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INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS

GENEVA

TECHNICAL WORKING PARTY FOR AGRICULTURAL CROPS

Thirty-First Session
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DRAFT TEST GUIDELINES FOR POTATO
DOCUMENT TG/23/6(PROJ.1)

Document prepared by experts from Germany

The attached document TG/23/6(proj.1) already incorporates the standard wording of document TGP/7.2, which was adopted by the Technical Committee at its thirty-eighth session in April 2002, and includes some additional standard wording from document TGP/7.1 Draft 1, also agreed at that session.

[Document TG/23/6(proj.1) follows]

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INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS

GENEVA

POTATO*

Solanum tuberosum L.*

GUIDELINES

FOR THE CONDUCT OF TESTS

FOR DISTINCTNESS, UNIFORMITY AND STABILITY

Alternative Names:*

Latin	English	French	German	Spanish
Solanum tuberosum L.	Potato	Pomme de terre	Kartoffel	Papa, Patata
S. tuberosum L. sensu lato				

ASSOCIATED DOCUMENTS

These guidelines should be read in conjunction with document TG/1/3, "General Introduction to the Examination of Distinctness, Uniformity and Stability and the Development of Harmonized Descriptions of New Varieties of Plants" (hereinafter referred to as 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

1. Subject of these Guidelines

1.1 These Test Guidelines apply to all varieties of *Solanum tuberosum* L.

2. Material Required

2.1 The competent authorities decide on the quantity and quality of the plant material required for testing the variety and when and where it is to be delivered. Applicants submitting material from a State other than that in which the testing takes place must ensure that all customs formalities and phytosanitary requirements are complied with.

2.2 The material is to be supplied in the form of tuber.

2.3 The minimum quantity of plant material, to be supplied by the applicant, should be:

100 tubers in each year of testing

2.4 The diameter of the tubers to be delivered should be 35 to 50 mm. The tubers supplied should be visibly healthy, not lacking in vigor or affected by any important pest or disease.

2.5 The plant material should not have undergone any treatment which would affect the expresion 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 Duration of Tests

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

3.2 Testing Place

The tests should normally be conducted at one place. If any characteristics of the variety, which are relevant for the examination of DUS, cannot be seen at that place, the variety may be tested at an additional place.

3.3 Conditions for Conducting the Examination

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.

3.3.1 Characteristics on plants or parts of plants to be selected in a particular way

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

[a] Lightsprout: All observations on the lightsprout should be made a total of 8 tubers as a minimum. The method is given in chapter 8.

[b] Flower: All observations of flower color should be made on freshly opened flowers

3.3.2 Timing of the examination

The optimum stage of development for the assessment of each characteristic is indicated by a number in the second column of the Table of Characteristics. The stages of development denoted by each number are described at the end of Chapter 8.

3.3.3 Type of observation – visual or measurement

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

VG: visual assessment by a single observation of a group of plants or parts of plants
MG: single measurement of a group of plants or parts of plants

3.4 Test Design

3.4.1 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.

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

3.5 Number of Plants / Parts of Plants to be Examined

Unless otherwise indicated, all observations should be made on the total number of 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 minimum duration of tests recommended in section 3.1 reflects, in general, the need to ensure that any differences in a characteristic are sufficiently consistent.

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 A population standard of 1% and an acceptance probability of 95% should be applied.

4.2.3 On the basis of this population standard, the acceptable number of off-types tolerated in a sample size of 60 is 2. The acceptable number of off-types tolerated in a sample size of 8 is 1.

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 or plant 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 is 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) Lightsprout: proportion of blue in anthocyanin coloration of base (characteristic 4)
(b) Flower corolla: intensity of anthocyanin coloration of inner side (characteristic 32)
(c) Flower corolla: proportion of blue in anthocyanin coloration of inner side on colored flower (characteristic 33)
(d) Plant: time of maturity (characteristic 35)
(e) Tuber: color of skin (characteristic 39)

Proposal from Australia: Tuber: color of flesh (characteristic 41)

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 Section 6.1.2

(QL) Qualitative characteristic – see Section 6.3
(QN) Quantitative characteristic – see Section 6.3
(PQ) Pseudo-Qualitative characteristic – see Section 6.3

(+) See Explanations on the Table of Characteristics in Chapter 8.

Stage of development: see Section 3.3.2

VG-MG: see Section 3.3.3

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

Char. No.	Method of Examination	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
1	**1 VG**	**Lightsprout: size**					
(+)	a						
		small				Grata	3
		medium				Ute	5
		large				Gloria	7
2.	**1 VG**	**Lightsprout: shape**					
(*)	a						
(+)							
		spherical				Albas	1
		ovoid				Gloria	2
		conical				Nicola	3
		broad cylindrical				Cilena	4
		narrow cylindrical					5
3.	**1 VG**	**Lightsprout: intensity of anthocyanin coloration of base**					
(*)	a						
		absent or very weak					1
		weak				Karatop	3
		medium				Grandifolia	5
		strong				Granola	7
		very strong				Karida	9

Char. No.	Method of Examination	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
4. **(*)** **(+)**	**1** **VG** a	**Lightsprout: proportion of blue in anthocyanin coloration of base**					
		low					1
		medium					2
		high					3
5. **(*)**	**1** **VG** a	**Lightsprout: pubescence of base**					
		absent or very weak					1
		weak				Hela	3
		medium				Alwara	5
		strong				Rikea	7
		very strong					9
6. **(+)**	**1** **VG** a	**Lightsprout: size of tip in relation to base**					
		small				Quinta	3
		medium				Granola	5
		large				Erntestolz	7
7. **(+)**	**1** **VG** a	**Lightsprout: habit of tip**					
		closed				Quinta	1
		intermediate				Rita	3
		open				Premiere	5

Char. No.	Method of Examination	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
8.	**1 VG** a	**Lightsprout: anthocyanin coloration of tip**					
		absent or very weak					1
		weak				Karatop	3
		medium				Planta	5
		strong				Assia	7
		very strong					9
9.	**1 VG** a	**Lightsprout: pubescence of tip**					
		absent or very weak					1
		weak				Cilena	3
		medium				Linda	5
		strong				Agria	7
		very strong					9
10. (*)	**1 VG** a	**Lightsprout: number of root tips**					
		few				Sanira	3
		medium				Nicola	5
		many				Moni	7
11. (+)	**1 VG** a	**Lightsprout: length of lateral shoots**					
		short				Arkula	3
		medium				Aiko	5
		long				Quinta	7

Char. No.	Method of Examination	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
12. **(+)**	**2** **VG**	**Plant: type**					
		stem type				Quarta	1
		intermediate type				Desiree	2
		leaf type					3
13. **(*)** **(+)**	**2** **VG**	**Plant: growth habit**					
		upright				Quinta	1
		semi-upright				Secura	3
		spreading				Atica	5
14. **(*)** **(+)**	**2** **VG**	**Stem: extent of anthocyanin coloration**					
		absent or very small				Hela	1
		small				Marena	3
		medium				Saturna	5
		large				Bimonda	7
		very large					9
15. **(+)**	**2** **VG**	**Leaf: outline size**					
		small				Baronesse	3
		medium				Taiga	5
		large				Fausta	7

Char. No.	Method of Examination	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
16. **(+)**	**2 VG**	**Leaf: silhouette**					
		closed				Likaria	1
		intermediate				Ponto	3
		open				Grandifolia	5
17. **(+)**	**2 VG**	**Leaf: frequency of secondary leaflets**					
		weak				Solara	3
		medium				Producent	5
		strong				Hercules	7
18.	**2 VG**	**Leaf: green color**					
		light				Angela	3
		medium				Ulme	5
		dark				Calla	7
19. **(+)**	**2 VG**	**Leaf: extent of anthocyanin coloration of midrib on upper side**					
		absent or very small				Grata	1
		small				Angela	3
		medium				Camilla	5
		large				Felicitas	7
		very large				Desiree	9

Char. No.	Method of Examination	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
20. **(+)**	**2 VG**	**Second pair of lateral leaflets: size**		**Proposed to delete!**			
		very small					1
		small					3
		medium					5
		large					7
		very large					9
21. **(+)**	**2 VG**	**Second pair of lateral leaflets: width in relation to length**					
		narrow					3
		medium					5
		broad					7
22. **(+)**	**2 VG**	**Terminal and lateral leaflets: frequency of coalescence**					
		absent or very low					1
		low				Palma	3
		medium				Baronesse	5
		high				Kolibri	7
		very high					9

Char. No.	Method of Examination	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
23.	**2 VG**	**Leaflets: waviness of margin**		**Proposed to delete!**			
		absent or very weak					1
		weak				Grata	3
		medium				Marabel	5
		strong				Aiko	7
		very strong					9
24.	**2 VG**	**Leaflets: depth of veins**		**Proposed to delete!**			
		shallow					3
		medium					5
		deep					7
25.	**2 VG**	**Leaflets: glossiness of the upperside**		**Proposed to delete!**			
		dull				Satina	3
		medium				Ute	5
		glossy				Christa	7
26. (+)	**2 VG**	**Flower bud: extent of anthocyanin coloration**					
		absent or very small				Grata	1
		small				Panda	3
		medium				Donella	5
		large				Ponto	7
		very large					9

Char. No.	Method of Examination	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
27.	**3 VG**	**Plant: height**					
		very short					1
		short				Atica	3
		medium				Leyla	5
		tall				Grata	7
		very tall				Tomba	9
28. (*)	**3 VG**	**Plant: frequency of flowers**					
		absent or very low				Achat	1
		low				Walli	3
		medium				Rita	5
		high				Aiko	7
		very high				Sibu	9
29. (+)	**3 VG**	**Inflorescence: size**					
		small				Accent	3
		medium				Cilena	5
		large				Karakter	7
30. (+)	**3 VG**	**Inflorescence: extent of anthocyanin coloration of peduncle**					
		absent or very small				Lyra	1
		small				Liu	3
		medium				Saturna	5
		large				Desiree	7
		very large					9

Char. No.	Method of Examination	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
31.	**3 VG** b	**Flower corolla: size**					
		very small					1
		small				Sommergold	3
		medium				Erntestolz	5
		large				Baronesse	7
		very large					9
32. (*)	**3 VG** b	**Flower corolla: intensity of anthocyanin coloration of inner side**					
		absent or very weak				Grata	1
		weak				Secura	3
		medium				Ponto	5
		strong				Producent	7
		very strong					9
33. (*) (+)	**3 VG** b	**Flower corolla: proportion of blue in anthocyanin coloration of inner side on colored flower**					
		low				Granola	1
		medium				Pamina	2
		high				Maritiema	3

Char. No.	Method of Examination	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
34. **(*)** **(+)**	**3** **VG** b	**Flower corolla: extent of coloration on colored flower**					
		absent or very small					1
		small					3
		medium					5
		large					7
		very large					9
35. **(*)** **(+)**	**4** **MG**	**Plant: time of maturity**					
		very early				Christa	1
		early				Cilena	3
		medium				Nicola	5
		late				Aula	7
		very late				Producent	9
36. **(*)** **(+)**	**5** **VG**	**Tuber: shape**					
		round				Mentor	1
		short-oval				Aula	2
		oval				Desiree	3
		long-oval				Linda	4
		long				Exquisa	5
		very long				Pompadour	6

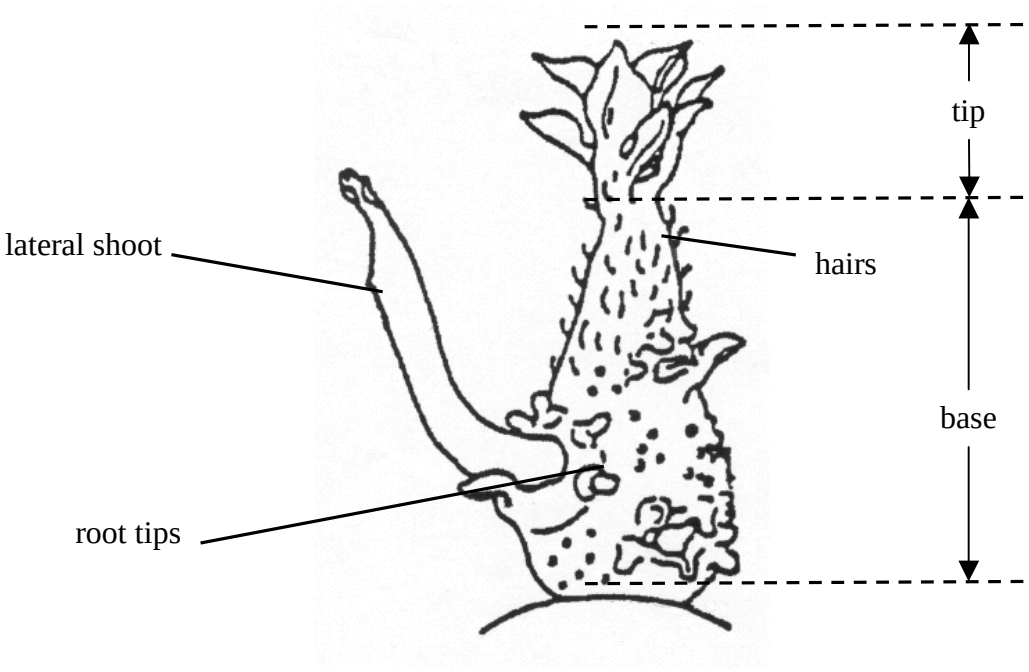
Char. No.	Method of Examination	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
37.	**5 VG**	**Tuber: depth of eyes**					
		shallow				Fresco	3
		medium				Erntestolz	5
		deep					7
38.	**5 VG**	**Tuber: smoothness of skin**		**NL, UK, DE propose to delete!**	**AUS wants to keep char. to describe the "russet" type..**		
		smooth					1
		intermediate					2
		rough					3
39. (*)	**5 VG**	**Tuber: color of skin**		**Can "russet" be considered in this char.?**			
		light beige					1
		yellow				Cilena	2
		red				Desiree	3
		blue					4
		red parti-colored					5
		blue parti-colored					6
40.	**5 VG**	**Tuber: color of base of eye**					
		white					1
		yellow				Granola	2
		red				Quarta	3
		blue					4

Char. No.	Method of Examination	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
41. (*)	**5 VG**	**Tuber: color of flesh**					
		white				Sibu	1
		cream				Desiree	2
		light yellow				Indira	3
		medium yellow				Quarta	4
		dark yellow				Leyla	5
		red					6
		red parti-colored					7
		blue					8
		blue parti-colored					9
42. (+)	**5 VG**	**Light beige and yellow skinned varieties only:** **Tuber: anthocyanin coloration of skin in reaction to light**					
		absent or very weak				Agata	1
		weak				Fausta	3
		medium				Linda	5
		strong				Palma	7
		very strong					9

8. Explanations on the Table of Characteristics

Ads. 1-11: Lightsprout

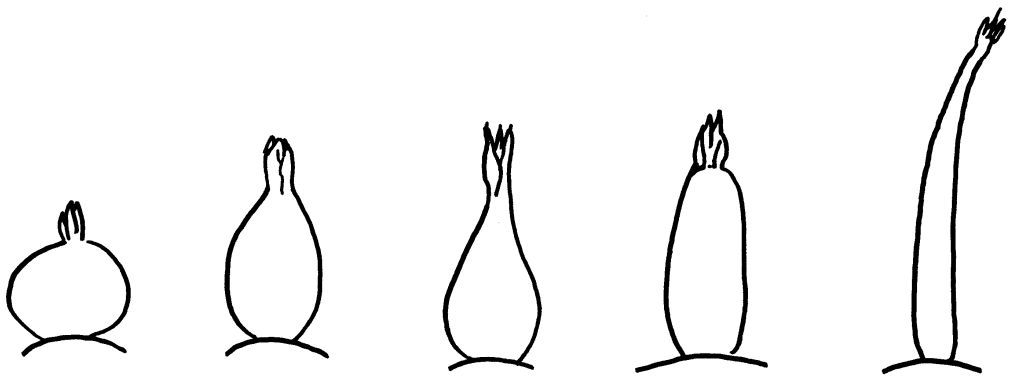
Lightsprout



The spectrum and the intensity of the light source are the most determining factors for the expression of characteristics of lightsprouts. This spectrum is unambiguously defined by the type of lamps and the voltage used. When extremes are avoided the influence of the temperature on the speed of development is small. A good expression of characteristics is obtained with lightsprouts growing in a cabinet at room temperature under exclusion of day light and under continuous light of small incandescent bulbs (6V AC / 0.05 A, 8 pro square meter, 25-40 cm above the tubers).

The method for cultivation of lightsprouts has still to be agreed!

Ad. 2: Lightsprout: shape



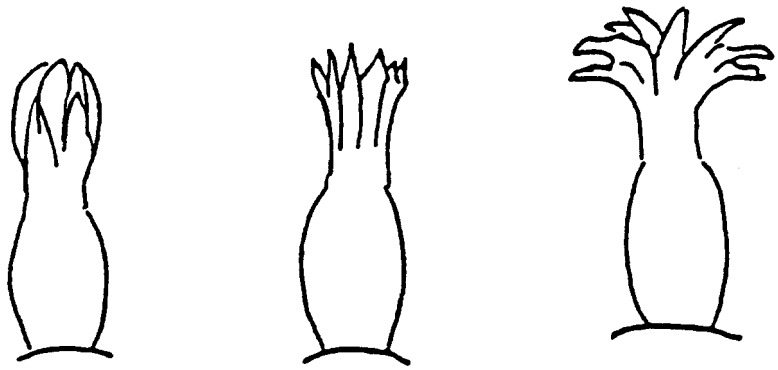
1	2	3	4	5
spherical	ovoid	conical	broad cylindrical	narrow cylindrical

Ad. 4: Lightsprout: proportions of blue in anthocyanin coloration of base,

and 33: Flower corolla: proportion of blue in anthocyanin coloration of inner side on colored flower

The color of anthocyanin results from a red and a blue component. If the proportion of blue is low the anthocyanin appears red-violet. If the proportion of blue is high the anthocyanin appears blue-violet.

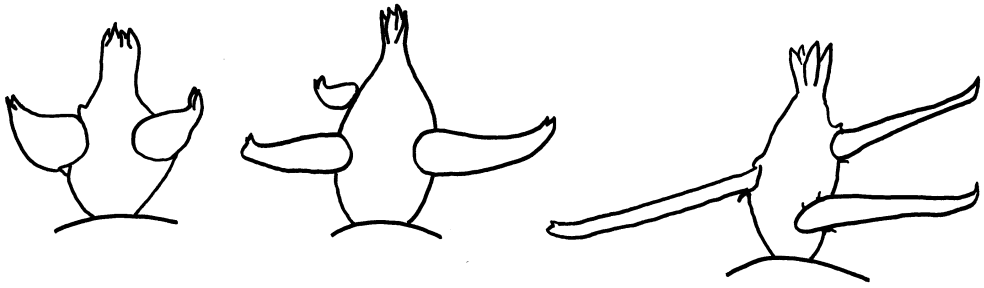
Ad. 7: Lightsprout: habit of tip



1	3	5
closed	intermediate	open

The characteristic should be observed after about 10 weeks when a good differentiation in the collection is reached.

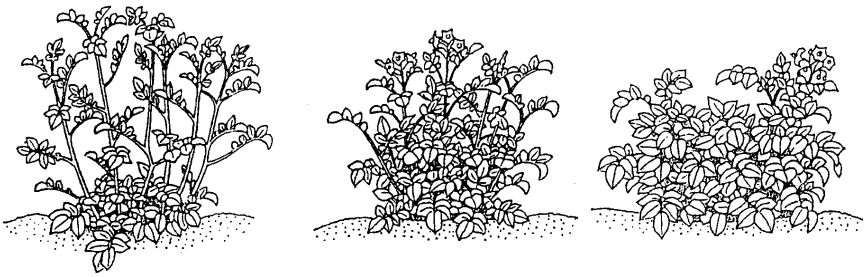
Ad. 11: Lightsprout: length of lateral shoots



3	5	7
short	medium	long

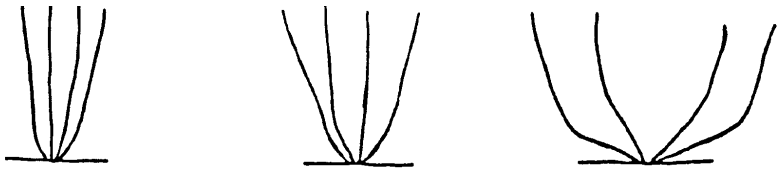
Ad. 12: Plant: type

Stem-type: foliage open, stems clearly visible
Intermediate: foliage half open, stems partly visible
Leaf-type: foliage closed, stems not or hardly visible



1	2	3
stem-type	intermediate-type	leaf-type

Ad. 13: Plant: growth habit



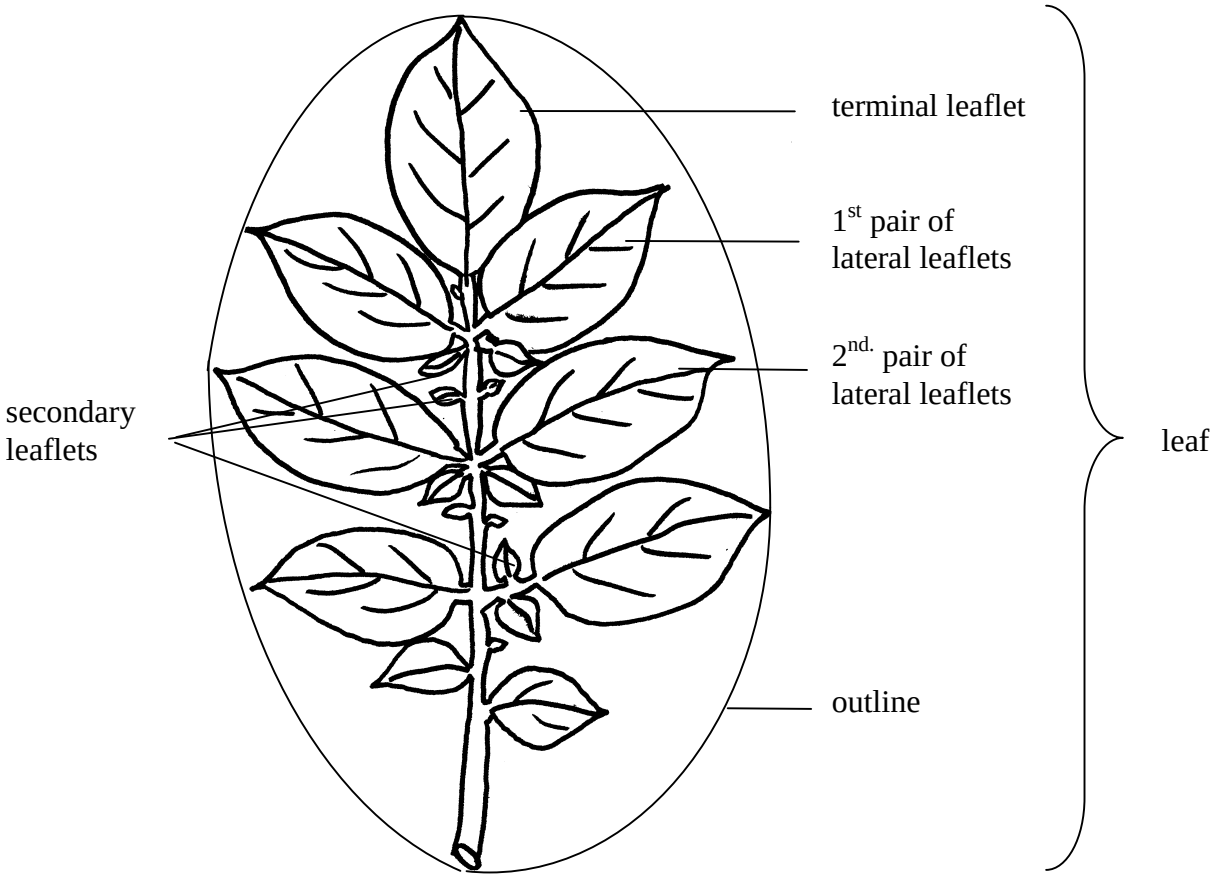
1	3	5
upright	semi-upright	spreading

Ads. 14, 19, 26, 30, 34: Extent of anthocyanin coloration

The extent of anthocyanin coloration should be observed in relation to the total area. Distribution and intensity should not be considered.

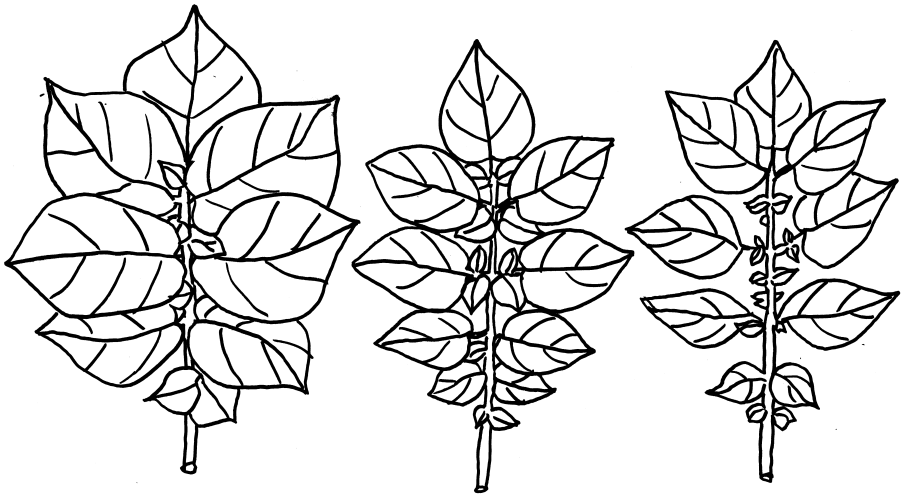
The extent of anthocyanin coloration of flower buds should be observed on fully developed buds before the corolla is visible.

Ads. 15 to 25: Leaf characteristics



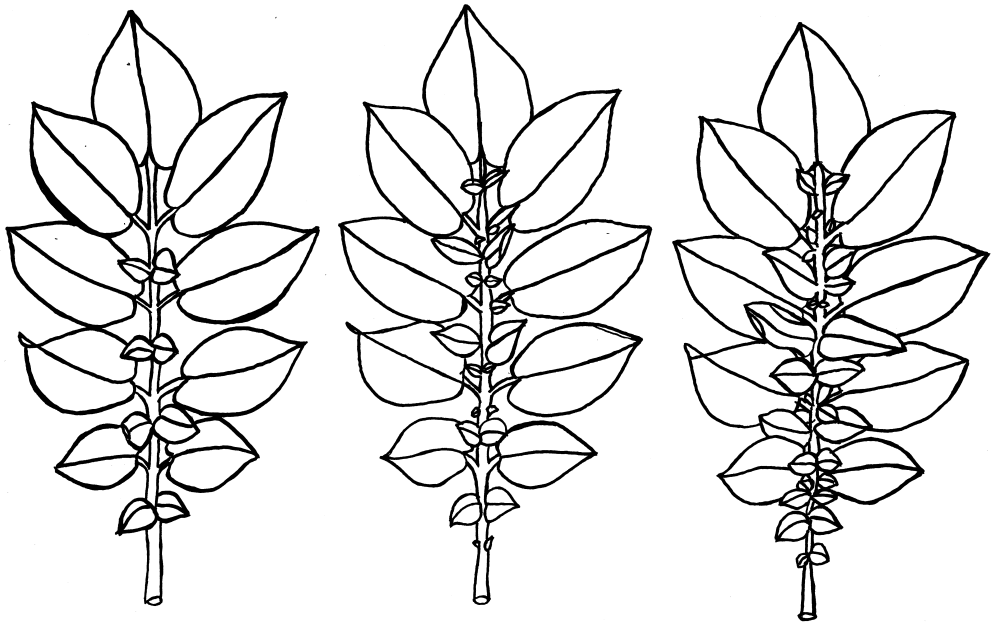
All observations on the leaf should be made on fully developed young leaves in the middle of the plant. For the observation of characteristic 15, 16, 17 and 20 leaves should be picked in the middle of a stem of each of 20 plants.

Ad. 16: Leaf: silhouette



1	3	5
closed	intermediate	open

Ad. 17: Leaf: frequency of secondary leaflets

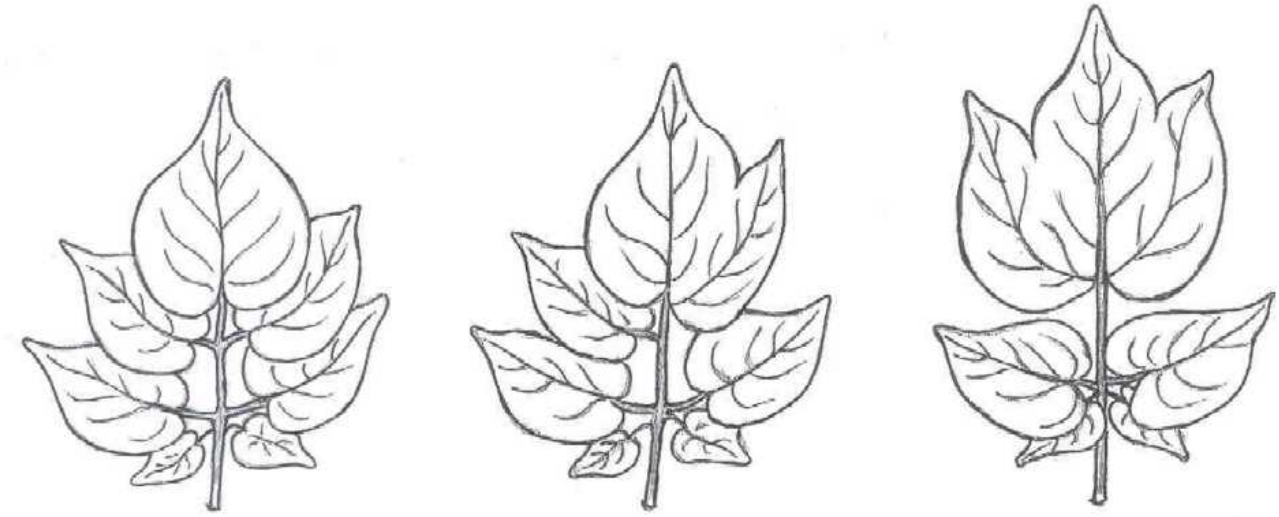


3	5	7
weak	medium	strong

Ad. 21: Second pair of lateral leaflets: width in relation to length

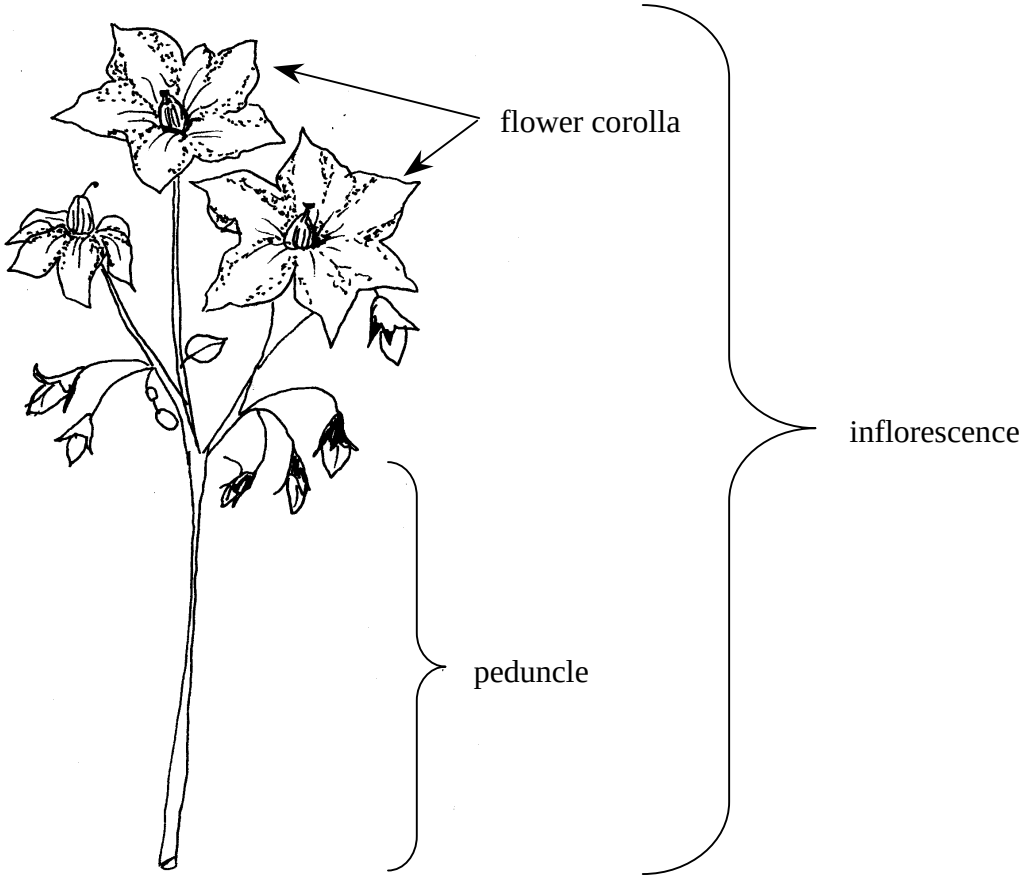
3	5	7
narrow	medium	broad

Ad. 22: Terminal and lateral leaflets: frequency of coalescence



not coalescent coalescent

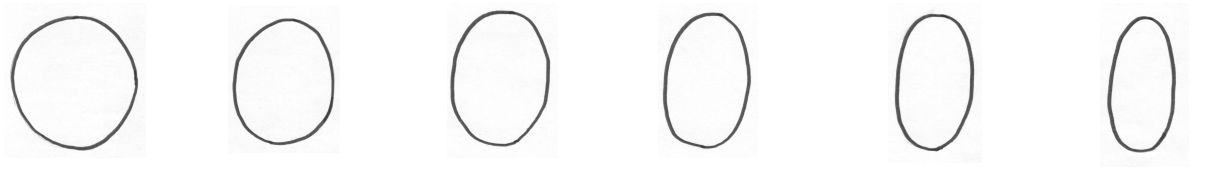
Ads. 29–34: Flower characteristics



Ad. 35: Plant: time of maturity

The time of maturity is reached when 80% of the leaves are dead.

Ad. 36: Tuber: shape



1	2	3	4	5	6
round	short oval	oval	long-oval	long	very long

Index: length x 100/width

< 110	110-129	130-149	150-169	170-199	> 199

Ad. 42: Light beige and yellow skinned varieties only: Tuber: anthocyanin coloration of skin in reaction to light

The anthocyanin development in the skin of light beige and yellow skinned varieties should be assessed after 10 days of exposure to full daylight or after 150 hours of exposure to artificial light.

OPTIMAL STAGE OF ASSESSMENT OF CHARACTERISTICS

1 = about 12 weeks after starting
2 = bud stage
3 = flowering stage
4 = ripening stage of tubers
5 = after harvest

9. Literature

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 *Latin Name*	*Solanum tuberosum* L.
1.2 Common Name	POTATO

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

4.2 Method of Propagating the Variety

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 (4)	**Lightsprout: proportion of blue in anthocyanin coloration of base**		
	low		1[ ]
	medium		2[ ]
	high		3[ ]
5.2 (28)	**Plant: frequency of flowers**		
	absent or very low		1[ ]
	low		3[ ]
	medium		5[ ]
	high		7[ ]
	very high		9[ ]
5.3 (32)	**Flower corolla: intensity of anthocyanin coloration of inner side**		
	absent or very weak		1[ ]
	weak		3[ ]
	medium		5[ ]
	strong		7[ ]
	very strong		9[ ]
5.4 (33)	**Flower corolla: proportion of blue in anthocyanin coloration of innerside on colored flower**		
	low		1[ ]
	medium		2[ ]
	high		3[ ]

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

	Characteristics	Example Varieties	Note
5.5 (35)	**Plant: time of maturity**		
	very early		1[ ]
	early		3[ ]
	medium		5[ ]
	late		7[ ]
	very late		9[ ]
5.6 (36)	**Tuber: shape**		
	round		1[ ]
	short-oval		2[ ]
	oval		3[ ]
	long-oval		4[ ]
	long		5[ ]
	very long		6[ ]
5.7 (39)	**Tuber: color of skin**		
	light beige		1[ ]
	yellow		2[ ]
	red		3[ ]
	blue		4[ ]
	red parti-colored		5[ ]
	blue parti-colored		6[ ]

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

	Characteristics	Example Varieties	Note
5.8 (40)	**Tuber: color of base of eye**		
	white		1[ ]
	yellow		2[ ]
	red		3[ ]
	blue		4[ ]
5.10 (41)	**Tuber: color of flesh**		
	white		1[ ]
	cream		2[ ]
	light yellow		3[ ]
	medium yellow		4[ ]
	dark yellow		5[ ]
	red		6[ ]
	red parti-colored		7[ ]
	blue		8[ ]
	blue parti-colored		9[ ]

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

6. Similar varieties and differences from these varieties

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)	*Plant: height*	*e.g. note 3*	*note 7*
		e.g. short	*tall*
		e.g. 90 cm	*130 cm*

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?

7.1.1 Resistance to pest and diseases

Yes [ ] No [ ]

(If yes, please provide details)

7.1.2 Other

Yes [ ] No [ ]

(If yes, please provide details)

7.2 Special conditions for the examination of the variety

7.2.1 Are there any special conditions for growing the variety or conducting the examination?

Yes [ ] No [ ]

7.2.2 If yes, please give details:

7.3 Other information

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.

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

9. I hereby declare that, to the best of my knowledge, the information provided in this form is correct:

Applicant's name

Signature | Date

[Annex follows]

ANNEX

The following Annex will be modified according to the results of the ringtest which is carried out with participation of Austria, Czech Republic and Germany. The ringtest is still going on and will be finished in early 2003.

ADDITIONAL USEFUL EXPLANATIONS

Table of Contents

PART I

INTRODUCTION

The following Annex contains a list of characteristics derived by using electrophoresis and a description of the method to be used. UPOV decided to place these characteristics in an Annex to the Test Guidelines, thereby creating a special category of characteristic, because the majority of the UPOV member States is of the view that it is not possible to establish distinctness solely on the basis of a difference found in a characteristic derived by using electrophoresis. Such characteristics should therefore only be used as a complement to other differences in morphological or physiological characteristics. UPOV reconfirms that these characteristics are considered useful but that they might not be sufficient on their own to establish distinctness. They should not be used as a routine characteristic but at the request or with the agreement of the applicant of the candidate variety.

PART II

CHARACTERISTICS DERIVED BY USING ELECTROPHORESIS

Stage [1] / Stade [1] / Stadium [1] / Estado [1]	English	français	deutsch	español	Example Varieties / Exemples / Beispielssorten / Variedades ejemplo	Note/ Nota
43.	**Allele expression at loci Est 2 and Est 3**					
	Genotype j+o				Hansa	1
	Genotype l+c				Sieglinde	2
	Genotype j+c				Karolin	3
	Genotype a+o				Desiree	4
	Genotype d+o				Achat	5
	Genotype h+o				Jetta	6
	Genotype i+b				Selma	7
	Genotype i+o				Renate	8
	Genotype j+b				Ute	9
	Genotype o+o				Ulla	11
	Genotype f+o				Walli	12
	Genotype k+o				Belita	13
	Genotype i+c				Karakter	15
	Genotype l+o				Roxy	16
	Genotype k+d				Junior	17
	Genotype b+o				Cleopatra	18
	Genotype d+c				Krometa	19
	Genotype e+o				Sibu	20
	Genotype c+o				Obelix	22
	Genotype d+b				Vital	23
	Genotype g+b				Premiere	26
	Genotype jf+o				Protea	27

	Stage [1] / Stade [1] / Stadium [1] / Estado [1] English	français	deutsch	español	Example Varieties / Exemples / Beispielssorten / Variedades ejemplo	Note/ Nota
44.	**Allele expression at locus Prx**					
	Genotype a or j				Hansa	1
	Genotype b				Corine	2
	Genotype c				Tomensa	3
	Genotype d				Amigo	4
	Genotype e				Jetta	5
	Genotype g				Thomana	6
	Genotype f				Diana	7
	Genotype h				Kanjer	8
45.	**Allele expression at locus Pat**					
	Genotype 9.01				Calla	1
	Genotype 6.01				Artana	2
	Genotype 7.06				Karnico	4
	Genotype 1.01				Secura	6
	Genotype 6.02				Quinta	7
	Genotype 2.01				Erntestolz	9
	Genotype 2.02				Desiree	11
	Genotype 5.01				Belita	13
	Genotype 5.02				Solina	14
	Genotype 2.04				Delia	16
	Genotype 7.01				Fausta	17
	Genotype 3.01				Quarta	19
	Genotype 7.04				Grata	20
	Genotype 3.02				Irmgard	21
	Genotype 7.05				Atica	23
	Genotype 7.03				Pallina	25

Stage [1] Stade [1] Stadium [1] Estado [1]	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
45. (cont.)	**Allele expression at locus Pat (cont.)**					
	Genotype 3.08				Danva	26
	Genotype 8.06				Padea	28
	Genotype 8.10				Karida	29
	Genotype 8.07				Elles	30
	Genotype 4.01				Indira	31
	Genotype 8.03				Darwina	33
	Genotype 4.02				Christa	34
	Genotype 8.02				Escort	35
	Genotype 8.14				Sirius	36
	Genotype 8.13				Krometa	37
	Genotype 8.12				Arnika	39
	Genotype 4.08				Sommergold	40
	Genotype 4.12				Saturna	42
	Genotype 4.07				Cinja	43
	Genotype 8.11				Vebeca	44
	Genotype 4.11				Pepo	45
	Genotype 3.03				Ulla	47
	Genotype 3.04				Fasan	49
	Genotype 3.09				Combi	50
	Genotype 7.07				Franca	51
	Genotype 3.05				Karolin	52
	Genotype 4.04				Rubin	53
	Genotype 4.03				Pia	54
	Genotype 8.04				Shepody	55
	Genotype 4.09				Walli	57
	Genotype 3.07				Junior	58

Stage [1] / Stade [1] / Stadium [1] / Estado [1]	English	français	deutsch	español	Example Varieties / Exemples / Beispielssorten / Variedades ejemplo	Note/ Nota
45. (cont.)	**Allele expression at locus Pat (cont.)**					
	Genotype 7.08				Adretta	60
	Genotype 3.06				Gloria	61
	Genotype 7.11				Ukama	62
	Genotype 10.01				Liu	63
	Genotype 4.05				Cleopatra	65
	Genotype 4.06				Felsina	67
	Genotype 8.05				Kardal	68
	Genotype 8.15				Albas	70
	Genotype 8.16				Feska	72
	Genotype 4.14				Aiko	73
	Genotype 8.08				Solara	74
	Genotype 4.15				Amigo	75
	Genotype 8.09				Thomana	76
	Genotype 2.03				Pompadur	77
	Genotype 10.02				Kranich	80
	Genotype 4.16				Möwe	85
	Genotype 7.02				Orlando	86
	Genotype 4.17				Oktan	87

PART III

DESCRIPTION OF THE METHODS TO BE USED

Polyacrylamide gel electrophoresis methods for the analysis of esterases, peroxydases and patanins in potatoes

1. Number of tubers per test

- for distinctness, uniformity and stability: 10 tubers
- for checking identity: 4 tubers

The tubers should be mature, preferably harvested after senescence of foliage. Tubers stored between 4 -10° C can be used independent of the season as long as there is no or only slight sprouting.

2. Apparatus and equipment

Centrifuge
Cryostat
Power supply with a capacity of at least 400 V and 150 mA
Rocking platform shaker
Vertical dual slab gel system

Any suitable vertical electrophoresis system can be used, provided that the gels can be kept at a constant temperature. A gel thickness of no more than 1.5 mm is recommended. The power supply should be capable of delivering both constant current and constant voltage output.

3. Chemicals

All chemicals should be of “Analytical Reagent” grade or better.

3.1. Chemicals for protein extraction

Amidoblack 10 B
Sodium disulphite $Na_2S_2O_5$
Sodium sulphite Na_2SO_3
Sucrose

3.2. Chemicals for electrophoresis

40% Acrylamide solution **(Security advice: Acrylamide is an extremely toxic chemical!)**
Ammonium persulfate (APS)
2% Bisacrylamide solution
Boric acid
Bromophenol blue (BPB)
3-(Dimethylamino)propionitrile (DMAPN)
Ethanol
Glycine
Hydrochloric acid (HCl)
Sucrose
NNN´N`-Tetramethylethylenediamine (TEMED)
Tris-(hydroxymethyl)-aminomethane (TRIS)

3.3. Chemicals for staining of proteins

Acetone
Coomassie Blue G250
Coomassie Blue R250
Dianisidine-2HCl **(Security advice: Dianisidine is an extremely toxic chemical !)**
Disodium hydrogen phosphate -Dodecahydrate (Na_2HPO_4 x $12H_2O$)
Fast Blue RR Salt
Glacial acetic acid
Glycerol
30% Hydrogen peroxyde
Methanol
1-Naphthyl acetate
Sodium dihydrogen phosphate - Monohydrate (NaH_2PO_4 x $1H_2O$)
Trichloroacetic acid (TCA)

4. Solutions

4.1. Extraction solutions

No.	Solution	Ingredients	Amount	Remark
4.1.1.	Extraction solution A	Sodium sulphite Sodium disulphite de-ionised water	5.00 g 3.75 g 100 ml	to be stored at 6° C
4.1.2.	Extraction solution B	Sucrose Amidoblack 10B de-ionised water	500 g 0.3 g ad 1000 ml	to be stored at 6° C
4.1.3.	Extraction solution C	Extraction solution A Extraction solution B	10 ml 100 ml	to be prepared daily

4.2. Electrophoresis buffers and gel preparation solutions

4.2.1. Buffers and Solutions for PAGE pH 7.9 of the esterases

No.	Solution	Ingredients	Amount	Remark
4.2.1.1.	Stock gel buffer	TRIS Boric acid de-ionised water	30.26 g 36.60 g ad 1000 ml	
4.2.1.2.	40% Acrylamide solution	Acrylamide de-ionised water	40 g ad 100 ml	For safety a commercial solution should be used
4.2.1.3.	2% BIS solution	Bis acrylamide de-ionised water	2 g ad 100 ml	For safety a commercial solution should be used
4.2.1.4.	2% APS solution	Ammonium persulfate de-ionised water	1 g ad 50 ml	to be prepared daily
4.2.1.5.	Tank buffer	Stock gel buffer 4.2.1.1. de-ionised water	125 ml 875 ml	to be prepared daily

4.2.2. Buffers and Solutions for PAGE pH 8.9 of the peroxydases and patanins

No.	Solution	Ingredients	Amount	Remark
4.2.2.1	Resolving gel buffer	TRIS de-ionised water	75.4 g ad 1000 ml	adjusted to pH 8.9 with HCl.
4.2.2.2	Stacking gel buffer	TRIS Bromophenol blue de-ionised water	16 g 100 mg ad 1000 ml	adjusted to pH 6.7 with HCl
4.2.2.3.	Stacking gel preparing solution	Stacking gel buffer 4.2.2.2. 40% Acrylamide solution 2% Bisacrylamide solution de-ionised water Sucrose	280 ml 45 ml 73 ml 150 ml 80 g	
4.2.2.4	40% Acrylamide solution	Acrylamide de-ionised water	40 g ad 100 ml	For safety a commercial solution should be used
4.2.2.5.	2% BIS solution	Bis acrylamide de-ionised water	2 g ad 100 ml	For safety a commercial solution should be used
4.2.2.6.	2% APS solution	Ammonium persulfate de-ionised water	0.4 g ad 20 ml	to be prepared daily
4.2.2.7.	10% Ethanol solution	Ethanol de-ionised water	10 ml ad 100 ml	
4.2.2.8.	Stock tank buffer	TRIS Glycine de-ionised water	5.2 mg 3.5 g ad 1000 ml	

4.2.2.9.	Tank buffer	Stock tank buffer (4.2.2.8.) de-ionised water	50 ml ad 1000 ml	to be prepared daily

4.3. Staining Solutions for patanins, peroxydases and esterases

No.	*Solution*	Ingredients	Amount	Remark
4.3.1.	Stock solution	Coomassie Blue G 250 Coomassie Blue R 250 de-ionised water	0.25 g 0.75 g ad 100 ml	to be stirred for at least 1 h; to be shaken very well before use
4.3.2.	Staining solution for patanins	TCA Glacial acetic acid normal water Methanol Stock solution (4.3.1.)	240 g 280 ml 3300 ml 600 ml 100 ml	
4.3.3.	Staining buffer A for esterases	Na_2HPO_4 x $12H_2O$ de-ionised water	53.7 g ad 1000 ml	
4.3.4.	Staining buffer B for esterases Staining buffer for peroxydases	NaH_2PO_4 x $1H_2O$ de-ionised water	20.7 g ad 1000 ml	
4.3.5.	Dianisidine solution	Dianisidine-2 HCl de-ionised water	1 g ad 100 ml	can be stored at 6° C for 1 week
4.3.6.	2% Glyceriol solution	Glycerol water	20 g ad 1000 ml	

5. Procedure

5.1 Preparation of the sample

The tubers are frozen in a deepfreezer at –20° C and then thawed at room temperature.

A 2 ml screw topped tube containing 0.4 ml extraction solution C (4.1.2.) is needed for the analysis of each tuber.

The thawed tubers are cut in two halves and squeezed out. 1.5 ml of the sap are collected in the above mentioned tube and mixed with the extraction solution C by shaking. Now the solutions are centrifuged for 15 min at 3000 Rpm and 10° C. The clear supernants are transferred into new, empty 2-ml-screw topped tubes and are then frozen. Before starting the electrophoresis the protein extracts are thawed and transferred as aliquots of 0.15 ml in a microtiter plate.

5.2 Preparation of the gels

5.2.1. Preparation of the gels for PAGE pH 7.9 of the esterases

Clean and dry gel cassettes are assembled, according to the design of the equipment used.

Preparation of about 100 ml gel solution (T: 4.9%; C: 4.7%):

Under carefully stirring 108 mg sodium sulphite are dissolved in 55 ml de-ionised water. The following solutions are added:

30 ml Stock gel buffer (4.2.1.1.),
30 ml 40% Acrylamide solution (4.2.1.2.) and
30 ml 2% BIS solution (4.2.1.3.).

Finally the polymerisation is started by addition of
1.2 ml DMAPN solution and
4.5 ml 2% APS solution (4.2.1.4.).

After mixing the gels are carefully poured, avoiding the formation of air bubbles. The well-forming “combs” are inserted in the liquid gels and the polymerisation is allowed to take place at room temperature for at least 15 min. The “combs” are then removed carefully from the gel cassettes. The wells are rinsed using tank buffer (4.2.1.5.).

5.2.2. Preparation of the gels for PAGE pH 8.9 of the peroxydases and patanins

Clean and dry gel cassettes are assembled, according to the design of the equipment used.

Each gel consists of resolving gel and stacking gel.

Preparation of about 100 ml resolving gel solution (T: 5.5%; C: 4.4%):

The following solutions are mixed under slowly stirring:

60 ml resolving gel buffer (4.2.2.1.),
14 ml de-ionised water,
14 ml 40% Acrylamide solution (4.2.2.4.) and
13 ml 2% BIS solution 4.2.2.5.).

Finally the polymerisation is started by addition of
100 µl TEMED and
6 ml 2% APS solution (4.2.2.6.)

The gels are carefully poured, avoiding the formation of air bubbles, and the polymerisation is allowed to take place at room temperature for at least 15 min. The gel cassettes should not be filled entirely, in order to leave room for a 14 mm layer of stacking gel. The gel surface is carefully overlapped with 10% ethanol solution (4.2.2.7.) using a syringe. When the polymerisation is finished, the gel surface is rinsed with de-ionised water and dried with filter paper.

Preparation of stacking gels:

15 ml stacking gel buffer (4.2.2.3.),
60 µl TEMED and
375 µl 2 % APS-Lösung (4.2.2.6.) are mixed under slowly stirring.

The gels are carefully poured, avoiding the formation of air bubbles. The well-forming "combs" are inserted in the liquid gels and the polymerisation is allowed to take place at room temperature for around 15 min. The "combs" are then removed carefully from the gel cassettes. The wells are rinsed using tank buffer (4.2.2.9.).

5.3 Sample loading

For the electrophoretic separation of the esterases and peroxydases each gel well is filled with 6 µl - 12 µl extract from microtiter plate (see 5.1.) depending on the size of the comb well. For the electrophoretic separation of the patanins each gel well is filled with 3 µl - 6 µl extract from microtiter plate (see 5.1.) depending on the size of the comb well.

5.4 Electrophoresis

5.4.1. Conditions for PAGE pH 7.9 of the esterases

Tank buffer	= Solution 4.2.1.5
Current for a gel (11 cm broad, 1 mm thick)	= in the beginning 40 mA, and then 80 mA
Voltage	= max. 300 V
Temperature	= 5° C to 15° C
Migration way	= from the cathode (-) to the anode (+)
Migration distance	= 6 cm Amido black

5.4.2. Conditions for PAGE pH 8.9 of the peroxydases and patanins

Tank buffer	= Solution 4.2.2.9.
Current for a gel (11 cm broad, 1 mm thick)	= in the beginning 40 mA, and then 80 mA
Voltage	= max. 300 V
Temperature	= 5° C to 15° C
Migration way	= from the cathode (-) to the anode (+)
Migration distance	= 6 cm Bromphenol blue

5.5 Staining

5.5.1. Staining of esterases

Gels from the PAGE pH 8.9 are marked, e.g. by cutting the gels corner. Then the gels are transferred in a staining container filled with a mixture of 120 ml staining buffer A (4.3.3.) and 80 ml staining buffer B (4.3.4.) and incubated on a rocking platform shaker. 50 mg 1-Naphthylacetate are dissolved in 3 drops acetone and diluted with des-ionised water, until this

solution becomes turbid. The solution is added to the buffer solution with the gels. 100 mg Fast blue RR salt are suspended in 5 ml acetone and diluted with 5 ml des-ionised water. This solution is added to the buffer solution with the gels immediately.

The staining time ranges between 15 and 40 minutes. For destaining the gels are incubated on the shaker in des-ionised water for 2 x 30 min. Finally the gels are incubated on the shaker in 2% glycerol solution (4.3.6.) for 30 min. After this incubation the gels are dried between two layers of cellophane soaked in 2% glycerol solution (4.3.6.).

5.5.2. Staining of peroxydases

Gels from the PAGE pH 8.9 are marked, e.g. by cutting the gels corner. Then the gels are transferred in a staining container filled with 200 ml staining buffer (4.3.4.) and incubated on a rocking platform shaker. 10 ml Dianisidine solution (4.3.5.) are added. After 30 sec the staining reaction is started by addition of 260 µl 30% hydrogen peroxyde.

The staining time ranges between 10 and 20 minutes. For destaining the gels are incubated on the shaker in des-ionised water for 2 x 30 min. Finally the gels are incubated on the shaker in 2% glycerol solution (4.3.6.) for 30 min. After this incubation the gels are dried between two layers of cellophane soaked in 2% glycerol solution (4.3.6.).

5.5.3. Staining of patanins

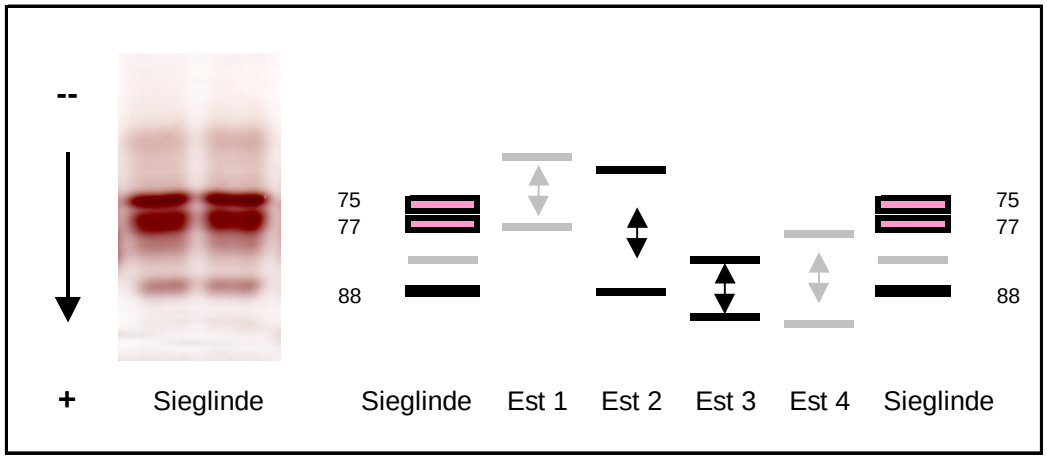
Gels from the PAGE pH 8.9 are marked, e.g. by cutting the gels corner. Then the gels are transferred in a staining container filled with 300 ml staining solution (4.3.2.) and incubated on a rocking platform shaker for 3 hours. The gels remain in the staining solution over night – without shaking. For destaining the gels are incubated on the shaker in normal water for 2 x 30 min. Finally the gels are incubated on the shaker in 2% glycerol solution (4.3.6.) for 30 min. After this incubation the gels are dried between two layers of cellophane soaked in 2% glycerol solution (4.3.6.).

6. Recognition of protein alleles

6.1. Recognition of the alleles encoding esterase isoenzymes

The positions of the individual esterase isoenzymes are calibrated by the variety Sieglinde. The variety Sieglinde shows three bands with high enzymatic activity in the following positions: 75 + 77 + 88.

The esterase isoenzymes of the potato tuber are extremely polymorphic. For a clear interpretation the zymogrammes are divided in four band blocks. The band blocks Est 1 and Est 4 have only a low enzymatic activity. The band blocks Est 2 and Est 3 have a strong enzymatic activity. Only Est 2 and Est 3 are used for assessment of distinctness, uniformity and stability.



Potatoes are vegetatively propagated tetraploid species. Therefore a lot of heterozygous genotypes can be expected. Individual genotypes can be distinct merely by the gene dosage. Such genotypes are often found in Est 2 and Est 3.

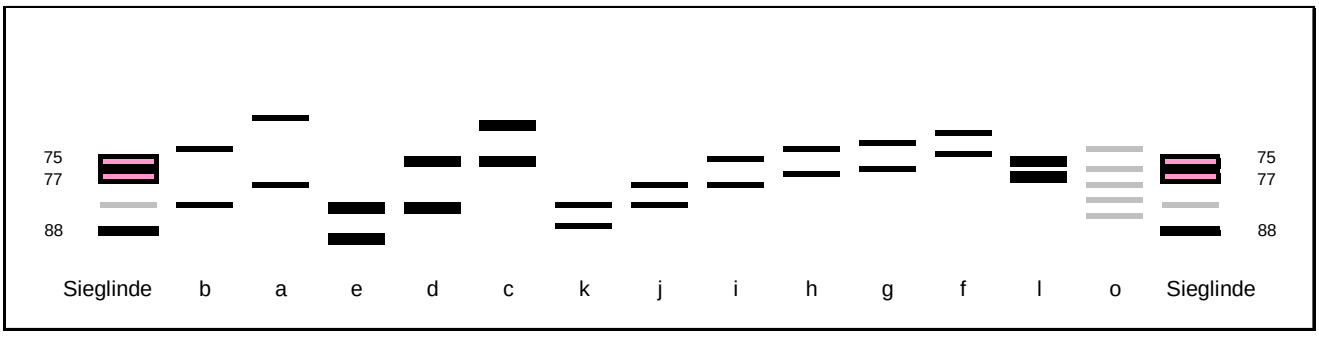
Combinations between null-allele and active alleles and genotypes having the full gene dosage show identical bands. Therefore they are scored as identical.

Est 2	Est 3	Example variety	Note
a	o	Desiree	4
b	o	Cleopatra	18
c	o	Obelix	22
d	o	Achat	5
e	o	Sibu	20
f	o	Walli	12
h	o	Jetta	6
i	o	Renate	8
j	o	Hansa	1
k	o	Belita	13
l	o	Roxy	16
o	o	Ulla	11

Est 2	Est 3	Example variety	Note
d	b	Vital	23
g	b	Premiere	26
i	b	Selma	7
j	b	Ute	9

Est 2	Est 3	Example variety	Note
d	c	Krometa	19
i	c	Karakter	15
j	c	Karolin	3
k	d	Junior	17
l	c	Sieglinde	2

6.1.1. Schematization of the genotypes in Est 2

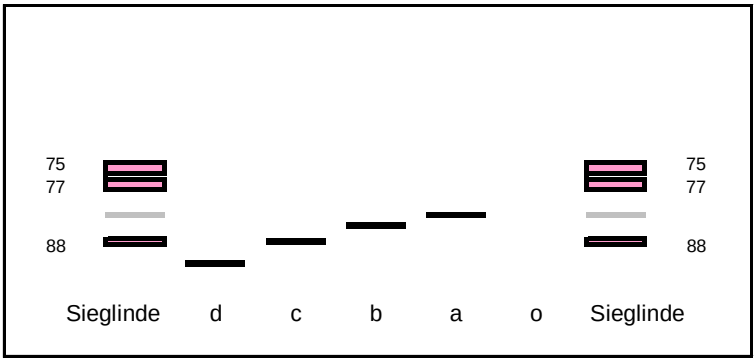


In Est 2 most genotypes show two bands (denomination: a –l). Sometimes genotypes with more than two bands are detectable. These types can be interpreted as combinations of two genotypes containing two bands.

Genotype in Est 2	Genotype in Est 3	Example variety	Remarks	Note
dl	o	Leyla	not distinguishable from genotype Est 2: d + Est 3: o	5
dl	c	Aiko	not distinguishable from genotype Est 2: d + Est 3: c	19
jf	o	Protea		27

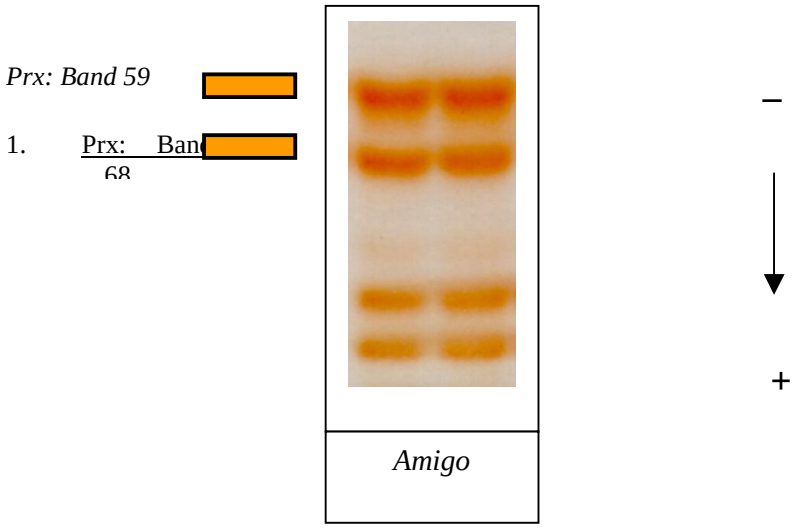
There is an overlapping of the gene products 75 and 77 encoded by genotype “Est 2: l” with gene product assigned to Est 1. Therefore it is not possible to have a clear separation between the bastard type “Est 2: l x d” and the genotype “Est 2: d”. Therefore the genotype dl and the genotype l are not scored as different.

6.1.2. Schematization of the genotypes in Est 3



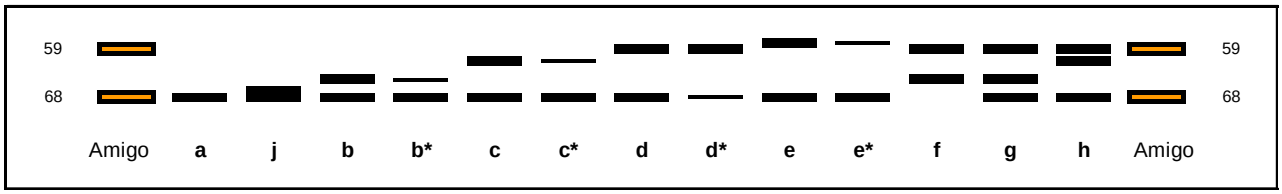
6.2. Recognition of the alleles encoding peroxydase isoenzymes

The peroxydase isoenzymes of the potato tuber are monomeric enzymes. The position of the individual peroxydase isoenzymes is calibrated by the variety Amigo. The variety Amigo shows two bands: 59 + 68.



Genotype	Example	Note
a	Hansa	1
b	Corine	2
c	Tomensa	3
d	Amigo	4
e	Jetta	5

Genotype	Example	Note
f	Diana	7
g	Thomana	6
h	Kanjer	8
j		1



Genotypes marked by an asterisk show decreased gene dosage in individual peroyxdases. They can be interpreted as combination between active alleles and the null-allele. Such genotypes are generally assigned to the genotypes with full gene dosage. The genotype j produces a zymogramme closely related to the genotype a; so the genotypes a and j are not scored as different. Both genotypes have the same note: note 1.

6.3. Recognition of the alleles encoding PAT

Patanins are monomeric peptide chains.

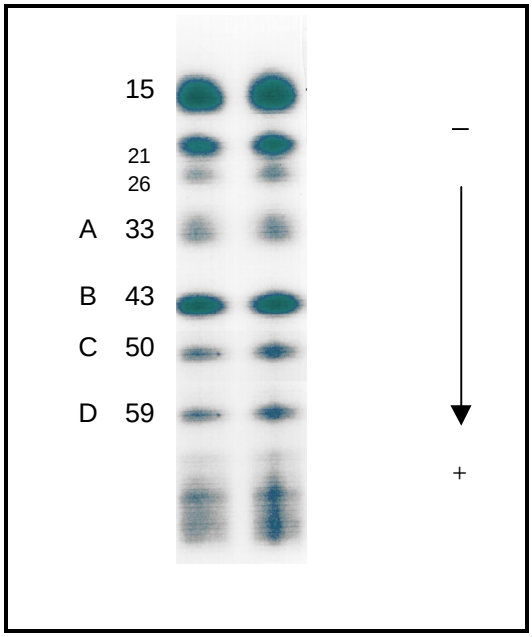
Genotype	Example variety	Note
1.01	Secura	6
2.01	Erntestolz	9
2.02	Desiree	11
2.03	Pompadur	77
2.04	Delia	16
3.01	Quarta	19
3.02	Irmgard	21
3.03	Ulla	47
3.04	Fasan	49
3.05	Karolin	52
3.06	Gloria	61
3.07	Junior	58
3.08	Danva	26
3.09	Combi	50
4.01	Indira	31
4.02	Christa	34
4.03	Pia	54
4.04	Rubin	53
4.05	Cleopatra	65
4.06	Felsina	67
4.07	Cinja	43

Genotype	Example variety	Note
4.08	Sommergold	40
4.09	Walli	57
4.10	Juliver	27
4.11	Pepo	45
4.12	Saturna	42
4.13		84
4.14	Aiko	73
4.15	Amigo	75
4.16		85
4.17	Oktan	87
5.01	Belita	13
5.02	Solina	14
6.01	Artana	2
6.02	Quinta	7
7.01	Fausta	17
7.02		86
7.03	Pallina	25
7.04	Grata	20
7.05	Atica	23
7.06	Karnico	4
7.07	Franca	51

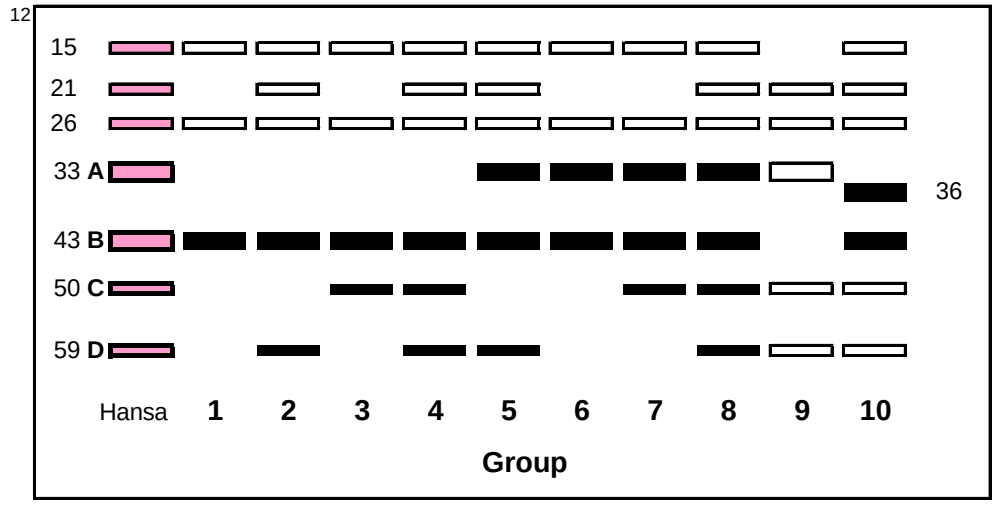
Genotype	Example variety	Note
7.08	Adretta	60
7.09	Ukama	62
8.01	Berolina	18
8.02	Escort	35
8.03	Darwina	33
8.04	Shepody	55
8.05	Kardal	68
8.06	Padea	28
8.07	Elles	30
8.08	Solara	74
8.09	Thomana	76
8.10	Karida	29
8.11	Vebeca	44
8.12	Arnika	39
8.13	Krometa	37
8.14	Sirius	36
8.15	Alba	70
8.16	Feska	72
9.01	Calla	1
10.01	Liu	63
10.02	Kranich	80

6.3.1. Grouping of the banding patterns

Patanins are defined by their electrophoretic mobility (REM-value). The positions of the individual patanins are illustrated by the example variety Hansa.

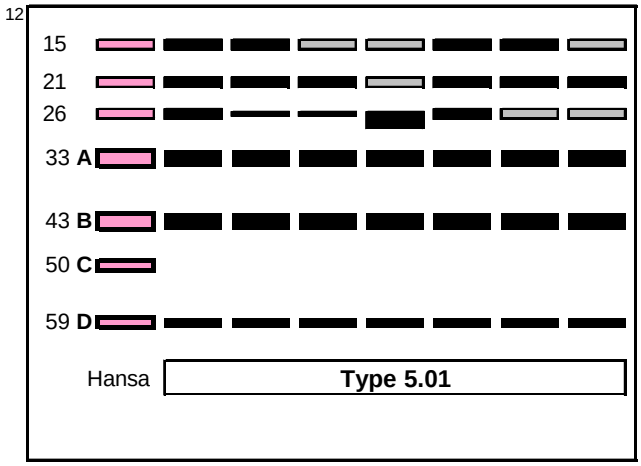


Patanins are extremely polymorphic proteins. The number of allele combinations is very high with more than 80. Therefore a grouping of the patanin patterns is necessary. Patanins with high mobility (REM-value between 33 and 60) are used for grouping. These patanins are identical with the A-, B-, C- and D-bands by STEGEMANN and LÖSCHKE. They form 8 groups: group 1 – group 8. Additionally two special groups are existing: Group 10 is defined by the presence of the band 36 and group 9 is defined by the absence of the B-band.



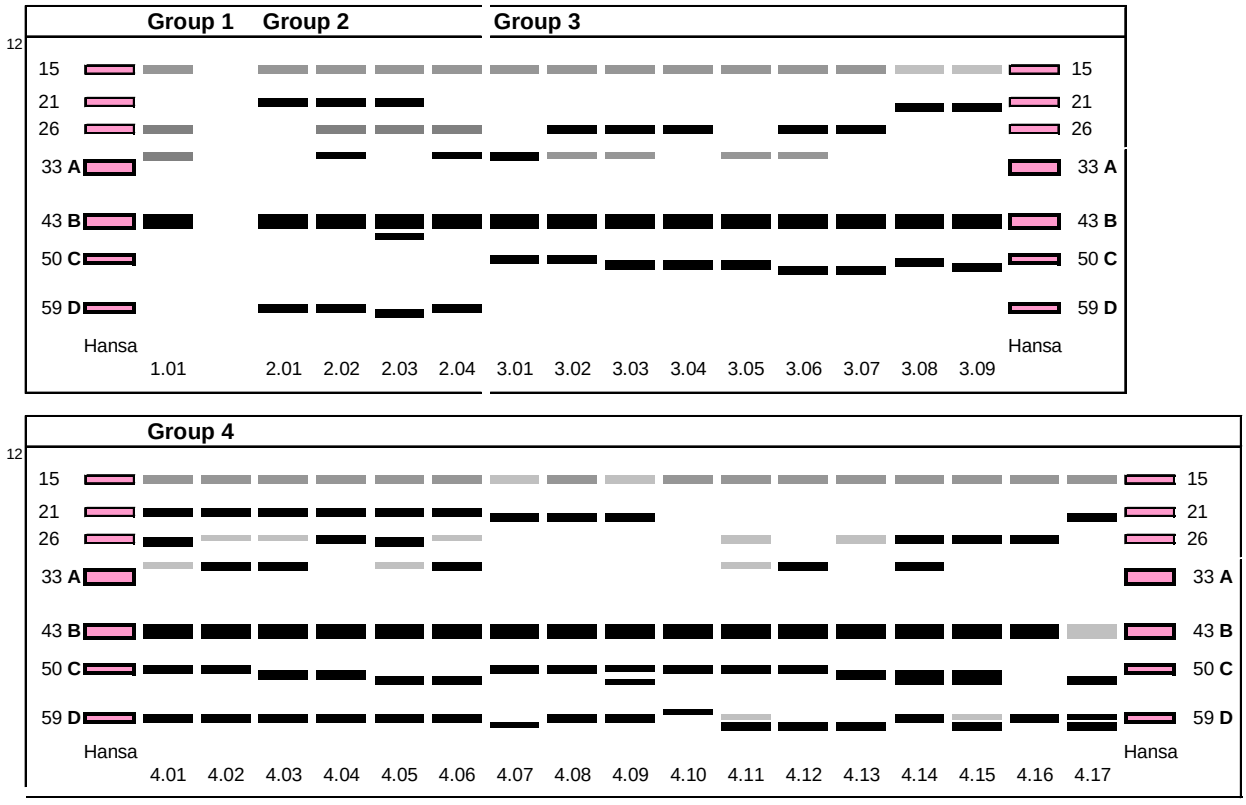
6.3.2. Analysis of the band intensity

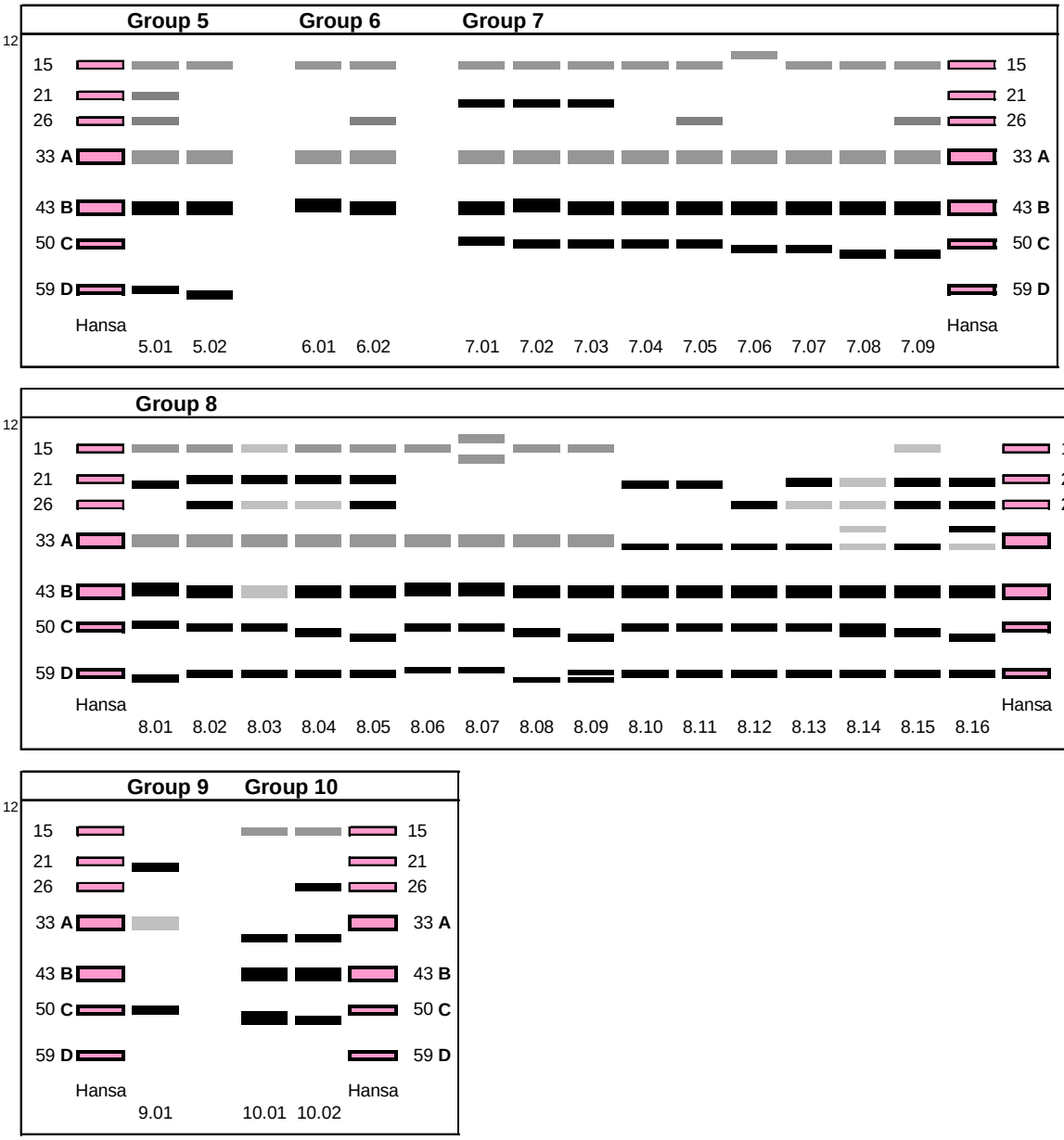
Differences in band intensities can be caused by different gene dosage. They are observed in the position 15, 21, 26, 31, 33 and 34. This occurs for example in type 5.01.



Patterns differing only in band intensities scored as identical.

6.3.3. Schematization of the banding patterns





Remarks to the groups 5 to 8

The band 33 is an extremely broad band and overlays the band 31; so in the presence of the band 33 the band 31 is not scorable. This is valid also in the case of a decreased band 33.

Literature

STEGEMANN; H. u. LOESCHKE, V.: Index of European Potato Varieties. Identification by electrophoretic Spectra, National registers, Appraisal of Characteristics, Genetic Data. Mitt. Biol. Bundesanst. Berlin-Dahlem, Heft 168, 1976.

[End of Annex and of document]