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| Geneva | | | | | | | | |
| DRAFT | | |
|  | **SORGHUM**  UPOV Code: SRGHM  *Sorghum bicolor*  *Sorghum xdrummondii* | | | | | [[1]](#footnote-1)\* |

**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:\*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *Botanical name* | *English* | *French* | *German* | *Spanish* |
| *Sorghum bicolor Sorghum xdrummondii* | 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.

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ANNEX COMMENTS BY THE SUBGROUP

# Subject of these Test Guidelines

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

# 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.

# 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.

# 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:

1. description of parental lines according to the Test Guidelines;
2. 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;
3. 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;
4. 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.

# 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”.

# 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)

# Table of Characteristics/Tableau des caractères/Merkmalstabelle/Tabla de caracteres

|  |  | English | français | deutsch | español | Example Varieties Exemples Beispielssorten Variedades ejemplo | Note/ Nota |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **1.** | **12-14 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** |  | 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 |
| **3.** | **41-49 MS** | **Plant: number of tillers** | **Plante: nombre de tiges** | **Rispe: Anzahl der Bestockungstriebe** | **Planta: número de tallos** |  |  |
| **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 |
| **4.** | **45-59 VG** | **Leaf: intensity of green color** | **Feuille: intensité de la couleur verte** | **Blatt: Grünfärbung der Blattspreite** | **Hoja: intensidad del color verde** |  |  |
| **QN** |  | 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 |
| **5. (\*)** | **45-59 VG** | **Leaf: color of midrib** | **Feuille: couleur de la nervure principale** | **Blatt: Farbe der Mittelrippe** | **Hoja: color de la nerviadura principal** |  |  |
| **PQ** | **(a)** | white | blanc | weiss | blanco | Dorado E, Gardavan | 1 |
|  |  | light green | vert clair | hellgrün | verde claro |  | 2 |
|  |  | yellowish white | blanc jaunâtre | gelblich weiβ | 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 |
| **6.  (+)** | **45-59 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** | **(a)** | 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 |
| **7. (\*) (+)** | **51 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 |
| **8.** | **65-69 VG** | **Glume: anthocyanin coloration** | **Glume : pigmentation anthocyanique** | **Hüllspelze: Anthocyanfärbung** | **Gluma: pigmentación antociánica** |  |  |
| **QN** | **(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 |
| **9.** | **65-69 VG** | **Stigma: anthocyanin coloration** | **Stigmate : pigmentation anthocyanique** | **Narbe: Anthocyanfärbung** | **Estigma: pigmentación antocianica** |  |  |
| **QN** | **(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 |
| **10. (\*) (+)** | **65-69 VG** | **Stigma: color** | **Stigmate: couleur** | **Narbe: Farbe** | **Estigma: color** |  |  |
| **PQ** | **(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 |
| **11.  (+)** | **65-69 VG** | **Stigma: length** | **Stigmate : longueur** | **Narbe: Länge** | **Estigma: longitud** |  |  |
| **QN** | **(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 |
| **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** | **(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 |
| **13.  (+)** | **65-69 VG** | Flower: self-fertility | Fleur : autofertilité | Blüte: Selbstfertilität | Flor: Autofertilidad |  |  |
| **PQ** |  | 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 |
| **14.** | **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** | **(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 |
| **15.** | **69 VG** | **Panicle: density at end of flowering** | **Panicule : compacité à la fin de la floraison** | **Rispe: Dichte zum Ende der Blüte** | **Panícula: densidad al final de la floración** |  |  |
| **QN** | **(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 |
| **16. (\*) (+)** | **69-75 VG** | **Lemma: length of arista** | **Glumelle : longueur de l’arista** | **Lemma: Länge arista** | **Lema: longitud de la arista** |  |  |
| **QN** | **(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 |
| **17.  (\*)** | **70-75 VG** | **Dry anther: color** | **Anthère sèche : couleur** | **Dry anthere: Farbe** | **Antera seca: color** |  |  |
| **PQ** | **(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 |
| **18. (\*)** | **75-85 MS** | **Plant: length** | **Plante : longueur** | **Pflanze: länge** | **Planta: altura total** |  |  |
| **QN** |  | 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 |
| **19.** | **75-85 VG/ MS** | **Stem: diameter** | **Tige : diamètre** | **Stengel: Durchmesser** | **Tallo: diámetro** |  |  |
| **QN** | **(c)** | small | petit | klein | pequeño | SF2003, Vidan 697 | 3 |
|  |  | medium | moyen | mittel | medio | Celliu, Double TX, PR88Y20 | 5 |
|  |  | large | grand | groß | grande | Elite | 7 |
| **20.** | **75-85 VG/ MS** | **Leaf: length of blade** | **Feuille : longueur du limbe** | **Blatt: Länge der Spreite** | **Panícula: longitud del limbo** |  |  |
| **QN** | **(a)** | 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 |
| **21.** | **75-85 VG/ MS** | **Leaf: width of blade** | **Feuille : largeur du limbe** | **Blatt: Breite der Spreite** | **Hoja: anchura del limbo** |  |  |
| **QN** | **(a)** | 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** | **Panicule : longueur** | **Rispe: Länge** | **Panícula: longitud** |  |  |
| **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** | **Panicle: length of neck** | **Panicule : longueur du col** | **Rispe: Länge des halses** | **Panícula: longitud del cuello** |  |  |
| **QN** |  | 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 |
| **24.** | **75-85 VG/ MS** | **Panicle: length of primary lateral branches** | **Panicule : longueur des branches latérales primaires** | **Rispe: Länge der primäre seitenäste** | **Panícula: longitud de las ramas laterales primarias** |  |  |
| **QN** | **(b)** | short | courte | kurz | corto | Beefbuilder, Nectar | 3 |
|  |  | medium | moyenne | mittel | medio | Grazer, Nicol | 5 |
|  |  | long | longue | lang | largo | Gardavan | 7 |
| **25. (\*)** | **92-93 VG** | **Panicle: density at maturity** | **Panicule : compacité à 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 | Argence | 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: position of broadest part** | **Panicule : position de la plus large part** | **Rispe: Position des breitesten Bereichs** | **Panícula: posición de la parte más ancha** |  |  |
| **PQ** |  | 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 |
| **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 |
| **29. (\*)** | **92-93 VG** | **Grain: color after threshing** | **Grain : couleur après battage** | **Korn: Farbe nach dem Dreschen** | **Grano: color después de la recogida** |  |  |
| **PQ** |  | 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 |
| **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 | 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 |
| **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 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 |
| **34.  (+)** | **92-93 VG** | **Grain: type of endosperm** | **Grain : type d’endosperme** | **Korn: Art der Endosperm** | **Grano: tipo 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 of endosperm** | **Grain : couleur de l´albumen vitreux de l’endosperme** | **Korn: Farbe des glasigen albumen** | **Grano: color del albumen vitroso del endospermo** |  |  |
| **PQ** |  | 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 |
| **36.   (+)** | **MG/MS** | **Plant: photoperiod sensitivity** | **Plante: sensibibilité à la photopériode** | **Pflanze: photoperiodischen empfindlichkeit** | **Planta: sensibilidad al fotoperiodo** |  |  |
| **QL** |  | insensitive | insensible | unempfindlich | insensible | Albita | 1 |
|  |  | sensitive | sensible | empfindlich | sensible | Teide | 9 |

# 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:

1. The observation should be made on the third leaf from the top of the plant excluding flag leaf.
2. The observation should be made in the middle third of the main panicle.
3. The observation should be made just above the third leaf from the top of the plant excluding flag leaf.

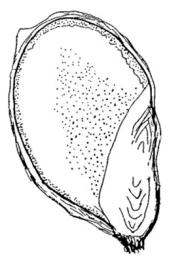


1. Char. 5, 6, 20 and 21

(b) Char. 8, 9, 10, 11, 12, 14, 15, 16, 17 and 24

(c) Char. 19





Germ (32)

Germ (32)

Radicle

Epiblast

Plumule

Scutellum

Testa

Farinaceous endosperm (34)

Stylet

Vitreous endosperm (34, 35)

Vitreous endosperm (34, 35)

Farinaceous endosperm (34)

Testa

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

|  |  |  |
| --- | --- | --- |
| area of discoloration of midrib | | |
| 3 | 5 | 7 |
| small | medium | large |

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

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

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

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

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  |  |  |  |  |
| 1 | 3 | 5 | 7 | 9 |
| absent or very short | short | medium | long | very long |

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 | 2 | 3 | 4 | 5 |
| very low | low | medium | high | very high |

Ad. 28: Glume: length

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

Ad. 31: Grain: shape in dorsal view

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| 1 | 2 | 3 | 4 |
| narrow elliptic | elliptic | oval | 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 Chapter 9)

1. **Scope**

Applicable to whole grain sorghum

1. **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 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.

1. **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.

1. **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.

1. **Apparatus**

Glass beakers (50 ml)

Tea strainer

Aluminum foil

Paper towel

1. **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 gentle blot them dry with another piece of paper towel.

6.8 Count tannin sorghum grains. Tannin sorghum grains are those grains that are **black ove**r **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.

1. **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

1. **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 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.

|  |  |  |
| --- | --- | --- |
| IMG_8937 | C:\sorgo upov\2014\IMG_6697 - copia.JPG | IMG_8910 |
| 1 | 2 | 3 |
| absent or very low | medium | very high |

**Conclusions: Grain content of tannin**

Number of grains to be observed: 100 grains

1 absent or very low: ≤5% tannin

2 medium: >5% - >95% tannin

3 high: ≥95% tannin

Ad. 34: Grain: type of endosperm

The observation should be made on the longitudinal section.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| \\JESUSMERIDA-PC\Users\Public\IMG_7709.jpg | D:\FOTOS SORGO PROTOCOLO\RETOCADAS YA\IMG_7722.jpg | D:\FOTOS SORGO PROTOCOLO\RETOCADAS YA\IMG_7730.JPG | D:\FOTOS SORGO PROTOCOLO\RETOCADAS YA\IMG_7724.jpg | D:\FOTOS SORGO PROTOCOLO\RETOCADAS YA\IMG_7702.jpg |
| 1 | 3 | 5 | 7 | 9 |
| fully vitreous | ¾ vitreous | half vitreous | ¾ farinaceous | 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** |
|  | **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 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** |
| 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 |

# 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)

# 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.) MOENCH* | | | | | |  | | |
|  | | |  | | | | | |  | | |
|  | | | SORGHUM SUDANENSE (PIPER) STAPF | | | | | |  | | |
|  | | |  | | | | | |  | | |
|  | | | SORGHUM BICOLOR (L.) MOENCH x SORGHUM SUDANENSE (PIPER) STAFF | | | | | |  | | |
|  | | |  | | | | | |  | | |
|  | | | Others (specify name): | | | | | |  | | |
|  | | |  | | | | | |  | | |
| 1.2 Common name | | | Sorghum | | | | | |  | | |
|  | | |  | | | | | |  | | |
|  | | | Sudan grass | | | | | |  | | |
|  | | |  | | | | | |  | | |
|  | | | Hybrids resulting from the crossing of Sorghum bicolor and Sorghum sudanense | | | | | |  | | |
|  | | |  | | | | | |  | | |
|  | | | Others (specify name): | | | | | |  | | |
|  | | |  | | | | | | | |  |
|  | | |  | | | | | |  | | |
| 2. Applicant | | | | | | | | | | | |
|  | | |  | | | | | |  | | |
| Name | | |  | | | | | |  | | |
|  | | |  | | | | | |  | | |
| Address | | |  | | | | | |  | | |
|  | | |  | | | | | |  | | |
| Telephone No. | | |  | | | | | |  | | |
|  | | |  | | | | | |  | | |
| Fax No. | | |  | | | | | |  | | |
|  | | |  | | | | | |  | | |
| E-mail address | | |  | | | | | |  | | |
|  | | |  | | | | | |  | | |
| Breeder (if different from applicant) | | | | | | | | |  | | |
|  | | |  | | | | | |  | | |
|  | | |  | | | | | |  | | |
|  | | |  | | | | | |  | | |
| 3. Proposed denomination and breeder’s reference | | | | | | | | | | | |
|  | | |  | | | | | |  | | |
| Proposed denomination | | |  | | | | | |  | | |
| (if available) | | |  | | | | | |  | | |
| Breeder’s reference | | |  | | | | | |  | | |
|  | | |  | | | | | |  | | |
| [[2]](#footnote-2)#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)   |  | | --- | |  | | | | | | | | | | | | |
| 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)   |  | | --- | |  | | | | | | | | | | | | |
| 5. Characteristics of the variety to be indicated (the number in brackets refers to the corresponding characteristic in Test Guidelines; please mark the note which best corresponds). | | | | | | | | | | | |
|  | Characteristics | | | | | | Example Varieties | | | Note | |
| **5.1 (5)** | Leaf: color of midrib | | | | | |  | | |  | |
|  | 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 [ ] | |
| 5.2 (7) | 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 | | | | | |  | | |  | |
|  | white | | | | | | P8500 | | | 1 [ ] | |
|  | light yellow | | | | | | Albita | | | 2 [ ] | |
|  | medium yellow | | | | | | Argence, Dorado E, | | | 3 [ ] | |
|  | dark yellow | | | | | | Digestivo, Nutri Honey | | | 4 [ ] | |
|  | grey | | | | | | Nectar, Vidan 697 | | | 5 [ ] | |
|  | Characteristics | | | | | | Example Varieties | | | Note | |
| 5.4 (16) | Lemma: length of arista | | | | | |  | | |  | |
|  | 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 [ ] | |
| 5.5 (17) | Dry anther: color | | | | | |  | | |  | |
|  | light yellow | | | | | |  | | | 1 [ ] | |
|  | pink grey | | | | | |  | | | 2 [ ] | |
|  | orange | | | | | | Dorado DR, Gardavan | | | 3 [ ] | |
|  | orange red | | | | | | Elite, PR82G55 | | | 4 [ ] | |
|  | red | | | | | |  | | | 5 [ ] | |
|  | red brown | | | | | |  | | | 6 [ ] | |
| 5.6 (18) | Plant: length | | | | | |  | | |  | |
|  | 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 | | | | | | Zöldozön | | | 11[ ] | |
|  | high to very high | | | | | | Rona 1 | | | 12[ ] | |
|  | very high | | | | | | Agnes | | | 13[ ] | |
|  | very high to extremely high | | | | | | Gardavan | | | 14[ ] | |
|  | extremely high | | | | | |  | | | 15[ ] | |
|  | Characteristics | | | | | | Example Varieties | | | Note | |
| **5.7 (25)** | Panicle: density at maturity | | | | | |  | | |  | |
|  | 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 [ ] | |
| 5.8 (26) | Panicle: position of broadest part | | | | | |  | | |  | |
|  | very low | | | | | |  | | | 1 [ ] | |
|  | low | | | | | | PR84G62 | | | 2 [ ] | |
|  | medium | | | | | | Nutri Honey | | | 3 [ ] | |
|  | high | | | | | | Beefbuilder | | | 4 [ ] | |
|  | very high | | | | | | Vidan 697 | | | 5 [ ] | |
| **5.9 (27)** | Glume: color at maturity | | | | | |  | | |  | |
|  | 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 [ ] | |
|  | Characteristics | | | | | | Example Varieties | | | Note | |
| 5.10 (29) | Grain: color after threshing | | | | | |  | | |  | |
|  | 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[ ] | |
| 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: | | | | | | | | | | | |
| [[3]](#footnote-3)#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. | | | | | | | | | | | |
| 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 | **France**  Alternative Name:  To delete “Sorgho du Soudan” |
| 2.3 | **Hungary**  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 | **France**  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.  **Hungary**  An explanation in Chapter 8.2 should be welcomed concerning this characteristic.   |  | | --- | | **Germany**  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  **Kenya**  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 | **China**  We suggest to use MG only. |
| Char. 9  Stigma: anthocyanin coloration  Char. 10  Stigma: color | **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.11  Stigma: length | **Kenya**  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 | **Kenya**  Indicate the part to be examined with an arrow. |
| Char. 13  Flower:  self-fertility | **Hungary**  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”. |
| Char. 16  Dry stamen: color | **France**  France can provide an example variety for states 2 and 5.  **Germany**  To check whether to observe at stage 65-69 instead 70-75. |
| Char. 18  Plant: length | 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?   |  | | --- | | **GERMANY**  to delete 'strong tendency short' (6) and 'strong tendency high' (10) ['tendency' is unclear regarding direction up rsp. down: 'strong tendency short' could be above or below 'short', 'strong tendency high' could be above or below 'high' (also in proj.3 'tendency' is not used in the same way)]  - to replace hyphens in states of expressions by 'to'  **Japan**  Plant: length is measured by extending the leaf. So, this characteristic is affected by leaf length.  And this characteristic may be affected by panicle length.  If we keep 15 notes, "culm: length" is appropriate. | |
| Char. 19  Stem: diameter | France:  To check whether to observe at stage 69-85 instead 75-85  Is it easy to score this characterististics as a VG one and to use a 9 note scale? |
| Char. 23  Panicle: length of neck | **Japan**  9 notes are appropriate.  "Neck of panicle: length above flag sheath" is appropriate. |
| Char. 29  Grain: color after threshing | **Japan**  Example varieties of "purple" and "black" are needed. |
| Char. 33  Grain: content of tannin | **France**  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. |
| Char. 34  Grain: type 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 of endosperm | **Germany**  To read ‘'Grain: color of vitreous endosperm' to be in line with Char. 34. |
| Char. 36  Plant: photoperiod sensitivity | **Hungary**  We have no idea how to observe this characteristic, so an explanation in Chapter 8.2 should be warmly welcomed. |
|  | **Kenya**  Include - Grain: Shape in Profile view  Consider including the above characteristic as provided in the previous version of 1989 - TG/122/3. |
| Ad. 13 | **France**  **In doubtful cases the heads….** |
| Ad. 36 | **Germany**  to check whether it should read '… at least 12 hours.' |
| Technical questionnaire | **Germany**  Botanical names: to harmonize with botanical names at front page. |

[End of Annex and of document]

1. \* 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.] [↑](#footnote-ref-1)
2. # Authorities may allow certain of this information to be provided in a confidential section of the Technical Questionnaire. [↑](#footnote-ref-2)
3. # Authorities may allow certain of this information to be provided in a confidential section of the Technical Questionnaire. [↑](#footnote-ref-3)