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INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS

GENEVA

DRAFT

PEA *

UPOV Code: PISUM_SAT

Pisum sativum L.

GUIDELINES

FOR THE CONDUCT OF TESTS

FOR DISTINCTNESS, UNIFORMITY AND STABILITY

*prepared by an expert from the United Kingdom**to be considered by the
Technical Working Party for Vegetables
at its forty-second session to be held in Cracow, Poland, from June 23 to 27, 2008**Technical Working Party for Agricultural Crops
at its thirty-seventh session, to be held in Nelspruit, South Africa, from July 14 to 18, 2008**Alternative Names:* *

<i>Botanical name</i>	<i>English</i>	<i>French</i>	<i>German</i>	<i>Spanish</i>
<i>Pisum sativum</i> L, <i>Pisum arvense</i> L.	Pea, Field Pea	Pois	Erbse	Guisante, Arvejo

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.]

<u>TABLE OF CONTENTS</u>	<u>PAGE</u>
1. SUBJECT OF THESE TEST GUIDELINES.....	3
2. MATERIAL REQUIRED	3
3. METHOD OF EXAMINATION.....	3
3.1 Number of Growing Cycles	3
3.2 Testing Place	3
3.3 Conditions for Conducting the Examination.....	3
3.4 Test Design	4
3.5 Number of Plants / Parts of Plants to be Examined.....	4
3.6 Additional Tests	4
4. ASSESSMENT OF DISTINCTNESS, UNIFORMITY AND STABILITY	4
4.1 Distinctness	4
4.2 Uniformity.....	5
4.3 Stability	5
5. GROUPING OF VARIETIES AND ORGANIZATION OF THE GROWING TRIAL.....	5
6. INTRODUCTION TO THE TABLE OF CHARACTERISTICS	6
6.1 Categories of Characteristics.....	6
6.2 States of Expression and Corresponding Notes.....	6
6.3 Types of Expression.....	6
6.4 Example Varieties	6
6.5 Legend.....	7
7. TABLE OF CHARACTERISTICS/TABLEAU DES CARACTÈRES/MERKMALSTABELLE/TABLA DE CARACTERES.....	8
8. EXPLANATIONS ON THE TABLE OF CHARACTERISTICS	24
8.1 Explanations covering several characteristics	24
8.2 Explanations for individual characteristics	24
9. LITERATURE	42
10. TECHNICAL QUESTIONNAIRE	43

1. Subject of these Test Guidelines

These Test Guidelines apply to all varieties of *Pisum sativum* 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 seed.

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

1,000 g or at least 12,000 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. In cases where the seed is to be stored, the germination capacity should be as high as possible and should, be stated by the applicant.

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 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 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 100 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 on single plants should be made on 20 plants or parts taken from each of 20 plants and any other observations made on all 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 For the assessment of uniformity, a population standard of 1% and an acceptance probability of at least 95% should be applied. In the case of a sample size of 100 plants, 3 off-types are allowed.

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) Plant: anthocyanin coloration (characteristic 1)
- (b) Stem: length (characteristic 5)
- (c) Leaf: leaflets (characteristic 9)
- (d) Stipule: flecking (characteristic 21)
- (e) Pod: parchment (characteristic 40)

- (f) Varieties without entire parchment only: Pod: thickened wall (characteristic 41)
- (g) Varieties without thickened pod wall only: Pod: shape of distal part (characteristic 42)
- (h) Pod: color (characteristic 45)
- (i) Immature seed: intensity of green color (characteristic 49)
- (j) Seed: type of starch grains (characteristic 51)
- (k) Seed: color of cotyledon (characteristic 54)
- (l) Varieties with anthocyanin only: Seed: marbling of testa (characteristic 55)
- (m) Varieties with anthocyanin only: Seed: violet or pink spots on testa (characteristic 56)
- (n) Seed: hilum color (characteristic 57)

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 3.3.3

- (a)-(c) 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.	30 – Plant: anthocyanin coloration	Plante: pigmentation anthocyanique	Pflanze: Anthocyanfärbung			
(*)	VG					
(+)						
QL	absent	absente	fehlend		Avola, Solara	1
	present	présente	vorhanden		Pidgin, Rosakrone	9
2.	30 – Stem: anthocyanin coloration of axil	Tige: pigmentation anthocyanique au point d’insertion du stipule	Stengel: Anthocyanfärbung der Achsel			
	VG					
QL	absent	absente	fehlend		Avola, Maro	1
	present	présente	vorhanden		Assas, Caroubel	9
3.	30- <u>Only varieties with anthocyanin coloration of axil:</u>	Tige: type de la pigmentation anthocyanique au point d’insertion du stipule	Stengel: Typ der Anthocyanfärbung der Achsel			
	240 VG					
	VG					
QL	single ring	anneau simple	einfacher Ring		Assas, Tirabeque	1
	double ring	anneau double	doppelter Ring		Caroubel	2
4.	30- Stem: fasciation	Tige: fasciation	Stengel: Verbänderung			
(*)	199 VG					
(+)	VG					
QL	absent	absente	fehlend		Avola, Solara	1
	present	présente	vorhanden		Bikini, Rosakrone	9
5.	240 – Stem: length	Tige: longueur	Stengel: Länge			
(*)	250					
(+)	MG/ MS					
QN	very short	très petite	sehr kurz		Zephyr	1
	short	petite	kurz		Nobel, Mini	3
	medium	moyenne	mittel		Calibra, Xantos	5
	long	grande	lang		Blauwschokker, Livia	7
	very long	très grande	sehr lang		Mammoth Melting Sugar	9

	English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
6.	210 –	Stem: number of				
(*)	240	nodes up to and				
(+)	MS	including first fertile				
		node				
QN	very few	très petit	sehr gering		Kelvil	1
	few	petit	gering		Smart, Zero4	3
	medium	moyen	mittel		Markana, Susan	5
	many	grand	groß		Cooper	7
	very many	très grand	sehr groß		Regina	9
7.	40-	Foliage: color	Feuillage: couleur	Laub: Farbe		
(*)	240					
(+)	VG					
PQ	yellow green	vert jaune	gelbgrün		Pilot	1
	green	vert	grün		Avola, Progreta	2
	blue green	vert bleu	blaugrün		Polar	3
8.	40-	<u>Varieties with green</u>				
	240	<u>foliage only:</u>				
	VG	Foliage: intensity of				
		color				
QN	light	claire	hell		Paris, Twinkle	3
	medium	moyenne	mittel		Lisa, Rondo	5
	dark	foncée	dunkel		Waverex	7
9.	20-	Leaf: leaflets	Feuille: folioles	Blatt: Blattfiedern		
(*)	240					
	VG					
QL	absent	absentes	fehlend		Hawk, Solara	1
	present	présentes	vorhanden		Avola, Rhea	9

	English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
10.	200- 240	Leaf: maximum number of leaflets				
(+)	MS/ VG					
QN	few	petit	gering		Jof	3
	medium	moyen	mittel		Dark Skin Perfection, Finale	5
	many	grand	groß		Ultimo	7
11.	216- 226	Leaflet: size	Foliolle : taille	Blattfieder: Größe		
(+)	MS/ VG					
QN	(a) very small	très petite	sehr klein		Payette	1
	small	petite	klein		Mini	3
	medium	moyenne	mittel		Finale	5
	large	grande	groß		Alderman	7
	very large	très grande	sehr groß		Mammoth Melting Sugar	9
12.	216- 226	Leaflet: length	Foliolle: longueur	Blattfieder: Länge		
	MS/ VG					
QN	(a) short	courte	kurz		Eagle, Polar	3
	medium	moyenne	mittel		Bohatyr, Dakota	5
	long	longue	lang		Delikata, Mammoth Melting Sugar	7
13.	216- 226	Leaflet: width	Foliolle: largeur	Blattfieder: Breite		
	MS/ VG					
QN	(a) narrow	étroite	schmal		Alouette, Grapis	3
	medium	moyenne	mittel		Dakota, Irina	5
	broad	large	breit		Adept, Tirabeque	7

	English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
14. 216- 226	Leaflet: position of broadest part					
(+)	MS/ VG					
QN	(a)				Nobel, Salome	1
					Columbia, Maro	2
					Griffin, Progreta	3
15. 30 - 240	Leaflet: dentation					
(+)	VG					
QN	(a)				Progreta	1
					Snowflake	3
					Cabree	5
					Amos	7
					Sugar Star	9
16. 216- (* 226 (+)	Stipule: length	Stipule: longueur	Nebenblatt: Länge			
(+)	MS/ VG					
QN	(b)				Eagle, Steffi	3
					Timo, Twinkle	5
					Alderman, Rhea	7
17. 216- (* 226 (+)	Stipule: width	Stipule: largeur	Nebenblatt: Breite			
(+)	MS/ VG					
QN	(b)				Eagle, Steffi	3
					Timo, Twinkle	5
					Mammoth Melting Sugar	7

	English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
18.	216- 226 MS/ VG	Stipule: size	Stipule: taille	Nebenblatt: Größe		
QN	(b)	small	petite	klein	Dakota, Zero4,	3
		medium	moyenne	mittel	Jackpot, Misty	5
		large	grande	groß	Beetle, Mammoth Melting Sugar	7
19.	216- 226 MS	Stipule: length from axil to tip	Stipule : longueur du point d'insertion au stipule à l'extrémité	Nebenblatt: Länge zwischen der Achsel und der Spitze		
(+)	MS					
QN	(b)	short	courte	kurz	Fortress, Zero4,	3
		medium	moyenne	mittel	Cabree, Orka	5
		long	longue	lang	Beetle, Mammoth Melting Sugar	7
20.	216- 226 VG/ MS	Stipule: length of lobe below axil				
(+)	VG/ MS					
QN	(b)	absent or very short				1
		short			Dakota, Ramrod	3
		medium			Kahuna, Twinkle	5
		long			Eden, Quantum	7
21.	20- 240 MS/ VG	Stipule: flecking	Stipule: macules	Nebenblatt: Marmorierung		
(*)	240					
(+)	MS/ VG					
QL		absent	absentes	fehlend	Lisa, Tafila	1
		present	présentes	vorhanden	Avola, Maro	9

	English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
22. (+)	200-240 VG	Stipule: maximum density of flecking	Stipule : densité maximale des macules	Nebenblatt: maximale Dichte der Marmorierung		
QN	very sparse	très lâche	sehr locker		Progreta	1
	sparse	lâche	locker		Backgammon, Waxwing	3
	medium	moyenne	mittel		Accent, Ambassador	5
	dense	dense	dicht		Avola, Zelda	7
	very dense	très dense	sehr dicht		Oregon Sugar Pod	9
23. (+)	216-226 MS/VG	Petiole: length (from axil to the first leaflet or tendril)				
QN	short	court	kurz		Hellas, Keo	3
	medium	moyen	mittel		Avola, Solara	5
	long	long	lang		Saskia, Tafila	7
24. (+)	216-226 MS/VG	<u>Varieties without leaflets only:</u> Petiole: total length (from axil to last tendril)				
QN	short	court	kurz		Choucas, Fredrio	3
	medium	moyen	mittel		Alambo, Alezan	5
	long	long	lang		Arosa, Calao	7
25. (*) (+)	214 MG	Time of flowering	Époque de floraison	Zeitpunkt der Blüte		
QN	very early	très précoce	sehr früh		Tempo	1
	early	précoce	früh		Smart, Zero4	3
	medium	moyenne	mittel		Carlton, Waverex	5
	late	tardive	spät		Cooper, Purser	7
	very late	très tardive	sehr spät		Livioletta	9

	English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
26.	216- (* (+)	<u>Non-fasciated varieties only:</u> Plant: maximum number of flowers per node	<u>Variétés non-fasciées seulement :</u> Plante : nombre maximal de fleurs par	<u>Nur nicht-verbänderte Sorten:</u> Pflanze: maximale Anzahl Blüten pro Knoten		
QN	one	une	eine		Progress No. 9, Tyla	1
	two	deux	zwei		Banff, Cooper	3
	three	trois	drei		Zodiac, Ultimo	5
	four or more	quatre ou plus	vier oder mehr		Arnesa, Calibra, Survivor	7
27.	216- (* (+)	<u>Varieties with anthocyanin coloration only:</u> Flower: color of wing	<u>Variétés avec anthocyane seulement :</u> Fleur : pigmentation anthocyanique de l'aile	<u>Nur Sorten mit Anthocyan:</u> Blüte: Anthocyanfärbung des Flügels		
PQ	(b)	white with pink blush	<i>rose pâle</i>	<i>blassrosa</i>		1
		pink	rose	rosa	Rosakrone	2
		reddish purple	pourpre rougeâtre	rötlich purpur	Assas	3
28.	216- (* (+)	<u>Varieties without anthocyanin only:</u> Flower: color of standard	<u>Variétés sans anthocyane seulement :</u> Fleur : couleur de l'étendard	<u>Nur Sorten ohne Anthocyan:</u> Blüte: Farbe der Fahne		
PQ	(b)	white	blanc	weiß	Gloton, Record	1
		whitish cream	blanc à crème	weiß bis cremefarben	Cooper, Maro	2
		cream	crème	cremefarben	Orcado	3
29.	216- (* (+)	Flower: width of standard	Fleur: largeur maximale de l'étendard	Blüte: maximale Breite der Fahne		
MS/ VG						
QN	(b)	narrow	étroite	schmal	Eagle, Progreta	3
		medium	moyenne	mittel	Bikini, Cooper	5
		broad	large	breit	Pilot, Tafila	7

	English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
30. (*)(+)	216-218 VG	Flower: shape of base of standard	Fleur : forme de la base de l'étendard	Blüte: Form des Fahnengrunds		
QN	(b)	strongly raised	fortement cunéiforme	stark keilförmig		1
		moderately raised	cunéiforme	keilförmig	Progreta	3
		level	droite	gerade	Markado, Solara	5
		moderately arched	arquée	zweilappig	Avola, Cooper	7
		strongly arched	fortement arquée	stark zweilappig	Bohatyr, Kennedy	9
31. (+)	216-218 VG	Flower: undulation of standard	Fleur : intensité de l'ondulation de l'étendard	Blüte: Intensität der Wellung der Fahne		
QN	(b)	absent or very weak	nulle ou très faible	fehlend oder sehr gering	Ultimo, Woody	1
		weak	faible	gering	Cooper, Dakota	3
		medium	moyenne	mittel	Ibiza, Kodiak	5
		strong	forte	stark	Koka, Reveille	7
		very strong	très forte	sehr stark	Téléphone nain, Télévision	9
32.	216-218 VG	Flower: width of upper sepal	Fleur: largeur du sépale	Blüte: Breite des Kelchblatts		
QN	(b)	narrow	étroite	schmal	Abador	3
		medium	moyenne	mittel	Conservor	5
		broad	large	breit	Kodiak	7
33. (+)	212-240 VG	Flower: shape of apex of upper sepal	Fleur : forme du sommet du sépale supérieur (au deuxième florifère)	Blüte: Form der Spitze des oberen Kelchblatts (am zweiten blütentragenden Knoten)		
PQ	(b)	acuminate	acuminé	mit langer ausgezogener Spitze	Dawn	1
		pointed	pointu	zugespitzt	Kelvedon Wonder	2
		rounded	arrondi	abgerundet	Kodiak	3

	English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
34.	218 - Peduncle: length of spur					
(+)	MS/ VS					
QN	(b)	short	court	kurz	Cabro, Kirio	3
		medium	moyen	mittel	Metaxa, Rialto	5
		long	long	lang	Alezan, Calao	7
35.	235- Peduncle: length from stem to first pod					
(+)	MS/ VG					
QN	(c)	short	court	kurz	Goblin, Orcado	3
		medium	moyen	mittel	Bohatyr, Maro	5
		long	long	lang	Kabuki, Reveille	7
36.	235 - Peduncle: length between 1st and second pods					
(+)	MS/ VS					
QN	(c)	short	court	kurz	Alize, Atila	3
		medium	moyen	mittel	Kirio	5
		long	long	lang	Aladin	7
37.	235 - Peduncle: number of bracts					
(+)	MS					
QN	(b)	absent or few			Fauvette, Kirio,	1
		medium			Delta, Duez	2
		many			Eiffel, Goelan	3

	English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
38.	240	Pod: length	Gousse: longueur	Hülse: Länge		
(*)	MS/ VG					
QN	(c)	very short	très courte	sehr kurz	Cepia, Vermio	1
		short	courte	kurz	Progreta, Solara	3
		medium	moyenne	mittel	Cooper, Jof	5
		long	longue	lang	Hurst Green Shaft, Protor	7
		very long	très longue	sehr lang	Tirabeque	9
39.	240	Pod: width	Gousse : largeur maxi male	Hülse: maximale Breite		
(*)	MS/ VG					
(+)						
QN	(c)	very narrow	très étroite	sehr schmal	Claire	1
		narrow	étroite	schmal	Picar, Ultimo	3
		medium	moyenne	mittel	Progreta, Solara	5
		broad	large	breit	Finale, Kahuna	7
		very broad	très large	sehr breit	Kennedy	9
40.	310	Pod: parchment	Gousse: parchemin	Hülse: Pergamentschicht		
(*)	VG					
(+)						
QL	(c)	not entire	absent	fehlend	Sugar Ann	1
		entire	entièrement présent	vollständig vorhanden	Avola, Solara	2
41.	240	<u>Only varieties without entire parchment:</u> Pod: thickened wall	<u>Variétés sans parchemin ou avec parchemin partiel seulement:</u> Gousse : paroi épaisse	<u>Nur Sorten mit fehlender oder teilweise vorhandener Pergamentschicht:</u> Hülse: verdickte Wand		
(*)	VG					
(+)						
QL	(c)	absent	absente	fehlend	Nofila, Reuzensuiker	1
		present	présente	vorhanden	Cygnnet, Sugar Ann	9

	English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
42. (*)(+)	240 VG <u>Varieties without thickened pod wall</u> only: Pod: shape of distal part	<u>Variétés à gousse sans paroi épaisse</u> seulement : Gousse : forme de la partie distale	<u>Nur Sorten ohne verdickte</u> Hülsenwand: Hülse: Form des Hülsenendes			
QL	(c) pointed	pointue	zugespitzt		Jof, Oskar	1
	blunt	tronquée	stumpf		Avola, Solara	2
43. (*)(+)	240 VG Pod: degree of curvature	Gousse : intensité de la courbure	Hülse: Stärke der Krümmung			
QN	(c) absent or very weak	absente ou très faible	fehlend oder sehr gering		Finale, Maro	1
	weak	faible	gering		Eagle, Span	3
	medium	moyenne	mittel		Hurst Green Shaft, Carlton	5
	strong	forte	stark		Jof, Delikata	7
	very strong	très forte	sehr stark		Oskar	9

Proposal to replace Pod: type of curvature with a characteristic for type of curvature similar to that used in bean.

The states used in French bean are: concave, s-shaped and convex. This would not work in Peas as there are no fully convex varieties and no varieties with s-shaped pods..

44. (+)	240 VG Pod: type of curvature					
	convex peduncle end and straight apex end				Avola, Hawk	1
	(c) convex peduncle end and concave apex end					2
	straight peduncle end with concave apex end				Jof	3
	concave peduncle end and concave apex end				Oskar	4

	English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
45.	230 - Pod: color	Gousse: couleur	Hülse: Farbe			
(*)	240					
(+)	VG					
PQ	(c) yellow	jaune	gelb			1
	green	verte	grün		Avola, Solara	2
	blue-green	vert bleu	blaugrün		Show Perfection	3
	purple	pourpre	purpur		Blauwschokker	4
46.	230 - Pod: intensity of green color	Gousse : intensité de la couleur verte	Hülse: Intensität der grünen Farbe			
(*)	240					
(+)	VG					
QN	(c) light	claire	hell		Solara, Ultimo	3
	medium	moyenne	mittel			5
	dark	foncée	dunkel		Dark Skin Perfection, Hawaii	7
47.	240- Only varieties without entire parchment: Pod: suture strings	Variétés sans parchemin ou avec parchemin partiel seulement : Gousse : fils de la suture	Nur Sorten mit fehlender oder teilweise vorhandener Pergamentschicht: Hülse: Fäden der Naht	=		
(*)	245					
(+)	VG					
QL	(c) absent or rudimentary	absents ou rudimentaires	fehlend oder rudimentär		Nofila, Sugar Lace	1
	present	présents	vorhanden		Crispi, Reuzensuiker	9
48.	226 Pod: number of ovules	Gousse: nombre d'ovules	Hülse: Anzahl Samenanlagen			
(*)						
(+)	MS					
QN	(c) few	faible	gering		De Grace, Phoenix,	3
	medium	moyen	mittel		Backgammon, Hawk	5
	many	élevé	groß		Karisma	7

	English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
49. (*)(+)	230-240 VG	Immature seed: intensity of green color	Gousse: intensité de la couleur verte de la graine immature	Hülse: Intensität der grünen Farbe des unreifen Samens		
QN	light	claire	hell		Solara, Ultimo	3
	medium	moyenne	mittel			5
	dark	foncée	dunkel		Dark Skin Perfection, Hawaii	7
50. (+)	320 VG	Seed: predominant shape	Graine: forme	Samen: Form		
PQ	ellipsoid	ovoïde	eiförmig		Solara	1
	cylindrical	cylindrique	zylindrisch		Span, Timo	2
	rhomboid	rhomboïde	rhomboid		Maro, Progreta	3
	irregular					4
51. (*)(+)	320 VG	Seed: type of starch grains	Graine: forme du grain d'amidon	Samen: Form des Stärkekorns		
QL	simple	lisse	einfach		Adagio, Maro, Solara	1
	compound	étoilé	zusammengesetzt		Avola, Polar	2
52. (*)(+)	320 VG	<u>Varieties with cylindrical shaped seeds and simple starch grains only:</u> Seed: wrinkling of cotyledon				
QL	absent	absentes	fehlend			1
	present	présentes	vorhanden			9

	English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
53. (*)	320 VG	<u>Varieties with compound starch grains only:</u> Seed: intensity of wrinkling of cotyledon	Graine : intensité des rides sur les cotylédons	Samen: Stärke der Schrumpfung des Keimblatts		
QN	weak				Darfon, Zefier	3
	medium	moyenne	mittel		Ziggy	5
	strong	forte	stark		Oskar, Quad	7
	very strong					9
54. (*)(+)	320 VG	Seed: color of cotyledon	Graine: couleur des cotylédons	Samen: Farbe des Keimblatts		
PQ	green	verts	grün		Avola, Solara	1
	yellow	jaunes	gelb		Caractacus, Hardy	2
	orange	orange	orange			3
55. (*)	320 VG	<u>Varieties with anthocyanin only:</u> Seed: marbling of testa	Variétés avec anthocyane seulement: Graine: marbrure des téguments	Nur Sorten mit Anthocyan: Samen: Marmorierung der Samenschale		
QL	absent	absente	fehlend		Rhea, Rif	1
	present	présente	vorhanden		Assas, Pidgin	9
56. (*)	320 VG	<u>Varieties with anthocyanin only:</u> Seed: violet or pink spots on testa	Variétés avec anthocyane seulement: Graine: taches violettes ou roses sur les téguments	Nur Sorten mit Anthocyan: Samen: violette oder rosa Punktierung auf der Samenschale		
QL	absent	absentes	fehlend		Pidgin, Rif	1
	faint	faibles	gering		Assas, Susan	2
	intense	intenses	intensiv		Arvika, Rhea	3

	English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
57.	320	Seed: hilum color	Graine: couleur du hile	Samen: schwarze Nabelfarbe		
(*)	VG					
(+)						
QL	not colored	autre que noir	anders als schwarz		Avola, Solara	1
	colored	noir	schwarz		Nofila, Rif	2
58.	320	Varieties with anthocyanin only: Seed: color of testa	Variétés avec anthocyane seulement: Graine: couleur du tégument	Nur Sorten mit Anthocyan: Samen: Farbe der Samenschale		
	VG					
PQ	reddish brown	brun rougeâtre	rötlichbraun		Rhea, Rosakrone	1
	brown	brun	braun		Pidgin	2
	brownish green	vert brunâtre	bräunlichgrün		Lisa, Susan	3
59	320	Seed: weight	Graine: poids de semences	Samen: Samengewicht		
(*)	MG					
(+)						
QN	very low				Ultimo	1
	low				Hawk, Iceberg	3
	medium				Mammoth Melting Sugar, Phoenix	5
	high				Kennedy, Maro	7
	very high				Bamby, Kabuki	9
60.	VS	Resistance to <i>Fusarium oxysporum</i> f. sp. <u>pisi</u>	Résistance à <i>Fusarium oxysporum</i> f. sp. <u>pisi</u>	Resistenz gegen <i>Fusarium oxysporum</i> f. sp. <u>pisi</u>		
(+)						
QL	Race 1	Race 1	Pathotyp 1			
69	absent	absente	fehlend		Eden, Mammoth Melting Sugar	1
	present	présente	vorhanden		Rwinkle, Solara	9
61.	VG	Resistance to <i>Erysiphe pisi</i> Syd.	Résistance à <i>Erysiphe pisi</i> Syd.	Resistenz gegen <i>Erysiphe pisi</i> Syd.		
(+)						
QL	absent	absente	fehlend		Cabro	1
	present	présente	vorhanden		Iceberg	9

	English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
62.	VS	Resistance to	Résistance à	Resistenz gegen		
(+)	<u>Ascochyta pisi,</u> Race C	<u>Ascochyta pisi,</u> race C	<u>Ascochyta pisi,</u> Pathotyp C			
QL	absent	absente	fehlend		Kelvedon Wonder	1
	present	présente	vorhanden		Rondo	9

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) Leaflet: Unless otherwise indicated, all observations should be made on the first leaflet at the second flowering node.
- (b) Stipule, flower and peduncle: Unless otherwise indicated, all observations should be made at the second flowering node
- (c) Pod: Unless otherwise indicated, all observations should be made at the second fertile node

8.2 *Explanations for individual characteristics*

Ad. 1: Plant: anthocyanin coloration

The anthocyanin coloration should be recorded as present if anthocyanin occurs in one or more of the following: seed, foliage, stem, axil, flower or pod.

Ad. 4: Stem: fasciation

The expression of fasciation is more clearly expressed in longer daylengths. Fasciated stems may be ribbed and flattened up to a width of 3 cm; several apical growing points often result in multiple flowers or pods at the top of the plant. Flower and pod counts should not be assessed on fasciated varieties.



Ad. 5: Stem: length

Only the main stem should be recorded. The observations should be made on harvested plants when seed is green and fully developed. The measurement should include the first two nodes with scale leaves.

Ad. 6: Stem: number of nodes up to and including the first fertile node

Only the main stem should be recorded.

The first two nodes, which have 'scale' leaves, should be included in all node counts.

Ad. 7: Foliage: color

In some genetic backgrounds yellow-green foliage color is difficult to separate from the pale green foliage color without the use of example varieties.

Ad. 10: Leaf: maximum number of leaflets

Assessment should be made over the whole plant.

Ad. 11: Leaflet: size

Size may be assessed visually or by measuring surface area using digital techniques

Ad. 14: Leaflet: position of broadest part

[TO BE PROVIDED]

1	2	3
at middle to slightly towards base	moderately towards base	strongly towards base

Ad. 15: Leaflet: dentation

The maximum expression should be recorded; observations should only be made on the main stem (excluding aerial and basal branches), and above node six.

[TO BE PROVIDED]

1	3	5	7	9
absent or very weak	weak	medium	strong	very strong

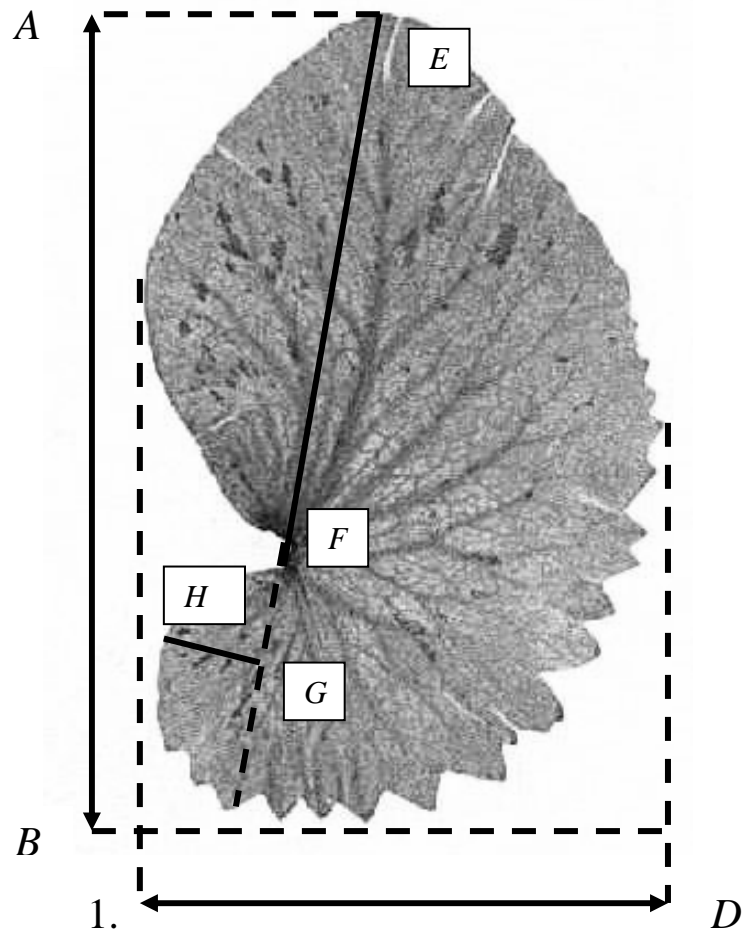
Ad. 16: Stipule: length

Ad. 17: Stipule: width

Ad. 19: Stipule: length from axil to tip

Ad. 20: Stipule: length of lobe below axil

Observations should be made on stipules which have been detached from the plant and flattened.



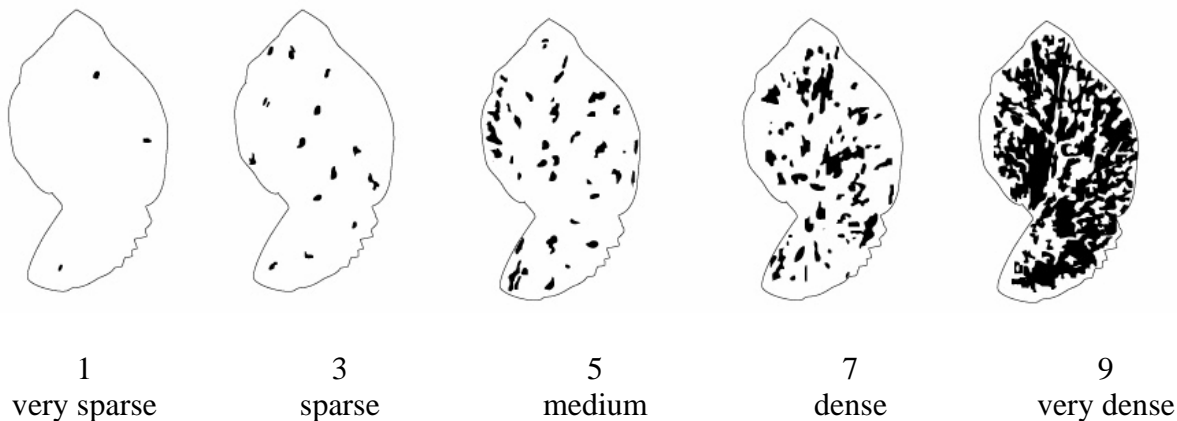
Stipule: length (16)	A - B
Stipule: width (17)	C - D
Stipule: length from axil to tip (19)	E - F
Stipule: lobe below axil (20)	G - H

(perpendicular to the line E - G)

Ad. 21: Stipule: flecking

Ad. 22: Stipule: maximum density of flecking

Assessment should be made on the main stem only. The presence of flecking on any stipule on the main stem means that flecking is present. It should be ensured that foliage at the lowest nodes has not senesced before assessment. The plant should have at least eight nodes, since flecking in some varieties may not be expressed at lower nodes.



Ad. 23: Petiole: length (from axil to the first leaflet or tendril)

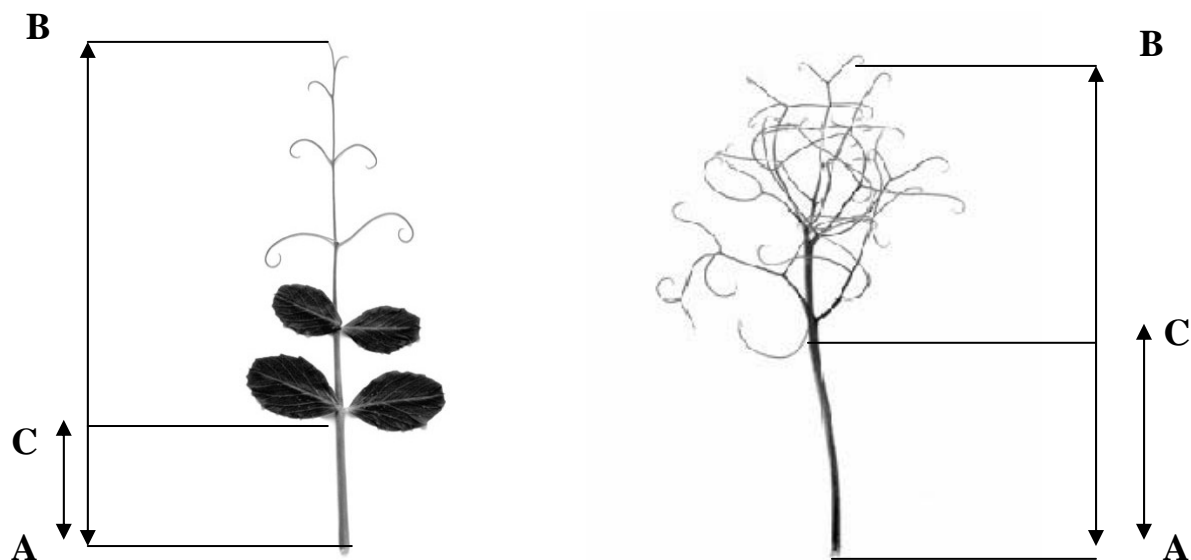
Ad. 24: Varieties without leaflets only: Petiole: total length (from axil to last tendril)

Petiole length from axil to the first leaflet or tendril (23)

A - C

Total length of petiole including tendrils (24)

A - B



Ad. 25: Time of flowering

The time of flowering is when 30% of plants have at least one flower open.

Ad. 26: Non-fasciated varieties only: Plant: maximum number of flowers per node

Assessment should be made over all flowering nodes. The lowest flowering nodes may have fewer flowers.

Ad. 28: Varieties without anthocyanin only: Flower: color of standard

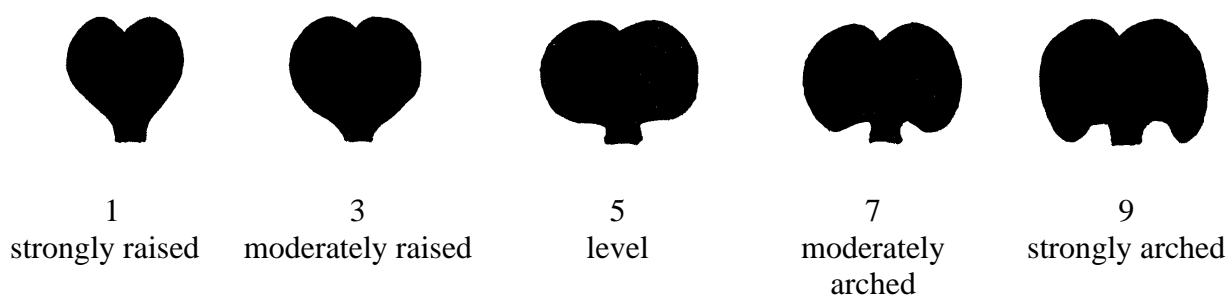
The color of standard should be recorded on flowers which are fully opened, and fresh.

Ad. 29: Flower: width of standard

The standard should be detached from the flower and flattened on a hard, flat surface.

Ad. 30: Flower: shape of base of standard

The standard should be detached and flattened on a hard, flat surface

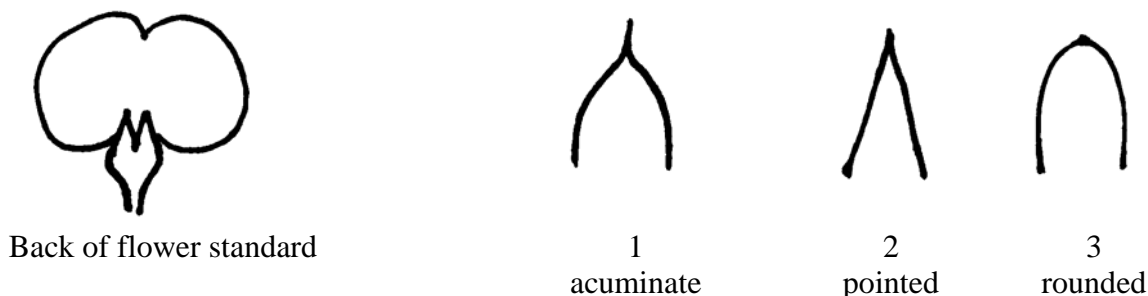


Ad. 31. Flower: undulation of standard

The maximum expression on the plant should be recorded. Flowers recorded should be fully opened and not senescing.

Ad 33: Flower: shape of apex of upper sepal

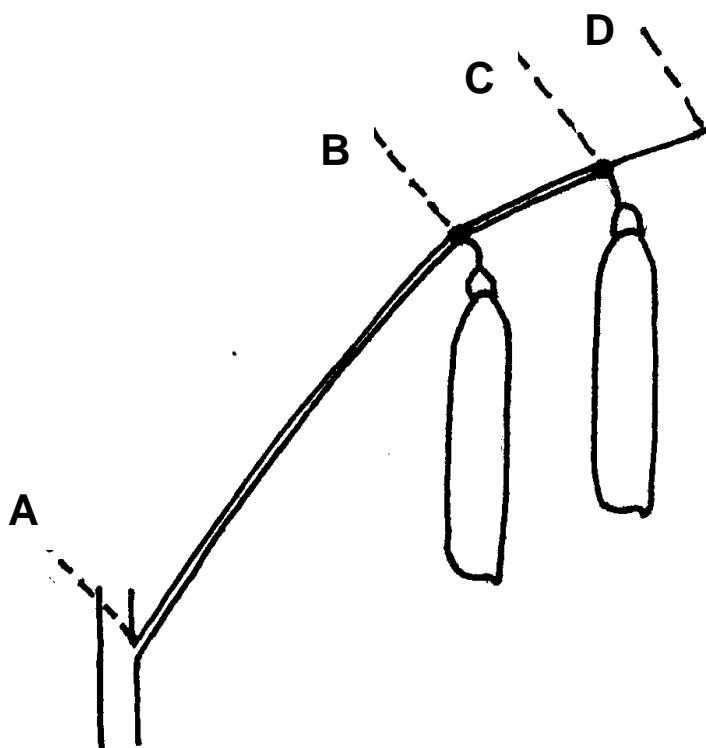
TWA: (+) to be added to Char 37 with an illustration based on TGP/14.2.1 (&.2) Draft 5, II, Section 2.4.3 (Page 19)



Ad. 34: Peduncle: length of spur

Ad. 35: Peduncle: length from stem to first pod

Ad. 36: Peduncle: length between 1st and second pods



A – B = Peduncle: length from stem to first pod (35)

B – C = Peduncle: length between first and second pods (36)

C – D = Peduncle: length of spur (34)

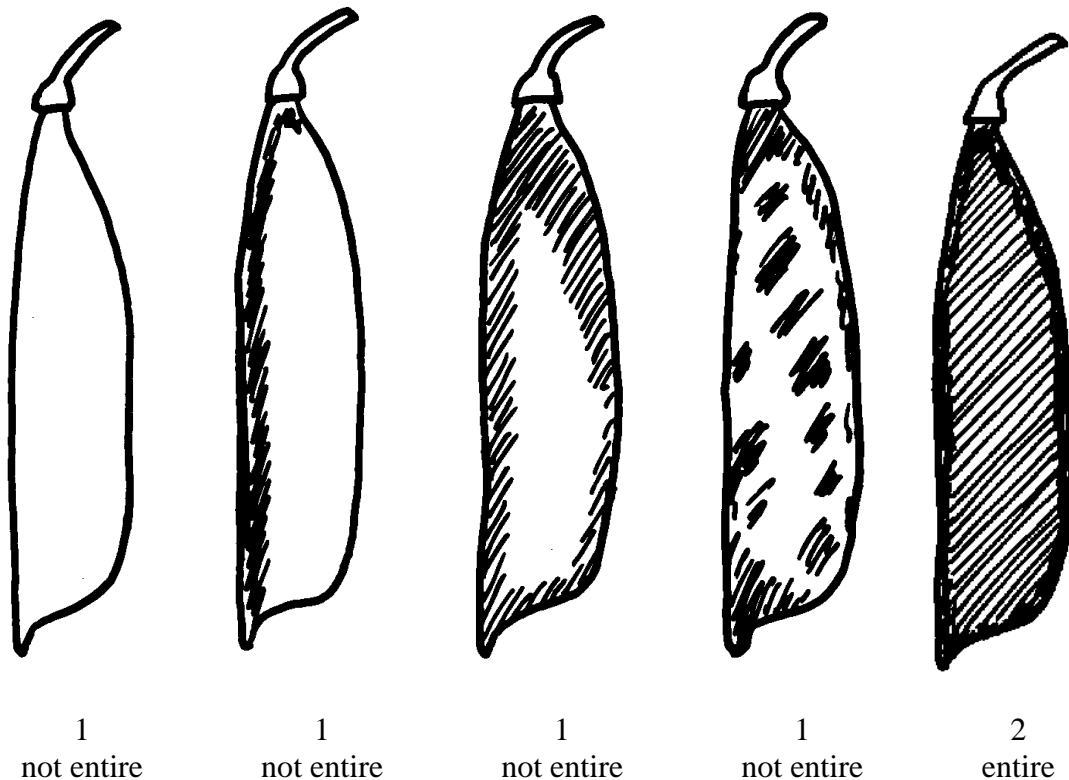
Ad. 37: Peduncle: number of bracts

The number of bracts is calculated on the basis of averages across plants

Ad. 39: Pod: width

The observations should be made on well developed green pods; the width is assessed from suture to suture on unopened pods

Ad. 40: Pod: parchment
 (viewed on the inside of the pod wall)



(1) The observations should be made on dry pods with the exception of ‘Snap Peas’. Snap Peas (Sugar Peas with thickened pod walls) are best recorded when green, in order to minimize fungal infection which can prevent observation of the parchment.

(2) The pod should be opened along the suture without damaging the edges of the two sides of the pod. The distribution of sclerenchyma, which makes up the parchment, may either be observed by staining (a drop of Phloroglucinol dissolved in Ethanol followed by a drop of concentrated (37%) Hydrochloric Acid), or by reflecting light (preferably daylight) on the inside of the pod wall.

The expression of parchment is controlled by two genes *p* and *v* and has four phenotypes:

<u>Genotype</u>	<u>Phenotype</u>
P V	Parchment occurring as a strong thick entire layer
p V	Parchment reduced to a strip along upper and/or lower sutures
P v	Parchment reduced to either patches, or a very thin entire layer
p v	Parchment absent

The following spontaneous mutation rates are known to occur:

p to P	0.05 - 0.2%
v to V	0.3 - 3.0%

The effect of these spontaneous mutations will be to increase the levels of parchmented plants in parchment-free or partially parchmented types. Since both genes can mutate at the same time, this increase in plants with pod parchment can occur within a few generations.

Ad. 41: Only varieties without entire parchment: Pod: thickened wall

The observations should be made on well developed pods not showing any signs of senescence. Unopened harvested pods should be cut in cross section to examine pod wall thickness.

Ad. 42: Varieties without thickened pod wall only: Pod: shape of distal part

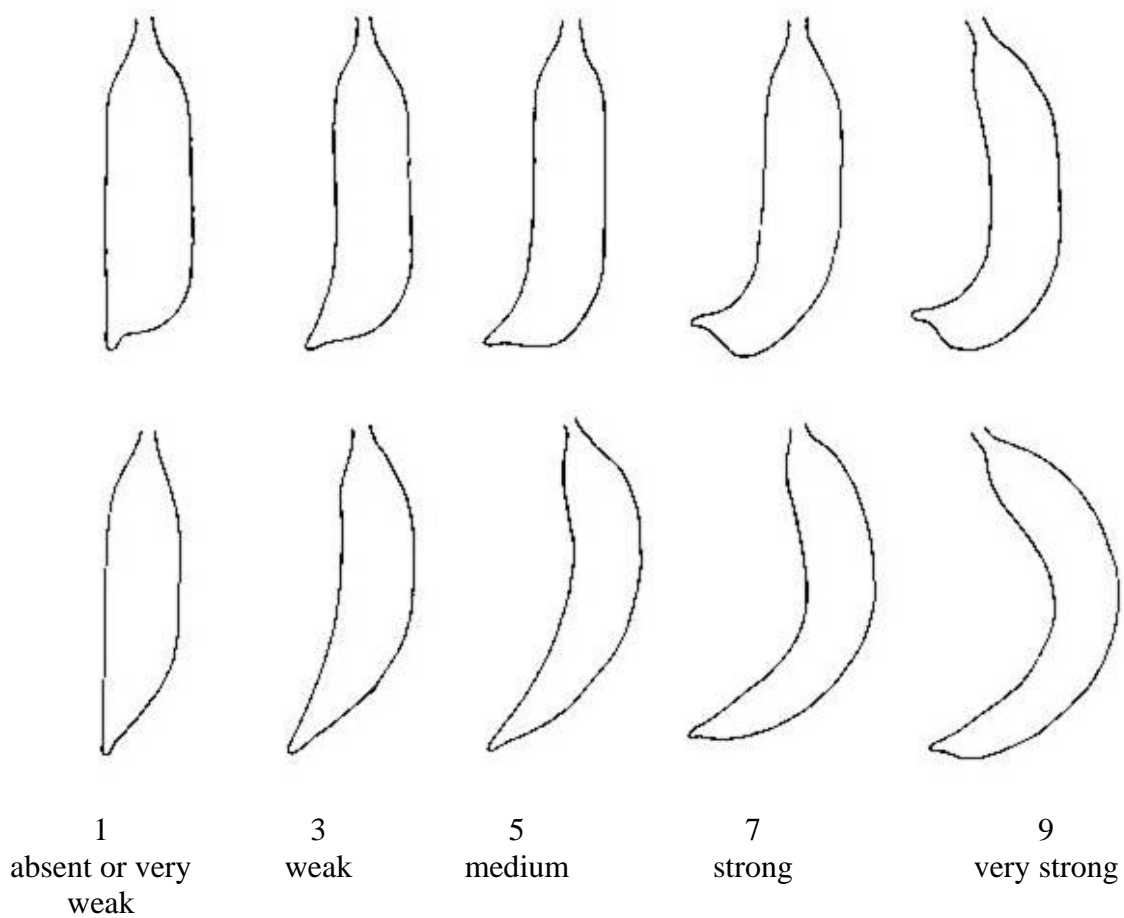
Observations should be made on several nodes of each plant when pods are fully developed, but before any senescence. Care should be taken when recording strongly curved pods, where the 'beak' is longer than the pod tip, or where parchment is not entire.



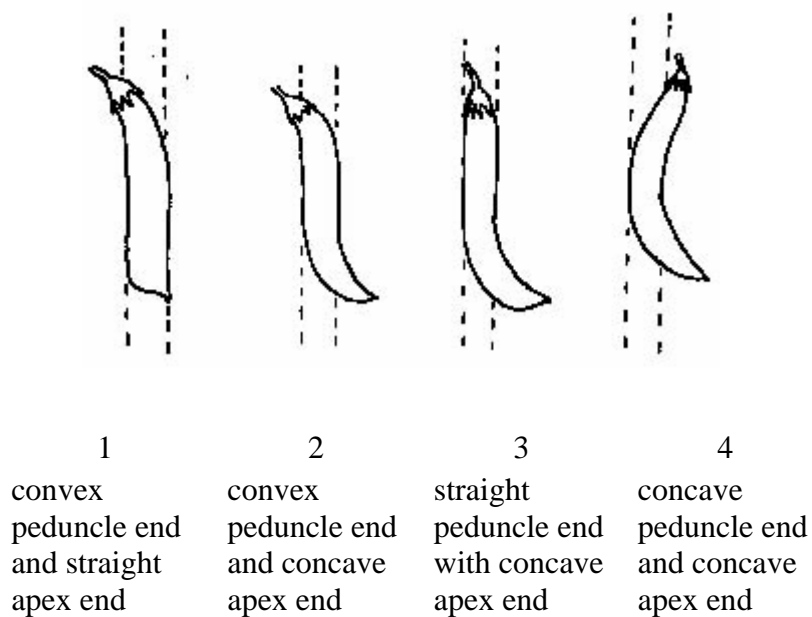
1
pointed

2
blunt

Ad. 43: Pod: degree of curvature



Ad. 44: Pod: type of curvature



Ad. 45: Pod: color

Green pods may be pale or dark, the color is correlated with pale or dark immature seed color.

Blue-green pods are dark and slightly bluish. The color develops with time, and may be more accentuated in hotter, drier conditions.

Purple pods may be entirely purple or partially purple; occasionally the amount and distribution of anthocyanin may vary up the plant.

Ad. 47: Only varieties without entire parchment: Pod: suture strings

When temperatures exceed 20° C, the formation of suture strings is delayed. Observations should be made on fully developed pods.

Where suture strings are absent or partial and starch grains are compound, seed wrinkling in some seeds is much reduced; this expression is not considered to be a lack of uniformity; it may be affected by a penetrance factor and does not respond to selection.

Ad. 48: Pod: number of ovules

The number of ovules is best recorded when the pods are flat.

Ad. 49: Immature seed: intensity of green color

Immature seed color in some varieties with green cotyledons may appear creamy white before the seed is fully developed. Assessment should be undertaken in comparison with fresh immature seed of the example varieties.

Assessment of dry seed characteristics

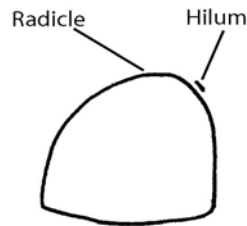
Seed should be mature and dry. For varieties with anthocyanin pigment, tannins in the testa often darken with age, obscuring many characteristics. Recording of seed characteristics should therefore be carried out within nine months of harvest. Assessment of some characteristics is easiest under conditions of bright natural daylight.

Ad. 50: Seed: predominant shape

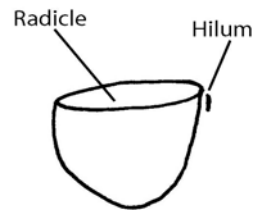
Seeds which grow nearest the peduncle end or the distal end of the pod ('end seeds') are rounded on the radicle or the distal (opposite to the radicle) surfaces and should be excluded before shape is assessed. 'Golf ball' and other irregular dimpling should be ignored.

Exclusion of 'end' seeds

Orientate the seed so that the hilum is at the upper right hand side with radicle on top.



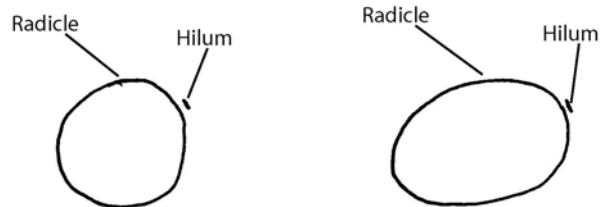
If the seed is rounded on the radicle surface only, it is an end seed growing nearest the peduncle end of the pod



If the seed is rounded on the distal surface only, it is an end seed growing nearest the distal end of the pod

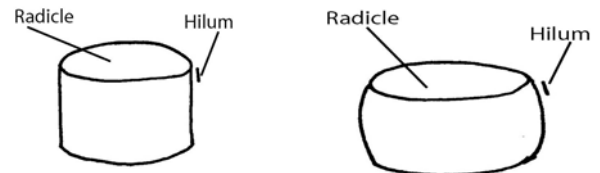
1. Ellipsoid

Seeds with no, or very weak, compression on the radicle and/or the distal surfaces



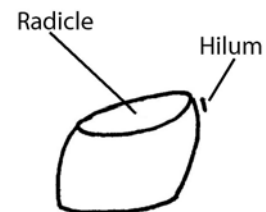
2. Cylindrical

Seeds compressed on the radicle and distal surfaces. Square to rectangular or with rounded sides in longitudinal section.



3. Rhomboid

Seeds irregularly compressed on the radicle and distal surfaces, but also irregularly compressed on the abaxial surfaces.



4. Irregular

Seeds irregularly compressed; not one of the above shapes.

Ad. 51: Seed: type of starch grains

(1) Following the removal of the testa, fine fragments of tissue should be extracted from the cotyledon and placed on a microscope slide. A droplet of water is added to the extracted tissue and another microscope slide is placed on top. The tissue and water mixture is then squashed gently between the two slides. Too much pressure during squashing results in

fragmentation of the grains, too little pressure will not provide a layer thin enough for examination.

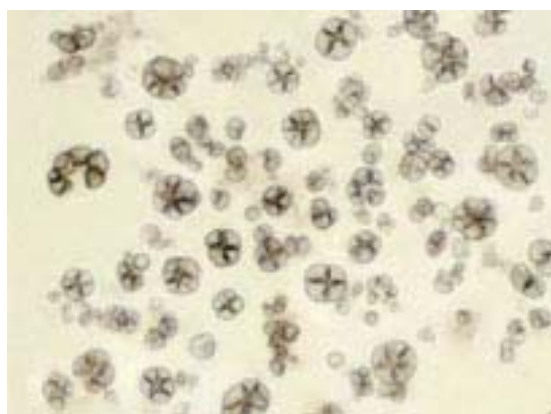
(2) A microscope with transmitted light, using X16 eye-pieces and either X10 or X40 objectives, is most suitable for examination. For examination of compound grains the larger objectives will be required.

(3) Simple grains resemble wheat seeds or coffee beans in shape, often with what looks like a suture line running along their length.

(4) Compound grains look irregularly star-shaped and appear to be made of a number of segments. The center of the grains may appear cross-shaped. In varieties with high sweetness, compound starch grains are very small and few in number.



1
simple



2
compound

Ad. 52: Varieties with cylindrical shaped seeds and simple starch grains only: Seed: wrinkling of cotyledon

‘Golf ball’ and large dimples should be ignored in the assessment of cotyledon wrinkling.

Ad. 54: Seed: color of cotyledon

Following the removal of the testa, the seed is cut along the line of the cotyledon suture. Assessment of both external (abaxial) and internal (adaxial) surfaces of the cotyledon may be necessary. Immature seeds should be excluded from the assessment.

The expression varies with environmental conditions:

- bleaching, caused by sunlight or chemical changes in the plant, can remove color from seeds making it difficult to determine cotyledon color; cutting the seed in half enables the assessment of the internal color which may be less affected.
- color becomes dull with age, even if seed is stored in cold, dark conditions.
- color can darken in the presence of high amounts of Tragacanth oil occurring on the underside of the testa. This fades as the seed ages. Seeds with tannin may darken with age.
- orange cotyledons can be difficult to determine without reference to an example variety.

Ad. 57: Seed: hilum color

The hilum color can be influenced by the presence of tannin in the testa. The hilum area should be lightly polished with a cloth before recording, to remove any loose tissue present.

Ad. 59: Seed: weight

Seed weight should be measured on at least two samples of 100 seeds. The observations should be made on harvest seed only. Immature and infected seeds should be excluded; the seed should be dry, (approximately 10-15% moisture content) at time of recording.

Ad. 60: Resistance to *Fusarium oxysporum* f. sp. *lisi* Race 1

Host differentials used for test:

Race 1: Line JI 1360 ex 'Dark Skinned Perfection' (resistant)

Line JI 1365 ex 'Little Marvel' (susceptible)

Isolates and isolate identity

Isolate identity is determined by testing against the host differential set described by Haglund and Kraft (1979). All isolates are derived from single spore cultures.

Isolates used in the test: Race 1: IPO culture collection no. 20379

Maintenance of isolates

Maintain in a refrigerator at 4°C as a soil culture (loam) and pass through a susceptible variety every 2-3 years. Isolate identity is determined by testing against a host differential set.

Source for isolates:

Race 1 :

Research Institute for Plant Protection (IPO)
PO Box 9060
NL-6700 GW Wageningen
The Netherlands

Preparation of inoculum and assessment of disease

Cultures of the fungus are grown in liquid Czapek-Dox medium at 2°C in daylight conditions for 7 days. The liquid is continuously aerated by sterile air. The cultures are strained through muslin followed by centrifugation at 3,500 rpm for 10 minutes; the solution is diluted with distilled water to a concentration of 10⁶ spores/ml

Inoculation and assessment of disease Test plants and controls are raised in 8 litres of 1:1 peat and sand mixture and adjusted to pH 5.0. 1 litre of spore suspension is used. Two replicates of 10 plants are grown for assessment; a third replicate is grown if any problems arise.

After 3 weeks, or 4 - 5 node stage, the basal third of the seedling roots can be cut and dipped into the inoculum for 3-5 seconds before being transplanted. Four weeks after inoculation, surviving seedlings are recorded as resistant.

Composition of the Czapek-Dox liquid medium

2.0 g	Sodium Nitrate
0.5 g	Potassium Chloride
1.0 g	Dipotassium Phosphate
0.5 g	Magnesium Sulphate
0.01 g	Ferrous Sulphate
30.0 g	Saccharose

The above mixture is added to 1 litre of distilled water and poured into a flask; the solution is sterilized in an autoclave at 115°C for 20 minutes.

Genetic background

The expression of resistance to race 1 is controlled by the gene Fw.

Ad. 61: Resistance to *Erysiphe pisi* Syd. (Powdery Mildew)

Host differentials

Line JI 502 ex 'Rondo' (susceptible)

Line JI 1559 ex WBH 1677 = 'Mexique-4' (resistant)

Isolates and isolate identity

No isolates are maintained as infection is natural. There are no known races.

Genetic background

Two recessive genes confer resistance: er1 and er2

'Rondo' is susceptible (Er1 Er2)

'Mexique-4' is resistant (er1 er2)

Assessment of disease

Infected foliage surfaces are white and powdery. Tissue beneath the infected areas may turn purplish followed by the production of black fruiting structures. Badly infected tissue remains soft and fails to dry out naturally.

In resistant plants, infection is absent or localized in very small patches (pustules). Infestation may overtake resistant plants during senescence.

Ad. 62: Resistance to of *Ascochyta pisi* Lib. Race C (Ascochyta Leaf and Pod Spot)

Host differentials:

Line JI 502 ex 'Rondo' (resistant)

Line JI 394 ex 'Kelvedon Wonder' (susceptible)

Isolates and isolate identity

Isolate used in the test: Tezier Strain

Isolate identity is determined by testing against a host differential set.

Maintenance of isolates

Maintain on Mathur medium at ambient temperature. Isolate identity is determined by testing against a host differential set.

Source for isolates:

GEVES SNES

Station Nationale d'Essais de Semences

Rue George Morel, B.P.24

49071 Beaucouzé Cedex France

Preparation of inoculum

Add 0.4% Tween 80 wetting agent to aid dispersal of spores. Remove hyphal fragments by straining solution through muslin. Concentration of 10^6 spores/ml

Inoculation and assessment of disease

Grow seedlings in glasshouse under natural daylength at 20°C and high humidity. Spray inoculum on young seedlings 10-15 days after emergence; mist spray 2 or 3 times per day for 15 minutes. Alternatively, inoculation can be made at the apex of enclosed leaves. This method does not require conditions of high humidity.

Plants are assessed about 5 days after inoculation. Infection is very clear when present: necrotic lesions are slightly sunken, brown and sharply delineated. Lesions are circular on pods and elongated on stems. Two replicates of 10 plants are grown; a third replicate is grown if any problems arise.

Genetic background:

The expression of resistance to Race C (also known as BP2) is controlled by a single dominant gene Rap2. Five pathotypes and four resistance genes are known.

KEY FOR THE GROWTH STAGES
CLE POUR LES STADES DE CROISSANCE
SCHLUESSEL FUER DIE ENTWICKLUNGSSTADIEN

Key Clé Schlüssel	General Description	Description générale	Allgemeine Beschreibung
0	<u>Germination</u>	<u>Germination</u>	<u>Keimung</u>
00	Dry seed	Graine sèche	Trockenkorn
10	<u>Seedling growth</u>	<u>Croissance de la plantule</u>	<u>Wachstum des Keimlings</u>
16	Young seedling with first scale leaf developed	Jeune plantule avec première feuille à écailles développée	Junger Keimling mit ersten entwickelten Schuppenblättern
18	Young seedling with second scale leaf developed	Jeune plantule avec deuxième feuille à écailles développée	Junger Keimling mit zweiten entwickelten Schuppenblättern
20	First pair of stipules at the third node fully opened	Première paire de stipules au niveau du troisième noeud complètement ouverte	Erstes Paar Nebenblätter am dritten Knoten voll geöffnet
22	Stipules at the fourth node fully opened	Stipules au niveau du quatrième noeud complètement ouverts	Nebenblätter am vierten Knoten voll geöffnet
25	Stipules at the fifth node fully opened	Stipules au niveau du cinquième noeud complètement ouverts	Nebenblätter am fünften Knoten voll geöffnet
28	Stipules at the sixth node fully opened	Stipules au niveau du sixième noeud complètement ouverts	Nebenblätter am sechsten Knoten voll geöffnet
30	<u>Vegetative growth</u>	<u>Croissance végétative</u>	<u>Vegetatives Wachstum</u>
31	Stipules at the seventh node fully opened	Stipules au niveau du septième noeud complètement ouverts	Nebenblätter am siebenten Knoten voll geöffnet
34	Stipules at the eighth node fully opened	Stipules au niveau du huitième noeud complètement ouverts	Nebenblätter am achten Knoten voll geöffnet
40	Stipules at the tenth node fully opened	Stipules au niveau du dixième noeud complètement ouverts	Nebenblätter am zehnten Knoten voll geöffnet
n	Stipules at the Nth node fully opened	Stipules au niveau du N-ième noeud complètement ouverts	Nebenblätter am N-ten Knoten voll geöffnet
200	<u>Reproductive stage</u>	<u>Stade de reproduction</u>	<u>Generatives Stadium</u>
200	Initiation of first flower	Apparition de la première fleur	Beginn der ersten Blüte
206	Development of first flower bud enclosed in stipules	Développement de la première fleur, mais à l'intérieur des stipules	Entwicklung der ersten in Nebenblätter eingeschlossenen Blütenknospe
208	Development and sometimes elongation of peduncle	Développement et parfois allongement du pédoncule	Entwicklung und manchmal Verlängerung des Blütenstandstiels

Key Clé Schlüssel	General Description	Description générale	Allgemeine Beschreibung
210	Emergence of first flower bud from stipules	Apparition du premier bourgeon à fleurs hors des stipules	Erscheinen der ersten Blütenknospe aus den Nebenblättern
212	Emergence of standards from the calyx	Apparition des étendards hors du calice	Erscheinen der Fahne aus dem Kelch
214	Opening of the standards and emergence of the wings	Ouverture des étendards et apparition des ailes	Oeffnen der Fahne und Erscheinen der Flügel
216	Slight opening of the wings to show the keel	Légère ouverture des ailes découvrant la carène	Leichtes Oeffnen der Flügel und Erscheinen des Kieles
218	Standards usually fully opened	Etendards généralement complètement ouverts	Fahnen normalerweise voll geöffnet
220	Standards beginning to crumple at the margins	Etendards commençant à se friper sur les bords	Fahnen beginnen am Rand zu kräuseln
222	Standards and wings showing signs of withering	Etendards et ailes présentant des signes de flétrissure	Fahnen und Flügel weisen Zeichen des Welkens auf
224	Emergence of the first flat pod	Apparition de la première gousse aplatie	Erscheinen der ersten flachen Hülse
226	Elongation of the flat pod with clearly visible ovules	Allongement de la gousse aplatie avec des ovules nettement visibles	Verlängerung der flachen Hülse mit deutlich sichtbaren Samenanlagen
230	Swelling of the ovules and slight swelling of the pod wall	Gonflement des ovules et léger renflement de la paroi de la gousse	Schwellen der Samenanlagen und leichtes Schwellen der Hülsenwand
235	Green seed rounded becoming slightly firm; pods almost fully swollen or developed	Graine verte arrondie devenant légèrement ferme; gousses presque entièrement formées ou développées	Grüner rundlicher Samen wird leicht fest; Hülse fast vollkommen geschwollen oder entwickelt
240	Green seed firm, becoming starchy; pods fully developed or swollen	Graine verte ferme, devenant amylicée; gousses pleinement développées ou gonflées	Grüner Samen fest; wird leicht stärkehaltig; Hülsen voll entwickelt oder geschwollen
245	Green seed becoming pale, testas tough; pod beginning to lose color	Graine verte devenant pâle, téguments épais; gousse commençant à se décolorer	Grüner Samen wird blass, Samenschale fest; Hülse beginnt Farbe zu verlieren
250	Stem and lower foliage becoming yellowish	Tige et feuillage inférieur devenant jaunâtre	Stengel und niedrige Blätter werden gelblich
255	Seed drying and becoming yellowish green; pod becoming wrinkled	Dessèchement de la graine devenant vert jaunâtre; gousse commençant à se rider	Samen trocknet und wird gelblichgrün; Hülse wird schrumpfig
260	Lower foliage becoming dry at margins	Feuillage inférieur devenant sec sur les bords	Untere Blätter werden am Rand trocken
265	Seed yellowish green; pods wrinkled, pale green	Graine vert jaunâtre; gousses ridées vert pâle	Samen gelblichgrün; Hülsen schrumpfig, blassgrün

Key Clé Schlüssel	General Description	Description générale	Allgemeine Beschreibung
270	Lower foliage becoming dry and papery	Feuillage inférieur devenant sec et semblable à du papier	Untere Blätter werden trocken und papierartig
275	Seed yellowish-white and rubbery; pods wrinkled and yellowish-green	Graine blanc jaunâtre et caoutchouteuse; gousse ridée et de couleur vert jaunâtre	Samen gelblichweiss und gummiartig; Hülsen schrumpfig und gelblichgrün
280	Stem drying out, becoming yellowish green	Dessèchement de la tige devenant vert jaunâtre	Stengel trocknet aus, wird gelblichgrün
285	Lowest pods yellowish-brown, dry and papery	Gousses inférieures de couleur brun jaunâtre, sèches et semblables à du papier	Unterste Hülsen gelblich-braun, trocken und papierartig
290	Stem becoming stiff and brittle and appearing yellowish-white	Tige devenant érigée et fragile, et de couleur blanc jaunâtre	Stengel wird steif und zerbrechlich und erscheint gelblichweiss
300	Lower and middle nodes with dry papery foliage; lower pods dry and papery	Feuillage sec et semblable à du papier sur tous les noeuds inférieurs et médians; gousses inférieures sèches et semblables à du papier	Untere und mittlere Knoten mit trockenen, papierartigen Blättern; untere Hülsen trocken und papierartig
305	All nodes with dry papery foliage; lower and middle pods dry and papery	Feuillage sec et semblable à du papier sur tous les noeuds; gousses inférieures et médianes sèches et semblables à du papier	Alle Knoten mit trockenen, papierartigen Blättern; untere und mittlere Hülsen trocken und papierartig
310	All nodes with dry papery foliage and pods; seed drying but not hard	Feuillage et gousses secs et semblables à du papier sur tous les noeuds; graine se desséchant, mais non dure	Alle Knoten mit trockenen, papierartigen Blättern und Hülsen; Samen trocknet, ist aber noch nicht hart
320	Hard dry seed	Graine dure et sèche	Harter trockener Samen

9. Literature

Biddle, A.J., Knott, C.M., 1988: The Pea Growing Handbook. Sixth edition. Ed. G.P. Gent. Processors and Growers Research Organisation, Peterborough, UK

Blixt, S., 1972: Mutation Genetics in *Pisum*. *Agri. Hort. Genet.*, 30, pp. 1-293

Blixt, S., 1974: The Pea. In *Handbook of Genetics*. Ed.R.C. King, Plenum Press, New York

Blixt, S., 1977: The Gene Symbols of *Pisum*. *Pisum Newsletter*, 9 (suppl.)

Casey, R., Davies, D.R., CAB International 1993: Peas: Genetics, Molecular Biology and Biotechnology. *Biotechnology in Agriculture Series*, No. 10.

Cousin, R., 1974: Les pois. étude génétique des caractères, classification, caractéristiques variétales portant sur les variétés inscrites au catalogue officiel français. Institut national de la recherche agronomique, Paris.

Fourmant, R., 1956: Les variétés de pois cultivés en France. Institut national de la recherche agronomique, Paris.

Hagedorn, D.J., 1984: Compendium of Pea Diseases. The American Phytopathological Society, Minnesota, LISA.

Hedrick, U.P., 1928: The Vegetables of New York. Vol. Part I: Peas. New York Agricultural Experiment Station Albany, New York, USA

Khvostova, V.V., 1983: Genetics and Breeding of Peas. Amerind Publishing Co. Pvt. Ltd. New Delhi

Lamprecht, H., 1974: Monographie der Gattung *Pisum*. Steiermarkische Landesdruckerei, Graz, AU

Makasheva, R.Kh., 1983: The Pea. Amerind Publishing Co. Pvt. Ltd., New Dehli

Marx, G.A., 1977: Classification, Genetics and Breeding. in 'The Physiology of the Garden Pea' (J.F. Sutcliffe and J.S. Pate, eds.) pp. 21-44. Academic Press. London and Orlando

Murfet, I.C., 1976: Physiological genetics of flowering in 'Physiology of the garden pea', Academic Press.

Murfet, I.C. 1985: in 'CRC Handbook of Flowering' Ed. A.H. Halevy, CRC Press, Boca Raton, IV, pp. 97-126

Murfet, I.C., Reid, J.B., 1985: The control of flowering and internode length in *Pisum*. In "The Pea Crop - a basis for improvement" Eds. Hebblethwaite, Heath, Dawkins. Butterworths, London, 6, pp. 67-80

Wellensiek, S.J., 1925*: Genetic monograph on *Pisum*. *Bibl. Genetica*, 2, pp. 343-47676

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	<input type="text" value="Pisum sativum L."/>	
1.2 Common Name	<input type="text" value="Pea"/>	
2. Applicant		
Name	<input type="text"/>	
Address	<input type="text"/>	
Telephone No.	<input type="text"/>	
Fax No.	<input type="text"/>	
E-mail address	<input type="text"/>	
Breeder (if different from applicant)	<input type="text"/>	
3. Proposed denomination and breeder's reference		
Proposed denomination (if available)	<input type="text"/>	
Breeder's reference	<input type="text"/>	

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

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 Plant: anthocyanin coloration (1)			
absent	Avola, Solara	1 []	
present	Pidgin, Rosakrone	9 []	
5.2 Stem: number of nodes up to and including first fertile node (6)			
very few	Kelvil	1 []	
few	Smart, Zero4	3 []	
medium	Markana, Susan	5 []	
many	Cooper	7 []	
very many	Regina	9 []	
5.3 Foliage: color (7)			
yellow green	Pilot	1 []	
green	Avola, Progreta	2 []	
blue green	Polar	3 []	
5.4 Leaf: leaflets (9)			
absent	Hawk, Solara	1 []	
present	Avola, Rhea	9 []	

TECHNICAL QUESTIONNAIRE		Page {x} of {y}	Reference Number:
Characteristics	Example Varieties	Note	
5.6 Stipule: flecking (21)			
absent	Lisa, Tafila	1 []	
present	Avola, Maro	9 []	
5.7 Time of flowering (25)			
very early	Tempo	1 []	
early	Smart, Zero4	3 []	
medium	Carlton, Waverex	5 []	
late	Cooper, Purser	7 []	
very late	Livioletta	9 []	
5.8 <u>Non-fasciated varieties only:</u> Plant: maximum number of flowers per node (26)			
two	Progress No. 9, Tyla	1 []	
two	Banff, Cooper	3 []	
three	Ultimo, Zodiac,	5 []	
four or more	Arnesa, Calibra, Survivor	7 []	
5.9 <u>Varieties with anthocyanin coloration only:</u> Flower: color of wing (27)			
white with pink blush		1 []	
pink	Rosakrone	2 []	
reddish purple	Assas	3 []	
5.10 Flower: shape of base of standard (30)			
strongly raised		1 []	
moderately raised	Progreta	3 []	
level	Markado, Solara	5 []	
moderately arched	Avola, Copper	7 []	
strongly arched	Boahtyr, Kennedy	9 []	

TECHNICAL QUESTIONNAIRE		Page {x} of {y}	Reference Number:
Characteristics	Example Varieties	Note	
5.11 Pod: length (38)			
very short	Cepia, Vermio	1	[]
short	Progreta, Solara	3	[]
medium	Copper, Jof	5	[]
long	Hurst Grrn Shaft, Protor	7	[]
very long	Tirabeque	9	[]
5.12 Pod: width (39)			
very narrow	Claire	1	[]
narrow	Picar, Ultimo	3	[]
medium	Progreta, Solara	5	[]
broad	Finale, Kahuna	7	[]
very broad	Kennedy	9	[]
5.13 Pod: parchent (40)			
not entire	Sugar Ann	1	[]
entire	Avola, Solara	2	[]
5.14 <u>Only varieties without entire parchent:</u> Pod: thickened wall (41)			
absent	Nofila, Reuzensuiker	1	[]
present	Cygnnet, Sugar Ann	9	[]
5.15 <u>Varieties without thickened pod wall only:</u> Pod: shape of distal part (42)			
pointed	Jof, Oskar	1	[]
blunt	Avola, Solara	2	[]

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:	
Characteristics	Example Varieties	Note	
5.16 Pod: color (45)			
yellow		1 []	
green	Avola, Solara	2 []	
blue-green	Show Perfection	3 []	
purple	Blauwschokker	4 []	
5.17 <u>Only varieties without entire parchment</u>: Pod: suture strings (47)			
absent or rudimentary	Nofila, Sugar Lace	1 []	
present	Crispi, Reuzensuiker	9 []	
5.18 Pod: number of ovules (48)			
few	De Grace, Phoenix	3 []	
medium	Backgammon, Hawk	5 []	
many	Karisma	7 []	
5.19 Immature seed: intensity of green color (49)			
light	Solara, Ultimo	3 []	
medium		5 []	
dark	Dark Skin Perfection, Hawaii	7 []	
5.20 Seed: type of starch grains (51)			
simple	Adagio, Maro, Solara,	1 []	
compound	Avola, Polar	2 []	

TECHNICAL QUESTIONNAIRE		Page {x} of {y}	Reference Number:
Characteristics	Example Varieties	Note	
5.21 Seed: color of cotyledon (54)			
green	Avola, Solara	1 []	
yellow	Caractacus, Hardy	2 []	
orange		3 []	
5.22 <u>Varieties with anthocyanin only</u>: Seed: marbling of testa (55)			
absent	Rif, Rhea	1 []	
present	Assas, Pidgin	9 []	
5.23 <u>Varieties with anthocyanin only</u>: Seed: violet or pink spots on testa (56)			
absent	Pidgin, Rif	1 []	
faint	Assas, Susan	2 []	
intense	Arvika, Rhea	3 []	
5.24 Seed: hilum color (57)			
not colored	Avola, Solara	1 []	
colored	Nofila, Rif	2 []	
5.25 Seed: weight (59)			
very low	Ultimo	1 []	
low	Hawk, Iceberg	3 []	
medium	Mammoth Melting Sugar, Phoenix	5 []	
high	Kennedy, Maro	7 []	
very high	Bamby, Kabuki	9 []	

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:
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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
<i>Example</i>	<i>Time of flowering</i>	<i>early</i>	<i>medium</i>

Comments:

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

Use

fresh market	<input type="checkbox"/>
canning	<input type="checkbox"/>
freezing	<input type="checkbox"/>
dry seed for human consumption	<input type="checkbox"/>
dry protein	<input type="checkbox"/>
forage	<input type="checkbox"/>
other (please specify)	<input type="checkbox"/>

.....

Resistance to disease	Resistant	Susceptible	Not tested
Fusarium Wilt (Race 1) (Common Wilt)	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Powdery mildew	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Ascochyta (leaf and pod spot) Race C	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Resistance to other diseases
 (please give details below)

.....

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:
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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:
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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".

.....

9.3 Has the plant material to be examined been tested for the presence of virus or other pathogens?

Yes []

(please provide details as specified by the Authority)

No []

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]