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INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS

Geneva

DRAFT

BROCCOLI

UPOV Code(s):

BRASS_OLE_GBC

Brassica oleracea L. var. *italica* Plenck

GUIDELINES

FOR THE CONDUCT OF TESTS

FOR DISTINCTNESS, UNIFORMITY AND STABILITY

prepared by an expert from the Netherlands (Kingdom of the)
to be considered by the
Technical Committee at its sixty-first session,
to be held Geneva from 2025-10-20 to 2025-10-21

Disclaimer: this document does not represent UPOV policies or guidance

This document contains the following changes proposed by the Technical Working Party for Vegetables (TWV), at its fifty-ninth session[1], presented in grey highlight:

(a) Addition of characteristics "Resistance to *Plasmodiophora brassicae* (Pb) – Races 0 to 3" at the end of the Table of Characteristics;
(b) Addition of explanation "Resistance to *Plasmodiophora brassicae* (Pb) – Races 0 to 3";
(c) Addition of characteristics "Resistance to *Plasmodiophora brassicae* (Pb) – Races 0 to 3" to TQ 5. with option "not tested".

Alternative names:*

Botanical name	*English*	*French*	*German*	*Spanish*
Brassica oleracea L. var. *italica* Plenck, *Brassica oleracea* subvar. *cymosa* Duchesne, *Brassica oleracea* var. *cymosa* (Duchesne) DC.	Broccoli, Calabrese, Sprouting Broccoli, Winter broccoli	Brocoli, Chou brocoli	Brokkoli	Brécol, Brócoli, Bróculi

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.

[1] held by electronic means, from May 5 to 8, 2025.

* 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.]

ASSOCIATED DOCUMENTS

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

Other associated UPOV documents: TG/45/7 Cauliflower

* 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.]

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1. Subject of these Test Guidelines

1.1 These Test Guidelines apply to all varieties of *Brassica oleracea* L. var. *italica* Plenck.

1.2 The botanical difference between broccoli and cauliflower is that broccoli produces heads bearing clusters of developed flower buds, whereas cauliflower produces curds consisting of a tightly-packed mass of undifferentiated tissue which in an advanced stage will develop into flower buds.

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 5,000 seeds

The seed should meet the minimum requirements for germination, species and analytical purity, health and moisture content, specified by the competent authority.

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

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 reference in the Table of Characteristics. The stages of development denoted by each reference are described in Chapter 8.4.

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.

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

3.5 Additional Tests

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

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 cross-pollinated 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 cross-pollinated varieties should be according to the recommendations for cross-pollinated varieties in the General Introduction.

4.2.4 For the assessment of uniformity of inbred lines and 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. In addition, for hybrids, a population standard of 3% and an acceptance probability of at least 95% should be applied for inbred plants obviously resulting from the selfing of a parent line. In the case of a sample size of 60 plants, 4 inbred plants 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) Only Calabrese type varieties: Head: level of main head in relation to plant height (characteristic 13)
(b) Head: color (characteristic 17)
(c) Time of harvest maturity (characteristic 23)
(d) Male sterility (characteristic 24)

Firstly, the collection should be divided according to the two growth types in 8.3: Explanations covering several characteristics: Calabrese type and Sprouting type. In case of doubt to which growth type a variety belongs, it should be tested in both growth types.

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) See Explanations on the Table of Characteristics in Chapter 8.1

7 Growth stage key See Explanations on the Table of Characteristics in Chapter 8.4

(s) summer and autumn varieties

(o) overwintering varieties

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

	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
1. (*)	**QN MG/VG**		**1**			
	Plant: height	**Plante : hauteur**	**Pflanze: Höhe**	**Planta: altura**		
	very short	très basse	sehr niedrig	muy baja		1
	short	basse	niedrig	baja	Chronos (s), Packman (s)	3
	medium	moyenne	mittel	media	Capitano (s), Forester (s), Jeremy (s), Monty (s)	5
	tall	haute	hoch	alta	Heraklion (s), Poseidon (s)	7
	very tall	très haute	sehr hoch	muy alta	Blaze (s), Burbank (o)	9
2.	**QN VG**	**(+) (a)**	**1**			
	Leaf: attitude	**Feuille : port**	**Blatt: Haltung**	**Hoja: porte**		
	erect	dressé	aufrecht	erecto	Poseidon (s)	1
	semi-erect	demi-dressé	halbaufrecht	semierecto	Arcadia (s), Capitano (s), Chronos (s)	3
	horizontal	horizontal	waagerecht	horizontal	Ember (o), Monflor (s)	5
3. (*)	**QN MS/VG**	**(+) (a)**	**1**			
	Leaf: length	**Feuille : longueur**	**Blatt: Länge**	**Hoja: longitud**		
	short	courte	kurz	corta	Emperor (s), Getti e foglie (s), Kanga (s), Kechua (s)	3
	medium	moyenne	mittel	media	Cresta (o)	5
	long	longue	lang	larga	Cardinal (o), Monclano (s), Monrello (s)	7
4.	**QN MS/VG**	**(+) (a)**	**1**			
	Leaf: width	**Feuille : largeur**	**Blatt: Breite**	**Hoja: anchura**		
	very narrow	très étroite	sehr schmal	muy estrecha		1
	narrow	étroite	schmal	estrecha	Arcadia (s)	3
	medium	moyenne	mittel	media	Cresta (o), Green Belt (s), Marathon (s)	5
	broad	large	breit	ancha	Cardinal (o), Red Fire (o), Monrello (s)	7

	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
5. (*) QN VG		**(+) (a)**	**1**			
	Leaf: number of lobes	**Feuille : nombre de lobes**	**Blatt: Anzahl der Lappen**	**Hoja: número de lóbulos**		
	absent or very few	nul ou très petit	fehlend oder sehr wenige	nulo o muy bajo	Violet Queen (s)	1
	few	petit	wenige	bajo	Early White Sprouting (o), Koros (s)	3
	medium	moyen	mittel	medio	Chronos (s), Tinman (s)	5
	many	grand	viele	alto	Burbank (o), Red Fire (o)	7
	very many	très grand	sehr viele	muy alto	Bordeaux (s)	9
6. (*) PQ VG		**(a)**	**1**			
	Leaf blade: color	**Limbe : couleur**	**Blattspreite: Farbe**	**Limbo: color**		
	green	vert	grün	verde	Claret (o), Inspiration (s)	1
	grey green	vert gris	graugrün	verde grisáceo	Capitano (s)	2
	blue green	vert bleu	blaugrün	verde azulado	Bordeaux (s), Ironman (s)	3
7. QN VG		**(a)**	**1**			
	Leaf blade: intensity of color	**Limbe : intensité de la couleur**	**Blattspreite: Intensität der Farbe**	**Limbo: intensidad del color**		
	light	claire	hell	claro		3
	medium	moyenne	mittel	medio		5
	dark	foncée	dunkel	oscuro		7
8. (*) QN VG		**(+) (a)**	**1**			
	Leaf blade: undulation of margin	**Limbe : ondulation du bord**	**Blattspreite: Wellung des Randes**	**Limbo: ondulación del borde**		
	absent or very weak	nulle ou très faible	fehlend oder sehr gering	ausente o muy débil		1
	weak	faible	gering	débil	Kanga (s)	3
	medium	moyenne	mittel	media	Marathon (s)	5
	strong	forte	stark	fuerte	Blaze (s)	7
	very strong	très forte	sehr stark	muy fuerte	Bonarda (o), Claret (o), Rudolph (s)	9
9. QN VG		**(+) (a)**	**1**			
	Leaf blade: dentation of margin	**Limbe : dentelure du bord**	**Blattspreite: Zähnung des Randes**	**Limbo: dentado del borde**		
	weak	faible	gering	débil	Violet Queen (s)	3
	medium	moyenne	mittel	medio	Cresta (o)	5
	strong	forte	stark	fuerte	Claret (o)	7

	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
10.	**QN VG**	**(a)**	**1**			
	Leaf blade: blistering	**Limbe : cloqûre**	**Blattspreite: Blasigkeit**	**Limbo: abullonado**		
	absent or very weak	nulle ou très faible	fehlend oder sehr gering	ausente o muy débil	Capitano (s)	1
	weak	faible	gering	débil	Blaze (s)	3
	medium	moyenne	mittel	medio	Cumbal (s), Red Arrow (o)	5
	strong	forte	stark	fuerte	Bonarda (o), Cardinal (o)	7
	very strong	très forte	sehr stark	muy fuerte		9
11.	**QN VG**	**(a)**	**1**			
	Petiole: anthocyanin coloration	**Pétiole : pigmentation anthocyanique**	**Blattstiel: Anthocyanfärbung**	**Pecíolo: pigmentación antociánica**		
	absent or very weak	absente ou très faible	fehlend oder sehr gering	ausente o muy débil	Capitano (s), Jeremy (s), Kanga (s)	1
	medium	moyenne	mittel	medio	Early Purple Sprouting (o), Monarda (s)	3
	very strong	très forte	sehr stark	muy fuerte	Mendocino (o), Red Fire (o)	5
12.	**QN MS/VG**	**(+) (a)**	**1**			
	Petiole: length	**Pétiole : longueur**	**Blattstiel: Länge**	**Pecíolo: longitud**		
	very short	très court	sehr kurz	muy corto	Violet Queen (s)	1
	short	court	kurz	corto	Kanga (s)	3
	medium	moyen	mittel	medio	Ramoso Calabrese (s)	5
	long	long	lang	largo	Groene Calabrese (s), Monflor (s)	7
	very long	très long	sehr lang	muy largo		9
13. **(*)**	**QN VG**	**(+)**	**2**			
	<u>Only Calabrese type varieties</u>: Head: level of main head in relation to plant height	**<u>Seulement les variétés de type calabrais</u>: Pomme : niveau de la pomme principale par rapport à la hauteur de la plante**	**<u>Nur Sorten des Calabrese-Typs</u>: Kopf: Höhe des Hauptkopfs im Verhältnis zur Höhe der Pflanze**	**<u>Solo variedades de tipo Calabrese</u>: Cabeza: nivel de la cabeza principal en relación con la altura de la planta**		
	low	bas	niedrig	bajo	Marathon (s)	1
	medium	moyen	mittel	medio		2
	high	haut	hoch	alto	Sibsey (s), SV0097BL (s)	3

	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
14.	**QN MS/VG**	**(+)**	**2**			
	<u>Only Calabrese type varieties</u>: Head: length of branching at base of main head	**<u>Seulement les variétés de type calabrais</u> : Pomme : longueur des ramifications à la base de la pomme principale**	**<u>Nur Sorten des Calabrese-Typs</u>: Länge der Verzweigungen an der Basis des Hauptkopfes**	**<u>Solo variedades de tipo Calabrese</u>: Cabeza: longitud de las ramificaciones de la cabeza principal**		
	very short	très courtes	sehr kurz	muy cortas	Violet Queen (s)	1
	short	courtes	kurz	cortas	Chronos (s), Kanga (s)	3
	medium	moyennes	mittel	medias	Lord (s)	5
	long	longues	lang	largas	Monflor (s)	7
	very long	très longues	sehr lang	muy largas		9
15. **(*)**	**QN MS/VG**	**(+)**	**2**			
	Head: diameter	**Pomme : diamètre**	**Kopf: Durchmesser**	**Cabeza: diámetro**		
	very small	très petit	sehr klein	muy pequeño	Broccolo di Natale (o), Early Purple Sprouting (o), Getti e foglie (s)	1
	small	petit	klein	pequeño		3
	medium	moyen	mittel	medio	Marathon (s)	5
	large	grand	groß	grande	Packman (s)	7
	very large	très grand	sehr groß	muy grande	Violet Queen (s)	9
16. **(*)**	**QN VG**	**(+)**	**2**			
	<u>Only Calabrese type varieties</u>: Head: shape in longitudinal section	**<u>Seulement les variétés de type calabrais</u> : Pomme : forme en section longitudinale**	**<u>Nur Sorten des Calabrese-Typs</u>: Kopf: Form in Längsschnitt**	**<u>Solo variedades de tipo Calabrese</u>: Cabeza: forma en sección longitudinal**		
	circular	circulaire	rund	circular	Forester (s)	1
	transverse broad elliptic	elliptique transverse large	quer breit elliptisch	elíptica transversal ancha		2
	transverse medium elliptic	elliptique transverse moyenne	quer mittel elliptisch	elíptica transversal mediana	Sibsey (s)	3
	transverse narrow elliptic	elliptique transverse étroite	quer schmal elliptisch	elíptica transversal estrecha	Calabria (s)	4

	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
17. **(*)**	**PQ** **VG**		**2**			
	Head: color	**Pomme : couleur**	**Kopf: Farbe**	**Cabeza: color**		
	whitish	blanchâtre	weißlich	blanquecino	Burbank (o), Cresta (o), Early White Sprouting (o)	1
	green	vert	grün	verde	Forester (s)	2
	grey green	vert gris	graugrün	verde grisáceo	Marathon (s)	3
	blue green	vert bleu	blaugrün	verde azulado	Ironman (s), Tirreno (s)	4
	violet	violet	violett	violeta	Bordeaux (s), Early Purple Sprouting (o)	5
18.	**QN** **VG**	**(+)**	**2**			
	Head: intensity of color	**Pomme : intensité de la couleur**	**Kopf: Intensität der Farbe**	**Cabeza: intensidad del color**		
	light	claire	hell	claro		3
	medium	moyenne	mittel	medio		5
	dark	foncée	dunkel	oscuro		7
19.	**QN** **VG**		**2**			
	Only varieties with Head: color: whitish, green, grey green or blue green: Head: intensity of anthocyanin coloration	**Seulement les variétés avec Pomme : couleur : crème, vert, vert gris ou vert bleu : Pomme : intensité de la pigmentation anthocyanique**	**Nur Sorten mit Kopf: Farbe: weißlich, grün, graugrün oder blaugrün: Kopf: Intensität der Anthocyanfärbung**	**Solo variedades con Cabeza: color: blanquecino, verde, verde grisáceo o verde azulado: Cabeza: intensidad de la pigmentación antociánica**		
	absent or very weak	nulle ou très faible	fehlend oder sehr gering	ausente o muy débil	Early White Sprouting (o)	1
	weak	faible	gering	débil		2
	medium	moyenne	mittel	media	Steel (s)	3
	strong	forte	stark	fuerte		4
20.	**QN** **VG**	**(+)**	**2**			
	Only Calabrese type varieties: Head: knobbling	**Seulement les variétés de type calabrais : Pomme : protubérance**	**Nur Sorten des Calabrese-Typs: Kopf: Höckerbildung**	**Solo variedades de tipo Calabres: Cabeza: protuberancias**		
	weak	faible	gering	poco prominentes	Sibsey (s)	3
	medium	moyenne	mittel	moderadamente prominentes	Cumbal (s), Ironman (s), Marathon (s)	5
	strong	forte	stark	muy prominentes	Monflor (s)	7

		English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
21.		**QN VG**		**2**			
		Head: diameter of flower bud	**Pomme : diamètre du bouton floral**	**Kopf: Durchmesser der Blütenknospe**	**Cabeza: diámetro del botón floral**		
		very small	très petite	sehr klein	muy pequeño		1
		small	petite	klein	pequeño	SV0097BL (s)	3
		medium	moyenne	mittel	medio	Kechua (s)	5
		large	grande	groß	grande	Calabria (s), Kanga (s)	7
		very large	très grande	sehr groß	muy grande		9
22.		**QN VG**		**2**			
		Only Calabrese type varieties: Plant: development of secondary heads	**Seulement les variétés de type calabrais : Pomme : développement des pommes secondaires**	**Nur Sorten des Calabrese-Typs: Pflanze: Entwicklung von sekundären Köpfen**	**Solo variedades de tipo Calabres: Planta: prominencia de las cabezas secundarias**		
		absent or very weak	nulle ou très faible	fehlend oder sehr gering	ausentes o muy poco prominentes	Lord (s), Montop (s)	1
		weak	faible	gering	poco prominentes	Chronos (s)	3
		medium	moyenne	mittel	moderadamente prominentes	Giotto (s)	5
		strong	forte	stark	muy prominentes	Cresta (o)	7
23.	**(*)**	**QN MG**	**(+)**	**2**			
		Time of harvest maturity	**Époque de maturité de récolte**	**Zeitpunkt der Erntereife**	**Época de madurez para la cosecha**		
		very early	très précoce	sehr früh	muy temprana	Sibsey (s)	1
		early	précoce	früh	temprana	Monflor (s), Red Fire (o)	3
		medium	moyenne	mittel	media	Tinman (s), Mendocino (o)	5
		late	tardive	spät	tardía	Marathon (s), Burbank (o)	7
		very late	très tardive	sehr spät	muy tardía	Hallmark (s)	9
24.	**(*)**	**QL MS/VS**	**(+)**	**3**			
		Male sterility	**Stérilité mâle**	**Männliche Sterilität**	**Androesterilidad**		
		absent	absente	fehlend	ausente	Marathon (s)	1
		present	présente	vorhanden	presente	Chevalier (s), Parthenon (s)	9

	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
25.	**PQ VG**		**3**			
	Flower: color	**Fleur : couleur**	**Blüte: Farbe**	**Flor: color**		
	white	blanc	weiß	blanco		1
	whitish	crème	weißlich	blanquecino		2
	light yellow	jaune clair	hellgelb	amarillo claro	Serydan (s)	3
	medium yellow	jaune moyen	mittelgelb	amarillo medio	Monflor (s)	4
	dark yellow	jaune foncé	dunkelgelb	amarillo oscuro	Alletta (s), Sibsey (s)	5
26.	**QL VS**	**(+)**				
	Resistance to *Plasmodiophora brassicae* (Pb) – Race Pb: 0	**Résistance à *Plasmodiophora brassicae* (Pb) – Race Pb: 0**	**Resistenz gegen *Plasmodiophora brassicae* (Pb) – Pathotyp Pb: 0**	**Resistencia a *Plasmodiophora brassicae* (Pb) – Raza Pb: 0**		
	absent	absente	fehlend	ausente	Marathon	1
	present	présente	vorhanden	presente	Monclano	9
27.	**QL VS**	**(+)**				
	Resistance to *Plasmodiophora brassicae* (Pb) – Race Pb: 1	**Résistance à *Plasmodiophora brassicae* (Pb) – Race Pb: 1**	**Resistenz gegen *Plasmodiophora brassicae* (Pb) – Pathotyp Pb: 1**	**Resistencia a *Plasmodiophora brassicae* (Pb) – Raza Pb: 1**		
	absent	absente	fehlend	ausente	Marathon	1
	present	présente	vorhanden	presente	Monclano	9
28.	**QL VS**	**(+)**				
	Resistance to *Plasmodiophora brassicae* (Pb) – Race Pb: 2	**Résistance à *Plasmodiophora brassicae* (Pb) – Race Pb: 2**	**Resistenz gegen *Plasmodiophora brassicae* (Pb) – Pathotyp Pb: 2**	**Resistencia a *Plasmodiophora brassicae* (Pb) – Raza Pb: 2**		
	absent	absente	fehlend	ausente	Marathon, Monclano	1
	present	présente	vorhanden	presente		9
29.	**QL VS**	**(+)**				
	Resistance to *Plasmodiophora brassicae* (Pb) – Race Pb: 3	**Résistance à *Plasmodiophora brassicae* (Pb) – Race Pb: 3**	**Resistenz gegen *Plasmodiophora brassicae* (Pb) – Pathotyp Pb: 3**	**Resistencia a *Plasmodiophora brassicae* (Pb) – Raza Pb: 3**		
	absent	absente	fehlend	ausente	Marathon	1
	present	présente	vorhanden	presente	Monclano	9

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 fully developed leaves in the middle third of the plant.

8.2 Explanations for individual characteristics

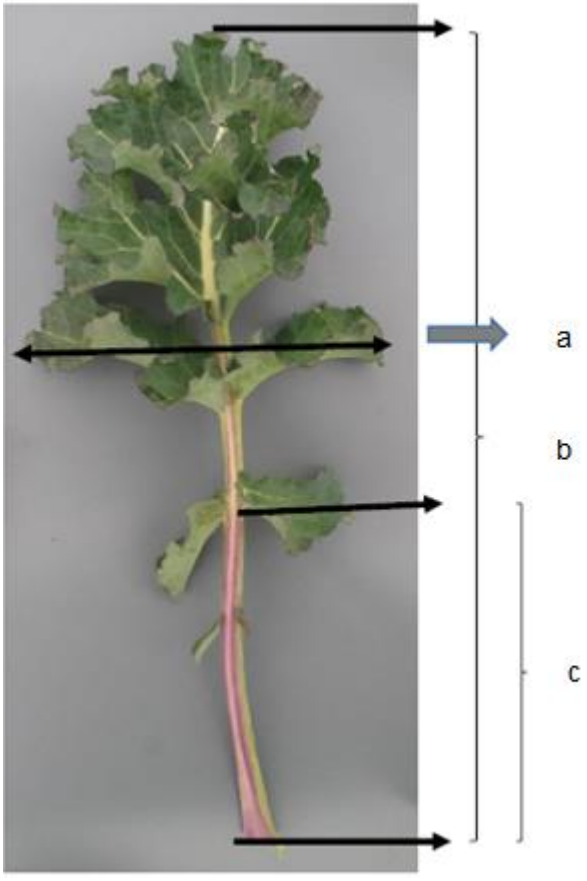
Ad. 2: Leaf: attitude

1
erect

3
semi-erect

5
horizontal

Ad. 3: Leaf: length

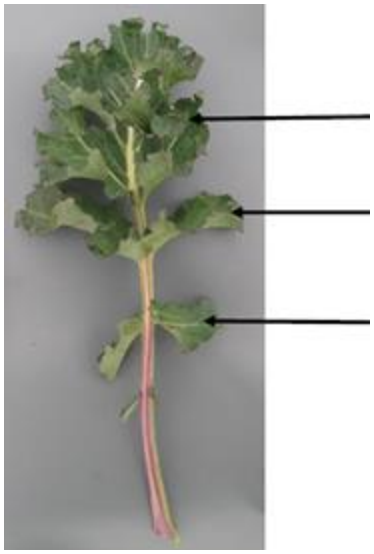


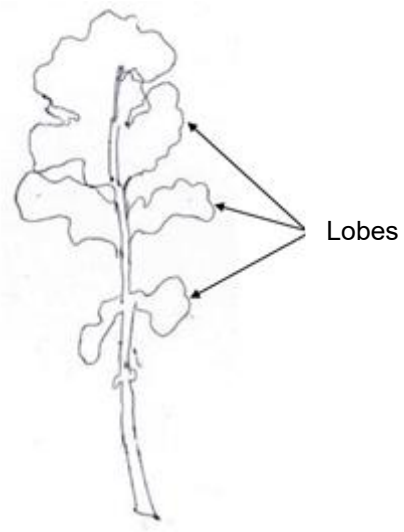
a = Leaf: length (characteristic 3)
b = Leaf: width (characteristic 4)
c = Petiole: length (characteristic 12)

Ad. 4: Leaf: width

See Ad. 3

Ad. 5: Leaf: number of lobes





Parts of the leaf blade are considered as lobes if their length is at least equivalent to the width of the leaf petiole at their point of attachment and if both notches of the blade have at least half the length of the lobe itself

Ad. 8: Leaf blade: undulation of margin

3
weak

5
medium

7
strong

Ad. 9: Leaf blade: dentation of margin

3
weak

5
medium

7
strong

Ad. 12: Petiole: length

See Ad. 3

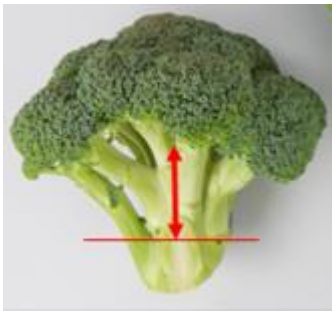
Ad. 13: Only Calabrese type varieties: Head: level of main head in relation to plant height

1
low

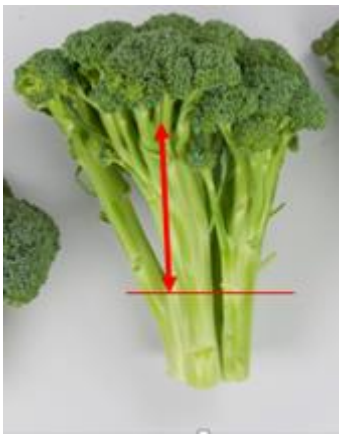
2
medium

3
high

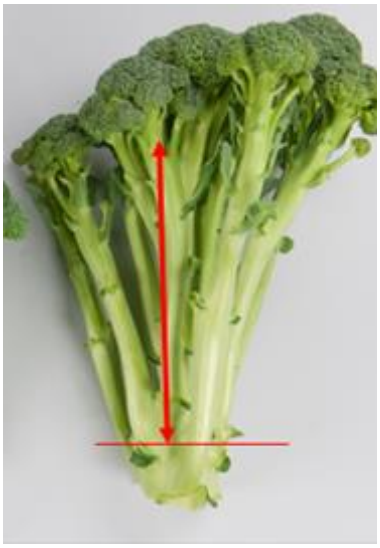
Ad. 14: Only Calabrese type varieties: Head: length of branching at base of main head



3
short



5
medium



7
long

Ad. 15: Head: diameter

The observation of the diameter of heads of a sprouting type should be made by estimation or measurement of the average diameter of the heads of a plant.

Ad. 16: Only Calabrese type varieties: Head: shape in longitudinal section

1
circular

2
transverse broad elliptic

3
transverse medium elliptic

4
transverse narrow elliptic

Ad. 18: Head: intensity of color

Observations should be made on green, grey green, blue green and violet heads, excluding whitish heads.

Ad. 20: Only Calabrese type varieties: Head: knobbling

3
weak

5
medium

7
strong

Observations to be made on the prominence of protuberances of the surface of the head.

Ad. 23: Time of harvest maturity

Time of harvest maturity is when 50% of the plants have a head (Calabrese type)/ multiple heads (Sprouting type) ready for harvest.

The varieties are divided into two harvest maturity characteristics because the varieties for summer and autumn are never included in the same trial with the overwinter varieties: The overwinter varieties need a much larger amount of cold to develop a head (which is in fact the start of flowering), usually a winter period, whereas the summer and autumn varieties start to develop a head after a little amount of cold. This mechanism is called vernalisation: The induction of flowering by exposure to a certain amount of time of cold temperatures.

In broccoli, time of harvest maturity is strongly influenced by the temperature and the season of growing. Nevertheless, at the same place and for the same growing season, time of harvest maturity is an important characteristic for the assessment of distinctness of varieties. For those reasons, no example varieties are provided in the Test Guidelines and the variety description should always state the place and the season of growing.

Ad. 24: Male sterility

To be tested in a field trial and/or in a DNA marker test[2].

In the case of a field trial, the type of observation is VS. In the case of a DNA marker test, the type of observation is MS.

Field trial:

Observations should be made on fully opened flowers. Tapping or shaking the flowering stem will release pollen, which, if present, can be observed on dark colored paper or card. The absence of pollen production is an indication of male sterility. The presence of pollen production is an indication of male fertility.

male fertile (pollen present)

male sterile (pollen absent)

DNA marker test:

If the cytoplasmic male sterility (CMS) marker is absent, the variety is expected to have male fertile flowers. If the CMS marker is present, the variety is expected to have male sterile flowers.

In cases where the DNA marker test result does not confirm the declaration in the TQ, a field trial should be performed to observe whether the variety has male fertile or male sterile flowers due to another mechanism.

[2] The description of the method to test male sterility for *Brassica* (CMS marker) is covered by a trade secret. The owner of the trade secret, Syngenta Seeds B.V., has given its consent for the use of the CMS marker solely for the purposes of examination of Distinctness, Uniformity and Stability (DUS) and for the development of variety descriptions by UPOV and authorities of UPOV members. Syngenta Seeds B.V. declares that neither UPOV, nor authorities of UPOV members that use the CMS marker for the above purposes will be held accountable for possible (mis)use of the CMS marker by third parties. Please contact Naktuinbouw, Netherlands, to obtain the method and information on the CMS marker for the purposes mentioned above.

Ad. 26 to 29: Resistance to *Plasmodiophora brassicae* (Pb) – Races 0 to 3

1.	Pathogen	*Plasmodiophora brassicae*
2.	Quarantine status	no
3.	Host species	*Brassica oleracea*
4.	Source of inoculum	Naktuinbouw[3] (NL)
5.	Isolate	Race Pb: 0, Pb: 1, Pb: 2 and Pb: 3
6.	Establishment isolate identity	with genetically defined differentials from Naktuinbouw (NL) The most recent table is available through ISF at https://www.worldseed.org/our-work/plant-health/differential-hosts/
7.	Establishment pathogenicity	symptoms on susceptible *Brassica oleracea spp.*
8.	Multiplication inoculum	
8.1	Multiplication medium	Plant roots
8.2	Multiplication variety	Susceptible variety Bartolo (WC), Granaat (CC)[4]
8.3	Plant stage at inoculation	Seedling, 1 week after sowing
8.4	Inoculation medium	Water
8.5	Inoculation method	2 ml spore suspension (10^7 sp/ml) Pipette to the base of each seedling.
8.6	Harvest of inoculum	Harvest roots 6-8 weeks after inoculation
8.7	Check of harvested inoculum	Microscopic count
8.8	Shelf life/viability inoculum	Frozen 3 years, room temperature 1-2 days
9.	Format of the test	
9.1	Number of plants per genotype	20 plants
9.2	Number of replicates	2 replicates (2 x 10)
9.3	Control varieties	Susceptible: Bartolo (WC)[4] Resistant to race Pb: 0 051632 Bejo (WC), Clapton (CF), Lodero (RC) Resistant to race Pb: 1 Clapton (CF), Lodero (RC) Resistant to race Pb: 2 Lodero (RC) Resistant to race Pb: 3 051632 Bejo (WC)
9.5	Test facility	Glasshouse or climatic room
9.6	Temperature	20-22°C
9.7	Light	Natural, extended to 16 h if needed
9.9	Special measures	A moderate amount of water is required to prevent rotting. Keep the soil saturated in the first week. During plant growth the soil should not be too dry to lower the soil temperature.
9.8	Season	Not in winter, not in too warm conditions if test performed in greenhouse
10.	Inoculation	
10.1	Preparation inoculum	Symptomatic roots are homogenized ca. 1 min in a blender. Dilute clubs 1:4 with demineralized water. Blender the mix for less than 1 minute. (Beware: longer blendering may cause overheating of the suspension)
10.2	Quantification inoculum	count spores; adjust to 10^7 spores per ml
10.3	Plant stage at inoculation	1 week old seedlings
10.4	Inoculation method	Pipette 1 ml on both sides at the base of each seedling, totalling 2 ml per plant.
10.7	Observation, evaluation and end of test	6 weeks after inoculation (destructive)

[3] Naktuinbouw: resistentie@naktuinbouw.nl
[4] WC=White cabbage, CC=Chinese cabbage, RC=Red cabbage, CF=Cauliflower

11.	Observations	
11.1	Method	Visual: observation of severe galling and growth retardation Destructive: observation on a 0-3 scale for galling
11.2	Observation scale	class 0 = no swellings or a few small spheroid galls class 1 = very slight swelling, usually confined to the lateral roots class 2 = moderate swelling on lateral and/or tap roots or slight swelling of the main root and browning and ultimately death of all the lateral roots class 3 = severe swelling on lateral and/or tap roots
11.3	Validation of test	Validation on controls. Expected response of controls: Susceptible control: -most plants in classes 2 and 3 Resistant control: -most plants in classes 0 and 1
12.	Interpretation of data in terms of UPOV characteristic states	[1] absent: distribution of plants in the classes comparable with susceptible control [9] present: distribution of plants in the classes comparable with resistant control
13.	Critical control points	Clubroot is a zoosporic pathogen. Keep isolates spatially well-separated.

0 = no galling

1 = a few small galls

2 = moderate galling

2 = slight swelling of the main root, no lateral roots

3 = severe galling

8.3 Types of Broccoli

Calabrese type: One main head and no or small secondary heads that develop in the axils, usually later than the main head

Sprouting type: Multiple heads, the main head is of the same size as the heads in the axils and all develop at the same time

8.4 Growth stages

1 = just before harvest maturity
2 = at harvest maturity
3 = at full flowering

9. Literature

Gray, 1982: Taxonomy and Evolution of Broccoli (*Brassica oleracea* var. *italica*). Economic Botany 36, pp. 397-410

Gray, 1989: Taxonomy and Evolution of Broccoli and Cauliflower. Baileya 23(1), pp. 28-46.

Helm, J., 1960: Brokkoli und Spargelkohl. Der Züchter 30, pp. 223-241

Marshall, B., Thompson, R., 1987: A Model of the Influence of Air Temperature and Solar Radiation on the Time of Maturity of Calabrese Brassica oleracea var. italica. Annals of Botany 60, pp. 513-519

Miller, C.H., Konster, T.R., and Lamont, W.J., 1985: Cold Stress Influence on Premature Flowering of Broccoli. HortScience 20(2), pp. 193-195

Wiebe, H.J., 1975: The morphological development of cauliflower and broccoli cultivars depending on temperature. Sci. Hort. 3, pp. 95-101

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 oleracea* L. var. *italica* Plenck
1.2 Common name	Broccoli, Calabrese, Sprouting Broccoli, Winter broccoli

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)

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)	Self-pollination	[ ]
(b)	Cross-pollination	[ ]
(i)	Synthetic variety	[ ]
(ii)	Population	[ ]
(c)	Hybrid	[ ]
(d)	Three-way hybrid	[ ]
(e)	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)	**Plant: height**		
	very short		1 [ ]
	very short to short		2 [ ]
	short	Chronos (s), Packman (s)	3 [ ]
	short to medium		4 [ ]
	medium	Capitano (s), Forester (s), Jeremy (s), Monty (s)	5 [ ]
	medium to tall		6 [ ]
	tall	Heraklion (s), Poseidon (s)	7 [ ]
	tall to very tall		8 [ ]
	very tall	Blaze (s), Burbank (o)	9 [ ]
5.2 (5)	**Leaf: number of lobes**		
	absent or very few	Violet Queen (s)	1 [ ]
	very few to few		2 [ ]
	few	Early White Sprouting (o), Koros (s)	3 [ ]
	few to medium		4 [ ]
	medium	Chronos (s), Tinman (s)	5 [ ]
	medium to many		6 [ ]
	many	Burbank (o), Red Fire (o)	7 [ ]
	many to very many		8 [ ]
	very many	Bordeaux (s)	9 [ ]
5.3 (6)	**Leaf blade: color**		
	green	Claret (o), Inspiration (s)	1 [ ]
	grey green	Capitano (s)	2 [ ]
	blue green	Bordeaux (s), Ironman (s)	3 [ ]

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

	Characteristics	Example Varieties	Note
5.4 (8)	**Leaf blade: undulation of margin**		
	absent or very weak		1 [ ]
	very weak to weak		2 [ ]
	weak	Kanga (s)	3 [ ]
	weak to medium		4 [ ]
	medium	Marathon (s)	5 [ ]
	medium to strong		6 [ ]
	strong	Blaze (s)	7 [ ]
	strong to very strong		8 [ ]
	very strong	Bonarda (o), Claret (o), Rudolph (s)	9 [ ]
5.5 (13)	**<u>Only Calabrese type varieties</u>: Head: level of main head in relation to plant height**		
	low	Marathon (s)	1 [ ]
	medium		2 [ ]
	high	Sibsey (s), SV0097BL (s)	3 [ ]
5.6 (15)	**Head: diameter**		
	very small	Broccolo di Natale (o), Early Purple Sprouting (o), Getti e foglie (s)	1 [ ]
	very small to small		2 [ ]
	small		3 [ ]
	small to medium		4 [ ]
	medium	Marathon (s)	5 [ ]
	medium to large		6 [ ]
	large	Packman (s)	7 [ ]
	large to very large		8 [ ]
	very large	Violet Queen (s)	9 [ ]
5.7 (16)	**<u>Only Calabrese type varieties</u>: Head: shape in longitudinal section**		
	circular	Forester (s)	1 [ ]
	transverse broad elliptic		2 [ ]
	transverse medium elliptic	Sibsey (s)	3 [ ]
	transverse narrow elliptic	Calabria (s)	4 [ ]

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

	Characteristics	Example Varieties	Note
5.8 (17)	**Head: color**		
	whitish	Burbank (o), Cresta (o), Early White Sprouting (o)	1 [ ]
	green	Forester (s)	2 [ ]
	grey green	Marathon (s)	3 [ ]
	blue green	Ironman (s), Tirreno (s)	4 [ ]
	violet	Bordeaux (s), Early Purple Sprouting (o)	5 [ ]
5.9 (23)	**Time of harvest maturity**		
	very early	Sibsey (s)	1 [ ]
	very early to early		2 [ ]
	early	Monflor (s), Red Fire (o)	3 [ ]
	early to medium		4 [ ]
	medium	Tinman (s), Mendocino (o)	5 [ ]
	medium to late		6 [ ]
	late	Marathon (s), Burbank (o)	7 [ ]
	late to very late		8 [ ]
	very late	Hallmark (s)	9 [ ]
5.10 (24)	**Male sterility**		
	absent	Marathon (s)	1 [ ]
	present	Chevalier (s), Parthenon (s)	9 [ ]
5.11 (26)	**Resistance to *Plasmodiophora brassicae* (Pb) – Race Pb: 0**		
	absent	Marathon	1 [ ]
	present	Monclano	9 [ ]
	not tested		[ ]
5.12 (27)	**Resistance to *Plasmodiophora brassicae* (Pb) – Race Pb: 1**		
	absent	Marathon	1 [ ]
	present	Monclano	9 [ ]
	not tested		[ ]
5.13 (28)	**Resistance to *Plasmodiophora brassicae* (Pb) – Race Pb: 2**		
	absent	Marathon, Monclano	1 [ ]
	present		9 [ ]
	not tested		[ ]
5.14 (29)	**Resistance to *Plasmodiophora brassicae* (Pb) – Race Pb: 3**		
	absent	Marathon	1 [ ]
	present	Monclano	9 [ ]
	not tested		[ ]

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	*Plant: height*	*medium to tall*	*very tall*

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

7.3.1 Growth type

1. Calabrese type [ ]
2. Sprouting type [ ]

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]