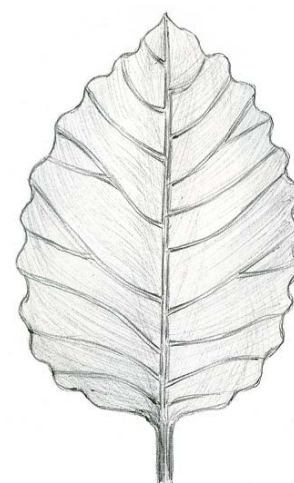
To be assessed on last completely developed leaf, before inflorescence appears



1
entire



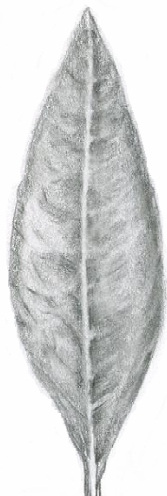
2
crenate



3
undulate

Ad. 11: Leaf: shape

To be assessed on last completely developed leaf, before inflorescence appears



1
lanceolate



2
elliptic



3
ovate

Ad. 13: Root: color

The root should be extracted for the observations of color on root.

Ad. 14: Inflorescence: time of flowering

To be observed be made at full flowering (50 % of the plants).

Ad. 25: Inflorescence: density

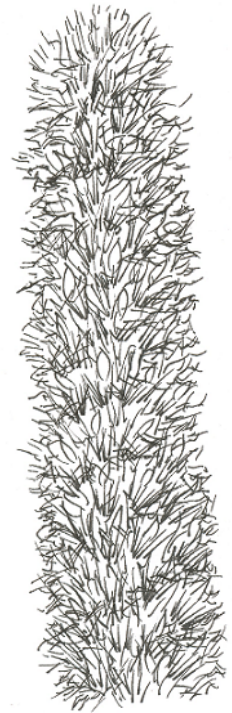
The density of the inflorescence relates to the number and position of the glomerules. Observed in the main inflorescence



3
sparse



5
medium



7
dense

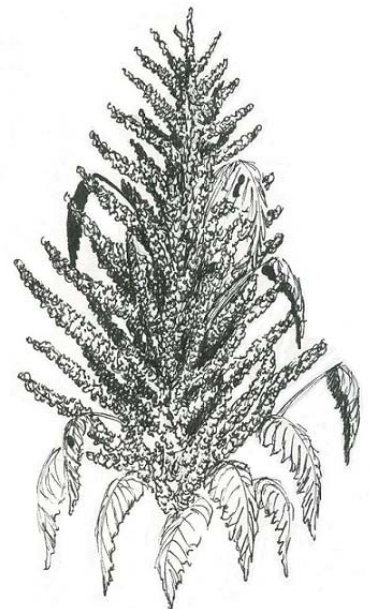
Ad. 26: Inflorescence: shape



3
compact

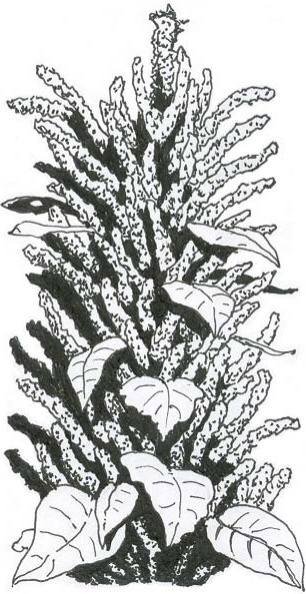


5
intermediate



7
open

Ad. 27: Inflorescence: type



1
amaranth form

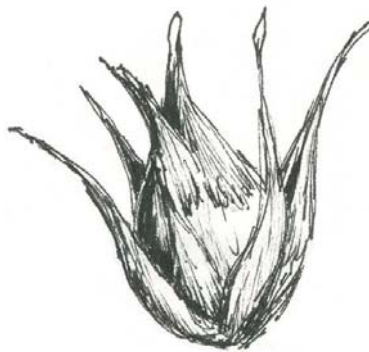


2
glomerule form

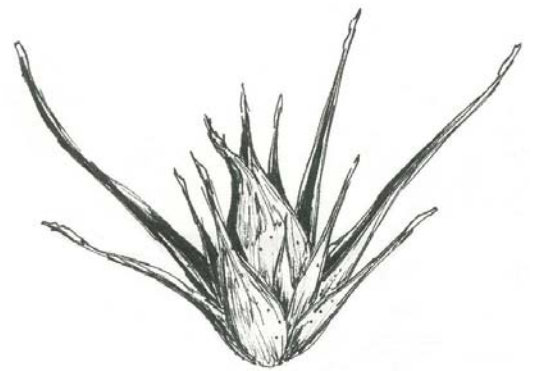
Ad. 29: Inflorescence: size of bract relative to utricle



small
1



equal
2



large
3

Ad. 31: Inflorescence: attitude



1
upright or very weakly recurved



3
weakly recurved



5
moderately recurved



7
strongly recurved



9
very strongly recurved

Ad. 33: Plant: time of maturity

Physiological maturity is reached when smashing of seeds is no longer possible by pressing them using the fingers. Seeds 20 should be taken from the mid part of the main inflorescence, after completely anthesis in 95 %.

The change of inflorescence coloration is the most widely used criterion to determine physiological maturity. In green inflorescences coloration turns into a golden one, whereas red inflorescences turn into a brown-reddish color. In this phase, if inflorescences are shaken, mature seeds fall down.

Ad. 34: Plant: height (at maturity).

From the base of the plant to the tip of the inflorescence.

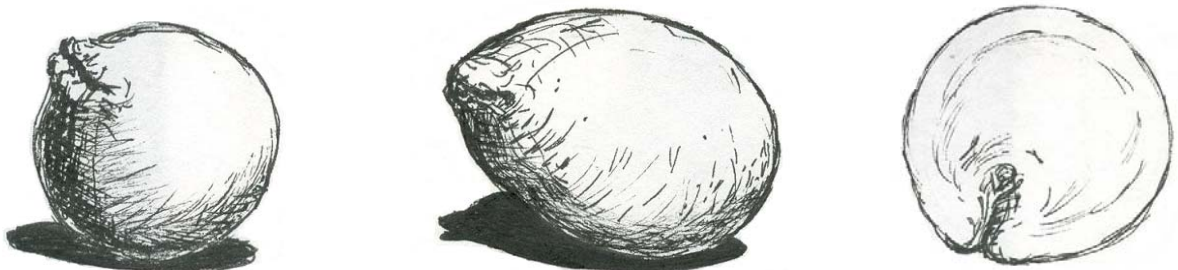
Ad. 36: Stem: undulation of margin (at maturity)



1
flat entire

2
undulate

Ad. 38: Seed: shape



1
spheroid

2
ellipsoid

3
discoid (flattened)

Ad. 40: Seed weight per 1000 grains (10 % moisture)

The seed weight should be measured on eight samples of 100 seeds, at moisture of 10%.

In order to score this trait, first the Moisture Content is determined through the one-step method of oven drying.

A 2-gram seed sample is taken with two replications. The formula is the following one:

$$\text{MC} = \frac{\text{P2} - \text{P3}}{\text{P2} - \text{P1}} \quad \text{X 100 (wet weight basis)} \longrightarrow \quad \text{IMC}$$

Where:

MC = Moisture content

P1 = Weight in grams of the container and lid

P2 = Weight in grams of the container, lid and seeds

P3 = Weight in grams of the container, lid and seeds after dried in the oven

Later, one-thousand seeds from each replication are counted and weighted using a precision scale (W1000 S).

Afterwards, based on the obtained results, an adjustment is made to obtain PMS at 10 % of moisture (FMC).

This adjustment is obtained using the formula:

$$\text{FW}_{10\% \text{ of moisture}} = \text{W 1000S} \frac{(100 - \text{IMC})}{(100 - \text{FMC})}$$

Where:

FW = Final weight at the desired (10 %) moisture level

W1000S = Weight one-thousand seeds

IMC = Initial moisture

FMC = Final or desired (10 %) moisture content

Ad. 41: Seed: pop percent (relative increase of volume).

The moisture content (it must be between 14 and 16%); if it is necessary, should be soaked.

To accomplish popping of the seed, the use of a Hot Air Flow Popper, working at a temperature of 220°C, is recommended. For the scoring of this trait the seed moisture content should be determined before popping, since the Popping Expansion Volume (PEV) is directly related to the Moisture Content (MC) and genotype.

On the other hand, if optimization of the seed moisture content is desired (16%), water should be added to the seed, since at harvest seed typically is a moisture content between 10 and 12%. While performing this test the absorption time of moisture by the seed should be taken into account because it is associated to the chemical composition of starch, to the size and shape of amylose/amylopectin.

$$IW (100 - IMC) = FW (100 - FMC) \longrightarrow FW (100 - IMC) = X (100 - FMC)$$

$$X = IW \frac{(100 - IMC)}{(100 - FMC)}$$

$$\mathbf{Weight}_{(\text{add water})} = \mathbf{X} - \mathbf{IW}$$

Where:

IW: Initial weight
FW: Final weight at the desired moisture content
IMC: Initial moisture content
FMC: Final or desired moisture content

9. Literature

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Mexican Experts in *Amaranth*: Carballo, Aquiles. E-mail: carballo@colpos.mx, Coordinator. Ramírez Ma. Elena, Colegio de Postgraduados (CP). Bernal, Roberto. Instituto Tecnológico Agropecuario (ITA) 29. Espitia, Eduardo. INIFAP.

The figures have been prepared by “Jesús Javier Pastrana C”. High school student.

Descriptors used by OMNI-Hungary (provided by COBORU)

10. Technical Questionnaire

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:
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	Application date: (not to be filled in by the applicant)
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TECHNICAL QUESTIONNAIRE
to be completed in connection with an application for plant breeders' rights

1. Subject of the Technical Questionnaire

1.1 Botanical Name

1.2 Common Name

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:
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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 []

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 Cotyledon: anthocyanin coloration (1)		
absent	Eniko, Maros, Revancha	1 []
present	Edit, Nutrisol, Reka, Rojita	9 []
5.2 Seedling: anthocyanin coloration of hypocotyls (2)		
absent		1 []
present	Edit, Nutrisol, Rojita	9 []
5.3 Petiole: anthocyanin coloration (18)		
absent	Edit, Maros, Revancha, Rojita	1 []
present	Nutrisol, Reka, Roza	9 []

TECHNICAL QUESTIONNAIRE		Page {x} of {y}	Reference Number:
	Characteristics	Example Varieties	Note
5.4	Leaf blade: presence of blotch		
(20)			
	absent	Eniko, Maros, Reka, Revancha, Roza	1 []
	present	Edit	9 []
5.5	Leaf blade: shape distribution of blotch		
(23)			
	ovoid	Edit	1 []
	“V”shaped		2 []
5.6	Inflorescence: color		
(24)			
	yellow		1 []
	yellowish green		2 []
	yellowish brown		3 []
	green	Eniko, Maros, Revancha	4 []
	pink	Roza	5 []
	red	Edit, Rojita	6 []
	purple	Nutrisol, Reka	7 []
	brown		8 []
5.7	Inflorescence: type		
(27)			
	amaranth form	Nutrisol	1 []
	glomerule form	Reka, Revancha, Roza	2 []
5.8	Inflorescence: size of bract relative to utricle		
(29)			
	smaller	Reka	1 []
	equal	Revancha	2 []
	larger	Edit, Nutrisol	3 []

TECHNICAL QUESTIONNAIRE		Page {x} of {y}	Reference Number:
	Characteristics	Example Varieties	Note
5.9	Inflorescence: growth type		
(30)			
	determinate	Eniko, Maros, Revancha	1 []
	indeterminate	Nutrisol	2 []
5.10	Stem: anthocyanin coloration of base (at maturity)		
(35)			
	absent		1 []
	present	Nutrisol, Revancha, Roza	2 []
5.11	Stem: undulation of margin (at maturity)		
(36)			
	flat entire	Reka	1 []
	undulate	Edit, Maros, Revancha, Roza	2 []
5.12	Seed: color		
(37)			
	white	Edit, Maros, Revancha, Roza	1 []
	yellow		2 []
	brown		3 []
	pink	Reka	4 []
	black		5 []
5.13	Seed: shape		
(38)			
	spheroid		1 []
	ellipsoid	Nutrisol, Revancha	2 []
	discoid (flattened)	Rojita	3 []
5.14	Seed: type		
(39)			
	crystalline	Nutrisol, Rojita	1 []
	floury	Edit, Revancha	2 []

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 your candidate variety
<i>Example</i>		<i>(example to be inserted) (example to be inserted)</i>	
Comments:			

#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

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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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.

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]