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UPOV

INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS

GENEVA

DRAFT

PEAS *

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 thirty-ninth session, to be held in Nitra, Slovakia from June 6 to 10, 2005
and
the Technical Working Party for Agricultural Crops at its thirty-fourth session to be held in Christchurch, New Zealand, from October 31 to November 4, 2005

Alternative Names:*

Botanical name	*English*	*French*	*German*	*Spanish*
Pisum sativum L.	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.

Other associated UPOV 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.]

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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 should be made on 20 plants or parts taken from each of 20 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) Seed: type of starch grain (characteristic 2)
(b) Seed: color of cotyledon (characteristic 3)
(c) Varieties with anthocyanin only: Seed: marbling of testa (characteristic 4)
(d) Varieties with anthocyanin only: Seed: violet or pink spots on testa (characteristic 5)
(e) Seed: hilum color (characteristic 6)

(f) Plant: anthocyanin coloration (characteristic 9)
(g) Leaf: leaflets (characteristic 18)
(h) Stipule: type of development (characteristic 26)
(i) Stipule: 'rabbit-eared' stipules (characteristic 27)
(j) Stipule: flecking (characteristic 34)
(k) Pod: parchment (characteristic 53)
(l) Varieties with no or partial parchment only: Pod: thickened wall (characteristic 54)
(m) Varieties without thickened pod wall only: Pod: shape of distal part (characteristic 57)
(n) Pod: color (characteristic 60)
(o) Pod: intensity of green color of immature seed (characteristic 61)

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 (Section 6.1.2)

(QL) Qualitative characteristic – see Chapter 6 (Section 6.3)
(QN) Quantitative characteristic – see Chapter 6 (Section 6.3)
(PQ) Pseudo-qualitative characteristic – see Chapter 6 (Section 6.3)

MG: single measurement of a group of plants or parts of plants – see Chapter 3.3.3
MS: measurement of a number of individual plants or parts of plants – see Chapter 3.3.3
VG: visual assessment by a single observation of a group of plants or parts of plants –see Chapter 3.3.3
VS: visual assessment by observation of individual plants or parts of plants – see Chapter 3.3.3

(a)-(b) See Explanations on the Table of Characteristics in Chapter 8.1

(+) See Explanations on the Table of Characteristics in Chapter 8.2

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

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
1.	**00 VG**	**Seed: shape**	**Graine: forme**	**Samen: Form**			
PQ	**(b)**	spherical	sphérique	kugelförmig		Nofila, Goeland	1
		ovoid	ovoïde	eiförmig		Solara	2
		cylindrical	cylindrique	zylindrisch		Span, Timo	3
		rhomboid	rhomboïde	rhomboid		Maro, Progreta	4
		triangular	triangulaire	dreieckig		Protor	5
		irregular	irrégulière	unregelmässig		Géant à fleur violette	6
2. (*) (+)	**00 VG**	**Seed: type of starch grains**	**Graine: forme du grain d'amidon**	**Samen: Form des Stärkekorns**			
QL		simple	lisse	einfach		Maro, Solara, Adagio	1
		compound	étoilé	zusammengesetzt		Avola, Polar	2
3. (+)	**00 VG**	**Seed: color of cotyledon**	**Graine: couleur des cotylédons**	**Samen: Farbe des Keimblatts**			
QL	**(b)**	green	verts	grün		Avola, Solara	1
		yellow	jaunes	gelb		Hardy, Caractacus	2
		orange	orange	orange		(Oliver)	3
4. (*)	**00 VG**	**Varieties with anthocyanin only Seed: marbling of testa**	**Variétés avec anthocyane seulement: Graine: marbrure des téguments**	**Nur Sorten mit Anthocyan: Samen: Marmorierung der Samenschale**			
QL	**(b)**	absent	absente	fehlend		Rif, Rhea	1
		present	présente	vorhanden		Assas, Birdie	9

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
5. (*)	**00 VG**	**Varieties with anthocyanin only: 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	**(b)**	absent	absentes	fehlend		Rif, Birdie	1
		faint	faibles	gering		Assas, Susan	2
		intense	intenses	intensiv		Arvika, Rhea	3
6. (*)	**00 VG**	**Seed: hilum color**	**Graine: couleur du hile**	**Samen: schwarze Nabelfarbe**			
QL	**(b)**	not black	autre que noir	anders als schwarz		Avola, Birdie	1
		black	noir	schwarz		Nofila, Rif	2
7.	**00 VG**	**Varieties with anthocyanin only: Seed: color of testa**	**Variétés avec anthocyane seulement: Graine: couleur du tégument**	**Nur Sorten mit Anthocyan: Samen: Farbe der Samenschale**			
PQ	**(b)**	reddish brown	brun rougeâtre	rötlichbraun		Pidgin, Rosakrone	1
		brown	brun	braun		Poneka	2
		brownish green	vert brunâtre	bräunlichgrün		Lisa, Susan	3
8. (+)	**00 VG**	**Varieties with unwrinkled seed and simple starch grains only: Seed: dimpled cotyledons**	**Variétés avec graines sans rides et avec grains d'amidon lisses seulement: Graine: fossettes sur les cotylédons**	**Nur Sorten mit Samen ohne Schrumpfung und mit einfachen Stärkekörnern: Samen: Grübchen des Keimblatts**			
QL	**(b)**	absent	absentes	fehlend		Columbia, Solara	1
		present	présentes	vorhanden		Maro, Progreta	9
9.	**00 - 320 VG**	**Plant: anthocyanin coloration**	**Plante: pigmentation anthocyanique**	**Pflanze: Anthocyan-färbung**			
QL		absent	absente	fehlend		Avola, Solara	1
		present	présente	vorhanden		Pidgin, Rosakrone	9

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
10. **(+)**	**218 MG/ VC**	**Plant: height (at flowering)??**	**Plante: hauteur**	**Pflanze: Höhe**			
QN		very short	très petite	sehr niedrig		Columbia	1
		short	petite	niedrig		Solara, Mini	3
		medium	moyenne	mittel		Lord Chancellor, Toskana	5
		tall	grande	hoch		Blauwschokker, Rhea	7
		very tall	très grande	sehr hoch		Livioletta	9
11. **(+)**	**30-199 VG**	**Stem: fasciation**	**Tige: fasciation**	**Stengel: Verbänderung**			
QL		absent	absente	fehlend		Avola, Solara	1
		present	présente	vorhanden		Bikini, Rosakrone	9
12. **(+)**	**240 MS**	**Stem: length**	**Tige: longueur**	**Stengel: Länge**			
QN		very short	très petite	sehr kurz		Elma	1
		short	petite	kurz		Birte, Mini	3
		medium	moyenne	mittel		Lord Chancellor, Minor	5
		long	grande	lang		Blauwschokker, Livia	7
		very long	très grande	sehr lang		Enka	9
13. **(*)**	**230 – 240 MS**	**Stem: number of nodes up to and including first fertile node**	**Tige: nombre de noeuds jusqu'au premier noeud fertile inclus**	**Stengel: Anzahl Knoten bis einschliesslich des ersten Blütenstandes**			
QN		very few	très petit	sehr gering		Kelvil	1
		few	petit	gering		Miragreen, Waverking	3
		medium	moyen	mittel		Markana, Susan	5
		many	grand	gross		Cooper	7
		very many	très grand	sehr gross		Regina	9

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
14.	**30-240 VG**	**Stem: anthocyanin coloration of axil**	**Tige: pigmentation anthocyanique au point d'insertion du stipule**	**Stengel: Anthocyanfärbung der Achsel**			
QL		absent	absente	fehlend		Avola, Maro	1
		present	présente	vorhanden		Assas, Caroubel	9
15.	**30-240 VG**	**Stem: type of anthocyanin coloration of axil**	**Tige: type de la pigmentation anthocyanique au point d'insertion du stipule**	**Stengel: Typ der Anthocyanfärbung der Achsel**			
QL		single ring	anneau simple	einfacher Ring		Assas, Tirabeque	1
		double ring	anneau double	doppelter Ring		Caroubel, (Enka)	2
16. (*)	**40-240 VG**	**Foliage: color**	**Feuillage: couleur**	**Laub: Farbe**			
PQ	**(a)**	yellow green	vert jaune	gelbgrün		Pilot	1
		green	vert	grün		Avola, Progreta	2
		blue green	vert bleu	blaugrün		Polar	3
17. (+)	**40-240 VG**	**<u>Varieties with green foliage only</u>: Foliage: intensity of color**					
QN	**(b)**	light	claire	hell		Twinkle, Algera	3
		medium	moyenne	mittel		Lisa, Rondo	5
		dark	foncée	dunkel		Waverex	7
18. (*)	**20-240 VG**	**Leaf: leaflets**	**Feuille: folioles**	**Blatt: Blattfiedern**			
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
19.	**20-240 VG**	**Leaf: waxiness of surface of upper leaflet**	**Feuille: pruine sur la surface de la foliole supérieure**	**Blatt: Wachsschicht der Oberfläche der obersten Blattfieder**			
QL		absent	absente	fehlend		(Citrina)	1
		present	présente	vorhanden		Avola, Maro	9
20.	**30-240 MS or VG**	**Leaf: average maximum number of leaflets**	**Feuille: nombre maximal moyen de folioles**	**Blatt: durchschnittliche maximale Anzahl von Blattfiedern**			
QN		few	petit	gering		Jof	3
		medium	moyen	mittel		Dark Skin Perfection, Finale	5
		many	grand	gross		Ultimo	7
21.	**216-226 MS/ VG**	**Leaflet: size (largest leaf at second flowering node)**	**Foliole: taille (la plus grand feuille au deuxième noeud florifère)**	**Blattfieder: Grösse (grösstes Blatt am zweiten blütentragenden Knote)**			
QN		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
22.	**216-226 MS/ VG**	**Leaflet: length**	**Foliole: longueur**	**Blattfieder: Länge**			
QN		short	courte	kurz		Polar, Eagle	3
		medium	moyenne	mittel		Bohatyr, Dakota	5
		long	longue	lang		Delikata, Mammoth Melting Sugar	7

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
23.	**216-226 MS/ VG**	**Leaflet: width**	**Foliole: largeur**	**Blattfieder: Breite**			
QN		narrow	étroite	schmal		Alouette, Grapis	3
		medium	moyenne	mittel		Dakota, Irina	5
		broad	large	breit		Adept, Tirabeque	7
24.	**216-226 MS/ VG**	**Leaflet: distance from widest point to base**	**Foliole: distance du point le plus large à la base**	**Blattfieder: Abstand zwischen der grössten Breite und der Basis**			
QN		short	petite	klein		Griffin, Progreta	3
		medium	moyenne	mittel		Columbia, Maro	5
		long	grande	gross		Nobel, Salome	7
25. **(+)**	**30-240 VG**	**Leaflet: dentation**					
QN		absent or very weak	très faible	sehr gering		Progreta	1
		weak	faible	gering		Snowflake	3
		medium	moyenne	mittel		Miracle	5
		strong	forte	stark		Amos	7
		very strong	très forte	sehr stark		Sugar Star	9
26.	**30-240 VG**	**Stipule: type of development**	**Stipule: type de développement**	**Nebenblatt: Art der Entwicklung**			
QL		rudimentary	rudimentaire	rudimentär		(Filby)	1
		well developed	bien développé	voll entwickelt		Avola, Progreta, Solara	2

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
27. **(+)**	**30-240 VG**	**Stipule: 'rabbit-eared' habit**	**Stipule: stipules en forme d'oreilles de lapin**	**Nebenblatt: hasenohrartige Nebenblätter**			
QN		absent or very weak	absentes ou très faibles	fehlend oder sehr schwach		Avola, Maro	1
		moderately expressed	moyennement expressés	mittelmäβig ausgeprägt			2
		strongly expressed	fortement expressés	stark ausgeprägt		Ibiza, Progreta	3
28. **(+)**	**216-226**	**Stipule: length**	**Stipule: longueur**	**Nebenblatt: Länge**			
QN	**MS/ VG**	short	courte	kurz		Eagle, Steffi	3
		medium	moyenne	mittel		Twinkle, Timo	5
		long	longue	lang		Alderman, Rhea	7
29. **(+)**	**216-226 MS/ VG**	**Stipule: width**	**Stipule: largeur**	**Nebenblatt: Breite**			
QN		narrow	étroite	schmal		Eagle, Steffi	3
		medium	moyenne	mittel		Twinkle, Timo	5
		broad	large	breit		Nettuno, Mammoth Melting Sugar	7
30.	**216-226 MS/ VG**	**Stipule: size**	**Stipule: taille**	**Nebenblatt: Grösse**			
QN		small	petite	klein		Alfetta, Dakota	3
		medium	moyenne	mittel		Jackpot, Misty	5
		large	grande	gross		Beetle, Manille	7

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
31. **(+)**	**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**			
QN		short	courte	kurz		Alfetta, Fortress	3
		medium	moyenne	mittel		Orka, Cabree	5
		long	longue	lang		Beetle, Manille	7
32. **(+)**	**216-226 MS**	**Stipule: length from axil to base**	**Stipule: longueur du point d'insertion au stipule à l'extrémité**	**Nebenblatt: Länge zwischen der Achsel und der Basis**			
QN		short	courte	kurz		Toskana, Dakota	3
		medium	moyenne	mittel		Eiffel, Misty	5
		long	longue	long		Quantum, Manille	7
33. **(+)**	**216-226 MS**	**Stipule: length of lobe below axil**					
QN		short				Ramrod, Dakota	3
		medium				Kahuna, Twinkle	5
		long				Eden, Quantum	7
34. **(*)** **(+)**	**20-240 VG**	**Stipule: flecking**	**Stipule: macules**	**Nebenblatt: Marmorierung**			
QL		absent	absentes	fehlend		Lisa, Tafila	1
		present	présentes	vorhanden		Avola, Maro	9
35. **(+)**	**20-240 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		Waxwing, Backgammon	3
		medium	moyenne	mittel		Ambassador, Accent	5
		dense	dense	dicht		Sephia, Avola	7
		very dense	très dense	sehr dicht		Oregon Sugar Pod	9

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
36. **(+)**	**216-226 MS/ VG**	**Petiole: length (from axil to the first leaflet or tendril)**					
QN		short				Hellas, Keo	3
		medium				Avola, Solara	5
		long				Saskia, Tafila	7
37. **(+)**	**216-226 MS/ VG**	**<u>Varieties without leaflets only</u>: Petiole: total length (from axil to last tendril)**					
QN		short				Choucas, Fredrio	3
		medium				Alambo, Alezan	5
		long				Calao, Arosa	7
38. **(+)**	**214 MS/ VG**	**Time of flowering**	**Epoque de floraison**	**Zeitpunkt der Blüte**			
QN		very early	très précoce	sehr früh		Tempo	1
		early	précoce	früh		Smart, Sparkle	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
39. (*)	**216-226 MS/ VG**	**Non-fasciated varieties only: Plant: maximum number of flowers per node**	**Variétés non-fasciées seulement: Plante: nombre maximal de fleurs par noeud**	**Nur nicht-verbänderte Sorten: Pflanze: maximale Anzahl Blüten pro Knoten**			
QN		one	une	eine		Progress No. 9, Tyla	1
		one to two	une à deux	eine bis zwei		American Wonder, Maro	2
		two	deux	zwei		Banff, Cooper	3
		two to three	deux à trois	zwei bis drei		Samish, Waverking	4
		three	trois	drei		Nettuno, Ultimo	5
		three to four	trois à quatre	drei bis vier		Twilight, Athena	6
		four or more	quatre ou plus	vier oder mehr			7
40. (*)	**216-218 VG**	**Varieties with anthocyanin only: Flower: anthocyanin coloration of wing**	**Variétés avec anthocyane seulement: Fleur: pigmentation anthocyanique de l'aile**	**Nur Sorten mit Anthocyan: Blüte: Anthocyanfärbung des Flügels**			
PQ		pink blush	rose pâle	blassrosa		Golf	1
		pink	rose	rosa		Rosakrone	2
		reddish purple	pourpre rougeâtre	rötlich purpur		Assas	3
41. (+)	**216-218 VG**	**Varieties without anthocyanin only: Flower: color of standard**	**Variétés sans anthocyane seulement: Fleur: couleur de l'étendard**	**Nur Sorten ohne Anthocyan: Blüte: Farbe der Fahne**			
PQ		white	blanc	weiss		Gloton, Record	1
		whitish cream	blanc à crème	weiss bis cremefarben		Maro, Cooper	2
		cream	crème	cremefarben		Orcado, Cratos	3

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
42. **(+)**	**216-218**	**Flower: width of standard**	**Fleur: largeur maximale de l'étendard**	**Blüte: maximale Breite der Fahne**			
QN	**MS/ VG**	narrow	étroite	schmal		Progreta, Eagle	3
		medium	moyenne	mittel		Cooper, Bikini	5
		broad	large	breit		Pilot, Birdie	7
43. **(+)**	**216-218 VG**	**Flower: shape of base of standard**	**Fleur: forme de la base de l'étendard**	**Blüte: Form des Fahnengrunds**			
QN		strongly raised	fortement cunéiforme	stark keilförmig			1
		raised	cunéiforme	keilförmig		Progreta, Picar	3
		level	droite	gerade		Markado, Solara	5
		arched	arquée	zweilappig		Avola, Cooper	7
		strongly arched	fortement arquée	stark zweilappig		Bohatyr, Kennedy	9
44.	**216-218 VG**	**Flower: intensity of undulation of standard**	**Fleur: intensité de l'ondulation de l'étendard**	**Blüte: Intensität der Wellung der Fahne**			
QN		absent or very weak	nulle ou très faible	fehlend oder sehr gering		Ultimo, Woody	1
		weak	faible	gering		Cooper, Dakota	3
		medium	moyenne	mittel		Alex, Kodiak	5
		strong	forte	stark		Reveille, Koka	7
		very strong	très forte	sehr stark		Téléphone nain, Télévision	9
45.	**216-218 VG**	**Flower: width of upper sepal (at second fertile node)**	**Fleur: largeur du sépale**	**Blüte: Breite des Kelchblatts**			
QN		narrow	étroite	schmal		Abador	3
		medium	moyenne	mittel		Conservor	5
		broad	large	breit		Kodiak	7

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
46.	**212-240 VG**	**Flower: shape of apex of upper sepal (at second flowering node)**	**Fleur: forme du sommet du sépale supérieur(au deuxième noeud florifère)**	**Blüte: Form der Spitze des oberen Kelchblatts(am zweiten blütentragenden Knoten)**			
PQ		accuminate	acuminé	mit langer ausgezogener Spitze		Dawn	1
		pointed	pointu	zugespitzt		Kelvedon Wonder	2
		rounded	arrondi	abgerundet		Kodiak	3
47. **(+)**	**235-245 MS/ VG**	**Peduncle: length from stem to first pod**					
QN		short	court	kurz		Goblin, Orcado	3
		medium	moyen	mittel		Bohatyr, Maro	5
		long	long	lang		Kabuki, Reveille	7
48. **(+)**	**MS/ VS**	**Peduncle: length of between 1st and second pods**					
QN		short				Atila, Alize	3
		medium				Access, Kirio	5
		long				Alex, Aladin	7
49. **(+)**	**MS/ VS**	**Peduncle: length of spur**					
QN		short				Cabro, Kirio	3
		medium				Rialto, Metaxa	5
		long				Alezan, Calao	7
50.	**MS/ VS**	**Peduncle: number of bracts**					
QN		absent or very few				Kirio, Fauvette	3
		medium				Delta, Duez	5
		many				Eiffel, Goelan	7

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
51.	**240 MS/ VG**	**Pod: length (as for 46)**	**Gousse: longueur (comme pour 46)**	**Hülse: Länge (wie unter 46)**			
QN	**(a)**	very short	très courte	sehr kurz		Vermio, Cepia	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		Roi de Carouby	9
52. (*) (+)	**240 MS/ VG**	**Pod: width (as for 46)**	**Gousse: largeur maxi male (comme pour 46)**	**Hülse: maximale Breite(wie unter 46)**			
QN	**(a)**	very narrow	très étroite	sehr schmal		Disco	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
53. (+)	**310 VG**	**Pod: parchment**	**Gousse: parchemin**	**Hülse: Pergamentschicht**			
QL	**(a)**	absent or partial	absent	fehlend		Sugar Ann	1
		entire	entièrement présent	vollständig vorhanden		Avola, Solara	2
54.	**240 VG**	**Varieties with no or partial parchment only: Pod: thickened wall**	**Variétés sans parchemin ou avec parchemin partiel seulement: Gousse: paroi épaisse**	**Nur Sorten mit fehlender oder teilweise vorhandener Pergamentschicht: Hülse: verdickte Wand**			
QL	**(a)**	absent	absente	fehlend		Nofila, Reuzensuiker	1
		present	présente	vorhanden		Cygnet, Sugar Ann	9

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
55. **(+)**	**235 – 240 VG**	**Pod: type of concave curvature**					
QL		curvature along the length of the pod				Edula	1
		curvature towards the pod apex only				Jof	2
56. **(*)** **(+)**	**240 VG**	**Pod: degree of curvature**	**Gousse: intensité de la courbure**	**Hülse: Stärke der Krümmung**			
QN	**(a)**	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		Crispi, Oskar	9
57. **(*)** **(+)**	**240 VG**	**<u>Varieties without thickened pod wall only</u>: Pod: shape of distal part**	**<u>Variétés à gousse sans paroi épaisse seulement</u>: Gousse: forme de la partie distale**	**<u>Nur Sorten ohne verdickte Hülsenwand</u>: Hülse: Form des Hülsenendes**			
QL	**(a)**	pointed	pointue	zugespitzt		Jof, Oskar	1
		blunt	tronquée	stumpf		Avola, Solara	2
58. **(+)**	**240 VS MS**	**Pod: position of the ovary compared to the midpoint of the pod**					
		above				Edula, Carlton	1
		level				Banff	2
		below				Avola, Hawk	3

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
59. **(+)**	**240 VS MS**	**Pod: postion of the apex compared to the midpoint of the seed-bearing suture**					
		above				Edula, Jof	1
		level				Milor, Pluton	2
		below					3
60. **(*)**	**240 VG**	**Pod: color**	**Gousse: couleur**	**Hülse: Farbe**			
PQ	**(a)**	yellow	jaune	gelb		(Orlex)	1
		green	verte	grün		Avola, Solara	2
		blue-green	vert bleu	blaugrün		Miracle, Miragreen	3
		purple	pourpre	purpur		Blauwschokker	4
61.	**240 VG**	**Pod: intensity of green color**	**Gousse: intensité de la couleur verte**	**Hülse: Intensität der grünen Farbe**			
QN	**(a)**	light	claire	hell		Ultimo, Solara	3
		medium	moyenne	mittel			5
		dark	foncée	dunkel		Hawaii, Dark Skin Perfection	7
62.	**240-245 VG**	**Varieties with no or partial parchment only: Pod: suture strings**	**Variétés sans parcheminou avec parchemin partiel seulement: Gousse: fils de la suture**	**Nur Sorten mit fehlender oder teilweise vorhandener Pergamentschicht: Hülse: Fäden der Naht**	-		
QL	**(a)**	absent or rudimentary	absents ou rudimentaires	fehlend oder rudimentär		Nofila, Sugar Lace	1
		present	présents	vorhanden		Reuzensuiker, Crispi	9

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
63.	**240-255 VG**	**<u>Varieties with anthocyanin only</u>: Pod: anthocyanin coloration of suture**	**<u>Variétés avec anthocyane seulement</u>: Gousse: pigmentation anthocyanique de la suture**	**<u>Nur Sorten mit Anthocyan</u>: Hülse: Anthocyanfärbung der Naht**			
QL	**(a)**	absent	absente	fehlend		Pidgin, Desiree	1
		present	présente	vorhanden		Lisa, Super Delicia	9
64.	**240-255 VG**	**<u>Varieties with anthocyanin only</u>: Pod: spots of anthocyanin color-ation on outer wall**	**<u>Variétés avec anthocyane seulement</u>: Gousse: pigmentation anthocyanique en taches sur la paroi externe**	**<u>Nur Sorten mit Antho cyan</u>: Hülse: Antho- - cyanflecke auf der Aussenwand**			
QL	**(a)**	absent	absente	fehlend		Sirius, Lisa	1
		present	présente	vorhanden		Pidgin, Caroubel	9
65. (*) (+)	**230-240 MS**	**Pod: number of ovules**	**Gousse: nombre d'ovules**	**Hülse: Anzahl Samen- anlagen**			
QN	**(a)**	few	faible	gering		Pegas, De Grace	3
		medium	moyen	mittel		Hawk, Backgammon	5
		many	élevé	gross		Karisma	7
66.	**230-240 VG**	**Pod: intensity of green color of immature seed**	**Gousse: intensité de la couleur verte de la graine immature**	**Hülse: Intensität der grünen Farbe des unreifen Samens**			
QN	**(a)**	light	claire	hell		Ultimo, Solara	3
		medium	moyenne	mittel			5
		dark	foncée	dunkel		Dark Skin Perfection, Hawaii	7

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
67.	**MG VG**	**Plant: height when green seed fully developed**					
QN		very short				Columbia, Birgit	1
		short				Hawk, Alfetta	3
		medium				Birdie, Gotik	5
		tall				Show Perfection, Livioletta	7
		very tall				Mammoth Melting Sugar, Rhea	9
68.	**320 MS/ VG**	**Seed: time of maturity**	**Graine: époque de maturité**	**Samen: Zeitpunkt der Reife**			
QN	**(b)**	very early	très précoce	sehr früh			1
		early	précoce	früh		(Belinda), (Bodil)	3
		medium	moyenne	mittel		Finale, (Livia)	5
		late	tardive	spät		(Minor)	7
		very late	très tardive	sehr spät		NFG Krupp Peluschke	9
69.	**320 VG**	**Seed: wrinkling of cotyledon**	**Graine: intensité des rides sur les cotylédons**	**Samen: Stärke der Schrumpfung des Keimblatts**			
QN	**(b)**	absent or very weak	faible	gering		Maro, Solara	3
		weak				Jessy, Merle	
		medium	moyenne	mittel		(Zorba), (Calama)	5
		strong	forte	stark		Sherwood, Esprit	7
		very strong				(Sparkle), Oskar	9

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
70. (*) (+)	**320 MG**	**Seed: 100 seed weight**	**Graine: poids de 10 semences**	**Samen: 100 Samengewicht**			
QN	**(b)**	very low				Ultimo	1
		low				Hawk, Iceberg	3
		medium				Mammoth Melting Sugar, Toskana	5
		high				Kennedy, Maro	7
		very high				Bamby, Cratos	9
71. (+)	**VS**	**Resistance to <u>Fusarium oxysporum</u> f. sp. <u>pisi</u>**	**Résistance à <u>Fusarium oxysporum</u> f. sp. <u>pisi</u>**	**Resistenz gegen <u>Fusarium oxysporum</u> f. sp. <u>pisi</u>**			
QL							
71.1		**Race 1**	**Race 1**	**Pathotyp 1**			
		absent	absente	fehlend		JI 1365 ex 'Little Marvel'	1
		present	présente	vorhanden		JI 1362 ex 'Dark Skin Perfection'	9
71.2		**Race 2**	**Race 2**	**Pathotyp 2**			
		absent	absente	fehlend		JI 1363 ex WSU 28	1
		present	présente	vorhanden		JI 1364 ex WSU 23	9
71.3		**Race 5**	**Race 5**	**Pathotyp 5**			
		absent	absente	fehlend		JI 1365 ex 'Little Marvel'	1
		present	présente	vorhanden		JI 1364 ex WSU 23	9

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
71.4		**Race 6**	**Race 6**	**Pathotyp 6**			
		absent	absente	fehlend		JI 1365 ex 'Little Marvel'	
		present	présente	vorhanden		JI 1363 ex WSU 28	
72.	**VG**	**Resistance to <u>Erysiphe pisi</u> Syd**	**Résistance à <u>Erysiphe pisi</u> Syd.**	**Resistenz gegen <u>Erysiphe pisi</u> Syd.**			
(+)							
QL		absent	absente	fehlend		JI 502 ex 'Rondo'	1
		present	présente	vorhanden		JI 1559 ex Mexique 4	9
73.	**VS**	**Resistance to <u>Ascochyta pisi</u>, Race C**	**Résistance à <u>Ascochyta pisi</u>, race C**	**Resistenz gegen <u>Ascochyta pisi</u>, Pathotyp C**			
(+)							
QL		absent	absente	fehlend		JI 394 ex 'Kelvedon Wonder'	1
		present	présente	vorhanden		JI 502 ex 'Rondo'	9
74.	**VS**	**Resistance to <u>Pseudomonas syringae</u> pv. <u>pisi</u>**	**Résistance à <u>Pseudomonas syringae</u> pv. <u>pisi</u>**	**Resistenz gegen <u>Pseudomonas syringae</u> pv. <u>pisi</u>**			
(+)							
QL							
74.1		**Pathovar 2**	**Pathotype 2**	**Pathotyp 2**			
		absent	absente	fehlend		JI 2430 ex 'Kelvedon Wonder'	1
		present	présente	vorhanden		JI 2431 ex 'Early Onward'	9
74.2		**Pathovar 4**	**Pathotype 4**	**Pathotyp 4**			
		absent	absente	fehlend		JI 2431 ex 'Early Onward'	1
		present	présente	vorhanden		JI 2439 ex 'Fortune'	9

		English	français	deutsch	español	Example Varieties/ Exemples/ Beispielssorten/ Variedades ejemplo	Note/ Nota
75. (+)	**VS**	**Resistance to Seed-borne Mosaic Virus (SbmV) Strain P1**	**Résistance au virus de la mosaïque transmis par les semences (SbmV) race P1**	**Resistenz gegen Saatgutübertragenes Blattrollmosaikvirus (SbmV) Pathotyp P1**			
QL		absent	absente	fehlend		JI 363 ex 'Lincoln'	1
		present	présente	vorhanden		JI 968 ex WBH 1779	9
76. (+)	**VS**	**Resistance to Bean Yellow Mosaic Virus (BYMV)**	**Résistance au virus de la mosaïque jaune du Haricot (BYMV)**	**Resistenz gegen Gelbes Bohnenmosaikvirus (BYMV)**			
QL		absent	absente	fehlend		JI 502 ex 'Rondo'	1
		present	présente	vorhanden		JI 394 ex 'Kelvedon Wonder'	9
77. (+)	**VS**	**Resistance to Pea Enation Mosaic Virus (PEMV)**	**Résistance au virus enation de la mosaïque du Pois (PEMV)**	**Resistenz gegen Scharfes Adernmosaik (PEMV)**			
QL		absent	absente	fehlend		ex 'Dark Skin Perfection'	1
		present	présente	vorhanden		ex 'Perfected Freezer 60'	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) Foliage and pod: Unless otherwise indicated, all observations on the foliage and the pod should be made before green harvest maturity.

(b) Seed: All observations on the seed should be made on dry seed and, with the exception of characteristics 2 and 9, on seed harvested on the plots.

8.2 Explanations for individual characteristics

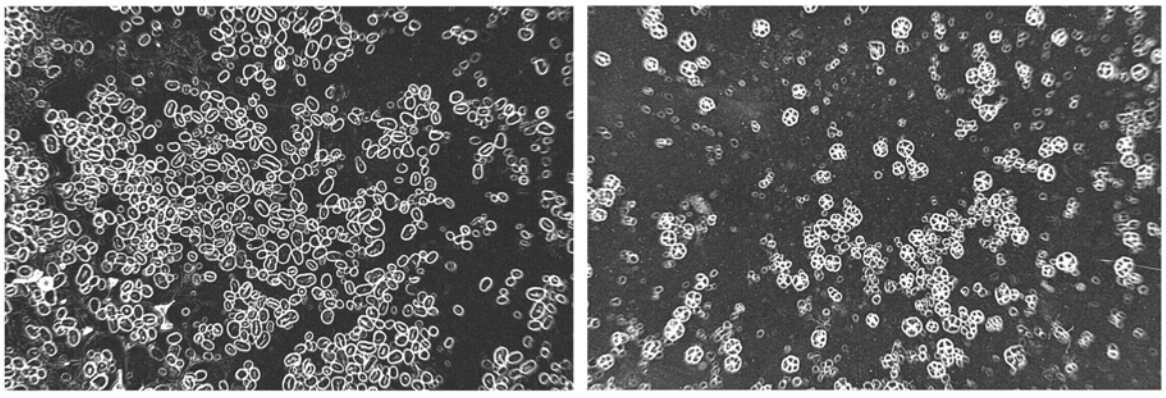
Ad. 2: Seed: type of starch grains

(l) 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 easy 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. Too much pressure during squashing causes grain fragmentation.



1
simple

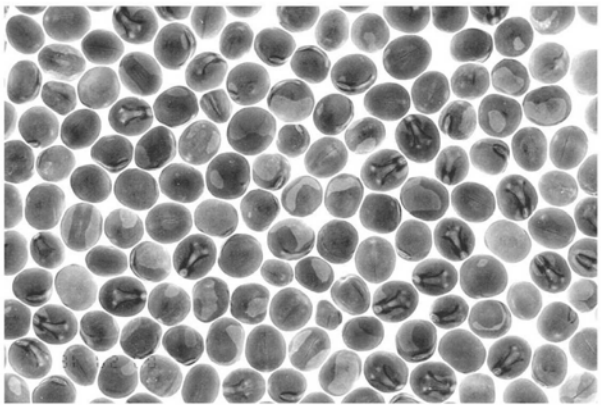
2
compound

Ad. 3: Seed: color of cotyledon

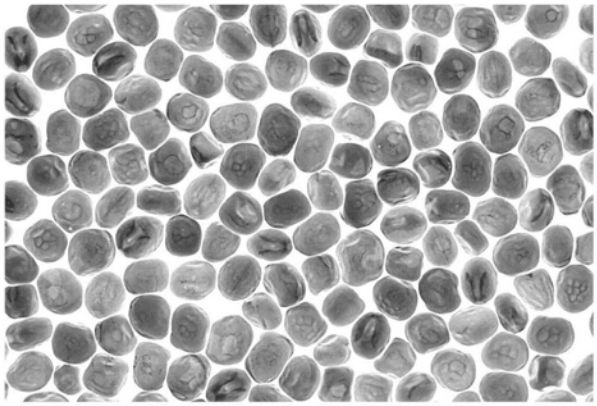
Following the removal of the testa, the seed is cut along the line of the cotyledon suture. Color assessment should be made in comparison with example varieties. Dry immature seeds should be excluded from the assessment.

Ad. 8: Varieties with unwrinkled seed and simple starch grains only: Seed: dimpled cotyledons

Record, for varieties with unwrinkled seed and simple starch grains, on dry seed within 9 months of harvest. Seed should not be immature. Dimpling is recorded as present when the seed surface is very slightly 'rippled', as typified by Marrowfat seeds.



1
absent



2
present

Ad. 10: Plant: height (at flowering)?

The observations should be made when at least 30% of the plants have one flower open.

Ad. 11: Stem: fasciation

In conditions of long daylength, the growing point in fasciated varieties may divide resulting in multiple flowers or parts of flowers and ribbed and flattened stems, sometimes up to 3 cm wide. Varieties which express fasciation, may not do so in growing environments with shorter daylengths. Flower and pod counts should not be assessed on varieties which are expressing fasciation.

Ad. 12: Stem: length

The observations should be made on harvested plants at mature green seed stage. The measurement should include the first two nodes with scale leaves.

Ad. 25: Leaflet: dentation

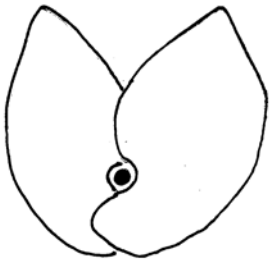
The maximum expression should be recorded; observations should be made over the whole plant, with the exception of the lowest six nodes and all aerial and basal branches.

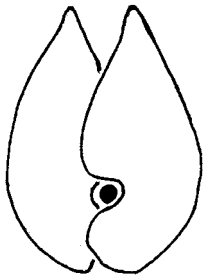
Still to be provided

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

Ad. 27: Stipule: 'rabbit-eared' habit

'Rabbit-eared' stipules are parallel, rather than divergent, with pointed tips. Strong expression is linked with flowers that have a raised standard base shape and narrower more gracile leaflets.

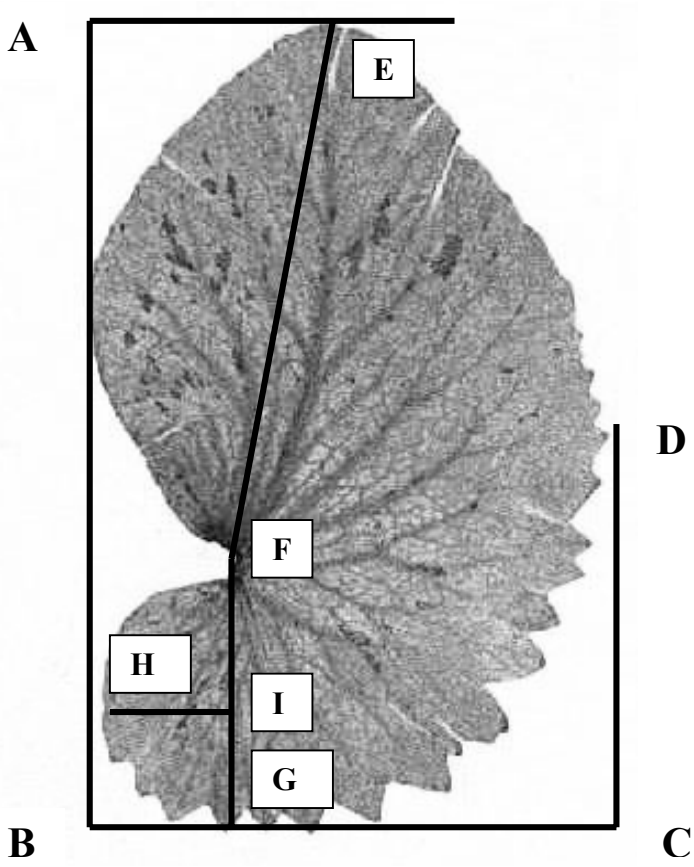




1	2	3
absent or very weak	moderately expressed	strongly expressed

Ads. 28, 29, 31, 32, 33: Stipule: length (28), Stipule: width (29), Stipule: length from axil to tip (31), Stipule: length from axil to base (32), Stipule: length of lobe below axil (33)

The observations should be made at the second fertile node on stipules which have been detached from the plant and flattened.



Stipule: length (28)	A - B
Stipule width (29)	B - C
Stipule: length from axil to tip (31)	E – F
Stipule: length from axil to base (32)	F – G
Stipule: length of lobe below axil (33)	H - I

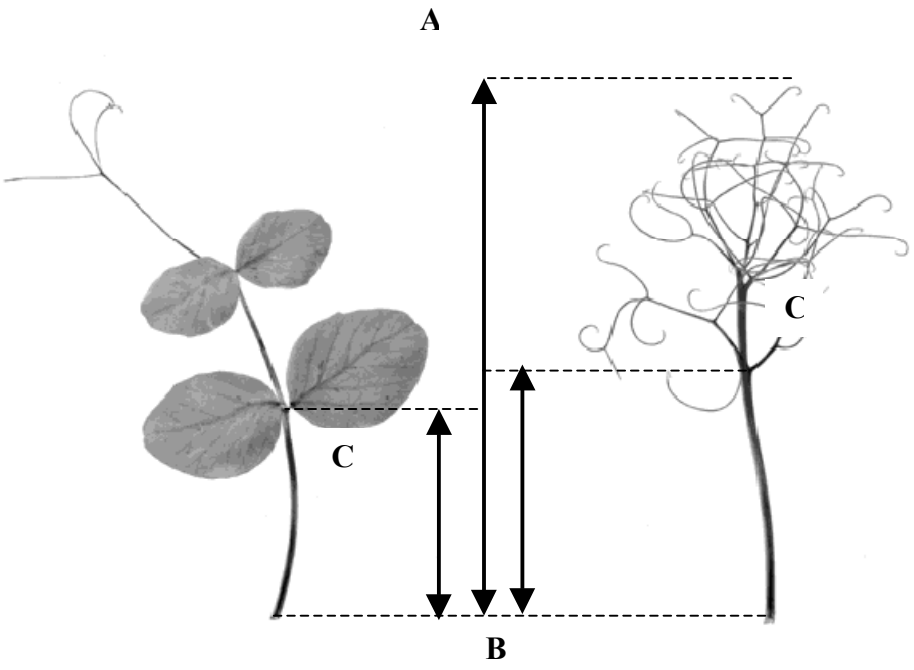
Ads. 34 and 35: Stipule: flecking (34) and Stipule: maximum density of flecking (35)

The observations should be made over the whole plant. Care has to be taken to ensure 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. Assessment should be made on the main stem only.

Still to be provided

1	3	5	7	9
very sparse	sparse	medium	dense	very dense

Ads. 36 and 37: Petiole: length (from axil to the first leaflet or tendril) (36), Varieties without leaflets only: Petiole: total length (from axil to last tendril) (37)



Petiole length from axil to the first leaflet or tendril	B - C
Total length of petiole including tendrils	A - B

The observations should only be made at the second fertile node. The length should be recorded from the axil to the point where the first tendril branches.

Ad. 38: Time of flowering

The observations should not be made before 30% of the plants have at least one flower open.

Ad. 41: Varieties without anthocyanin only: Flower: color of standard

The color of standard should be recorded on flowers which are fully opened, and fresh. Assessment should be made in comparison with example varieties.

Ad. 42: Flower: width of standard

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

Ad. 43: Flower: shape of base of standard

The standard should be detached and flattened on a hard surface

1	3	5	7	9
strongly raised	raised	level	arched	strongly arched

Ads. 47, 48, 49: Peduncle: length from stem to first pod (47), Peduncle: length between first and second pods (48), Peduncle: length of spur (49)

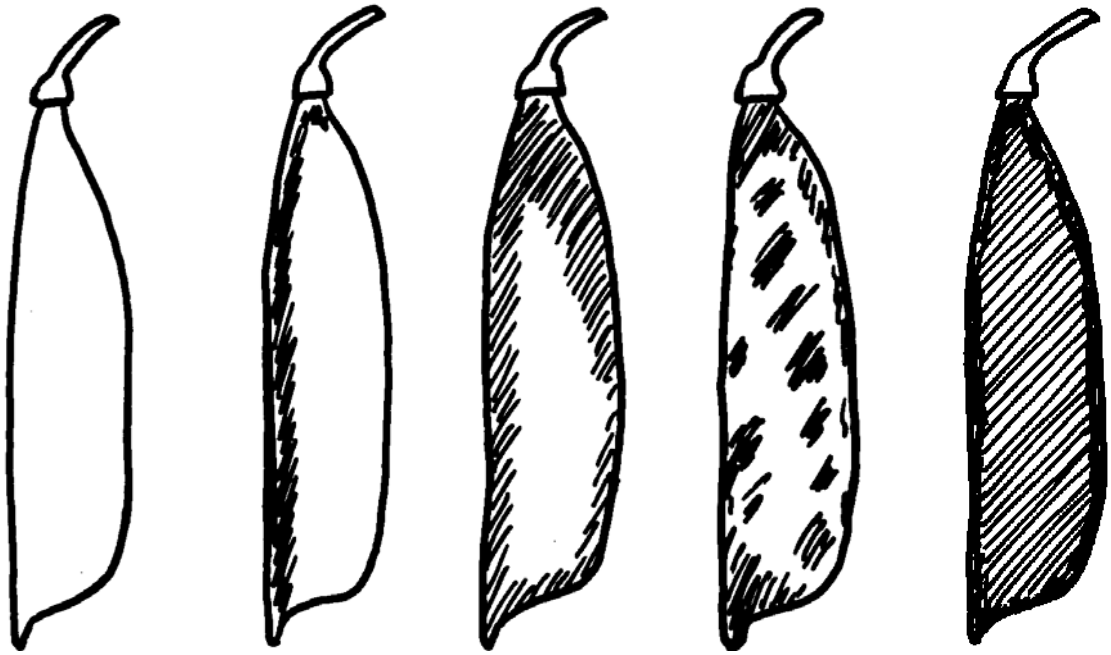
The observations should be made at the first flowering node. Measurements should be taken from the axil to the first node or bend in the peduncle.

Illustration to be provided from material in 2005 field trial

Ad. 52: Pod: width (at second flowering node)

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

Ad. 53: Pod: parchment

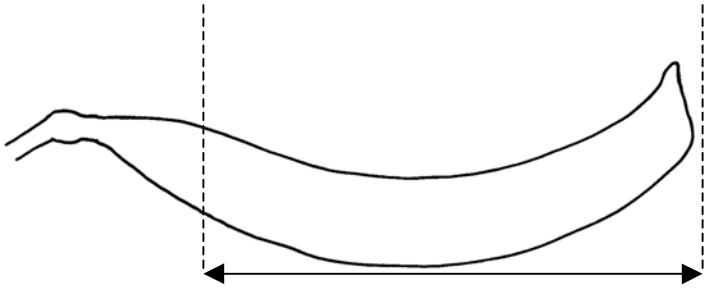


1	1	1	1	2
absent or partial	absent or partial	absent or partial	absent or partial	entire

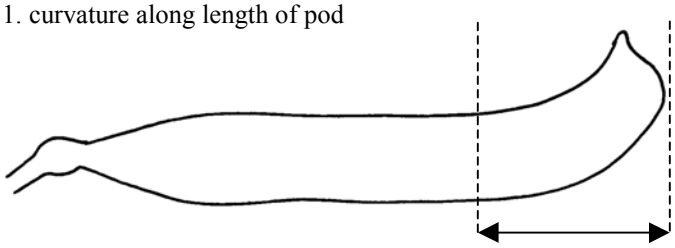
(l) The observations should be made on dry pods with the exception of 'Snap Peas', which have thickened pod walls; these are best recorded when green, in order to minimize fungal infection which obscures assessment

(2) The pod should be opened along the suture without damaging the edges of the two valves. The distribution of sclerenchyma, which makes up the parchment, may either be observed by staining with Phoroglucinol in Hydrochloric Acid, or by reflecting light (preferably daylight) on the inside of the pod wall

Ad. 55: Pod: type of concave curvature



1. curvature along length of pod



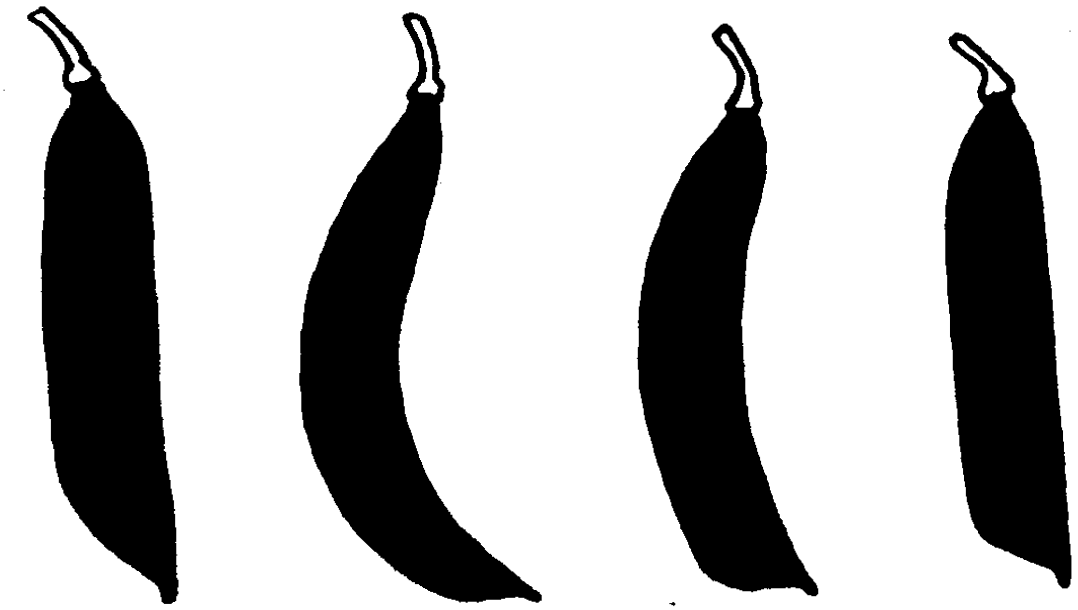
2. curvature towards the pod apex only

Ad. 56: Pod: degree of curvature

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

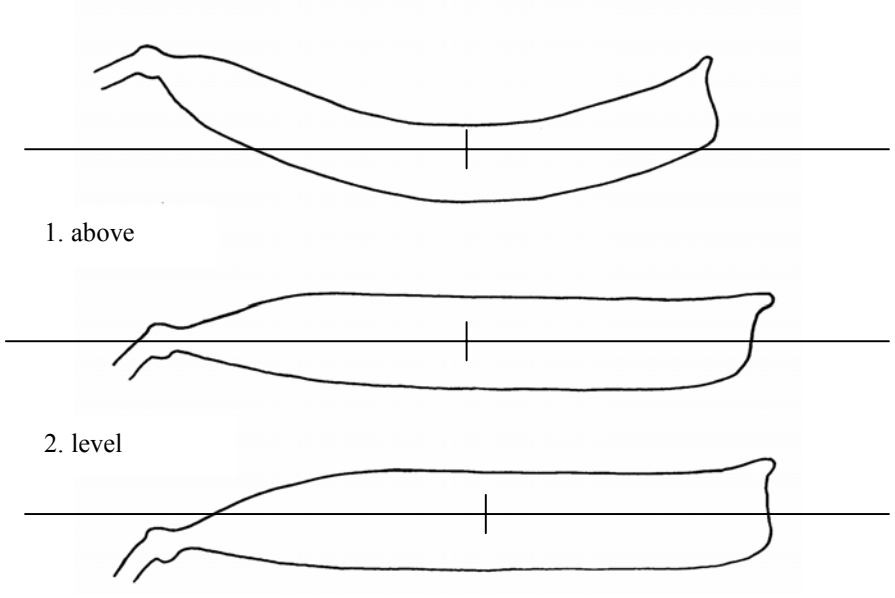
Ad. 57: Varieties without thickened pod wall only: Pod: shape of distal part

The observations should be made only on varieties without thickened pod wall.

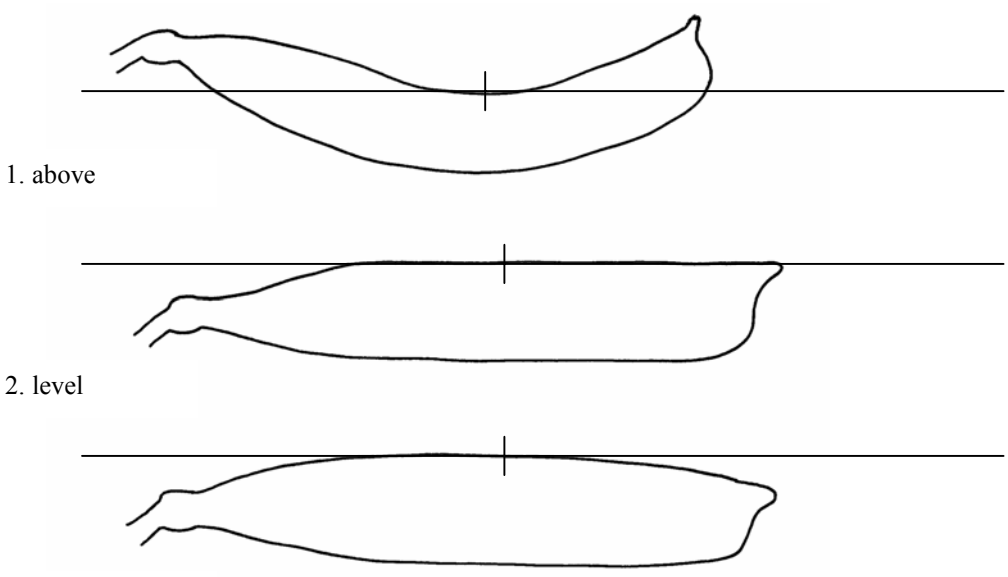


1	1	2	2
pointed	pointed	blunt	blunt

Ad. 58: Pod: position of ovary compared to the midpoint of the pod



Ad. 59: Pod: position of the apex compared to the midpoint of the seed-bearing suture



1. above

2. level

3. below

Ad. 65: Pod: number of ovules

The observations should be made at the second fertile node preferably when seeds are partially developed, but before senescence.

Ad. 70: Seed: 100 seed weight

Seed weight should be measured on two samples of 100 seeds. The observations should be made on harvest seed only. The weight varies markedly from site to site; it varies to a lesser extent from season to season at one site. Immature and infected seeds should be excluded; the seed should be dry, (approximately 10-15% moisture content) at time of recording.

Ad. 71.1 – 71.4: Resistance to *Fusarium oxysporum* f. sp. *pisi* Races 1, 2, 5 and 6

Host Differential

A list of host differentials which may be used for testing these characteristics, addresses for obtaining recommended isolates, example varieties and host differentials, are provided in Annex I to these Test Guidelines.

Maintenance of isolates

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

Preparation of inoculum

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 10^6 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.

Ad. 72: Resistance to *Erysiphe pisi* Syd.: Powdery Mildew

Host Differential

A list of host differentials which may be used for testing this characteristic, addresses for obtaining recommended isolates, example varieties and host differentials, are provided in Annex I to these Test Guidelines.

Maintenance of isolates

It is not necessary to maintain isolates; infection occurs from natural sources

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

Ad. 73: Resistance to Race C of *Ascochyta pisi* Lib. Ascochyta Leaf and Pod Spot

Host Differential

A list of host differentials which may be used for testing this characteristic, addresses for obtaining recommended isolates, example varieties and host differentials, are provided in Annex I to these Test Guidelines.

Maintenance of isolates

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

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.

Ad. 74.1 and 74.2: Resistance to *Pseudomonas syringae* pv. *pisi* Races 2 and 4.

Host differential

A list of host differentials which may be used for testing these characteristics, addresses for obtaining recommended isolates, example varieties and host differentials, are provided in Annex I to these Test Guidelines.

Maintenance of isolates

Bacteria are stored either as lyophilized cultures in sealed vials at ambient temperature or as frozen suspensions at -80°C. Isolate identity is determined by serological reactions and by their pathogenicity to one or more host differential cultivars.

Preparation of the inoculum

Bacteria are grown on plates of King's Medium B for 24-48 hours at 25°C. Bacteria are scraped from the culture surface for inoculation

Inoculation and assessment of disease

10-14 day old seedlings, grown under glass at 20°C, are inoculated into young growing tissue of the stem at the axil with the stipule. The tip of a sterilized entomological mounting pin is scraped along the culture surface and stabbed into the plants at the two youngest nodes (2 inoculations / plant).

Plant reactions are recorded 5-10 days after inoculation as either resistant or susceptible. Susceptible response is expressed as water soaked tissue around the point of inoculation; resistant response is expressed as a localized necrotic reaction

Two replicates of 10 plants are inoculated for each race; a third replicate is grown if any problems arise.

Ad. 75: Resistance to Seed-borne Mosaic Virus Strain P1

Host differential

A list of host differentials which may be used for testing this characteristic, addresses for obtaining recommended isolates, example varieties and host differentials, are provided in Annex I to these Test Guidelines.

Maintenance of isolates

Symptomatic leaves or shoot tissue of infected seedlings are used to prepare inoculum, and are stored dry at -18°C.

Isolate identity is determined by reaction to antiserum in serological tests and by reaction with a set of host differential cultivars.

Preparation of inoculum

Infected dry plant tissue is ground in a phosphate buffer (pH 8.5, 0.005M).

Inoculation and assessment of disease

Inoculum is applied after a dark period (early morning), to Carborundum powder dusted leaves of 10-14 day old seedlings. Inoculated plants are maintained at 24°C and 14,000 Klux. Care is taken to avoid too much damage of the tissue to prevent necrosis. Two replicates of 10 plants are grown; a third replicate is grown if problems arise.

Susceptible plants are stunted and have rolling of the leaf margins, with or without leaf mosaic. The presence of infection in the plant is detected by ELISA test.

Ad. 76: Resistance to Bean Yellow Mosaic Virus

Host differential

A list of host differentials which may be used for testing this characteristic, addresses for obtaining recommended isolates, example varieties and host differentials, are provided in Annex I to these Test Guidelines.

Maintenance of isolates

Isolates are stored as infected dry tissue at +5°C or infected tissue at –18°C.

Preparation of inoculum

Infected dry tissue is ground in a phosphate buffer (pH 8.5, 0.005M).

Inoculation and assessment of disease

Plants are grown under glass at 20°C and supplementary lighting to provide a 14-16 hour daylength; (supplementary illumination 500 watts/m^2). At the 2-3 leaf stage the isolate is added to the plant following abrasion with Carborundum powder.

Assessment of disease

Ten days after the inoculation, whether or not symptoms exist. Two replicates of 10 plants are grown; a third replicate is grown if problems arise.

Ad. 77: Resistance to Pea Enation Mozaic Virus

Host differential

A list of host differentials which may be used for testing this characteristic, addresses for obtaining recommended isolates, example varieties and host differentials, are provided in an annex to this guideline.

Maintenance of Isolates
Symptomatic leaves or shoot tissue of infected seedlings are used to prepare inoculum; lyophilized infected tissue is stored at –20°C.

Preparation of inoculum

Grind desiccated infected tissue (1:50, w/vol) in phosphate buffer (pH 8.5 O.O5M), allow to re-hydrate for 5 minutes before grinding again. Crude extract is applied to carborundum-dusted young leaves.

Inoculation and assessment of disease

Apply inoculum to first fully-expanded true leaves, lightly dusted with 400-mesh carborundum. Maintain inoculated plants at 20 to 25°C and 11,000 Lux. (Use of plants after 2- to 3-1eaf stage produces unreliable results.)

Symptoms consisting of stunting, mosaic, and leaf-shape deformity typically develop 10 to 15 days after inoculation. Non-inoculated control plants are essential for establishing the effects of viral inoculation. For homozygous lines, 20 to 50 inoculated seedlings should accurately determine resistance or susceptibility of genotype.

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	Germination	Germination	Keimung
00	Dry seed	Graine sèche	Trockenkorn
10	Seedling growth	Croissance de la plantule	Wachstum des Keimlings
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	Vegetative growth	Croissance végétative	Vegetatives Wachstum
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	Reproductive stage	Stade de reproduction	Generatives Stadium
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 amylacée; 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

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* General reference texts

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	*Pisum sativum* L.
1.2 Common Name	Peas

2. Applicant

Name	
Address	
Telephone No.	
Fax No.	
E-mail address	
Breeder (if different from applicant)	

3. Proposed denomination and breeder's reference

Proposed denomination (if available)	
Breeder's reference	

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

[#]4. Information on the breeding scheme and propagation of the variety

4.1 Breeding scheme

Variety resulting from:

4.1.1 Crossing

(a) controlled cross [ ]
(please state parent varieties)
(b) partially known cross [ ]
(please state known parent variety(ies))
(c) unknown cross [ ]

4.1.2 Mutation [ ]
(please state parent variety)

4.1.3 Discovery and development [ ]
(please state where and when discovered and how developed)

4.1.4 Other [ ]
(please provide details)

.....

4.2 Method of propagating the variety

[#] 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 (2)	**Seed: type of starch grains**		
	simple	Maro, Soalra, Adagio	1 [ ]
	compound	Avola, Polar	2 [ ]
5.2 (3)	**Seed: color of cotyledon**		
	green	Avola, Solara	1 [ ]
	yellow	Hardy, Caractacus	2 [ ]
	orange	Oliver	3 [ ]
5.3 (4)	**Seed: marbling of testa (varieties with anthocyanin only)**		
	absent	Rif, Rhea	1 [ ]
	present	Assas, Birdie	2 [ ]
5.4 (5)	**Seed: violet or pink spots on testa (varieties with anthocyanin only)**		
	absent	Rif, Birdie	1 [ ]
	faint	Assas, Susan	2 [ ]
	intense	Arvika, Rhea	3 [ ]
5.5 (6)	**Seed: hilum color**		
	not black	Avola, Birdie	1 [ ]
	black	Nofila, Rif	2 [ ]
5.6 (8)	**Seed: dimpled cotyledons (varieties with unwrinkled seed and simple starch grains only)**		
	absent	Columbia, Solara	1 [ ]
	present	Maro, Progreta	9 [ ]

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

	Characteristics	Example Varieties	Note
5.7 (9)	**Plant: anthocyanin coloration**		
	absent	Avola, Solara	1 [ ]
	present	Pidgin, Rosakrone	9 [ ]
5.8 (10)	**Plant: height (at flowering)**		
	very short	Columbia	1 [ ]
	short	Solara, Mini	3 [ ]
	medium	Lor Chancellor, Toskana	5 [ ]
	tall	Blauwschokker, Rhea	7 [ ]
	very tall	Livioletta	9 [ ]
5.9 (11).	**Stem: fasciation**		
	absent	Avola, Soalra	1 [ ]
	present	Bikini, Rosakrone	9 [ ]
5.10 (13)	**Stem: number of nodes up to and including first fertile node**		
	very few	Kelvil	1 [ ]
	few	Miragreen, Waverking	3 [ ]
	medium	Markana, Susan	5 [ ]
	many	Cooper	7 [ ]
	very many	Regina	9 [ ]
5.11 (16)	**Foliage: color**		
	yellow green	Pilot	1 [ ]
	green	Avola, Progreta	2 [ ]
	blue-green	Polar	3 [ ]

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

	Characteristics	Example Varieties	Note
5.12 (18)	**Leaf: leaflets**		
	absent	Hawk, Solara	1 [ ]
	present	Avola, Rhea	9 [ ]
5.13 (21)	**Leaflet: size (largest leaf at second flowering node)**		
	very small	Payette	1 [ ]
	small	Mini	2 [ ]
	medium	Finale	5 [ ]
	large	Alderman	7 [ ]
	very large	Mammoth Melting Sugar	9 [ ]
5.14 (25)	**Leaflet: dentation**		
	absent or very weak	Progreta	1 [ ]
	weak	Snowflake	3 [ ]
	medium	Miracle	5 [ ]
	strong	Amos	7 [ ]
	very strong	Sugar Star	9 [ ]
5.15 (27)	**Stipule: 'rabbit-eared' habit**		
	absent or very weak	Avola, Maro	1 [ ]
	moderately expressed		2 [ ]
	strongly expressed	Ibiza, Progreta	3 [ ]
5.16 (34)	**Stipule: flecking**		
	absent	Lisa, Tafila	1 [ ]
	present	Avola, Maro	9 [ ]

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

	Characteristics	Example Varieties	Note
5.17 (35)	**Stipule: maximum density of flecking**		
	very sparse	Progreta	1 [ ]
	sparse	Waxwing, Backgammon	3 [ ]
	medium	Ambassador, Accent	5 [ ]
	dense	Sephia, Avola	7 [ ]
	very dense	Oregon Sugar Pod	9 [ ]
5.18 (38)	**Time of flowering**		
	very early	Tempo	1 [ ]
	early	Smart, Sparkle	3 [ ]
	medium	Carlton, Waverex	5 [ ]
	late	Cooper, Purser	7 [ ]
	very late	Livioletta	9 [ ]
5.19 (39)	**Plant: maximum number of flowers per node (non-fasciated varieties only)**		
	one	Progress No. 9, Tyla	1 [ ]
	one to two	American Wonder, Maro	2 [ ]
	two	Banff, Cooper	3 [ ]
	two to three	Samish, Waverking	4 [ ]
	three	Nettuno, Ultimo	5 [ ]
	three to four	Twilight, Athena	6 [ ]
	four or more		7 [ ]
5.20 (40)	**Flower: anthocyanin colorationof wing (varieties with anthocyanin only)**		
	pink blush	Golf	1 [ ]
	pink	Rosakrone	2 [ ]
	reddish purple	Assas	3 [ ]

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

	Characteristics	Example Varieties	Note
5.21 (43)	**Flower: shape of base of standard**		
	strongly raised		1 [ ]
	raised	Progreta, Picar	3 [ ]
	medium	Markado, Solara	5 [ ]
	arched	Avola, Copper	7 [ ]
	strongly arched	Boahtyr, Kennedy	9 [ ]
5.22 (51)	**Pod: length (at second flowering node)**		
	very short	Vermio, Cepia	1 [ ]
	short	Progreta, Solara	3 [ ]
	medium	Copper, Jof	5 [ ]
	long	Hurst Grren Shaft, Protor	7 [ ]
	very long	Roi de Carouby	9 [ ]
5.23 (52)	**Pod: width (at second flowering node)**		
	very narrow	Disco	1 [ ]
	narrow	Picar, Ultimo	3 [ ]
	medium	Progreta, Solara	5 [ ]
	broad	Final, Kahuna	7 [ ]
	very broad	Kennedy	9 [ ]
5.24 (53)	**Pod: parchment**		
	absent or partial	Sugar Ann	1 [ ]
	entire	Avola, Solara	2 [ ]
5.25 (54)	**Pod: thickened wall (varieties with no or partial parchment only)**		
	absent	Nofila, Reuzensuiker	1 [ ]
	present	Cygnet, Suggar Ann	9 [ ]

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

	Characteristics	Example Varieties	Note
5.26 (56)	**Pod: degree of curvature**		
	absent or very weak	Finale, Maro	1 [ ]
	weak	Eagle, Span	3 [ ]
	medium	Hurst Green Shaft, Carlton	5 [ ]
	strong	Jof, Delikata	7 [ ]
	very strong	Crispi, Oskar	9 [ ]
5.27 (57)	**Pod: shape of distal part (varieties without thickened pod wall only)**		
	pointed	Jof, Oskar	1 [ ]
	blunt	Avola, Solara	2 [ ]
5.28 (60)	**Pod: color**		
	yellow	(Orlex)	1 [ ]
	green	Avola	2 [ ]
	blue-green	Miracle, Miragreen	3 [ ]
	purple	Blauschokker	4 [ ]
5.29 (62)	**Pod: suture strings (varieties with no or partial pod parchment)**		
	absent or rudimentary	Nofila, Sugar Lace	1 [ ]
	present	Reuzensuiker, Crispi	2 [ ]
5.30 (65)	**Pod: number of ovules**		
	few	Pegas, De Grace	3 [ ]
	medium	Hawk, Backgammon	5 [ ]
	many	Karisma	7 [ ]7

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

	Characteristics	Example Varieties	Note
5.31 (66)	**Pod: intensity of green color of immature seed**		
	light	Ultimo, Solara	3 [ ]
	medium		5 [ ]
	dark	Dark Skin Perfection, Hawaii	7 [ ]
5.32 (70)	**Seed: 100 seed weight**		
	very low	Ultimo	1 [ ]
	low	Hawk, Iceberg	3 [ ]
	medium	Mammoth Melting Sugar, Toskana	5 [ ]
	high	Kennedy, Maro	7 [ ]
	very high	Bamby, Cratos	9 [ ]

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

6. Similar varieties and differences from these varieties

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

Denomination(s) of variety(ies) similar to your candidate variety	Characteristic(s) in which your candidate variety differs from the similar variety(ies)	Describe the expression of the characteristic(s) for the **similar** variety(ies)	Describe the expression of the characteristic(s) for **your** candidate variety
GN 33 [Note 1] *Example*	*[e.g. Flower color]*	*[e.g. orange]*	*[e.g. orange red]*

Comments:

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

[#]7. Additional information which may help in the examination of the variety

7.1 In addition to the information provided in sections 5 and 6, are there any additional characteristics which may help to distinguish the variety?

Yes [ ] No [ ]

(If yes, please provide details)

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

Yes [ ] No [ ]

(If yes, please provide details)

7.3 Other information

Use

fresh market	[ ]
canning	[ ]
freezing	[ ]
dry seed for human consumption	[ ]
dry protein	[ ]
forage	[ ]
other (please specify)	[ ]

……..

Resistance to diseases

Fusarium Wilt (Race 1) (Common Wilt)	[ ]
Fusarium Wilt (Race 2) (Near Wilt)	[ ]
Fusarium Wilt (Race 5)	[ ]
Fusarium Wilt (Race 6)	[ ]
Powdery mildew	[ ]
Ascochyta (leaf and pod spot) Race C	[ ]
Pea Bacterial Wilt (Pseudomonas)	[ ]

specify races/pathovars……

Pea Seed-borne Mosaic Virus (P1 strain)	[ ]
Bean Yellow Mosaic Virus (BYMV)	[ ]
Pea Enation Mosaic Virus (PEMV)	[ ]
Other (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:

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. 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 of 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

[Annex I follows]

ANNEX I

ANNEX I TO THE UPOV TEST GUIDELINES FOR PEA (*PISUM SATIVUM* L.)

The information provided in this annex relates to the characters listed in the Table of Characteristics, and is additional to that given under Explanations on the Table of Characteristics. Much of this information indicates what is known of the genetics and lists key genetic references, for those who wish to investigate characteristics further or understand the inheritance of the genes involved.

The literature reference numbers refer to bibliography in this Annex

Availability of example varieties and lines

Where example varieties are no longer in commerce, or where genetic lines are used to provide examples, small quantities of seed are available from:

Scottish Agricultural Science Agency,
Herbage & Vegetable Crops
1 Roddinglaw Road,
Edinburgh
EH12 9FJ
U.K

For seed of Host Differential Lines for disease tests, see comments following characteristic 70.

Additional comments for characteristics in the guideline

Character 1. Seed: shape

The shape can be influenced by environmental conditions, although it is generally consistent from year to year, provided the seed has reached its full development. The separation of 'Marrowfat' types on seed shape can be difficult.

The expression of individual seed genes are difficult to separate due to the interaction of genes which:

- directly influence the shape of the whole seed, radicle or hilum
- influence the testa and thereby affect seed shape
- affect shape indirectly through the influence of the pod

Literature reference (with gene symbols in brackets):

i) genes influencing shape of whole seed, radicle or hilum, and

ii) genes influencing the testa: 16(z), 21(rb), 29(z), 31(ar), 40(fov), 42(sul), 45(mifo), 47(Him), 49(foe), 58(r), 66(ar), 68(l), 71(l), 75(di), 76(r).

iii) genes indirectly affecting seed shape through influence on the pod: 42(com, pla, qua).

Characteristic 2. Seed: type of starch grains
Characteristic 69. Seed: wrinkling of cotyledon

The expression of both starch grains and cotyledon wrinkling are controlled by the genes R and Rb and are related in the following way:

Genotype	Phenotype
r rb	wrinkled cotyledons, compound starch grains
r Rb	smooth cotyledons, simple starch grains
R rb	wrinkled cotyledons, simple starch grains

The genotype R rb has smaller, finer cotyledon wrinkling.
Literature reference: 21, 58, 76.

Characteristic 3. Seed: color of cotyledon

The expression varies with enviromental conditions:

- bleaching, caused by sunlight or chemical changes in the plant, can remove color from both green and yellow cotyledon seeds;
- 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.

The expression of cotyledon color is controlled by two genes:

Genotype	Phenotype
I	yellow cotyledons
i	green cotyledons
orc	orange cotyledons

To date, in commercial cultivars the orc gene has probably not been used.

In current cultivars the range of cotyledon color is from yellow to orange-yellow and from pale to dark green. Literature reference: 58, 76, 103.

Characteristic 4. Seed: marbling of testa (varieties with anthocyanin only)

The marbling is most easily observed on seeds which have tannin in the testa; however, marbling can also occur in the absence of tannin, giving the seed a dirty grey appearance, which is known

as ghost marbling. The expression of testa marbling is controlled by the gene M. Literature reference: 52, 76.

Characteristic 5. Seed: violet or pink spots on testa (varieties with anthocyanin only)

The expression occurs as clearly defined faint or intense spots which are usually violet due to the presence of anthocyanin. However, spot color can be pink due to modification by other genes.

The expression of spotting is controlled by the complimentary genes F and Fs. There is no intermediate expression between faint spotting and intense spotting, the latter being caused by an allele of the Fs gene: Fs >ex. Literature reference: 25, 51, 76, 78.

Characteristic 6. 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, if any loose tissue is present. The expression is controlled by the gene Pl. Literature reference: 53, 76.

Spontaneous mutation: from melanin absent to melanin present has been reported in the literature, but has rarely been observed. The precise mutation rate is unknown. Spontaneous mutation has not been reported in white flowered types. Literature reference: 18.

Characteristic 7. Seed: color of testa.

Record on varieties with anthocyanin only. The testa color is modified in the same way as flower color - reddish brown testa being controlled either by the gene am, or, the b gene. Brown testa is a result of the a gene without any modification, although varying intensity of tannin color with age is caused by the gene z. It is likely, therefore, that the greenish brown testa color is caused by the lack of intensification of tannins in the testa.

Characteristic 8. Seed: dimpled cotyledons (varieties with unwrinkled seed and simple starch grains only)

Record on varieties with simple starch grains and unwrinkled seeds. Appears as a slight ‘rippling’ of the testa surface and should not be confused with wrinkling. Most ‘Marrowfat’ varieties have dimpled seeds. Controlled by the gene di. Literature reference: 75.

Characteristic 9. Plant: anthocyanin coloration

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

The expression of anthocyanin is controlled by the gene a and modified by the genes am and b. Literature reference: 58, 76. There are a number of genes whose expression is dependent on the dominant allele of the gene a. Their expression is hidden, not absent, in the presence of the recessive allele.

Assessment of dry seed characteristics

For best assessment, seed should be mature and preferably not severely bleached, and the recording should be carried out within nine months after harvest. For varieties with anthocyanin pigment, tannins in the testa often darken with age, (usually after nine months) obscuring many characteristics.

Assessment of some characteristics is difficult under artificial light, being easiest under conditions of bright natural daylight.

Characteristic 10: Plant height (at flowering)

This characteristic is recorded at flowering. Some varieties will grow very little after flowering, whilst others continue to grow. The differentiation of these varieties can be achieved by recording both plant height and stem length (see characteristic 12).

Characteristic 11. Stem: fasciation

The degree of expression of fasciation varies considerably with environmental conditions, although the presence or absence of fasciation in any environment is usually clear. Fasciated stems are, to a lesser or greater extent, flattened with several apical growing points. Fasciation is controlled by two complimentary genes fa and fas. Literature reference: 30, 58, 76.

Characteristic 12. Stem: length.

Stem length at mature green seed stage (and plant height at flowering) may vary considerably with site and season due to different responses to daylength, temperature and soil moisture. However, within years, both characteristics are highly discriminating.

A complex interaction between internode and flowering genes influence stem length, habit, branching and flowering. Literature reference: 58, 61.

Characteristic 13. Stem: number of nodes up to and including the first fertile node

The first two nodes, which have 'scale' leaves, should be included in all node counts. The expression is controlled by the gene lf, which has four alleles which could be used for classification of cultivars;

Genotype	Phenotype
lf > a	very early (very low flowering nodes 5-7)
lf	early (low flowering nodes 8-12)
Lf	late (high flowering nodes 13-16/18)
Lf > d	very late (very high flowering nodes 16/18 and above)

However, stable expression depends on night temperatures above 17°C; if temperature falls below this critical threshold, the node of flowering will be lowered, resulting in misclassification.

The effect is greatest with very late and late flowering types, and is smallest in early flowering types. Very early flowering types do not appear to be affected.

Where flower abortion occurs, the node of flower initiation will provide a more consistent measure of flowering node. Classification is only reliable when assessed under controlled conditions with standard lines of known genetic inheritance. Literature reference: 14, 59, 65, 76.

Characteristic 14. Stem: anthocyanin coloration of axil

The expression is controlled by the gene d which is dependent on the gene a. The color is usually reddish-purple, but can be pink when modified by the am or b genes. Literature reference: 69, 76.

Characteristic 15. Stem: type of anthocyanin coloration of axil

The expression is controlled by the gene d which has five alleles:

Genotype	Phenotype
D>w	double axil ring
D>co	single axil ring
D>ma	incomplete ring - two spots in axil
D>tet	incomplete ring - four spots in axil
D	absence of pigment in axil

Only the first two phenotypes are included in the table of characteristics, being the most common in commercial material. The latter three phenotypes have occurred as variants in commercial varieties. All the phenotypes are dependent on the presence of anthocyanin gene a. Literature reference: 17, 26, 57, 67, 69, 76.

Characteristic 16. Foliage: color

The expression of foliage color is discontinuous and is controlled by 4 genes:

Genotype	Phenotype	Literature reference numbers
o	yellow-green foliage	76
pa Vim	green foliage	33, 78
Pa vim	green foliage	33, 78
cov	blue-green foliage	35

Blue-green foliage can mask green and yellowish-green foliage. Green foliage color can mask yellowish-green foliage. When both genes o and cov are dominant, then foliage color is green.

Another gene py causes the plant to turn yellowish rapidly with the approach of maturity, and senescing earlier than normal. py is independent of the other foliage color genes. Literature reference: 54.

Characteristic 17. Foliage: intensity of color (varieties with green foliage only)

In some genetic backgrounds yellowish-green foliage color is difficult to separate from the palest green foliage color without the use of example varieties. Literature reference: 33, 78.

Characteristic 18. Leaf: leaflets

The absence of leaflets is controlled by the gene af. There are at least three different sources of the af gene which have arisen by mutation. Literature reference: 07, 19, 22.

Characteristic 19: Leaf: waxiness of surface of upper leaflet

The expression is controlled by the gene wlo. There are several genes controlling the distribution and density of wax on the plant. Literature reference: 62.

Characteristic 20. Leaf: average maximum number of leaflets

The maximum expression should be recorded wherever it occurs on the plant. Although appearing to be continuously expressed, this characteristic can be very uniform within cultivars. Occasional plants may have a larger number of leaflets. The maximum number of leaflets should be recorded for a sample of plants, and an average value calculated.

Characteristic 21. Leaflet: size (largest leaf at second flowering node)
Characteristic 22. Leaflet: length
Characteristic 23. Leaflet: width
Characteristic 24. Leaflet: distance from widest point to base

The observations should be made at the second fertile node. These characteristics are influenced by environmental conditions and are under the control of several interacting genes, giving the impression of continuous expression.

Characteristic 25. Leaflet: dentation

The expression is controlled by the gene td. Plants which are recessive have no dentation, or have one, two or occasionally three teeth (notches) on the leaflet margin. Where dentation is very marked, it is likely that another gene int has intensified the expression of td. In all cases assessment should be on the main stem only and above node six. This is because expression on branches (both aerial and basal) can be the opposite of that on the main stem. One theory to explain this is that expression is affected by a switching mechanism, being positive for expression on the main stem and negative for branches.

Expression at the lowest nodes appears to be dentate in nearly all cases, but is unrelated to expression above node six. Such expression on low nodes and branches can also be observed in other characteristics, such as flecking.

Leaf serration and incision are unrelated and independently controlled by the genes Ser and Inci. Literature reference: 44, 64, 73.

Characteristic 26. Stipules: type of development

Stipules are rudimentary if they are lanceolate and have significantly reduced surface area (up to 80%). Plants with 'Rabbit-eared' stipules are not examples of reduced stipules, but are well developed.

The expression is controlled by the gene st. This gene is unlikely to be used in future breeding programs, since there is reported to be linkage with susceptibility to Downy Mildew. Literature reference: 63, 73.

Characteristic 27. Stipule: 'rabbit-eared' habit

The expression of 'rabbit-eared' stipules is part of a syndrome affecting flowers (flowers reduced with raised standard base shape), foliage (leaflets and stipules more pointed and reduced in area), and to a lesser extent stem habit; it is not under Mendelian genetic control. Selection pressures have been known to revert to their original form. If there is doubt about whether the stipules are 'rabbit-eared', then the occurrence of the syndrome in other parts of the plant will confirm presence. Literature reference: 05.

Characteristic 34. Stipule: flecking
Characteristic 35. Stipule: maximum density of flecking.

Flecking is a discontinuous pattern of foliage flecks caused by the raising of the surface cells from the underlying tissue; it is controlled by the gene fl which has four alleles:

Genotype	Phenotype
fl	Flecking absent or occasionally one or two flecks
Fl	Flecking sparse
Fl>v	Flecking intermediate
Fl>w	Flecking very dense, almost entirely covering the leaf surface

The guideline treats flecking in two ways; characteristic 33 differentiates between absent (represented by the allele fl) and present (represented by the alleles Fl and Fl>v). Characteristic 34 differentiates the degree of flecking within the alleles Fl and Fl>v.

The allele Fl>w is rarely observed in commercial material but occasionally occurs as a variant. Plants which are recessive either have no flecking, or have one or two flecks.

Spontaneous Mutation

There is evidence to support mutation from flecked to non-flecked types, and also back mutation from non-flecked to flecked, but these occurrences are rare and can not be identified without assessment over at least three generations. Literature reference: 06, 50, 67.

Characteristic 38. Time of flowering

The expression is controlled by the interaction of several genes for flowering and internode length. For further information see notes for characteristic 13. Literature reference: 14, 60, 61.

Characteristic 39. Plant: maximum number of flowers per node (non-fasciated varieties only)

The observations should be made only on non-fasciated varieties. The maximum number of flowers per node should be calculated as a mean of a recorded sample. The observations should be made when highest nodes produce flower buds which do not open. Flower number is mainly controlled by two genes fn and fna and results in three phenotypes:

Genotype	Phenotype
Fn Fna	Single flowered
Fn fna	Double flowered
fn Fna	Double flowered
fn fna	Triple, or more than triple, flowered

Literature reference: 28, 65, 76

Characteristic 40. Flower: anthocyanin coloration of wing (varieties with anthocyanin only)

There are several genes which influence flower color, but many are difficult to determine due to complex genetic and environmental interaction. The usual reddish-purple color is controlled by the gene a, the basic gene for anthocyanin expression. The two most easily identifiable phenotypes, which modify the reddish-purple color to produce a pink coloration, are controlled by the am and b genes: Literature reference: am 10, b 70, 76, a 58, 76.

Genotype	Phenotype
am	slight, in some cases very slight, pink blush
b	pink color

Characteristic 44. Flower: intensity of undulation of standard

The maximum expression on the plant should be recorded. It should be ensured that flowers recorded are fully opened and not senescing.

Characteristic 53. Pod: parchment.

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

Genotype	Phenotype
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

Literature reference: 58, 76.

Spontaneous mutation

The following 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 can be very rapid.

Characteristic 54. Pod: thickened wall (varieties with no or partial parchment only)

The observations should be made only on varieties with no or partial parchment. They should be made on well developed pods not showing any signs of senescence. Unopened pods should be cut in cross section.

The expression is controlled by the gene n. Although the guideline characteristic concerns varieties with absent or partial parchment, thickened pod walls can occur in fully parchmented types. Literature reference: 74

Characteristic 55. Pod: type of concave curvature
Characteristic 56. Pod: degree of curvature
Characteristic 58. Pod: position of ovary compared to the midpoint of the pod
Characteristic 59. Pod: position of the apex compared to the midpoint of the seed-bearing suture

The maximum expression should be recorded; assessment should be made on the whole plant.
The 'hook end' on long podded types should be ignored when assessing curvature.

The expression of pod curvature is controlled by three genes co, con and cp which result in a number of different phenotypic classes, which, with care, can be differentiated. The position of the ovary and the pod apex is related to the pod curvature genotype. Literature reference: 23, 32, 74, 77.

Characteristic 57. Pod: shape of distal part (varieties without thickened pod wall only)

The observations should not be made on varieties with thickened pod walls, as the assessment of pod tip shape is unreliable where a thickened wall is present. 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. Some varieties have a blunt tip which is rounded, but the beak is higher up the pod.

The expression is controlled by the gene bt. Literature reference: 01, 29, 76.

Characteristic 60. Pod: color

This is a discontinuous multi-state characteristic - the expression for each state being under independent genetic control.

Yellow pods

Expression is controlled by the gene gp. Peduncles, sepals and upper stems can also appear a milky yellowish color. In the presence of anthocyanin coloration, the pods appear pale red. Literature reference: 58, 76.

Green pods

Green pods occur when the genes for yellow, blue-green or purple pods are not being expressed.

Blue-green pods

Expression is controlled by the gene dp. Pods are dark and slightly bluish, but not as blue as blue-green foliage (characteristic 14). The color develops with time, and may be more accentuated in hotter, drier conditions. Literature reference: 55.

Purple pods

Two genes, Pu and Pur, control the expression of purple pods. Occasionally expression can be unstable, appearing and disappearing on the same plant, but this is not a uniformity problem. The gene Pur has four alleles which affect the presence and distribution of coloration:

Genotype	Phenotype
Pur	pods entirely purple
pur>a	major part of pods purple
pur>b	minor part of pods purple
pur	pods lacking anthocyanin

Literature reference numbers: 24, 32, 58.

Characteristic 61. Pod: intensity of green color
Characteristic 66. Pod: intensity of green color of immature seed

The observations should be made at a stage when the seed is firm, but before seeds become starchy to taste. Pods should show no sign of senescence or drying out.

Expression is controlled by the genes pa and vim. It should be possible to classify all material into two categories pale and dark green, although it is possible to differentiate degrees of

intensity within these groups; however, small changes in the stage of development can affect this intensity. Literature reference: 33, 78.

Where the blue-green pods (gene dp) are expressed, immature seed color can also be intensified. Literature reference: 55.

Immature seed color of green cotyledon types may appear creamy white before the seed is fully developed; this is probably the result of the recessive allele of the gene gla which causes the disappearance of chlorophyll from the testa. Literature reference: 39.

Characteristic 62. Pod: suture strings (varieties with no or partial parchment only)

If assessed when pods are not fully developed, suture strings will be absent or partial, so observations should be made on fully developed pods. When temperatures exceed 20° C, suture strings will appear later than normal.

Expression is controlled by the gene sin. Literature reference number: 24.

Where suture strings are absent or partial and starch grains are compound, seed wrinkling in part of the population 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. The genetic control of this expression is not fully understood.

Characteristic 63. Pod: anthocyanin coloration of suture (varieties with anthocyanin only)

The observations should be made over the whole plant when pods are well developed and are beginning to dry out. The expression is controlled by two genes sru and srub. Literature reference: 46.

Characteristic 64. Pod: spots of anthocyanin coloration on outer wall (varieties with anthocyanin only)

They should be made over the whole plant when pods are well developed and are beginning to dry out. If present, several fine spots of anthocyanin appear on the pod wall - often in an area around, or on top of, the underlying seeds. The expression is controlled by two genes rup and rups. Literature reference: 46.

Characteristic 68. Seed: time of maturity

The seed should be hard and dry for accurate assessment.

Characteristic 69. Seed: wrinkling of cotyledon

The observations should be made on harvested seed. 'Golf ball' and large dimples should be ignored as these can also be found on smooth seeded (non-wrinkled types). Cylindrically shaped seed types should be assessed carefully, because some are smooth seeded.

Characteristic 70. Seed: 100 seed weight

The assessment should be made on harvested seed. The expression varies with environmental conditions.

CHARACTERISTICS USED FOR TESTING DISEASE RESISTANCE

It is recommended that disease resistance tests for the following characteristics make use of a standard set of host differentials which are available from the John Innes Centre, with a back-up set in Edinburgh:

John Innes Centre
Pea Gene Bank
Colney Lane
Norwich
NR4 7UH
U.K.

Scottish Agricultural Science Agency,
Herbage & Vegetable Crops,
1 Roddinglaw Road,
Edinburgh
EH 12 9FJ
U.K.

Host Differentials for Characteristics Listed in the UPOV Test Guidelines

Host Differential Line	**Charact-eristic**	**Disease**	**Race**	**Res/Susc**
JI 1360 ex 'Dark Skinned Perfection'	71	*Fusarium oxysporum* f. sp. *pisi*	1	Resistant
JI 1365 ex 'Little Marvel'	71	*Fusarium oxysporum* f. sp. *pisi*	1	Susceptible
JI 1364 ex WSU 23	71	*Fusarium oxysporum* f. sp. *pisi*	2	Resistant
JI 1363 ex WSU 28	71	*Fusarium oxysporum* f. sp. *pisi*	2	Susceptible
JI 1364 ex WSU 23	71	*Fusarium oxysporum* f. sp. *pisi*	5	Resistant
JI 1365 ex 'Little Marvel'	71	*Fusarium oxysporum* f. sp *pisi*	5	Susceptible
JI 1363 ex WSU 28	71	*Fusarium oxysporum* f. sp. *pisi*	6	Resistant
JI 1365 ex 'Little Marvel'	71	*Fusarium oxysporum* f. sp. *pisi*	6	Susceptible
JI 502 ex 'Rondo	72	*Erisyphe pisi* Syd.	-	Susceptible
JI 1599 ex WBH 1677 ('Mexique-4')	72	*Erisyphe pisi* Syd. -	-	Resistant
JI 502 ex 'Rondo'	73	*Ascochyta pisi* Lib	C	Resistant
JI 394 ex 'Kelvedon Wonder'	73	*Ascochyta pisi* Lib	C	Susceptible
JI 2430 ex 'Kelvedon Wonder'	74	*Pseudomonas syringae* pv. *pisi*	2	Susceptible
JI 2439 ex 'Fortune'	74	*Pseudomonas syringae* pv. *pisi*	2	Resistant
JI 2431 ex 'Early Onward'	74	*Pseudomonas syringae* pv. *pisi*	4	Susceptible
JI 2438 ex 'Partridge'	74	*Pseudomonas syringae* pv. *pisi*	4	Resistant
JI 363 ex 'Lincoln'	75	Seed-borne Mosaic Virus Strain	P1	Susceptible
JI 968 ex WL 1799 / PI 193835	75		P1	Resistant
JI 502 ex 'Rondo'	76	Bean Yellow Mosaic Virus	-	Susceptible
JI 394 ex 'Kelvedon Wonder'	76	Bean Yellow Mosaic Virus	-	Resistant
ex 'Dark Skinned Perfection'	77	Pea Enation Mosaic Virus	-	Susceptible
ex 'Perfected Freezer 60'	77	Pea Enation Mosaic Virus	-	Resistant

It should be emphasized that host differentials are pure lines and are more reliable than commercial varieties of the same name, since the latter may not have sufficiently uniform resistance or susceptibility to carry out accurate tests.

It is also recommended that isolates are obtained from the sources listed under each characteristic, so that the risk of differences arising due to multiple maintenance, are reduced.

Characteristics 71.1 - 71.4. Resistance to *Fusarium oxysporum* f. sp. p*isi*: Fusarium wilt Races 1, 2, 5 and 6.

Host differentials used for test:

Race 1: Line JI 1360 ex 'Dark Skinned Perfection' (resistant)
Line JI 1365 ex 'Little Marvel' (susceptible)

Race 2: Line JI 1364 ex WSU 23 (resistant)
Line JI 1363 ex WSU 28 (susceptible)

Race 5: Line JI 1364 ex WSU 23 (resistant)
Line JI 1365 ex 'Little Marvel' (susceptible)

Race 6: Line JI 1363 ex WSU 28 (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
Race 2: WSU culture type 2
Race 5: IPO culture collection no. 10279
Race 6: WSU culture type 6

Maintenance of isolates for:

Races 1 and 5:

The Institute for Plant Protection (IPO)
Binnenhaven 12, PO Box 9060
6700 GW Wageningen
The Netherlands

Races 2 and 6:

Washington State University,
Research and Extension Unit,
Mount Vernon, Washington 98273,
United States of America

Genetic background

The expression of resistance to race 1 is controlled by the gene Fw and to race 2 by the gene Fnw; races 5 and 6 are controlled by single dominant genes but no symbols have been allocated.

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.

Literature reference:

Race 1: 11, 72, 80, 98; Race 2: 11, 80, 97, 98, 99; Race 5: 11, 81, 98; Race 6: 11, 82, 98

Characteristic 72. Resistance to *Erysiphe pisi* Syd.: Powdery Mildew

Host differentials used for test

Line JI 502 ex 'Rondo' (susceptible)
Line JI 1559 ex WBH 1677 = 'Mexique-4' (resistant)

Genetic background and symptoms of infection

Two recessive genes confer resistance: er1 and er2

'Rondo' is susceptible (Er1 Er2)
'Mexique-4' is resistant (er1 er2)

Literature reference: 11, 12, 56, 86, 102.

Characteristic 73. Resistance to Race C of *Ascochyta pisi* Lib.: Ascochyta Leaf and Pod Spot

Host differentials used for test:

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.

Isolates are maintained at:

INRA
Station de Genetique et d'Amelioration des Plantes
Etoile de Choisy, Route de Saint-Cyr
Versailles 78026 Cedex
France

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.

Literature reference: 11, 83, 100, 101.

Characteristics 74.1, 74.2 Resistance to *Pseudomonas syringae* pv. *pisi*: Bacterial blight Races 2 and 4.

Host differentials used for test

Race 2: Line JI 2430 ex 'Kelvedon Wonder' (susceptible)
Line JI 2438 ex 'Partridge' (susceptible)
Line JI 2431 ex 'Early Onward' (resistant)
Line JI 2439 ex 'Fortune' (resistant)

Race 4: Line JI 2430 ex 'Kelvedon Wonder' (susceptible)
Line JI 2431 ex 'Early Onward' (susceptible)
Line JI 2438 ex 'Partridge' (resistant)
Line JI 2439 ex 'Fortune' (resistant)

Since the method for testing all races is the same, the following Host Differentials are available

	RACE						
HOST DIFFERENTIAL	1	2	3	4	5	6	7
Line JI 2430 ex 'Kelvedon Wonder'	S	S	S	S	S	S	S
Line JI 2431 ex 'Early Onward'	S	R	S	S	R	S	R
Line JI 2432 ex 'Belinda'	R	S	R	S	S	S	R
Line JI 2435 ex 'Hurst Greenshaft'	R	S	S	R	R	S	R
Line JI 2436 ex 'Vinco'	R	R	R	S	R	S	R
Line JI 2437 ex 'Sleaford Triumph'	R	S	R	R	R	S	R
Line JI 2439 ex 'Fortune'	R	R	R	R	R	S	R

Isolates and isolate identity

The following isolates are used for testing:

RACE	ISOLATE
1	299A
2	202
3	870A
4	895A

5	974B
6	1704B
7	2491A

Isolate identity is determined by serological reactions (Taylor 1972; Taylor and Dye 1972) and by their pathogenicity to one or more host differential cultivars.

Isolates are maintained at:

Horticultural Research International
Wellesbourne
Warwick
CV35 9EF
United Kingdom

Genetic background

Races 2 and 4 are controlled by different single dominant genes. No gene symbols have been assigned. Resistance to Race 6 is known in accessions of *Pisum abyssinicum*. Literature reference: 11, 87, 88, 89, 90.

Characteristic 75. Resistance to Seed-borne Mosaic Virus: Strain P1

Host differentials used for test

Strain P1: Line JI 363 ex 'Lincoln' (susceptible)
Line JI 968 = WL 1779 = PI 193835 (resistant)

Isolates and isolate identity

Isolates used in the test: PSbm P1 Versailles Strain

Isolate identity is determined by reaction to antiserum in serological tests and by reaction with a set of host differential cultivars.

Isolates are maintained at:

INRA
Station de Genetique et d'Amelioration des Plantes
Etoile de Choisy, Route de Saint-Cyr
Versailles 78026 Cedex
France

Genetic background:

Resistance is pathotype specific, with single recessive genes for each pathotype. There are 4 known genes for resistance. The gene sbm-1 controls resistance to the P1 Strain. Literature reference: 11, 91, 93.

Characteristic 76. Resistance to Bean Yellow Mosaic Virus

Host differentials used for test

Line JI 502 ex 'Rondo' (susceptible)
Line JI 394 ex 'Kelvedon' Wonder (resistant)

Isolates:

Isolate used in the test: Versailles Strain
Isolate are maintained at:

INRA
Station de Genetique et d'Amelioration des Plantes
Etoile de Choisy, Route de Saint-Cyr
Versailles 78026 Cedex
France

Genetic background

Resistance is conferred by the gene *mo*.
Literature reference: 11, 79, 85, 92.

Characteristic 77. Resistance to Pea Enation Mozaic Virus

Host differentials used for test

'Dark Skinned Perfection' (susceptible)
'Perfected Freezer 60' (resistant)

Isolates

Lyophilized infected tissue is stored at -20°C. The virus remains viable for more than 5 years under these storage conditions.

Isolate PEM-3 is readily mechanically transmissible, is stable during long-term maintenance (i.e. has not produced variants), and is representative of PEMV occurring naturally in North America and Europe (i.e. glasshouse inoculations produce results agreeing with those obtained by natural field inoculations).

Isolates of PEMV tend to be monotypic; thus similar results should be possible with other isolates from North America or Europe.

Isolate (and other reference isolates) maintained at:

USDA ARS,
Dept. of Botany Plant Pathology,
Oregon State University,
Corvallis
Oregon 97331-2902
U.S.A.

Genetic background

A single dominant gene, En confers tolerance to PEMV infection (i.e. the gene enables plants to grow and produce well when virus-infected). Expression of PEM symptoms is dependent upon numerous factors, including inoculum concentration, plant age at infection, plant-growth environment, and perhaps gene interactions.

Literature reference: 11, 94, 95, 96.

[Annex II follows]

ANNEX II. ASSESSMENT OF CHARACTERISTICS FOR UNIFORMITY: A CAUTIONARY NOTE ON VARIABLE PENETRANCE AND INCOMPLETE DOMINANCE.

The expression of several characteristics in a population may be partial due to low penetrance, or, modified due to incomplete dominance.

It is important therefore, to be aware of their expression, so that rejection on the grounds of apparently lacking uniformity, could be avoided in cases where there may in fact be genetic homogeneity.

Characteristics with low penetrance or incomplete dominance, could be used for Distinctness purposes (viz. two varieties could be separated if one always had the expression of a characteristic, and the other never expressed the characteristic). The following characteristics can be clearly observed, but have variable expression from 1-80 %:

1. Seed: grey median stripe	00	absent	Avola, Solara	1
		present	Valgreen	9

When present, a diffuse grey stripe about two millimetres wide occurs around the suture of the cotyledons. The stripe does not occur on the inside of the testa and is more easily observed on seeds which have simple starch grains. This characteristic is very difficult to observe on seeds with tannins or anthocyanins present. Expression is variable due to incomplete dominance and is controlled by the gene gri. Literature reference: 27.

2. Seed: violet color of testa	00	absent	Assas	1
		present	Arvika	9

Anthocyanin expression may vary from diffuse pale purple patches, often restricted to part of the testa, to very dark purple covering the entire testa. It is often more clearly expressed under glasshouse conditions. Expression is variable due to partial penetrance and is controlled by the gene Obs. Literature reference: 15, 37.

3. Seed: ‘golf-ball’ dimpling	00	absent	Paloma	1
		present	Birte, Solara	9

‘Golf-ball’ dimpling occurs as close-set small shallow impressions occurring on the testa and the underlying cotyledons. Expression is variable due to partial penetrance and is present on between 40 and 80 % of the seeds; it is controlled by the gene mifo. Literature reference: 45.

4. Seed: grey area over radicle	00	absent	-	1
		present		9

The area of the radicle is greyish colored and is only easily observed on simple starch grained varieties which lack anthocyanin. Expression is variable due to incomplete dominance and is controlled by the gene rag. Literature reference: 43.

5. Seed: broad impression over radicle	00	absent		1
		present		9

This characteristic is expressed as a broad, shallow impression in the area of the radicle. Heterozygous seeds have a shallower impression; Expression is controlled by the gene fov. Literature reference: 40.

6. Seed: narrow impression over radicle	00	absent	Alaska, Ascona	1
		present	Solara	9

This characteristic is expressed as a deep groove-like impression in the area of the radicle. Expression is variable due to incomplete penetrance and is controlled by the gene sul. If the genes fov and sul are expressed together, they cannot be reliably separated. Literature reference: 42.

7. Seed: degree of Tragacanth oil	00	absent or very slight		1
		slight	Record	3
		medium	Alaska	5
		much	Solara	7
		very much	Morehu	9

Tragacanth oil is present underneath the testa and may be observed as an oily spot from the outside. It is most easily observed on seeds with simple starch grains. Expression is variable due to incomplete dominance and is controlled by the gene Tra. Record on seed within nine months of harvest. Very high Tragacanth oil levels, as in the variety Morehu, may be the expression of an additional allele. Literature reference: 27, 34.

8. Stem: dichotomous branching	30-240	absent	1
		present	9

The division of the stem into two similarly developing parts usually occurs approximately half way up the stem. Expression is variable due to partial penetrance and is controlled by the gene bif. Literature reference: 08, 09.

9. Leaflet: incision of tip	216-226	absent	1
		present	9

The leaflet tip is incised with the main vein growing on free of the incision. Expression is variable due to partial penetrance and is controlled by the gene ins. Literature reference: 41.

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* = General texts

[Notes follow]

NOTES: NEW CHARACTERISTICS PROPOSED FOR ADDITION TO THE UPOV TEST GUIDELINES BY THE UK

New characters have been proposed because of their suitability for automated measurement.

Based on data recorded in 2003 and 2004 DUS trials, the following information on the number of varieties each characteristic can separate at P=0.02 is given:

Characteristic	Variety Separations
New agreed characteristics	
33. Stipule: length of lobe below axil	6,355
31. Stipule: length from axil to tip	5,805
30. Stipule: area	5,387
32. Stipule: length from axil to base	4,359
Existing characteristics	
29. Stipule: width	6,373
28. Stipule: length	5,082
51. Pod: length	6,490
52. Pod: width	8,316
Proposed new characteristics	
58. Pod: position of ovary compared to the midpoint of the pod	9,822
59. Pod: position of apex compared to the midpoint of the seed-bearing suture.	8,047

(Character numbers above relate to the latest revision (May 2005) to the guideline)

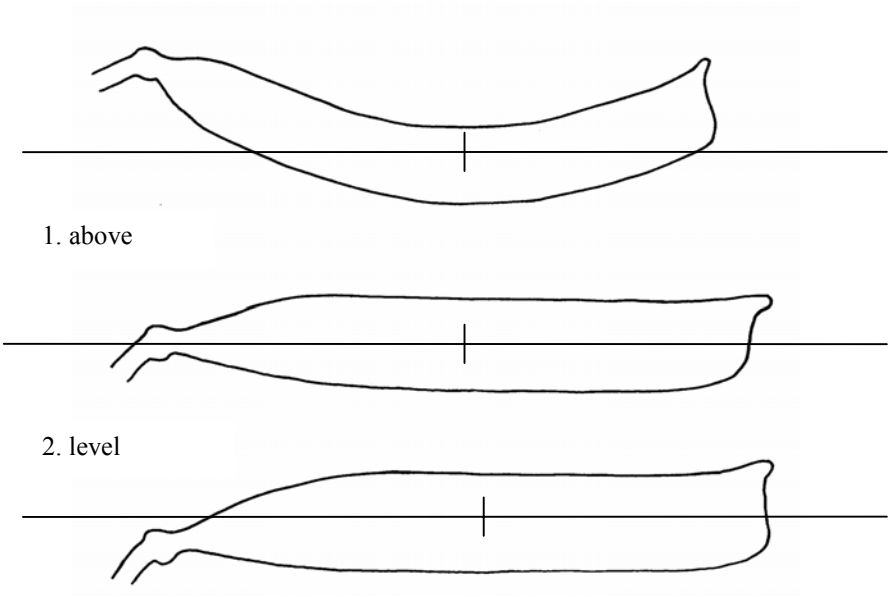
Total number of possible pair separations	**23,653**

In view of the usefulness of the two new pod characteristics (58 and 59), the UK proposes that these be added to the Test Guidelines. These characteristics can be visually scored or measured and will distinguish different types of pod curvature.

F.N.Green
18.05.2005

Proposed new pod characteristics for Revised Pea Test Guidelines

58. Pod: position of the ovary compared to the midpoint of the pod

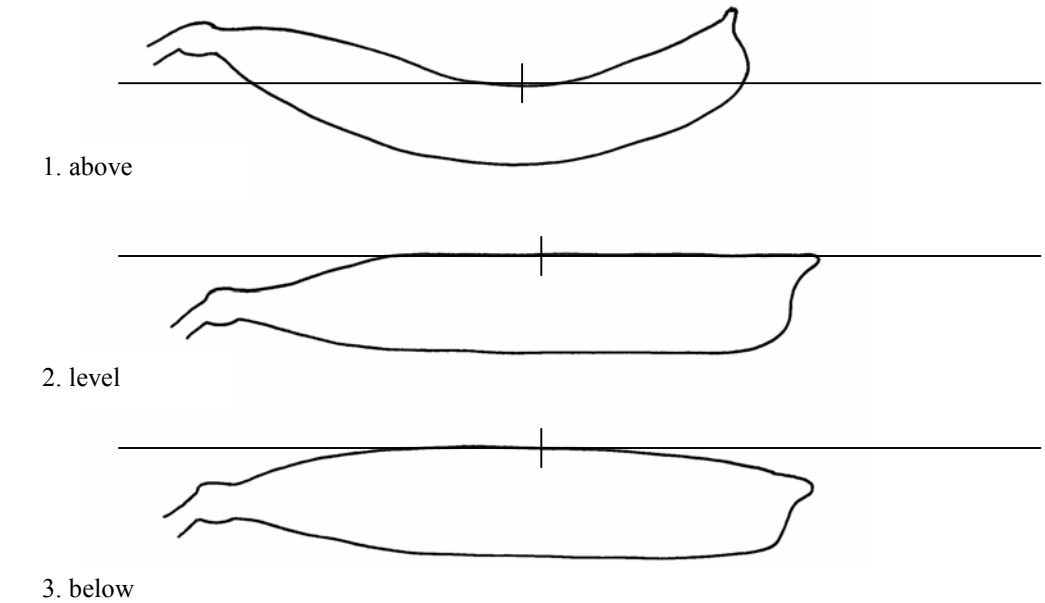


1. above

2. level

3. below

59. Pod: position of the apex compared to the midpoint of the seed-bearing suture



1. above

2. level

3. below

[Response to TWA follows]

RESPONSE TO TWA COMMENTS ON TG/7/10 (PROJ.1) AND TWA/33/12

Example varieties to be checked
The example varieties will be revised

4 Seed: marbling of testa
To read: 'Only varieties with plant anthocyanin coloration absent'
This definition is not correct – both example varieties have anthocyanin. Expression in anthocyanin absent types is extremely rare and I am not aware that this occurs in a variety.

5 Seed: violet or pink spots on testa
To change state 1 to 'absent or very faint'
Do not agree. I am not aware of any variety where very faint anthocyanin spotting cannot be separated from varieties with no spotting.

6 Seed: hilum color
State 'non-black' to have note 2
Agree

8 Seed: dimpled cotyledons
To read 'varieties with simple starch grain only: Seed: dimpled cotyledons'
If this was accepted it would be possible to confuse wrinkled seeds having simple starch grains (such a type exists) with seeds having dimpled cotyledons. This is why the qualification is written to exclude wrinkled seeds.

To be moved after Char. 63
This characteristic separates Marrowfats from other varieties. It is possible to use sowing seed to select controls before the trial is sown. I would therefore prefer to retain this characteristic in its current position.

10 Plant: height
To insert missing note 3
Agree

16 Foliage: color
To be retained unchanged
Agree

22 Leaflet: size
To add (+) and explain which leaf and leaflet to observe
Agree. Largest leaflet at the second fertile node.

36 Time of flowering
To be indicated as QN
Agree

37 Plant: maximum number of flowers per node
To add (+) and explain which flower is to be observed, define fasciation (as there is no characteristic to do this) and to specify the node. To review the wording of the states.
The maximum number of flowers is not recorded at a specific node, it is the maximum expression of flowering at any node on the plant.

Fasciation is in the current guideline (char.11), though there is no explanation. An (+) and an explanation will be added to char. 11.

The wording of the states is the best solution to record flower number. Many varieties do not have a uniform number of 1, 2, 3 or more flowers, but have variation at any one node which produces a population average of 1.9, 2.1 or 2.5 etc. Many older varieties have less than 2 flowers - few are uniformly 1 flowered. Multipodded varieties also vary in the number of flowers produced. This is not a lack of uniformity, but the result of several interacting environmental and genetic factors such as soil moisture, temperature, flower initiation and abortion and two complimentary genes. Add a small percentage of incomplete dominance in certain genetic backgrounds and the picture becomes quite complicated. However, it is visually easy to separate varieties which have 1, 2 or 3 flowers at every node. Separation of averages can be undertaken using statistical methods.

41 Flower: color of standard
To change 'white to cream' to 'whitish cream'
Agree

43 Flower: shape of base of standard
To change 'raised' to 'moderately raised' and 'arched' to 'moderately arched'.
Is this change necessary – has anyone been confused by the existing states?

45 Flower: width of sepal
To add (+) and explain which sepal to observe as there seem to be differences between flowers.
Agree

46 Flower: shape of apex of upper sepal (at second flowering node)
To be indicated as PQ
Agree

New chars. After 47

Flower: length of peduncle between 1st and 2nd flowers
Flower: length of peduncle spur
Peduncle: number of bracts

To add (+) and provide explanation on how to examine the characteristics. To check the characteristics provide useful discrimination between varieties. To specify whether MS or VS.

An explanation will be provided. Characteristic will be QN and MS as indicated in TG/7/10 (proj.1). The fact that there are example varieties would indicate that the characteristics are discriminatory.

48 Pod: length

(*) to be deleted

Pod length is an important discriminating characteristic, both in agricultural and vegetable peas. The asterisk has been removed. However, it is essential to record this for a description - its absence would be a serious omission.

50 Pod: parchment

To be split into two characteristics (absent/present; degrees of presence) or state 1 to read 'absent or partially present'. Leading expert to rearrange the other states accordingly and allocate example varieties.

The second option is the proposal made by the TWV. The first proposal is not a good one, because partial parchment is distributed differently in different genotypes, hence the proposed simplification of the characteristic.

New Char. after 51

Pod: type of concave curvature

Questioned whether this was really a clear cut QL two state characteristic. Thought to be more likely to have 3 states and be QN.

If there is concave curvature along the length of the pod it is quite clear. The alternative, concave curvature towards the pod tip is also clear. It is qualitative and is based on the genotype.

55 Pod: color

To add for clarification: 'only varieties with green pods'

Not appropriate for 55, but could agree to reword 56 Pod: intensity of green color.

66-72 Disease characteristics

Methods to be provided in Chapter 8

The information in the current guideline will be inserted.

F. N. Green
18.05.2005

[Note 1] Drafters of Test Guidelines should provide a suitable example for the individual Test Guidelines concerned e.g.: