



TWV/31/4

ORIGINAL: English

DATE: October 22, 1997

INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS
GENEVA

TECHNICAL WORKING PARTY FOR VEGETABLES

Thirty-First Session

Valencia, Spain, November 24 to 28, 1997

WORKING PAPER ON TEST GUIDELINES FOR SWEDE
(*Brassica napus* L. var. *napobrassica* Rchb.)

Document prepared by the Office of the Union

<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	6
VIII. Explanations on the Table of Characteristics	11
IX. Literature	16
X. Technical Questionnaire	17

I. Subject of these Guidelines

These Test Guidelines apply to all varieties of *Brassica napus* L. var. *napobrassica* Rchb.

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, the quantity of seed to be supplied by the should be:

500g.

The seed should at least meet the minimum requirements for germination capacity, moisture content and purity for marketing certified seed (standard seed in case of vegetable varieties) in the country in which the application is made. The germination capacity should be as high as possible.

2. 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 2 similar growing periods.

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 normal growth. 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. As a minimum, each test should include a total of 120 plants which should be divided between 2 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. All observations determined by measurement or counting should be made on 60 plants or parts of 60 plants.

2. All plants indicated under Chapter III above should be used for the testing of uniformity.
3. Unless otherwise indicated, all observations on the leaves should be made on the largest fully green (no senescence) leaf.
4. Assessment of leaf color should be made on leaves before powdery mildew infection is established.
5. Observations on root skin color should be made before cork development obscures the skin.

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:
 - (i) Leaf: lobes (characteristic 3)
 - (ii) Root: anthocyanin coloration of skin above soil level (characteristic 14)
 - (iii) Root: color of neck surface between leaf scars (characteristic 21)
 - (iv) Root: color of flesh (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 purpose 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.

Example varieties included in the table of characteristics within brackets are no longer available commercially, but small amounts of seed of these varieties can be obtained from:

UK Vegetable Genebank
Genetic Resources Unit
Horticulture Research International
Wellesbourne
Warwickshire
CV35 9EF
UNITED KINGDOM.

The optimum stage of development for the assessment of each characteristic is indicated by a number in the second column. The stages of development denoted by each number are described at the end of chapter VIII.

VII. Table of Characteristics/Tableau des caracteres/Merkmalstabelle

Characteristics Caracteres Merkmale	Growth Key	English	français	deutsch	Example Varieties Exemples Beispielssorten	Note
(*) 1. Leaf: intensity of green color	100-150	light	clair	hell	Airlie	3
Feuille: intensité de la couleur verte		medium	moyen	mittel	Marian	5
Blatt: Intensität der Grünfärbung		dark	foncé	dunkel	(Heinkenborsteler), Joan	7
2. Leaf: glaucosity	100-150	weak	faible	gering	Seefelder	3
Feuillage: glaucescence		medium	moyenne	mittel		5
Blatt: Bereifung		strong	forte	stark	Heinkenborsteler	7
(*) 3. Leaf: lobes	80-150	absent	absents	fehlend	(Niko, Mella)	1
(+) Feuille: lobes		present	présents	vorhanden	Magres	9
Blatt: Blattlappen						
(+) 4. Leaf: number of major lobes	100-150	few	petit	gering	Wilhelmsburger	3
Feuille: nombre de grands lobes		medium	moyen	mittel	Ruta Otofte	5
Blatt: Anzahl Hauptlappen		many	grand	hoch	Marian	7
(*)5. Leaf: length of terminal lobe	100-150	short	courte	kurz	(Laurentian)	3
(+) Feuille: longueur du lobe terminal		medium	moyenne	mittel	Sator Otofte	5
Blatt: Länge des Endlappens		long	longue	lang	Kenmore	7
(*) 6. Leaf: width of terminal lobe	100-150	narrow	étroite	schmal	(Laurentian)	3
(+) Feuille: largeur du lobe terminal		medium	moyenne	mittel	Sator Otofte	5
Blatt: Breite des Endlappens		broad	large	breit	Kenmore	7
(*) 7. Leaf: total length of longest green leaf (including petiole)	100-150	short	courte	kurz		3
Feuille: longueur totale de la plus longue feuille verte (y compris le pétiole)		short to medium	courte à moyenne	kurz bis mittel	Melfort	4
Blätt: Gesamtlänge des längsten grünen Blattes (einschließlich Stiel)		medium	moyenne	mittel	Ruta Otofte	5
		medium to long	moyenne à longue	mittel bis lang	Kenmore	6
		long	longue	lang		7

Characteristics Caracteres Merkmale	Growth Key	English	français	deutsch	Example Varieties Exemples Beispielssorten	Note
(*) 8. Leaf: width at widest point (+) Feuille: largeur au point le plus large Blatt: Breite an der breitesten Stelle	100-150	narrow	étroite	schmal	(Dryden)	3
		medium	moyenne	mittel	Ruta Otofte	5
		broad	large	breit	Kenmore	7
(+) 9. Leaf: number of minor lobes between major lobes Feuille: nombre de petits lobes entre les grands lobes Blatt: Anzahl Nebenlappen zwischen den Hauptlappen	100-150	few	petit	gering	Grunkopfige Gelbe Wilhelmsburger	3
		medium	moyen	mittel	Ruta Otofte	5
		many	grand	hoch	(Gry)	7
(+) 10. Leaf: number of minor lobes on petiole Feuille: nombre de petits lobes sur le pétiole Blatt: Anzahl Nebenlappen am Stiel	100-150	few	petit	gering	Wilhelmsburger	3
		medium	moyen	mittel	Doon Major	5
		many	grand	hoch	Merrick	7
(*) 11. Petiole: attitude (+) Pétiole: port Blattstiel: Stellung	100-150	erect	dressé	aufrecht		1
		erect - to semi-erect	dressé à demi-dressé	aufrecht bis halbaufrecht	Vittoria, Invitation	2
		semi-erect	demi-dressé	halbaufrecht		3
		semi-erect to horizontal	demi-dressé à horizontal	halbaufrecht bis waagrecht	Ruta Otofte	4
		horizontal	horizontal	waagrecht	Seefelder, Melfort, Helena, Brora	5
12. Petiole: width Pétiole: largeur Blattstiel: Breite	100-150	thin	mince	dünn	(Vogesa)	3
		medium	moyen	mittel	Marian	5
		thick	épais	dick	(Heinkenborsteler)	7

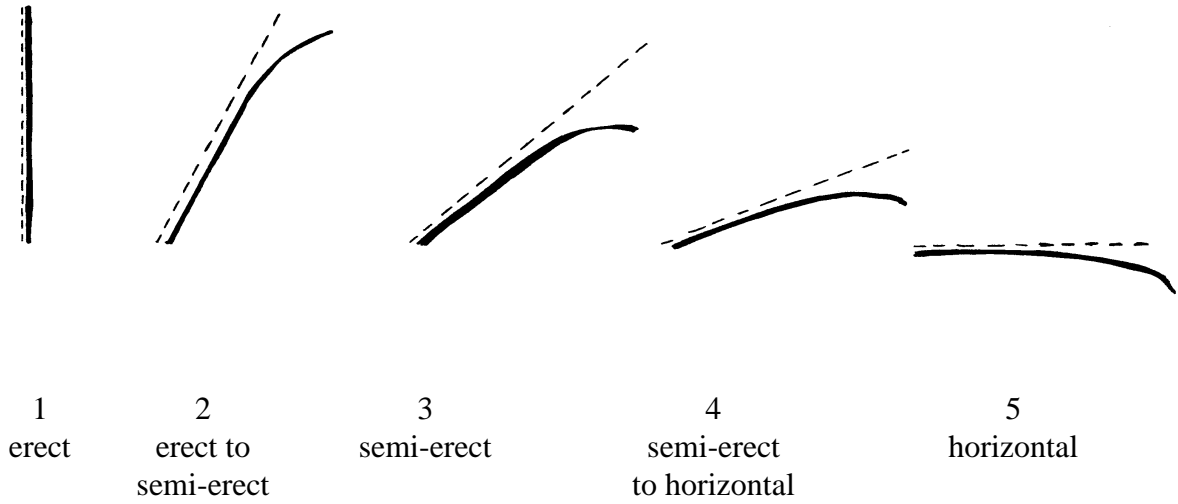
Characteristics Caracteres Merkmale	Growth Key	English	français	deutsch	Example Varieties Exemples Beispielssorten	Note
(*) 13. Root: color of skin above soil Racine: couleur de l'épiderme de la partie hors terre Rübe: Farbe des Epidermis des oberirdischen Teiles	350-370	green	vert	grün	Melfort	1
		bronze	bronze	bronze	(Harrietfield)	2
		reddish or purple	rougâtre ou pourpre	rötlich oder purpur	Kenmore	3
(*) 14. Root: anthocyanin coloration of skin above soil Racine: pigmentation anthocyanique de l'épiderme de la partie hors terre Rübe: Anthocyanfärbung des Epidermis der oberirdischen Teiles	350-370	absent	absente	fehlend	Seefelder	1
		present	présente	vorhanden	Ruta Otofte	9
15.1 <u>Bronze skinned varieties only</u> : Root: intensity of anthocyanin coloration of skin above soil level <u>Seulement des variétés avec l'épiderme bronze</u> : Racine: intensité de la pigmentation anthocyanique de l'épiderme de la partie hors terre <u>Nur für Sorten mit bronzefarbenden Epidermis</u> Rübe: Stärke der Anthocyanfärbung der Epidermis des oberirdischen Teiles	360-370	weak	faible	gering	Melfort	3
		medium	moyenne	mittel	(Angus)	5
		strong	fort	stark	Merrick	7
15.2 <u>Reddish and purple skinned varieties only</u> : Root: intensity of anthocyanin coloration of skin above soil level <u>Seulement des variétés rougeâtres ou pourpres</u> : Racine: intensité de la pigmentation anthocyanique de l'épiderme de la partie hors terre <u>Nur für rötliche oder purpurfarbene Sorten</u> : Rübe: Stärke der Anthocyanfärbung der Epidermis des oberirdischen Teiles	365-375	weak	faible	gering	Champion	3
		medium	moyenne	mittel	Doon Major	5
		strong	forte	stark	Ruby	7

Characteristics Caracteres Merkmale	Growth Key	English	français	deutsch	Example Varieties Exemples Beispielssorten	Note
16. Root: color of skin below soil level	360-380	white	blanc	weiss	(Niko)	1
		yellow	jaune	gelb	(Mella)	2
Racine: couleur de l'épiderme de la partie enterrée		reddish	rougeâtre	rötlich	Marian	3
Rübe: Farbe der Epidermis des unterirdischen Teiles						
(*) 17. Root: shape (+) Racine: forme Rübe: Form	360-390	transverse elliptic	elliptique transverse	quer elliptisch	Acme, Seefelder	1
		circular	arrondie	rund	Ruby	2
		broad elliptic	elliptique large	breit elliptisch	Kenmore	3
		obovate	obovale	verkehrt eiförmig	Doon Major	4
		oblong	oblongue	rechteckig	(Viking)	5
(*) 18. Root: length Racine: longueur Rübe: Länge	360-390	short	courte	kurz	Sator Otofte	3
		medium	moyenne	mittel	Airlie, Ruby	5
		long	longue	lang	(Aubigny Green Top)	7
(*) 19. Root: diameter Racine: diamètre du collet Rübe: Durchmesser des Halses	360-390	small	petit	klein	(Laurentian)	3
		medium	moyen	mittel	Ruta Otofte, Sator Otofte	5
		large	grande	groß	Kenmore	7
(*) 20. Root: length of 'neck' Racine: diamètre du collet Rübe: Länge des Halses	170-190	short	court	kurz	Melfort, Helena	3
		medium	moyen	mittel	Ruta Otofte, Sator Otofte	5
		long	long	lang	Vittoria, (Aubigny Green Top)	7
(*) 21. Root: colour of neck surface between leaf scars Racine: couleur de la surface du collet entre les cicatrices pétiolaires Rübe: Farbe der Oberfläche des Halses zwischen den Blattnarben	170-190	uniform red or purple	uniformement rouge ou pourpre	einheitlich rot oder purpur	Champion, Magres	1
		green or purple mottled with green	verte ou violette marbrée de vert	grün oder purpur mit grüner Marmorierung	Melfort , (Angus)	2

Characteristics Caracteres Merkmale	Growth Key	English	français	deutsch	Example Varieties Exemples Beispielsorten	Note
(*) 22. Root: colour of flesh	360-380	white	blanche	weiss	Merrick	1
Racine: couleur de la chair		yellow	jaune	gelb	Magres	2
Rübe: Farbe des Fleisches						
23. Root: intensity of yellow color of flesh	360-380	weak	faible	gering	Doon Major	3
Racine: intensité de la couleur jaune de la chair		medium	moyenne	mittel	Magres	5
Rube: Stärke der Gelbfärbung des Fleisches		strong	forte	stark		7
(+) 24. Root: dry matter content (when roots of early maturing varieties are fully developed and mature)	370-380	low	faible	gering	Doon Major	3
Racine: teneur en matière sèche (quant les racines des variétés de maturation précoce sont complètement développées et mûres)		medium	moyenne	mittel	Sator Otofte, Magres	5
Rübe: Trockensubstanzgehalt (wenn die Rüben der frühreifenden Sorten vollentwickelt und reif sind)		high	élevée	hoch	(Dryden)	7

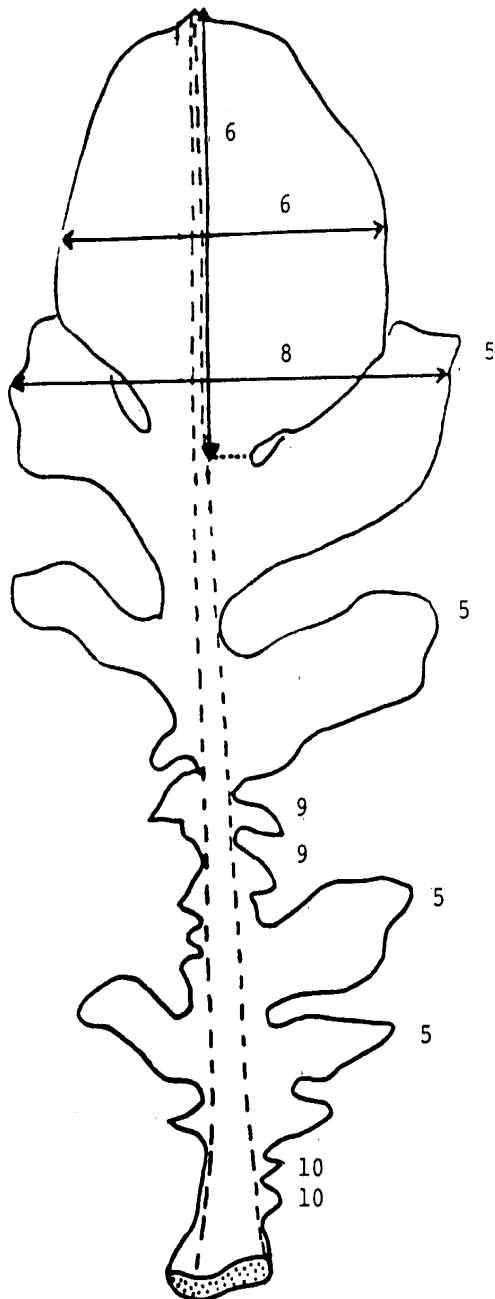
VIII. Explanations on the Table of Characteristics

Ad. 1: Petiole: attitude



Leaf attitude should be assessed along the dotted line, ignoring any reflexing at the leaf tip.

Ad. 4-10: Leaf



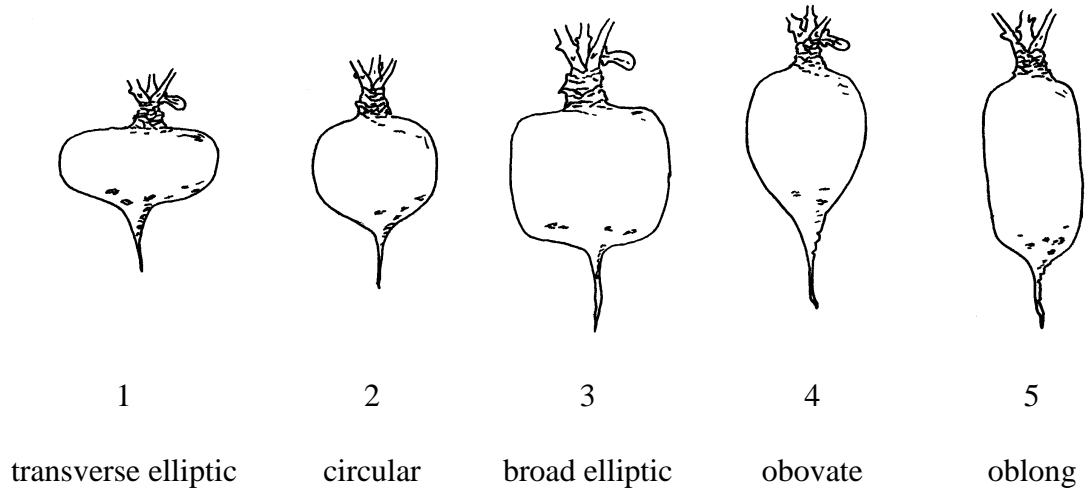
4. Leaf: number of major lobes
(To be recorded on one side of the midrib only and excluding terminal lobe)

A major lobe is defined as leaf tissue more than 2cm in length which is cut on both sides to at least half the distance towards the midrib.

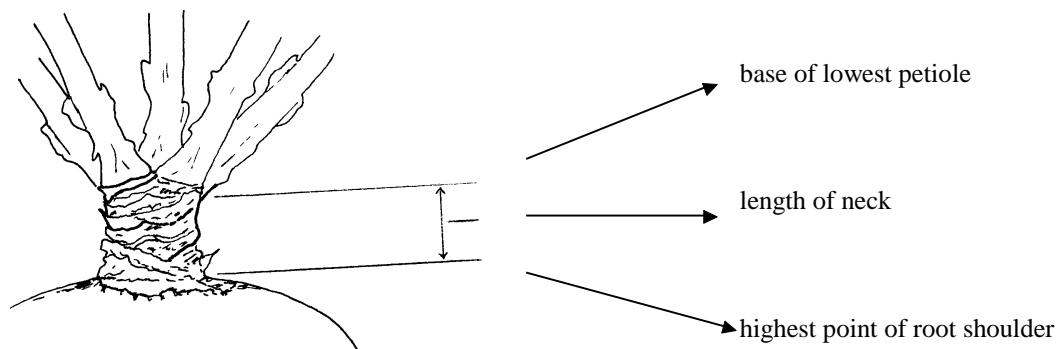
5. Leaf: length of terminal lobe
6. Leaf: width of terminal lobe
8. Leaf: width at widest point
9. Leaf: number of minor lobes between major lobes
10. Leaf: number of minor lobes on petiole

A minor lobe is defined as leaf tissues less than 2cm in length which is cut on both sides, to at least half the distance towards the midrib.

Ad. 17: Root: shape



Ad. 20: Root: length of neck



Ad. 24: Root: dry matter content

One core, approximately 15 mm in diameter, is sampled diagonally (45 degrees) through the root entering at the root shoulder. A core sampled diagonally is more representative of the root than a vertical or horizontal core. Fifteen roots are sampled randomly from each plot in four replications; malformed or damaged roots are excluded from the sample. The cores are placed in a polythene bag and sealed and labeled with the plot number. If there is any delay between sampling and weighing the cores, storage in a fridge will keep cores in good condition for up to 24 hours.

2 cm are cut off each end of the fifteen cores to remove the root skin and to reduce the harder tissue under the skin surface. The trimmed cores are weighed as a bulk and placed in a drying oven in trays with a mesh base to allow circulation of hot air.

The oven temperature is set at 60 °C with 85 % recirculated air. The temperature should not be set too high, otherwise caramelisation of the tissue will affect the dry matter content. The cores are left in the drying oven for at least 48 hours. The cores should be allowed to cool for one hour after removal from the oven; dry cool cores should snap when bent. The fifteen dry cores are weighed as a bulk. Both wet and dry weights should be measured to two decimal places.

The difference between the wet and dry core weight indicates the amount of water lost in the drying process. The dry matter percentage is calculated by using the formula

$$\frac{\text{Dry Weight}}{\text{Wet Weight}} \times 100$$

Key to Growth Stages00 Dry seed

0 - 10 Germination and emergence through soil

Seedling growth

12 Elongation of emerging shoot

15 Elongation and opening of cotyledons

20 Cotyledons fully opened

30 Cotyledons fully opened and full development of first true leaf

40 Second leaf fully developed

50 Third leaf fully developed and initial senescence of cotyledons

60 Fourth leaf fully developed and partial senescence of cotyledons

70 Fifth leaf fully developed and advanced senescence/drop of cotyledons

Leaf development

80 Sixth leaf fully developed;

90 Seventh leaf fully developed; initial senescence of first true leaf in early cultivars

100 Eighth leaf fully developed; 30 % senescence of first true leaf

110 Ninth leaf fully developed; 60% senescence of first true leaf

120 Tenth leaf fully developed; complete senescence and drop of first true leaf

130 Eleventh leaf fully developed.

140

150 Few leaf scars becoming exposed on root 'neck'

160

170

180 Many leaf scars exposed on root 'neck'

Root development

300 slight swelling of the root at ground level

320 development of a small swollen root above ground level

340 swollen root medium

360 root fully developed with no cork on skin

370 root fully developed with 40% cork development on skin

380 root fully developed with 80 - 100% cork development

390 root flesh becoming pithy and fibrous

400 root flesh fibrous and pithy

X. Literature

Bailey, L.H., 1922. *Gentes Herbarum (The Kinds of Plants) Vol. I. The Cultivated Brassicas. Fasc.2.* Ithaca, New York

Bailey, L.H., 1930. *Gentes Herbarum (The Kinds of Plants) Vol. II. The Cultivated Brassicas. Fasc.V.* Ithaca, New York

Davey, V. McM., 1931. Colour inheritance in swedes and turnips and its bearing on the identification of commercial stocks. *Scot. Journ. Agric.* XIV (3): 1-13.

Davey, V. McM., 1932. Inheritance of colour in *Brassica napus*. *J.Genet.*, XXV (2). 183-190.

Dyson, P.W., 1980. A comparison of two sampling methods for the estimation of dry matter and mineral content of swede roots. *J. Sci. Food Agric.* 31. 585-592.

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

Klein Geltink, D.J.A.,1983. Inheritance of leaf shape in turnip (*Brassica rapa* L. partim.) and rape (*Brassica napus* L.). *Euphytica* 32 (2): 361-365.

McNaughton, I.H. and Thow, R.F., 1972. Swedes and Turnips: Review article. *Field Crop Abstracts.* Vol.25 No.1.

McNaughton, I.H., 1995. Swedes and rapes. In: *Evolution of crop plants.* Ed. Simmonds, N.W. and Smartt, J. Longman Scientific and Technical. London. 68-75.

Pink, D.A.C. 1993. Swede and turnip. In *Genetic improvement of vegetable crops.* Eds. Kalloo,G. and Berg, B.O. 511-519. Pergamon Press Ltd. Oxford.

Shattuck, V.I. and Proudfoot, K.G. 1990. Rutabaga breeding. *Plant Breeding Reviews*, 8, 217-248.

Yarnell, S.H., 1956. Cytogenetics of Vegetable Crops. II. Crucifers. *Botanical review*, 22 (2), 81-166.

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>	
1. Species	<p style="text-align: center;"><i>Brassica napus</i> L. var. <i>napobrassica</i> (L.) Rchb. SWEDE, RUTABAGA</p>
2. Applicant (Name and address)	
3. Proposed denomination or breeder's reference	
4. Information on origin, maintenance and reproduction of the variety	

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

Characteristics	Example Varieties	Note
5.1 Leaf: lobes (3)		
absent	Mella, Niko	1[]
present	Magres	9[]
5.2 Root: color of skin above soil (13)		
green	Melfort	1[]
bronze	(Harrietfield)	2[]
reddish or purple	Kenmore	3[]
5.3 Root: anthocyanin coloration of skin above soil level (14)		
absent	Seefelder	1[]
present	Ruta Otofte	9[]
5.4 Root: intensity of anthocyanin coloration of skin above (15) soil level		
weak	Melfort, Champion	3[]
medium	Angus, Doon Major	5[]
strong	Merrick, Ruby	7[]
5.5 Root: shape (17)		
transverse elliptic	Acme, Seefelder	1[]
circular	Ruby	2[]
broad elliptic	Kenmore	3[]
obovate	Doon Major	4[]
oblong	(Viking)	5[]

5.6 Root: length of 'neck'
(20)

short	Melfort, Helena	3[]
medium	Ruta Otofte, Sator Otofte	5[]
long	Vittoria, (Aubigny Green Top)	7[]

5.7 Root: color of flesh
(22)

white	Merrck	1[]
yellow	Magres	2[]

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 Main use:

- Agricultural/fodder []
- Vegetable []

7.3 Dry matter content:

- low []
- medium []
- high []

7.4 Other information

[End of document]