

UPOV

TG/120/4(proj.2)

ORIGINAL: English

DATE: 2010-02-10

INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS
GENEVA

DRAFT

DURUM WHEAT

UPOV Code: TRITI_TUR_DUR

Triticum turgidum L. subsp. *durum* (Desf.) Husn.**GUIDELINES****FOR THE CONDUCT OF TESTS****FOR DISTINCTNESS, UNIFORMITY AND STABILITY***prepared by an expert from Australia**to be considered by the**Technical Working Party for Agricultural Crops at its thirty-ninth session,
to be held in Osijek, Croatia, from May 24 to 28, 2010*

Alternative Names: *

<i>Botanical name</i>	<i>English</i>	<i>French</i>	<i>German</i>	<i>Spanish</i>
<i>Triticum turgidum</i> L. subsp. <i>durum</i> (Desf.) Husn.	Durum Wheat, Hard Wheat,	Blé dur	Durumweizen, Hartweizen	Trigo Duro
<i>Triticum durum</i> Desf., <i>Triticum turgidum</i> subsp. <i>turgidum</i> conv. <i>durum</i> (Desf.) MacKey <i>Triticum turgidum</i> L.	Macaroni Wheat			

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.

Other associated UPOV documents: TG/3/11 + Corr. Wheat

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1. Subject of these Test Guidelines

These Test Guidelines apply to all varieties of *Triticum turgidum* L. subsp. *durum* (Desf.) Husn.

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.

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

seed 5 kg and
ears (if requested) 100.

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. Ears should contain a sufficient number of viable seeds to establish a satisfactory row of plants for observation.

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 Stage of development for the assessment

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 the descriptions of the growth stages of the Zadoks decimal code for cereals at the end of Chapter 8.3.

3.3.3 Type of plot for observation

The recommended type of plot in which to observe the characteristic is indicated by the following key in the second column of the Table of Characteristics:

- B: row plot
C: special test

Comment from Germany: Section 3.3.4 to be deleted. In particular, indication of B is not necessary. C is covered by additional test in 3.6. (C could be kept in the table of char., but only explained in 6.5.

3.4 Test Design

3.4.1 Each test should be designed to result in a total of at least 2,000 plants, which should be divided between 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.

3.4.3 Single ear rows: if tests on ear rows are conducted, at least 100 ear rows should be observed.

3.5 Additional Tests

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

4. Assessment of Distinctness, Uniformity and Stability

4.1 Distinctness

4.1.1 General Recommendations

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

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

Unless otherwise indicated, all observations for the purposes of distinctness should be made on 20 plants or parts taken from each of 20 plants, 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, a population standard of 0.1% and an acceptance probability of at least 95% should be applied. In the case of a sample size of 2,000 plants, 5 off-types are allowed.

4.2.3 For the assessment of uniformity of ear-rows, a population standard of 1% and an acceptance probability of at least 95% should be applied. In the case of a sample size of 100 ear-rows, 3 off-type ear-rows are allowed.

Comment from Germany: To read: "For the assessment of uniformity of characteristics on ear-rows, individual plants or parts of plants (visual assessment by observation of a number individual ear rows, plants or parts of plants) a population standard of 1% and an acceptance probability of at least 95 % should be applied. In case of a sample size of 100 the number of off-types ear-rows, plants or parts of plants, 3 off-types are allowed should not exceed 3 in 100. (population standard of 1% and an acceptance probability of at least 95 %)."

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 further examined by testing a new seed stock to ensure that it exhibits the same characteristics as those shown by the initial material supplied.

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) Lower glume: hairiness of external surface (characteristic 21)
- (b) Straw: pith in cross section (half way between base of ear and stem node below) (characteristic 22)
- (c) Awn: color (characteristic 23)
- (d) Ear: color at maturity (characteristic 25)
- (e) Plant: seasonal type (characteristic 33)

Comment from New Zealand: Ear: distribution of awns (characteristic 14) would be a useful grouping characteristic.

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*

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 4.15

B: row plot

C: special test

(a) See Explanations on the Table of Characteristics in Chapter 8.1

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

0-11 See Explanations on the Table of Characteristics in Chapter 8.3

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

Comment from Germany : To delete B for row plots.

	English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
1.	09-11	Coleoptile: anthocyanin coloration				
(+)	VG					
	C					
QN	absent or very weak				Fara, Kronos, Valgiorgio	1
	weak				Campomoro	3
	medium				Capdur, Chandur, Yallaroi	5
	strong				Kamilaroi, Primadur, Wollaroi	7
	very strong				EGA Bellaroi, Miradur, Tamaroi	9
2.	10	First leaf: anthocyanin coloration				
(+)	VG					
	C					
QN	absent or very weak				Kronos	1
	weak				Tamaroi, Yallaroi	3
	medium				Cargivox	5
	strong				Enrico Avanzi	7
	very strong				Aldura	9
Comment from Hungary: Char. 2 not observed.						
Comment from France: Char. 2 : FR is not in favor to keep it due to absence of variability in our variety collection. If kept it must be as proposed in your draft without asterisk.						
3.	25-29	Plant: growth habit at tillering stage				
(*)	VG					
(+)	B					
QN	erect				EGA Bellaroi	1
	semi-erect				Jiloca, Kronos	3
	intermediate				Tamaroi, Valnova, Yallaroi, Don Sebastian	5
	semi-prostrate					7
	prostrate					9

	English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
4.	50-51	Plant: frequency of plants with recurved flag leaves				
QN		absent or very low			Roqueño, Bolo	1
		low			Don Jose	3
		medium				5
		high				7
		very high			Capdur	9
5.	50-51	Plant: time of ear emergence				
(*)	VG					
	B					
QN		very early				1
		early			Don Jose	3
		medium			Arrivato, Tamaroi, Yallaroi, Don Sebastian	5
		late			Kronos	7
		very late				9
6.	55-59	Flag leaf: glaucosity of sheath				
(*)	VG					
	B					
QN		absent or very weak			Capeiti 8	1
		weak			Hyperno	3
		medium			Kalka	5
		strong			Arrivato, Yallaroi, Grandur, Jiloca, Don Sebastian	7
		very strong			Tamaroi, Valnova	9

	English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
7. (*)	55-59 VG B					
	Flag leaf: glaucosity of lower side of leaf blade					
QN	absent or very weak				EGA Bellaroi	1
	weak				Grandur, Hyperno, Bolo	3
	medium				Esquilache	5
	strong				Bidi 17, Kalka	7
	very strong					9
8.	55-59 VG B					
	Flag leaf: anthocyanin coloration of auricles					
QN	absent or very weak				Kamilaroi, Tamaroi	1
	weak				Yallaroi, Carpio	3
	medium				Don Jose	5
	strong				Wollaroi, Carioca	7
	very strong					9
Comment from Hungary: Char. 8 susceptible to environmental condotions						
Comment from France: Char. 8 too susceptible to environment in our opinion. We propose to delete it.						
9.	55-59 VS B					
	Flag leaf: hairiness of auricle margin					
QL	absent				Tamaroi	1
	present					9
Comment from Hungary: Char. 9 not observed.						
Comment from France: Char. 9 never observed in FR. If kept it must be as proposed in your draft without asterisk.						

	English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
10.	55-75	Culm: hairiness of uppermost node				
(+)	VS					
	B					
QN	absent or very weak				Andente, Bidi 17, Don Sebastian	1
	weak				Esquilache, Grandur, Tamaroi, Carpio	3
	medium				Mexa, Yallaroi	5
	strong				Arrivato	7
	very strong					9
11.	60-69	Culm: glaucosity of neck				
(*)	VG					
	B					
QN	absent or very weak				Capeiti 8	1
	weak					3
	medium				Andente, Don Jose	5
	strong				Roqueño, Tamaroi, Don Sebastian	7
	very strong				Kronos	9
12.	60-69	Ear: glaucosity				
(*)	VG					
	B					
QN	absent or very weak				Capeiti 8	1
	weak				Jiloka, Kronos	3
	medium				Oscar, Yallaroi, Don Jose	5
	strong				EGA Bellaroi, Grandur, Roqueño, Tamaroi, Don Sebastian	7
	very strong					9

	English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
13.	75-92	Plant: height (stem, ear and awn)				
(*)	MS					
(+)	B					
QN	very short				Gargiflash, Oscar	1
	short				Kamilaroi, Mexa	3
	medium				Grandur, Yallaroi, Don Jose	5
	tall				Capelli, Senatore, Tamaroi	7
	very tall					9

Comment from Germany: "Plant: height (stem, ear and awn)" see Ad. 13

14.	70-92	Ear: distribution of awns				
	VG					
(+)	B					
PQ	awnless					1
	tip awned				Saintly	2
	half awned					3
	fully awned				Arrivato, Tamaroi	4

Comment from Hungary: Char. 14 can be kept. We can have a variety which is only distinguishable based on this characteristic, so it can be useful.

Comment from France: Char. 14 FR is not in favor to keep it due to absence of variability in our variety collection. If kept it must be as proposed in your draft without asterisk.

15.	75-92	Ear: length of awns at tip relative to length of ear				
(*)	VG					
	B					
QN	shorter				Saintly	1
	equal				Tamaroi	2
	longer				Arrivato, Oscar	3

	English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
16.	80-92 Lower glume: shape					
(+)	VG B					
	(a)					
PQ	ovoid				Grandur, Kronos, Randur, Tamaroi, Carpio	1
	elongated				Oscar, Yallaroi, Don Jose	2
	strongly elongated				Bidi-17, line4210.23.6, Don Sebastian	3
16	80-92 Lower glume: length					
(a)	MS/VG					
	(a)					
QN	B					
	short					3
	medium				Vitron	5
	long				Don Jose	7
Comment from Spain: Add Char. 16(a) as a new characteristic.						
17.	80-92 Lower glume: shape of					
(+)	VS B					
	(a)					
PQ	sloping				Yallaroi, Don Jaime	1
	rounded				Esquilache, Wollaroi	2
	straight				Hyperno, Roqueño, Don Jose	3
	elevated				Tamaroi, Amilcar	4
	elevated with a prominent 2 nd beak				Capdur, Oscar, Saintly, Don Sebastian	5
18.	80-92 Lower glume: width of					
(+)	VS B					
	(a)					
QN	narrow				Oscar Tamaroi	3
	medium				Kronos	5
	broad					7
Comment from Spain: Char 18 Add very narrow in state 1 with example variety Don Sebastian						

	English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
19.	80-92	Lower glume: length of beak				
	VS					
	B					
QN	(a)	very short			Jiloca, Saintly	1
		short			Tamaroi, Vitron	3
		medium			Kailaroi, Don Jose	5
		long			Mexa, Mellaria	7
		very long				9
20.	80-92	Lower glume: shape of beak				
	VS					
	B					
(+)						
QN	(a)	straight			Durox, Mexa, Saintly	1
		slightly curved			Bidi 17, Hyperno, Tamaroi, Don Jose	3
		moderately curved			Capdur, Kamilaroi, Don Jaime	5
		strongly curved				7
21.	80-92	Lower glume: hairiness of external surface				
	VS					
	B					
(*)						
QL	(a)	absent			Grandur, Hyperno, Roqueño, Don Sebastian	1
		present			Paramo, Wollaroi, Don Jose	9

Comment from Germany: For Char. 17 to 21 To replace "(as for 16)" by lower letter according to 8.1

	English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
22.	90-92	Straw: pith in cross section (half way between base of ear and stem node below)				
(*)	VS					
(+)	B					
QN	thin				Hyperno, Valnova	1
	medium				Tamaroi	2
	thick				line4210.23.6, Paramo	3
Comment from Hungary: Char. 22 to use a scale of 3 to 7						
Comment from France: Char. 22 we propose to use this scale 3 to 7 instead of 1 to 3 because incase of Durum wheat this characteristic is more stable compared to soft wheat and it's possible to observe it as a true quantitative characteristic						
23.	90-92	Awn: color				
(*)	VS					
	B					
PQ	white				Esquilache, Kronos, Don Sebastian	1
	light brown				Kamailaroi, Yallaroi	2
	medium purple				line4210.23.6, Tejon	3
	dark purple				Capdur, Tamaroi, Valnova, Don Jose	4
24.	90-92	Ear: length (excluding awns)				
(*)	MS					
	B					
QN	very short					1
	short				Don Jaime	3
	medium				Arrivato, Kronos, Don Jose	5
	long				Valnova	7
	very long					9
25.	90-92	Ear: color at maturity				
(*)	VS					
	B					
PQ	white				Esquilache, Valdur, Yallaroi, Don Jose	1
	slightly colored				Randur	2
	strongly colored				Kronos, Tamaroi	3

	English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota	
26.	92	Ear: density					
(*)	VS						
(+)	B						
QN	very lax					1	
	lax				Kamilaroi	3	
	medium				Kalka, Roqueño, Vitron	5	
	dense				Arrivato, Bidi-7, Don Jose	7	
	very dense					9	

27.	92	Grain: color					
(*)	VS						
	B						
QN	white				Arrivato	1	
	light brown				Tamaroi	2	
	dark brown				Bellaroi, Hyperno	3	

Comment from Germany: is Char. 27 a PQ character?

Comment from Hungary: Char. 27 susceptible to environmental condotions

Comment from France: Char 27 too susceptible to environment in our opinion. We propose to delete it.

28.	92	Grain: length of brush					
(*)	VG	hair in dorsal view					
(+)	B						
QN	short				Kalka, Chandur, Roqueño	1	
	medium				Arrivato, Andente, Valdur	3	
	long				Clairdoc	5	

Comment from Germany: 5 states might be too much. To check if (*) is correct.

Comment from Hungary: Char. 28 to use a scale of 3 to 7

Comment from France: Char. 28 We propose to use the scale 3 to 7 in order to keep the note 1 for varieties without brush hair.

	English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
29.	92 Grain: length					
	MS/VG					
	B					
QN	short				Arrivato	1
	medium				Tamaroi, Vitron	3
	long				EGA Bellaroi	5
Comment from Germany: Char. 29 too much dependent on environment? Correlation with shape?						
Comment from Hungary: Char. 29 never observed.						
Comment from France: Char 29 never observed in FR. If kept it must be as proposed in your draft without asterisk.						
30.	92 Grain: width					
	MS/VG					
	B					
QN	narrow					1
	medium				Tamaroi	3
	wide				Yallaroi	5
Comment from Germany: Char. 30 too much dependent on environment? Correlation with shape?						
Comment from Hungary: Char. 30 never observed.						
Comment from France: Char 30 never observed in FR. If kept it must be as proposed in your draft without asterisk.						
31.	92 Grain: shape					
	VG					
(+)	B					
PQ	ovoid				Amilcar	1
	semi-elongated				Tejon, Bolo	2
	elongated				Capelli, Chandur, Senatore, Don Jose	3

	English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota	
32.	92	Grain: coloration with phenol					
(+)	VG						
	C						
QN	absent or very light				Esquilache, Hyperno, Don Jose	1	
	light				Randur, Burgos	3	
	medium					5	
	dark					7	
	very dark					9	
33	92	Plant: seasonal type					
(*)	VG						
(+)	C						
PQ	winter type					1	
	alternative type				Camacho, Valmora	2	
	spring type				Kalka, Saintly, Tejon	3	

8. Explanations on the Table of Characteristics

8.1 *Explanations covering several characteristics*

Characteristics containing the following key in the second column of the Table of Characteristics should be examined as indicated below:

Comment from Germany: To add explanation for Char. 16 to 21

- (a) All observations on the spikelet should be made in the mid-third of the ear.

8.2 *Explanations for individual characteristics*

Comment from Germany: To delete illustrations are provided where necessary

Ad. 1: Coleoptile: anthocyanin coloration

Method for the Determination of Anthocyanin Coloration

Number of grains per test	100 grains for distinctness and uniformity
Preparation of grains	Set up non-dormant grains on moistened filter paper with a Petri dish lid during germination
Place	Laboratory or glasshouse
Light	After the coleoptiles have reached a length of about 1 cm in darkness, they are placed in artificial light (daylight equivalent), 12,000 to 15,000 lux continuously for 3 - 4 days
Temperature	15 to 20°C.
Time of recording	Coleoptiles fully developed (about 1 week) at stage 09-11
Scale of recording	See characteristic 1 in the Table of Characteristics
Note	At least one of the example varieties should be included as a control when testing for distinctness

Comment from Germany: One example variety is not sufficient.

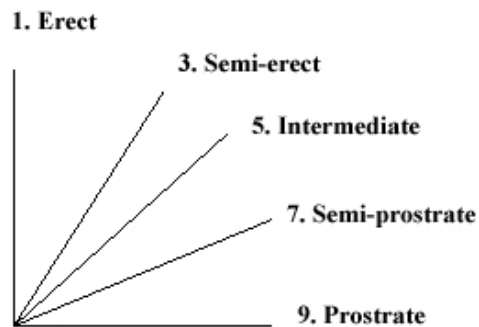
Ad. 2: First leaf: anthocyanin coloration

The plants should be grown in the glasshouse on neutral substrate (for example sand) at a temperature of 18°C and at 15000 Lux continuous illumination from the time of appearance of the coleoptile. The color of the substrate should be preferably pale to get a better contrast

for the observation. The intensity of anthocyanin coloration should be observed at exactly stage 10 as the expression may disappear thereafter.

Ad. 3: Plant: growth habit at tillering stage

The growth habit at tillering stage (growth stages 25-29) should be assessed visually from the attitude of the leaves and tillers. The angle formed by the outer leaves and the tillers with an imaginary middle axis should be used.

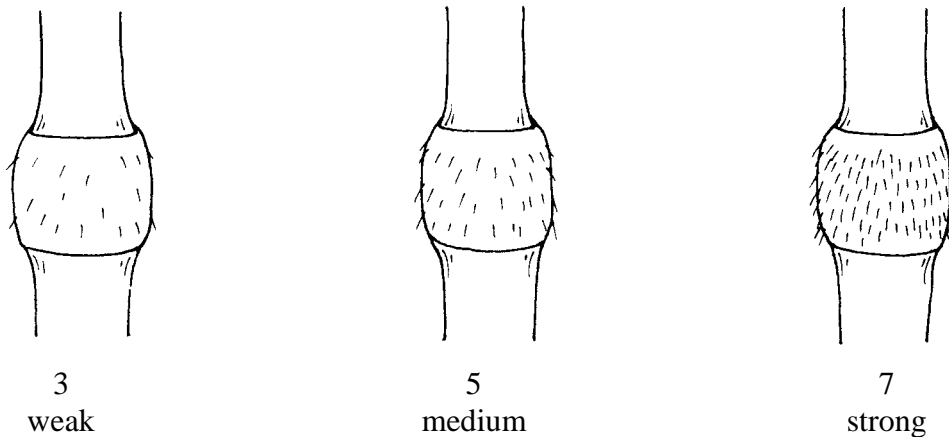


Ad. 5: Plant: time of ear emergence

Observations should be made when the first spikelet is visible on ears of 50% plants.

Comment from Germany: "The time of ear emergence is reached ~~Observations should be made~~ when the first spikelet is visible on ears of 50% plants."

Ad. 10: Culm: hairiness of uppermost node



Ad. 13: Plant: height

Natural plant height including stem, ear and awn is measured with a meter scale. The height is taken from the base of the plant to the tip of the highest awn.

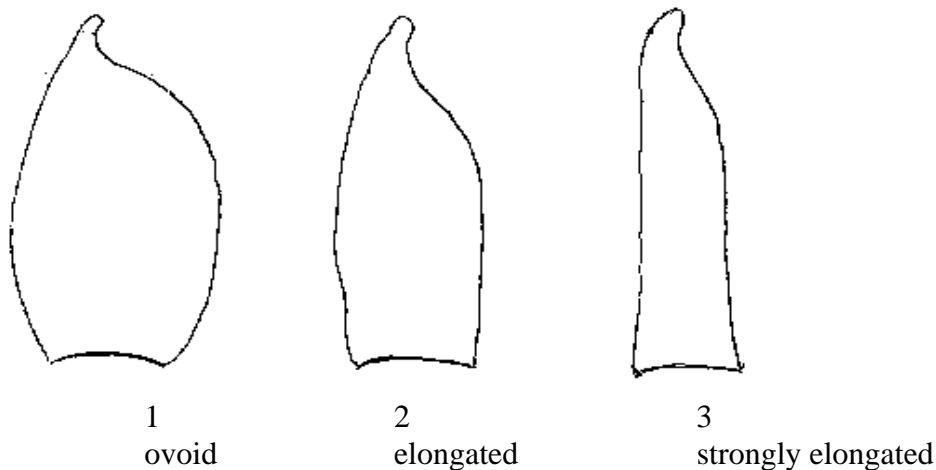
Comment from Germany: "Natural plant height should be measured including stem, ear and awn is measured with a meter scale. The height is taken from the base of the plant to the tip of the highest awn."

Ad. 14: Ear: distribution of awns

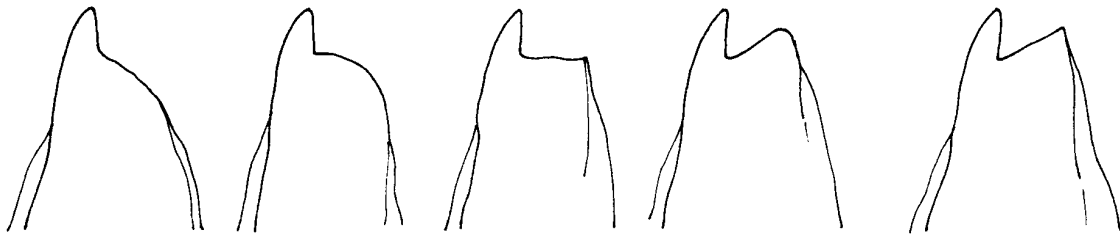


Comment from Germany: Illustration to be improved. The illustration should focus on the distribution of awns only (just to have 4 ears).

Ad. 16: Lower glume: shape (spikelet in mid-third of ear)



Ad. 17: Lower glume: shape of shoulder



1
sloping

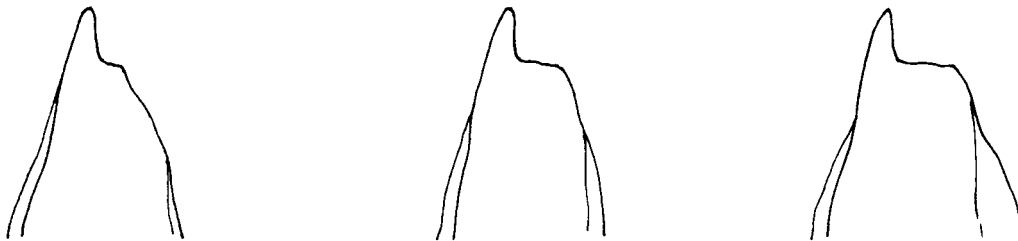
2
rounded

3
straight

4
elevated

5
elevated with 2nd beak present

Ad. 18: Lower glume: width of shoulder

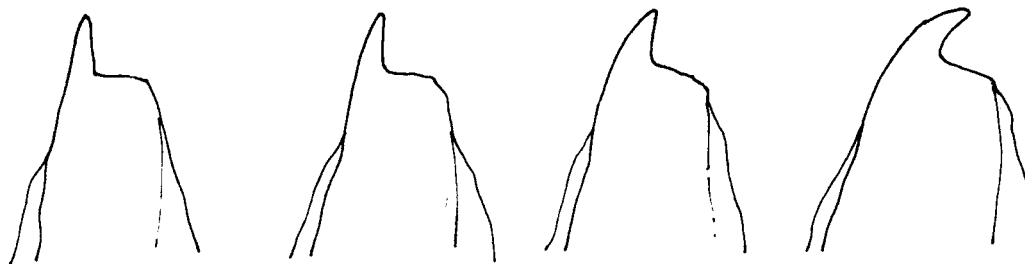


3
narrow

5
medium

7
broad

Ad. 20: Lower glume: shape of beak



1
straight

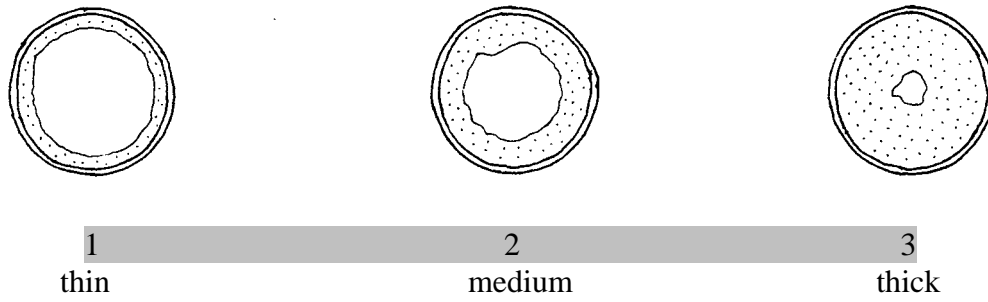
3
slightly curved

5
moderately curved

7
strongly curved

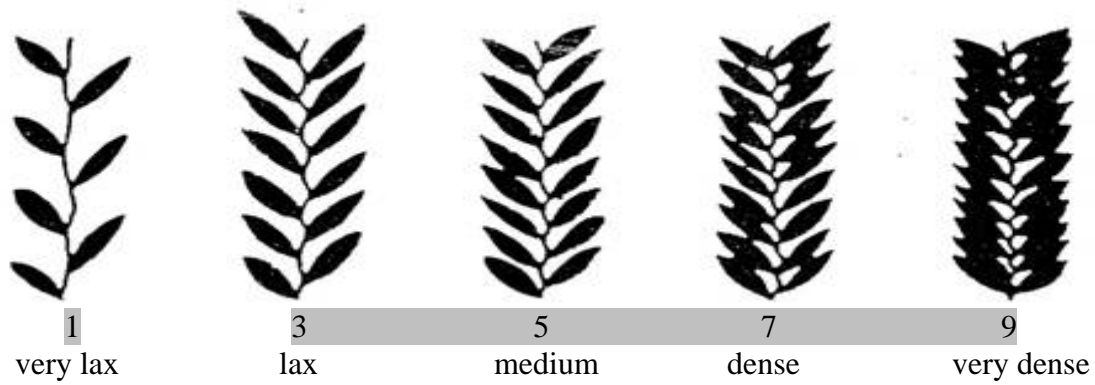
Comment from Germany: To add explanation for Char. 16 to 21

Ad. 22: Straw: pith in cross section



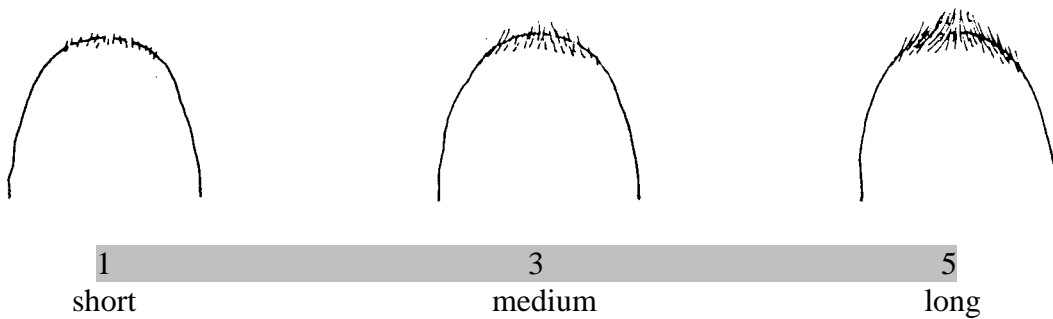
The pith in cross section should be observed half way between base of ear and stem node below.

Ad. 26: Ear: density

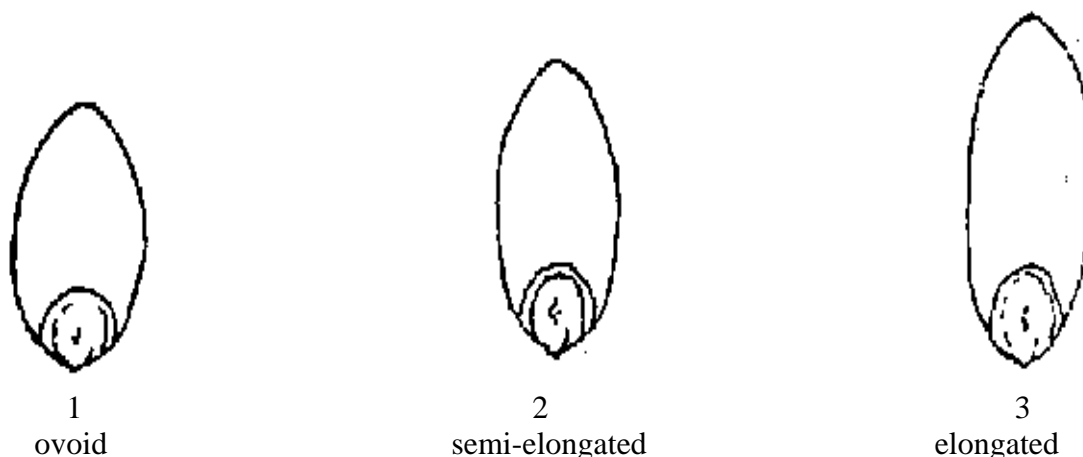


Ad. 28: Grain: length of brush hair in dorsal view

Brush hair length is viewed from the top of the grain and can be described in the following ways:



Ad. 31: Grain: shape



Ad. 32: Grain: coloration with phenol

Method for Determination of Phenol Reaction

Number of grains per test	100 grains for distinctness and uniformity. The grains should not have been treated chemically.
Equipment	Petri dishes (approx. 9 cm diameter).
Preparation of grains	Soak in tap water for 16 to 20 hours, drain and remove surface water, place the grains with crease downwards, cover dish with lid.
Concentration of solution	1 per cent Phenol-solution (freshly made up).
Amount of solution	The grains should be about 3/4 covered.
Place	Laboratory
Light	Daylight - out of direct sunshine.
Temperature	18 to 20°C.
Time of recording	4 hours (after adding solution).
Scale of recording	See characteristic 37 in the Table of Characteristics.
Note	At least one of the example varieties should be included as a control.

Comment from Germany: Scale of recording – See characteristic 32
Note - One example variety is not sufficient.

Ad. 33: Plant: seasonal type

The seasonal type should be assessed on one or several plots sown in springtime. Example varieties should always be included in the plots. When the example varieties behave according to this description, the varieties under study can be described. At the time when the latest spring type variety is fully mature (growth stage 91/92 of the Zadoks decimal code), the growth stage reached by the respective variety should be assessed. The states of expression are defined as follows:

Winter type: The plants have reached stage 45 of the Zadoks decimal code (boots swollen) at maximum

Alternative type: The plants have exceeded stage 45 of the Zadoks decimal code ---as a rule they have exceeded stage 75---and have reached stage 90 at maximum

Spring type: The plants have exceeded stage 90 of the Zadoks decimal code.

8.3 *The descriptions of the growth stages of the Zadoks decimal code for cereals*

Comment from Germany: To improve the format for the Growth stage table.

0	Germination	5	Inflorescence (ear/panicle) emergence
00	Dry seed	50	--
01	Start of imbibition (water absorption)	51	First spikelet of inflorescence just visible
02	--	52	--
03	Imbibition complete	53	1/4 of inflorescence emerged
04	--	54	--
05	Radicle (root) emerged from caryopsis (seed)	55	1/2 of inflorescence emerged
06	--	56	--
07	Coleoptile	57	3/4 of inflorescence emerged
08	--	58	--
09	Leaf just at coleoptile tip	59	Emergence of inflorescence
1	Seedling growth	6	Anthesis (flowering)
10	First leaf through coleoptile	60	--
11	First leaf unfolded	61	Beginning of anthesis
12	2 leaves unfolded	62	--
13	3 leaves unfolded	63	--
14	4 leaves unfolded	64	--
15	5 leaves unfolded	65	Anthesis half-way
16	6 leaves unfolded	66	--
17	7 leaves unfolded	67	--
18	8 leaves unfolded	68	--
19	9 or more leaves unfolded	69	Anthesis complete
2	Tillering	7	Milk development
20	Main shoot only	70	--
21	Main shoot and 1 tiller	71	Caryopsis (kernel) water ripe
22	Main shoot and 2 tillers	72	--
23	Main shoot and 3 tillers	73	Early milk
24	Main shoot and 4 tillers	74	--

25	Main shoot and 5 tillers	75	Medium milk
26	Main shoot and 6 tillers	76	--
27	Main shoot and 7 tillers	77	Late milk
28	Main shoot and 8 tillers	78	--
29	Main shoot and 9 or more tillers	79	--
3	Stem elongation	8	Dough development
30	Pseudostem (leaf sheath) erection	80	--
31	First node detectable	81	--
32	2nd node detectable	82	--
33	3rd node detectable	83	Early dough
34	4th node detectable	84	--
35	5th node detectable	85	Soft dough
36	6th node detectable	86	
37	Flag leaf just visible	87	Hard dough
38	--	88	--
39	Flag leaf ligule just visible	89	--
4	Booting	9	Ripening
40	--	90	--
41	Flag leaf sheath extending	91	Caryopsis hard (difficult to divide)
42	--	92	Caryopsis hard (not dented by thumbnail)
43	Boots just visibly swollen	93	Caryopsis loosening in daytime
44	--	94	Over-ripe, straw dead and collapsing
45	Boots swollen	95	Seed dormant
46	--	96	Viable seed giving 50% germination
47	Flag leaf sheath opening	97	Seed not dormant
48	--	98	Secondary dormancy induced
49	First awns visible	99	Secondary dormancy lost

9. Literature

Annicchiarico, P., Pecetti, L., 1994: Morpho-physiological traits as descriptors for discrimination of durum wheat germplasm. Genetic Resources and Crop Evaluation. Kluwer Academic Publishers, NL, 41: 47-54.

Fitzsimmons, R.W., Martin, R.H., Roberts, G.I., Wrigley, C.W., 1986: Australian Cereal Identification. Commonwealth Scientific and Industrial Research Organization, East Melbourne, AU.

J.C. Zadoks, T.T. Chang, C.F. Konzak., 1974: A Decimal Code for the Growth Stages of Cereals. Weed Research, NL, 14:415-421.

Naghavi, M.R., Monfared, R.S., Ahkami, A.H., Ombidbakhsh, M.A., 2009: Genetic Variation of Durum Wheat Landrace and Cultivars Using Morphological and Protein Markers, Proceedings of World Academy of Science, Engineering and Technology, Volume 37, January 2009 (ISSN-3740), Dubai, AE.

Payne, P.I., Lawrence, G.J., 1983: Catalogue of Alleles For the Complex Gene Loci, Glu-A1, Glu-B1, Glu-D1, Which Code For High Molecular Weight Subunits of Glutenin in Hexaploid Wheat. Cereal Research Communications 11, Budapest, HU, pp. 29-35.

Sparks, G.A., Bezar, H.J., Lamberrts, R., 1987: Identification of New Zealand Wheat Cultivars. Crop Research Division, DISR, Christchurch, NZ.

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	<input type="text" value="Triticum turgidum L. subsp. durum (Desf.) Husn."/>	
1.2 Common name	<input type="text" value="Durum Wheat"/>	
2. Applicant		
Name	<input type="text"/>	
Address	<input type="text"/>	
Telephone No.	<input type="text"/>	
Fax No.	<input type="text"/>	
E-mail address	<input type="text"/>	
Breeder (if different from applicant)	<input type="text"/>	
3. Proposed denomination and breeder's reference		
Proposed denomination (if available)	<input type="text"/>	
Breeder's reference	<input type="text"/>	

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

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

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

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

(c) unknown cross

4.1.2 Mutation
(please state parent variety)

--

4.1.3 Discovery and development
(please state where and when discovered and how developed)

--

4.1.4 Other
(please provide details)"

--

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

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:
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4.2 Method of propagating the variety

4.2.1 Seed-propagated varieties

(a) Self-pollination []

(b) Hybrid []

(c) Other []

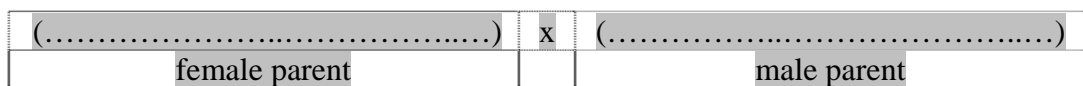
(please provide details)

4.2.2 Other []

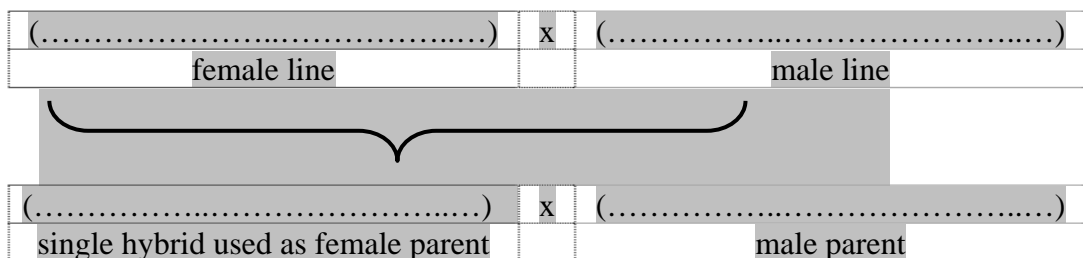
(please provide details)

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



Three-Way Hybrid



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:
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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 Lower glume: hairiness of external surface (21)		
absent	Grandur, Hyperno, Roqueño, Don Sebastian	1[]
present	Paramo, Wollaroi, Don Jose	9[]
5.2 Straw: pith in cross section (half way between base of ear and stem node below) (22)		
thin	Hyperno, Valnova	1[]
medium	Tamaroi	2[]
thick	line4210.23.6, Paramo	3[]
5.3 Awn: color (23)		
white	Esquilache, Kronos, Don Sebastian	1[]
light brown	Kamailaroi, Yallaroi	2[]
medium purple	line4210.23.6, Tejon	3[]
dark purple	Capdur, Tamaroi, Valnova, Don Jose	4[]
5.4 Ear: color at maturity (25)		
white	Esquilache, Valdur, Yallaroi, Don Jose	1[]
slightly colored	Randur	2[]
strongly colored	Kronos, Tamaroi	3[]

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:
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Characteristics	Example Varieties	Note
5.5 Grain: coloration with phenol (32)		
absent or very light	Esquilache, Hyperno, Don Jose	1[]
very light to light		2[]
light	Randur, Burgos	3[]
light to medium		4[]
medium		5[]
medium to dark		6[]
dark		7[]
dark to very dark		8[]
very dark		9[]
5.7 Plant: seasonal type (33)		
winter type		1[]
alternative type	Camacho, Valmora	2[]
spring type	Kalka, Saintly, Tejon	3[]

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:
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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
<i>Example</i>	<i>Ear: color at maturity</i>	<i>white</i>	<i>strongly colored</i>

Comments:

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:
<p>#7. Additional information which may help in the examination of the variety</p> <p>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?</p> <p>Yes [] No []</p> <p>(If yes, please provide details)</p> <p>7.2 Are there any special conditions for growing the variety or conducting the examination?</p> <p>Yes [] No []</p> <p>(If yes, please provide details)</p> <p>7.3 Other information</p> <p>A representative color photograph of the variety should accompany the Technical Questionnaire.</p>		
<p>8. Authorization for release</p> <p>(a) Does the variety require prior authorization for release under legislation concerning the protection of the environment, human and animal health?</p> <p>Yes [] No []</p> <p>(b) Has such authorization been obtained?</p> <p>Yes [] No []</p> <p>If the answer to (b) is yes, please attach a copy of the authorization.</p>		

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:
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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]