



TWV/32/5

ORIGINAL: English

DATE: May 25, 1998

INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS
GENEVA

TECHNICAL WORKING PARTY FOR VEGETABLES

Thirty-Second Session

Slupia Wielka, Poland, June 29 to July 3, 1998

WORKING PAPER ON TEST GUIDELINES FOR SWEDE

Document prepared by experts from the United Kingdom

<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	13
IX. Growth Key	17
IX. Literature	19
XI. Technical Questionnaire	20

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 or certified seed in the 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 (non-senescent) leaf.
4. Assessment of leaf color should be made on leaves before powdery mildew infection is established.
5. Observations on root skin colour 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: type (characteristic 3)
 - ii) Root: anthocyanin coloration of skin above soil level (characteristic 14)
 - iii) Root: intensity of anthocyanin coloration of skin above soil (characteristic 15.1)
 - iv) Root: colour of neck surface between leaf scars (characteristic 21)
 - v) 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 Beispielsorten	Note
(*) 1. Leaf: intensity of green color Feuille: couleur Blatt: Farbe	100-150	light		hell	Airlie	3
		medium	moyen	mittel	Marian	5
		dark	foncé	dunkel	Joan	7
2. Leaf: glaucosity Feuillage: glaucescence Blatt: Bereifung	100-150	weak	faible	gering	Seefelder	3
		medium	moyenne	mittel		5
		strong	forte	stark	Heinkenborsteler	7
(*) 3. Leaf: type (+) Feuille: lobes Blatt: Blattlappen	80-150	entire			(Niko, Mella)	1
		lobed			Magres	2
(+) 4. Leaf: number of major lobes Feuille: nombre de grands lobes Blatt: Anzahl Hauptlappen	100-150	few	petit	gering	Wilhelmsburger	3
		medium	moyen	mittel	Ruta Otofte	5
		many	grand	hoch	Marian	7
(*) 5. Leaf: length of terminal lobe (+)	100-150	short			(Laurentian)	3
		medium			Sator Otofte	5
		long			Kenmore	7
(*) 6. Leaf: width of terminal lobe (+)	100-150	narrow			(Laurentian)	3
		medium			Sator Otofte	5
		broad			Kenmore	7

Characteristics Caracteres Merkmale	Growth Key	English	français	deutsch	Example Varieties Exemples Beispielssorten	Note
(*) 7. Leaf: length of longest green leaf (including petiole)	100-150	short			(Excelsior)	3
Feuille: longueur de la plus longue feuille verte (y compris le pétiole)		medium			Ruta Otofte	5
Blätt: Gesamtlänge des längsten grünen Blattes (einschliesslich stiel)		long				7
(*) 8. Leaf: width	100-150	narrow	étroite	schmal	(Dryden)	3
(+) Feuille: largeur		medium	moyenne	mittel	Ruta Otofte	5
Blatt: Breite		broad	large	breit	Kenmore	7
(+) 9. Leaf: number of minor lobes between major lobes	100-150	few	petit	gering	Grunkopfige Gelbe Wilhelmsburger	3
Feuille: nombre de petits lobes entre les grands lobes		medium	moyen	mittel	Ruta Otofte	5
Blatt: Anzahl Nebenlappen zwischen den Hauptlappen		many	grand	hoch	(Gry)	7
(+) 10. Leaf: number of minor lobes on petiole	100-150	few	petit	gering	Wilhelmsburger	3
Feuille: nombre de petits lobes sur le pétiole		medium	moyen	mittel	Doon Major	5
Blatt: Anzahl Nebenlappen am Stiel		many	grand	hoch	Merrick	7
(*) 11. Petiole: attitude	100-150	erect				1
(+) Feuille: port		semi-erect			Ruta Otofte	3
Blatt: haltung		horizontal			Helena, Brora	5

Characteristics Caracteres Merkmale	Growth Key	English	français	deutsch	Example Varieties Exemples Beispielssorten	Note
12. Petiole: width	100-150	thin	mince	dünn	(Vogesa)	3
Feuille: épaisseur du pétiole		medium	moyen	mittel	Marian	5
Blatt: Dicke des Stieles		thick	épais	dick	(Heinkenborsteler)	7
(*) 13. Root: predominant color (+) of skin above soil	240-270	green			Melfont	1
		bronze			(Harrietfield)	2
		reddish purple			Kenmore	3
(*) 14. Root: anthocyanin (+) coloration of skin above soil	240-270	absent	absente	fehlend	Seefelder	1
Racine: pigmentation anthocyanique de l'épiderme de la partie horsterre		present	présente	vorhanden	Ruta Otofte	9
(*) 15.1 Root: intensity of anthocyanin coloration of skin above soil (for varieties with predominantly green or bronze skin colour)	250-270	weak			Melfont	3
		medium			(Angus)	5
		strong			Merrick	7
Racine: intensité de la pigmentation anthocyanique de l'épiderme de la partie hors terre						
Rübe: Stärke der Anthocyanfärbung der Epidermis des oberirdischen Teiles	100-150					

Characteristics Caracteres Merkmale	Growth Key	English	français	deutsch	Example Varieties Exemples Beispielssorten	Note
(*) 15.2 Root: intensity of anthocyanin coloration of skin above soil (for varieties with predominantly reddish purple skin colour)	365-375	weak	faible	gering	Champion	3
		medium	moyenne	mittel	Doon Major	5
		strong	forte	stark	Ruby	7
Racine: intensité de la pigmentation anthocyanique de l'épiderme de la partie hors terre						
Rübe: Stärke der Anthocyanfärbung der Epidermis des oberirdischen Teiles						
16. Root: color of skin below soil level	360-380	white	blanc	weiss	(Niko)	1
Racine: couleur de l'épiderme de la partie enterrée		yellow	jaune	gelb	(Mella)	2
		reddish	rougeâtre	rötlich	Marian	3
Rübe: Farbe der Epidermis des unterirdischen Teiles						
(*) 17. Root: shape (+)	360-390	transverse elliptic	elliptique transverse	quer elliptisch	Acme, Seefelder	1
Racine: forme		circular	arrondie	rund	Ruby	2
Rübe: form		broad elliptic	elliptique large	breit elliptisch	Kenmore	3
		obovate	obovale	verkehrt eiförmig	Doon Major	4
		oblong	oblongue	rechteckig	(Viking)	5
(*) 18. Root: length	260-290	short	courte	kurz	Sator Otofte	3
Racine: longueur		medium	moyenne	mittel	Airlie, Ruby	5
Rübe: Länge		long	longue	lang	(Aubigny Green Top)	7

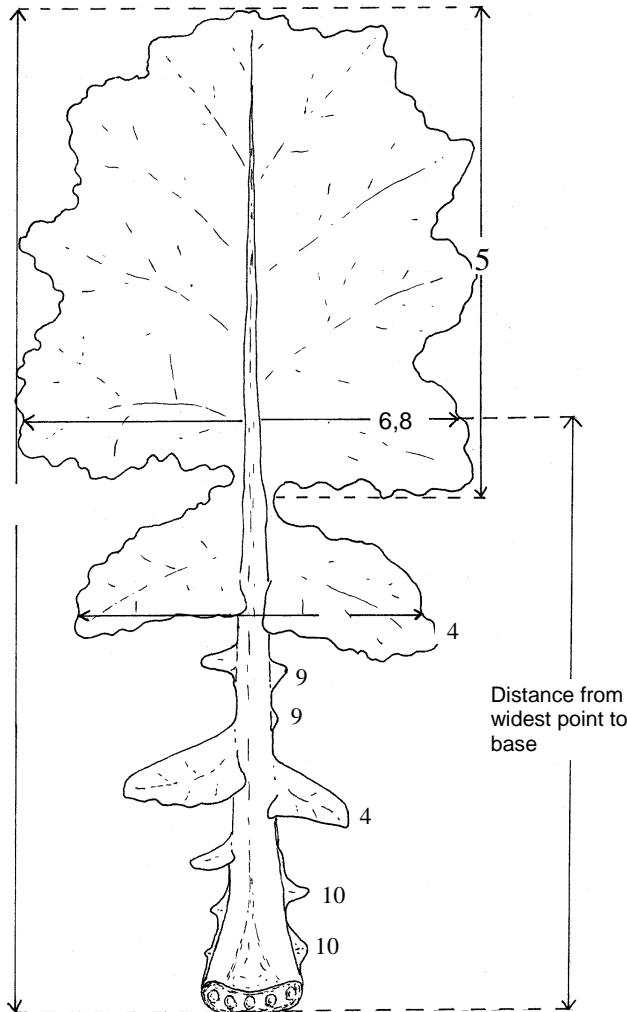
Characteristics Caracteres Merkmale	Growth Key	English	français	deutsch	Example Varieties Exemples Beispielsorten	Note
(*) 19. Root: diameter	260-290	small	etroite	schmal	(Laurentian)	3
Racine: longueur due collet		medium	moyen	mittel	Ruta Otofte, Sator Otofte	5
Rübe: Länge des Halses		large	large	breit	Kenmore	7
(*) 20. Root: length of 'neck'	260-290	short	court	kurz	Melfort, Helena	3
(+) Racine: longueur due collet		medium	moyen	mittel	Ruta Otofte, Sator Otofte	5
Rübe: Länge des Halses		long	long	lang	Vittoria, (Aubigny Green Top)	7
(*) 21. Root: colour of 'neck' surface between leaf scars	260-280	uniform reddish purple	uniformement	einheitlich rot oder pur-pur	Champion, Magres	1
(+) Racine: couleur de la surface du collet entre les cicatrices pétiolaires		green or purple mottled with green	verte ou violette marbrée de vert	grün oder pur-pur mit gruner Marmorierung	Melfort (Angus)	2
(*) 22. Root: colour of flesh	260-280	white	blanche	weiss	Merrick	1
Racine: couleur de la chair		yellow	jaune	gelb	Magres	2
23. Root: intensity of yellow color of flesh	260-280	weak	faible	gering	Doon Major	3
		medium	moyenne	mittel	Magres	5
Raince: intensité de la couleur jaune de la chair		strong	forte	stark		7
Rube: Stärke der Gelbtärbung des Fleisches						

Characteristics Caracteres Merkmale	Growth Key	English	français	deutsch	Example Varieties Exemples Beispielssorten	Note
(+) 24. Root: dry matter content (when roots of early maturing varieties are fully developed and mature) Racine: teneur en matière sèche (quant les racines des variétés de maturation précoce sont complètement développées et mûres) Rübe: Trockensubstanz-gehalt (wenn die Rüben der trühreifenden Sorten vollentwickelt und reit sind)	270-280	low	faible	gering	Doon Major	3
		medium	moyenne	mittel	Sator Otofte, Magres	5
		high	élevée	hoch	(Dryden)	7
25. Plant: height at flowering	370-380	short	courte	kurz		3
		medium	moyenne	mittel		5
		tall				7
26. Flower: color of petal	370-400	lemon yellow				1
		orange-yellow				2
27. Flower: length of petal	370-400	short	court	kurz		3
		medium	moyen	mittel		5
		long	long	lang		7
28. Flower: width of petal	370-400	narrow				3
		medium				5
		broad				7

Characteristics Caracteres Merkmale	Growth Key	English	français	deutsch	Example Varieties Exemples Beispielsorten	Note
29. Siliqua: length	430-475	short				3
		medium				5
		long				7
30. Siliqua: length of beak	430-475	short				3
		medium				5
		long				7
31. Siliqua: length of peduncle	430-475	short	courte	kurz		3
		medium	moyenne	mittel		5
		long				7
32. Plant: height after flowering	430-500	short				3
		medium				5
		tall				7
33. Time of flowering (from early spring sowing)	370-380	early	courte	kurz		3
		medium	moyenne	mittel		5
		late				7

VIII. Explanations on the Table of Characteristics

Ad. 3 - 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

7. Leaf: total length of longest green leaf (including petiole)

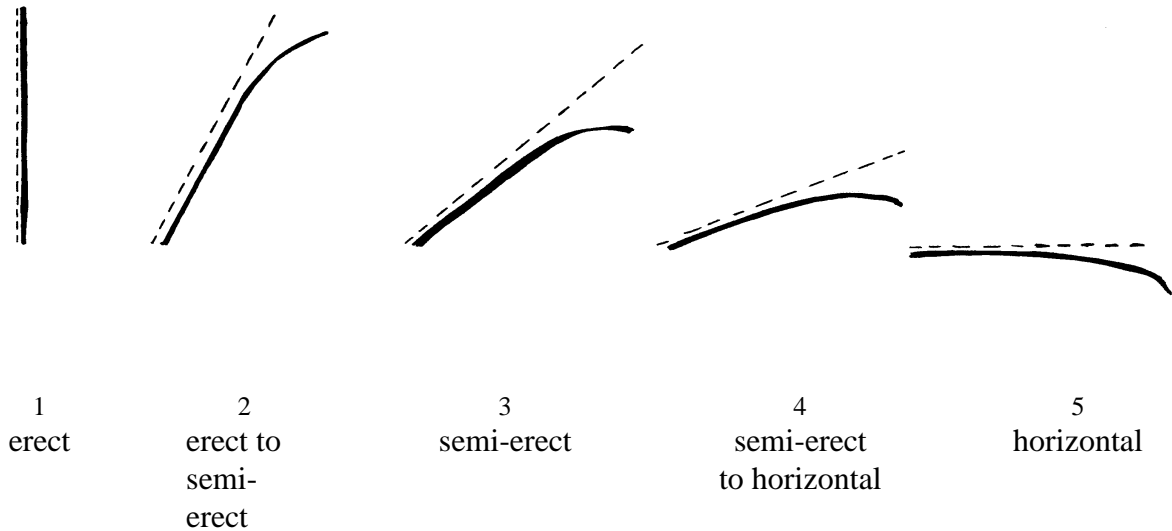
8. Leaf: width

9. Leaf: number of minor lobes between major lobes

10. Leaf: number of minor lobes on petiole (below lowest major lobe)

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. 11 Petiole: attitude



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

Ad. 13. Root: predominant color of skin above soil

The characteristic describes the predominant color of the skin above soil over the whole root. Very slight expression of anthocyanin should be ignored on green skinned roots.

Bronze skin color is defined as chlorophyll expression with partial, but clear, expression of anthocyanin.

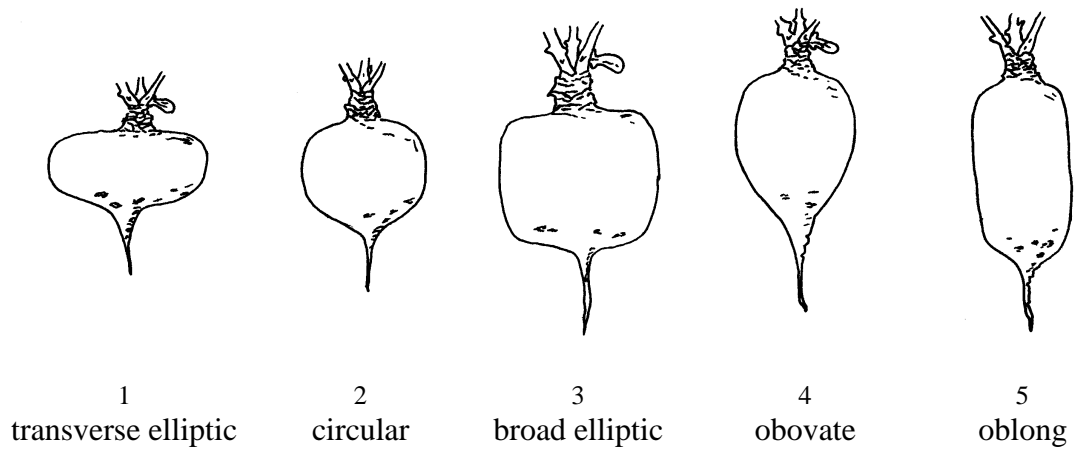
Ad. 15.1 Root: intensity of anthocyanin coloration of skin above soil
(Green or Bronze skinned varieties only)

The expression of root skin colour in Swede would appear to be simple observation with three clear states of expression: Green, Purple or Bronze.

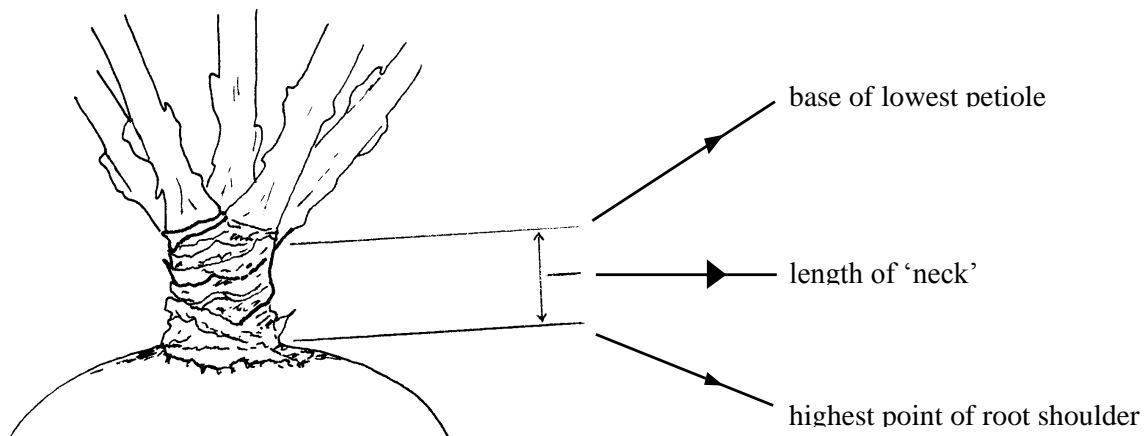
On closer examination some green skinned varieties have very slight anthocyanin expression and should be classified as Bronze skinned.

This characteristic should be recorded before the start of root cork development.

Ad. 17 Root: shape



Ad. 20 Root: length of 'neck'



Ad. 21 Root: color of neck surface between leaf scars

This characteristic in conjunction with characteristic 15.1 are essential for the correct skin color classification.

The following key can be used for grouping varieties.

- | | |
|--|----------------------|
| Neck surface between leaf scars green and root skin colour green | Green skinned Group |
| Neck surface between leaf scars green and root skin colour with small expression of anthocyanin | Bronze skinned Group |
| Neck surface between leaf scars green mottled with purple and root skin colour with small or extensive expression of anthocyanin | Bronze skinned Group |

Neck surface between leaf scars entirely purple with anthocyanin expressed on root skin

Purple skinned Group

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 labelled with the plot number. If there is a delay between sampling and weighing the cores, storage in a fridge will keep cores in good condition for up to 24 hours.

2 cms 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 stages

00 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

- 200 slight swelling of the root at ground level
- 220 development of a small swollen root above ground level
- 240 swollen root medium
- 260 root fully developed with no cork on skin
- 270 root fully developed with 40% cork development on skin
- 280 root fully developed with 80 - 100% cork development
- 290 root flesh becoming pithy and fibrous
- 299 root flesh fibrous and pithy

Flowering

- 310 initial formation and elongation of the flowering stem
- 330 elongation of the flowering stem with clean space between leaves
- 350 first bud formation and further elongation of stem
- 360 terminal inflorescence in bud
- 370 terminal inflorescence with first open flower
- 380 terminal inflorescence fully flowering
- 400 terminal inflorescence fully flowering
- 420 development of siliqua with elongation of flowering stem

- 430 lowest fully developed siliqua green
- 450 lowest fully developed siliqua senescing and going brown
- 475 lowest fully developed siliqua dry with seed beginning to dry
- 500 lowest fully developed siliqua dry with mature dry seed

Literature

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Reference Number
(not to be filled in by the applicant)

TECHNICAL QUESTIONNAIRE
to be completed in connection with an application for plant breeders' rights

1. Species *Brassica napus* L. var. *napobrassica* (L.) Rchb.)

SWEDE, RUTABAGA

2. Applicant (Name and address)/

3. Proposed denomination or breeder's reference

4. Information on origin, maintenance and reproduction or the variety

4.1 Variety Type

(i) Open-pollinated variety []

(ii) Single Hybrid []

(iii) Three-way hybrid []

(iv) Other []

4.2 Genetic origin and breeding method

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

Yes [] No []

(b) Has such authorisation been obtained?

Yes [] No []

If the answer to that question is 'yes', please attach a copy of such authorisation.

4.3 Other information

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

Caracteres de la variete a indiquer (le chiffre entre parentheses renvoie au caractere correspondant dans les principes directeurs d'examen; priere de marquer d'une croix le niveau d'expression approprie).

Anzugebende Merkmale der Sorte (die in Klammern angegebene Zahl verweist auf das entsprechende Merkmal in den Prüfungsrichtlinien; die Ausprägungsstufe, die der Sorte am nächsten kommt, bitte ankreuzen).

Characteristics Caracteres Merkmale	English	français	deutsch	Example Varieties Exemples Beispielssorten	Note
5.1 Leaf: type (3)	entire			Mella, Niko	1 []
Feuille: lobes	lobed			Magres	2 []
Blatt: Blattlappen					
5.2 Root: color of skin above (13) soil	green			Melfort	1 []
	bronze			(Harrietfield)	2 []
	reddish purple			Kenmore	3 []
5.3 Root: anthocyanin coloration (14) of skin above soil level	absent	absente	fehlend	Seefelder	1 []
Racine: pigmentation anthocyanique de l'épigerme de la partie hors terre	present	présente	vorhanden	Ruta Otofte	9 []
Rübe: Anthocyanärbung der Epidermis des oberirdischen Teiles					

Characteristics Caracteres Merkmale	English	français	deutsch	Example Varieties Exemples Beispielssorten	Note
5.4 Root: intensity of anthocyanin coloration of skin above soil level Racine: intensité de la pigmentation anthocyanique de l'épiderme de la partie hors terre Rübe: Stärke der Anthocyanfärbung der Epidermis des oberirdischen Teiles	weak	faible	gering	Melfort, Champion	3 []
	medium	moyenne	mittel	Angus, Doon Major	5 []
	strong	forte	stark	Merrick, Ruby	7 []
5.5 Root: shape (18) Racine: forme Rübe: form	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 []
5.6 Root: length of 'neck' (21) Racine: longueur due collet Rube: Länge des Halses	short	court	kurz	Melfort, Helena	3 []
	medium	moyen	mittel	Ruta Otofte, Sator Otofte	5 []
	long	long	lang	Vittoria, (Aubigny GreenTop)	
5.7 Colour of flesh (23) Racine: couleur de la chair Rübe: Farbe des Fleisches	white	bianche	weiss	Merrick	1 []
	yellow	jaune	gelb	Magres	2 []

6. Similar varieties and differences from these varieties

Denomination of varieties

Differences

7. Additional information which may help to distinguish the variety

7.1 Resistance to pests and diseases

7.2 Main use:

- Agricultural/fodder []

- Vegetable

 Processing []

 Supermarket vegetable []

 Garden []

7.3 Dry Matter content:

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

7.4 Other information

[Annex follows]

ANNEX

WORKING PAPER ON TEST GUIDELINES FOR SWEDE TWV/31/4
 RESPONSE TO COMMENTS MADE BY THE TWA IN TWA/26/11

Generative characters

- No generative characters have been considered necessary for DUS tests on Swede, as the reference collection and the number of candidates are both small. There have been few problems of distinctness, so there has been no need to record generative characteristics. There is little morphological variation between cultivars for generative characteristics.
- The range of variation expressed is dependent on the trialling method used. Two trialling methods are available if generative characters are to be assessed:

1. Over-winter the spring sown crop (sown in April/May in UK)

This results in a very short flowering period, as the material may have been subjected to a maximum vernalisation stimulus. There is also the difficulty of over-wintering the crop successfully in areas where winter temperatures fall below freezing for a prolonged period. This method also affects rotation for an additional year.

2. Very early spring sowing (February in UK)

Flowering takes place (June) in the year of sowing. The flowering period is longer than in the over-wintered crop, but requires a separate trial which adds expense to the DUS test.

- There is only one normal flowering type within the crop (spring sown, biennial)

The UK would therefore recommend method 2 for DUS tests.

The following generative characteristics have been added to the guideline:

Plant: height at appearance of flowering	short(3) medium (5) long (7)
Time of flowering	early (3) medium (5) late (7)
Flower: color of petal	lemon yellow (1) orange yellow (2)
Flower: length of petal	short (3) medium (5) long (7)
Flower: width of petal	narrow (3) medium (5) broad (7)
Plant: height after flowering	short(3) medium (5) long (7)
Siliqua: length	short(3) medium (5) long (7)
Siliqua: length of beak	short(3) medium (5) long (7)
Silqua: length of peduncle	short(3) medium (5) long (7)

The UK recommends that the generative characteristics should not have an asterisk. Although few varieties have been described for regenerative characteristics, these could be useful for certification. Only flower colour would be suitable for grouping, but as this has

perfect correlation with flesh color in the vegetative stage, there is no need to include it for grouping.

- New characteristic to follow 8. Leaf: width
Leaf: distance from widest point to base short(3) medium(5) long(7)
This can be a useful discriminator, particularly for varieties with entire leaves.

Splitting of characteristic 15 Root: intensity of anthocyanin coloration

The range and variation of expression of anthocyanin intensity are very different in the Bronze and in the Purple skin color. If both were incorporated in one characteristic the scale would not be regular; in addition, the expression of anthocyanin in Bronze skinned varieties is not expressed over the entire root.

Characteristic 19: Root: diameter of the neck

This was not considered to be useful for Distinctness by the TWV and was deleted from the working paper at the 30th meeting in Brno.

Reference to the use of COYU

The number of degrees of freedom obtained using 2 years trial data is not sufficient given the small number of controls for each candidate. COYD and COYU in Swede could be used with a long term LSD.

[End of Annex and of document]