



TG/122/4(proj.3)  
ORIGINAL: English  
DATE: 2014-08-29

## INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS

Geneva

DRAFT

### SORGHUM

UPOV Code: SRGHM

*Sorghum bicolor*  
*Sorghum xdrummondii*

### 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-third session, to be held in Mar del Plata, Argentina, from November 17 to 21, 2014*

Alternative Names:\*

<i>Botanical name</i>	<i>English</i>	<i>French</i>	<i>German</i>	<i>Spanish</i>
<i>Sorghum bicolor</i>	Sorghum,	Sorgho,	Mohrenhirse,	Sorgo,
<i>Sorghum xdrummondii</i>	Sudan Grass	Sorgho du Soudan	Sudangrass	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](http://www.upov.int)), for the latest information.]

<u>TABLE OF CONTENTS</u>	<u>PAGE</u>
1. SUBJECT OF THESE TEST GUIDELINES.....	3
2. MATERIAL REQUIRED.....	3
3. METHOD OF EXAMINATION .....	3
3.1 NUMBER OF GROWING CYCLES .....	3
3.2 TESTING PLACE .....	3
3.3 CONDITIONS FOR CONDUCTING THE EXAMINATION .....	3
3.4 TEST DESIGN .....	3
3.5 ADDITIONAL TESTS.....	4
4. ASSESSMENT OF DISTINCTNESS, UNIFORMITY AND STABILITY .....	4
4.1 DISTINCTNESS .....	4
4.2 UNIFORMITY .....	5
4.3 STABILITY.....	5
5. GROUPING OF VARIETIES AND ORGANIZATION OF THE GROWING TRIAL.....	6
6. INTRODUCTION TO THE TABLE OF CHARACTERISTICS.....	6
6.1 CATEGORIES OF CHARACTERISTICS .....	6
6.2 STATES OF EXPRESSION AND CORRESPONDING NOTES .....	6
6.3 TYPES OF EXPRESSION .....	7
6.4 EXAMPLE VARIETIES.....	7
6.5 LEGEND .....	7
7. TABLE OF CHARACTERISTICS/TABLEAU DES CARACTERES/MERKMALSTABELLE/TABLA DE CARACTERES .....	8
8. EXPLANATIONS ON THE TABLE OF CHARACTERISTICS.....	16
8.1 EXPLANATIONS COVERING SEVERAL CHARACTERISTICS .....	16
8.2 EXPLANATIONS FOR INDIVIDUAL CHARACTERISTICS .....	17
8.3 DECIMAL CODE FOR THE GROWTH STAGES OF CEREALS .....	23
9. LITERATURE .....	25
10. TECHNICAL QUESTIONNAIRE.....	26
 ANNEX            COMMENTS BY THE SUBGROUP	

## 1. Subject of these Test Guidelines

These Test Guidelines apply to all varieties of *Sorghum bicolor* and *Sorghum xdrummondii* (Steud.) Miklsp. & Chase

## 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 parental components  
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 parental 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 parental 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 parental 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 7)
- (b) Plant: length (characteristic 18)
- (c) Panicle: position of broadest part (characteristic 26)
- (d) Grain: 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)-(c) See Explanations on the Table of Characteristics in Chapter 8.1

(+) See Explanations on the Table of Characteristics in Chapter 8.2

12-93 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
<b>1.</b>	<b>12-14 VG</b>	<b>Seedling: anthocyanin coloration of coleoptile</b>	<b>Plantule : pigmentation anthocyanique du coleoptile</b>	<b>Keimpflanze: Anthocyanfärbung der Keimscheide</b>	<b>Plántula: pigmentación antocianica del coleóptilo</b>	
<b>QN</b>	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
<b>2.</b>	<b>15 VG (+)</b>	<b>Leaf: anthocyanin coloration of blade</b>	<b>Feuille: pigmentation anthocyanique du limbe</b>	<b>Blatt: Anthocyanfärbung der Blattspreite</b>	<b>Hoja: coloración antocianica del limbo</b>	
<b>QN</b>	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	PR85G85	5
	strong	forte	stark	fuerte		7
	very strong	très forte	sehr stark	muy fuerte		9
<b>3.</b>	<b>41-49 MS</b>	<b>Plant: number of tillers</b>	<b>Plante: nombre de tiges</b>	<b>Rispe: Anzahl der Bestockungstriebe</b>	<b>Planta: número de tallos</b>	
<b>QN</b>	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-Dzün, Zöldike	7
<b>4.</b>	<b>45-59 VG</b>	<b>Leaf: intensity of green color</b>	<b>Feuille: intensité de la couleur verte</b>	<b>Blatt: Grünfärbung der Blattspreite</b>	<b>Hoja: intensidad del color verde</b>	
<b>QN</b>	very light	très clair	sehr hell	muy claro		1
	light	clair	hell	claro	Nectar	2
	medium	moyenne	mittel	medio	Grazer, P8500	3
	dark	foncé	dunkel	oscuro	GK ZSófia	4
	very dark	très fonce	sehr dunkel	muy oscuro		5
<b>5.</b>	<b>45-59 VG (*)</b>	<b>Leaf: color of midrib</b>	<b>Feuille: couleur de la nervure principale</b>	<b>Blatt: Farbe der Mittelrippe</b>	<b>Hoja: color de la nerviadura principal</b>	
<b>PQ</b>	<b>(a)</b> white	blanc	weiss	blanco	Dorado E, Gardavan	1
	light green	vert clair	hellgrün	verde claro		2
	yellowish white	blanc jaunâtre	gelblich weiß	blanco amarillento	Beefbuilder, Vidan 697	3
	light yellow	jaune clair	hellgelb	amarillo claro	PR82G55, PR87G57	4
	medium yellow	jaune moyenne	mittelgelb	amarillo medio	P8500	5
	dark yellow	jaune foncé	dunkelgelb	amarillo oscuro	Digestivo	6
	brownish	brunâtre	bräunlich	amarronado	Teide	7



	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
<b>6.</b>	<b>45-59 VG</b>	<b>Leaf: area of discoloration of midrib</b>	<b>Feuille: surface de la décoloration de la nervure principale</b>	<b>Blatt: Bereich der Verfärbung der Mittelrippe</b>	<b>Hoja: area de la decoloración de la nerviadura principal</b>	
<b>(+)</b>						
<b>QN</b>	<b>(a)</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	groß	grande	Primsilo 7
		very large	très grande	sehr groß	muy grande	9
<b>7.</b>	<b>51 MG/MS</b>	<b>Plant: time of panicle emergence</b>	<b>Plante : époque d'apparition des panicules</b>	<b>Pflanze: Zeitpunkt des Rispschiebens</b>	<b>Planta: época de aparición de las panículas</b>	
<b>(*)</b>						
<b>(+)</b>						
<b>QN</b>		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
<b>8.</b>	<b>65-69 VG</b>	<b>Glume: anthocyanin coloration</b>	<b>Glume : pigmentation anthocyanique</b>	<b>Hüllspelze: Anthocyanfärbung</b>	<b>Gluma: pigmentación antocianica</b>	
<b>QN</b>	<b>(b)</b>	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
<b>9.</b>	<b>65-69 VG</b>	<b>Stigma: anthocyanin coloration</b>	<b>Stigmate : pigmentation anthocyanique</b>	<b>Narbe: Anthocyanfärbung</b>	<b>Estigma: pigmentación antocianica</b>	
<b>QN</b>	<b>(b)</b>	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
<b>10.</b>	<b>65-69 VG</b>	<b>Stigma: color</b>	<b>Stigmate: couleur</b>	<b>Narbe: Farbe</b>	<b>Estigma: color</b>	
<b>(*)</b>						
<b>(+)</b>						
<b>PQ</b>	<b>(b)</b>	white	blanc	weiss	blanco	P8500 1
		light yellow	jaune clair	hellgelb	amarillo claro	Albita 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
<b>11.</b>	<b>65-69 VG</b>	<b>Stigma: length</b>	<b>Stigmate : longueur</b>	<b>Narbe: Länge</b>	<b>Estigma: longitud</b>	
<b>(+)</b>						
<b>QN</b>	<b>(b)</b>	very short	très court	sehr kurz	muy corto	1
		short	court	kurz	corto	Aralba, Velox 701 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
<b>12.</b>	<b>65-69 VG</b>	<b>Flower with pedicel: length of flower</b>	<b>Fleur pédicellée : longueur de la fleur</b>	<b>Gestielte Blüte: Länge der Blüte</b>	<b>Flor pedicelada: longitud de la flor</b>	
<b>(+)</b>						
<b>QN</b>	<b>(b)</b>	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
<b>13.</b>	<b>65-69 VG</b>	<b>Flower: self-fertility</b>	<b>Fleur : autofertilité</b>	<b>Blüte: Selbstfertilität</b>	<b>Flor: Autofertilidad</b>	
<b>(+)</b>						
<b>PQ</b>		absent or very low	nulle ou très basse	fehlend oder sehr gering	ausente o muy baja	1
		medium	moyenne	medium	media	2
		high	haute	hoch	alta	Aneto, P8500 3
<b>14.</b>	<b>69 VG</b>	<b>Glume: color <u>at end of flowering</u></b>	<b>Glume : couleur <u>à la fin de la floraison</u></b>	<b>Hüllspelze: Farbe <u>zum Ende der Blüte</u></b>	<b>Gluma: color <u>al final de la floración</u></b>	
<b>PQ</b>	<b>(b)</b>	medium green	verte moyen	mittelgrün	verde medio	1
		light green	vert clair	hellgrün	verde claro	2
		yellow green	vert jaune	gelbrün	amarillo verdoso	Grazer, PR82G55 3
		light yellow	Jaune clair	hellgelb	amarillo claro	Nutri Honey 4
		medium yellow	jaune moyen	mittelgelb	amarillo medio	Teide 5
<b>15.</b>	<b>69 VG</b>	<b>Panicle: density at <u>end of flowering</u></b>	<b>Panicule : compacité <u>à la fin de la floraison</u></b>	<b>Rispe: Dichte zum <u>Ende der Blüte</u></b>	<b>Panícula: densidad <u>al final de la floración</u></b>	
<b>QN</b>	<b>(b)</b>	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

	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
<b>16. 69-75 (* (+)</b>	<b>VG</b>	<b>Lemma: length of arista</b>	<b>Glumelle : longueur de l'arista</b>	<b>Lemma: Länge arista</b>	<b>Lema: longitud de la arista</b>	
<b>QN</b>	<b>(b)</b>	absent or very short	nulle ou très courte	fehlend oder sehr kurz	ausente o muy corta	Dorado E, Grazer 1
		short	courte	kurz	corta	Lussi, Nectar 3
		medium	moyenne	mittel	media	Digestivo, SF 2003 5
		long	longue	lang	larga	Vidan 697 7
		very long	très long	sehr lang	muy larga	9
<b>17. 70-75 (*</b>	<b>VG</b>	<b>Dry anther: color</b>	<b>Anthère sèche : couleur</b>	<b>Dry anthere: Farbe</b>	<b>Antera seca: color</b>	
<b>PQ</b>	<b>(b)</b>	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
<b>18. 75-85 (*</b>	<b>MS</b>	<b>Plant: length</b>	<b>Plante : longueur</b>	<b>Pflanze: länge</b>	<b>Planta: altura total</b>	
<b>QN</b>		extremely short	extrêmement courte	sehr gering	extremadamente baja	Sibelus 1
		extremely short to very short	extrêmement courte - courte	kurz	extremadamente baja - muy baja	Aruski 2
		very short	très courte	sehr kurz	muy baja	PR88Y20 3
		very short to 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 to medium	courte – moyenne	kurz - mittel	baja – media	Jumak 7
		medium	moyenne	mittel	media	Topsilo 8
		medium to 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 to 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 to 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
<b>19. 75-85 VG/ MS</b>		<b>Stem: diameter</b>	<b>Tige : diamètre</b>	<b>Stengel: Durchmesser</b>	<b>Tallo: diámetro</b>	
<b>QN</b>	<b>(c)</b>	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
<b>20.</b>	<b>75-85 VG/MS</b>	<b>Leaf: length of blade</b>	<b>Feuille : longueur du limbe</b>	<b>Blatt: Länge der Spreite</b>	<b>Panícula: longitud del limbo</b>	
<b>QN (a)</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	SF2003	7
	very long	très long	sehr lang	muy larga		9
<b>21.</b>	<b>75-85 VG/MS</b>	<b>Leaf: width of blade</b>	<b>Feuille : largeur du limbe</b>	<b>Blatt: Breite der Spreite</b>	<b>Hoja: anchura del limbo</b>	
<b>QN (a)</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
<b>22.</b>	<b>75-85 VG/MS (+)</b>	<b>Panicle: length</b>	<b>Panicule : longueur</b>	<b>Rispe: Länge</b>	<b>Panícula: longitud</b>	
<b>QN</b>	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
<b>23.</b>	<b>75-85 VG/MS (+)</b>	<b>Panicle: length of neck</b>	<b>Panicule : longueur du col</b>	<b>Rispe: Länge des halses</b>	<b>Panícula: longitud del cuello</b>	
<b>QN</b>	absent or very short	nulle ou très courte	fehlend oder sehr kurz	ausente o muy corto	PR84G62	1
	short	courte	kurz	corto	Nectar, Profus	3
	medium	moyenne	mittel	medio	Nicol, SF2003	5
	long	longue	lang	largo	Arlys, Vidan 697	7
	very long	très longue	sehr lang	muy largo		9
<b>24.</b>	<b>75-85 VG/MS</b>	<b>Panicle: length of primary lateral branches</b>	<b>Panicule : longueur des branches latérales primaires</b>	<b>Rispe: Länge der primäre seitenäste</b>	<b>Panícula: longitud de las ramas laterales primarias</b>	
<b>QN (b)</b>	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
<b>25.</b>	<b>92-93</b>	<b>Panicle: density at maturity</b>	<b>Panicule : compacité à maturité</b>	<b>Rispe: Dichte zur Reife</b>	<b>Panícula: densidad en maduración</b>	
<b>(*)</b>	<b>VG</b>					
<b>QN</b>	very sparse	très lâche	sehr locker	muy laxa	DK18, Gardavan	1
	sparse	lâche	locker	laxa	Grazer, SF2003	3
	medium	moyenne	mittel	media	Argence	5
	dense	compacte	dicht	densa	Nectar, PR85G85	7
	very dense	très compacte	sehr dicht	muy densa	Albita, Velox 701	9
<b>26.</b>	<b>92-93</b>	<b>Panicle: position of broadest part</b>	<b>Panicule : position de la plus large part</b>	<b>Rispe: Position des breitesten Bereichs</b>	<b>Panícula: posición de la parte más ancha</b>	
<b>(*)</b>	<b>VG</b>					
<b>(+)</b>						
<b>PQ</b>	very low	très basse	sehr niedrig	muy baja		1
	low	Basse	niedrigt	baja	PR84G62	2
	medium	moyenne	mittel	media	Nutri Honey	3
	high	haute	hoch	alta	Beefbuilder	4
	very high	très haute	sehr hoch	muy alta	Vidan 697	5
<b>27.</b>	<b>92-93</b>	<b>Glume: color at maturity</b>	<b>Glume : couleur à maturité</b>	<b>Hüllspelze: Farbe zur Reife</b>	<b>Gluma: color en maduración</b>	
<b>(*)</b>	<b>VG</b>					
<b>PQ</b>	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
<b>28.</b>	<b>92-93</b>	<b>Glume: length</b>	<b>Glume : longueur</b>	<b>Hüllspelze: Länge</b>	<b>Gluma: longitud</b>	
<b>(+)</b>	<b>VG</b>					
<b>QN</b>	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
<b>29. 92-93 (*) VG</b>	<b>Grain: color after threshing</b>	<b>Grain : couleur après battage</b>	<b>Korn: Farbe nach dem Dreschen</b>	<b>Grano: color después de la recogida</b>		
<b>PQ</b>	white	blanc	weiss	blanco	Choice	1
	grey white	blanc gris	grauweiss	blanco grisáceo	Albita, PR88G20	2
	yellowish white	blanc jaunâtre	gelblichweiss	blanco amarillento	Aralba, PR88Y20	3
	light yellow	jaune clair	hellgelb	amarillo claro	Beefbuilder, Gardavan	4
	orange	orange	orange	naranja	Argence, PR85G85	5
	orange red	rouge orangé	orangerot	rojo anaranjado	PR82G55, PR83G66	6
	light 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
	purple	pourpre	lila	purpura		10
	black	noir	schwarz	negro		11
<b>30. 92-93 MG</b>	<b>Weight of 1000 grains</b>	<b>Poids de mille grains</b>	<b>Tausendkorngewicht</b>	<b>Peso de 1000 granos</b>		
<b>QN</b>	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
<b>31. 92-93 (+) VG</b>	<b>Grain: shape in dorsal view</b>	<b>Grain : forme de la face dorsale</b>	<b>Korn: Form in der Rückansicht</b>	<b>Grano: forma de la cara dorsal</b>		
<b>PQ</b>	narrow elliptic	elliptique étroite	schmal elliptisch	elíptica estrecha	Aneto, Vidan 697	1
	broad elliptic	elliptique large	breit elliptisch	elíptica ancha	Nectar, Nutri Honey	2
	ovate	ovale	eiförmig	oval	Bechna	3
	circular	circulaire	rund	circular		4
<b>32. 92-93 (+) VG</b>	<b>Grain: size of mark of germ</b>	<b>Grain : taille de l'empreinte du germe</b>	<b>Korn: Größe des Keimbereichs</b>	<b>Grano: tamaño de la marca del germen</b>		
<b>QN</b>	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
<b>33. 92-93 (+)</b>	<b>Grain: content of tannin</b>	<b>Grain : teneur en tannin</b>	<b>Korn: Tanningehalt</b>	<b>Grano: contenido en tanino</b>		
<b>QN</b>	absent or very low	nulle ou très bas	fehlend oder sehr gering	ausente o muy bajo	Albita	1
	medium	moyen	medium	medio	PR82G55	5
	very high	très haut	sehr hoch	muy alto	Gardavan, Nectar	9

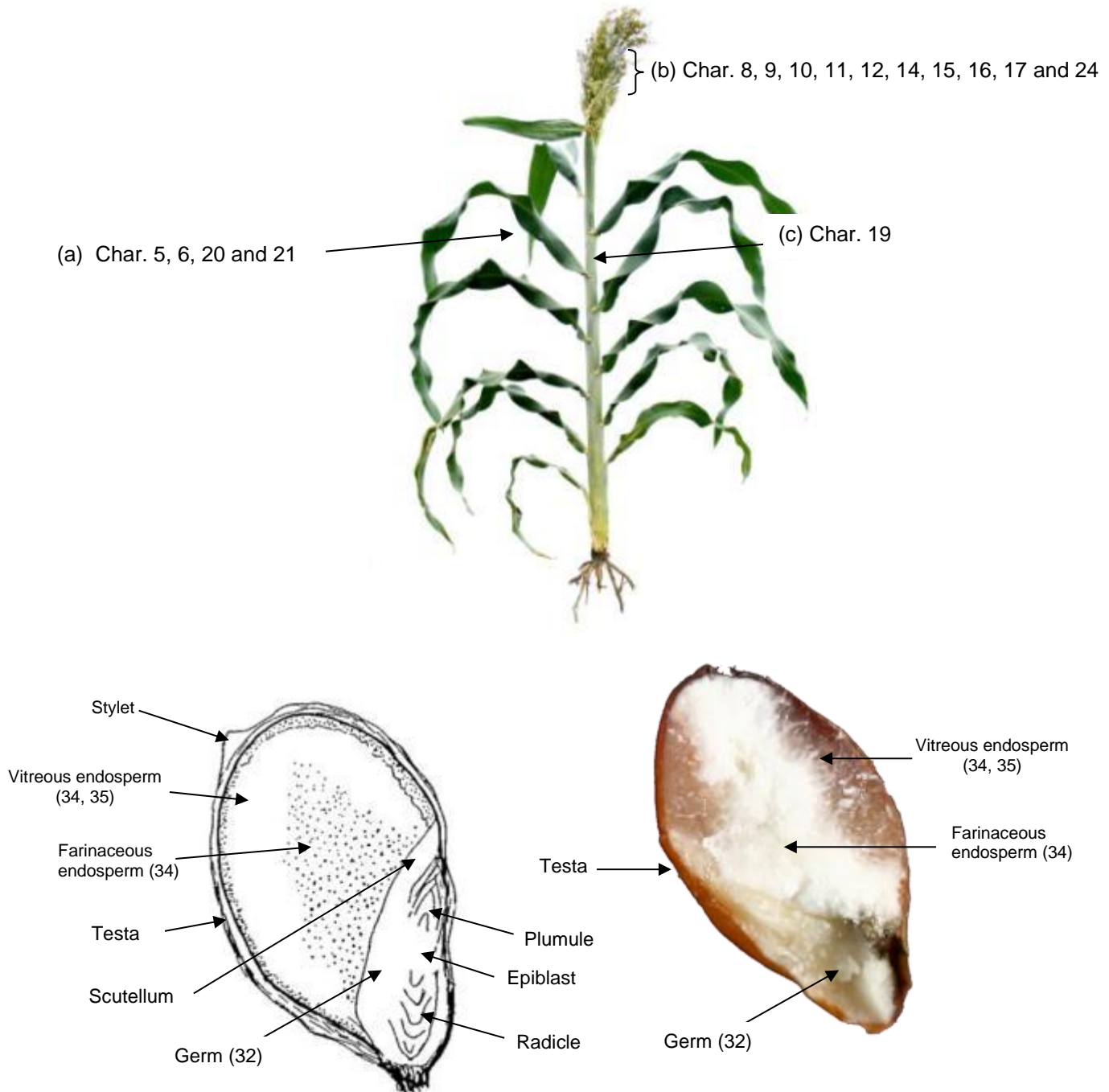
	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
<b>34. 92-93 VG (+)</b>	<b>Grain: type of endosperm</b>	<b>Grain : type d'endosperme</b>	<b>Korn: Art der Endosperm</b>	<b>Grano: tipo del endospermo</b>		
<b>QN</b>	fully vitreous	complètement vitreux	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	complètement farineux	vollmehlig	completamente harinoso	PR83G66, PR82G10	9
<b>35. 92-93 VG</b>	<b>Grain: color of vitreous albumen of endosperm</b>	<b>Grain : couleur de l'albumen vitreux de l'endosperme</b>	<b>Korn: Farbe des glasigen albumen</b>	<b>Grano: color del albumen vítreo del endospermo</b>		
<b>PQ</b>	white	blanc	weiss	blanco	Sanggat, Sweet Virginia	1
	yellow	jaune	gelb	amarillo medio	Dorado E, PR88Y20	2
	orange	orange	orange	naranja	P8500, PR83G66	3
	violet	violacé	violett	violeta	Nectar, Nicol	4
<b>36. MG/MS (+)</b>	<b>Plant: photoperiod sensitivity</b>	<b>Plante: sensibilité à la photopériode</b>	<b>Pflanze: photoperiodischen empfindlichkeit</b>	<b>Planta: sensibilidad al fotoperiodo</b>		
<b>QL</b>	insensitive	insensible	unempfindlich	insensible	Albita	1
	sensitive	sensible	empfindlich	sensible	Teide	9

## 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 top of the plant excluding flag leaf.
- (b) The observation should be made in the middle third of the main panicle.
- (c) The observation should be made just above the third leaf from the top of the plant excluding flag leaf.



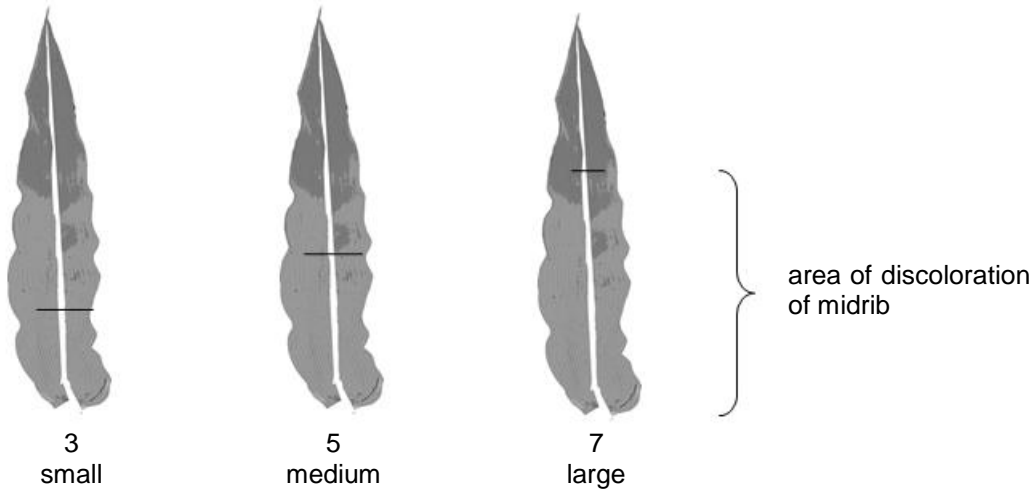


8.2 Explanations for individual characteristics

Ad. 2: Leaf: anthocyanin coloration of blade

The observation should be made on the third leaf from the bottom.

Ad. 6: Leaf: area of discoloration of midrib



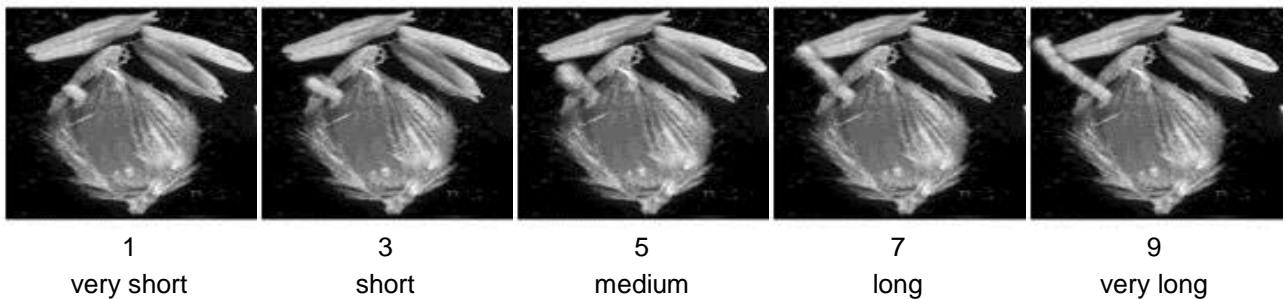
Ad. 7: Plant: time of panicle emergence

The time of panicle emergence is when the tip of the panicle has emerged from flag leaf sheath on 50% of the plants.

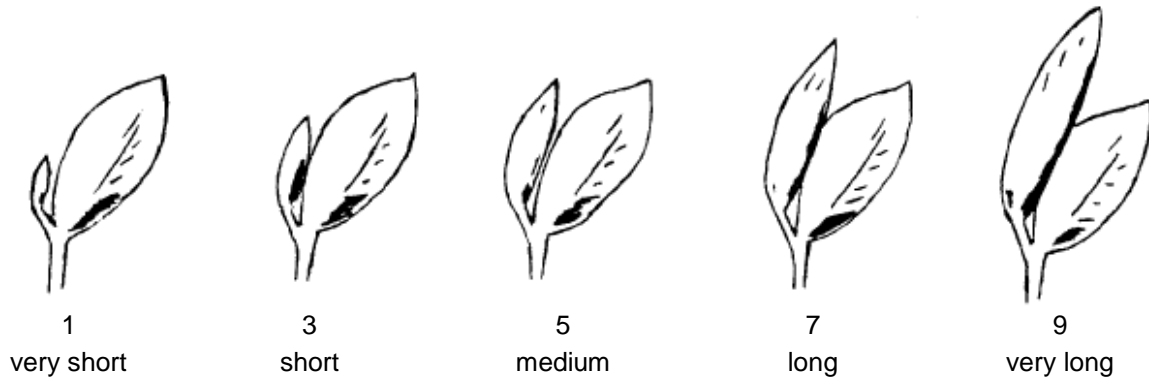
Ad. 10: Stigma: color

Impossibility to observe in case of strong anthocyanin coloration.

Ad. 11: Stigma: length



Ad. 12: Flower with pedicel: length of flower



Ad. 13: Flower: self-fertility

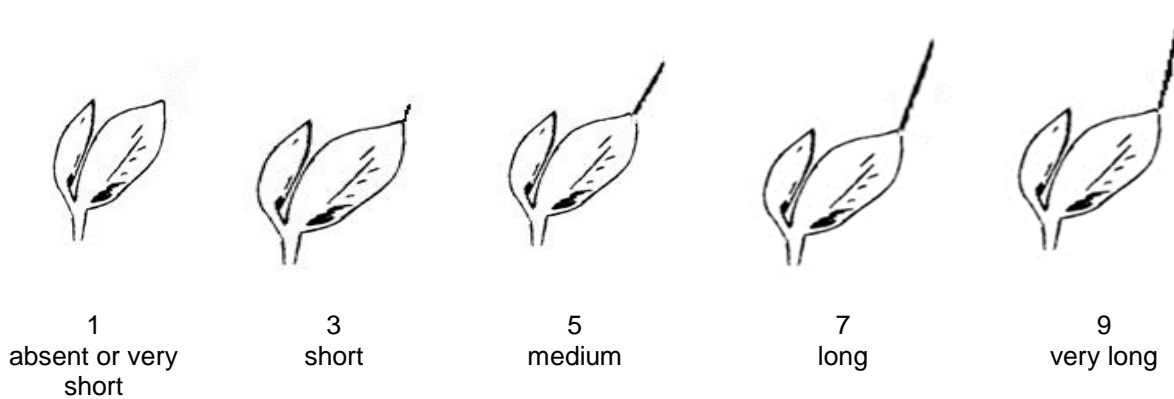
To be observed on 10 plants.

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

Panicle: self-fertility

- 1 absent or very low: 0% - 10%
- 2 medium: 11% - 70%
- 3 high: 71% - 100%

Ad. 16: Lemma: length of arista



Ad. 22: Panicle: length

The assessment must be done without the neck.

Ad. 23: Panicle: length of neck

The neck is between flag leaf and first ramification of panicle.

Ad. 26: Panicle: position of broadest part



1  
very low



2  
low



3  
medium



4  
high



5  
very high

Ad. 28: Glume: length



1  
very short  
(about 1/4 of grain covered)



3  
short  
(about 1/2 of grain covered)



5  
medium  
(about 3/4 of grain covered)



7  
long  
(as long as grain)



9  
very long

Ad. 31: Grain: shape in dorsal view



1  
narrow elliptic



2  
elliptic

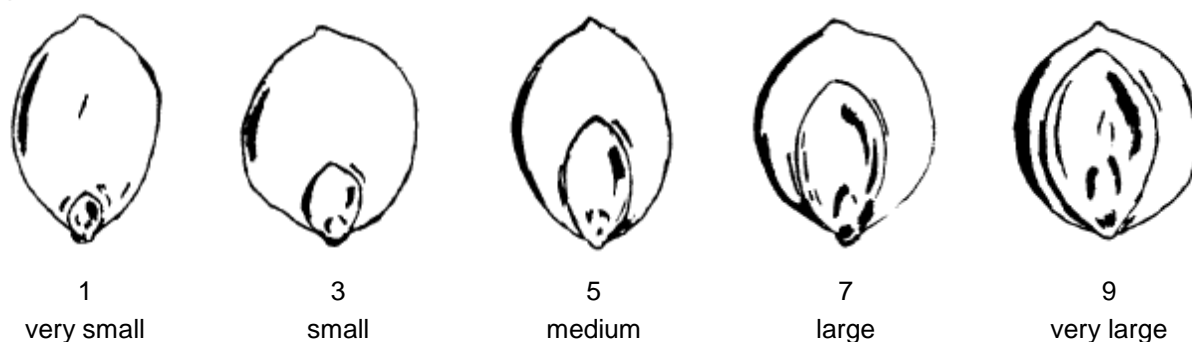


3  
oval



4  
circular

Ad. 32: Grain: size of mark of germ



Ad. 33: Grain: content of tannin

**METHOD DETECTION OF TANNIN IN SORGHUM GRAIN BY THE BLEACH TEST** (see reference in Chapter 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 variously referred to as: non-tannin, lowtannin, condensed tannin-free, or sweet sorghums.

In this Test Guidelines 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. Procedure

- 6.1 Test must be performed in duplicate.
- 6.2 Known tannin sorghum and non-tannin sorghum standards must be included each time the test is performed.
- 6.3 One hundred whole, sound sorghum grains are placed in a beaker.
- 6.4 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.
- 6.5 Incubate beaker at room temperature (20-30°C) for 20 minutes, swirling contents of beaker every 5 minutes.
- 6.6 Empty contents of beaker into tea strainer, discarding bleaching reagent. Rinse sorghum grains in tea strainer with tap water.
- 6.7 Empty contents of tea strainer onto sheet of paper towel. Spread grains out into a single layer and gently blot them dry with another piece of paper towel.
- 6.8 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.

## 7. Presentation of results

- 7.1 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.
- 7.2 Expression of results  
Results should be expressed as:  
Percentage tannin sorghum, e.g. 90% tannin sorghum

## 8. Recommended standards

It is recommended that: Batches containing  $\geq 95\%$  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 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 spoon full of caustic soda.
- 4 Any clear glass or plastic beaker or container with a diameter of around 3 cm.



1  
absent or very low



2  
medium



3  
very high

**Conclusions: Grain content of tannin**

Number of grains to be observed: 100 grains

- 1 absent or very low:  $\leq 5\%$  tannin
- 2 medium:  $>5\%$  -  $>95\%$  tannin
- 3 high:  $\geq 95\%$  tannin

Ad. 34: Grain: type of endosperm

The observation should be made on the longitudinal section.



1  
fully vitreous



3  
 $\frac{3}{4}$  vitreous



5  
half vitreous



7  
 $\frac{3}{4}$  farinaceous



9  
fully farinaceous

Ad. 36: Plant: photoperiod sensitivity

Photoperiod insensitive sorghum will initiate floral development depending only of the amount of light hours per day.

Photoperiod sensitive sorghum will not initiate floral development until the light hours during the day are more or less than 12 hours.

### 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
	<b>GERMINATION</b>
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)
	<b>LEAF DEVELOPMENT</b>
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 leaves unfolded
	<b>TILLERING</b>
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.
	<b>STEM ELONGATION</b>
30	Pseudo stem erection
31	1 <sup>st</sup> node detectable
32	2 <sup>nd</sup> node detectable
33	3 <sup>rd</sup> node detectable
34	4 <sup>th</sup> node detectable
35	
36	
37	Flag leaf just visible, still rolled
38	
39	Flag leaf stage: flag leaf fully unrolled, ligule just visible
	<b>BOOTING</b>
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**

50  
51 Beginning of heading: tip of inflorescence emerged from sheath, first spikelet just visible  
52 20% of inflorescence emerged  
53 30% of inflorescence emerged  
54 40% of inflorescence emerged  
55 50% of inflorescence emerged  
56 60% of inflorescence emerged  
57 70% of inflorescence emerged  
58 80% of inflorescence emerged  
59 End of heading: inflorescence fully emerged

**FLOWERING, ANTHESIS**

60  
61 Beginning of flowering: first anthers visible  
62  
63  
64  
65 Full flowering: 50% of anthers mature  
66  
67  
68  
69 End of flowering: all spikelets have completed flowering but some dehydrated anthers may remain.

**DEVELOPMENT OF FRUIT**

70  
71 Watery ripe: first grains have reached half their final size  
72  
73 Early milk  
74  
75 Medium milk: grain content milky, grains reached final size, still green  
76  
77 Late milk  
78  
79

**RIPENING**

80  
81  
82  
83 Early dough  
84  
85 Soft dough: grain content soft but dry. Fingernail impression not held.  
86  
87 Hard dough: grain content solid. Fingernail impression held  
88  
89 Fully ripe: grain hard, difficult to divide with thumbnail

**SENESCENCE**

90  
91  
92 Over-ripe: grain very hard cannot be dented by thumbnail  
93 Grains loosening in day-time  
94  
95  
96  
97 Plant dead and collapsing  
98  
99 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](mailto:jtaylor@postino.up.ac.za), **Method detection of tannin in sorghum grain by the bleach test** (ad.33)

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.

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)
<b>TECHNICAL QUESTIONNAIRE</b> to be completed in connection with an application for plant breeders' rights		
1. Subject of the Technical Questionnaire		
1.1 Botanical name	<input type="text" value="SORGHUM BICOLOR (L.) MOENCH"/>	
	<input type="text" value="SORGHUM SUDANENSE (PIPER) STAFF"/>	
	<input type="text" value="SORGHUM BICOLOR (L.) MOENCH x SORGHUM SUDANENSE (PIPER) STAFF"/>	
	<input type="text" value="Others (specify name):"/>	
1.2 Common name	<input type="text" value="Sorghum"/>	
	<input type="text" value="Sudan grass"/>	
	<input type="text" value="Hybrids resulting from the crossing of Sorghum bicolor and Sorghum sudanense"/>	
	<input type="text" value="Others (specify name):"/>	
2. Applicant		
Name	<input type="text"/>	
Address	<input type="text"/>	
Telephone No.	<input type="text"/>	
Fax No.	<input type="text"/>	
E-mail address	<input type="text"/>	
Breeder (if different from applicant)	<input type="text"/>	
3. Proposed denomination and breeder's reference		
Proposed denomination (if available)	<input type="text"/>	
Breeder's reference	<input type="text"/>	

#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 single hybrid male parent line

(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
<b>5.1 Leaf: color of midrib (5)</b>		
white	Dorado E, Gardavan	1 [ ]
light green		2 [ ]
yellowish white	Befbuilder, Vidan 697	3 [ ]
light yellow	PR82G55, PR87G57	4 [ ]
medium yellow	P8500	5 [ ]
dark yellow	Digestivo	6 [ ]
brownish	Teide	7 [ ]
<b>5.2 Plant: time of panicle emergence (7)</b>		
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 [ ]
<b>5.3 Stigma: color (10)</b>		
white	P8500	1 [ ]
light yellow	Albita	2 [ ]
medium yellow	Argence, Dorado E,	3 [ ]
dark yellow	Digestivo, Nutri Honey	4 [ ]
grey	Nectar, Vidan 697	5 [ ]

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

Characteristics	Example Varieties	Note
<b>5.4 Lemma: length of arista</b> <b>(16)</b>		
absent or very short	Dorado E, Grazer	1 [ ]
very short to short		2 [ ]
short	Lussi, Nectar	3 [ ]
short to medium		4 [ ]
medium	Digestivo, SF2003	5 [ ]
medium to long		6 [ ]
long	Vidan 697	7 [ ]
long to very long		8 [ ]
very long		9 [ ]
<b>5.5 Dry anther: color</b> <b>(17)</b>		
light yellow		1 [ ]
pink grey		2 [ ]
orange	Dorado DR, Gardavan	3 [ ]
orange red	Elite, PR82G55	4 [ ]
red		5 [ ]
red brown		6 [ ]
<b>5.6 Plant: length</b> <b>(18)</b>		
extremely short	Sibelus	1 [ ]
extremely short to very short	Aruski	2 [ ]
very short	PR88Y20	3 [ ]
very short to short	Albita	4 [ ]
short	PR84G62	5 [ ]
strong tendency short	PR82G55	6 [ ]
short to medium	Jumak	7 [ ]
medium	Topsilo	8 [ ]
medium to high	Zöldike	9 [ ]
strong tendency high		10 [ ]
high	Zöldozón	11 [ ]
high to very high	Rona 1	12 [ ]
very high	Agnes	13 [ ]
very high to extremely high	Gardavan	14 [ ]
extremely high		15 [ ]

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

Characteristics	Example Varieties	Note
<b>5.7 Panicle: density <u>at maturity</u></b> (25)		
very sparse	DK18, Gardavan	1 [ ]
very sparse to sparse		2 [ ]
sparse	Grazer, SF2003	3 [ ]
sparse to medium		4 [ ]
medium	Argence	5 [ ]
medium to dense		6 [ ]
dense	Nectar, PR85G85	7 [ ]
dense to very dense		8 [ ]
very dense	Albita, Velox 701	9 [ ]
<b>5.8 Panicle: position of broadest part</b> (26)		
very low		1 [ ]
low	PR84G62	2 [ ]
medium	Nutri Honey	3 [ ]
high	Beefbuilder	4 [ ]
very high	Vidan 697	5 [ ]
<b>5.9 Glume: color <u>at maturity</u></b> (27)		
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 [ ]

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

Characteristics	Example Varieties	Note
<b>5.10 Grain: color after threshing</b> <b>(29)</b>		
white	Choice	1 [ ]
grey white	Albita, PR88G20	2 [ ]
yellowish white	Aralba, PR88Y20	3 [ ]
light 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 [ ]
purple		10 [ ]
black		11 [ ]



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 <b>similar</b> variety(ies)	Describe the expression of the characteristic(s) for <b>your</b> candidate variety
<i>Example</i>	<i>Plant: time of panicle emergence</i>	<i>early</i>	<i>early to medium</i>

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.

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]

## ANNEX

## COMMENTS BY THE SUBGROUP

ITEM	COMMENTS
Front page	<b>France</b> Alternative Name: To delete "Sorgho du Soudan"
2.3	<b>Hungary</b> We would appreciate a higher amount of seed sample of parental components (0.5 kg as a minimum), as there is not so much difference in the TSW of inbred lines, hybrids and open pollinated varieties.
Char. 3 Plant: number of tillers	<b>France</b> MS/MG/VG. May be measured, or even observed, on a group of plants.  We wonder if 9 states of expression are necessary, and its consequences on the assessment of uniformity. We would be in for of 5 states instead of 9.  <b>Hungary</b> An explanation in Chapter 8.2 should be welcomed concerning this characteristic.  <b>Germany</b> To explain whether there is a minimum height necessary to be counted as a tiller (e.g. one third of height of plant) in order to avoid counting of rudimentary tillers  <b>Kenya</b> NB. It will be good to state that tillering data should not be collected on plants whose apical bud has been damaged by pests at early growth, since tillering is enhanced in such situations.
Char. 6 Plant: time of panicle emergence	<b>China</b> We suggest to use MG only.
Char. 9 Stigma: anthocyanin coloration Char. 10 Stigma: color	<b>China</b> 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 " <u>varieties with anthocyanin coloration absent or weak only</u> : stigma: color.
Char.11 Stigma: length	<b>Kenya</b> Due to minor differences on the length of stigma in some varieties, theres need to have fewer states that are well illustrated.
Char. 12 Flower with pedicel: Length of flower	<b>Kenya</b> Indicate the part to be examined with an arrow.
Char. 13 Flower: self-fertility	<b>Hungary</b> Flower: self-fertility": We would prefer characteristic "Flower: fertility" instead of the suggested one. A sterile female line (A-line) of a hybrid variety always has its fertile version (B-line), and usually there is no other difference between the A-line and the B-line than the sterility/fertility, which is definitely not "selffertility". However, I have to admit that we have no idea, how to observe characteristic "Flower: fertility".

<p>Char. 16 Dry stamen: color</p>	<p><b>France</b> France can provide an example variety for states 2 and 5.</p> <p><b>Germany</b> To check whether to observe at stage 65-69 instead 70-75.</p>
<p>Char. 18 Plant: length</p>	<p>France To check whether to observe at stage 69-75 instead 70-75 Some inbred lines are shorter than hibryd Sibelius and Arusk, know in France as around 3-4. We will propose a range of example varieties, specially for the shortest states. Would it be possible, before flying to Argentina, to get the Spanish range so we can check if it suits to French range of varieties?</p> <p><b>GERMANY</b> to delete 'strong tendency short' (6) and 'strong tendency high' (10) ['tendency' is unclear regarding direction up resp. down: 'strong tendency short' could be above or below 'strong tendency high' could be above or below 'high' (also in proj.3 'tendency' is not the same way)] - to replace hyphens in states of expressions by 'to'</p> <p><b>Japan</b> Plant: length is measured by extending the leaf. So, this characteristic is affected by length. And this characteristic may be affected by panicle length. If we keep 15 notes, "culm: length" is appropriate.</p>
<p>Char. 19 Stem: diameter</p>	<p>France: To check whether to observe at stage 69-85 instead 75-85 Is it easy to score this characteristics as a VG one and to use a 9 note scale?</p>
<p>Char. 23 Panicle: length of neck</p>	<p><b>Japan</b> 9 notes are appropriate. "Neck of panicle: length above flag sheath" is appropriate.</p>
<p>Char. 29 Grain: color after threshing</p>	<p><b>Japan</b> Example varieties of "purple" and "black" are needed.</p>
<p>Char. 33 Grain: content of tannin</p>	<p><b>France</b> The protocole added in the explanations is suitable for presence of testa, not for evaluation of tannin content (although both characteristics are closely linked).  5 states of expression will be more realistic.</p>
<p>Char. 34 Grain: type of endosperm</p>	<p><b>China</b> 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.</p>
<p>Char. 35 Grain: color of vitreous albumen of endosperm</p>	<p><b>Germany</b> To read "Grain: color of vitreous endosperm" to be in line with Char. 34.</p>
<p>Char. 36 Plant: photoperiod sensitivity</p>	<p><b>Hungary</b> We have no idea how to observe this characteristic, so an explanation in Chapter 8.2 should be warmly welcomed.</p>

	<b>Kenya</b> Include - Grain: Shape in Profile view Consider including the above characteristic as provided in the previous version of 1989 - TG/122/3.
Ad. 13	<b>France</b> <b>In doubtful cases the heads....</b>
Ad. 36	<b>Germany</b> to check whether it should read '... at least 12 hours.'
Technical questionnaire	<b>Germany</b> Botanical names: to harmonize with botanical names at front page.

[End of Annex and of document]