E

TG/45/7 Rev. 3(proj.1)
ORIGINAL: English
DATE: 2025-08-19

INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS

GENEVA

DRAFT

CAULIFLOWER

UPOV Code: BRASS_OLE_GBB

Brassica oleracea L. convar *botrytis* (L.) Alef. var. *botrytis* L.

[*]

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) Revision of characteristic 28 "Male sterility";
(b) Revision of explanation Ad. 28 "Male sterility";
(c) Addition of characteristics "Resistance to *Plasmodiophora brassicae* (Pb) – Races 0 to 3" at the end of the Table of Characteristics;
(d) Addition of explanation "Resistance to *Plasmodiophora brassicae* (Pb) – Races 0 to 3";
(e) Addition of characteristics "Resistance to *Plasmodiophora brassicae* (Pb) – Races 0 to 3" to TQ 5. with option "not tested" and "Male sterility";
(f) Revision of the Technical Questionnaire, Section TQ 7.3 "Other information".

[*] 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.]

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

Alternative Names:*

Botanical name	*English*	*French*	*German*	*Spanish*
Brassica oleracea L. convar. *botrytis* (L.) Alef. var. *botrytis,* *Brassica caulifloria* Lizg.	Cauliflower	Chou-fleur	Blumenkohl	Coliflor

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.

TABLE OF CONTENTS PAGE

1. Subject of these Test Guidelines

These Test Guidelines apply to all varieties of *Brassica oleracea* L. convar. *botrytis* (L.) Alef. var. *botrytis*. L.

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:

5,000 seeds or 10 g.

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

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 Type of observation

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

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

3.4 Test Design

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

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

3.5 Number of Plants / Parts of Plants to be Examined

Unless otherwise indicated, all observations on single plants should be made on 20 plants or parts taken from each of 20 plants and any other observations made on all plants in the test.

3.6 Additional Tests

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

4. Assessment of Distinctness, Uniformity and Stability

4.1 Distinctness

4.1.1 General Recommendations

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

4.1.2 Consistent Differences

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

4.1.3 Clear Differences

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

4.2 Uniformity

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

4.2.2 Cross-pollinated varieties

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

4.2.3 Single cross hybrids and inbred lines

For the assessment of uniformity of single cross hybrids and inbred lines, 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 single cross 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 tested, either by growing a further generation, or by testing a new seed stock to ensure that it exhibits the same characteristics as those shown by the previous material supplied.

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

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) Seedling: anthocyanin coloration of hypocotyl (characteristic 1)
(b) Curd: color (characteristic 21)
(c) Flower: color (characteristic 25)
(d) Earliness in spring planting (characteristic 26)
(e) Earliness in summer planting (characteristic 27)

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

6. Introduction to the Table of Characteristics

6.1 Categories of Characteristics

6.1.1 Standard Test Guidelines Characteristics

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

6.1.2 Asterisked Characteristics

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

6.2 States of Expression and Corresponding Notes

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

6.3 Types of Expression

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

6.4 Example Varieties

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

6.5 Legend

(*) Asterisked characteristic – see Chapter 6.1.2

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

MG, MS, VG, VS See Chapter 3.3.2

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

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

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

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
1. (*)	**VG**	**Seedling: anthocyanin coloration of hypocotyl**	**Plantule : pigmentation anthocyanique de l'hypocotyle**	**Keimpflanze: Anthocyanfärbung des Hypokotyls**	**Plántula: pigmentación antociánica del hipocotilo**		
QL		absent	absente	fehlend	ausente	Brio	1
		present	présente	vorhanden	presente	Ciren, Dominant	9
2.	**VG/ MG**	**Plant: height (at time of harvest)**	**Plante : hauteur (à la récolte)**	**Pflanze: Höhe (bei Erntereife)**	**Planta: altura (en la época de la cosecha)**		
QN	**(a)**	very short	très basse	sehr niedrig	muy baja		1
		short	basse	niedrig	baja	Luxor, Opaal	3
		medium	moyenne	mittel	media	Fastman, Mexico	5
		tall	haute	hoch	alta	Neven, Sirente	7
		very tall	très haute	sehr hoch	muy alta	Calisa, Paradiso	9
3.	**VG/ MG**	**Stem: length (up to insertion of first leaf)**	**Pied : longueur (jusqu'à l'insertion de la première feuille)**	**Strunk: Länge (bis zum Ansatz des ersten Blattes)**	**Tallo: longitud (hasta la inserción de la primera hoja)**		
QN	**(a)**	short	court	kurz	corta	Mexico, Opaal	3
		medium	moyen	mittel	media	Fanch, Nautilus	5
		long	long	lang	larga	Neven, Paradiso	7
4. (*) (+)	**VG**	**Leaf: attitude**	**Feuille : port**	**Blatt: Haltung**	**Hoja: porte**		
QN	**(a)**	erect	dressé	aufrecht	erecto	Igloo, Paradiso	1
		semi-erect	demi-dressé	halbaufrecht	semierecto	Erfurter Zweg, Fastman	3
		horizontal	horizontal	waagerecht	horizontal	Isabel, Opaal	5

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
5. (*)	**VG/ MS**	**Leaf: length**	**Feuille : longueur**	**Blatt: Länge**	**Hoja: longitud**		
QN	**(a)**	very short	très courte	sehr kurz	muy corta		1
		short	courte	kurz	corta	Nagano, Opaal	3
		medium	moyenne	mittel	media	Aviso, Fanch	5
		long	longue	lang	larga	Géant de Naples tardif, Snow March, Memphis	7
		very long	très longue	sehr lang	muy larga	Magnifico, Paradiso	9
6. (*)	**VG/ MS**	**Leaf: width**	**Feuille : largeur**	**Blatt: Breite**	**Hoja: anchura**		
QN	**(a)**	very narrow	très étroite	sehr schmal	muy estrecha	Alverda, Géant de Naples tardif	1
		narrow	étroite	schmal	estrecha	Andes, Capvert	3
		medium	moyenne	mittel	media	Broden, Lindon	5
		broad	large	breit	ancha	Memphis, Vogue	7
		very broad	très large	sehr breit	muy ancha	Torens	9
7. (*)	**VG**	**Leaf: ratio width/length**	**Feuille : rapport largeur/longueur**	**Blatt: Verhältnis Länge/Breite**	**Hoja: relación anchura/longitud**		
QN	**(a)**	small	petit	klein	pequeña	Akita, Géant de Naples tardif	3
		medium	moyen	mittel	media	Astell, Buren	5
		large	grand	groß	grande	Arbon, Lazio	7
8. (+)	**VG**	**Leaf: lobing**	**Feuille : découpure du bord**	**Blatt: Lappung**	**Hoja: lobulado**		
QL	**(a)**	absent	absente	fehlend	ausente	Idol	1
		present	présente	vorhanden	presente	Atao, Minaret, Romanesco ottobrino	9

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
9.	**VG**	**Leaf: color (with wax if present)**	**Feuille : couleur (avec la pruine éventuellement)**	**Blatt: Farbe (mit Wachs, sofern vorhanden)**	**Hoja: color (incluida la cerocidad, si está presente)**		
PQ	**(a)**	green	verte	grün	verde	Baltimore, Belot, Lecerf	1
		grey green	vert gris	graugrün	verde grisáceo	Calisa, Delira, Géant de Naples tardif	2
		blue green	vert bleu	blaugrün	verde azulado	Arbon, Barrier Reef, Ciren	3
10. (*)	**VG**	**Leaf: intensity of color (as for 9)**	**Feuille : intensité de la couleur (comme pour 9)**	**Blatt: Intensität der Farbe (wie unter 9)**	**Hoja: intensidad del color (como en el 9)**		
QN	**(a)**	light	claire	hell	clara	Baltimore, Ciren	3
		medium	moyenne	mittel	media	Barrier Reef, Belot, Calisa	5
		dark	foncée	dunkel	oscura	Arbon, Lecerf	7
11.	**VG**	**Leaf: twisting of tip**	**Feuille : torsion du sommet**	**Blatt: Drehung der Spitze**	**Hoja: torsión de la punta**		
QN	**(a)**	absent or very weak	absente ou très faible	fehlend oder sehr gering	ausente o muy débil	Akita, Alverda	1
		weak	faible	gering	débil	Belot, Di Jesi	3
		medium	moyenne	mittel	media	Barca, Imola	5
		strong	forte	stark	fuerte	Oceano, Sernio	7
		very strong	très forte	sehr stark	muy fuerte		9
12.	**VG**	**Leaf: shape in cross-section**	**Feuille : forme en section transversale**	**Blatt: Form im Querschnitt**	**Hoja: forma en sección transversal**		
QN	**(a)**	concave	concave	konkav	cóncava	Bruce, Géant de Naples tardif	1
		flat	plane	eben	plana	Akita, Emeraude	2
		convex	convexe	konvex	convexa	Cortes, Fanch	3

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
13.	**VG**	**Leaf: blistering**	**Feuille : cloqûre**	**Blatt: Blasigkeit**	**Hoja: abullonado**		
QN	**(a)**	absent or very weak	nulle ou très faible	fehlend oder sehr gering	ausente o muy débil	Akita, Lecerf	1
		weak	faible	gering	débil	Alpen, Opaal	3
		medium	moyenne	mittel	medio	Montano, Nautilus, Sergeant	5
		strong	forte	stark	fuerte	Sernio, Siria	7
		very strong	très forte	sehr stark	muy fuerte		9
14. **(+)**	**VG**	**Leaf: crimping near main vein**	**Feuille : plissement à proximité de la nervure principale**	**Blatt: Kräuselung nahe der Hauptader**	**Hoja: ondulado cerca del nervio principal**		
QN	**(a)**	absent or very weak	nul ou très faible	fehlend oder sehr gering	ausente o muy débil	Avelek, Fangio	1
		weak	faible	gering	débil	Balmoral, Flanca	3
		medium	moyen	mittel	medio	Mexico, Vinson	5
		strong	fort	stark	fuerte	Akito, Sernio	7
		very strong	très fort	sehr stark	muy fuerte	Izoar, Minioc	9
15.	**VG**	**Leaf: undulation of margin**	**Feuille : ondulation du bord**	**Blatt: Randwellung**	**Hoja: ondulación del borde**		
QN	**(a)**	absent or very weak	absente ou très faible	fehlend oder sehr gering	ausente o muy débil	Étoile 23, Géant de Naples	1
		weak	faible	gering	débil	Akita, Beluga	3
		medium	moyenne	mittel	media	Admirable, Alice Springs	5
		strong	forte	stark	fuerte	Purdy, Siria	7
		very strong	très forte	sehr stark	muy fuerte	Celebrity	9
16. **(*)**	**VG**	**Curd: covering by inner leaves**	**Pomme : couverture par les feuilles internes**	**Blume: Deckung durch innere Blätter**	**Cabeza: cobertura de las hojas internas**		
QN	**(b)**	not covered	pas couverte	nicht bedeckt	descubierto	Capvert, Opaal	1
		partly covered	partiellement couverte	teilweise bedeckt	parcialmente cubierto	Celesta, Eskimo	2
		fully covered	complètement couverte	vollständig bedeckt	completamente cubierto	Amistad, Charif	3

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
17. (*) (+)	**MS**	**Curd: height**	**Pomme : hauteur**	**Blume: Höhe**	**Cabeza: altura**		
QN	**(b)**	short	basse	niedrig	baja	Lecerf, Mechelse 2	3
		medium	moyenne	mittel	media	Kernis, Tetris	5
		tall	haute	hoch	alta	Amistad, Gitano	7
18. (*)	**MS**	**Curd: diameter**	**Pomme : diamètre**	**Blume: Durchmesser**	**Cabeza: diámetro**		
QN	**(b)**	small	petit	klein	pequeño	Alverda, Lumina	3
		medium	moyen	mittel	medio	Barrier Reef, Malaga	5
		large	grand	groß	grande	Fremont, Novia, Plessi	7
19. (*) (+)	**VG**	**Curd: shape in longitudinal section**	**Pomme : forme en section longitudinale**	**Blume: Form im Längsschnitt**	**Cabeza: forma en sección longitudinal**		
PQ	**(b)**	circular	circulaire	rund	circular	Gipsy Moth, Linero	1
		transverse broad elliptic	elliptique transverse large	breit quer elliptisch	elíptica transversal amplia	Aviron, Melody	2
		transverse medium elliptic	elliptique transverse moyenne	mittel quer elliptisch	elíptica transversal media	Akita, Celesta	3
		transverse narrow elliptic	elliptique transverse étroite	schmal quer elliptisch	elíptica transversal estrecha	Erfurter, Lecerf	4
		triangular	triangulaire	dreieckig	triangular	Minaret, Romanesco ottobrino	5
20. (*) (+)		**<u>Excluding varieties with curd shape: triangular:</u> Curd: doming**	**<u>Variétés à pomme triangulaire exclues</u> : Pomme : courbure du sommet**	**<u>Außer Sorten mit dreieckiger Blume:</u> Blume: Wölbung**	**<u>Excluidas las variedades de la cabeza triangular</u>: Cabeza: abovedado**		
	(b)	weak	faible	gering	débil	Burgh, Lecerf	3
		medium	moyenne	mittel	medio	Akita, Géant de Naples tardif	5
		strong	forte	stark	fuerte	Belot, White Rock	7

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
21. (*)	**VG**	**Curd: color**	**Pomme : couleur**	**Blume: Farbe**	**Cabeza: color**		
PQ	**(b)**	whitish	blanchâtre	weißlich	blanquecino	Astell, Iceberg	1
		yellow	jaune	gelb	amarillo	Di Jesi	2
		orange	orange	orange	naranja	Cheddar, Sunset	3
		green	verte	grün	verde	Alverda, Amfora, Minaret	4
		violet	violette	violett	violeta	Graffiti	5
22. (+)	**VG**	**Curd: knobbling**	**Pomme : relief**	**Blume: Höckerbildung**	**Cabeza: protuberancias**		
QN	**(b)**	very fine	très fin	sehr fein	muy finas		1
		fine	fin	fein	finas	Nautilus, Opaal	3
		medium	moyen	mittel	medias	Corvilia, Nedeleg	5
		coarse	grossier	grob	gruesas	Niagara	7
		very coarse	très grossier	sehr grob	muy gruesas	Minaret, Navona	9
23. (+)	**VG**	**Curd: texture**	**Pomme : granulation**	**Blume: Körnung**	**Cabeza: textura**		
QN	**(b)**	fine	fine	fein	fina	Boris, Erfurter	3
		medium	moyenne	mittel	media	Beluga, Galiote	5
		coarse	grossière	grob	gruesa	Géant de Naples tardif, Niagara	7
24.	**VG**	**Curd: anthocyanin coloration after harvest maturity**	**Pomme : pigmentation anthocyanique après maturité de récolte**	**Blume: Anthocyanfärbung nach der Erntereife**	**Cabeza: coloración antociánica después de la madurez para la cosecha**		
QL		absent	absente	fehlend	ausente	Evita, Mantis	1
		present	présente	vorhanden	presente	Flanca, Planita	9
25. (*) (+)	**VG/ MS**	**Flower: color**	**Fleur : couleur**	**Blüte: Farbe**	**Flor: color**		
QL		white	blanc	weiß	blanco	Bruce, Ecrin	1
		yellow	jaune	gelb	amarillo	Flora Blanca, Lecerf	2

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
26. (*) (+)	**MS**	**Earliness in spring planting**	**Précocité du repiquage au printemps**	**Frühzeitigkeit bei Frühjahrspflanzung**	**Precocidad en la plantación de primavera**		
QN		very early	très hâtive	sehr früh	muy precoz		1
		very early to early	très hâtive à hâtive	sehr früh bis früh	muy precoz a precoz		2
		early	hâtive	früh	precoz		3
		early to medium	hâtive à moyenne	früh bis mittel	precoz media		4
		medium	moyenne	mittel	media		5
		medium to late	moyenne à tardive	mittel bis spät	media a tardía		6
		late	tardive	spät	tardía		7
		late to very late	tardive à très tardive	spät bis sehr spät	tardía a muy tardía		8
		very late	très tardive	sehr spät	muy tardía		9

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
27. (*) (+)	**MS**	**Earliness in summer planting**	**Précocité du repiquage en été**	**Frühzeitigkeit bei Sommerpflanzung**	**Precocidad en la plantación de verano**		
QN		very early autumn type	type automne : très hâtive	sehr früher Herbsttyp	tipo muy precoz de otoño		1
		very early to early autumn type	type automne : très hâtive à hâtive	sehr früher bis früher Herbsttyp	tipo muy precoz a precoz de otoño		2
		early autumn type	type automne : hâtive	früher Herbsttyp	tipo precoz de otoño		3
		early to medium autumn type	type automne : hâtive à moyenne	früher bis mittlerer Herbsttyp	tipo precoz a medio de otoño		4
		medium autumn type	type automne : moyenne	mittlerer Herbsttyp	tipo medio de otoño		5
		medium to late autumn type	type automne : moyenne à tardive	mittlerer bis später Herbsttyp	tipo medio a tardío de otoño		6
		late autumn type	type automne : tardive	später Herbsttyp	tipo tardío de otoño		7
		late to very late autumn type	type automne : tardive à très tardive	später bis sehr später Herbsttyp	tipo tardío a muy tardío de otoño		8
		very late autumn type	type automne : très tardive	sehr später Herbsttyp	tipo muy tardío de otoño		9
		very early winter type	type hiver : très hâtive	sehr früher Wintertyp	tipo muy precoz de invierno		10
		very early to early winter type	type hiver : très hâtive à hâtive	sehr früher bis früher Wintertyp	tipo muy precoz a precoz de invierno		11
		early winter type	type hiver : hâtive	früher Wintertyp	tipo precoz de invierno		12
		early to medium winter type	type hiver : hâtive à moyenne	früher bis mittlerer Wintertyp	tipo precoz a medio de invierno		13
		medium winter type	type hiver : moyenne	mittlerer Wintertyp	tipo medio de invierno		14
		medium to late winter type	type hiver : moyenne à tardive	mittlerer bis später Wintertyp	tipo medio a tardío de invierno		15
		late winter type	type hiver : tardive	später Wintertyp	tipo tardío de invierno		16
		late to very late winter type	type hiver : tardive à très tardive	später bis sehr später Wintertyp	tipo tardío a muy tardío de invierno		17
		very late winter type	type hiver : tardive	sehr später Wintertyp	tipo muy tardío de invierno		18

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
28. (*) (+)	**MS/ VS**	**Male sterility**	**Stérilité mâle**	**Männliche Sterilität**	**Androesterilidad**		
QN		absent	absente	fehlend	ausente	Alpha 2, Flora Blanca	1
		partially present	partiellement présente	partiell vorhanden	parcialmente presente	Dunvez, Odegwen	2
		totally present	totalement présente	vollständig vorhanden	totalmente presente	Aviron, Bodilis	3
29. (+)	**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**		
QL		absent	absente	fehlend	ausente	Freedom	1
		present	présente	vorhanden	presente	Clapton	9
30. (+)	**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**		
QL		absent	absente	fehlend	ausente	Freedom	1
		present	présente	vorhanden	presente	Clapton	9
31. (+)	**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**		
QL		absent	absente	fehlend	ausente	Clapton, Freedom	1
		present	présente	vorhanden	presente		9
32. (+)	**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**		
QL		absent	absente	fehlend	ausente	Freedom	1
		present	présente	vorhanden	presente	Clapton	9

8. Explanations on the Table of Characteristics

8.1 Explanations covering several characteristics

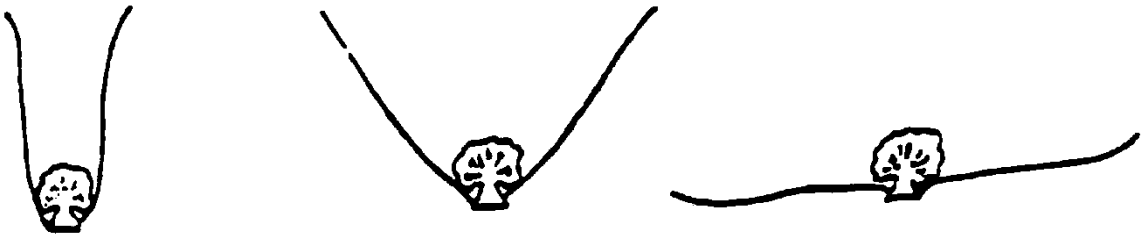
Characteristics containing the following key in the second column of the Table of Characteristics should be examined as indicated below:

(a) Foliage and leaf: Observations on the foliage and the leaf which should be made at the time of full development of the foliage, before curd formation.

(b) Curd: Observations on the curd which should be made when the curd is fully developed (at harvest maturity).

8.2 Explanations for individual characteristics

Ad. 4: Leaf: attitude



1
erect

5
semi-erect

9
horizontal

Ad. 8: Leaf: lobing

1
absent

9
present

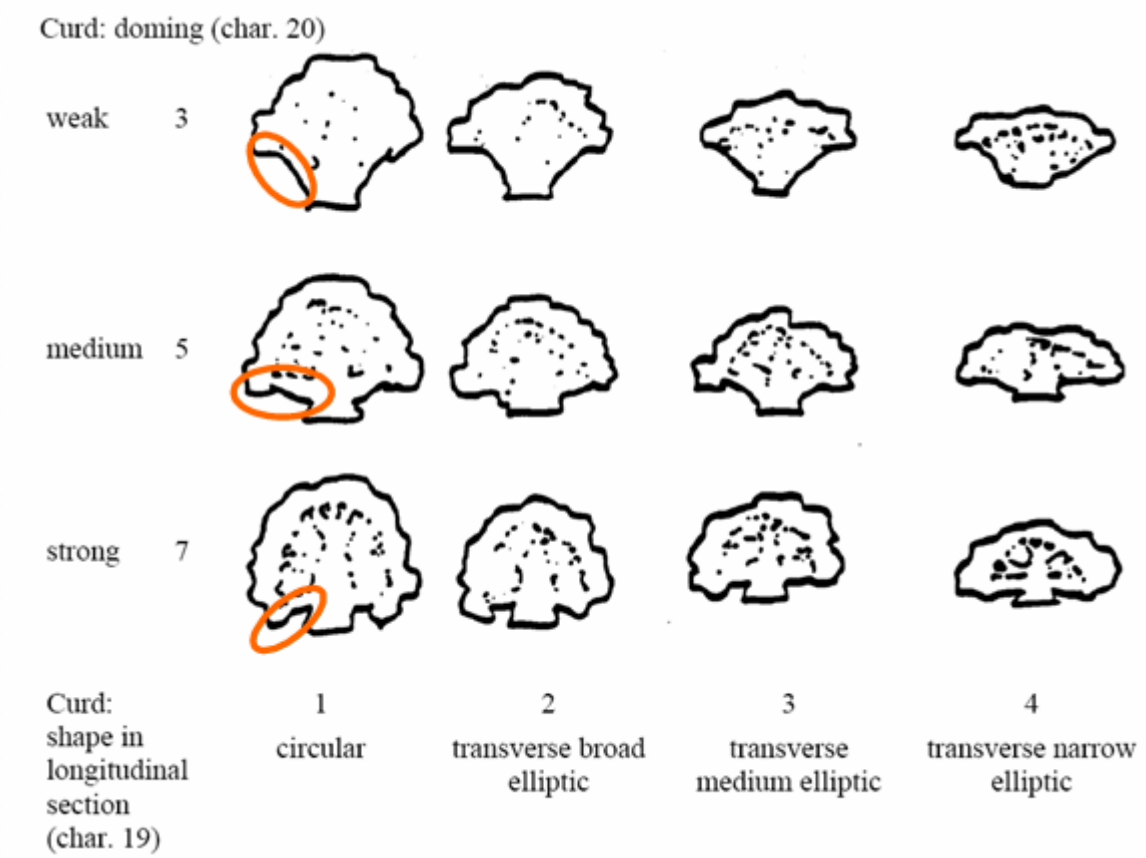
Ad. 14: Leaf: crimping near main vein

1	5	9
absent or very weak	medium	very strong

Ad. 17: Curd: height

3	5	7
short	medium	tall

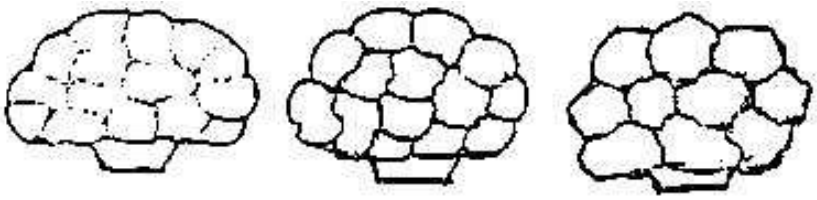
Ad. 19: Curd: shape in longitudinal section
Ad. 20: Excluding varieties with curd shape: triangular: Curd: doming



5
triangular

Ad. 22: Curd: knobbling

lateral view



3
fine

5
medium

7
coarse

Ad. 23: Curd: texture

The texture is “fine” when the surface of the curd is very smooth and is “coarse” when the surface of the curd is granular.

Ad 25: Flower: color

To be tested in a field and/or in a DNA marker test.

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

Field trial:

Observation of color of flowers.

1	2
white	yellow

DNA marker test:

The markers are linked to the gene CCD4. The functional allele causes white petal color. Functional loss of this gene leads to yellow petal color. The markers corresponding with the functional or nonfunctional allele are based on 3 SNP markers located at position ~1296bp in the gene (Han et al. 2019).

The marker test can be performed in multiplex-with the marker test for male sterility (Ad. 28).

The presence of the functional or nonfunctional CCD4 alleles can be detected by the described co-dominant markers.

1.	Characteristic	Flower: color
2.	Functional gene	Functional CCD4 gene: white Nonfunctional CCD4 gene: yellow
3.1	Primers	Tm of the primers is ~57°C Forward Primer: '5-CTGGATTCAACATCATTCACG CT-3' Reverse Primer: '5-CGGTGACGAGATCGATCTTCA-3'
3.2	Probes	White Probe: '5-Fluorophore-ATCGCTCCAAATATTATGT-Quencer-3' Yellow Probe: '5-Fluorophore-GCTCCGAACGTTATGT-Quencer-3'
		The probes are MGB probes (Applied biosystems) or XS probes (Biolegio). The Tm of the probes must be ordered at 67°C. Fluorophores can be modified according to compatibility with the filters on the real-time PCR machine.
4.	Format of the test	
4.1	Number of plants per genotype	at least 20 plants
4.2	Control varieties	Homozygous allele for functional CCD4 gene (white petal color) present: Ecrin Heterozygous functional allele and nonfunctional allele of the CCD4 gene present (variety is white): Bruce Homozygous allele for nonfunctional CCD4 gene (yellow petal color) present: Magnifico
6.	PCR conditions (mastermix dependent)	1. Initial denaturation step 10 min 95 °C 2. 40 cycles 15 sec 95 °C and 1 min 60°C. Every cycle ends with a plate reading.
8.	Interpretation of test results	
	White (1):	Probe for functional allele (white petal color) is homozygous present, the variety has white flowers. Both probes for both alleles are present (heterozygous), the variety has white flowers.
	Yellow (2)	Probe for nonfunctional allele (yellow petal color) is homozygous present, the variety has yellow 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 white or yellow flowers due to another mechanism.

Ad. 26: Earliness in spring planting
Ad. 27: Earliness in summer planting

In cauliflower, earliness is strongly influenced by the temperature and the season of growing. Nevertheless, at the same place and for the same growing season, earliness 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. 28: 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.

Absent: all plants with male fertile flowers

Partially present: 50% of the plants with male fertile flowers and 50% plants with male sterile flowers

Totally present: all plants with male sterile flowers

State “partially present” is linked to hybrids produced with a motherline which is heterozygous for genic male sterility (GMS), such hybrids segregate in a ratio 1:1 for male sterility. If the segregation occurs in the predicted manner, the hybrid should be classified as partially present (state 2).

male fertile (pollen present)

male sterile (pollen absent)

[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.

DNA marker test and/or field trial:

Varieties declared male fertile (state 1) or total male sterile (state 3) in the TQ, can be examined in a field trial or in a DNA marker test.
Varieties with partial male sterility (state 2) and vegetatively propagated, total male sterile lines (state 3) cannot be examined in a DNA marker test but must be observed in a field trial.

It should be noted that lines exist which are male sterile due to the homozygous recessive monogenic male sterility (GMS) gene. These lines are used for the production of hybrids which then will be male fertile. However when a heterozygous mother line is used, the produced hybrids will be partially male sterile (state 2). Due to their nature these lines have to be propagated vegetatively. They are male sterile but do not have the DNA marker for the presence of cytoplasmic male sterility (CMS). So vegetatively propagated male sterile lines cannot be examined in a DNA marker test but must be observed in a field trial.

In cases where only a DNA marker test is allowed (state 1 and state 3 seed-propagated varieties) and the CMS maker appears to be absent, the variety is expected to have male fertile flowers. In cases where the CMS marker is present, the variety is expected to have male sterile flowers. All varieties declared partially sterile (state 2) and vegetatively propagated lines declared total male sterile (state 3) should be tested in a field trial.

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 or is segregating due to another mechanism.

The marker test can be performed in multiplex with the marker test for flower color (Ad. 25).

Ad. 29 to 32: 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.

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

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)
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

9. Literature

Fengqing Han, Huilin Cui, Bin Zhang, Xiaoping Liu, Limei Yang, Mu Zhuang, Honghao Lv, Zhansheng Li, Yong Wang, Zhiyuan Fang, Jianghua Song and Yangyong Zhang, 2019: Map-based cloning and characterization of BoCCD4, a gene responsible for white/yellow petal color in *B. oleracea* BMC Genomics. 20:242

Fujime, Y., 1983: Studies on Thermal Conditions of Curd Formation and Development in Cauliflower and Broccoli, with Special Reference to Abnormal Curd Development. Memoires of Faculty of Agriculture, Kagawa University, No. 40, February 1983, pp. 1-123, JP.

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

Nieuwhof, M., 1969: Cole Crops. World Crops Books: Leonard Hill, London, GB.

Sadik, S., 1962: Morphology of the curd of cauliflower. Amer. Bot. 49, pp. 290-297.

Tsunoda, S., Hinata, K., and Gomez-Campo, C., 1980: Brassica Crops and Wild Allies. Biology and Breeding, Japan Scientific Societies Press, Tokyo, JP.

Wiebe, H.J., 1972/73: Wirkung von Temperatur und Licht auf Wachstum und Entwicklung von Blumenkohl. Gartenbauwissenschaft 37, pp. 165-178, 37, pp. 293-303, 37, pp. 455-469, 38, pp. 263-279, 38, pp. 433-440.

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

Wiebe, H.J., 1981: Influence of transplant characteristics and growing conditions on curd size (buttoning) of cauliflower. Acta Hort. 122, pp. 99-105.

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

In the case of hybrid varieties which are the subject of an application for plant breeders' rights, and where the parent lines are to be submitted as a part of the examination of the hybrid variety, this Technical Questionnaire should be completed for each of the parent lines, in addition to being completed for the hybrid variety.

1. Subject of the Technical Questionnaire

1.1 Botanical Name	*Brassica oleracea* L. convar. *botrytis* (L.) Alef. var. *botrytis* L.
1.2 Common Name	Cauliflower

2. Applicant

Name	
Address	
Telephone No.	
Fax No.	
E-mail address	
Breeder (if different from applicant)	

3. Proposed denomination and breeder's reference

Proposed denomination (if available)	
Breeder's reference	

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

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

4.1 Breeding scheme

Variety resulting from:

4.1.1 Crossing

(a) controlled cross [ ]
(please state parent varieties)
(b) partially known cross [ ]
(please state known parent variety(ies))
(c) unknown cross [ ]

4.1.2 Mutation [ ]
(please state parent variety)

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

4.1.4 Other [ ]
(please provide details)

4.2 Method of propagating the variety

4.2.1 Seed-propagated varieties

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

4.2.2 Other [ ]
(please provide details)

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

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

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)	**Seedling: anthocyanin coloration of hypocotyl**		
	absent	Brio	1[ ]
	present	Ciren, Dominant	9[ ]
5.2 (10)	**Leaf: intensity of color (with wax if present)**		
	light	Baltimore, Ciren	3[ ]
	medium	Barrier Reef, Belot, Calisa	5[ ]
	dark	Arbon, Lecerf	7[ ]
5.3 (21)	**Curd: color**		
	whitish	Astell, Iceberg	1[ ]
	yellow	Di Jesi	2[ ]
	orange	Cheddar, Sunset	3[ ]
	green	Alverda, Amfora, Minaret	4[ ]
	violet	Graffiti	5[ ]
5.4 (25)	**Flower: color**		
	white	Bruce, Ecrin	1[ ]
	yellow	Flora Blanca, Lecerf	2[ ]

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

	Characteristics	Example Varieties	Note
5.5 (26)	**Earliness in spring planting**		
	very early		1[ ]
	very early to early		2[ ]
	early		3[ ]
	early to medium		4[ ]
	medium		5[ ]
	medium to late		6[ ]
	late		7[ ]
	late to very late		8[ ]
	very late		9[ ]

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

	Characteristics	Example Varieties	Note
5.6 (27)	**Earliness in summer planting**		
	very early autumn type		1[ ]
	very early to early autumn type		2[ ]
	early autumn type		3[ ]
	early to medium autumn type		4[ ]
	medium autumn type		5[ ]
	medium to late autumn type		6[ ]
	late autumn type		7[ ]
	late to very late autumn type		8[ ]
	very late autumn type		9[ ]
	very early winter type		10[ ]
	very early to early winter type		11[ ]
	early winter type		12[ ]
	early to medium winter type		13[ ]
	medium winter type		14[ ]
	medium to late winter type		15[ ]
	late winter type		16[ ]
	late to very late winter type		17[ ]
	very late winter type		18[ ]
5.7 (28)	**Male sterility**		
	absent	Alpha 2, Flora Blanca	1[ ]
	partially present	Dunvez, Odegwen	2[ ]
	totally present	Aviron, Bodilis	3[ ]

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

	Characteristics	Example Varieties	Note
5.8 (29)	**Resistance to *Plasmodiophora brassicae* (Pb) – Race Pb: 0**		
	absent	Freedom	1 [ ]
	present	Clapton	9 [ ]
	not tested		[ ]
5.9 (30)	**Resistance to *Plasmodiophora brassicae* (Pb) – Race Pb: 1**		
	absent	Freedom	1 [ ]
	present	Clapton	9 [ ]
	not tested		[ ]
5.10 (31)	**Resistance to *Plasmodiophora brassicae* (Pb) – Race Pb: 2**		
	absent	Clapton, Freedom	1 [ ]
	present		9 [ ]
	not tested		[ ]
5.11 (32)	**Resistance to *Plasmodiophora brassicae* (Pb) – Race Pb: 3**		
	absent	Freedom	1 [ ]
	present	Clapton	9 [ ]
	not tested		[ ]

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

6. Similar varieties and differences from these varieties

Please use the table, and space provided for comments, below 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	*Curd: color*	*yellow*	*orange*

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. Method of propagation of the variety:

(i) seed-propagated [ ]
(ii) vegetatively propagated [ ]

In case of varieties with note 2 (“partially present”), please indicate:

7.3.2. Parental background of hybrids:

(i) seed-propagated parents [ ]
(ii) one or more vegetatively propagated parents [ ]

8. Authorization for release

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

Yes [ ] No [ ]

(b) Has such authorization been obtained?

Yes [ ] No [ ]

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

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

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

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]