TG/60/7(proj.2)
ORIGINAL: English
DATE: 2007-10-08

INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS

GENEVA

DRAFT

BEETROOT

UPOV Code: BETAA_VUL_GVC

Beta vulgaris L. ssp. v*ulgaris* var. *conditiva* Alef.

[*]

GUIDELINES

FOR THE CONDUCT OF TESTS

FOR DISTINCTNESS, UNIFORMITY AND STABILITY

prepared by experts from the Netherlands

to be considered by the Enlarged Editorial Committee at its meeting to be held in Geneva, Switzerland, on January 8, 2008

Alternative Names:[*]

Botanical name	*English*	*French*	*German*	*Spanish*
Beta vulgaris L. ssp. *vulgaris* var. *conditiva* Alef., *Beta vulgaris* L. ssp. *vulgaris* var. *esculenta* L., *Beta vulgaris* L. ssp. *vulgaris* var. *hortensis*	Beetroot, Garden Beet	Betterave rouge, Betterave potagère	Rote Rübe, Rote Bete	Remolacha de cocona, Remolacha de mesa, Remolacha roja

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.

[*] 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.]

TABLE OF CONTENTS PAGE

1. Subject of these Test Guidelines

These Test Guidelines apply to all varieties of *Beta vulgaris* L. ssp. v*ulgaris* var. *conditiva* Alef.

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:

200 g or 9000 seeds.

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

2.5 The plant material supplied should be visibly healthy, not lacking in vigor, nor affected by any important pest or disease.

2.6 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 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 200 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 should be made on 40 plants or parts taken from each of 40 plants.

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 should be according to the recommendations for cross-pollinated varieties in the General Introduction. For the characteristics, Root: shape in longitudinal section (characteristic 17), Root: external color (characteristic 23) and Root: prominence of rings (characteristic 26), a population standard of 2% and an acceptance probability of 95% should be applied. In the case of a sample size of 200 plants, 7 off-types are allowed.

4.2.3 Hybrid varieties

For the assessment of uniformity, a population standard of 2 % and an acceptance probability of at least 95 % should be applied. In the case of a sample size of 200 plants, 7 off-types are allowed. In addition a population standard of 2 % and an acceptance probability of at least 95 % should be applied to clearly recognizable inbred plants. In the case of a sample size of 200 plants the additional maximum number of clearly recognizable inbred plants would be 7.

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.

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) Germity (characteristic 1)
(b) Leaf blade: color (characteristic 9**)**
(c) Root: shape in longitudinal section (characteristic 17)
(d) Root: external color (characteristic 23)
(e) Bolting tendency (from an early sowing) (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

C: special test

(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/ MS**	**Germity**	**Germie**	**Germität**	**Germia**		
QL	**C**	monogerm	monogerme	monogerm	monogérmen	Monodet, Monopoly	1
		multigerm	multigerme	multigerm	multigérmen	Crosby, Detroit 2	2
2. (*)	**VG**	**Seedling: red coloration of hypocotyl**	**Plantule: coloration rouge de l'hypocotyle**	**Keimpflanze: Rotfärbung des Hypokotyls**	**Plántula: color rojo del hipocotilo**		
QL		absent	absente	fehlend	ausente	Albina Vereduna	1
		present	présente	vorhanden	presente	Crosby, Detroit 2	9
3.	**VG**	**Leaf: attitude of petiole**	**Feuille: port du pétiole**	**Blatt: Haltung des Stieles**	**Hoja: porte del peciolo**		
QN	**(a)**	erect	dressé	aufrecht	erecto	Dragon, Forono	1
		semi-erect	demi-dressé	halbaufrecht	semierecto	Crosby, Detroit 2	3
		horizontal	horizontal	waagerecht	horizontal		5
4. (*)	**VG**	**Leaf: attitude of blade**	**Feuille: port du limbe**	**Blatt: Haltung der Spreite**	**Hoja: porte del limbo**		
QN	**(a)**	erect	dressé	aufrecht	erecto	Dragon	1
		semi-erect	demi-dressé	halbaufrecht	semierecto	Bikores	3
		horizontal	horizontal	waagerecht	horizontal	Detroit 5, Forono	5
		semi-pendulous	demi-retombant	halbhängend	semicolgante	D'Egypte	7
		pendulous	retombant	hängend	colgante		9
5. (*)	**VG/ MS**	**Leaf: length (including petiole)**	**Feuille: longueur (pétiole inclus)**	**Blatt: Länge (einschließlich Stiel)**	**Hoja: longitud (incluyendo peciolo)**		
QN	**(a)**	short	courte	kurz	corta	Babybeat	3
		medium	moyenne	mittel	media	Boltardy	5
		long	longue	lang	larga	Bull's Blood	7

		English	français	Deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
6. (*)	**VG/ MS**	**Leaf blade: length**	**Limbe: longueur**	**Blattspreite: Länge**	**Limbo: longitud**		
QN	**(a)**	short	court	kurz	corto	Babybeat	3
		medium	moyen	mittel	medio	Detroit 2	5
		long	long	lang	largo	Crosby	7
7. (*)	**VG/ MS**	**Leaf blade: width**	**Limbe: largeur**	**Blattspreite: Breite**	**Limbo: anchura**		
QN	**(a)**	narrow	étroit	schmal	estrecho	Bikores	3
		medium	moyen	mittel	medio	Detroit 2	5
		broad	large	breit	ancho	Crosby	7
8. (*)	**VG**	**Leaf blade: shape**	**Limbe: forme**	**Blattspreite: Form**	**Limbo: forma**		
QN	**(a)**	narrow elliptic	elliptique étroit	schmal elliptisch	elíptica estrecha	Cheltenham Mono	3
		medium elliptic	elliptique moyen	mittel elliptisch	elíptica media	Detroit 2	5
		broad elliptic	elliptique large	breit elliptisch	elíptica ancha	Burpee’s Golden	7
9. (*)	**VG**	**Leaf blade: color**	**Limbe: couleur**	**Blattspreite: Farbe**	**Limbo: color**		
QN	**(a)**	only green	seulement verte	nur grün	sólo verde	Albina Vereduna	1
		green and red	verte et rouge	grün und rot	verde y rojo	D’Egypte	2
		only red	seulement rouge	nur rot	sólo rojo	Bull’s Blood	3
10. (*)	**VG**	**Leaf blade: intensity of green color**	**Limbe: intensité de la couleur verte**	**Blattspreite: Intensität der Grünfärbung**	**Limbo: intensidad del color verde**		
QN	**(a)**	light	claire	hell	claro	Solist	3
		medium	moyenne	mittel	medio	Regala	5
		dark	foncée	dunkel	oscuro	Monopoly	7

		English	français	Deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
11.	**VG**	**Leaf blade: red coloration of veins**	**Limbe: coloration rouge des nervures**	**Blattspreite: Rotfärbung der Adern**	**Limbo: color rojo de los nervios**		
QN	**(a)**	absent or very weak	nulle ou très faible	fehlend oder sehr gering	ausente o muy débil	Albina Vereduna	1
		weak	faible	gering	débil	Chioggia	3
		medium	moyenne	mittel	media	Regala	5
		strong	forte	stark	fuerte	D'Egypte	7
		very strong	très forte	sehr stark	muy fuerte	Bull's Blood	9
12. (*)	**VG**	**Leaf blade: undulation of margin**	**Limbe: ondulation du bord**	**Blattspreite: Wellung des Randes**	**Limbo: ondulación del márgen**		
QN	**(a)**	absent or very weak	nulle ou très faible	fehlend oder sehr gering	ausente o muy débil	Burpee's Golden	1
		weak	faible	gering	débil	Trianon	3
		medium	moyenne	mittel	medio	Regala	5
		strong	forte	stark	fuerte	D'Egypte	7
		very strong	très forte	sehr stark	muy fuerte	Detroit 5	9
13. (*)	**VG**	**Leaf blade: blistering**	**Limbe: cloqûre**	**Blattspreite: Blasigkeit**	**Limbo: vesiculación**		
QN	**(a)**	weak	faible	gering	débil	Crosby	3
		medium	moyenne	mittel	media	Bikores	5
		strong	forte	stark	fuerte	Burpee's Golden	7
14.	**VG**	**Petiole: width of base (at root insertion)**	**Pétiole: largeur de la base (à l'insertion sur la racine)**	**Blattstiel: Breite der Basis (am Rübenansatz)**	**Peciolo: anchura de la base (en la inserción de la raíz)**		
QN	**(a)**	narrow	étroite	schmal	estrecha	Cylindra	3
		medium	moyenne	mittel	media	Bikores	5
		broad	large	breit	ancha	Crosby	7

		English	français	Deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
15. (*)	**VG**	**Petiole: main color of lower side**	**Pétiole: couleur principale de la face inférieure**	**Blattstiel: Hauptfarbe der Unterseite**	**Peciolo: color principal de la cara inferior**		
PQ	**(a)**	green	verte	grün	verde	Albina Vereduna	1
		orange	orange	orange	naranja	Burpee's Golden	2
		red	rouge	rot	rojo	Crapaudine	3
		purple	violette	purpur	púrpura	Babybeat, Bull's Blood	4
16. (*)	**VG**	**Root: position in soil**	**Racine: position dans le sol**	**Rübe: Sitz im Boden**	**Raíz: posición en el suelo**		
QN	**(b)**	very shallow	très superficielle	sehr flach	muy superficial	D'Egypte	1
		shallow	superficielle	flach	superficial		3
		medium	moyennement enterrée	mittel	media	Boltardy	5
		deep	enterrée	tief	profunda	Albina Vereduna	7
		very deep	très enterrée	sehr tief	muy profunda	Crapaudine	9
17. (*) (+)	**VG**	**Root: shape in longitudinal section**	**Racine: forme en section longitudinale**	**Rübe: Form im Längsschnitt**	**Raíz: forma en sección longitudinal**		
PQ	**(b)**	transverse narrow elliptic	elliptique transverse étroite	quer schmal elliptisch	elíptica transversal estrecha	D'Egypte	1
		transverse elliptic	elliptique transverse	quer elliptisch	elíptica transversal	Crosby	2
		circular	circulaire	rund	circular	Detroit 2	3
		obovate	obovale	verkehrt eiförmig	oboval	Albina Vereduna	4
		narrow oblong	oblongue étroite	schmal rechteckig	oblonga estrecha	Cylindra	5
		narrow obtriangular	obtriangulaire étroite	schmal verkehrt dreieckig	obtriángular estrecha	Cheltenham Mono	6
18. (*)	**VG/ MS**	**Root: length**	**Racine: longueur**	**Rübe: Länge**	**Raíz: longitud**		
QN	**(b)**	short	courte	kurz	corta	D'Egypte	3
		medium	moyenne	mittel	media	Detroit 2	5
		long	longue	lang	larga	Forono	7

		English	français	Deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
19. (*)	**VG/ MS**	**Root: width**	**Racine: largeur**	**Rübe: Breite**	**Raíz: anchura**		
QN	**(b)**	narrow	étroite	schmal	estrecha	Forono	3
		medium	moyenne	mittel	media	Detroit 2	5
		broad	large	breit	larga	D'Egypte	7
20.	**MS/ VG**	**Root: ratio length/width ratio**	**Racine: rapport longueur/largeur**	**Rübe: Verhältnis Länge/Breite**	**Raíz: relación longitud/anchura**		
QN	**(b)**	small	petit	klein	pequeña	D'Egypte	1
		medium	moyen	mittel	media	Detroit 2	3
		large	grand	groß	grande	Cylindra	5
21. (*) (+)	**VG**	**Root: shape of base**	**Racine: forme de la base**	**Rübe: Form der Basis**	**Raíz: forma de la base**		
PQ	**(b)**	pointed	pointue	spitz	puntiaguda	Cheltenham Mono, Crapaudine	1
		rounded	arrondie	abgerundet	redondeada	Babybeat, Crimson King	2
		flat	aplatie	flach	plana	D'Egypte	3
		recessed	déprimée aplatie	eingesunken	deprimida		4
22.	**VG**	**Root: corkiness**	**Racine: présence de liège**	**Rübe: Korkbildung**	**Raíz: acorchado**		
QN	**(b)**	absent or very weak	nulle ou très faible	fehlend oder sehr gering	ausente o muy débil		1
		weak	faible	gering	débil	Boltardy	3
		medium	moyenne	mittel	medio	Monami	5
		strong	forte	stark	fuerte	Crapaudine	7
		very strong	très forte	sehr stark	muy fuerte		9

		English	français	Deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
23. (*)	**VG**	**Root: external color**	**Racine: couleur externe**	**Rübe: Außenfarbe**	**Raíz: color externo**		
PQ	**(b)**	white	blanche	weiß	blanco	Albina Vereduna	1
		yellow	jaune	gelb	amarillo	Burpee's Golden	2
		reddish purple	pourpre-rougeâtre	rötlichpurpurn	púrpura rojizo	Detroit 2	3
24. (*)	**VG**	**Root: main color of flesh**	**Racine: couleur principale de la chair**	**Rübe: Hauptfarbe des Fleisches**	**Raíz: color principal de la carne**		
PQ	**(b)**	white	blanche	weiß	blanco	Albina Vereduna	1
		yellow orange	jaune orange	gelb orange	naranja amarillento	Burpee's Golden	2
		red	rouge	rot	rojo	Detroit 2	3
		purple	violette	purpur	púrpura	Cylindra	4
25.	**VG**	**Root: intensity of main color of flesh**	**Racine: intensité de la couleur principale de la chair**	**Rübe: Intensität der Hauptfarbe des Fleisches**	**Raíz: intensidad del color principal de la carne**		
QN	**(b)**	light	claire	hell	claro		3
		medium	moyenne	mittel	medio		5
		dark	foncée	dunkel	oscuro		7
26.	**VG**	**Root: prominence of rings**	**Racine: proéminence des cercles**	**Rübe: Ausprägung der Ringe**	**Raíz: prominencia de anillos**		
QN	**(b)**	absent or very weak	nulle ou très faible	fehlend oder sehr gering	ausente o muy débil	Akela, Larka	1
		weak	faible	gering	débil	Forono	3
		medium	moyenne	mittel	media	Pacemaker III	5
		strong	forte	stark	fuerte	Bull's Blood	7
		very strong	très forte	sehr stark	muy fuerte	Chioggia	9

		English	français	Deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
27. (*) (+)	**MG**	**Bolting tendency (from an early sowing)**	**Tendance à la montaison (en semis précoce)**	**Neigung zum Schossen (bei Frühkultur)**	**Tendencia a la salida a flor (en siembra temprana)**		
QN	**C**	absent or weak	nulle ou faible	fehlend oder gering	ausente o débil	Boltardy, Dragon	1
		medium	moyenne	mittel	media	Pronto	2
		strong	forte	stark	fuerte	Pacemaker III	3

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) All observations on leaves should be made on fully developed leaves.
(b) All observations on the root should be made on fully developed roots.

8.2 Explanations for individual characteristics

Ad. 1: Germity

Germity should be observed on 200 plants. Monogerm seed should be genetically monogerm and at least 90% of seed clusters should lead to single plants. Multigerm seed would lead to less than 90% single plants.

Ad. 17: Root: shape in longitudinal section

1
transverse narrow elliptic

2
transverse elliptic

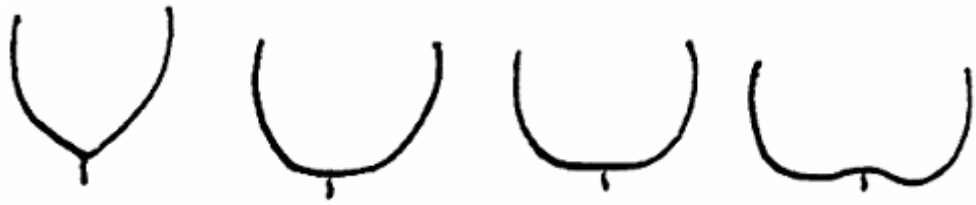
3
circular

4
obovate

5
narrow oblong

6
narrow obtriangular

Ad. 21: Root: shape of base



1	2	3	4
pointed	rounded	flat	recessed

Ad. 27: Bolting tendency (from an early sowing)

Method of cold treatment

Seed is laid out on a filter paper, which should be kept moist for germination. The minimum germination temperature is 18°C. With emergence of the root the seedlings should be transplanted into modules and subjected to cold treatment in cold storage for four weeks at 3°C without artificial lighting.

After the cold treatment the seedlings should be cultivated under normal conditions, preferably in the greenhouse (2°C minimum temperature, ventilation at 7°C). Multigerm varieties with several seedlings emerging from one cluster should not usually be singled. After the development of two true leaves, the young plants should be transplanted into the open field.

The bolted plants (with shoot axis elongated by more than 5 cm) should be counted at least once a week.

It is recommended to conduct this test as early as possible in the growing season, because bolting is very strongly influenced by the climatic conditions after cold treatment. Beetroot is very sensitive to devernalization at temperatures above 18°C.

9. Literature

Adas, L., Benjamin, L.R. et al., 1982: Spacing red beet for high returns. Grower 97/1982, pp. 19-23.

Banga, O., 1950: Krotenstudies. 1950, VIII Veredelingsmethodiek bij de rode biet. Inst. v.d. Vered. v. Tuinb. gew. Med. 21, p. 18.

Banga, O., 1952: Some observations on the influence of the length of day on the leaf growth of red garden beets. Euphytica, pp. 43-48.

Banga, O., 1962: Speiserübe. In: Handbuch der Pflanzenzüchtung, Band VI. Paul Parey Verlag, Berlin, Hamburg, pp. 79-103.

Basse, H., Glaschke, B. et al., 1956: Rote Rüben. In: Gemüsesorten, II Teil (Kohl-, Blatt- und Wurzelgemüse), 1. Auflage. Paul Parey Verlag, Berlin, Hamburg, pp. 112-115.

Chaux, C., 1972: Betterave rouge. In: Productions légumières. J.B. Baillière et fils, 1972, Paris, pp. 310-315.

George, R.A.T., 1985: Chenopodiaceae. In: Vegetable Seed Production, 1. Auflage. Longman Group Limited, Essex, pp. 105-113.

Hahn, P., Schmidt, M., 1951: Rote Rüben. In: Kohl- und Wurzelgemüse, Band 2. Deutscher Bauernverlag, Berlin, pp. 233-241.

Hegi, G., Conert, H.J. (Hrsg.), 1979: Beta. In: Illustrierte Flora von Mitteleuropa, Band III Teil III (Angospermae, Dicotyleclones 1), 1. Auflage. Paul Parey Verlag, Berlin, Hamburg, pp. 550-569.

Helm, J., 1957: Die historische Entwicklung der Gliederung von Beta vulgaris L. in Untersippen und deren Nomenklatur in: Die Kulturpflanze 5., pp. 55-74.

Holland, H., 1957: Classification and performance of varieties of red beet. Nat. Veg. Res. Stat., Wellesbourne, 7th Ann. Rep. for 1956, pp. 16-42.

v. Hösslin, R., Mappes, F. et al., 1964: Die Rote Rübe. In: Gemüsebau. BLV Verlagsgesellschaft, München, Basel, Wien, pp. 264-268.

Krug, H., 1991: Rote Rübe. In: Gemüseproduktion, 2. Auflage. Paul Parey Verlag, Berlin, Hamburg, pp. 287-293.

Nottingham, S., 2004: Beetroot. E-book, Chapter 5.
(http://ourworld.compuserve.com/homepages/Stephen_Nottingham/beetroot.htm)

Phillips, R., Rix, M., 1993: Beet. In Vegetables, 1. Auflage. Pan Books Ltd., London, pp. 70-75.

Thompson, R.C., 1939: Influence of various factors on the shape of beetroots. Journ. Agr. Res. 58, pp. 733-745.

Warne, L.G.G., 1953: Effects of close spacing on the growth of garden beet. Nature 1972, 506 pp.

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

Wiebosch, W.A., 1945: Koelbehandeling van zaden (jarowisatie) van overjarige gewassen ten behoeve van de zaadteelt. 1945, Med. Dir. Tuinbouw 8, pp. 127-132.

Zentralstelle für Sortenwesen der DDR (Hrsg.), 1973: Rote Rüben. In: Sortenratgeber. VEB Deutscher Landwirtschaftsverlag, 1973, Berlin, 47 pp.

10. Technical Questionnaire

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:
		Application date: (not to be filled in by the applicant)

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

1. Subject of the Technical Questionnaire

1.1 Botanical name	*Beta vulgaris* L. ssp. v*ulgaris* var. *conditiva* Alef.
1.2 Common name	Beetroot

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

Seed-propagated varieties

(a) Cross-pollination
(i) population [ ]
(ii) synthetic variety [ ]

(b) Hybrid [ ]

(c) 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)	**Germity**		
	monogerm	Monodet, Monopoly	1[ ]
	multigerm	Crosby, Detroit 2	2[ ]
5.2 (9)	**Leaf blade: color**		
	only green	Albina Vereduna	1[ ]
	green and red	D'Egypte	2[ ]
	only red	Bull's Blood	3[ ]
5.3 (10)	**Leaf blade: intensity of green color**		
	light	Solist	3[ ]
	medium	Regala	5[ ]
	dark	Monopoly	7[ ]
5.4 (17)	**Root: shape in longitudinal section**		
	transverse narrow elliptic	D'Egypte	1[ ]
	transverse elliptic	Crosby	2[ ]
	circular	Detroit 2	3[ ]
	obovate	Albina Vereduna	4[ ]
	narrow oblong	Cylindra	5[ ]
	narrow obtriangular	Cheltenham Mono	6[ ]

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

	Characteristics	Example Varieties	Note
5.5 (18)	**Root: length**		
	short	D'Egypte	3[ ]
	medium	Detroit 2	5[ ]
	long	Forono	7[ ]
5.6 (23)	**Root: external color**		
	white	Albina Vereduna	1[ ]
	yellow	Burpee's Golden	2[ ]
	reddish purple	Detroit 2	3[ ]
5.7 (24)	**Root: main color of flesh**		
	white	Albina Vereduna	1[ ]
	yellow orange	Burpee's Golden	2[ ]
	red	Detroit 2	3[ ]
	purple	Cylindra	4[ ]
5.8 (27)	**Bolting tendency (from an early sowing)**		
	absent or weak	Boltardy, Dragon	1[ ]
	medium	Pronto	2[ ]
	strong	Pacemaker III	3[ ]

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

6. Similar varieties and differences from these varieties

Please use the following table and box for comments to provide information on how your candidate variety differs from the variety (or varieties) which, to the best of your knowledge, is (or are) most similar. This information may help the examination authority to conduct its examination of distinctness in a more efficient way.

Denomination(s) of variety(ies) similar to your candidate variety	Characteristic(s) in which your candidate variety differs from the similar variety(ies)	Describe the expression of the characteristic(s) for the **similar** variety(ies)	Describe the expression of the characteristic(s) for **your** candidate variety
Example	*Root: external color*	*yellow*	*reddish purple*

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 Main use

(a) (baby) leaf [ ]
(b) baby beet [ ]
(c) fresh market [ ]
(d) industry [ ]
(e) other [ ]

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]