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INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS

Geneva

DRAFT

TURNIP*

UPOV Code(s):

BRASS_RAP_RAP

Brassica rapa L. subsp. *rapa*

GUIDELINES

FOR THE CONDUCT OF TESTS

FOR DISTINCTNESS, UNIFORMITY AND STABILITY

prepared by experts from France
to be considered by the
Technical Working Party for Vegetables
at its fifty-third session, to be held in Seoul, Republic of Korea,
from 2019-05-20 to 2019-05-24

Disclaimer: this document does not represent UPOV policies or guidance

Alternative names:*

Botanical name	*English*	*French*	*German*	*Spanish*
Brassica rapa L. subsp. *rapa*	Turnip	Navet	Herbstrübe, Mairübe	Nabo

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/185 Turnip rape

* 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 *Brassica rapa* L. subsp. *rapa*.

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:

20 g or 10,000 seeds

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

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

3.1.2 The two independent growing cycles should be in the form of two separate plantings.

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

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.

3.4 Test Design

3.4.1 Each test should be designed to result in a total of at least 60 plants, which should be divided between at least 2 replicates.

3.4.1 The design of the tests should be such that plants or parts of plants may be removed for measurement or counting without prejudice to the observations which must be made up to the end of the growing cycle.

3.5 Additional Tests

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

4. Assessment of Distinctness, Uniformity and Stability

4.1 Distinctness

4.1.1 General Recommendations

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

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 or Parts of Plants to be Examined

Unless otherwise indicated, for the purposes of distinctness, all observations on single plants should be made on 40 plants or parts of plants 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 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 These Test Guidelines have been developed for the examination of seed-propagated varieties. For varieties with other types of propagation, the recommendations in the General Introduction and document TGP/13 "Guidance for new types and species" Section 4.5 "Testing Uniformity" should be followed.

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

4.2.4 The assessment of uniformity for hybrid varieties depends on the type of hybrid and should be according to the recommendations for hybrid varieties in the General Introduction.

4.2.5 For the assessment of uniformity of hybrid varieties, a population standard of 1% and an acceptance probability of at least 95% should be applied. In the case of a sample size of 60 plants, 2 off-types are allowed.

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) Ploidy (characteristic 1)
(b) Petiole: anthocyanin coloration (characteristic 2)
(c) Leaf: type (characteristic 6)
(d) Root: degree of swelling (characteristic 16)
(e) Only varieties with root: degree of swelling: medium or strong: Root: color of skin above soil (characteristic 18)
(f) Only varieties with root: degree of swelling: medium or strong: Root: color of skin below soil (characteristic 20)
(g) Only varieties with root: degree of swelling: medium or strong: Root: color of flesh (characteristic 21)
(h) Only varieties with root: degree of swelling: medium or strong: Root: shape in longitudinal section (characteristic 23)

5.4 Guidance for the use of grouping characteristics, in the process of examining distinctness, is provided through the General Introduction and document TGP/9 “Examining Distinctness”.

6. Introduction to the Table of Characteristics

6.1 Categories of Characteristics

6.1.1 Standard Test Guidelines Characteristics

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

6.1.2 Asterisked Characteristics

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

6.2 States of Expression and Corresponding Notes

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

6.2.2 In the case of qualitative and pseudo-qualitative characteristics (see Chapter 6.3), all relevant states of expression are presented in the characteristic. However, in the case of quantitative characteristics with 5 or more states, an abbreviated scale may be used to minimize the size of the Table of Characteristics. For example, in the case of a quantitative characteristic with 9 states, the presentation of states of expression in the Test Guidelines may be abbreviated as follows:

State	*Note*
small	3
medium	5
large	7

However, it should be noted that all of the following 9 states of expression exist to describe varieties and should be used as appropriate:

State	*Note*
very small	1
very small to small	2
small	3
small to medium	4
medium	5
medium to large	6
large	7
large to very large	8
very large	9

6.2.3 Further explanation of the presentation of states of expression and notes is provided in document TGP/7 “Development of Test Guidelines”.

6.3 Types of Expression

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

6.4 Example Varieties

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

6.5 Legend

	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
1 **2**	**3** **4**	**5** **6**	**7**			
	Name of characteristics in English	**Nom du caractère en français**	**Name des Merkmals auf Deutsch**	**Nombre del carácter en español**		
	states of expression	types d'expression	Ausprägungsstufen	tipos de expresión		

1 Characteristic number

2 (*) Asterisked characteristic – see Chapter 6.1.2

3 Type of expression
QL Qualitative characteristic – see Chapter 6.3
QN Quantitative characteristic – see Chapter 6.3
PQ Pseudo-qualitative characteristic – see Chapter 6.3

4 Method of observation (and type of plot, if applicable)
MG, MS, VG, VS – see Chapter 4.1.5

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

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

7 Growth stage key See Explanations on the Table of Characteristics in Chapter 8.3

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

		English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
1.	**(*)**	**QL VG/VS**	**(+)**	**12-700**			
		Ploidy					
		diploid				Milan White	2
		tetraploid				Taronda	4
2.	**(*)**	**QL VG**		**30-90**			
		Petiole: anthocyanin coloration					
		absent				De Nancy à feuille entière	1
		present				Hinona, Onobeni, Scarlet Queen Red Stem	9
3.		**QN VG**	**(+)** **(a)**	**70-130**			
		Leaf: attitude					
		erect				Hinona, Samson	1
		semi-erect				Agressa, Noir long	3
		horizontal				Goldana, Richelieu, Teltower Kleine	5
4.		**QN VG**	**(+)** **(a)**	**100-130**			
		Leaf: degree of recurving of the apex					
		absent or very weak				Milan White Forcing, Ordes	1
		weak				Declic, Fuku Komachi	3
		medium				Delilah	5
		strong				Marteau	7
		very strong				Barkant	9
5.	**(*)**	**QN VG**		**(a)** **100-130**			
		Leaf: intensity of green color					
		very light					1
		light				Leielander, Ordes, Rondo	3
		medium				Civasto R	5
		dark				Blanc globe à collet violet, Tokyo Top	7
		very dark				Richelieu	9

		English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
6.	**(*)**	**QL VG**	**(+) (a)**	**100-130**			
		Leaf: type					
		entire				Agressa, Appin, De Nancy à feuille entière, Declic, Polybra, Rondo, Simax, Taronda	1
		lobed				Barkant, Blanc globe à collet violet, Civasto R, Richelieu, Tokyo Cross	2
7.		**QN MS/VG**	**(+) (a)**	**100-130**			
		Leaf: number of lobes					
		few				Tokyo Cross	3
		medium				Blanc globe à collet violet, Richelieu	5
		many				Barkant, Civasto R	7
8.		**QN VG**	**(+) (a)**	**100-130**			
		<u>Only varieties with leaf: type: entire</u>: Leaf: depth of incisions of margin at basal part					
		very shallow				Declic	1
		shallow				Agressa, Taronda	3
		medium				De Nancy à feuille entière	5
		deep				Simax	7
		very deep				Polybra	9
9.		**QN VG**	**(a)**	**100-130**			
		Leaf: undulation of margin					
		absent or very weak				Tokyo Cross	1
		weak				De Nancy à feuille entière, Tokyo Top	3
		medium				Rouge plat hâtif à feuille entière	5
		strong				Delilah, Falko	7
		very strong				Rondo	9

		English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
10.	**QN VG**	**(+) (a)**	**100-130**				
	Leaf: dentation of margin of upper part of the leaf						
	absent or very weak					De Milan à forcer à collet rose	1
	weak					Milan White	3
	medium					Polybra	5
	strong					Greleiro Senhora Conceição, Taronda	7
	very strong					Appin	9
11.	**(*) QN MS/VG**	**(+) (a)**	**100-130**				
	Leaf: length						
	very short					De Milan à forcer à collet rose	1
	short					Milan White, Richelieu	3
	medium					Blanc globe à collet violet, Tokyo Cross	5
	long					Greleiro Senhora Conceição, Ordes	7
	very long					Simax	9
12.	**QN MS/VG**	**(+) (a)**	**100-130**				
	Leaf: width						
	narrow					De Milan à forcer à collet rose, Milan White Forcing	3
	medium					Barkant	5
	broad					Simax	7
	very broad					Greleiro Senhora Conceição, Ordes	9
13.	**QN MS/VG**	**(+) (a)**	**100-130**				
	<u>Only varieties with leaf: type: lobed</u>: Leaf: length of terminal lobe						
	short					Richelieu	3
	medium					Blanc globe à collet violet, Petrovskaja 1, Snowball	5
	long					D'Auvergne hâtive, Jaune boule d'or	7

		English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
14.		**QN MS/VG**	**(+) (a)**	**100-130**			
		Only varieties with leaf: type: lobed: Leaf: width of terminal lobe					
		narrow				Richelieu	3
		medium				Blanc globe à collet violet, Jaune boule d'or	5
		broad				Long d'Alsace	7
15.		**QN VG**	**(a)**	**100-130**			
		Leaf: hairiness of upper side					
		absent or very weak				Appin, Rondo	1
		weak				Tokyo Market	3
		medium				De Milan à forcer à collet rose	5
		strong				Blanc dur d'hiver, Rouge plat hâtif à feuille entière	7
		very strong					9
16.	**(*)**	**QN VG**	**(+)**	**240-260**			
		Root: degree of swelling					
		absent or weak				Grelos de Santiago, Simax	1
		medium				Globo blanco de Lugo	2
		strong				Polybra, Tokyo Market	3
17.	**(*)**	**QN VG**	**(+)**	**260-290**			
		Only varieties with root: degree of swelling: medium or strong: Root: position in soil					
		very shallow				Declic, Milan White Forcing	1
		shallow				Oasis	3
		medium				Agressa	5
		deep				Jaune boule d'or, Noir long	7
		very deep				Teltower Kleine	9

		English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
18.	**(*)**	**PQ VG**		**240-260**			
		Only varieties with root: degree of swelling: medium or strong: Root: color of skin above soil					
		white				Tokyo Cross	1
		green				Leielander, Petrovskaja 1, Rondo	2
		yellow-orange				Jaune boule d'or	3
		red				Scarlet Queen Red Stem	4
		reddish purple				Falko, Hinona	5
		bluish purple				Blanc globe à collet violet	6
		black				Noir long	7
19.		**QN VG**		**240-260**			
		Only varieties with root: degree of swelling: medium or strong: Root: intensity of coloration of skin above soil					
		light					1
		medium					2
		dark					3
20.	**(*)**	**PQ VG**		**240-260**			
		Only varieties with root: degree of swelling: medium or strong: Root: color of skin below soil					
		white				Milan White Forcing, Natsu Komachi, Taronda	1
		yellow				Goldana, Jaune boule d'or, Petrovskaja 1	2
		red				Scarlet Queen Red Stem	3
		purple					4
		black				Noir long	5
21.	**(*)**	**QL VG**		**240-280**			
		Only varieties with root: degree of swelling: medium or strong: Root: color of flesh					
		white				Noir long, Scarlet Queen Red Stem, Taronda	1
		yellow				Goldana, Jaune boule d'or, Petrovskaja 1	2

		English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
22.		**QL VG**		**240-280**			
		Only varieties with root: degree of swelling: medium or strong: Root: anthocyanin coloration of flesh					
		absent				Marteau	1
		present				Scarlet Queen Red Stem	9
23.	**(*)**	**PQ VG**	**(+)**	**260-280**			
		Only varieties with root: degree of swelling: medium or strong: Root: shape in longitudinal section					
		oblate narrow elliptic				Platte Witte Mei	1
		oblate elliptic				Milan White	2
		circular				Rondo	3
		square				Champion Green Top, Yellow	4
		broad oblong				Barkant, Delilah	5
		narrow oblong				Long d'Alsace	6
		ovate					7
		narrow triangular					8
		obtriangular					9
24.	**(*)**	**QN MS/VG**		**260-280**			
		Only varieties with root: degree of swelling: medium or strong: Root: length					
		very short				Milan White	1
		short				The Wallace	3
		medium				Dynamo	5
		long				Taronda	7
		very long				Kranjska Podolgovata	9
25.		**QL VG**	**(+)**	**260-280**			
		Only varieties with root: degree of swelling: medium or strong: Root: curvature of vertical axis					
		absent				Taronda	1
		present				De Croissy	9

		English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
26.	**(*)**	**QN VG**		**260-280**			
		<u>Only varieties with root: degree of swelling: medium or strong</u>: Root: position of broadest part					
		above middle				Marteau	1
		at middle				Jaune boule d'or	2
		below middle				Blanc dur d'hiver	3
27.	**(*)**	**QN MS/VG**	**(+)**	**260-280**			
		<u>Only varieties with root: degree of swelling: medium or strong</u>: Root: diameter					
		small				Hakutaka	3
		medium				Rondo	5
		large				Massif	7
28.	**(*)**	**QN VG**	**(+)**	**(b)**	**260-280**		
		<u>Only varieties with root: degree of swelling: medium or strong</u>: Root: shape of collar					
		strongly depressed				De Milan à forcer à collet rose	1
		depressed				Milan White Forcing	3
		flat				Milan White	5
		raised				Taronda	7
		strongly raised				Agressa	9
29.	**(*)**	**PQ VG**	**(+)**	**(b)**	**260-280**		
		<u>Only varieties with root: degree of swelling: medium or strong</u>: Root: shape of apex					
		narrow accute				Hinona, Noir long	1
		broad accute				Kranjska Podolgovata	2
		rounded				Civasto R	3
		truncate				Milan White	4
		depressed				Milan White Forcing	5

	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
30.	**QN MG/VG**		**260**			
	Only varieties with root: degree of swelling: medium or strong: Root: time of harvest maturity					
	early				Oasis	3
	medium				Civasto R	5
	late				Aberdeen Green Top Yellow	7
31.	**QN VG**	**(+)**	**310**			
	Plant: number of sprouts					
	none or very few				Taronda	1
	few				Largo de Alsacia	3
	medium				Saô Cosme	5
	many				Globo blanco de Lugo	7
	very many				Grelos de Santiago	9
32.	**QN MG/VG**		**370**			
	Plant: Time of flowering					
	very early				Greleiro Temporâo	1
	early				Grelos de Santiago, Tyfon	3
	medium				Globo blanco de Lugo, Marteau	5
	late				Bola de nieve, Jaune boule d'or	7
	very late				Golden Ball, Ordes, Platte Witte Mei	9
33.	**QN VG**		**370-400**			
	Petal: intensity of yellow color					
	light				Taronda	3
	medium					5
	dark				Jaune boule d'or	7

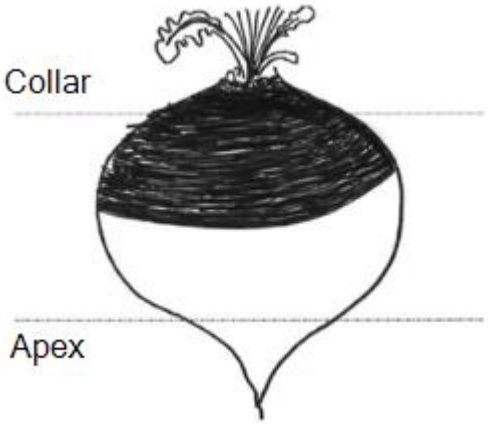
8. Explanations on the Table of Characteristics

8.1 Explanations covering several characteristics

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

(a) Observations should be made on the largest fully developed leave.

(b)



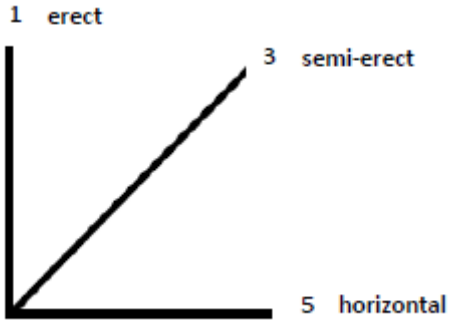
8.2 Explanations for individual characteristics

Ad. 1: Ploidy

The ploidy status of the plant can be checked by different methods :

- determination of the number of chromosomes of the non-thickened root meristem (which is the most reliable method),
- examination of the stomata on the lower side of the cotyledon (tetraploid varieties have more and longer stomata than diploid varieties),
- examination of the chloroplasts of the guard cells on the lower side of the cotyledon (the guard cells of tetraploid varieties are bigger and contain more chloroplasts (> 20) than those of diploid varieties (> 10).
- Flow cytometry (DNA quantification method).

Ad. 3: Leaf: attitude



Ad. 4: Leaf: degree of recurving of the apex

The black line represents the profile of the whole leaf.

1	3	5	7	9
absent or very weak	weak	medium	strong	very strong

Ad. 6: Leaf: type

1
entire

2
lobed

Ad. 7: Leaf: number of lobes

Parts of the leaf blade are considered to be lobes if:
1. They have a minimum length of 1 cm and
2. When folded back to the midrib as shown in Figs 1 and 2, the folded tissue meets the midrib

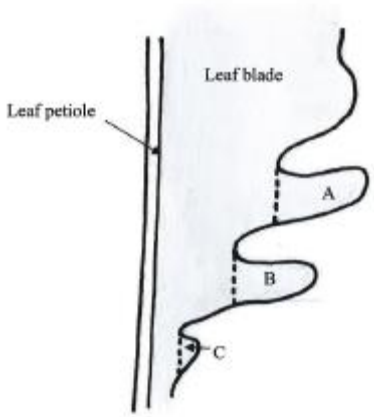


Figure 1

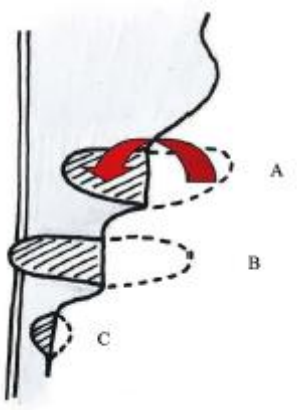
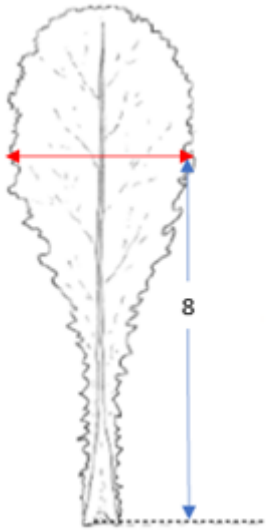


Figure 2

A is not a lobe as it does not meet the midrib when folded
B is a lobe as it meets the midrib when folded
C is too small to be a lobe as it is less than 1 cm in length and does not meet the midrib when folded

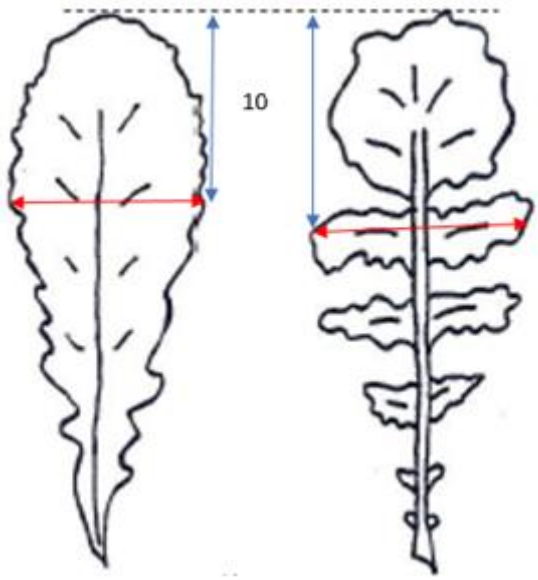
Ad. 8: Only varieties with leaf: type: entire: Leaf: depth of incisions of margin at basal part

Observations should be made below the broadest part of the leaf.

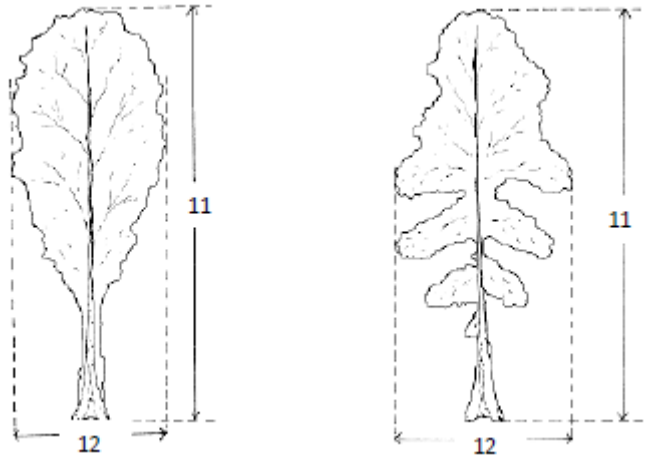


Ad. 10: Leaf: dentation of margin of upper part of the leaf

Observations should be made above the broadest part of the leaf.



Ad. 11: Leaf: length

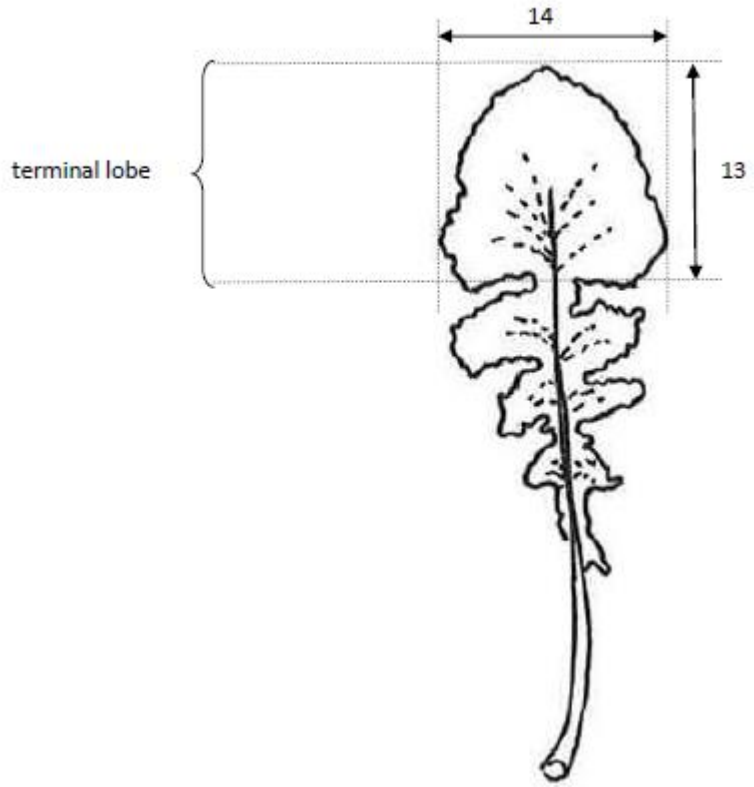


11 - Leaf: length
12 - Leaf: width

Ad. 12: Leaf: width

See Ad. 11

Ad. 13: Only varieties with leaf: type: lobed: Leaf: length of terminal lobe



13 - Length of terminal lobe
14 - Width of terminal lobe

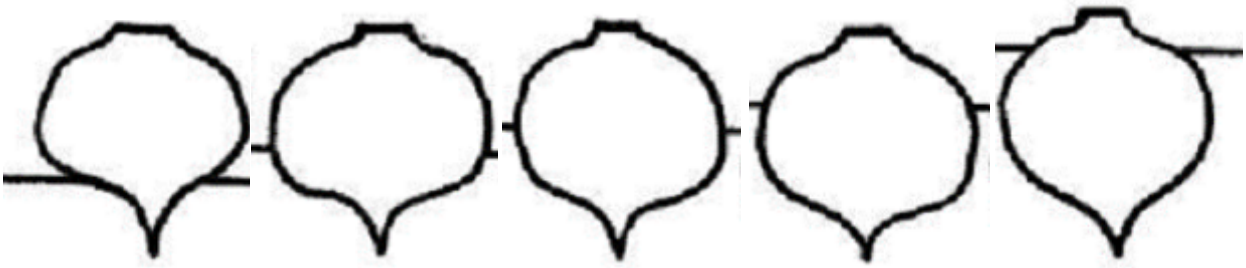
Ad. 14: Only varieties with leaf: type: lobed: Leaf: width of terminal lobe

See Ad. 13

Ad. 16: Root: degree of swelling

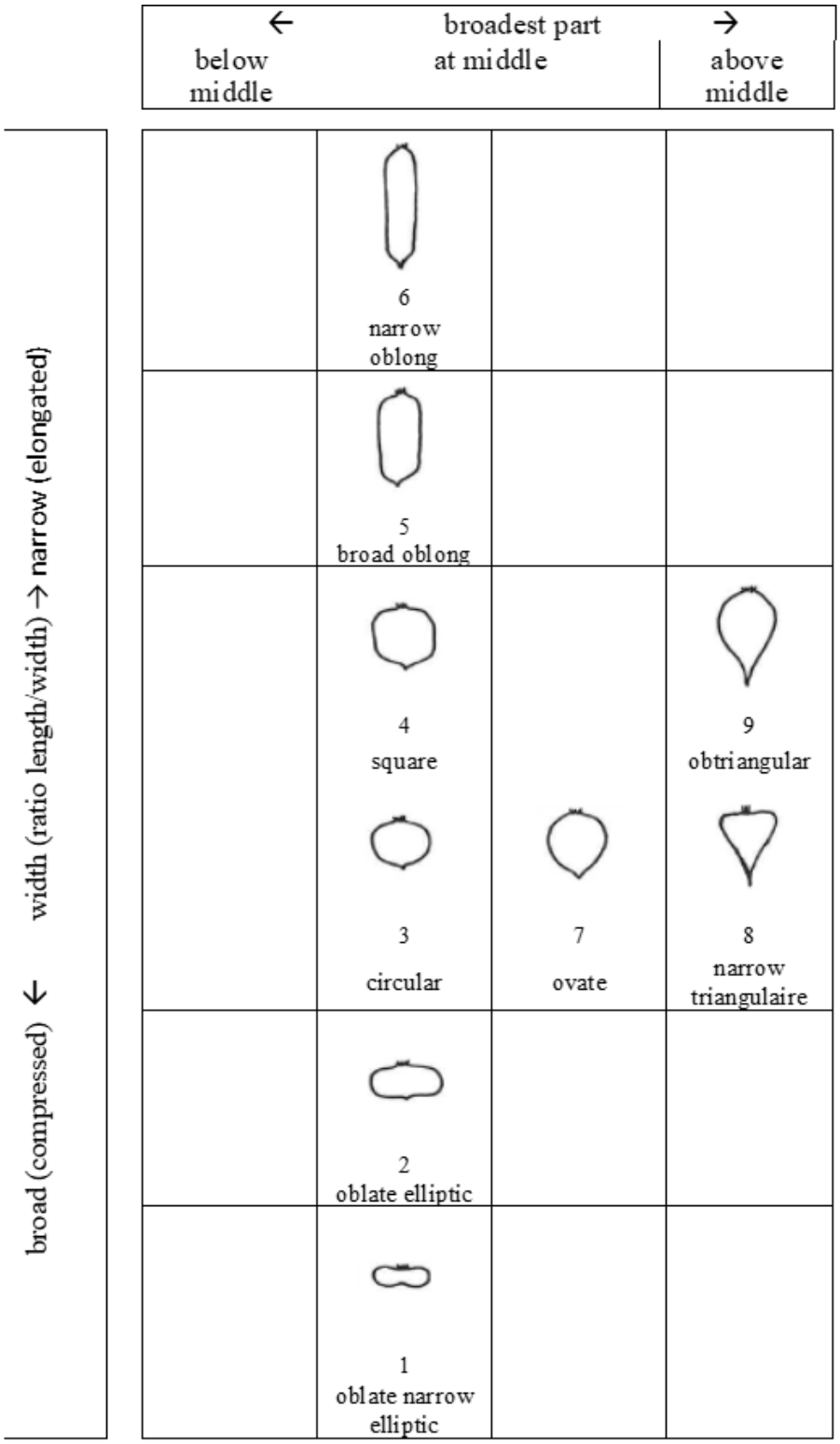
Observations of this character should be made at the full development of the plants.
Turnip can be consumed for its roots, but also for its leaves. As a result, the shape of the root can be strong or, at the opposite, absent or weak, even if intermediates situations exist.

Ad. 17: Only varieties with root: degree of swelling: medium or strong: Root: position in soil



1	3	5	7	9
very shallow	shallow	medium	deep	very deep

Ad. 23: Only varieties with root: degree of swelling: medium or strong: Root: shape in longitudinal section



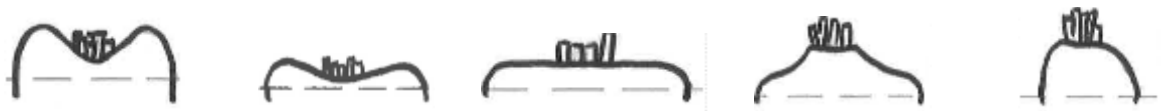
Ad. 25: Only varieties with root: degree of swelling: medium or strong: Root: curvature of vertical axis

This characteristic refers to the curvature of the vertical axis for roots that are taller than they are wide.

Ad. 27: Only varieties with root: degree of swelling: medium or strong: Root: diameter

The diameter of the root should be measured at the broadest point of the root

Ad. 28: Only varieties with root: degree of swelling: medium or strong: Root: shape of collar

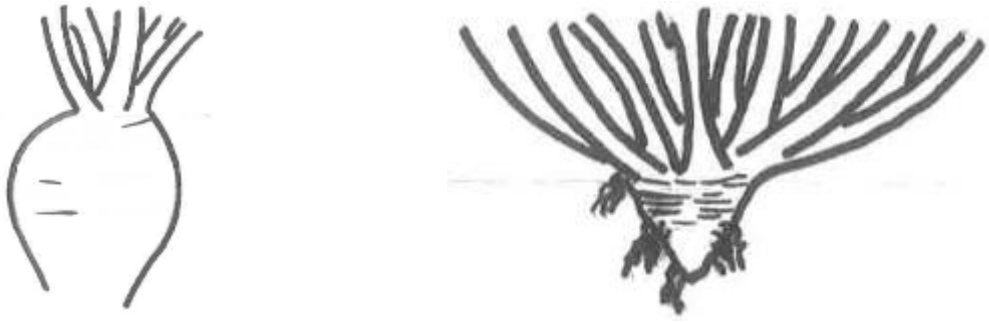


1	3	5	7	9
strongly depressed	depressed	flat	raised	strongly raised

Ad. 29: Only varieties with root: degree of swelling: medium or strong: Root: shape of apex

1	2	3	4	5
narrow accute	broad accute	rounded	truncate	depressed

Ad. 31: Plant: number of sprouts



1	9
none or very few	very many

8.3 Key to Growth Stages

00	Dry seed
1-10	Germination and emergence through soil
	Seedling growth
12	Elongation of emerging shoot
15	Elongation and opening of cotyledons
20	Cotyledons fully opened
30	Cotyledons fully opened and full development of first true leaf
40	Second leaf fully developed
50	Third leaf fully developed and initial senescence of cotyledons
60	Fourth leaf fully developed and partial senescence of cotyledons
70	Fifth leaf fully developed and advanced senescence/drop of cotyledons
	Leaf development
80	Sixth leaf fully developed
90	Seventh leaf fully developed; initial senescence of first true leaf in early cultivars
100	Eighth leaf fully developed; 30 % senescence of first true leaf
110	Ninth leaf fully developed; 60% senescence of first true leaf
120	Tenth leaf fully developed; complete senescence and drop of first true leaf
130	Eleventh leaf fully developed.
	Root development
200	Slight swelling of the root at ground level
220	Development of a small swollen root above ground level
240	Swollen root increasing in size but not fully developed
260	Root fully developed with no cork on skin
270	Root fully developed with 40% cork development on skin
280	Root fully developed with 80 - 100% cork development
290	Root flesh becoming pithy and fibrous
300	Root flesh pithy and fibrous
	Flowering and seed production on main stem
310	Initial formation and elongation of the flowering stem
330	Elongation of the flowering stem with clear space between leaves
350	First bud formation and further elongation of stem
360	Terminal inflorescence in bud
370	Terminal inflorescence with first open flower
380	Terminal inflorescence partially flowering
400	Terminal inflorescence fully flowering
420	Development of siliqua with elongation of flowering stem
430	Lowest fully developed siliqua green
450	Lowest fully developed siliqua senescing and going brown
475	Lowest fully developed siliqua dry with seed beginning to dry
500	Lowest fully developed siliqua dry with mature dry seed

9. Literature

Aoba, T., 1970: Inheritance of Seed Coat Color in Turnip, Jap. Journ. Breeding 20 (3): 173-197.

Baltjes, H. J., Klein Geltink, D. J. A., Nienhuis, K. H. and Luesink, B., 1985: Linking Distinctness and Description of Varieties, Journal National Institute Agricultural Botany. 17. p. 9-19.

Green, F. N. and Winfield, P. J., 1984: The Development of Distinctness, Uniformity and Stability tests for Turnip, Turnip Rape and Swede in the United Kingdom. Procedures of Better Brassicas ’84 Conference. St. Andrews. Eds. W. H. Macfarlane Smith, T. Hodgkin and A. B. Wills. 96-107.

Klein Geltink, D. J. A., 1983: Inheritance of Leaf Shape in Turnip (Brassica rapa L. partim) and Rape (Brassica napus L.). Euphytica 32 (2): 361-365.

McMaster Davey, V., 1931: Color Inheritance in Swedes and Turnips and its Bearing on the Identification of Commercial Stocks. Nat. Journ. Agric. XIV (3): 1-13.

Padilla, G., Cartea, M.E., Rodríguez, V., Ordás, A. 2005: Genetic diversity in a germplasm collection of Brassica rapa subsp. rapa L. from northwestern Spain. Euphytica 145 171-180

Scottish Crop Research Institute, Dundee. Kajanus, B., 1913: Über die Vererbungsweise gewisser Merkmale der Beta- und Brassica-Rüben. II Brassica. Zeitschrift für Pflanzenzüchtung, Band I (4): 419-466.

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	*Brassica rapa* L. subsp. *rapa*
1.2	Common name	Turnip

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 [ ]

(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)

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

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

4.2 Method of propagating the variety

4.2.1 Seed-propagated varieties

(a) Cross-pollination [ ]
(b) Hybrid [ ]
(c) Other (please provide details) [ ]

4.2.2 Other [ ]
(Please provide details)

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

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

	Characteristics	Example Varieties	Note
5.1 (1)	**Ploidy**		
	diploid	Milan White	2 [ ]
	tetraploid	Taronda	4 [ ]
5.2 (2)	**Petiole: anthocyanin coloration**		
	absent	De Nancy à feuille entière	1 [ ]
	present	Hinona, Onobeni, Scarlet Queen Red Stem	9 [ ]
5.3 (5)	**Leaf: intensity of green color**		
	very light		1 [ ]
	very light to light		2 [ ]
	light	Leielander, Ordes, Rondo	3 [ ]
	light to medium		4 [ ]
	medium	Civasto R	5 [ ]
	medium to dark		6 [ ]
	dark	Blanc globe à collet violet, Tokyo Top	7 [ ]
	dark to very dark		8 [ ]
	very dark	Richelieu	9 [ ]
5.4 (6)	**Leaf: type**		
	entire	Agressa, Appin, De Nancy à feuille entière, Declic, Polybra, Rondo, Simax, Taronda	1 [ ]
	lobed	Barkant, Blanc globe à collet violet, Civasto R, Richelieu, Tokyo Cross	2 [ ]
5.5 (16)	**Root: degree of swelling**		
	absent or weak	Grelos de Santiago, Simax	1 [ ]
	medium	Globo blanco de Lugo	2 [ ]
	strong	Polybra, Tokyo Market	3 [ ]

	Characteristics	Example Varieties	Note
5.6 (18)	**Only varieties with root: degree of swelling: medium or strong: Root: color of skin above soil**		
	white	Tokyo Cross	1 [ ]
	green	Leielander, Petrovskaja 1, Rondo	2 [ ]
	yellow-orange	Jaune boule d'or	3 [ ]
	red	Scarlet Queen Red Stem	4 [ ]
	reddish purple	Falko, Hinona	5 [ ]
	bluish purple	Blanc globe à collet violet	6 [ ]
	black	Noir long	7 [ ]
5.7 (20)	**Only varieties with root: degree of swelling: medium or strong: Root: color of skin below soil**		
	white	Milan White Forcing, Natsu Komachi, Taronda	1 [ ]
	yellow	Goldana, Jaune boule d'or, Petrovskaja 1	2 [ ]
	red	Scarlet Queen Red Stem	3 [ ]
	purple		4 [ ]
	black	Noir long	5 [ ]
5.8 (21)	**Only varieties with root: degree of swelling: medium or strong: Root: color of flesh**		
	white	Noir long, Scarlet Queen Red Stem, Taronda	1 [ ]
	yellow	Goldana, Jaune boule d'or, Petrovskaja 1	2 [ ]
5.9 (23)	**Only varieties with root: degree of swelling: medium or strong: Root: shape in longitudinal section**		
	oblate narrow elliptic	Platte Witte Mei	1 [ ]
	oblate elliptic	Milan White	2 [ ]
	circular	Rondo	3 [ ]
	square	Champion Green Top, Yellow	4 [ ]
	broad oblong	Barkant, Delilah	5 [ ]
	narrow oblong	Long d'Alsace	6 [ ]
	ovate		7 [ ]
	narrow triangular		8 [ ]
	obtriangular		9 [ ]

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	*Leaf: type*	*entire*	*lobed*

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

A representative color photograph of the variety displaying its main distinguishing feature(s), should accompany the Technical Questionnaire. The photograph will provide a visual illustration of the candidate variety which supplements the information provided in the Technical Questionnaire.

The key points to consider when taking a photograph of the candidate variety are:

- Indication of the date and geographic location
- Correct labeling (breeder's reference)
- Good quality printed photograph (minimum 10 cm x 15 cm) and/or sufficient resolution electronic format version (minimum 960 x 1280 pixels)"

Further guidance on providing photographs with the Technical Questionnaire is available in document TGP/7 "Development of Test Guidelines", Guidance Note 35 (http://www.upov.int/tgp/en/).

[The link provided may be deleted by members of the Union when developing authorities' own test guidelines.]

Main use:
- Root vegetable [ ]
- Leaf and stem consumption [ ]
- Stubble or Forage Turnip [ ]

Time of sowing:
- Spring sown [ ]
- Summer sown [ ]
- Autumn sown [ ]

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:

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]