



TG/VIGNA_RAD(proj.2)

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INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS

Geneva

DRAFT

MUNG BEAN

UPOV Code(s): VIGNA_RAD

Vigna radiata (L.) R. Wilczek

GUIDELINES

FOR THE CONDUCT OF TESTS

FOR DISTINCTNESS, UNIFORMITY AND STABILITY

*prepared by experts from China
to be considered by the
Technical Working Party for Agricultural Crops
at its fifty-third session, to be held virtually
from 2024-05-27 to 2024-05-30*

Disclaimer: this document does not represent UPOV policies or guidance

Alternative names:*

<i>Botanical name</i>	<i>English</i>	<i>French</i>	<i>German</i>	<i>Spanish</i>
<i>Vigna radiata</i> (L.) R. Wilczek	Mung Bean	Haricot mungo	Mungbohne, Mungobohne	Frijol mungo

The purpose of these guidelines ("Test Guidelines") is to elaborate the principles contained in the General Introduction (document TG/1/3), and its associated TGP documents, into detailed practical guidance for the harmonized examination of distinctness, uniformity and stability (DUS) and, in particular, to identify appropriate characteristics for the examination of DUS and production of harmonized variety descriptions.

ASSOCIATED DOCUMENTS

These Test Guidelines should be read in conjunction with the General Introduction and its associated TGP documents.

* These names were correct at the time of the introduction of these Test Guidelines but may be revised or updated. [Readers are advised to consult the UPOV Code, which can be found on the UPOV Website (www.upov.int), for the latest information.]

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1. Subject of these Test Guidelines

These Test Guidelines apply to all varieties of *Vigna radiata* (L.) R. Wilczek.

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:

500 g or at least 10,000 seeds

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.

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

2.5 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*

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

3.1.2 The two independent growing cycles should be in the form of two separate plantings.

3.1.3 The testing of a variety may be concluded when the competent authority can determine with certainty the outcome of the test.

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*

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.

3.4 *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 at least 2 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 *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.

4.1.4 Number of Plants or Parts of Plants to be Examined

Unless otherwise indicated, for the purposes of distinctness, all observations on single plants should be made on 20 plants or parts of plants 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 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. color 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*

- 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 These Test Guidelines have been developed for the examination of seed-propagated varieties. For varieties with other types of propagation, the recommendations in the General Introduction and document TGP/13 "Guidance for new types and species" Section 4.5 "Testing Uniformity" should be followed.
- 4.2.3 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. In the case of a sample size of 200 plants, 5 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 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) Hypocotyl: anthocyanin coloration (characteristic 1)
 - (b) Flower: color of corolla (characteristic 10)
 - (c) Time of maturity (characteristic 13)
 - (d) Plant: growth habit (characteristic 14)
 - (e) Seed: ground color of testa (characteristic 29)
 - (f) Seed: seed coat luster (characteristic 31)
- 5.4 Guidance for the use of grouping characteristics, in the process of examining distinctness, is provided through the General Introduction and document TGP/9 "Examining Distinctness".

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

6.2.1 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.

6.2.2 All relevant states of expression are presented in the characteristic.

6.2.3 Further explanation of the presentation of states of expression and notes is provided in document TGP/7 “Development of Test Guidelines”.

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

English		français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
1	2	3	4	5	6	7
Name of characteristics in English		Nom du caractère en français	Name des Merkmals auf Deutsch	Nombre del carácter en español		
states of expression		types d'expression	Ausprägungsstufen	tipos de expresión		

1 Characteristic number

2 (*) Asterisked characteristic – see Chapter 6.1.2

3 Type of expression
 QL Qualitative characteristic – see Chapter 6.3
 QN Quantitative characteristic – see Chapter 6.3
 PQ Pseudo-qualitative characteristic – see Chapter 6.3

4 Method of observation (and type of plot, if applicable)
 MG, MS, VG, VS – see Chapter 4.1.5

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

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

7 Growth stage key See Explanations on the Table of Characteristics in Chapter 8.3

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

	English		français		deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
1.	QL	VG	(+)		10			
	Hypocotyl: anthocyanin coloration							
	absent					Zhonglv1 C3408	1	
	present					Dayinggelv 925 C5786	9	
2.	QN	MG			20			
	Time of beginning of flowering							
	very early						1	
	early					Baolv 942 C5636	3	
	medium					Zhonglv1 C3408	5	
	late					Lvdou C2969	7	
	very late						9	
3. (*)	PQ	VG	(+)	(a)	30			
	Stem: intensity of anthocyanin coloration							
	green						1	
	greenish purple						2	
	purple						3	
4.	QN	VG	(+)	(a)	30			
	Stem: hairiness							
	absent						1	
	weak						2	
	strong						3	
5. (*)	PQ	VG	(+)	(b)	30			
	Leaf: shape of lateral leaflet							
	narrow oval						1	
	medium oval						2	
	broad oval						3	
	lobed						4	
6.	QN	VG	(+)	(b)	30			
	Leaf: intensity of green color							
	light						1	
	medium						2	
	dark						3	

	English		français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
13	(*)	QN	MG	(+)	40		
	Time of maturity						
	very early						1
	early				Baolv 942 C5636		3
	medium				Zhonglv1 C3408		5
	late				Lvdou C2969		7
	very late						9
14		PQ	VG	(+)	40-50		
	Plant: growth habit						
	determinate				Zhonglv1 C3408		1
	indeterminate				Yinggelvdou C1547		2
	sprawl				Lanlvdou C4157		3
15		QN	MS		40-50		
	Plant: height						
	very short				Gaoyangxiaolvdou C0229		1
	short				Dayanglvdou C0385		3
	medium				Zhonglv1 C3408		5
	tall				Quyanyangxiaolvdou C1819		7
	very tall				Hulvdou C1431		9
16		QN	MS		40-50		
	Plant: number of branches						
	few						1
	medium						2
	many						3
17		QN	VG		50		
	Plant: pod-shattering						
	absent or very weak						1
	weak						2
	strong						3
18		QN	VG	(+)	40-50		
	Plant: attitude of branches						
	erect						1
	semi erect						2
	horizontal						3

	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
19	QN	MS			50	
	Plant: number of pods					
	very few				Dayanglvdou C0385	1
	few				Gaoyangxiaolvdou C0229	3
	medium				Youlvdou C3247	5
	many				Zhonglv1 C3408	7
	very many				Hulvdou C1431	9
20	QN	MS			40	
	Stem: number of nodes					
	few					1
	medium					2
	many					3
21	PQ	MS	(c)		50	
	Pod: length					
	short				Hulvdou C2185	1
	medium				Zhonglv1 C3408	2
	long				Dayinggelv 925 C5786	3
22	QN	MS	(+)	(c)	50	
	Pod: number of seed					
	few				Fuxianlvdou C3455	1
	medium				Zhonglv1 C3408	2
	many				Dengxianlvdou C2737	3
23 (*)	PQ	VG	(+)	(c)	50	
	Pod: shape of pod					
	straight					1
	falcate					2
	incurved					3
24	PQ	VG	(c)		40	
	Stem: shape of section					
	round				Dengxianlvdou C2737	1
	oblate				Zhonglv1 C3408	2

	English		français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
25	(*)	PQ	VG	(c)	50		
		Pod: color					
		yellowish white				Hulvdou C2185	1
		brown				Dengxianlvdou C2737	2
		black				Zhonglv1 C3408	3
26		PQ	VG	(c)	50		
		Pod: color of hairiness					
		grey					1
		brown					2
27		QN	MG		50		
		Seed: weight per 1000 seeds					
		small					1
		medium					3
		large					5
28		PQ	VG	(+)	50		
		Seed: shape					
		sphere				Pinlvyouzi 88-49 C5234	1
		cylindrical				Dayinggelv 925 C5786	2
		spheric				Zhonglv1 C3408	3
29	(*)	PQ	VG	(+)	50		
		Seed: ground color of testa					
		green				Zhonglv1 C3408	1
		yellow				Suhuang 1 C6402	2
		brown				Hulvdou C2185	3
		black				Heizhengzhu C5503	4
30		QN	VG		50		
		Seed: intensity of green color					
		light					1
		medium					2
		dark					3

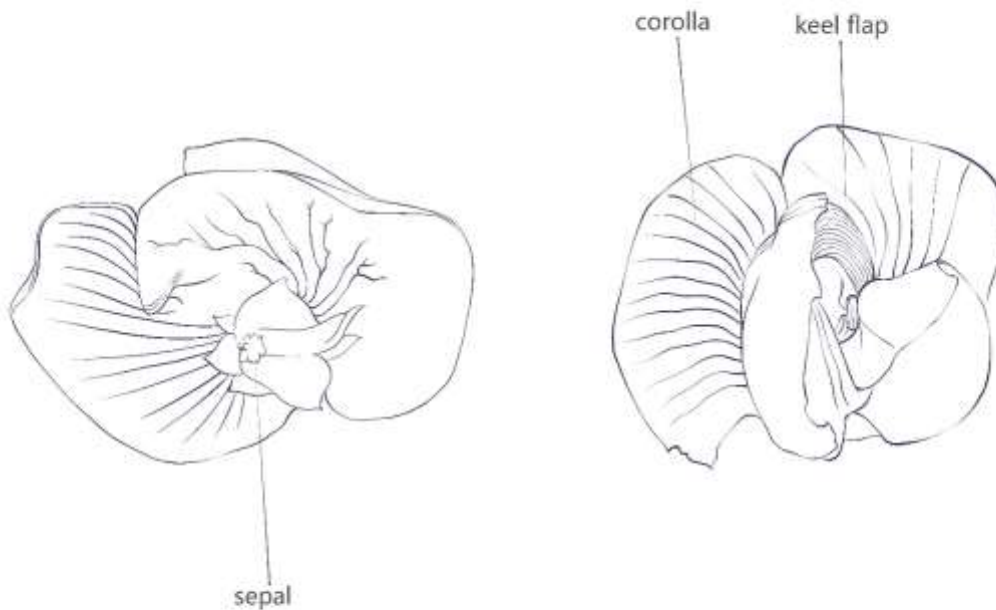
	English		français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
31	QL	VG		50			
	Seed: seed coat luster						
	absent						1
	present						9

8. Explanations on the Table of Characteristics

8.1 *Explanations covering several characteristics*

Characteristics containing the following key in the Table of Characteristics should be examined as indicated below:

- (a) Observe the middle and upper parts of the main stem.
- (b) Observations should be made on lateral leaflets of compound leaves at segments 8 to 10 in the middle and upper parts of the plant.
- (c) Measure the pod in the upper part of the plant.
- (d) Observations should be made on fresh fully open flowers. Diagram of flower parts:



8.2 Explanations for individual characteristics


Ad. 1: Hypocotyl : anthocyanin coloration

	
absent	present
1	9





Ad. 3: Stem: intensity of anthocyanin coloration

		
green	greenish purple	purple
1	2	3

Ad. 4: Stem: hairiness

		
absent	weak	strong
1	2	3

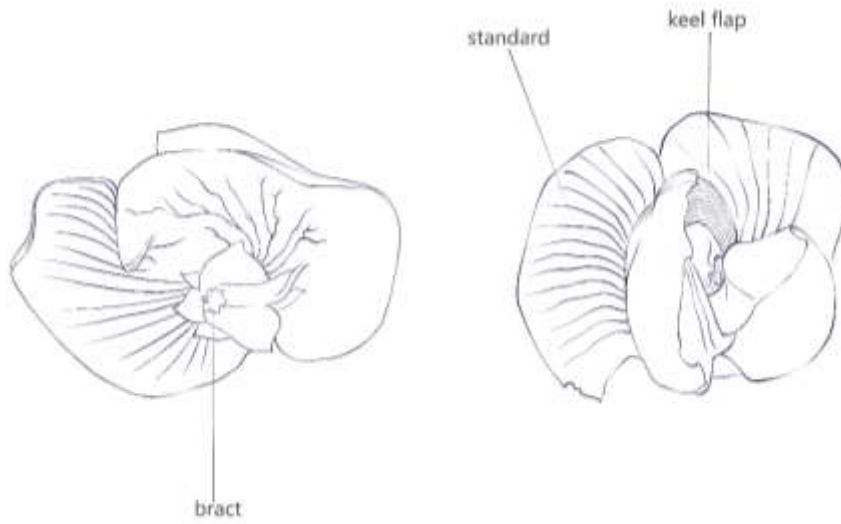
Ad. 5: Leaf: shape of lateral leaflet

			
narrow oval	medium oval	broad oval	lobed
1	2	3	4

Ad. 6: Leaf: intensity of green color



		
light	medium	dark
1	2	3

Ad. 10: Flower: color of corolla





		
light yellow	medium yellow	yellow with purple
1	2	3

Ad. 11: Flower: anthocyanin coloration of keel flap

	
absent	present
1	9



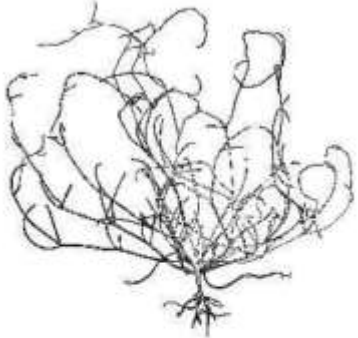
Ad. 12: Flower: anthocyanin coloration of sepal

	
absent	present
1	9



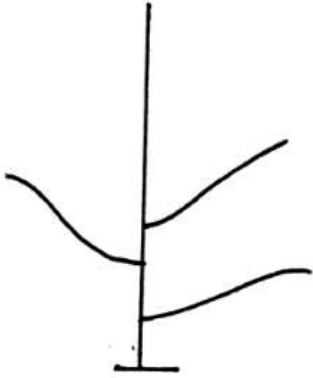
Ad. 13: Time of maturity

The time of maturity is reached when 50% of pods are mature, the pods are mature and the seeds are hard.

Ad. 14: Plant: growth habit

		
determinate	indeterminate	sprawl
1	2	3

Ad. 18: Plant: attitude of branches

		
erect	semi erect	horizontal
1	2	3




Ad. 22: Pod: number of seed

The number of nodes from the cotyledon node of the plant to the last node where the compound leaf unfolds at the top of the plant.


Ad. 23: Pod: shape of pod

		
straight	falcate	incurved
1	2	3

Ad. 28: Seed: shape

		
sphere	cylindrical	spheric
1	2	3

Ad. 29: Seed: ground color of testa

			
green	yellow	brown	black
1	2	3	4

8.3 *Decimal Code for the Growth Stages of Vigna radiata*

Code	Growth stages	General Description
10	Seedling stage	Opposite simple leaves fully spread
20	Initial flowering period	Ten percent of the plants in the plot have their first flower
30	Full-bloom stage	Seventy percent of the plants in the plot are flowering
40	Maturity stage	In the cell, 50% of the pods are mature, the pods are mature and the seeds are hard
50	Ull ripe stage	More than 90% of the pods in the cell were mature, the pods showed mature color, and the beans hardened

9. Literature

2013: Guidelines for the Conduct of Test for Distinctness, Uniformity and Stability of Mungbean (*Vigna radiata* L. Wilczek). Chinese standard, in Chinese.

Lixia Wang, et al. 2014: Adaptability and Phenotypic Variation of Agronomic Traits in Mungbean Core Collection under Different Environments in China. Beijing, CN.

10. Technical Questionnaire

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:
		Application date: (not to be filled in by the applicant)
TECHNICAL QUESTIONNAIRE to be completed in connection with an application for plant breeders' rights		
1. Subject of the Technical Questionnaire		
1.1	Botanical name	<input type="text" value="Vigna radiata (L.) R. Wilczek"/>
1.2	Common name	<input type="text" value="Mung Bean"/>
2. Applicant		
	Name	<input type="text"/>
	Address	<input type="text"/>
	Telephone No.	<input type="text"/>
	Fax No.	<input type="text"/>
	E-mail address	<input type="text"/>
	Breeder (if different from applicant)	<input type="text"/>
3. Proposed denomination and breeder's reference		
	Proposed denomination (if available)	<input type="text"/>
	Breeder's reference	<input type="text"/>

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:
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#4. Information on the breeding scheme and propagation of the variety

4.1 Breeding scheme

Variety resulting from:

4.1.1 Crossing []

(a) controlled cross []

(please state parent variety)

(.....) x (.....)

female parent male parent

(b) partially known cross []

(please state known parent variety(ies))

(.....) x (.....)

female parent male parent

(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)

Authorities may allow certain of this information to be provided in a confidential section of the Technical Questionnaire.

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:
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4.2 Method of propagating the variety	[]
4.2.1 Other (Please provide details)	[]
<input type="text"/>	

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:
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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 Leaf: shape of lateral leaflet (5)		
narrow oval		1 []
medium oval		2 []
broad oval		3 []
lobed		4 []
5.2 Leaf: anthocyanin coloration at base of leaflets (7)		
absent	Zhonglv1 C3408	1 []
present	Dayinggelv 925 C5786	9 []
5.3 Petiole: intensity of anthocyanin coloration (9)		
absent		1 []
present		9 []
5.4 Flower: color of corolla (10)		
light yellow		1 []
medium yellow		2 []
yellow with purple		3 []
5.5 Time of maturity (13)		
very early		1 []
early	Baolv 942 C5636	3 []
medium	Zhonglv1 C3408	5 []
late	Lvdou C2969	7 []
very late		9 []
5.6 Plant: growth habit (14)		
determinate	Zhonglv1 C3408	1 []
indeterminate	Yinggelvdou C1547	2 []
sprawl	Lanlvdou C4157	3 []

Characteristics	Example Varieties	Note
5.7 Plant: height (15)		
very short	Gaoyangxiaolvdou C0229	1 []
short	Dayanglvdou C0385	3 []
medium	Zhonglv1 C3408	5 []
tall	Quyaxiaolvdou C1819	7 []
very tall	Hulvdou C1431	9 []
5.8 Pod: shape of pod (23)		
straight		1 []
falcate		2 []
incurved		3 []
5.9 Pod: color (25)		
yellowish white	Hulvdou C2185	1 []
brown	Dengxianlvdou C2737	2 []
black	Zhonglv1 C3408	3 []
5.10 Seed: weight per 1000 seeds (27)		
small		1 []
medium		3 []
large		5 []
5.11 Seed: ground color of testa (29)		
green	Zhonglv1 C3408	1 []
yellow	Suhuang 1 C6402	2 []
brown	Hulvdou C2185	3 []
black	Heizhengzhu C5503	4 []
5.12 Seed: seed coat luster (31)		
absent		1 []
present		9 []

TECHNICAL QUESTIONNAIRE	Page {x} of {y}	Reference Number:
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6. Similar varieties and differences from these varieties

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

Denomination(s) of variety(ies) similar to your candidate variety	Characteristic(s) in which your candidate variety differs from the similar variety(ies)	Describe the expression of the characteristic(s) for the similar variety(ies)	Describe the expression of the characteristic(s) for your candidate variety
<i>Example</i>			
Comments:			

#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

Authorities may allow certain of this information to be provided in a confidential section of the Technical Questionnaire.

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8. Authorization for release

(a) Does the variety require prior authorization for release under legislation concerning the protection of the environment, human and animal health?

Yes [] No []

(b) Has such authorization been obtained?

Yes [] No []

If the answer to (b) is yes, please attach a copy of the authorization.

9. Information on plant material to be examined or submitted for examination

9.1 The expression of a characteristic or several characteristics of a variety may be affected by factors, such as pests and disease, chemical treatment (e.g. growth retardants or pesticides), effects of tissue culture, different rootstocks, scions taken from different growth phases of a tree, etc.

9.2 The plant material should not have undergone any treatment which would affect the expression of the characteristics of the variety, unless the competent authorities allow or request such treatment. If the plant material has undergone such treatment, full details of the treatment must be given. In this respect, please indicate below, to the best of your knowledge, if the plant material to be examined has been subjected to:

(a) Microorganisms (e.g. virus, bacteria, phytoplasma)	Yes []	No []
(b) Chemical treatment (e.g. growth retardant, pesticide)	Yes []	No []
(c) Tissue culture	Yes []	No []
(d) Other factors	Yes []	No []

Please provide details for where you have indicated "yes".

.....

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

Applicant's name

Signature Date

[End of document]