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|  |  | E  TG/122/4  **ORIGINAL:** English  DATE: 2015-03-25 |
| INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS | | |
| Geneva | | |

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|  | **SORGHUM**  UPOV Code: SRGHM\_BIC; SRGHM\_DRU  *Sorghum bicolor* (L.) Moench;  *Sorghum ×drummondii* (Steud.) Millsp. & Chase | [[1]](#footnote-1)\* |

**GUIDELINES**

**FOR THE CONDUCT OF TESTS**

**FOR DISTINCTNESS, UNIFORMITY AND STABILITY**

Alternative Names:\*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *Botanical name* | *English* | *French* | *German* | *Spanish* |
| *Sorghum bicolor* (L.) Moench*, Sorghum dochna* (Forssk.) Snowden, *Sorghum saccharatum* (L.) Moench, *Sorghum technicum* Batt. & Trab., *Sorghum vulgare* Pers. | Broomcorn, Durra, Feterita,  Forage Sorghum, Grain sorghum, Great Millet,  Kaffir-corn, Milo, Shallu, Sorghum, Sweet sorghum | Gros mil, Sorgho | Mohrenhirse | Daza, Sorgo,  Sorgo forrajero |
| *Sorghum ×drummondii* (Steud.) Millsp. & Chase, *Sorghum bicolor* (L.) Moench x *S. sudanense* (Piper) Stapf, *Sorghum bicolor* var. sudanense, *Sorghum saccharatum* (L.) Moench x *S. sudanense* (Piper) Stapf, *Sorghum sudanense* (Piper) Stapf, *Sorghum vulgare* Pers. x *S. sudanense* (Piper) Stapf | Chicken-corn, Shattercane, Sordan,  Sorghum x Sudan Grass, Sorghum-sudangrass, Sudan grass | Sorgho menu, Sorgho x Sorgho du Soudan | Mohrenhirse x Sudangras, Sudangrass | Pasto del Sudán, Pasto Sudán, Sorgo x Pasto del Sudán, Sudangrass |

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| --- |
| 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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# Subject of these Test Guidelines

These Test Guidelines apply to all varieties of *Sorghum bicolor* (L.) Moench and *Sorghum ×drummondii* (Steud.) Millsp. & 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, the parent lines and the formula may be used according to the following recommendations:

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

(ii) check of the originality of the parent lines in comparison with the variety collection, based on the characteristics in Chapter 7, in order to identify similar parent lines;

(iii) check of the originality of the hybrid formula in relation to the hybrids in the variety collection, taking into account the most similar lines; and

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

Further guidance is provided in documents TGP/9 “Examining Distinctness” and TGP/8 “Trial Design and Techniques Used in the Examination of Distinctness, Uniformity and Stability”.

### 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: Unless otherwise indicated, for the purposes of distinctness, all observations on single plants should be made on 10 plants or parts taken from each of 10 plants and any other observations made on all plants in the test, disregarding any off-type plants.

4.1.4.2 Other types of hybrids: Unless otherwise indicated, for the purposes of distinctness, all observations on single plants should be made on 20 plants or parts taken from each of 20 plants and any other observations made on all plants in the test, disregarding any off-type plants.

4.1.4.3 Open-pollinated varieties: Unless otherwise indicated, for the purposes of distinctness, all observations on single plants should be made on 40 plants or parts taken from each of 40 plants and any other observations made on all plants in the test, disregarding any off-type plants.

### 4.1.5 Method of Observation

The recommended method of observing the characteristic for the purposes of distinctness is indicated by the following key in the second column of the Table of Characteristics (see document TGP/9 “Examining Distinctness”, Section 4 “Observation of characteristics”):

MG: single measurement of a group of plants or parts of plants

MS: measurement of a number of individual plants or parts of plants

VG: visual assessment by a single observation of a group of plants or parts of plants

VS: visual assessment by observation of individual plants or parts of plants

Type of observation: visual (V) or measurement (M)

“Visual” observation (V) is an observation made on the basis of the expert’s judgment. For the purposes of this document, “visual” observation refers to the sensory observations of the experts and, therefore, also includes smell, taste and touch. Visual observation includes observations where the expert uses reference points (e.g. diagrams, example varieties, side-by-side comparison) or non-linear charts (e.g. color charts). Measurement (M) is an objective observation against a calibrated, linear scale e.g. using a ruler, weighing scales, colorimeter, dates, counts, etc.

Type of record: for a group of plants (G) or for single, individual plants (S)

For the purposes of distinctness, observations may be recorded as a single record for a group of plants or parts of plants (G), or may be recorded as records for a number of single, individual plants or parts of plants (S). In most cases, “G” provides a single record per variety and it is not possible or necessary to apply statistical methods in a plant-by-plant analysis for the assessment of distinctness.

In cases where more than one method of observing the characteristic is indicated in the Table of Characteristics (e.g. VG/MG), guidance on selecting an appropriate method is provided in document TGP/9, Section 4.2.

## 4.2 Uniformity

4.2.1 It is of particular importance for users of these Test Guidelines to consult the General Introduction prior to making decisions regarding uniformity. However, the following points are provided for elaboration or emphasis in these Test Guidelines:

4.2.2 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) Stigma: color (characteristic 10)

(c) Flower: self-fertility (characteristic 13)

(d) Plant: length (characteristic 18)

(e) Panicle: density at maturity (characteristic 25)

(f) Panicle: position of broadest part (characteristic 26)

(g) Grain: color (characteristic 29)

(h) Plant: photoperiod sensitivity (characteristic 36)

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 antociánica 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 | intensa | Piper | 7 |
|  |  | very strong | très forte | sehr stark | muy intensa |  | 9 |
| **2.  (+)** | **15 VG** | **Leaf: anthocyanin coloration of blade** | **Feuille : pigmentation anthocyanique du limbe** | **Blatt: Anthocyanfärbung der Spreite** | **Hoja: pigmentación antociánica 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 | intensa |  | 7 |
|  |  | very strong | très forte | sehr stark | muy intensa |  | 9 |
| **3.  (+)** | **41-49 MS/ MG/ VG** | **Plant: number of tillers** | **Plante : nombre de talles** | **Pflanze: Anzahl Bestockungstriebe** | **Planta: número de macollos** |  |  |
| **QN** |  | absent or very few | nul ou très petit | fehlend oder sehr wenige | nulo o muy bajo | PR83G66, Velox 701 | 1 |
|  |  | few | petit | wenige | bajo | Gardavan, PR82G10 | 2 |
|  |  | medium | moyen | mittel | medio | Nutri Honey | 3 |
|  |  | many | grand | viele | alto | NS-Dzïn, Zöldike | 4 |
|  |  | very many | très grand | sehr viele | muy alto |  | 5 |
| **4.** | **45-59 VG** | **Leaf: intensity of green color** | **Feuille : intensité de la couleur verte** | **Blatt: Intensität der Grünfärbung** | **Hoja: intensidad del color verde** |  |  |
| **QN** | **(a)** | very light | très faible | sehr hell | muy claro |  | 1 |
|  |  | light | faible | hell | claro | Nectar | 2 |
|  |  | medium | moyenne | mittel | medio | Grazer, P8500 | 3 |
|  |  | dark | forte | dunkel | oscuro | GK ZSófia | 4 |
|  |  | very dark | très forte | sehr dunkel | muy oscuro |  | 5 |
| **5. (\*)** | **45-59 VG** | **Leaf: color of midrib** | **Feuille : couleur de la nervure médiane** | **Blatt: Farbe der Mittelrippe** | **Hoja: color del nervio central** |  |  |
| **PQ** | **(a)** | white | blanc | weiß | blanco | Dorado E, Gardavan | 1 |
|  |  | yellowish white | blanc jaunâtre | gelblich weiß | blanco amarillento | Beefbuilder, Vidan 697 | 2 |
|  |  | light green | vert clair | hellgrün | verde claro |  | 3 |
|  |  | light yellow | jaune clair | hellgelb | amarillo claro | PR82G55, PR87G57 | 4 |
|  |  | medium yellow | jaune moyen | 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 décoloration de la nervure médiane** | **Blatt: farbloser Bereich der Mittelrippe** | **Hoja: zona descolorida del nervio central** |  |  |
| **QN** | **(a)** | absent or very small | nulle ou très petite | fehlend oder sehr klein | ausente o muy pequeña | Balto | 1 |
|  |  | small | petite | klein | pequeña |  | 3 |
|  |  | medium | moyenne | mittel | mediana | Super Sile 20 | 5 |
|  |  | large | grande | groß | grande | Primsilo | 7 |
|  |  | very large | très grande | sehr groß | muy grande |  | 9 |
| **7. (\*) (+)** | **51 MG/ MS** | **Plant: time of panicle emergence** | **Plante : époque de l’apparition de la panicule** | **Pflanze: Zeitpunkt des Rispenschiebens** | **Planta: época de aparición de las panículas** |  |  |
| **QN** |  | very early | très précoce | sehr früh | muy temprana | Ludan | 1 |
|  |  | early | précoce | früh | temprana | Artaban, Artigas | 3 |
|  |  | medium | moyenne | mittel | media | 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 | intensa |  | 7 |
|  |  | very strong | très forte | sehr stark | muy intensa |  | 9 |
| **9.** | **65-69 VG** | **Stigma: anthocyanin coloration** | **Stigmate : pigmentation anthocyanique** | **Narbe: Anthocyanfärbung** | **Estigma: pigmentación antociánica** |  |  |
| **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 | intensa |  | 7 |
|  |  | very strong | très forte | sehr stark | muy intensa |  | 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 | 2 |
|  |  | medium | moyen | mittel | mediano | Dorado E, Nutri Honey | 3 |
|  |  | long | long | lang | largo | Arfrio, PR82G55 | 4 |
|  |  | very long | très long | sehr lang | muy largo |  | 5 |
| **12.   (+)** | **65-69 VG** | **Flower with pedicel: length of flower** | **Fleur avec pédicelle : longueur de la fleur** | **Gestielte Blüte: Länge der Blüte** | **Flor con pedicelo: longitud de la flor** |  |  |
| **QN** | **(b)** | very short | très courte | sehr kurz | muy corta |  | 1 |
|  |  | short | courte | kurz | corta | Nicol, PR82G55 | 3 |
|  |  | medium | moyenne | mittel | mediana | Aneto, Gardavan | 5 |
|  |  | long | longue | lang | larga | SF2003 | 7 |
|  |  | very long | très longue | sehr lang | muy larga |  | 9 |
| **13. (\*) (+)** | **65-69 VG** | Flower: self-fertility | **Fleur : autogamie** | Blüte: Selbstbefruchtung | Flor: autofertilidad |  |  |
| **QN** |  | absent or very low | nulle ou très faible | fehlend oder sehr gering | ausente o muy baja |  | 1 |
|  |  | medium | moyenne | mittel | media |  | 2 |
|  |  | high | élevée | hoch | alta | Aneto, P8500 | 3 |
| **14.** | **69 VG** | **Glume: color at end of flowering** | **Glume : couleur à la fin de la floraison** | **Hüllspelze: Farbe zum Blühende** | **Gluma: color al final de la floración** |  |  |
| **PQ** | **(b)** | light green | vert clair | hellgrün | verde claro |  | 1 |
|  |  | medium green | vert moyen | mittelgrün | verde medio |  | 2 |
|  |  | yellow green | vert‑jaune | gelbgrün | verde amarillento | 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 : densité à la fin de la floraison** | **Rispe: Dichte zum Blühende** | **Panícula: densidad al final de la floración** |  |  |
| **QN** | **(b)** | very sparse | nulle ou très faible | sehr locker | muy rala |  | 1 |
|  |  | sparse | faible | locker | rala | Digestivo, Gardavan | 3 |
|  |  | medium | moyenne | mittel | media | Argence, Nutri Honey | 5 |
|  |  | dense | forte | dicht | densa | PR82G55, PR85G85 | 7 |
|  |  | very dense | Très forte | sehr dicht | muy densa | Velox 701 | 9 |
| **16. (\*) (+)** | **69-75 VG** | **Lemma: length of arista** | **Glumelle inférieure : longueur de la barbe** | **Deckspelze: Länge der Granne** | **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 | mediana | Digestivo, SF 2003 | 5 |
|  |  | long | longue | lang | larga | Vidan 697 | 7 |
|  |  | very long | très longue | sehr lang | muy larga |  | 9 |
| **17.  (\*)** | **69-75 VG** | **Dry anther: color** | **Anthère sèche : couleur** | **Trockene Anthere: Farbe** | **Antera seca: color** |  |  |
| **PQ** | **(b)** | light yellow | jaune clair | hellgelb | amarillo claro |  | 1 |
|  |  | greyish pink | rose grisâtre | gräulich rosa | rosa grisáceo |  | 2 |
|  |  | orange | orange | orange | naranja | Dorado DR, Gardavan | 3 |
|  |  | orange red | rouge‑orangé | 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** |  |  |
| **QN** |  | dwarf | naine | Zwergform | enana |  | 1 |
|  |  | dwarf to extremely short | naine à extrêmement petite | Zwergform bis äußerst kurz | enana a extremadamente baja |  | 2 |
|  |  | extremely short | extrêmement petite | äußerst kurz | extremadamente baja | Sibelus | 3 |
|  |  | extremely short to very short | extrêmement petite à très petite | äußerst kurz bis sehr kurz | extremadamente baja a muy baja | Aruski | 4 |
|  |  | very short | très petite | sehr kurz | muy baja | PR88Y20 | 5 |
|  |  | very short to short | très petite à petite | sehr kurz bis kurz | muy baja a baja | Albita | 6 |
|  |  | short | petite | kurz | baja | PR84G62 | 7 |
|  |  | short to medium | petite à moyenne | kurz bis mittel | baja a mediana | PR82G55 | 8 |
|  |  | medium | moyenne | mittel | mediana | Jumak | 9 |
|  |  | medium to tall | moyenne à haute | mittel bis groß | mediana a alta | Topsilo | 10 |
|  |  | tall | haute | groß | alta | Zöldike | 11 |
|  |  | tall to very tall | haute à très haute | groß bis sehr groß | alta a muy alta | Zöldozön | 12 |
|  |  | very tall | très haute | sehr groß | muy alta | Rona 1 | 13 |
|  |  | very tall to extremely tall | très haute à extrêmement haute | sehr groß bis äußerst groß | muy alta a extremadamente alta | Agnes | 14 |
|  |  | extremely tall | extrêmement haute | äußerst groß | extremadamente alta | Gardavan | 15 |
|  |  | extremely tall to giant | extrêmement haute à géante | äußerst groß bis riesig | extremadamente alta a gigante |  | 16 |
|  |  | giant | géante | riesig | gigante |  | 17 |
| **19.** | **69-85 MS** | **Stem: diameter** | **Tige : diamètre** | **Stengel: Durchmesser** | **Tallo: diámetro** |  |  |
| **QN** | **(c)** | small | petit | klein | pequeño | SF2003, Vidan 697 | 3 |
|  |  | medium | moyen | mittel | mediano | Cellu, 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** | **Hoja: longitud del limbo** |  |  |
| **QN** | **(a)** | very short | très court | sehr kurz | muy corto |  | 1 |
|  |  | short | court | kurz | corto | Buggy | 3 |
|  |  | medium | moyen | mittel | mediano | Choice, Vidan 697 | 5 |
|  |  | long | long | lang | largo | SF2003 | 7 |
|  |  | very long | très long | sehr lang | muy largo |  | 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 étroit | sehr schmal | muy estrecho |  | 1 |
|  |  | narrow | étroit | schmal | estrecho | Maya, Vidan 697 | 3 |
|  |  | medium | moyen | mittel | medio | Aneto | 5 |
|  |  | broad | large | breit | ancho | Beefbuilder, P8500 | 7 |
|  |  | very broad | très large | sehr breit | muy ancho |  | 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 | mediana | 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 | nul ou très court | fehlend oder sehr kurz | ausente o muy corto | PR84G62 | 1 |
|  |  | short | court | kurz | corto | Nectar, Profus | 3 |
|  |  | medium | moyen | mittel | mediano | Nicol, SF2003 | 5 |
|  |  | long | long | lang | largo | Arlys, Vidan 697 | 7 |
|  |  | very long | très long | 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 primären Seitenäste** | **Panícula: longitud de las ramificaciones primarias** |  |  |
| **QN** | **(b)** | short | courtes | kurz | cortas | Beefbuilder, Nectar | 3 |
|  |  | medium | moyennes | mittel | medianas | Grazer, Nicol | 5 |
|  |  | long | longues | lang | largas | Gardavan | 7 |
| **25. (\*)** | **92-93 VG** | **Panicle: density at maturity** | **Panicule : densité à maturité** | **Rispe: Dichte zur Reife** | **Panícula: densidad en la madurez** |  |  |
| **QN** |  | very sparse | très faible | sehr locker | muy rala | DK18, Gardavan | 1 |
|  |  | sparse | faible | locker | rala | Grazer, SF2003 | 3 |
|  |  | medium | moyenne | mittel | media | Argence | 5 |
|  |  | dense | dense | dicht | densa | Nectar, PR85G85 | 7 |
|  |  | very dense | très dense | sehr dicht | muy densa | Albita, Velox 701 | 9 |
| **26. (\*) (+)** | **92-93 VG** | **Panicle: position of broadest part** | **Panicule : position de la partie la plus large** | **Rispe: Position der breitesten Stelle** | **Panícula: posición de la parte más ancha** |  |  |
| **QN** |  | very low | très basse | sehr tief | muy baja |  | 1 |
|  |  | low | basse | tief | 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 à maturité** | **Hüllspelze: Farbe zur Reife** | **Gluma: color en la madurez** |  |  |
| **PQ** |  | white | blanc | weiß | blanco |  | 1 |
|  |  | light yellow | jaune clair | hellgelb | amarillo claro | PR88Y20 | 2 |
|  |  | medium yellow | jaune moyen | mittelgelb | amarillo medio | Dorado E, Nectar | 3 |
|  |  | light brown | brun clair | hellbraun | marrón claro | Grazer | 4 |
|  |  | reddish brown | brun rougeâtre | rötlich braun | marrón rojizo | Argence, P8500 | 5 |
|  |  | dark brown | brun foncé | dunkelbraun | marrón oscuro | PR82G55, Velox 701 | 6 |
|  |  | black | noir | 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 corta |  | 1 |
|  |  | short | courte | kurz | corta | PR83G66, PR87G57 | 3 |
|  |  | medium | moyenne | mittel | mediana | Aralba, PR85G85 | 5 |
|  |  | long | longue | lang | larga | Digestivo, Nutri Honey | 7 |
|  |  | very long | très longue | sehr lang | muy larga |  | 9 |
| **29. (\*) (+)** | **92-93 VG** | **Grain: color** | **Graine : couleur** | **Korn: Farbe** | **Grano: color** |  |  |
| **PQ** |  | white | blanc | weiß | blanco | Choice | 1 |
|  |  | yellowish white | blanc jaunâtre | gelblich weiß | blanco amarillento | Aralba, PR88Y20 | 2 |
|  |  | grey white | blanc‑gris | grauweiß | blanco grisáceo | Albita | 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 | violet | purpurn | púrpura |  | 10 |
|  |  | black | noir | schwarz | negro |  | 11 |
| **30.** | **92-93 MG** | **Weight of 1000 grains** | **Poids pour 1000 graines** | **Tausendkorngewicht** | **Peso de 1000 granos** |  |  |
| **QN** |  | very low | très faible | sehr gering | muy pequeño | Velox 701 | 1 |
|  |  | low | faible | gering | pequeño | Nicol, PR87G57 | 3 |
|  |  | medium | moyen | mittel | medio | Nutri Honey | 5 |
|  |  | high | élevé | groß | grande | Aralba, PR88Y20 | 7 |
|  |  | very high | très élevé | sehr groß | muy grande |  | 9 |
| **31.  (+)** | **92-93 VG** | **Grain: shape in dorsal view** | **Graine : forme en vue dorsale** | **Korn: Form in Rückenansicht** | **Grano: forma en vista dorsal** |  |  |
| **PQ** |  | narrow elliptic | elliptique étroit | schmal elliptisch | elíptico estrecho | Aneto, Vidan 697 | 1 |
|  |  | broad elliptic | elliptique large | breit elliptisch | elíptico ancho | 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** | **Graine : 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 | mediana | PR84G62, PR83G66 | 5 |
|  |  | large | grande | groß | grande | Dorado E, PR85G85 | 7 |
|  |  | very large | très grande | sehr groß | muy grande |  | 9 |
| **33.   (+)** | **92-93 MG** | **Grain: content of tannin** | **Graine : teneur en tanins** | **Korn: Tanningehalt** | **Grano: contenido de taninos** |  |  |
| **QN** |  | absent or very low | nulle ou très faible | fehlend oder sehr niedrig | nulo o muy bajo | Albita | 1 |
|  |  | medium | moyenne | mittel | medio | PR82G55 | 2 |
|  |  | very high | très élevée | sehr hoch | muy alto | Gardavan, Nectar | 3 |
| **34. (\*) (+)** | **92-93 VG** | **Grain: type of endosperm** | **Graine : type d’endosperme** | **Korn: Endospermtyp** | **Grano: tipo de endospermo** |  |  |
| **QN** |  | fully vitreous | entièrement vitreux | vollglasig | vítreo en su totalidad |  | 1 |
|  |  | ¾ vitreous | au ¾ vitreux | ¾ glasig | vítreo en sus ¾ partes | Nicol, SF2003 | 2 |
|  |  | half vitreous | à moitié vitreux | halbglasig | la mitad vítreo | Albita, Nectar | 3 |
|  |  | ¾ farinaceous | au ¾ farineux | ¾ mehlig | farináceo en sus ¾ partes | Beefbuilder, PR85G85 | 4 |
|  |  | fully farinaceous | entièrement farineux | vollmehlig | farináceo en su totalidad | PR83G66, PR82G10 | 5 |
| **35. (\*)** | **92-93 VG** | **Grain: color of vitreous endosperm** | **Graine : couleur de l’endosperme vitreux** | **Korn: Farbe des glasigen Endosperms** | **Grano: color de la porción vítrea del endospermo** |  |  |
| **PQ** |  | white | blanc | weiß | blanco | Sanggat, Sweet Virginia | 1 |
|  |  | yellow | jaune | gelb | amarillo | Dorado E, PR88Y20 | 2 |
|  |  | orange | orange | orange | naranja | P8500, PR83G66 | 3 |
|  |  | violet | violet | violett | violeta | Nectar, Nicol | 4 |
| **36.  (\*) (+)** | **MG/MS** | **Plant: photoperiod sensitivity** | **Plante : sensibilité photopériodique** | **Pflanze: Abhängigkeit von der Tageslänge** | **Planta: sensibilidad al fotoperíodo** |  |  |
| **QL** |  | insensitive | insensible | unabhängig | insensible | Albita | 1 |
|  |  | sensitive | sensible | abhängig | 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:

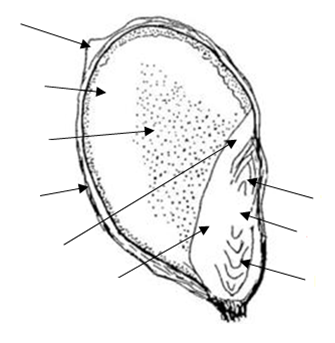
1. Observations should be made on the third leaf from the top of the plant excluding flag leaf.
2. Observations should be made in the middle third of the main panicle.
3. Observations should be made just above the third leaf from the top of the plant excluding flag leaf.



(a)

(c)

(b)



Radicle

Vitreous endosperm (34, 35)

Farinaceous endosperm (34)

Stylet

Testa

Scutellum

Germ (32)

Epiblast

Plumule

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. 3: Plant: number of tillers

The minimum height necessary to be counted as tiller should be one third of the height of the plant.

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 | 2 | 3 | 4 | 5 |
| 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 selfing 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. 18: Plant: length

Plant length should be observed from ground level to the top of the panicle.

Ad. 22: Panicle: length

Ad. 23: Panicle: length of neck

The neck is between flag leaf and first ramification of the panicle. The assessment of panicle length should be made without the neck.

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. 29: Grain: color

The color of the grain should be observed after threshing.

Ad. 31: Grain: shape in dorsal view

|  |  |  |  |
| --- | --- | --- | --- |
|  |  |  |  |
| 1 | 2 | 3 | 4 |
| narrow elliptic | broad elliptic | ovate | 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

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

**States of expression:**

Number of grains to be observed: 100 grains

1 absent or very low: ≤5% tannin

2 medium: >5% - <95% tannin

3 very 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 | 2 | 3 | 4 | 5 |
| fully vitreous | ¾ vitreous | half vitreous | ¾ farinaceous | fully farinaceous |

Ad. 36: Plant: photoperiod sensitivity

Photoperiod insensitive varieties are not dependent on the length of daylight for floral development.

Photoperiod sensitive varieties will not initiate floral development until the photoperiod is less than approximately 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 imbibition |
| 02 |  |
| 03 | Seed imbibition 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 soil 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

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# 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 | | | | | | | | | | | |
|  | | |  | | | | | |  | | |
| 1.1.1 Botanical name | | | *Sorghum bicolor* (L.) Moench | | | | | |  | | |
|  | | |  | | | | | |  | | |
| 1.1.2 Common name | | | Broomcorn, Durra, Feterita, Forage Sorghum, Grain sorghum, Great Millet, Kaffir-corn, Milo, Shallu, Sorghum, Sweet sorghum | | | | | |  | | |
|  | | |  | | | | | |  | | |
| 1.2.1 Botanical name | | | *Sorghum ×drummondii* (Steud.) Millsp. & Chase | | | | | |  | | |
|  | | |  | | | | | |  | | |
| 1.2.2 Common name | | | Chicken-corn, Shattercane, Sordan, Sorghum x Sudan Grass, Sorghum-sudangrass, Sudan grass | | | | | |  | | |
|  | | |  | | | | | | | |  |
|  | | |  | | | | | |  | | |
| 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 [ ] | |
|  | yellowish white | | | | | | Befbuilder, Vidan 697 | | | 2 [ ] | |
|  | light green | | | | | |  | | | 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, PR82G55 | | | 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 [ ] | |
| **5.4 (13)** | Flower: self-fertility | | | | | |  | | |  | |
|  | absent or very low | | | | | |  | | | 1 [ ] | |
|  | medium | | | | | |  | | | 2 [ ] | |
|  | high | | | | | | Aneto, P8500 | | | 3 [ ] | |
|  | Characteristics | | | | | | Example Varieties | | | Note | |
| 5.5 (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, SF 2003 | | | 5 [ ] | |
|  | medium to long | | | | | |  | | | 6 [ ] | |
|  | long | | | | | | Vidan 697 | | | 7 [ ] | |
|  | long to very long | | | | | |  | | | 8 [ ] | |
|  | very long | | | | | |  | | | 9 [ ] | |
| 5.6 (17) | Dry anther: color | | | | | |  | | |  | |
|  | light yellow | | | | | |  | | | 1 [ ] | |
|  | greyish pink | | | | | |  | | | 2 [ ] | |
|  | orange | | | | | | Dorado DR, Gardavan | | | 3 [ ] | |
|  | orange red | | | | | | Elite, PR82G55 | | | 4 [ ] | |
|  | red | | | | | |  | | | 5 [ ] | |
|  | red brown | | | | | |  | | | 6 [ ] | |
| 5.7 (18) | Plant: length | | | | | |  | | |  | |
|  | dwarf | | | | | |  | | | 1 [ ] | |
|  | dwarf to extremely short | | | | | |  | | | 2 [ ] | |
|  | extremely short | | | | | | Sibelus | | | 3 [ ] | |
|  | extremely short to very short | | | | | | Aruski | | | 4 [ ] | |
|  | very short | | | | | | PR88Y20 | | | 5 [ ] | |
|  | very short to short | | | | | | Albita | | | 6 [ ] | |
|  | short | | | | | | PR84G62 | | | 7 [ ] | |
|  | short to medium | | | | | | PR82G55 | | | 8 [ ] | |
|  | medium | | | | | | Jumak | | | 9[ ] | |
|  | medium to tall | | | | | | Topsilo | | | 10[ ] | |
|  | tall | | | | | | Zöldike | | | 11[ ] | |
|  | tall to very tall | | | | | | Zöldozön | | | 12[ ] | |
|  | very tall | | | | | | Rona 1 | | | 13[ ] | |
|  | very tall to extremely tall | | | | | | Agnes | | | 14[ ] | |
|  | extremely tall | | | | | | Gardavan | | | 15[ ] | |
|  | extremely tall to giant | | | | | |  | | | 16[ ] | |
|  | giant | | | | | |  | | | 17[ ] | |
|  | Characteristics | | | | | | Example Varieties | | | Note | |
| **5.8 (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 [ ] | |
| 5.9 (26) | Panicle: position of broadest part | | | | | |  | | |  | |
|  | very low | | | | | |  | | | 1 [ ] | |
|  | low | | | | | | PR84G62 | | | 2 [ ] | |
|  | medium | | | | | | Nutri Honey | | | 3 [ ] | |
|  | high | | | | | | Beefbuilder | | | 4 [ ] | |
|  | very high | | | | | | Vidan 697 | | | 5 [ ] | |
| **5.10 (27)** | Glume: color at maturity | | | | | |  | | |  | |
|  | white | | | | | |  | | | 1 [ ] | |
|  | light yellow | | | | | | PR88Y20 | | | 2 [ ] | |
|  | medium yellow | | | | | | Dorado E, Nectar | | | 3 [ ] | |
|  | light brown | | | | | | Grazer | | | 4 [ ] | |
|  | reddish brown | | | | | | Argence, P8500 | | | 5 [ ] | |
|  | dark brown | | | | | | PR82G55, Velox 701 | | | 6 [ ] | |
|  | black | | | | | | Digestivo, Vidan 697 | | | 7 [ ] | |
|  | Characteristics | | | | | | Example Varieties | | | Note | |
| 5.11 (29) | Grain: color | | | | | |  | | |  | |
|  | white | | | | | | Choice | | | 1 [ ] | |
|  | yellowish white | | | | | | Aralba, PR88Y20 | | | 2 [ ] | |
|  | grey white | | | | | | Albita | | | 3 [ ] | |
|  | light yellow | | | | | | Beefbuilder, Gardavan | | | 4 [ ] | |
|  | orange | | | | | | Argence, PR85G85 | | | 5 [ ] | |
|  | orange red | | | | | | PR82G55, PR83G66 | | | 6 [ ] | |
|  | light brown | | | | | | Velox 701 | | | 7 [ ] | |
|  | red brown | | | | | | Nutri Honey, PR82G10 | | | 8 [ ] | |
|  | dark brown | | | | | | Nicol, Vidan 697 | | | 9 [ ] | |
|  | purple | | | | | |  | | | 10 [ ] | |
|  | black | | | | | |  | | | 11[ ] | |
| 5.12 (36) | Plant: photoperiod sensitivity | | | | | |  | | |  | |
|  | insensitive | | | | | | Albita | | | 1 [ ] | |
|  | sensitive | | | | | | Teide | | | 9 [ ] | |
| 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 | | | | | | | | | | | |

[End 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)