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UPOV

INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS

GENEVA

DRAFT

*

PEARL MILLET

UPOV Code: PENNI_GLA

Pennisetum glaucum (L.) R. Br.

GUIDELINES

FOR THE CONDUCT OF TESTS

FOR DISTINCTNESS, UNIFORMITY AND STABILITY

prepared by an expert from Brazil

to be considered by the
Technical Working Party for Agricultural Crops at its thirty-eighth session,
to be held in Seoul, Republic of Korea, from August 31 to September 4, 2009

Alternative Names:*

Botanical name	*English*	*French*	*German*	*Spanish*
Pennisetum glaucum (L.) R. Br., *Pennisetum americanum* (L.) Leeke, *Pennisetum typhoides* (Burm.f.) Stapf C.E. Hubb.	Pearl Millet	Pénicillaire, Mil à chandelle, Mil Pénicillaire	Federborstengras	Mijo Perla, Panizo de Daimiel, Panizo mamozo

The purpose of these guidelines ("Test Guidelines") is to elaborate the principles contained in the General Introduction (document TG/1/3), and its associated TGP documents, into detailed practical guidance for the harmonized examination of distinctness, uniformity and stability (DUS) and, in particular, to identify appropriate characteristics for the examination of DUS and production of harmonized variety descriptions.

ASSOCIATED DOCUMENTS

These Test Guidelines should be read in conjunction with the General Introduction and its associated TGP documents.

* These names were correct at the time of the introduction of these Test Guidelines but may be revised or updated. [Readers are advised to consult the UPOV Code, which can be found on the UPOV Website (www.upov.int), for the latest information.]

TABLE OF CONTENTS PAGE

1. Subject of these Test Guidelines

These Test Guidelines apply to all varieties of *Pennisetum glaucum* (L.) R. Br.

2. Material Required

2.1 The competent authorities decide on the quantity and quality of the plant material required for testing the variety and when and where it is to be delivered. Applicants submitting material from a State other than that in which the testing takes place must ensure that all customs formalities and phytosanitary requirements are complied with.

2.2 The material is to be supplied in the form of seed.

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

1 kg.

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

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

2.5 The plant material should not have undergone any treatment which would affect the expression of the characteristics of the variety, unless the competent authorities allow or request such treatment. If it has been treated, full details of the treatment must be given.

3. Method of Examination

3.1 Number of Growing Cycles

The minimum duration of tests should normally be two independent growing cycles.

3.2 Testing Place

Tests are normally conducted at one place. In the case of tests conducted at more than one place, guidance is provided in TGP/9 “Examining Distinctness”.

3.3 Conditions for Conducting the Examination

3.3.1 The tests should be carried out under conditions ensuring satisfactory growth for the expression of the relevant characteristics of the variety and for the conduct of the examination.

3.3.2 The optimum stage of development for the assessment of each characteristic is indicated by a number in the second column of the Table of Characteristics. The stages of development denoted by each number are described at the end of Chapter 8.

3.3.3 The recommended method of observing the characteristic is indicated by the following key in the second column of the Table of Characteristics:

MG: single measurement of a group of plants or parts of plants
MS: measurement of a number of individual plants or parts of plants
VG: visual assessment by a single observation of a group of plants or parts of plants
VS: visual assessment by observation of individual plants or parts of plants

3.4 Test Design

3.4.1 Each test should be designed to result in a total of at least 240 plants, which should be divided between two or more 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 Number of Plants / Parts of Plants to be Examined

3.5.1 In the case of cross-pollinated varieties and three-way-cross hybrids, unless otherwise indicated, all observations on single plants should be made on 60 plants or parts taken from each of 60 plants and any other observations made on all plants in the test.

3.5.2 In the case of inbred lines and single-cross hybrids, unless otherwise indicated, 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.

3.6 Additional Tests

Additional tests, for examining relevant characteristics, may be established.

4. Assessment of Distinctness, Uniformity and Stability

4.1 Distinctness

4.1.1 General Recommendations

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

4.1.2 Consistent Differences

The differences observed between varieties may be so clear that more than one growing cycle is not necessary. In addition, in some circumstances, the influence of the environment is not such that more than a single growing cycle is required to provide assurance that the differences observed between varieties are sufficiently consistent. One means of ensuring that a difference in a characteristic, observed in a growing trial, is sufficiently consistent is to examine the characteristic in at least two independent growing cycles.

4.1.3 Clear Differences

Determining whether a difference between two varieties is clear depends on many factors, and should consider, in particular, the type of expression of the characteristic being examined, i.e. whether it is expressed in a qualitative, quantitative, or pseudo-qualitative manner. Therefore, it is important that users of these Test Guidelines are familiar with the recommendations contained in the General Introduction prior to making decisions regarding distinctness.

4.2 Uniformity

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

4.2.2 The assessment of uniformity for cross-pollinated varieties should be according to the recommendations for cross-pollinated varieties in the General Introduction.

4.2.3 For the assessment of uniformity of inbred lines and single-cross hybrids, a population standard of 1% and an acceptance probability of at least 95% should be applied. In the case of a sample size of 240 plants, 5 off-types are allowed.

4.2.4 The assessment of uniformity for hybrid varieties, other than single-cross hybrid varieties, depends on the type of hybrid and should be according to the recommendations for hybrid 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 may be assessed by testing a new seed stock to ensure that it exhibits the same characteristics as those shown by the previous material supplied.

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

5. Grouping of Varieties and Organization of the Growing Trial

5.1 The selection of varieties of common knowledge to be grown in the trial with the candidate varieties and the way in which these varieties are divided into groups to facilitate the assessment of distinctness are aided by the use of grouping characteristics.

5.2 Grouping characteristics are those in which the documented states of expression, even where produced at different locations, can be used, either individually or in combination with other such characteristics: (a) to select varieties of common knowledge that can be excluded from the growing trial used for examination of distinctness; and (b) to organize the growing trial so that similar varieties are grouped together.

5.3 The following have been agreed as useful grouping characteristics:

(a) Leaf sheath: pubescence (characteristic 6)
(b) Anther: color (characteristic 7)
(c) Time of flowering (characteristic 8)
(d) Glume: number of bristles (characteristic 18)

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

6. Introduction to the Table of Characteristics

6.1 Categories of Characteristics

6.1.1 Standard Test Guidelines Characteristics

Standard Test Guidelines characteristics are those which are approved by UPOV for examination of DUS and from which members of the Union can select those suitable for their particular circumstances.

6.1.2 Asterisked Characteristics

Asterisked characteristics (denoted by *) are those included in the Test Guidelines which are important for the international harmonization of variety descriptions and should always be examined for DUS and included in the variety description by all members of the Union, except when the state of expression of a preceding characteristic or regional environmental conditions render this inappropriate.

6.2 States of Expression and Corresponding Notes

States of expression are given for each characteristic to define the characteristic and to harmonize descriptions. Each state of expression is allocated a corresponding numerical note for ease of recording of data and for the production and exchange of the description.

6.3 Types of Expression

An explanation of the types of expression of characteristics (qualitative, quantitative and pseudo-qualitative) is provided in the General Introduction.

6.4 Example Varieties

Where appropriate, example varieties are provided to clarify the states of expression of each characteristic.

6.5 Legend

(*) Asterisked characteristic – see Chapter 6.1.2

QL: Qualitative characteristic – see Chapter 6.3
QN: Quantitative characteristic – see Chapter 6.3
PQ: Pseudo-qualitative characteristic – see Chapter 6.3

MG, MS, VG, VS: see Chapter 3.3.3

(+) See Explanations on the Table of Characteristics in Chapter 8.1
(DS1 - 9) See Explanations on the Table of Characteristics in Chapter 8.2

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

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
1.	**DS1**	**Seedling: Leaf sheath: anthocyanin coloration of base**				**Example varieties testing is in execution. still to be added**	
QN	**VG**	absent or weak					1
		medium					2
		strong					3
2.	**DS3**	**Culm: attitude of tillers**					
(+)	**VG**						
QN		erect				ADR 300, ADR 500	1
		semi-erect					3
		prostrate					5
3.	**DS3**	**Leaf blade: length**				**Example varieties tests are in process. Information to be added.**	
(+)	**MS**						
QN		short					3
		medium					5
		long					7
4.	**DS3**	**Leaf blade: width**					
(+)	**MS**						
QN		narrow					3
		medium				ADR 300, ADR 500	5
		broad					7

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
5.	**DS3 VG**	**Leaf blade: color**				**Example varieties tests are in process. Information to be added.**	
PQ		light green					1
		medium green					2
		dark green					3
		red					4
		purple					5
6. (*)	**DS3 VG**	**Leaf sheath: pubescence**				**Example varieties tests are in process. Information to be added.**	
QL		absent					1
		present					9
7. (*) (+)	**DS6^{+} VG**	**Anther: color**					
PQ		yellow				ADR 300	1
		brown					2
		purple					3
8. (*) (+)	**MG**	**Time of flowering**				**Example varieties tests are in process. Information to be added.**	
QN		very early					1
		early					3
		medium					5
		late					7
		very late					9

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
9. (*)	**DS6 VG**	**Culm: pubescence of node**					
QL		absent				ADR 300	1
		present					9
10. (*) (+)	**DS8 MG**	**Plant: length**				**Example varieties tests are in process. Information to be added.**	
QN		very short					1
		short					3
		medium					5
		tall					7
		very tall					9
11. (*) (+)	**DS8 VG**	**Panicle: shape**				**Example varieties tests are in process. Information to be added.**	
PQ		conical					1
		trullate					2
		subulate					3
		cylindric					4
		obtrullate					5
12. (*) (+)	**DS8 MS**	**Panicle: length of main rachis**				**Example varieties tests are in process. Information to be added.**	
QN		short					3
		medium					5
		long					7

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
13 (*)	**DS8 VG**	**Panicle: tip sterility**				**Example varieties tests are in process. Information to be added.**	
QL		absent					1
		present					9
14.	**DS8**	**Panicle: diameter**				**Example varieties tests are in process. Information to be added.**	
(+)	**MS**						
QN		small					3
		medium					5
		large					7
15.	**DS8**	**Panicle: exsertion**					
(+)	**VG**						
QN		absent or weak					1
		moderate					2
		strong					3
16.	**DS8 VG**	**Glume: anthocyanin coloration (excluding tips)**					
QL		absent					1
		present					9
17.	**DS8 VG**	**Bristle: anthocyanin coloration**				**Example varieties tests are in process. Information to be added.**	
QN		absent or very weak					1
		weak					3
		moderate					5
		strong					7

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
18. (*)	**DS8 VG**	**Glume: number of bristles**					
QL		one					1
		more than one					2
19. (+)	**DS8 VG**	**Only varieties with one bristle: Bristle: length**				**Example varieties tests are in process. Information to be added.**	
QN		short					3
		medium					5
		long					7
20. (+)	**DS8 VG**	**Only varieties with more than one bristle: Glume: density of bristles**					
QN		sparse					3
		medium					5
		dense					7
21. (+)	**DS8 MS**	**Culm: diameter**				**Example varieties tests are in process. Information to be added.**	
QN		small					3
		medium					5
		large					7
22. (+)	**DS8 MS**	**Culm: number of panicle-bearing tillers**				**Example varieties tests are in process. Information to be added.**	
QN		Monoculm					1
		few					2
		medium					3
		many					4

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
23. (*)	**DS8 VG**	**Culm: anthocyanin coloration of node**					
QN		absent or weak					1
		medium					3
		strong					5
24. (*) (+)	**DS8 VG**	**Culm: anthocyanin coloration of internode**				**Example varieties tests are in process. Information to be added.**	
QN		absent or weak					1
		medium					3
		strong					5
25. (*) (+)	**DS9 VG**	**Panicle: density**				**Example varieties tests are in process. Information to be added.**	
QN		sparse					3
		medium					5
		dense					7
26.	**DS9^{+}**	**Caryopsis: shape**				**Example varieties tests are in process. Information to be added.**	
(+)	**VG**						
PQ		elliptic					1
		rectangular					2
		circular					3
		obtrullate					4
		obtriangular					5

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
27. (*)	**DS9^{+} VG**	**Caryopsis: color**				**Example varieties tests are in process. Information to be added.**	
PQ		ivory					1
		cream					2
		yellow					3
		medium grey					4
		dark grey					5
		grey brown					6
		brown					7
		purple					8
		purplish black					9

8. Explanations on the Table of Characteristics

8.1 Explanations for individual characteristics

Ad. 3: Leaf blade: length
Ad. 4: Leaf blade: width

To be observed on the fourth node below the panicle on the main culm.

Ad. 7: Anthers : color

To be observed on recently opened flowers.

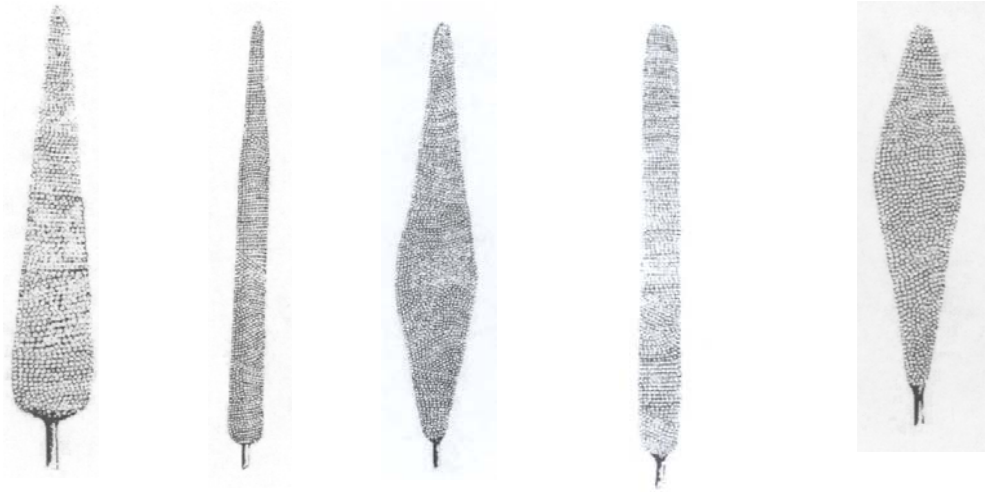
Ad. 8: Time of flowering

Time of flowering is when 50% of plants emit the stigma in the main panicle.

Ad. 10: Plant: length

To be observed on the main culm from the ground level to the tip of main panicle.

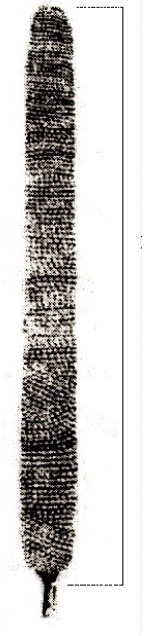
Ad. 11: Panicle: shape



1	2	3	4	5
conical	trullate	subulate	cylindric	obtrullate

Ad. 12: Panicle: length of main rachis

To be measured from the base to the tip of the panicle on main rachis .

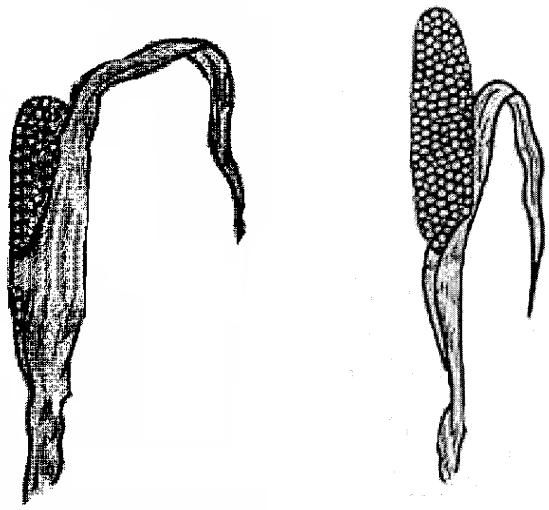


length of main rachis

Ad. 14: Panicle: diameter

To be observed in the broadest part of the panicle, excluding the bristles.

Ad. 15: Panicle: exsertion

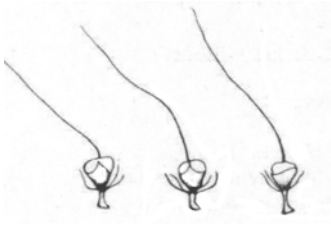


1	2	3
absent or weak	moderate	strong

Ad. 19: Only varieties with one bristle: Bristle: length

3
short

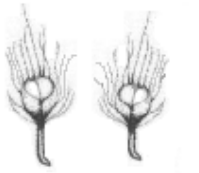
5
medium



7
long

Ad. 20: Only varieties with more than one bristle: Glume: density of bristles

3
sparse



5
medium

7
dense

Ad. 21: Culm: diameter

To be observed between the third and fourth nodes below the panicle.

Ad 22: Culm: number of panicle-bearing tillers

Monoculm -	1
Few -	2-3
Medium -	4-6
Many -	> 6

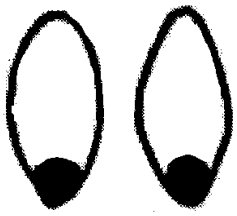
Ad. 24: Culm: anthocyanin coloration of internode

To be observed between the third and fourth nodes above the ground.

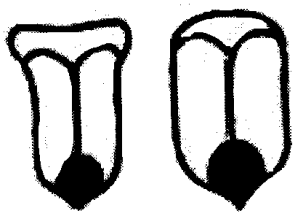
Ad. 25: Panicle: density

To be observed on the main panicle. (To add an illustration)

Ad. 26: Caryopsis: shape



1
elliptic



2
rectangular

3
circular

4
obtrullate

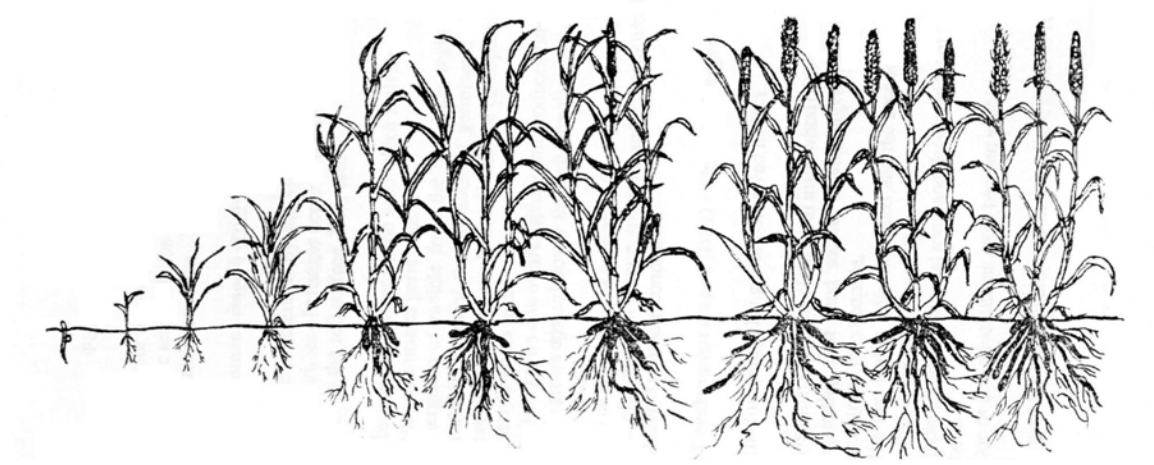
5
obtriangular

8.2 Growth stages

Characteristics containing the following key in the second column of the Table of Characteristics should be examined at the following stages (table and drawing adapted from the book "Pearl Millet, Seed Production & Technology" – see Chapter 9 Literature).

Growth Stage	**Identifying Characteristic**
GPI	Vegetative Phase
DS0	Emergence Stage
DS1	Three leaf Stage
DS2	Five Leaf Stage
DS3	Panicle Initiation Stage
GPII	Panicle Development Phase
DS4	Flag Leaf Stage
DS5	Boot Stage
DS6	Half Bloom Stage
DS6^{+}	Full Flowering (before anther dehiscence)
GPIII	Grain Filling Stage
DS7	Milk Stage
DS8	Dough Stage
DS9	Black Layer Formation
DS9^{+}	After thrash
DS9^{++}	After harvest time

DS-1: emergence
DS-1: three leaf
DS-2: five leaf
DS-3: panicle init.
DS-4: flag leaf
DS-5: boot
DS-6: half bloom
DS-7: milk
DS-8: dough
DS-9: black layer



Growth phase I (GP-I) vegetative	Growth phase II (GP-II) panicle development	Growth phase III (GP-III) grain filling

9. Literature

IBPGR/ICRISAT, 1993: Descriptors for Pearl Millet [*Pennisetum glaucum* (L.) R. Br.]., Rome

Khairwal, I.S., Ram C. & Chabbra, A.K., 1990: Pearl Millet, Seed Production & Technology. Ed Manohar.

Singh, F., Rai, K.N., Reddy, B.V.S. & Diwakar, B., 1997: Development of Cultivars and Seed Production Techniques in Sorghum and Pearl Millet – Training Manual, ICRISAT.

Drawings:

IBPGR/ICRISAT, 1993: Descriptors for Pearl Millet [*Pennisetum glaucum* (L.) R. Br.]., Rome

Khairwal, I.S., Ram C. & Chabbra, A.K., 1990: Pearl Millet, Seed Production & Technology. Ed Manohar.

10. Technical Questionnaire

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

	Application date: (not to be filled in by the applicant)

TECHNICAL QUESTIONNAIRE
to be completed in connection with an application for plant breeders' rights

1. Subject of the Technical Questionnaire

1.1 Botanical name	*Pennisetum glaucum* (L.) R. Br.
1.2 Common name	Pearl Millet

2. Applicant

Name	
Address	
Telephone No.	
Fax No.	
E-mail address	

Breeder (if different from applicant)

3. Proposed denomination and breeder's reference

Proposed denomination (if available)	
Breeder's reference	

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

[#]4. Information on the breeding scheme and propagation of the variety

4.1 Breeding scheme

Variety resulting from:

4.1.1 Crossing

(a) controlled cross [ ]
(please state parent varieties)

(b) partially known cross [ ]
(please state known parent variety(ies))

(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 Seed-propagated varieties

(a) Self-pollination [ ]
(b) Cross-pollination
(i) population [ ]
(ii) synthetic variety [ ]
(c) Hybrid (see below) [ ]
(d) Other [ ]
(please provide details)

4.2.2 Other [ ]
(please provide details)

[#] Authorities may allow certain of this information to be provided in a confidential section of the Technical Questionnaire.

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

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.

Single Hybrid

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

Three-Way Hybrid

(… female line …) x (… male line …)

=> single hybrid used as female parent x (… male parent …)

and should identify in particular:

(a) any male sterile lines
(b) maintenance system of male sterile lines.

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

5. Characteristics of the variety to be indicated (the number in brackets refers to the corresponding characteristic in Test Guidelines; please mark the note which best corresponds).

	Characteristics	Example Varieties	Note
5.1 (6)	**Leaf sheath: pubescence**		
	absent		1 [ ]
	present		9 [ ]
5.2 (7)	**Anther: color**		
	yellow	ADR 300	1 [ ]
	brown		2 [ ]
	purple		3 [ ]
5.1 (8)	**Time of flowering**		
	very early		1 [ ]
	early		3 [ ]
	medium		5 [ ]
	late		7 [ ]
	very late		9 [ ]
5.4 (18)	**Glume: number of bristles**		
	one		1 [ ]
	more than one		2 [ ]

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

6. Similar varieties and differences from these varieties

Please use the following table and box for comments to provide information on how your candidate variety differs from the variety (or varieties) which, to the best of your knowledge, is (or are) most similar. This information may help the examination authority to conduct its examination of distinctness in a more efficient way.

Denomination(s) of variety(ies) similar to your candidate variety	Characteristic(s) in which your candidate variety differs from the similar variety(ies)	Describe the expression of the characteristic(s) for the **similar** variety(ies)	Describe the expression of the characteristic(s) for **your** candidate variety
Example	[to be provided]		

Comments:

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

[#]7. Additional information which may help in the examination of the variety

7.1 In addition to the information provided in sections 5 and 6, are there any additional characteristics which may help to distinguish the variety?

Yes [ ] No [ ]

(If yes, please provide details)

7.2 Are there any special conditions for growing the variety or conducting the examination?

Yes [ ] No [ ]

(If yes, please provide details)

7.3 Other information

8. Authorization for release

(a) Does the variety require prior authorization for release under legislation concerning the protection of the environment, human and animal health?

Yes [ ] No [ ]

(b) Has such authorization been obtained?

Yes [ ] No [ ]

If the answer to (b) is yes, please attach a copy of the authorization.

[#] Authorities may allow certain of this information to be provided in a confidential section of the Technical Questionnaire.

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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]