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INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS

Geneva

DRAFT

SORGHUM

UPOV Code: SRGHM

Sorghum ssp.

GUIDELINES

FOR THE CONDUCT OF TESTS

FOR DISTINCTNESS, UNIFORMITY AND STABILITY

prepared by experts from Spain

to be considered by the

Technical Working Party for Agricultural Crops
at its forty-second session, to be held in Kyiv, Ukraine, from June 17 to 21 2013

Alternative Names:*

Botanical name	*English*	*French*	*German*	*Spanish*
Sorghum bicolor, Sorghum sudanense S. bicolor x S. sudanense	Sorghum, Sudan Grass	Sorgho, Sorgho du Soudan	Mohrenhirse, Sudangrass	Sorgo, Pasto de Sudán

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 *Sorghum bicolor*, *Sorghum sudanense* and hybrid *Sorghum bicolor* x *Sorghum sudanense*.

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:

0.2 kg for parentals
1 kg for hybrids and open-pollinated varieties.

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.

2.4 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 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 The optimum stage of development for the assessment of each characteristic is indicated by a number in the second column of the Table of Characteristics. The stages of development denoted by each number are described in Chapter 8.3.

3.4 Test Design

3.4.1 Each test should be designed to result in a total of at least 40 plants in the case of inbred lines and single hybrids and 60 plants in the case of other hybrids and open-pollinated varieties. Each test should be divided between at least 2 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.

To assess distinctness of hybrids, a pre-screening system on the basis of the parental lines and the formula may be established according to the following recommendations:

(i) description of parental lines according to the Test Guidelines;

(ii) check of the originality of the parental lines in comparison with the reference collection, based on the characteristics in Section 7 in order to screen the closest inbred lines;

(iii) check of the originality of the hybrid formula in comparison with those of the hybrids in common knowledge, taking into account the closest inbred lines;

(iv) assessment of the distinctness at the hybrid level of varieties with a similar formula.

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 Inbred lines and single hybrids: All observations on single plants (MS) should be made on 10 plants or parts taken from each of 10 plants and all other observations made on all plants in the test.

4.1.4.2 Other types of hybrids: All observations on single plants (MS) should be made on 20 plants or parts taken from each of 20 plants and all other observations made on all plants in the test.

4.1.4.3 Open-pollinated varieties: All observations on single plants (MS) should be made on 40 plants or parts taken from each of 40 plants and all other observations made on all plants in the test.

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 For the assessment of uniformity of inbred lines and single hybrids, a population standard of 3% and an acceptance probability of at least 95% should be applied. In the case of a sample size of 40 plants, 3 off-types are allowed. In addition, the same population standard and acceptance probability should apply to clear cases of out-crossed plants in inbred lines as well as plants obviously resulting from the selfing of a parent line in single-cross hybrids.

4.2.3 For three-way cross hybrids, double cross hybrids and open-pollinated varieties, the variability within the variety should not exceed the variability of comparable varieties already known.

4.2.4 The assessment of uniformity for open-pollinated varieties should be according to the recommendations for cross-pollinated 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 of inbred lines or open-pollinated varieties may be tested, either by growing a further generation, or by testing a new seed stock to ensure that it exhibits the same characteristics as those shown by the previous material supplied.

4.3.3 Where appropriate, or in cases of doubt, the stability of a hybrid variety may, in addition to an examination of the hybrid variety itself, also be assessed by examination of the uniformity and stability of its parent lines.

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) Plant: time of panicle emergence (characteristic 6)
(b) Plant: total height (characteristic 18)
(c) Panicle: shape (characteristic 26)
(d) Caryopsis: color after threshing (characteristic 29)

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)-(d) See Explanations on the Table of Characteristics in Chapter 8.1
(+) See Explanations on the Table of Characteristics in Chapter 8.2
14-93 See Explanations on the Table of Characteristics in Chapter 8.3 (Decimal Code for the Growth Stages)

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

		English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
1.	**14 VG**	**Seedling: anthocyanin coloration of coleoptile**	**Plantule : pigmentation anthocyanique du coléoptile**	**Keimpflanze: Anthocyanfärbung der Keimscheide**	**Plántula: pigmentación antocianica del coleóptilo**		
QN		absent or very weak	nulle ou très faible	fehlend oder sehr gering	ausente o muy débil	Aralba, Argence	1
		weak	faible	gering	débil	Aneto, PR85G85	3
		medium	moyenne	mittel	media	Cellu, Dorado E	5
		strong	forte	stark	fuerte	Piper	7
		very strong	très forte	sehr stark	muy fuerte		9
2.	**15 VG**	**Leaf: anthocyanin coloration of blade**	**Feuille: pigmentation anthocyanique du limbe**	**Blatt: Anthocyanfärbung der Blattspreite**	**Hoja: coloración antocianica del limbo**		
QN	**(a)**	absent or very weak	nulle ou très faible	fehlend oder sehr gering	ausente o muy débil	Albita, Double TX	1
		weak	faible	gering	débil	Alpilles, Solarius	3
		medium	moyenne	mittel	media		5
		strong	forte	stark	fuerte		7
		very strong	très forte	sehr stark	muy fuerte		9
3.	**45-60 VG**	**Foliage: intensity of green color**	**Feuillage: intensité de la couleur verte**	**Laub: Grünfärbung der Blattspreite**	**Follaje: intensidad del color verde**		
QN		light	clair	hell	claro	Nectar	3
		medium	moyenne	mittel	medio	Grazer, P8500	5
		dark	foncé	dunkel	oscuro	GK ZSófia	7
4. **(*)** **(+)**	**45-60 VG**	**Leaf: color of midrib**	**Feuille: couleur de la nervure principale**	**Blatt: Farbe der Mittelrippe**	**Hoja: color de la nerviadura principal**		
PQ	**(b)**	white	blanc	weiss	blanco	Dorado E, Gardavan	1
		yellowish white	blanc jaunâtre	gelblich weiβ	blanco amarillento	Beefbuilder, Vidan 697	2
		light yellow	jaune clair	hellgelb	amarillo claro	PR82G55, PR87G57	3
		medium yellow	jaune moyenne	mittelgelb	amarillo medio	P8500	4
		dark yellow	jaune foncé	dunkelgelb	amarillo oscuro	Digestivo	5
		brownish	brunâtre	bräunlich	amarronado	Teide	6
5. **(+)**	**45-60 VG**	**Leaf: area of discoloration of midrib**	**Feuille: surface de la décoloration de la nervure principale**	**Blatt: Bereich der Verfärbung der Mittelrippe**	**Hoja: area de la decoloración de la nerviadura principal**		
QN	**(b)**	absent or very small	absente ou très petite	fehlend oder sehr klein	ausente o muy pequeña	Balto	1
		small	petite	klein	pequeña		3
		medium	moyenne	mittel	media	Super Sile 20	5
		large	grande	groβ	grande	Primsilo	7
		very large	très grande	sehr groβ	muy grande		9

		English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
6. (*) (+)	**50 MG/ MS**	**Plant: time of panicle emergence**	**Plante : époque d´apparition des panicules**	**Pflanze: Zeitpunkt des Rispenschiebens**	**Planta: época de aparición de las panículas**		
QN		very early	très précoce	sehr früh	muy precoz	Ludan	1
		early	précoce	früh	precoz	Artaban, Artigas	3
		medium	moyenne	mittel	medio	Albita, Dorado DR	5
		late	tardive	spät	tardía	Béreny, PR82G55	7
		very late	très tardive	sehr spät	muy tardía		9
7.	**65-69 VG**	**Glume: color at end flowering**	**Glume : couleur à la fin de la floraison**	**Hüllspelze: Farbe zum Ende der Blüte**	**Gluma: color al final de la floración**		
PQ	**(c)**	medium green	verte moyen	mittelgrün	verde medio		1
		light green	vert clair	hellgrün	verde claro		2
		yellow green	vert jaune	gelbrün	amarillo verdoso		3
		green yellow	jaune vert	grüngelb	verde amarillento	Grazer, PR82G55	4
		light yellow	Jaune clair	hellgelb	amarillo claro	Nutri Honey	5
		medium yellow	jaune moyen	mittelgelb	amarillo medio		6
8.	**65-69 VG**	**Glume: anthocyanin coloration**	**Glume : pigmentation anthocyanique**	**Hüllspelze: Anthocyanfärbung**	**Gluma: pigmentación antociánica**		
QN	**(c)**	absent or very weak	nulle ou très faible	fehlend oder sehr gering	ausente o muy débil	Dorado E, Grazer	1
		weak	faible	gering	débil	Nicol	3
		medium	moyenne	mittel	media		5
		strong	forte	stark	fuerte		7
		very strong	très forte	sehr stark	muy fuerte		9
9.	**65-69 VG**	**Stigma: anthocyanin coloration**	**Stigmate : pigmentation anthocyanique**	**Narbe: Anthocyanfärbung**	**Estigma: pigmentación antocianica**		
QN	**(c)**	absent or very weak	nulle ou très faible	fehlend oder sehr gering	ausente o muy débil	Grazer, P8500	1
		weak	faible	gering	débil		3
		medium	moyenne	mittel	media		5
		strong	forte	stark	fuerte		7
		very strong	très forte	sehr stark	muy fuerte		9
10. (*) (+)	**65-69 VG**	**Stigma: color**	**Stigmate: couleur**	**Narbe: Farbe**	**Estigma: color**		
PQ	**(c)**	whitish	blanchâtre	weiβlich	blancuzco	P8500	1
		light yellow	jaune clair	hellgelb	amarillo claro	Beefbuilder	2
		medium yellow	jaune moyen	mittelgelb	amarillo medio	Argence, Dorado E	3
		dark yellow	jaune foncé	dunkelgelb	amarillo oscuro	Digestivo, Nutri Honey	4
		grey	gris	grau	gris	Nectar, Vidan 697	5

		English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
11.	**65-69 VG**	**Stigma: length**	**Stigmate : longueur**	**Narbe: Länge**	**Estigma: longitud**		
QN	**(c)**	very short	très court	sehr kurz	muy corto		1
		short	court	kurz	corto	Aneto, PR83G66	3
		medium	moyen	mittel	medio	Dorado E, Nutri Honey	5
		long	long	lang	largo	Arfrio, PR82G55	7
		very long	très long	sehr lang	muy largo		9
12. **(+)**	**65-69 VG**	**Flower with pedicel: length of flower**	**Fleur pédicellée : longueur de la fleur**	**Gestielte Blüte: Länge der Blüte**	**Flor pedicelada: longitud de la flor**		
QN	**(c)**	very short	très court	sehr kurz	muy corto		1
		short	court	kurz	corto	Nicol, PR82G55	3
		medium	moyen	mittel	medio	Aneto, Gardavan	5
		long	long	lang	largo	SF2003	7
		very long	très long	sehr lang	muy largo		9
13. **(+)**	**65-69 VG**	**Flower: self-fertility**	**Fleur : autofertilité**	**Blüte: Selbstfertilität**	**Flor: Autofertilidad**		
PQ		none	aucune	keine	ninguna		1
		partial	partielle	teilweise	parcial		2
		complete	complète	vollständig	completa	Aneto, P8500	3
14.	**65-69 VG**	**Panicle: density at <u>end of flowering</u>**	**Panicule : compacité á la <u>fin de la floraison</u>**	**Rispe: Dichte zum Ende der Blüte**	**Panícula: densidad al final de la floración**		
QN	**(c)**	very sparse	très lâche	sehr locker	muy laxa		1
		sparse	lâche	locker	laxa	Digestivo, Gardavan	3
		medium	moyenne	mittel	media	Argence, Nutri Honey	5
		dense	compacte	dicht	densa	PR82G65, PR85G85	7
		very dense	très compacte	sehr dicht	muy densa	Velox 701	9
15. **(*)** **(+)**	**69-75 VG**	**Lemma: arista formation**	**Glumelle : aristation**	**Deckspelze: Grannenbildung**	**Gluma: aristado**		
QN	**(c)**	absent or very weak	nulle ou très faible	fehlend oder sehr gering	ausente o muy débil	Dorado E, Grazer	1
		weak	faible	gering	débil	Lussi	3
		medium	moyenne	mittel	media	Digestivo, SF 2003	5
		strong	forte	stark	fuerte	Vidan 697	7
		very strong	très forte	sehr stark	muy fuerte	Digestivo	9

		English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
16. (*)	**70-75 VG**	**Dry stamen: color**	**Etamine sèche : couleur**	**Trockenes Staubgefäß: Farbe**	**Estambre seco: color**		
PQ	**(c)**	light yellow	jaune clair	hellgelb	amarillo claro		1
		pink grey	gris rosé	rosagrau	rosa grisáceo		2
		orange	orange	orange	naranja	Dorado DR, Gardavan	3
		orange red	rouge orange	orangerot	rojo anaranjado	Elite, PR82G55	4
		red	rouge	rot	rojo		5
		red brown	brun rouge	rotbraun	marrón rojizo		6
17.	**70-75 MS**	**Plant: number of tillers (forage varieties only)**	**Plante: nombre de tiges (variétés fourragères seulement)**	**Rispe: Anzahl der Bestockungstriebe (nur Mohrenhirse Futter)**	**Planta: número de tallos (solo para variedades forrajeras)**		
QN		absent or very few	null ou très faible	abwesend oder wenige	ausente o muy pocos	PR83G66, Velox 701	1
		few	faible	wenige	pocos	Gardavan, PR82G10	3
		medium	moyen	mittel	medio	Nutri Honey	5
		many	important	sehr viele	muchos	NS-Dzïn, Zöldike	7
18. (*)	**75-85 MS**	**Plant: total height**	**Plante : hauteur totale**	**Pflanze: Gesamthöhe**	**Planta: altura total**		
QN		extremely short	extrêmement courte	sehr gering	extremadamente baja	Sibelus	1
		extremely short – very short	extrêmement courte - courte	kurz	extremadamente baja - muy baja	Aruski	2
		very short	très courte	sehr kurz	muy baja	PR88Y20	3
		very short – short	très courte - courte	sehr kurz -kurz	muy baja-baja	Albita	4
		short	courte	kurz	baja	PR84G62	5
		strong tendency short	forte tendance à courte	starke tendenz kurz	fuerte tendencia a baja	PR82G55	6
		short – medium	courte – moyenne	kurz - mittel	baja – media	Jumak	7
		medium	moyenne	mittel	media	Topsilo	8
		medium – high	moyenne – haute	mittel - gross	media – alta	Zöldike	9
		strong tendency high	forte tendance à haute	starke tendenz gross	fuerte tendencia a alta		10
		high	haute	gross	alta	Zöldozön	11
		high – very high	haute – très haute	gross - sehr gross	alta – muy alta	Rona 1	12
		very high	très haute	sehr gross	muy alta	Agnes	13
		very high –extremely high	très haute – extrêmement haute	sehr gross- extrem gross	muy alta – extremadamente alta	Gardavan	14
		extremely high	extrêmement haute	extrem gross	extremadamente alta		15
19. (+)	**75-85 VG/ MS**	**Stem: diameter**	**Tige : diamètre**	**Stengel: Durchmesser**	**Tallo: diámetro**		
QN	**(d)**	small	petit	klein	pequeño	SF2003, Vidan 697	3
		medium	moyen	mittel	medio	Celliu, Double TX, PR88Y20	5
		large	grand	groß	grande	Elite	7

		English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
20. **(+)**	**75-85** **VG/** **MS**	**Leaf: length of blade**	**Feuille : longueur du limbe**	**Blatt: Länge der Spreite**	**Panícula: longitud del limbo**		
QN	**(b)**	very short	très court	sehr kurz	muy corta		1
		short	court	kurz	corta	Buggy	3
		medium	moyen	mittel	media	Choice, Vidan 697	5
		long	long	lang	larga		7
		very long	très long	sehr lang	muy larga		9
21. **(+)**	**75-85** **VG/** **MS**	**Leaf: width of blade**	**Feuille : largeur du limbe**	**Blatt: Breite der Spreite**	**Hoja: anchura del limbo**		
QN	**(b)**	very narrow	très étroite	sehr schmal	muy estrecha		1
		narrow	étroite	schmal	estrecha	Maya, Vidan 697	3
		medium	moyenne	mittel	media	Aneto	5
		broad	large	breit	ancha	Beefbuilder, P8500	7
		very broad	très large	sehr breit	muy ancha		9
22.	**75-85** **VG/** **MS**	**Panicle: length without neck**	**Panicule : longueur sans le col**	**Rispe: Länge ohne Hals**	**Panícula: longitud sin cuello**		
QN		very short	très courte	sehr kurz	muy corta		1
		short	courte	kurz	corta	Iggloo, Nectar	3
		medium	moyenne	mittel	media	Aneto, Dorado Dr	5
		long	longue	lang	larga	Jimggo	7
		very long	très longue	sehr lang	muy larga		9
23.	**75-85** **VG/** **MS**	**Neck of panicle: length above flag sheath**	**Col de la panicule : longueur au dessus de la feuille drapeau**	**Rispenhals: Länge oberhalb der Scheide des Fahnenblattes**	**Cuello de la panícula: longitud por encima de la hoja bandera**		
QN		absent or very short	nulle ou très courte	fehlend oder sehr kurz	ausente o muy corto		1
		short	courte	kurz	corto	Nectar, Profus	3
		medium	moyenne	mittel	medio		5
		long	longue	lang	largo	Arlys, Vidan 697	7
		very long	très longue	sehr lang	muy largo		9
24.	**75-85** **VG/** **MS**	**Panicle: length of branches**	**Panicule : longueur des ramifications**	**Rispe: Länge der verzweigungen**	**Panícula: longitud de las ramificaciones**		
QN	**(c)**	short	courte	kurz	corto	Beefbuilder, Nectar	3
		medium	moyenne	mittel	medio	Grazer, Nicol	5
		long	longue	lang	largo	Gardavan	7

		English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
25. (*)	**92-93 VG**	**Panicle: density at maturity**	**Panicule : compacité á maturité**	**Rispe: Dichte zur Reife**	**Panícula: densidad en maduración**		
QN		very sparse	très lâche	sehr locker	muy laxa	DK18, Gardavan	1
		sparse	lâche	locker	laxa	Grazer, SF2003	3
		medium	moyenne	mittel	media		5
		dense	compacte	dicht	densa	Nectar, PR85G85	7
		very dense	très compacte	sehr dicht	muy densa	Albita, Velox 701	9
26. (*) (+)	**92-93 VG**	**Panicle: shape**	**Panicule : forme**	**Rispe: Form**	**Panícula: forma**		
PQ		reversed pyramid	pyramide inversée	umgekehrte Pyramide	pirámide invertida		1
		broader upper part	évasée partie supérieure	oben breit	ensanchada parte superior	PR84G62, PR85G85	2
		broad middle part	Evasée partie demie	Mittig breit	ensanchada parte media	Nutri Honey	3
		broad lower part	panicule évasée dans la partie inférieure	unten breit	panícula ensanchada parte inferior	Beefbuilder	4
		pyramidal	pyramidale	pyramidenförmig	piramidal	Vidan 697	5
27. (*)	**92-93 VG**	**Glume: color at maturity**	**Glume : couleur á maturité**	**Hüllspelze: Farbe zur Reife**	**Gluma: color en maduración**		
PQ		white	blanc	weiss	blanco		1
		light yellow	jaune clair	hellgelb	amarillo claro	PR88Y20	2
		yellow	jaune	gelb	amarillo	Dorado E, Nectar	3
		light brown	brun clair	hellbraun	marrón claro	Grazer	4
		reddish brown	brun rougeâtre	rötlichbraun	marrón rojizo	Argence, P8500	5
		dark brown	brun foncé	dunkelbraun	marrón oscuro	PR82G55, Velox 701	6
		black	noire	schwarz	negro	Digestivo, Vidan 697	7
28. (+)	**92-93 VG**	**Glume: length**	**Glume : longueur**	**Hüllspelze: Länge**	**Gluma: longitud**		
QN		very short	très courte	sehr kurz	muy corto		1
		short	courte	kurz	corto	PR83G66; PR87G57	3
		medium	moyenne	mittel	medio	Aralba, PR85G85	5
		long	longue	lang	largo	Digestivo, Nutri Honey	7
		very long	très longue	sehr lang	muy largo		9

		English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
29. (*)	**92-93 VG**	**Caryopsis: color after threshing**	**Caryopse : couleur après battage**	**Karyopse: Farbe nach dem Dreschen**	**Cariópside: color después de la recogida**		
PQ		white	blanc	weiss	blanco	Choice	1
		grey white	blanc gris	grauweiss	blanco grisáceo	PR88G20	2
		yellowish white	blanc jaunâtre	gelblichweiss	blanco amarillento	Aralba, PR88Y20	3
		straw yellow	jaune paille	strohgelb	amarillo pálido	Beefbuilder, Gardavan	4
		orange	orange	orange	naranja	Argence, PR85G85	5
		orange red	rouge orangé	orangerot	rojo anaranjado	PR82G55, PR83G66	6
		ligth brown	brun clair	hellbraun	marrón claro	Velox 701	7
		red brown	brun rouge	rotbraun	marrón rojizo	Nutri Honey, PR82G10	8
		dark brown	brun foncé	dunkelbraun	marrón oscuro	Nicol, Vidan 697	9
30. (*)	**92-93 MG**	**Weight of 1000 grains**	**Poids de mille grains**	**Tausendkorngewicht**	**Peso de 1000 granos**		
QN		very low	très petit	sehr gering	muy pequeño	Velox 701	1
		low	petit	gering	pequeño	Nicol, PR87G57	3
		medium	moyen	mittel	medio	Nutri Honey	5
		high	grand	groß	grande	Aralba, PR88Y20	7
		very high	très grand	sehr groß	muy grande		9
31. (+)	**92-93 VG**	**Grain: shape in dorsal view**	**Grain : forme de la face dorsale**	**Korn: Form in der Rückansicht**	**Grano: forma de la cara dorsal**		
PQ		narrow elliptic	elliptique étroite	schmal elliptisch	elíptica estrecha	Vidan 697, Aneto	1
		broad elliptic	elliptique large	breit elliptisch	elíptica ancha	Nectar, Nutri Honey	3
		circular	circulaire	rund	circular	Aralba, Beefbuider	5
32. (+)	**92-93 VG**	**Grain: size of mark of germ**	**Grain : taille de l´empreinte du germe**	**Korn: Größe des Keimbereichs**	**Grano: tamaño de la marca del germen**		
QN		very small	très petite	sehr klein	muy pequeña		1
		small	petite	klein	pequeña	Digestivo, Grazer	3
		medium	moyenne	mittel	media	PR84G62, PR83G66	5
		large	grande	groß	grande	Dorado E, PR85G85	7
		very large	très grande	sehr groß	muy grande		9
33. (+)	**92-93**	**Grain: content of tannin**	**Grain : teneur en tannin**	**Korn: Tanningehalt**	**Grano: contenido en tanino**		
QN		absent	absente	fehlend	ausente	Albita, PR85G85	1
		present	présent	präsentieren	presente	Gardavan, Nectar	9

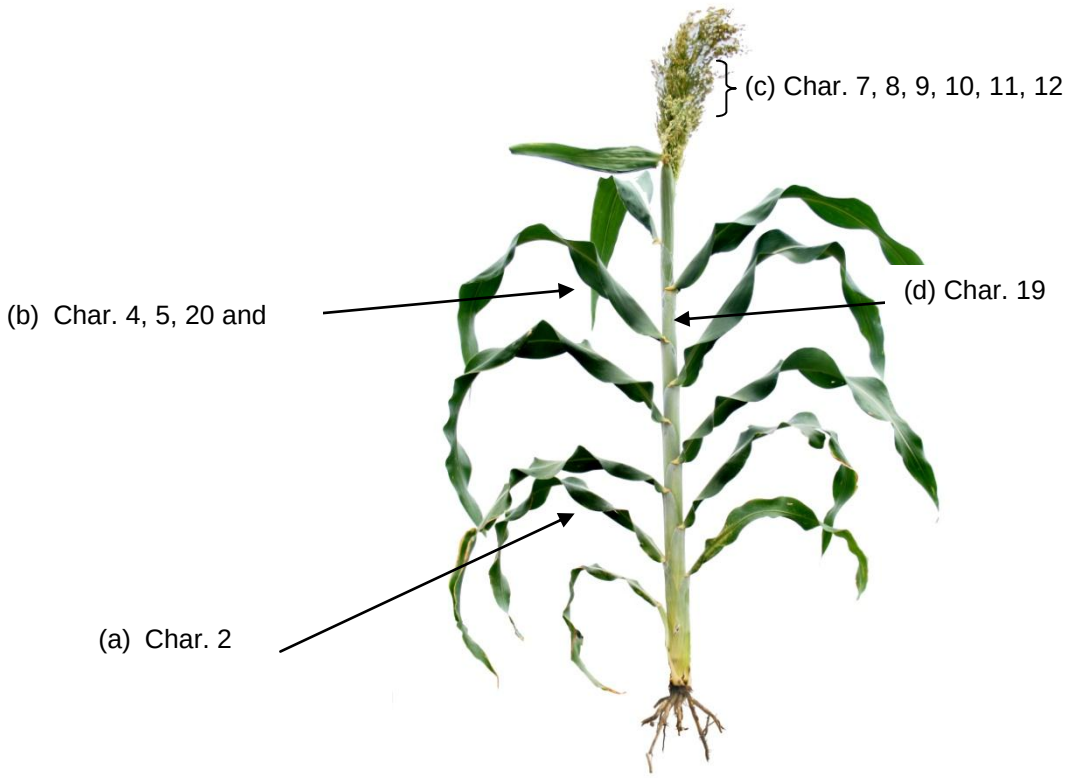
		English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
34. **(+)**	**92-93 VG**	**Grain: texture of endosperm**	**Grain : texture de l´endosperme**	**Korn: Textur des Endosperms**	**Grano: textura del endospermo**		
QN		fully vitreous	complétement vitreux	vollglasig	completamente vítreo		1
		¾ vitreous	¾ vitreux	¾ glasig	¾ vítreo	Nicol, SF2003	3
		half vitreous	demi-vitreux	halbglasig	medio vítreo	Albita, Nectar	5
		¾ farinaceous	¾ farineux	¾ mehlig	¾ harinoso	Beefbuilder, PR85G85	7
		fully farinaceous	complétement farineux	vollmehlig	completamente harinoso	PR83G66, PR82G10	9
35.	**92-93 VG**	**Grain: color of vitreous albumen**	**Grain : couleur de l´albumen vitreux**	**Korn: Farbe des glasigen Albumens**	**Grano: color del albumen vitroso**		
PQ		white	blanc	weiss	blanco	Sanggat, Sweet Virginia	1
		light yellow	jaune clair	hellgelb	amarillo claro	Albita	2
		yellow	jaune	gelb	amarillo medio	Dorado E, PR88Y20	3
		orange	orange	orange	naranja	P8500, PR83G66	4
		violet	violacé	violett	violeta	Nectar, Nicol	5
36.	**MG/ MS**	**Plant: photoperiod sensitivity**	**Plant: photoperiod sensitivity**	**Pflanze: photoperiodischen empfindlichkeit**	**Planta: sensibilidad al fotoperiodo**		
QN		insensitive	insensible	unempfindlich	insensible	Albita	1
		sensitive	sensible	empfindlich	sensible	Teide	2

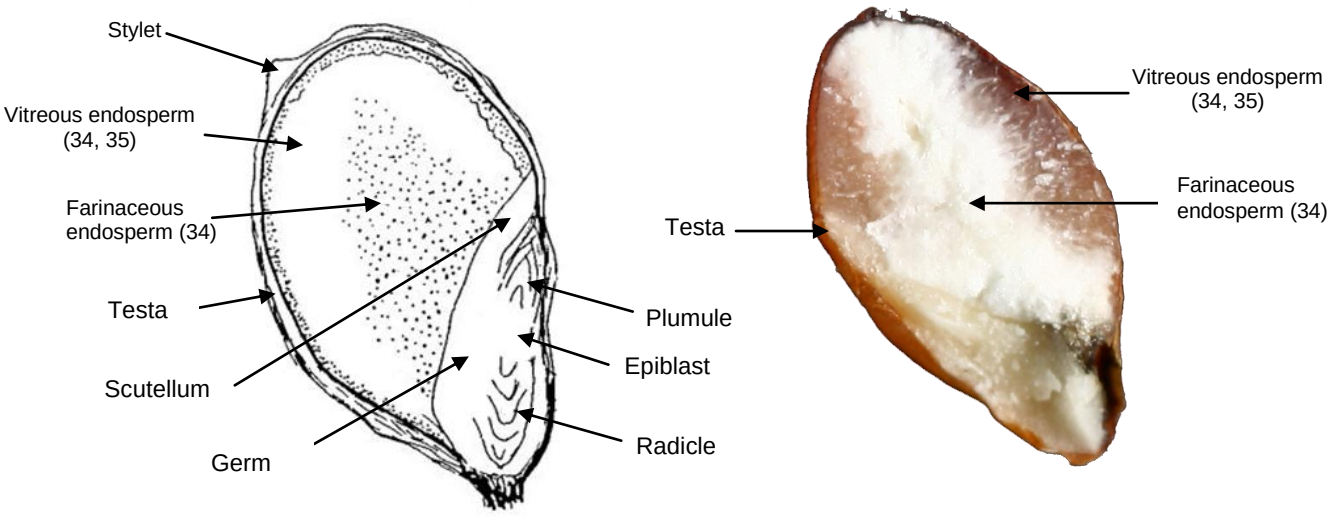
8. Explanations on the Table of Characteristics

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) The observation should be made on the third leaf from the lower.
(b) The observation should be made on the third leaf from the top of the plant excluding flag leaf.
(c) The observation should be made in the middle third of the main panicle.
(d) The observation should be made on the upper third leaf from the top of the plant excluding flag leaf.





8.2 Explanations for individual characteristics

Ad. 4: Leaf: color of midrib

1	2	3	4	5	6
white	yellowish white	light yellow	medium yellow	dark yellow	brownish

Ad. 5: Leaf: area of discoloration of midrib

1	3	5	7	9
absent or very small	small	medium	large	very large

Ad. 6: Plant: time of panicle emergence

50% of plants with the panicle half-emerged from flag leaf within a row (elementary plot). Unit: Day Number of the Year.

Ad. 10: Stigma: color

1	2	3	4
whitish	light yellow	medium yellow	dark yellow

Ad. 12: Flower with pedicel: length of flower

1	3	5	7	9
very short	short	medium	long	very long

Ad. 13: Flower: self-fertility

The heads are bagged with kraft bags before flowering. After maturity the bag is removed from each head, the estimated set seed in percentage of total number of florets is recorded.

Panicle: self-fertility
1 sterile: 0% - 10%
2 partially sterile: 11% - 70%
3 fertile: 71% - 100%

Ad. 15: Lemma arista formation

1	3	5	7	9
absent or very weak	weak	medium	strong	very strong

Ad. 26: Panicle: shape

1	2	3	4	5
reversed pyramid	broader upper part	broad middle part	broad lower part	pyramidal

Ad. 28: Glume: length

1	3	5	7	9
very short (about 1/4 of grain covered)	short (about 1/2 of grain covered)	medium (about 3/4 of grain covered)	long (as long as grain)	very long

Ad. 31: Grain: shape in dorsal view

1	3	5
narrow elliptic	broad elliptic	circular

Ad. 32: Grain: size of mark of germ

1	3	5	7	9
very small	small	medium	large	very large

Ad. 33: Grain: content of tannin

METHOD DETECTION OF TANNIN IN SORGHUM GRAIN BY THE BLEACH TEST (see reference in chaper 9)

1. Scope

Applicable to whole grain sorghum

2. Definitions

Certain varieties of sorghum contain proanthocyanidins (commonly referred to as tannins or more strictly-speaking condensed tannins) in the seed coat layer beneath the pericarp (commonly referred to as the testa layer) of the grain. These varieties are variously referred to as: tannin, high-tannin, brown, bird-proof, bird-resistant, or bitter sorghums.

Varieties of sorghum not containing tannins are various referred to as: non-tannin, lowtannin, condensed tannin-free, or sweet sorghums.

In this Standard the term “tannin sorghum” shall be used for those sorghums containing tannins and the term “non-tannin sorghum” used for those sorghums not containing tannins.

3. Principle

Sorghum grain is immersed in a sodium hypochlorite solution (bleach) containing alkali. The solution dissolves away the outer pericarp layer of sorghum grain, revealing the presence of a black pigmented testa layer in the case of tannin sorghums, or its absence in the case of non-tannin sorghums.

4. Reagent

4.1 Bleaching reagent

Five g sodium hydroxide is dissolved in 100 ml of 3.5% sodium hypochlorite solution (commercial bleach). Reagent can be stored at room temperature in light-proof bottle for up to one month.

4.2 Sorghum standards

An appropriate tannin and non-tannin standard.

5. Apparatus

Glass beakers (50 ml)
Tea strainer
Aluminum foil
Paper towel

6. Reference

Waniska, R.D., Hugo, L.F. & Rooney, L.W. 1992. Practical methods to determine the presence of tannins in sorghum. Journal of Applied Poultry Research 1:122-128.

7. Procedure

7.1
Test must be performed in duplicate

7.2
Known tannin sorghum and non-tannin sorghum standards must be included each time the test is performed.

7.3
One hundred whole, sound sorghum grains are placed in a beaker.

7.4
Bleaching reagent is added to **just** cover the sorghum grains and close beaker with aluminum foil. Too much bleaching reagent will cause over bleaching and give false negative results. If in doubt repeat using less reagent.

7.5
Incubate beaker at room temperature (20-30°C) for 20 minutes, swirling contents of beaker every 5 minutes.

7.6
Empty contents of beaker into tea strainer, discarding bleaching reagent. Rinse sorghum grains in tea strainer with tap water.

7.7
Empty contents of tea strainer onto sheet of paper towel. Spread grains out into a single layer and gentle blot them dry with another piece of paper towel.

7.8
Count tannin sorghum grains. Tannin sorghum grains are those grains that are **black over the entire surface of the grain**, unless the germ is somewhat lighter in colour. Non-tannin sorghum grains are those which are either completely white, **or** are brown over **part** of the surface of the grain.

8. Presentation of results

8.1
Calculate tannin sorghum grains as percentage of total sorghum grains. Duplicate determinations should not differ by more than +/- 5 grains, for example first determination 90%, second determination 85%, or 95%. The mean of the duplicate determinations should be calculated.

8.2 Expression of results
Results should be expressed as:
Percentage tannin sorghum, e.g. 90% tannin sorghum

9. Recommended standards

It is recommended that: Batches containing ≥ 95% tannin or non-tannin sorghum be classified as Tannin or Nontannin Sorghum, respectively.
Where batches contain < 95% tannin (or non-tannin) sorghum and > 5% non-tannin (or tannin) sorghum, the batch be classified as Mixed Tannin and Non-tannin Sorghum and that the percentage tannin sorghum be given.

NOTES

1 A 5 ml medicine measuring spoonful may be used to measure out approx. 5 g of sodium hydroxide if a weighing balance is not available.
2 Commercial caustic soda, sometimes marketed as drain cleaner, may be used.
3 Measure using for example a 200 ml 'Buddy' soft drink bottle (after use wash out with water and then crush bottle before disposal) and use a 2 x 5 ml medicine spoon measuring spoonfuls of caustic soda**.**
4 Any clear glass or plastic beaker or container with a diameter of around 3 cm.

International Association for Cereal Science and Technology (ICC) Study Group 32: Sorghum, Millets, Legumes and Composite Flours Chairperson: Prof J R N Taylor, University of Pretoria, South Africa, jtaylor@postino.up.ac.za

1
absent

2
present

Ad. 34: Grain: texture of endosperm

The observation should be made on the longitudinal section.

1
fully vitreous

3
¾ vitreous

5
half vitreous

7
¾ farinaceous

9
fully farinaceous

8.3 Decimal Code for the Growth Stages of Cereals

This decimal code is in close conformity with the BBCH-code (Witzenberger et al., 1989; Lancashire et al., 1991)

CODE	GENERAL DESCRIPTION
	GERMINATION
00	Dry seed
01	Beginning of seed inhibition
02	
03	Seed inhibition complete
04	
05	Radicle emerged from caryopsis
06	Radicle elongated, root hairs and /or side roots visible
07	Coleoptile emerged from caryopsis
08	
09	Emergence: coleoptile penetrates soli surface (cracking stage)
	LEAF DEVELOPMENT
10	First leaf through coleoptile
11	First leaf unfolded
12	2 leaves unfolded
13	3 leaves unfolded
14	4 leaves unfolded
15	5 leaves unfolded
16	6 leaves unfolded
17	7 leaves unfolded
18	8 leaves unfolded
19	9 or more 5 leaves unfolded
	TILLERING
20	No tillers
21	Beginning of tillering: first tiller detectable
22	2 tillers detectable
23	3 tillers detectable
24	4 tillers detectable
25	5 tillers detectable
26	6 tillers detectable
27	7 tillers detectable
28	8 tillers detectable
29	End of tillering. Maximum no. of tillers detectable.
	STEM ELONGATION
30	Pseudo stem erection
31	1st node detectable
32	2nd node detectable
33	3rd node detectable
34	4th node detectable
35	
36	
37	Flag leaf just visible, still rolled
38	
39	Flag leaf stage: flag leaf fully unrolled, ligule just visible
	BOOTING
40	
41	Early boot stage: flag leaf sheath extending
42	
43	Mid boot stage: flag sheath just visibly swollen
44	
45	Late boot stage: flag leaf sheath swollen
46	
47	Flag leaf sheath opening
48	
49	First awns visible (in awned forms only)

INFLORESCENCE EMERGENCE, HEADING

Beginning of heading: tip of inflorescence emerged from sheath, first spikelet just visible
20% of inflorescence emerged
30% of inflorescence emerged
40% of inflorescence emerged
50% of inflorescence emerged
60% of inflorescence emerged
70% of inflorescence emerged
80% of inflorescence emerged
End of heading: inflorescence fully emerged

FLOWERING, ANTHESIS

Beginning of flowering: first anthers visible

Full flowering: 50% of anthers mature

End of flowering: all spikelets have completed flowering but some dehydrated anthers may remain.

DEVELOPMENT OF FRUIT

Watery ripe: first grains have reached half their final size

Early milk

Medium milk: grain content milky, grains reached final size, still green

Late milk

RIPENING

Early dough

Soft dough: grain content soft but dry. Fingernail impression not held.

Hard dough: grain content solid. Fingernail impression held

Fully ripe: grain hard, difficult to divide with thumbnail

SENESCENCE

Over-ripe: grain very hard cannot be dented by thumbnail
Grains loosening in day-time

Plant dead and collapsing

Harvested product

9. Literature

Growth stages of mono- and dicotyledonous plants: BBCH-Monograph Edition 2001, edited by Uwe Meier, Centre for Agriculture and Forestry (8.3).

Frederiksen (1986), **longitudinal section seed** (8.1)

International Association for Cereal Science and Technology (ICC) Study Group 32: Sorghum, Millets, Legumes and Composite Flours Chairperson: Prof J R N Taylor, University of Pretoria, South Africa, jtaylor@postino.up.ac.za, **Method detection of tannin in sorghum grain by the bleach test** (ad.33)

Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria (INIA).**Sorghum plant picture** (8.1). **Longitudinal section picture** (8.1). **Leaf: color of midrib pictures** (ad. 4). **Stigma color pictures** (ad. 10). **Lemma arista formation drawings** (ad. 15). **Tannin in sorghum pictures** (ad.33). **Grain: texture of endosperm pictures** (ad. 34)

Groupe d'Etude et de contrôle des Variétés Et des Semences (GEVES). **Leaf: area of discoloration of midrib** (ad.5)

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	*Sorghum bicolor* L.
1.2 Common name	Sorghum

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

(i)	Inbred line	[ ]
(ii)	Single-cross hybrid	[ ]
(iii)	Three-way cross hybrid	[ ]
(iv)	Double-cross hybrid	[ ]
(v)	Open-pollinated variety	[ ]
(vi)	Other (provide details)	[ ]

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 In the case of hybrid varieties the production scheme for the hybrid should be provided on a separate sheet. This should provide details of all the parent lines required for propagating the hybrid e.g.

(a) Single Hybrid

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

(b) Three-Way Hybrid

single hybrid (below) used as female parent x (….....)
male parent line

or (…….....) x single hybrid (below) used as male parent
female parent line

(….....) x (….....…)
female parent line male parent line
single hybrid

(c) Double Hybrid

(….....…) x (….....…)
female parent line male parent line
single hybrid used as female parent

(….....) x (….....)
female parent line male parent line
single hybrid used as male parent

(single hybrid used as female parent) x (single hybrid used as male parent)

and should identify in particular:

(i) any male sterile female parent lines

……

(ii) maintenance system of male sterile female parent lines

……

4.2.2 Open–pollinated variety (please provide details)

4.2.3 Other (please provide details)

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 (4)	**Leaf: color of midrib**		
	white	Dorado E, Gardavan	1 [ ]
	yellowish white	Beefbuilder, Vidan 697	2 [ ]
	light yellow	PR82G55, PR87G57	3 [ ]
	medium yellow	P8500	4 [ ]
	dark yellow	Digestivo	5 [ ]
	brownish	Teide	6 [ ]
5.2 (6)	**Plant: time of panicle emergence**		
	very early	Ludan	1 [ ]
	very early to early		2 [ ]
	early	Artaban, Artigas	3 [ ]
	early to medium		4 [ ]
	medium	Albita, Dorado DR	5 [ ]
	medium to late		6 [ ]
	late	Béreny, PR 82G55	7 [ ]
	late to very late		8 [ ]
	very late		9 [ ]
5.3 (10)	**Stigma: color**		
	whitish	P8500	1 [ ]
	light yellow	Beefbuilder	2 [ ]
	medium yellow	Argence, Dorado E	3 [ ]
	dark yellow	Dorado E, Nutri Honey	4 [ ]
	grey	Nectar, Vidan 697	5 [ ]

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

	Characteristics	Example Varieties	Note
5.4 (18)	**Plant: total height**		
	extremely short	Sibelus	1 [ ]
	extremely short - short	Aruiski	2 [ ]
	very short	PR88Y20	3 [ ]
	very short - short	Albita	4 [ ]
	short	PR74G62	5 [ ]
	strong tendency short	PR82G55	6 [ ]
	short - medium	Jumak	7 [ ]
	medium	Topsilo	8 [ ]
	medium - high	Zöldike	9 [ ]
	strong tendency high		10[ ]
	high	Zöldozön	11[ ]
	high - very high	Rona 1	12[ ]
	very high	Agnes	13[ ]
	very high - extremely high	Gardavan	14[ ]
	extremely high		15[ ]
5.6 (25)	**Panicle: density at maturity**		
	very sparse	DK18, Gardavan	1 [ ]
	very sparse to sparse		2 [ ]
	sparse	Grazer, SF2003	3 [ ]
	sparse to medium		4 [ ]
	medium		5 [ ]
	medium to dense		6 [ ]
	dense	Nectar, PR85G85	7 [ ]
	dense to very dense		8 [ ]
	very dense	Albita, Velox 701	9 [ ]

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

	Characteristics	Example Varieties	Note
5.7 (26)	**Panicle: shape**		
	reversed pyramide		1 [ ]
	panicle broader upper part	PR84G62, PR85G85	2 [ ]
	broad middle part	Nutri Honey	3 [ ]
	broad lower part	Beefbuilder	4 [ ]
	pyramidal	Vidan 697	5 [ ]
5.8 (27)	**Glume: color <u>at maturity</u>**		
	white		1 [ ]
	light yellow	PR88Y20	2 [ ]
	yellow	Dorado E, Nectar	3 [ ]
	light brow	Grazer	4 [ ]
	reddish brow	Argence, P8500	5 [ ]
	dark brow	PR82G55, Velox 701	6 [ ]
	black	Digestivo, Vidan 697	7 [ ]
5.9 (29)	**Caryopsis: color after threshing**		
	white	Choice	1 [ ]
	grey white	PR88G20	2 [ ]
	yellowish white	Aralba, PR88Y20	3 [ ]
	straw yellow	Beefbuilder, Gardavan	4 [ ]
	orange	Argence, PR85G85	5 [ ]
	orange red	PR82G55, PR83G66	6 [ ]
	pale brown	Velox 701	7 [ ]
	red brown	Nutri Honey, PR82G10	8 [ ]
	dark brown	Nicol, Vidan 697	9 [ ]

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
Example	*Plant: time of panicle emergence*	*early*	*early to medium*

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

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

[Annex follows]

COMMENTS BY THE SUBGROUP

COVER PAGE	COMMENTS
4.2	**ESA** I have not received any reactions from our members regarding this issue. Therefore I conclude that there are no special concerns regarding the Uniformity thresholds as currently defined in the TG.
Char. 4 Leaf: color of midrib	**France** We propose a 7 levels scale: 1- White 2- Pale green 3- Dark green 4- Yellowish 5- Medium yellow 6- Dark yellow **7-** Brownish Brownish level is necessary to score BMR varieties with significantly lower lignin Could be scored on flag leaf or on third leaf from the top **Germany** To check whether to add 'light green' and 'dark green' and add pictures if applicable **China** We suggest "light green to be added. **Spain** We propose 1- White 2- Light green 3- Yellowish white 4- Light yellow 5- Medium yellow 6- Dark yellow 7- Brownish
Char. 5 Leaf: area of discoloration of midrib	**France** Find some pictures of the main levels for this characteristic (click on each level to get a big picture). I agree that in some cases it's quite difficult to score but in my opinion it wouldn't be a good option to delete it as can be discriminative. Discriminating characteristic but quite difficult to score in the low levels. See pictures of main states in 'C8' sheet. This characteristic can fluctuate depending on the leaf. We observe it on the third leaf from the top. **Spain** We propose to delete this characteristics. It's difficult to observe it and it's not very discriminative.
Char. 6 Plant: time of panicle emergence	**China** We suggest to use MG only

Char. 7 Glume: color at end flowering	**France** We propose to reordering and to delete "yellow green" : 1 - light green 2- green 3- green yellow 4 - light yellow 5 - yellow **China** yellow green" and "green yellow" are difficult to tell apart. Can we combine the two states into one? Another thing, the order of the states "light green "and "yellow green" should be reversed. We suggest to put "Ad 8. Glume: anthocyanin coloration" ahead of "Ad 7: Glume: color" in the table of characteristics. **Spain** We propose 1- light green 2- medium green 3- yellow green 4- light yellow 5- medium yellow
Char. 9 Stigma: anthocyanin coloration Char. 10 Stigma: color	**France** (Char. 9) To keep as it can be observed on forage varieties (Char 10) We wonder about greyish level as it had never been observed in our trials : would it be possible that it was caused by fungi ? **China** Both characteristics 9 and 10 involve colors of stigma. For characteristic 9, if the expression of anthocyanin coloration is above "medium" level, the true color of stigma will be obscured. We suggest the name of characteristic 10 be changed into "varieties with anthocyanin coloration absent or weak only: stigma:color
Char. 13 Flower: self-fertility	**France** Interesting characteristic as some hybrids are actually partially male sterile but quite difficult to score. Is it possible to get some information about the valuation method ? **China** This characteristic is not easy to observe. Temperature can have a strong influence on its expression
Char. 14 Panicle: density at end flowering	**Germany** To check whether there is a correlation between char. 14 and 25 which is strong enough to justify deletion of one of the two characteristics.
Char. 15 Lemma: arista formation	**China** The name is difficult to understand. Does it mean the length or density of awns or both? We suggest explanation be provided in chapter 8. **Spain** The density is difficult to evaluate, so we propose Lemma: arista length 1- Absent or very short 3- Short 5- Medium 8- Long 9- Very long

Char. 16 Dry stamen: color	**France** Why is this characteritic become an asterisked characteristic as it was not in the previous version ? **Germany** To read 'Dry anther: color' ('stamen' would contain anther and filament, the latter not being observed) To check whether to observe at stage 65-69 instead 70-75
Char. 17 Plant: number of tillers (forage varieties only)	**Tanzania** We from Tanzania think that inclusion of number of tillers for forage sorghum varieties is important characteristic; and should be included in the test guideline. **France** Tillering ability in Sorghum is actually affected by genotype (G), but it is also greatly influence by environmental factors (E) and by GxE interaction. Therefore it is not the best candidate as a new characteristic on the UPOV approach. However, it could be added as it can actually discriminate varieties and it would be even more useful within grain varieties. It would be necessary to mention that this characteristic must be observed under non stressful environmental conditions to enhance genetic variation versus environmental one. **Germany** Please note that we are not in favor to include the characteristic „number of tillers" in the TG because of it is strongly influenced by the environment (moreover restriction to 'Only varieties for forage use 'would not allow a clear separation between varieties and their possible use). **China** MS / VG should also be ok **Japan** We have proposed adding characteristic "number of tillers", but we would like to withdraw the proposal. I had been asked to submit data about "number of tillers" to the institution of sorghum breeding in our country. But data needed to discuss whether adding this characteristic was not ready. Data on the number of tillers of more than two years was not ready. It is difficult to compare the data for different year. Sorghum is classified into several types depending on use and ecological type. The number of mowing in the growing period relate to these types. Single mowing in the growing period, a range of data is not so wide (one to four /plant). Mowing of twice in the growing period, the difference between varieties is larger. The number of mowing is different depending on the variety. We need to collect data. We have problem to be solved. **UKRAINE** Ukrainian Institute for Plant Variety Examination agrees that inclusion of a number of tillers for forage sorghum is necessary. If waterlogged, forage sorghum varieties tiller out profoundly and sprout out 5-6 extra tillers. **Spain** The UPOV guideline can't be divided in different parts regarding the end use of materials. According we spoken about plant height, the separation of grain and forage varieties isn`t clear, therefore it isn't possible to take it only for forage varieties.

Char. 18.1 Plant: total height (grain varieties only) Char. 18.2 Plant: total height (forage varieties only)	**ESA** In my view, it is difficult to purpose 2 different scales for noting the same characteristic Indeed the Upov guideline must be useful for all the sorghum bicolor L Moench accessions. If we purpose 2 scales for plants size, so why not purpose 2 scales for panicule sizes where we find also very big differences between early grain materials and broomcorn sorghums for example. I think that the UPOV guideline can not be divided in different parts regarding the end use of materials. The other point you may consider regarding plant size, is that you will find some equivalences between very early silage materials like PrimSilo which are, in some cases, shorters than late Grain hybrids. So as conclusion, we need to accept that the size scale can be not very precise but the distinction of genotypes is coming from more than one alone characteristic. **FRANCE** To our opinion it's not accurate to split between grain and forage varieties as it can be the same taxon *Sorghum bicolor bicolor*. For instance Topsilo (Check variety for 18.1) and Classus (Check variety for 18.2) are both *Sorgum bicolor bicolor* taxon. In our field trials, for *Sorghum bicolor bicolor* varieties we have measured height from 72 cm to 376 cm in the same year and within the same location. These varieties are used for grain production for the smallers, silage and bio energy production for the tallers. Morever in some countries (USA), some varieties (eg. Topsilo) are used for both silage and grain productions depends on the farmer's needs. Concerning multi-cut forage varieties that are *Sorghum sudanense* or *Sorghum sudanense * Sorghum bicolor* taxons, these varieties are of intermediate height (around 200 cm). **SPAIN** Having two scales, for this character, causes problems with some varieties (very few), but the reality is that we find differences of more than 3 meters between the higher and the lower varieties and with a statistical analysis, 15 cm would be enough to consider two varieties as different between them. This means that we could have 20 different levels for this character. If we only have one scale and 9 levels, all grain varieties would be level 1 or 2 and the forage varieties 8 or 9, except a few number of varieties, which would be the exception. Therefore, one of the most important characteristic wouldn't be useful. We have the same problem in maize and we adopted two different scales, one for lines and hybrids of sweet corn and popcorn and other for the rest of hybrids and open-pollinated varieties. Experience shows that these two scales are very useful. We think it is necessary to solve this problem avoiding that this important characteristic doesn't be useful to describe and separate varieties, **so we propose a scale of 15 notes.** **GERMANY** To have only one characteristic for all sorghum varieties as there is no clear separation between varieties and their possible use. To check whether scale can be extended as follows : extremely short (note 1) - very short (note 3) – short (note 5) – medium (note 7) - high (note 9) – very high (note 11) – extremely high (note 13).
Char. 19 Stem: diameter	**GERMANY** To check discriminatory power of characteristic and whether to delete
Char. 23 Neck of panicle: length above flag sheath	**China** "Neck of panicle" is enough for this characteristic to be understood. "visible length above sheath" can be omitted.

Char. 24 Panicle: length of branches	**China** The branches here should be primary branches. The part of the panicle where branches are to be observed should be indicated.
Char. 26 Panicle: shape	**France** We use a larger scale that allowed intermediate level : 1 - reversed pyramide 3- panicle broader in upper part 5- symmetric 7 - panicle broader in lower part 9 - pyramidal **China** This characteristic fails to include all the states of expressions, especially some states in Chinese sorghum. We suggest a characteristic “panicle: position of the broadest part ” be used instead. With that characteristic, in combination of characteristics such as “Panicle: density”, “panicle: attitude of branches”, panicle could be better described.
Char. 29 Caryopsis:color after threshing	**China** Why not use “grain”? When is this characteristic to be observed: dry grains or directly after being thrashed in the field? There can be some difference in the density of color. In Chinese sorghum, some varieties have purple colored grains.
Char. 31 Grain: shape in dorsal view	**China** “Ovate” should be added as a state. In Chinese sorghum, “ovate” is quite common. The notes should be “1, 2, 3, 4”

Char. 33 Grain: content of tannin and old char.33 Grain: surface covered by testa	**FRANCE** We have just discussed with our sorghum expert yesterday about whether we should propose to keep characteristics 33 (surface covered by testa) instead of characteristics 34 (content of tannin). We get information from breeders some weeks ago that they could provide us a reliable method to score grain testa. We are now trying to apply this method and will give you back information as soon as we have it. **FRANCE** **Grain: content of tannin** Tannins (polyphenol) are costly to measure as their detection require specific laboratory equipment. Possible methods are vanillin-HCI method, HPLC and NIRS. This characteristic could be deleted if characteristic 33 is maintened **Grain: surface covered by testa** Difficult to evaluate with manual method consisting in scratching the surface of the seed to remove the pericarp. The problem is we do need to evaluate it accurately as silage varieties tend to have pigmented testa which indicates the presence of tannins. So from 2012, we use a standard method from International Association for Cereal Science and Technology (ICC 177), called bleach test and easy to implement. Sorghum grain is immersed in a sodium hypochlorite solution (bleach) containing alkali. The solution dissolves away the outer pericarp layer of sorghum grain, revealing the presence of a black pigmented testa layer in the case of tannin sorghums, or its absence in the case of non-tannin sorghums. See pictures of states in 'C33' sheet. Therefore, we would like to keep this characteristic and can provide documentation on the method. We don't understand why in the TG/122/4(proj.2) this characteristic is dropped and the content of tannin is conserved, the reverse would be a better option as to be measured content of tannin requires laboratory analysis. Furthermore, it's possible to assess uniformity with testa as we can observe each grain separetly while tannin analysis are done on a range of seeds. There is a correlation between pericarp color and tannins/testa presence but not accurate as tannin sorghum are usually brown but could also be white, yellow, orange or red. **ESA** The other point we discussed with Jesus is **Char 33 (surface covered by testa) and 34 (content of tannin)** My view is to keep a qualification of tannin presence as key to distinguish materials. It is an important point to qualify sorghum materials. But we can conserve only one character: presence of condensed tannin in grain. They are located in pigmented Testa. Dr Llyod Rooney purpose the chlorox beach test as tool to help to identify sorghum with tannin. **GERMANY** To check whether observation is possible with reasonable costs. **China** “Content of tannin” is a quantitative characteristic. In our experience, content of tannin varies extensively. Generally speaking, white colored varieties have undetectable or very low tannin content. As the colors of grain darken, tannin contents increase accordingly. Since it is linked to the grain color, maybe we can omit this characteristic.
Char. 34 Grain: texture of endosperm	**China** There seems to be too many states. Maybe a scale of “1, 2, 3, 4, 5” is better suited for this characteristics given the distinguishing power of naked eye.

Char. 35 Grain: color of vitreous albumen	**France** We propose a 4 levels scale : 1 - white 2- yellow 3- orange 4- violet It's a discriminating characteristic quite easy to evaluate in most cases. **Germany** To read 'medium yellow' or dark yellow (note (3) or to merge note and 3 to state 'yellow' (note 2)
Char. 36 Plant: photoperiod sensitivity	**France** Visual score on 1-9 scale for sensitivity to photoperiod. It could be a binary choice : 1- Insensitive / 9- Sensitive **Germany** To check whether observations is possible with reasonable costs. **China** There can be more states identified in this characteristic. However, it may be too troublesome to observe this characteristic.
New char.	**China** We suggest "Texture of lower glume " be added as a characteristic. In Chinese sorghum, the type of lower glumes can be divided into crustaceous and papery
Ad. 5	**Germany** To improve explanation for discoloration which is not clear on pictures. Area of discoloration in unclear as leaves are not complete on upper rsp. Lower part.
Ad. 33	**Germany** To improve point 9. 'Recommend standars' by indicating percentages and conclutions in a table.

[End of Annex and of document]