



PROTOCOL FOR TESTS ON DISTINCTNESS, UNIFORMITY AND STABILITY

***Glycine max* (L.) Merrill**

SOYA BEAN

UPOV Code: GLYCI_MAX

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Entry into force on 01/01/2017

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CPVO-TP/080/1

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1. SUBJECT OF THE PROTOCOL AND REPORTING

1.1 Scope of the technical protocol

This Technical Protocol applies to all varieties of *Glycine max*(L.) Merrill.

The protocol describes the technical procedures to be followed in order to meet the requirements of Council Regulation 2100/94 on Community Plant Variety Rights. The technical procedures have been agreed by the Administrative Council and are based on documents agreed by the International Union for the Protection of New Varieties of Plants (UPOV), such as the General Introduction to DUS (UPOV Document TG/1/3 http://www.upov.int/en/publications/intro_dus.htm), its associated TGP documents (<http://www.upov.int/en/publications/tgp/>) and the relevant UPOV Test Guideline TG/080/6 dated 01/04/1998 (<http://www.upov.int/edocs/tgdocs/en/tg080.pdf>) for the conduct of tests for Distinctness, Uniformity and Stability.

1.2 Entry into Force

The present protocol enters into force on **01/01/2017**. Any ongoing DUS examination of candidate varieties started before the aforesaid date will not be affected by the approval of the Technical Protocol. Technical examinations of candidate varieties are carried out according to the TP in force when the DUS test starts. The starting date of a DUS examination is considered to be the due date for submitting of plant material for the first test period.

In cases where the Office requests to take-over a DUS report for which the technical examination has either been finalized or which is in the process to be carried out at the moment of this request, such report can only be accepted if the technical examination has been carried out according to the CPVO TP which was in force at the moment when the technical examination started.

1.3 Reporting between Examination Office and CPVO and Liaison with Applicant

1.3.1 Reporting between Examination Office and CPVO

The Examination Office shall deliver to the CPVO a preliminary report ("the preliminary report") no later than two weeks after the date of the request for technical examination by the CPVO.

The Examination Office shall also deliver to the CPVO a report relating to each growing period ("the interim report") and, when the Examination Office considers the results of the technical examination to be adequate to evaluate the variety or the CPVO so requests, a report relating to the examination ("the final report").

The final report shall state the opinion of the Examination Office on the distinctness, uniformity and stability of the variety. Where it considers those criteria to be satisfied, or where the CPVO so requests, a description of the variety shall be added to the report. If a report is negative the Examination Office shall set out the detailed reasons for its findings.

The interim and the final reports shall be delivered to the CPVO as soon as possible and no later than on the deadlines as laid down in the designation agreement.

1.3.2 Informing on problems in the DUS test

If problems arise during the course of the test the CPVO should be informed immediately so that the information can be passed on to the applicant. Subject to prior permanent agreement, the applicant may be directly informed at the same time as the CPVO particularly if a visit to the trial is advisable.

1.3.3 Sample keeping in case of problems

If the technical examination has resulted in a negative report, the CPVO shall inform the Examination Office as soon as possible in case that a representative sample of any relevant testing material shall be kept.

2. MATERIAL REQUIRED

2.1 Plant material requirements

Information with respect to the agreed closing dates and submission requirements of plant material for the technical examination of varieties can be found on <http://www.cpvo.europa.eu/main/en/home/documents-and-publications/s2-gazette> in the special issue S2 of the Official Gazette of the Office. General requirements on submission of samples are also to be found following the same link.

2.2 Informing the applicant of plant material requirements

The CPVO informs the applicant that

- they are responsible for ensuring compliance with any customs and plant health requirements.
- the plant material supplied should be visibly healthy, not lacking in vigour, nor affected by any important pest or disease.
- 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.

2.3 Informing about problems on the submission of material

The Examination Office shall report to the CPVO immediately in cases where the test material of the candidate variety has not arrived in time or in cases where the material submitted does not fulfil the conditions laid down in the request for material issued by the CPVO.

In cases where the examination office encounters difficulties to obtain plant material of reference varieties the CPVO should be informed.

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"

http://www.upov.int/export/sites/upov/en/publications/tgp/documents/tgp_9_1.pdf.

3.3 Conditions for Conducting the Examination

The tests should be carried out under conditions ensuring satisfactory growth for the expression of the relevant characteristics of the variety and for the conduct of the examination.

The optimum stage of development for the assessment of each characteristic is indicated by a number in the third column of the Table of Characteristics. The stages of development denoted by each number are described in Chapter 8.2.

3.4 Test design

Each test should be designed to result in a total of at least 100 plants, which should be divided between at least two replicates.

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 Additional tests

In accordance with Article 83(3) of Council Regulation No. 2100/94 an applicant may claim either in the Technical Questionnaire or during the test that a candidate has a characteristic which would be helpful in establishing distinctness. If such a claim is made and is supported by reliable technical data, an additional test may be undertaken providing that a technically acceptable test procedure can be devised.

Additional tests will be undertaken, with the agreement of the President of CPVO, where distinctness is unlikely to be shown using the characters listed in the protocol.

3.6 Constitution and maintenance of a variety collection

The process for the constitution and the maintenance of a variety collection can be summarized as follows:

Step 1: Making an inventory of the varieties of common knowledge

Step 2: Establishing a collection ("variety collection") of varieties of common knowledge which are relevant for the examination of distinctness of candidate varieties

Step 3: Selecting the varieties from the variety collection which need to be included in the growing trial or other tests for the examination of distinctness of a particular candidate variety.

3.6.1 Forms of variety collection

The variety collection shall comprise variety descriptions and living plant material, thus a living reference collection. The variety description shall be produced by the EO unless special cooperation exists between EOs and the CPVO. The descriptive and pictorial information produced by the EO shall be held and maintained in a form of a database

3.6.2 Living Plant Material

The EO shall collect and maintain living plant material of varieties of the species concerned in the variety collection.

3.6.3 Range of the variety collection

The living variety collection shall cover at least those varieties that are suitable to climatic conditions of a respective EO.

3.6.4 Making an inventory of varieties of common knowledge for inclusion in the variety collection

The inventory shall take into account the list of protected varieties and the official, or other, registers of varieties, in particular:

The inventory shall include varieties protected under National PBR (UPOV contracting parties) and Community PBR, varieties registered in the Common Catalogue, the OECD list, the Conservation variety list and varieties in trade or in commercial registers for those species not covered by a National or the Common Catalogue.

3.6.5 Maintenance and renewal/update of a living variety collection

The EO shall maintain seeds in conditions which will ensure germination and viability, periodical checks, and renewal as required. For the renewal of existing living material the identity of replacement living plant material shall be verified by conducting side-by-side plot comparisons between the material in the collection and the new material.

4. ASSESSMENT OF DISTINCTNESS, UNIFORMITY AND STABILITY

The prescribed procedure is to assess distinctness, uniformity and stability in a growing trial.

4.1 Distinctness

4.1.1 General recommendations

It is of particular importance for users of this Technical Protocol to consult the UPOV-General Introduction to DUS (link in chapter 1 of this document) and TGP 9 'Examining Distinctness' (http://www.upov.int/export/sites/upov/en/publications/tgp/documents/tgp_9_1.pdf) prior to making decisions regarding distinctness. However, the following points are provided for elaboration or emphasis in this Technical Protocol.

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 Technical Protocols are familiar with the recommendations contained in the UPOV-General Introduction to DUS prior to making decisions regarding distinctness.

Decision standards

If distinctness is assessed using the 2 x 1% criterion, the varieties need to be significantly different in the same direction at the 1% level in at least two out of three years in one or more measured characteristics. The tests in each year are based on Student's two-tailed t-test of the differences between variety means with standard errors estimated using the residual mean square from the analysis of the variety x replicate plot means.

If distinctness is assessed by the combined over years distinctness analysis (COYD) the difference between two varieties is clear if the respective characteristics are different at the 1% significance level or less ($p < 0.01$) in a test over either two or three years."

If the significance level or statistical methods proposed are not appropriate the method used should be clearly described.

4.1.4 Unless otherwise indicated, for the purposes of distinctness, all observations on single plants should be made on 20 plants or parts taken from each of 20 plants and any other observations made on all plants in the test, disregarding any off-type plants.

4.1.5 Method of observation

The recommended method of observing the characteristic for the purposes of distinctness is indicated by the following key in the third column of the Table of Characteristics (see document TGP/9 "Examining Distinctness", Section 4 "Observation 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

Type of observation: visual (V) or measurement (M)

"Visual" observation (V) is an observation made on the basis of the expert's judgment. For the purposes of this document, "visual" observation refers to the sensory observations of the experts and, therefore, also includes smell, taste and touch. Visual observation includes observations where the expert uses reference points (e.g. diagrams, example varieties, side-by-side comparison) or non-linear charts (e.g. colour charts). Measurement (M) is an objective observation against a calibrated, linear scale e.g. using a ruler, weighing scales, colorimeter, dates, counts, etc.

Type of record: for a group of plants (G) or for single, individual plants (S)

For the purposes of distinctness, observations may be recorded as a single record for a group of plants or parts of plants (G), or may be recorded as records for a number of single, individual plants or parts of plants (S). In most cases, "G" provides a single record per variety and it is not possible or necessary to apply statistical methods in a plant-by-plant analysis for the assessment of distinctness."

In cases where more than one method of observing the characteristic is indicated in the Table of Characteristics (e.g. VG/MG), guidance on selecting an appropriate method is provided in document TGP/9, Section 4.2.

4.2 Uniformity

It is of particular importance for users of this Technical Protocol to consult the UPOV-General Introduction to DUS (link in chapter 1 of this document) and TGP 10 'Examining Uniformity' (http://www.upov.int/export/sites/upov/en/publications/tgp/documents/tgp_10_1.pdf) prior to making decisions regarding uniformity. However, the following points are provided for elaboration or emphasis in this Technical Protocol:

For the assessment of uniformity, a population standard of 0.5 % and an acceptance probability of at least 95 % should be applied. In the case of a sample size of 300 plants, 4 off-types are allowed.

4.3 Stability

4.3.1 It is of particular importance for users of this Technical Protocol to consult the UPOV-General Introduction to DUS (link in chapter 1 of this document) and TGP 11 'Examining Stability' (http://www.upov.int/export/sites/upov/en/publications/tgp/documents/tgp_11_1.pdf)

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 further examined by testing a new seed stock to ensure that it exhibits the same characteristics as those shown by the initial 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) Flower: colour (characteristic 6)
- b) Plant: colour of hairs of main stem (characteristic 7)
- c) Seed: hilum colour (characteristic 15)
- d) Plant: time of maturity (characteristic 18)

5.4 If other characteristics than those from the TP are used for the selection of varieties to be included into the growing trial, the EO shall inform the CPVO and seek the prior consent of the CPVO before using these characteristics.

6. INTRODUCTION TO THE TABLE OF CHARACTERISTICS

6.1 Characteristics to be used

The characteristics to be used in DUS tests and preparation of descriptions shall be those referred to in the table of characteristics. All the characteristics shall be used, providing that observation of a characteristic is not rendered impossible by the expression of any other characteristic, or the expression of a characteristic is prevented by the environmental conditions under which the test is conducted or by specific legislation on plant health. In the latter case, the CPVO should be informed.

The Administrative Council empowers the President, in accordance with Article 23 of Commission Regulation N°874/2009, to insert additional characteristics and their expressions in respect of a variety.

States of expression and corresponding notes

In the case of qualitative and pseudo-qualitative characteristics, all relevant states of expression are presented in the characteristic. However, in the case of quantitative characteristics with 5 or more states, an abbreviated scale may be used to minimize the size of the Table of Characteristics. For example, in the case of a quantitative characteristic with 9 states, the presentation of states of expression in the Test Guidelines may be abbreviated as follows:

State	Note
small	3
medium	5
large	7

However, it should be noted that all of the following 9 states of expression exist to describe varieties and should be used as appropriate:

State	Note
very small	1
very small to small	2
small	3
small to medium	4
medium	5
medium to large	6
large	7
large to very large	8
very large	9

6.2 Example Varieties

Where appropriate, example varieties are provided to clarify the states of expression of each characteristic.

6.3 Legend

For the CPVO N° column:

G	Grouping characteristic	– see Chapter 5
QL	Qualitative characteristic	
QN	Quantitative characteristic	
PQ	Pseudo-qualitative characteristic	
(+)	See Explanations on the Table of Characteristics in Chapter 8.1	

For the UPOV N° column:

The numbering of the characteristics is provided as a reference to the ad hoc UPOV guideline.

(*)	UPOV Asterisk characteristic – Characteristics that are important for the international harmonization of variety descriptions.
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For the column "stage, method":

10 – 89	See Explanations on the Table of Characteristics in Chapter 8.2
MG, MS, VG, VS	Method of observation – see Chapter 4.1.5

7. TABLE OF CHARACTERISTICS

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples	Note
1.	1	10	Hypocotyl: anthocyanin coloration		
QL	(*)	VG	absent	Castetis, Oac Erin	1
			present	Cordoba, Es Mentor, RGT Shouna	9
2.	7.	65-66	Leaf: blistering		
QN		VG	absent or very weak		1
			weak	Sy Emily, Cordoba	3
			medium	Es Gladiator, Isidor, Opaline	5
			strong		7
			very strong		9
3.	8.	65-66	Leaf: shape of lateral leaflet		
(+)	(*)	VG/VS	lanceolate	Astafor, Crina F, Opaline	1
PQ			triangular	Aldana, Sponsor	2
			pointed ovate	Es Mentor, RGT Shouna, Cordoba	3
			rounded ovate	Es Gladiator, RGT Speeda	4
4.	9.	65-66	Leaf: size of lateral leaflet		
(+)		MS/VG	small	Abelina, Korus, Cardiff	3
QN			medium	Ecudor, Sigalia, Sirelia	5
			large		7
5.	10.	65	Leaf: intensity of green colour		
QN		VG	light		3
			medium	Adsoy, Coraline, Malaga, Cordoba	5
			dark	Naya, Protina, Sirelia	7
6.	11.	66	Flower: colour		
QL	(*)	VG	white	Blancas, Castetis, Oac Erin	1
G			violet	Cordoba, Es Mentor, RGT Shouna	2

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples	Note
7.	5.	65-85	Plant: colour of hairs of main stem (on middle third)		
PQ	(*)	VG/VS	grey	Es Gladiator, Oac Erin, Protéix	1
G			tawny	Es Mentor, RGT Shouna, Cordoba	2
8.	3.	66-89	Plant: growth type		
(+)	(*)	VS/MS	determinate		1
PQ			semi-determinate	Es Mentor, Suedina, Sultana	2
			semi-determinate to indeterminate	Sigalia	3
			indeterminate	Ecudor, Oac Erin, RGT Shouna	4
9.	4.	66-80	Plant: growth habit		
(+)		VG	erect	Sultana	1
PQ			erect to semi-erect	RGT Shouna	2
			semi-erect	Cordoba, Ecudor	3
			semi-erect to horizontal	Astafor, Solena	4
			horizontal		5
10.	6.	85	Plant: height		
QN	(*)	MG/MS	very short		1
			very short to short		2
			short	Sultana	3
			short to medium	Es Mentor, Naya, Protina	4
			medium	Oac Erin, RGT Shouna, Sigalia	5
			medium to tall	Ecudor	6
			tall	GI Hermine, Vanessa	7
			tall to very tall		8
			very tall		9
11.	12.	85	Pod: intensity of brown colour		
QN		VG	light	Energy, Malaga, Suedina	3
			medium	Naya, Sultana	5
			dark		7

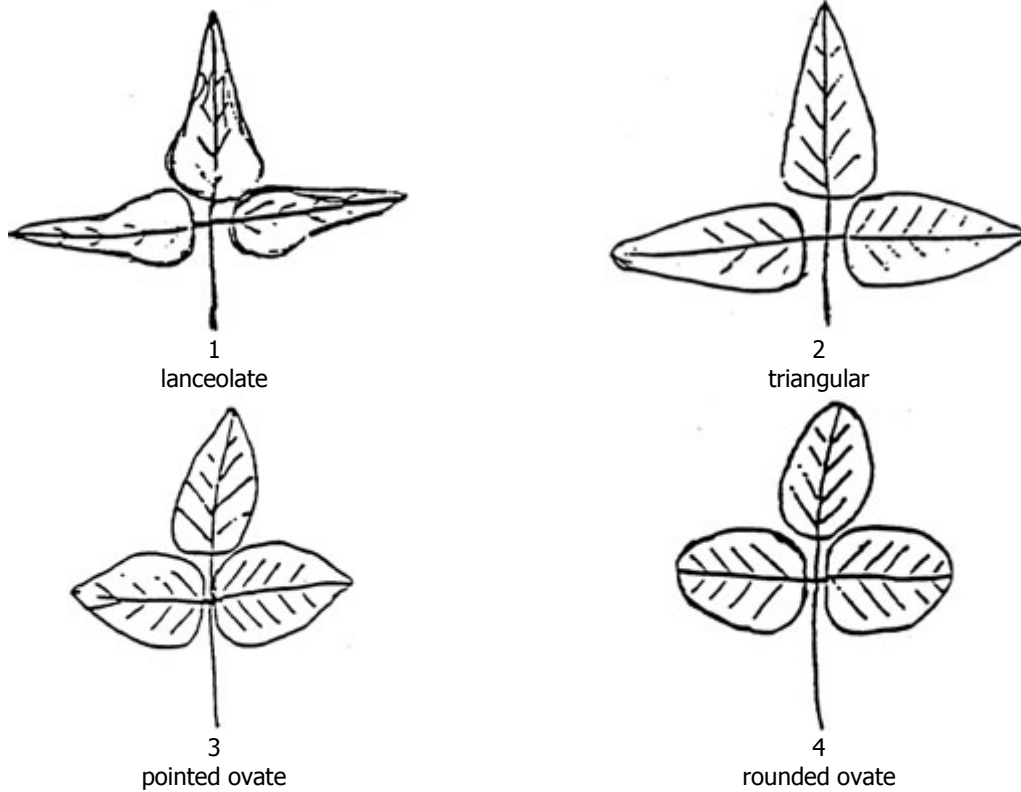
CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples	Note
12.	13.	89	Seed: size		
QN		VG	small	Astafor, Oac Erin, Protina	3
			medium	Coraline, Ecudor, Sigalia	5
			large	Isidor, Obelix, Safrana	7
13.	14.	89	Seed: shape		
PQ		VG	spherical	Astafor, Ecudor, ES Gladiator, Es Mentor	1
			spherical flattened	RGT Shouna, Sigalia	2
			elongated	Gallec, Naya, Obélix, SY Elliot, SY Livius	3
			elongated flattened		4
14.	15.	89	Seed: ground colour of testa (excluding hilum)		
PQ	(*)	VG	yellow	Cordoba, Es Mentor, RGT Shouna	1
			yellow green		2
			green		3
			light brown		4
			medium brown		5
			dark brown		6
			black		7
15.	17.	89	Seed: hilum colour		
PQ	(*)	VG	grey	Annushka, Castetis, Rgt Stumpa	1
			yellow	Es Mentor, Naya, Oac Erin	2
			light brown	Astafor, Ecudor, Santana	3
			dark brown	Solena, Sultana, Sunrise, Tourmaline	4
			imperfect black	Choco, GI Hermine, Regir	5
G			black	Atlantic, Cantoya, Isidor, Sigalia, Sirelia	6

CPVO N°	UPOV N°	Stage, Method	Characteristics	Examples	Note
16.	18.	89	Seed: colour of hilum funicle		
QL		VG	same as testa	Amandine, Cordoba, Es Mentor, RGT Shouna	1
			different to testa	Amarok, Meridian Pzo, Sy Livius	2
17.	19.	MG	Plant: time of beginning of flowering		
(+)	(*)		very early	Adsoy, Paradis, Sultana	1
QN			very early to early	Es Gladiator, Rgt Speeda, Sigalia	2
			early	Safrana, Sphera	3
			early to medium	Ecudor, Steara	4
			medium		5
			medium to late		6
			late		7
			late to very late		8
			very late		9
18.	20.	89	Plant: time of maturity		
QN	(*)	MG	very early	Adsoy, Laulema, Sultana	1
			very early to early	ES Mentor, Sigalia, Soprana	2
			early	Es Gladiator, Rgt Speeda	3
			early to medium	Goriziana, Isidor, Steara, RGT Sinfonia	4
			medium	Blancas, Ecudor, Mitsuko	5
			medium to late		6
			late		7
			late to very late		8
G			very late		9

8. EXPLANATIONS ON THE TABLE OF CHARACTERISTICS

8.1 Explanations for individual characteristics

Ad. 3: Leaf: shape of lateral leaflet



Ad. 4: Leaf: size of lateral leaflet

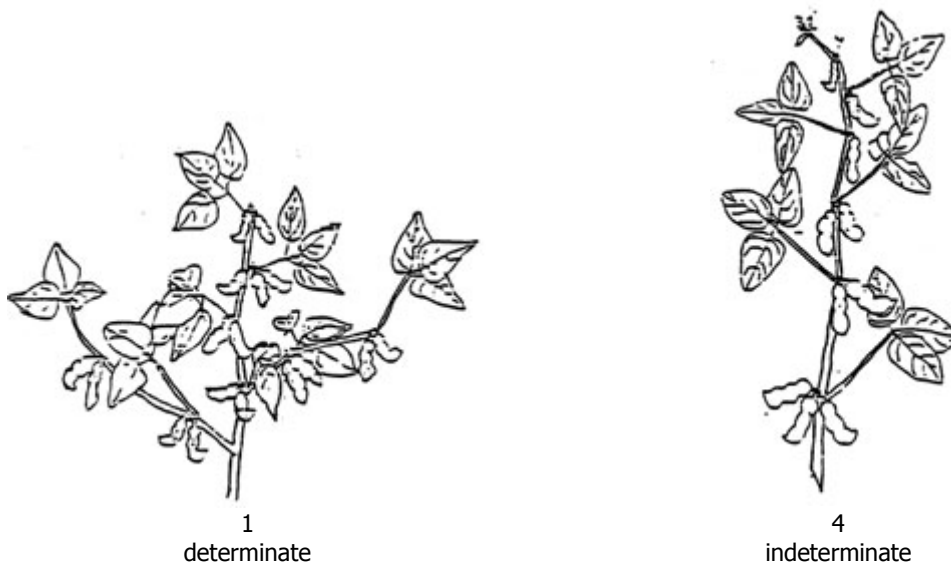


The characteristic can be assessed using one of the following types of observation:
MS: Measurement of a number of individual plants or parts of plants (length x width)
VG: Visual assessment by a single observation of a group of plants or parts of plants
VS: Visual assessment by observation of individual plants or parts of plants

Ad. 8: Plant: growth type

- Layout: This characteristic should preferably be assessed in a special trial with 3 or 4 replicates of 20 plants each with about 9 cm between plants in the rows. Any border effect must be avoided.
- Plant material: Candidate and example varieties must be grown in groups according to their earliness at maturity (characteristic 18).
- Observation:
At the beginning of flowering time (1 flower at any level of the main stem), the apex of the plant must be identified with a mark.
At maturity (free kernels in the pod), the number of nodes between the mark and the top of the plant is counted. The average number per variety gives—in comparison with standard varieties—the state of expression of the characteristics.

In addition, the characteristic “Size of the terminal leaf” could also be considered to separate more clearly the state of expression “determinate” (Note 1) from other states. The terminal leaf on the main stem of determinate varieties is more or less equal to other leaves at lower levels. For other types, the terminal leaf is clearly smaller.



Ad. 9: Plant: growth habit



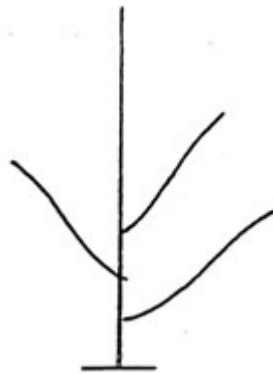
1
erect



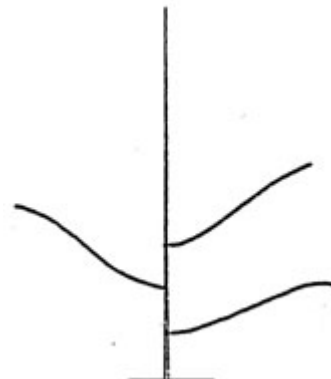
2
erect to semi-erect



3
semi-erect



4
semi-erect to horizontal



5
horizontal

Ad. 17: Plant: time of beginning of flowering

Depending on the location the stage of flowering is reached when 10% (late sowing) or 50% of the plants show at least one opened flower.

8.2 Growth stages (Meier, 1997)

CODE		DESCRIPTION
2- and 3 digit		
Principal growth stage 0: Germination		
00	000	Dry seed
01	001	Beginning of seed imbibition
02	002	-
03	003	Seed imbibition complete
04	004	-
05	005	Radicle emerged from seed
06	006	Elongation of radicle; formation of root hairs
07	007	Hypocotyl with cotyledons breaking through seed coat
08	008	Hypocotyl reaches the soil surface; hypocotyl arch visible
09	009	Emergence: hypocotyl with cotyledons emerged above soil surface ("cracking stage")
Principal growth stage 1: Leaf development (Main shoot)		
10	100	Cotyledons completely unfolded
11	101	First pair of true leaves unfolded (unifoliolate leaves on the first node)
12	102	Trifoliolate leaf on the 2nd node unfolded
13	103	Trifoliolate leaf on the 3rd node unfolded
1.	10.	States continuous till
19	109	Trifoliolate leaf on the 9th node unfolded. No side shoots visible ¹
-	110	Trifoliolate leaf on the 10th node unfolded ¹
-	111	Trifoliolate leaf on the 11th node unfolded ¹
-	112	Trifoliolate leaf on the 12th node unfolded ¹
-	113	Trifoliolate leaf on the 13th node unfolded ¹
-	11.	Stages continuous till
-	119	Trifoliolate leaf on the 19th node unfolded ¹

¹ The side shoot development may occur earlier; in this case continue with the principal growth stage 2

CODE		DESCRIPTION
2- and 3 digit		
Principal growth stage 2: Formation of side shoots		
20	200	-
21	201	First side shoot visible
22	202	2nd side shoot of first order visible
23	203	3rd side shoot of first order visible
2.	20.	Stages continuous till ...
29	209	9 or more side shoots of first order visible (2 digit) 9th side shoot of first order visible (3 digit)
-	210	10th side shoot of first order visible
-	221	First side shoot of 2nd order visible
-	22.	Stages continuous till ...
-	229	9th side shoot of 2nd order visible
-	2N1	First side shoot of Nth order visible
-	2N9	9th side shoot of Nth order visible
Principal growth stage 3: ²		
Principal growth stage 4: Development of harvestable vegetative plant parts – Main shoot -		
40	400	-
41	401	-
42	402	-
43	403	-
44	404	-
45	405	-
46	406	-
47	407	-
48	408	-
49	409	Harvestable vegetative plant parts have reached final size (Cutting of soybean plants for feeding purposes)

² The stem elongation of the soybean plant (Principal growth stage 3) proceeds parallel to the leaf development. Therefore a coding in the principal growth stage 3 has been omitted.

CODE		DESCRIPTION
2- and 3 digit		
Principal growth stage 5: Inflorescence emergence (Main shoot)		
50	500	-
51	501	First flower buds visible
52	502	-
53	503	-
54	504	-
55	505	First flower buds enlarged
56	506	-
57	507	-
58	508	-
59	509	First flower petals visible; flower buds still closed
Principal growth stage 6: Flowering (Main shoot)		
60	600	First flowers opened (sporadically in population)
61	601	Beginning of flowering about 10% of flowers open ³ Beginning of flowering ⁴
62	602	About 20% of flowers open ³
63	603	About 30% of flowers open ³
64	604	About 40% of flowers open ³
65	605	Full flowering: about 50% of flowers open ³ Main period of flowering ⁴
66	606	About 60% of flowers open ³
67	607	Flowering declining ³
68	608	-
69	609	End of flowering: first pods visible (approximately 5 mm length) ³

³ This definition refers to determinate varieties

⁴ This definition refers to indeterminate varieties

CODE		DESCRIPTION
2- and 3 digit		
Principal growth stage 7: Development of fruits and seeds		
70	700	First pod reached final length (15-20 mm)
71	701	About 10% of pods have reached final length (15-20 mm) ³ Beginning of pod development ⁴
72	702	About 20% of pods have reached final length (15-20 mm) ³
73	703	About 30% of pods have reached final length (15-20 mm) ³ Beginning of pod filling ⁴
74	704	About 40% of pods have reached final length (15-20 mm) ³
75	705	About 50% of pods have reached final length (15-20 mm) Continuation of pod filling. ³ Main period of pod development Continuation of pod filling ⁴
76	706	-
77	707	About 70% of pods have reached final length (15-20 mm): advanced pod filling. ³ Advanced pod filling ⁴
78	708	-
79	709	Approximately all pods have reached final length (15-20 mm). Seeds filling the cavity of the majority of pods ^{3,4}
Principal growth stage 8: Ripening of fruits and seeds		
80	800	First pod ripe, beans final colour, dry and hard
81	801	Beginning of ripening; about 10% of pods are ripe, beans final colour, dry and hard. ³ Beginning of pod and seed ripening ⁴
82	802	About 20% of pods are ripe; beans final colour, dry and hard ³
83	803	About 30% of pods are ripe; beans final colour, dry and hard ³
84	804	About 40% of pods are ripe; beans final colour, dry and hard ³
85	805	Advanced ripening; about 50% of pods are ripe; beans final colour, dry and hard. ³ Main period of pod and seed ripening ⁴
86	806	About 60% of pods are ripe; beans final colour, dry and hard ³
87	807	About 70% of pods are ripe; beans final colour, dry and hard ³
88	808	About 80% of pods are ripe; beans final colour, dry and hard ³
89	809	Full maturity: approximately all pods are ripe; beans final colour, dry and hard (= Harvest maturity) ³ Majority of pods are ripe; beans final colour, dry and hard ⁴

³ This definition refers to determinate varieties

⁴ This definition refers to indeterminate varieties

CODE		DESCRIPTION
2- and 3 digit		
Principal growth stage 9: Senescence		
90	900	-
91	901	About 10% of leaves discolored or fallen
92	902	About 20% of leaves discolored or fallen
93	903	About 30% of leaves discolored or fallen
94	904	About 40% of leaves discolored or fallen
95	905	About 50% of leaves discolored or fallen
96	906	About 60% of leaves discolored or fallen
97	907	Above ground parts of plants dead
98	908	-
99	909	Harvested product (seeds)

9. LITERATURE

Meier, Uwe (Editor), 1997: "Growth Stages of Mono- and Dicotyledonous Plants", BBCH-Monograph, Blackwell Wissenschafts-Verlag Berlin-Wien 1997 (quadrilingual version: English, français, deutsch, español)

10. TECHNICAL QUESTIONNAIRE

The Technical Questionnaire is available on the CPVO website under the following reference:
CPVO-TQ/080/1.