



INTERNATIONAL UNION
FOR THE PROTECTION
OF NEW VARIETIES OF
PLANTS

UNION INTERNATIONALE
POUR LA PROTECTION
DES OBTENTIONS
VÉGÉTALES

INTERNATIONALER
VERBAND ZUM SCHUTZ
VON PFLANZEN-
ZÜCHTUNGEN

UNIÓN INTERNACIONAL
PARA LA PROTECCIÓN
DE LAS OBTENCIONES
VEGETALES

GUIDELINES
FOR THE CONDUCT OF TESTS
FOR DISTINCTNESS, UNIFORMITY AND STABILITY

KOHLRABI

*(Brassica oleracea L. convar.
acephala (DC.) Alef. var. gongylodes L.;*
Brassica oleracea L. Gongylodes Group)

GENEVA
2002, 2016, 2022, 2023

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These Guidelines should be read in conjunction with document TG/1/2, which contains explanatory notes on the general principles on which the Guidelines have been established.

<u>TABLE OF CONTENTS</u>	<u>PAGE</u>
I. Subject of these Guidelines	3
II. Material Required	3
III. Conduct of Tests	3
IV. Methods and Observations	3
V. Grouping of Varieties	4
VI. Characteristics and Symbols	4
VII. Table of Characteristics	5
VIII. Explanations on Table of Characteristics	11
IX. Literature	16
X. Technical Questionnaire	17

I. Subject of these Guidelines

These Guidelines apply to all varieties of *Brassica oleracea* L. convar. *acephala* (DC.) Alef. var. *gongylodes* L. (*Brassica oleracea* L. *Gongylodes* Group).

II. Material Required

1. The competent authorities decide when, where and in what quantity and quality the seed required for testing the variety is to be delivered. Applicants submitting material from a State other than that in which the testing takes place must make sure that all customs formalities are complied with. As a minimum, for each year of the test the following quantity of seed is recommended:

20 g. or at least 4,000 seeds.

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

3. The plant material must not have undergone any treatment unless the competent authorities allow or request such treatment. If it has been treated, full details of the treatment must be given.

III. Conduct of Tests

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

2. The tests should normally be conducted at one place. If any important characteristics of the variety cannot be seen at that place, the variety may be tested at an additional place.

3. 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. The size of the plots should be such that plants or parts of plants may be removed for measurement and counting without prejudice to the observations which must be made up to the end of the growing period. Each test should be designed to result in a total of at least 40 plants, which should be divided between two or more replicates. Separate plots for observation and for measuring can only be used if they have been subject to similar environmental conditions.

4. Additional tests for special purposes may be established.

IV. Methods and Observations

1. Unless otherwise indicated, all observations determined by measurement, weighing or counting should be made on 40 plants or parts taken from each of 40 plants.

2. The assessment of uniformity for cross-pollinated varieties should be according to the recommendations in the General Introduction.
3. The assessment of uniformity for hybrid varieties depends on the type of hybrid and should be according to the recommendations in the General Introduction.
4. All observations on the plant and the leaf should be made before harvest maturity.
5. All observations on the kohlrabi should be made at harvest maturity.

V. Grouping of Varieties

1. The collection of varieties to be grown should be divided into groups to facilitate the assessment of distinctness. Characteristics which are suitable for grouping purposes are those which are known from experience not to vary, or to vary only slightly, within a variety. Their various states of expression should be fairly evenly distributed throughout the collection.
2. It is recommended that the competent authorities use the following characteristics for grouping varieties:
 - (a) Seedling: anthocyanin coloration of cotyledons (characteristic 1);
 - (b) Harvest maturity (characteristic 22).

VI. Characteristics and Symbols

1. To assess distinctness, uniformity and stability, the characteristics and their states as given in the Table of Characteristics should be used.
2. Notes (numbers), for the purposes of electronic data processing, are given opposite the states of expression for each characteristic.
3. Legend:
 - (*) Characteristics that should be used on all varieties in every growing period over which the examinations are made and always be included in the variety descriptions, except when the state of expression of a preceding characteristic or regional environmental conditions render this impossible.
 - (+) See Explanations on the Table of Characteristics in Chapter VIII.

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

English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
1. Seedling: (*) anthocyanin coloration of cotyledons	Plantule: pigmentation anthocyanique des cotylédons	Keimpflanze: Anthocyanfärbung der Keimblätter	Plántula: pigmentación antociánica de los cotiledones		
absent	absente	fehlend	ausente	Expreß Forcer	1
present	présente	vorhanden	presente	Azur-Star	9
2. Seedling: intensity of green coloration of cotyledons	Plantule: intensité de la couleur verte des cotylédons	Keimpflanze: Intensität der Grünfärbung der Keimblätter	Plántula: intensidad del color verde del cotiledón		
light	faible	hell	clara	Erko	3
medium	moyenne	mittel	media	Expreß Forcer	5
dark	forte	dunkel	oscura	Eder	7
3. Petioles: crossing (+)	Pétiolés: recouvrement	Blattstiele: Überschlagen	Pecíolos: cruzamiento		
absent	absent	fehlend	ausente	Expreß Forcer	1
present	présent	vorhanden	presente	Delikateß blauer	9
4. Petiole: length (* (+)	Pétiolé: longueur	Blattstiel: Länge	Pecíolo: longitud		
very short	très court	sehr kurz	muy corto	Primavera weiß	1
short	court	kurz	corto	Quickstar, Spree	3
medium	moyen	mittel	medio	Patrick, Rolano	5
long	long	lang	largo	Delikateß blauer	7
very long	très long	sehr lang	muy largo		9
5. Petiole: thickness (in the middle)	Pétiolé: épaisseur (au centre)	Blattstiel: Dicke (in der Mitte)	Pecíolo: grosor (en el medio)		
thin	mince	dünn	delgado	Avanti, Kohyro	3
medium	moyenne	mittel	medio	Noriko, Rolano	5
thick	forte	dick	grueso	Adriana	7

English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
6. Petiole: attitude (* (*)	Pétirole: port	Blattstiel: Haltung	Pecíolo: porte		
erect	dressé	aufrecht	erecto	Eder, Pader	1
semi-erect	demi-dressé	halbaufrecht	semierecto	Erko, Lanro	3
horizontal	horizontal	waagerecht	horizontal		5
7. Leaf blade: attitude (* (*)	Limbe: port	Blattspreite: Haltung	Limbo: porte		
erect	dressé	aufrecht	erecto	Eder	1
semi-erect	demi-dressé	halbaufrecht	semierecto	Erko, Lanro	3
horizontal	horizontal	waagerecht	horizontal		5
8. Leaf blade: length (* (+)	Limbe: longueur	Blattspreite: Länge	Limbo: longitud		
very short	très court	sehr kurz	muy corto		1
short	court	kurz	corto	Kohyro, Primavera weiß	3
medium	moyen	mittel	medio	Domino, Logo	5
long	long	lang	largo	Lanro, Noriko	7
very long	très long	sehr lang	muy largo	Gigant, Superschmelz	9
9. Leaf blade: width (* (+)	Limbe: largeur	Blattspreite: Breite	Limbo: anchura		
very narrow	très étroit	sehr schmal	muy estrecho		1
narrow	étroit	schmal	estrecho	Knaufs Ideal	3
medium	moyen	mittel	medio	Expreß Forcer	5
broad	large	breit	ancho	Noriko	7
very broad	très large	sehr breit	muy ancho	Gigant, Superschmelz	9

English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
10. Leaf blade: shape of apex (+)	Limbe: forme de la partie apicale	Blattspreite: Form des oberen Teils	Limbo: forma del ápice		
acute	aigüe	schmal spitz	aguda		1
pointed	pointue	spitz	puntiaguda		2
obtuse	obtuse	stumpf	obtusa	Avanti, Expreß Forcer	3
rounded	arrondie	abgerundet	redondeada	Noriko, Spree	4
broadly rounded	arrondie large	breit abgerundet	redondeada ancha	Gigant, Superschmelz	5
11. Leaf blade: number of margin incisions (on upper part of leaf) (+)	Limbe: nombre d'incisions du bord (partie supérieure de la feuille)	Blattspreite: Anzahl Randeinschnitte (am oberen Teil des Blattes)	Limbo: número de incisiones del borde (en la parte superior de la hoja)		
absent or very few	nul ou très petit	fehlend oder sehr gering	ausentes o muy escasas		1
few	petit	gering	escasas	Azur-Star	3
medium	moyen	mittel	medias	Expreß Forcer	5
many	grand	groß	numerosas		7
very many	très grand	sehr groß	muy numerosas		9
12. Leaf blade: depth of margin incisions (on upper part of leaf) (+)	Limbe: profondeur des incisions du bord (partie supérieure de la feuille)	Blattspreite: Tiefe der Randeinschnitte (am oberen Teil des Blattes)	Limbo: profundidad de las incisiones del borde (en la parte superior de la hoja)		
absent or very shallow	nulle ou très faible	fehlend oder sehr flach	ausentes o muy poco profundas		1
shallow	faible	flach	poco profundas	Oste	3
medium	moyenne	mittel	medias	Expreß Forcer	5
deep	profonde	tief	profundas	Soko	7
very deep	très profonde	sehr tief	muy profundas		9
13. Leaf blade: shape in cross section	Limbe: forme en coupe transversale	Blattspreite: Form im Querschnitt	Limbo: forma en sección transversal		
concave	concave	konkav	cóncava		1
plane	droite	eben	plana	Expreß Forcer	2
convex	convexe	konvex	convexa	Azur-Star, Erko	3

English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
14. Leaf blade: (*) blistering	Limbe: cloqure	Blattspreite: Blasigkeit	Limbo: abullonado		
weak	faible	gering	débil	Avanti	3
medium	moyenne	mittel	media	Spree	5
strong	forte	stark	fuerte	Lanro	7
15. Leaf blade: waxiness	Limbe: pruine	Blattspreite: Wachsschicht	Limbo: cerosidad		
weak	faible	gering	débil		3
medium	moyenne	mittel	media	Expreß Forcer	5
strong	forte	stark	fuerte	Blaril	7
16. Leaf blade: hue of (*) green color	Limbe: teinte de la couleur verte	Blattspreite: Ton der Grünfärbung	Limbo: tono del color verde		
absent	absente	fehlend	ausente	Erko, Noriko	1
greyish	grisâtre	gräulich	grisáceo	Expreß Forcer, Lanro	2
bluish	bleuâtre	bläulich	azulado	Azur-Star	3
17. Leaf blade: intensity (*) of green color	Limbe: intensité de la couleur verte	Blattspreite: Intensität der Grünfärbung	Limbo: intensidad del color verde		
very light	très claire	sehr hell	muy claro		1
light	claire	hell	claro		3
medium	moyenne	mittel	medio	Noriko, Quickstar	5
dark	foncée	dunkel	oscuro	Avanti, Lanro	7
very dark	très foncée	sehr dunkel	muy oscuro	Pader	9
18. Kohlrabi: number of (+) inner leaves	Rave: nombre de feuilles intérieures	Kohlrabi: Anzahl der inneren Blätter	Colinabo: número de hojas interiores		
few	petit	gering	escasas	Erko	3
medium	moyen	mittel	medias	Expreß Forcer	5
many	grand	groß	numerosas	Lanro	7

English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
19. Kohlrabi: color of skin (*)	Rave: couleur de l'épiderme	Kohlrabi: Farbe der Haut	Colinabo: color de la epidermis		
white	blanc	weiß	blanco	Beas	1
white green	vert blanc	weißgrün	verde blanquecino	Bode, Expreß Forcer, Lanro, Timpano	2
green	vert	grün	verde	Avaya, Erko, Gaston, Noriko	3
violet	violet	violett	violeta	Azur-Star, Oder, Purpuran	4
20. Kohlrabi: shape (*) (in longitudinal section) (+)	Rave: forme (coupe longitudinale)	Kohlrabi: Form (im Längsschnitt)	Colinabo: forma (en sección longitudinal)		
transverse narrow elliptic	elliptique transversal étroit	quer schmal elliptisch	elíptica transversal estrecha	Erko	1
transverse elliptic	elliptique transversal	quer elliptisch	elíptica transversal	Azur-Star, Quickstar	2
transverse broad elliptic	elliptique transversal large	quer breit elliptisch	elíptica transversal ancha	Noriko	3
circular	rond	rund	circular	Blaril	4
broad elliptic	elliptique large	breit elliptisch	elíptica ancha		5
21. Kohlrabi: shape of apex (*) (+)	Rave: forme du sommet	Kohlrabi: Form des oberen Endes	Colinabo: forma del ápice		
indented	concave	eingesunken	hundido	Expreß Forcer	3
level	plane	eben	plano	Avanti, Spree	5
raised	convexe	vorgewölbt	elevado	Gigant, Superschmelz	7
22. Harvest maturity (*) (+)	Maturité de récolte	Erntereife	Madurez para la cosecha		
very early	très précoce	sehr früh	muy temprana	Expreß Forcer	1
early	précoce	früh	temprana	Azur-Star, Quickstar	3
medium	moyenne	mittel	media	Lanro	5
late	tardive	spät	tardía	Delikateß blauer	7
very late	très tardive	sehr spät	muy tardía	Blaril	9

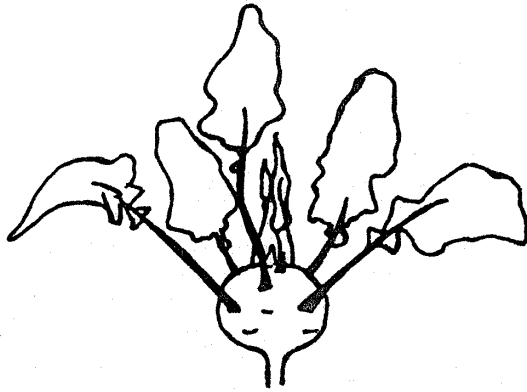
English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota	
23.	VS/	Male sterility	Stérilité mâle	Männliche Sterilität	Androesterilidad	
(*)	MS¹					
(+)						
QL²	absent	absente	fehlend	ausente	Expreß Forcer, Lanro	1
	present	présente	vorhanden	presente	Erika, Morre, Oasis	9

1 See document TGP/7 “Development of Test Guidelines”, Annex 3 “Guidance Notes (GN) for the TG Template”, GN 25 “Recommendations for conducting the examination” (http://www.upov.int/edocs/tgdocs/en/tgp_7.pdf)

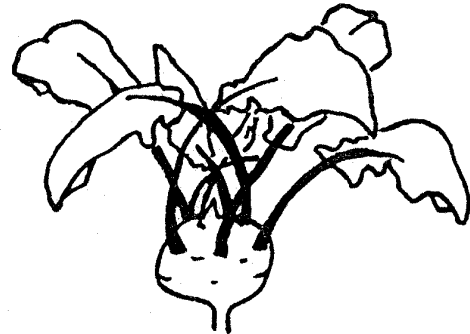
2 See document TGP/7 “Development of Test Guidelines”, Annex 3 “Guidance Notes (GN) for the TG Template”, GN 20 “Presentation of characteristics: States of expression according to type of expression of a characteristic”, 2. “Qualitative Characteristics” (http://www.upov.int/edocs/tgdocs/en/tgp_7.pdf)

VIII. Explanations on the Table of Characteristics

Ad. 3: Petioles: crossing



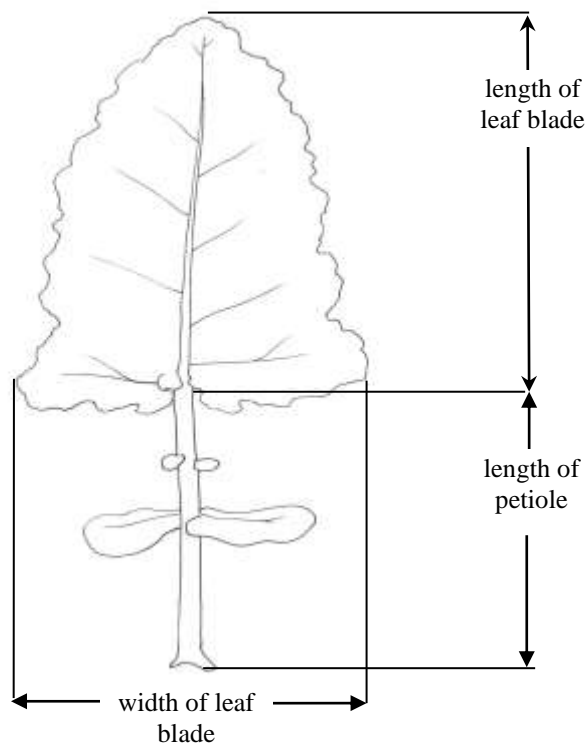
1
absent



9
present

Ad. 4: Petiole: length

Ad. 8 and 9: Leaf blade: length and width



Ad. 10: Leaf blade: shape of apex



1
acute



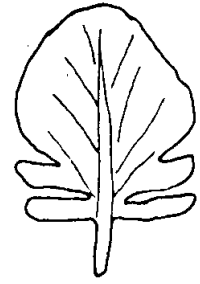
2
pointed



3
obtuse

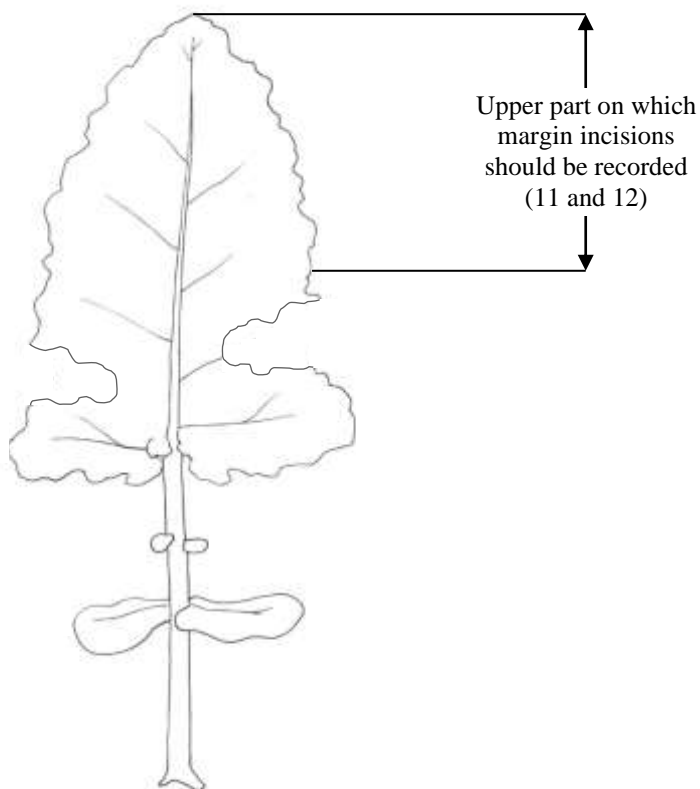


4
rounded

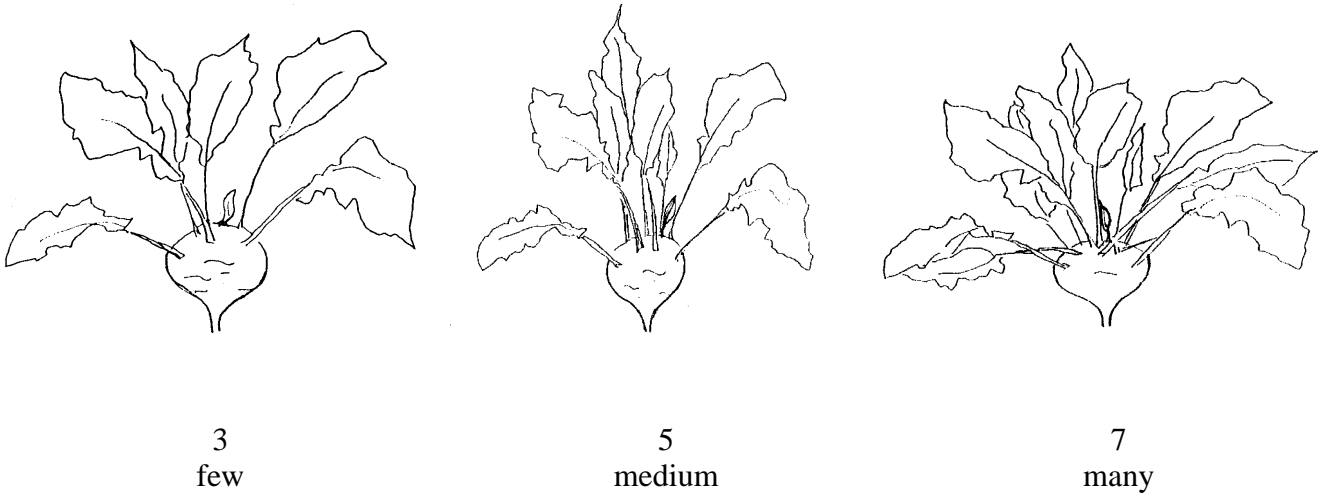


5
broadly rounded

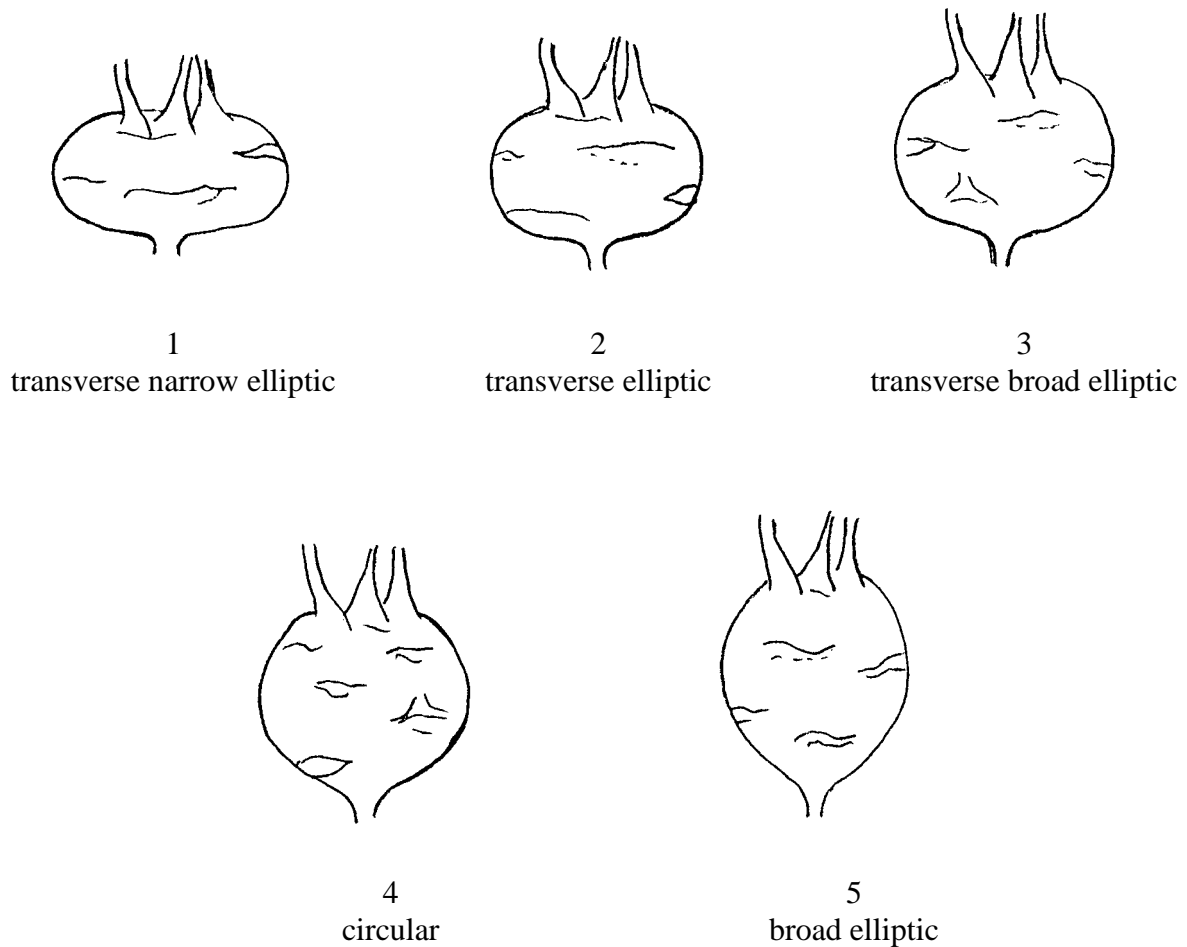
Ad. 11-12: Leaf blade: margin incisions (11 and 12)



Ad. 18: Kohlrabi: number of inner leaves



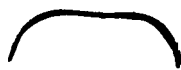
Ad. 20: Kohlrabi: shape (in longitudinal section)



Ad. 21: Kohlrabi: shape of apex



3
indented



5
level



7
raised

Ad. 22: Harvest maturity

Harvest maturity is considered as being reached if 50% of kohlrabis reach 7 cm diameter in the greenhouse or 8 cm diameter in the open field.

Ad. 23: Male sterility

To be tested in a field trial and/or in a DNA marker test³.

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.

³ 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.

IX. Literature

Becker, G. (1962): Kohlrabi in: Handbuch der Pflanzenzüchtung, Band VI, 2. Auflage, Paul Parey Verlag, Berlin –Hamburg, 201-203.

Becker-Dillingen, J. (1950): Kohlrabi in: Handbuch des gesamten Gemüsebaues, 5. Auflage, Parey Verlag, Berlin – Hamburg, 331-342.

Hahn, P. und Schmitt, U. (1951): Kohlrabi in: Kohl- und Wurzelgemüse, Arten- und Sortenkunde, Band 2, 1. Auflage, Deutscher Bauernverlag, Berlin, 108-138.

Kampe, K.; Basse, H.; Glaschke, B. und Schreiber, F. (1956): Kohlrabi in: Gemüsesorten, II. Teil (Kohl-, Blatt- und Wurzelgemüse), 1. Auflage, Parey Verlag, Berlin – Hamburg, 44-51.

Wiebe, H.-J. (1989): Vernalisation von wichtigen Gemüsearten – Ein Überblick. Gartenbauwissenschaft 54 (3), Ulmer Verlag, Stuttgart, 97-104.

Vogel, G. (1996): Kohlrabi in: Handbuch des speziellen Gemüsebaues. Ulmer Verlag, Stuttgart, 304 – 323.

X. Technical Questionnaire

	<p>Reference Number (not to be filled in by the applicant)</p>
<p style="text-align: center;">TECHNICAL QUESTIONNAIRE to be completed in connection with an application for plant breeders' rights</p>	
<p>1. Species <i>Brassica oleracea</i> L. convar. <i>acephala</i> (DC.) Alef. var. <i>gongyloides</i> L. (<i>Brassica oleracea</i> L. <i>Gongyloides</i> Group)</p> <p style="text-align: center;">KOHLRABI</p>	
<p>2. Applicant (Name and address)</p>	
<p>3. Proposed denomination or breeder's reference</p>	

<p>4. Information on origin, maintenance and reproduction of the variety</p> <p>4.1 Method of maintenance and reproduction</p> <p style="margin-left: 40px;">(i) hybrid []</p> <p style="margin-left: 40px;">(ii) open-pollinated variety []</p> <p style="margin-left: 40px;">(iii) other []</p> <p>4.2 Other information</p>			
<p>5. Characteristics of the variety to be given (the number in brackets refers to the corresponding characteristics in the Test Guidelines; please mark the state of expression which best corresponds)</p>			
Characteristics	Example Varieties	Note	
5.1 Seedling: anthocyanin coloration of cotyledons (1)			
absent	Expreß Forcer	1[]	
present	Azur-Star	9[]	
5.2 Leaf blade: blistering (14)			
weak	Avanti	3[]	
medium	Spree	5[]	
strong	Lanro	7[]	
5.3 Leaf blade: intensity of green color (17)			
very light		1[]	
light		3[]	
medium	Noriko, Quickstar	5[]	
dark	Avanti, Lanro	7[]	
very dark	Pader	9[]	

Characteristics	Example Varieties	Note
5.4 Kohlraabi: color of skin		
(19)		
white	Beas	1[]
white green	Bode, Expreß Forcer, Lanro, Timpano	2[]
green	Avaya, Erko, Gaston, Noriko	3[]
violet	Azur-Star, Oder, Purpuran	4[]
5.5 Kohlraabi: shape (in longitudinal section)		
(20)		
transverse narrow elliptic	Erko	1[]
transverse elliptic	Azur-Star, Quickstar	2[]
transverse broad elliptic	Noriko	3[]
circular	Blaril	4[]
broad elliptic		5[]
5.6 Harvest maturity		
(22)		
very early	Expreß Forcer	1[]
early	Azur-Star, Quickstar	3[]
medium	Lanro	5[]
late	Delikateß blauer	7[]
very late	Blaril	9[]

6. Similar varieties and differences between these varieties

Denomination of similar variety	Characteristic in which the similar variety is different ^{o)}	State of expression of similar variety	State of expression of candidate variety
---------------------------------	--	--	--

^{o)} In the case of identical states of expressions of both varieties, please indicate the size of the difference.

7. Additional information which may help to distinguish the variety

7.1 Resistance to pests and diseases

7.2 Special conditions for the examination of the variety

Variety for glasshouse culture 1 []

Variety for field production at 2 []
spring
summer 3 []
autumn 4 []

7.3 Other information

A representative photograph of one or more leaf blades of the variety may be added to the Technical Questionnaire.

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 that question is yes, please attach a copy of such an authorization.

[End of document]