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INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS

Geneva

DRAFT

MULBERRY

UPOV Code(s):

MORUS

Morus L.

GUIDELINES

FOR THE CONDUCT OF TESTS

FOR DISTINCTNESS, UNIFORMITY AND STABILITY

prepared by experts from Japan
to be considered by the
Technical Working Party for Fruit Crops
at its fiftieth session, to be held in Budapest, Hungary,
from 2019-06-24 to 2019-06-28

Disclaimer: this document does not represent UPOV policies or guidance

Alternative names:*

Botanical name	*English*	*French*	*German*	*Spanish*
Morus L.	Mulberry	Mûrier	Maulbeerbaum	Moro

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 *Morus* 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 plants on their own roots or on a rootstock specified by the competent authority.

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

5 plants.

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.

2.4 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 may be observed from a single planting, examined in two separate growing cycles.

3.1.3 In particular, it is essential that the plants produce a satisfactory crop of fruit in each of the two growing cycles.

3.1.4 The growing cycle is considered to be the duration of a single growing season, beginning with bud burst (flowering and/or vegetative), flowering and fruit harvest and concluding when the following dormant period ends with the swelling of new season buds.

3.1.5 In the case of male varieties, it is essential that the plants trees produce a satisfactory flowers in each of the two growing cycles and the growing cycle is considered to be the duraton of a single growing season, begining with bud burst (flowering and/or vegetative), flowering and concluding when the following dormant period ends with the swelling of new season buds.

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 Table of Characteristics. The stages of development denoted by each number are described in Chapter 8.

3.4 Test Design

3.4.1 Each test should be designed to result in a total of at least 5 plants.

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 5 plants or parts of plants taken from each of 5 plants and any other observations made on all plants in the test, disregarding any off-type plants.

In the case of observations of parts taken from single plants, the number of parts to be taken from each of the plants should be 2.

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 vegetatively 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 of vegetatively propagated varieties, a population standard of 1% and an acceptance probability of at least 95% should be applied. In the case of a sample size of 5 plants, no 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 plant 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) Plant: ploidy (characteristic 1)
(b) Leaf: phyllotaxis (characteristic 16)
(c) Leaf blade: shape of apex (characteristic 21)
(d) Flower: sex expression (characteristic 34)

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 In the case of qualitative and pseudo-qualitative characteristics (see Chapter 6.3), 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

6.2.3 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)-(f) See Explanations on the Table of Characteristics in Chapter 8.1

7 Not applicable

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**	**(+)**				
	Plant: ploidy					
	diploid	diploïde	diploid	diploide	Ichinose, Kenmochi	2
	triploid				Ayanobori, Ichibei, Shin-Kenmochi, Tagowase, Yukiasahi	3
	tetraploid				Yonbaiseiso	4
	pentaploid					5
	hexaploid				Keguwa	6
2.	**QN VG**					
	Tree: vigor					
	weak				Sekizaiso	3
	medium				Ichinose	5
	strong				Kenmochi, Oyutaka, Senshin	7
3.	**PQ VG**	**(+)**				
	Tree: growth habit					
	upright				Mitsuminami, Tokiyutaka	1
	semi-upright				Ichinose, Kenmochi	2
	semi-spreading				Ayanobori, Hayatesakari, Yukishinogi	3
	spreading				Sekizaiso	4
	weeping				Shidareguwa	5
4. (*)	**QN MS/VG**	**(a)**				
	Bud: size					
	small				Shin-Ichinose	1
	medium				Ichinose, Kenmochi	3
	large				Yukishinogi	5
5. (*)	**PQ VG**	**(a)**				
	Bud : shape					
	obtuse triangular				Atsubamidori, Shin-Ichinose	1
	triangular				Ichinose, Kenmochi	2
	acute triangular				Wasemidori	3
	spindle shaped				Negoyatakasuke	4

		English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
6.	**(*)**	**PQ VG**	**(a)**				
		Bud: color					
		light gray				Shin-Ichinose, Shiromeroso	1
		grayish brown				Atsubamidori	2
		yellowish brown				Kokuso 27	3
		reddish brown				Ichibei	4
		medium brown				Ichinose	5
		dark brown				Kenmochi	6
7.		**QN MS/VG**	**(+)** **(b)**				
		Branch: length of base without sprouts					
		short				Kairyo-Nezumigaeshi	3
		medium				Ichinose	5
		long				Kenmochi	7
8.		**QN MS/VG**	**(b)**				
		Branch: number					
		few				Shin-Ichinose	1
		medium				Ichinose, Kenmochi	3
		many				Kairyo-Nezumigaeshi, Yukishinogi	5
9.	**(*)**	**QN VG**	**(+)** **(b)**				
		Branch: uniformity					
		low				Sekizaiso	1
		medium				Ichinose, Kenmochi	3
		high				Mitsuminami, Tokiyutaka, Yukishinogi	5
10.		**QN MS/VG**	**(b)**				
		Branch: number of lateral branches					
		absent				Tokiyutaka	1
		few				Ichinose, Kenmochi	2
		medium				Kairyo-Nezumigaeshi	3
		many				Jumonji, Keikanso	4

		English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
11.		**QN MS/VG**	**(b)**				
		Branch: length					
		short				Negoyatakasuke	1
		medium				Ichinose, Kenmochi	3
		long				Shin-Ichinose	5
12.		**QN MS/VG**	**(b)**				
		Branch: thickness					
		thin				Mitsuminami, Nezumigaeshi	1
		medium				Ichinose, Kenmochi	3
		thick				Hayatesakari, Shinso 1	5
13.		**PQ VG**	**(b)**				
		Branch: color					
		light gray				Ichinose	1
		grayish brown				Mizusawaguwa	2
		greenish brown				Shin-Ichinose	3
		yellowish brown				Fukushimaoha	4
		reddish brown				Ichibei	5
		medium brown				Rohachi	6
		dark brown				Kenmochi	7
14.	**(*)**	**QN MS/VG**	**(+)** **(b)**				
		Branch: length of internode					
		short				Tokiyutaka	3
		medium				Ichinose, Kenmochi	5
		long				Ichibei	7
15.		**QL VG**	**(c)**				
		Leaf: presence of stipules					
		absent					1
		present				Florio	9

	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
16.	**QL VG**	**(+) (c)**				
	Leaf: phyllotaxis					
	one half				Chijimiguwa, Negoyatakasuke	1
	one third					2
	two fifth				Ichinose, Kenmochi	3
	three eighth				Wasemidori	4
	five thirteenth					5
17.	**(*) QN VG**	**(c)**				
	Leaf: attitude					
	upwards					1
	outwards				Ichinose, Kenmochi	2
	downwards				Asayuki, Shin-Ichinose	3
18.	**(*) QN MS/VG**	**(+) (c)**				
	Leaf blade: length					
	short					3
	medium					5
	long					7
19.	**(*) QN MS/VG**	**(+) (c)**				
	Leaf blade: width					
	narrow					3
	medium					5
	broad					7
20.	**(*) QN MS/VG**	**(+) (c)**				
	Leaf blade: thickness					
	thin				Kokuso 27, Shiwasuguwa, Yukishinogi	1
	medium				Ichinose, Kenmochi	2
	thick				Atsubamidori, Ayanobori, Shin-Kenmochi	3

	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
21. (*)	**PQ VG**	**(+) (c)**				
	Leaf blade: shape of apex					
	caudate				Fukayuki, Takinokawa	1
	acuminate				Kenmochi	2
	acute				Ichinose	3
	obtuse				Jikunashi	4
	retuse				Niken	5
22.	**PQ VG**	**(c)**				
	Leaf: shape					
	trianglar				Florio	1
	cordate					2
	oval					3
23. (*)	**PQ VG**	**(+) (c)**				
	Leaf blade: shape of base					
	cuneate				Popberry	1
	truncate				Jumonji, Negoyatakasuke	2
	retuse				Kenmochi	3
	cordate				Ichinose	4
	closed					5
24. (*)	**QL VG**	**(c)**				
	Leaf blade: sinus					
	absent				Rohachi, Takinokawa	1
	present				Ichibei, Ichinose, Kenmochi	9
25. (*)	**QN VG**	**(+) (c)**				
	Leaf blade: depth of sinus					
	shallow				Akagi, Shin-Ichinose, Shukakuichi	1
	medium				Ichinose	3
	deep				Kenmochi	5

	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
26.	**PQ VG**	**(+) (c)**				
	Leaf blade :margin					
	repand				Ichinose	1
	crenate				Kairyo-Roso, Kanmasari, Shin-Ichinose	2
	dentate				Fukushimaoha	3
	serrulate				Kenmochi, Oshimaso	4
	biserrate					5
	serrate				Akameroso	6
	aristate					7
27.	**QL VG**	**(c)**				
	Leaf: surface texture of blade					
	smooth				Florio, Indiana, Kairyo-Roso, Muki	1
	rough				Kokuso 27, Korin	2
28.	**QL VG**	**(c)**				
	Leaf: blistering of surface					
	absent				Florio	1
	present				Cattaneo fem	9
29.	**PQ VG**	**(c)**				
	Leaf blade: color of upper side					
	yellow					1
	yellowish green				Kibajumonji	2
	light green				Kairyo-Roso	3
	medium green				Ichinose	4
	dark green				Kenmochi, Shin-Kenmochi, Yukiasahi	5
30.	**QN VG**	**(c)**				
	Leaf blade: glossiness of upper side					
	absent				Keguwa	1
	weak				Ichibei	2
	medium				Ichinose, Kenmochi	3
	strong				Shin-Kenmochi	4

	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
31.	**QN MS/VG**	**(c)**				
	Petiole: length					
	absent or very short				Jikunashi	1
	short				Sanchutakasuke	3
	medium				Ichinose, Kenmochi	5
	long				Shiromekeiso	7
32.	**PQ VG**	**(c)**				
	Flower: color of buds					
	light brown				Indiana	1
	mediium brown				Florio	2
	dark brown				Cattaneo male	3
	reddish brown				Kokuso 21, Kokuso 27, Muki	4
33. **(*)**	**QN VG**	**(d)**				
	Flower: number of pistillate clusters					
	few				Ichibei	1
	medium				Ichinose	3
	many				Kenmochi	5
34.	**QL VG**	**(d)**				
	Flower: sex expression					
	staminate				Akameroso, Shimanouchi	1
	predominantly staminate				Hayatesakari, Kairyo-Nezumigaeshi	2
	hermaphrodite				Akagi, Oshimaso	3
	predominantly pistillate				Gorojiwase, Rohachi	4
	pistillate				Ichinose, Kenmochi	5
35.	**PQ VG**	**(d)**				
	Flower: shape of inflorescence					
	cylindric				Cattaneo male	1
	globose				Florio, Korin	2

		English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
36.	**QN** **MS/VG**		**(e)**				
	Fruit: number						
	absent or very few					Aobanezumi, Yukishinogi	1
	few					Kairyo-Nezumigaeshi, Minamisakari	3
	medium					Ichinose	5
	many					Kenmochi, Lalaberry, Mitsuminami, Popberry	7
37.	**QN** **MS/VG**		**(e)**				
	Fruit: length						
	short					Shidareguwa	3
	medium					Ichinose, Kenmochi	5
	long					Lalaberry, Popberry	7
38.	**QN** **MS/VG**		**(e)**				
	Fruit: width						
	narrow					Shidareguwa	3
	medium					Ichinose, Kenmochi	5
	broad					Lalaberry	7
	very broad					Popberry	9
39. **(*)**	**QN** **MS/VG**		**(e)**				
	Fruit: weight						
	light					Shidareguwa	3
	medium					Ichinose, Kenmochi	5
	heavy					Lalaberry	7
40.	**PQ** **VG**		**(+)** **(e)**				
	Fruit: shape						
	globose					Shidareguwa	1
	ellipsoid					Lalaberry	2
	cylindric					Ichinose, Kenmochi	3
	long cylindric						4
41.	**QN** **MG/MS/VG/VS**		**(d)**				
	Inflorescence : number of flowers						
	few					Korin	1
	mediium					Cattaneo male	2
	many					Cattaneo fem	3

		English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
42.		**PQ VG**	**(e)**				
		Fruit: color					
		white				Ege Beyaz	1
		yellowish white					2
		pink					3
		reddish purple					4
		light purple				Kozaemon, Tagowase	5
		dark purple					6
		black purple				Ichinose, Kenmochi, Lalaberry	7
43.	(*)	**QN MS/VG**	**(e)**				
		Fruit: length of peduncle					
		short					1
		medium				Ichinose, Kenmochi	3
		long					5
44.	(*)	**QN MG/MS/VG**	**(+)** **(e)**				
		Fruit: sweetness					
		low				Lalaberry, Popberry	1
		medium				Ichinose, Kenmochi	3
		high				Kozaemon, Tagowase	5
45.		**QN MG/MS/VG**	**(+)** **(f)**				
		Fruit: acidity					
		low				Kozaemon, Tagowase	1
		medium				Ichinose, Kenmochi, Popberry	3
		high				Lalaberry	5
46.		**QN MS/VG**	**(f)**				
		Seed: size					
		small					3
		medium				Ichinose, Kenmochi	5
		large				Lalaberry, Popberry	7

	English	français	deutsch	español	Example Varieties Exemples Beispielssorten Variedades ejemplo	Note/ Nota
47. **(*)**	**QN** **MS/VG**					
	Time of bud burst					
	early				Ichibei, Wasemidori	3
	medium				Ichinose, Kenmochi	5
	late				Akagi, Shinziro	7
48.	**QN** **MS/VG**					
	Time of flowering					
	early				Popberry	3
	medium				Ichinose, Kenmochi, Lalaberry	5
	late					7
49. **(*)**	**QN** **MS/VG**					
	Time of ripening					
	early				Popberry	1
	medium				Ichinose, Kenmochi	3
	late					5
50.	**QN** **MS/VG**	**(+)**				
	Rooting activity in cutting					
	low				Akagi, Kairyo-Nezumigaeshi, Oshimaso, Shukakuichi	1
	medium				Ichinose, Shin-Ichinose	2
	high				Kenmochi, Mitsuminami, Shin-Kenmochi, Yukiasahi	3
51.	**QN** **MS/VG**	**(+)**				
	Cold hardiness					
	weak				Minamisakari	1
	mediium				Hayatesakari, Ichinose, Kenmochi	3
	strong				Hachinose, Senshin, Tokiyutaka, Yukishinogi	5

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:

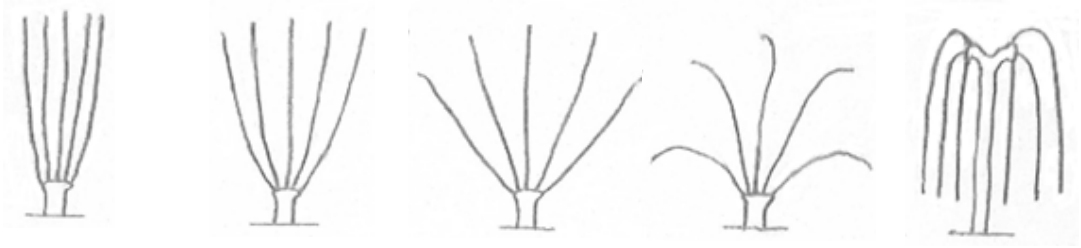
(a) Observations on the bud should be made during winter dormancy.
(b) Observations on the branch should be made before winter dormancy.
(c) Observations on the leaf should be made on the largest leaf on the upper third of the branch in harvest time.
(d) Observations on the flower should be made at the time of full flowering.
(e) Observations on the fruit should be made at the peak of the harvest.
(f) Observations on the seed should be made on the dry seed.

8.2 Explanations for individual characteristics

Ad. 1: Plant: ploidy

The ploidy should be observed by flow cytometry.

Ad. 3: Tree: growth habit



1	2	3	4	5
upright	semi-upright	semi-spreading	spreading	weeping

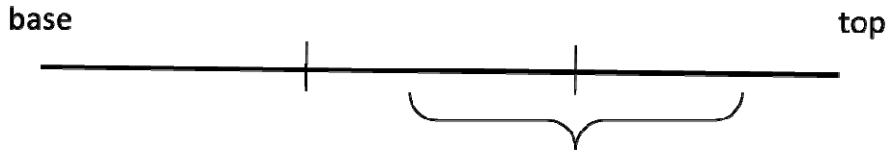
Ad. 7: Branch: length of base without sprouts

Observation should be made in spring.

Ad. 9: Branch: uniformity

Observation should be made on uniformity of length, width and direction of branches in a plant.

Ad. 14: Branch: length of internode

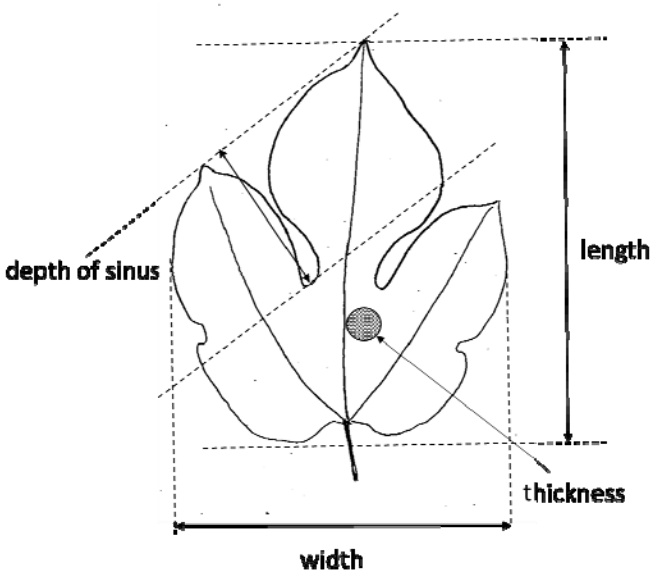


Observation should be made on the middle part between the middle third and the upper third of the branch.

Ad. 16: Leaf: phyllotaxis

Observation should be made on the upper third of the branch.

Ad. 18: Leaf blade: length



Ad. 19: Leaf blade: width

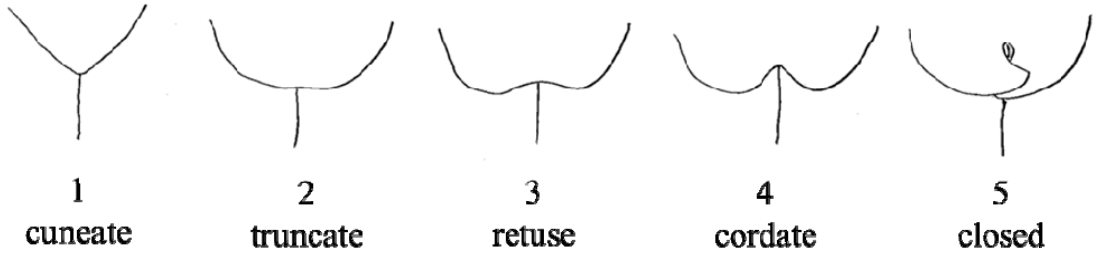
See Ad. 18.

Ad. 20: Leaf blade: thickness

See Ad.18.

Ad. 21: Leaf blade: shape of apex

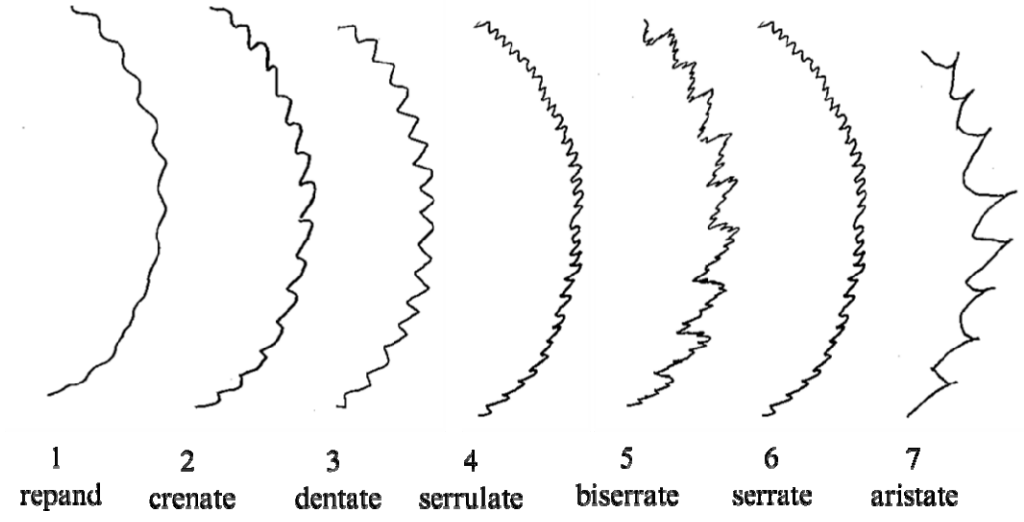
Ad. 23: Leaf blade: shape of base



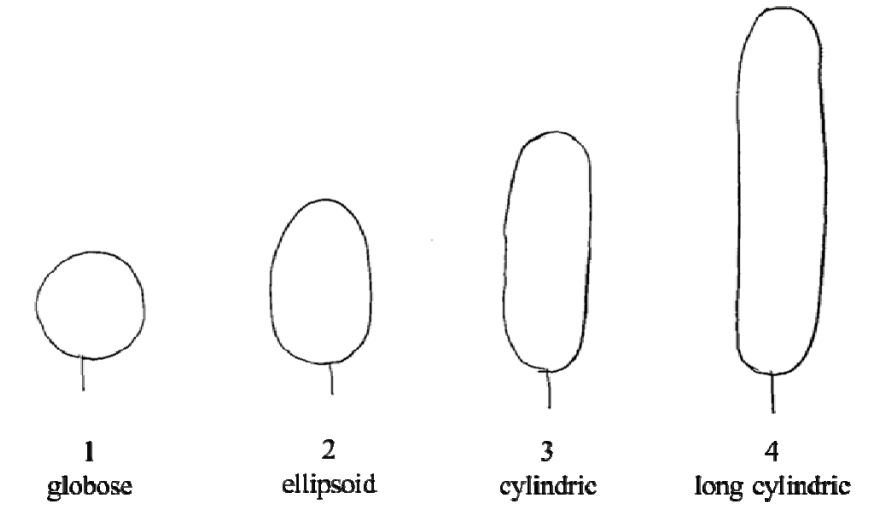
Ad. 25: Leaf blade: depth of sinus

See Ad. 18

Ad. 26: Leaf blade :margin



Ad. 40: Fruit: shape



Ad. 44: Fruit: sweetness

Sweetness should be observed in degree Brix with a refractometer.

Ad. 45: Fruit: acidity

Acidity should be observed by titration of titratable acids or pH meter.

Ad. 50: Rooting activity in cutting

Rooting activity should be evaluated from survival rate of rooted cutting.

Ad. 51: Cold hardiness

Cold hardiness should be evaluated from ratio of length of dead part / full length of a branch at time of bud burst.

9. Literature

Koyama, A., Yamanouchi, H. and Machii, H. (2001) Screening of mulberry genotypes suitable for fruit production and development of high-yielding strains with large fruits JARQ 35 (1): p59-p66

Machii, H., Koyama, A., and Yamanouchi, H. (2002) Mulberry Breeding, Cultivation and Utilization in Japan. In: Sánchez, M.D. (ed.) 2002. Mulberry for Animal Production . Animal Production and Health Paper 147. pp. 63-71. (FAO, Rome).

Yamanouchi, H., Koyama, A., Takyu, T., and Yoshioka, T. (2008) Flow cytometric analysis of various organs and cytochimeras of mulberry (Morus spp.) Journal of insect biotechnology and sericology 77(2), p95-p108

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	*Morus* L.
1.2 Common name	Mulberry

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)
(……..……..…) x (……..……..…)

female parent male parent

(b) partially known cross [ ]
(please state known parent variety(ies))

(please state known parent varieties)
(……..……..…) 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:

4.2 Method of propagating the variety

4.2.1 Other [ ]

(Please provide details)

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 (1)	**Plant: ploidy**		
	diploid	Ichinose, Kenmochi	2 [ ]
	triploid	Ayanobori, Ichibei, Shin-Kenmochi, Tagowase, Yukiasahi	3 [ ]
	tetraploid	Yonbaiseiso	4 [ ]
	pentaploid		5 [ ]
	hexaploid	Keguwa	6 [ ]
5.2 (3)	**Tree: growth habit**		
	upright	Mitsuminami, Tokiyutaka	1 [ ]
	semi-upright	Ichinose, Kenmochi	2 [ ]
	semi-spreading	Ayanobori, Hayatesakari, Yukishinogi	3 [ ]
	spreading	Sekizaiso	4 [ ]
	weeping	Shidareguwa	5 [ ]
5.3 (5)	**Bud : shape**		
	obtuse triangular	Atsubamidori, Shin-Ichinose	1 [ ]
	triangular	Ichinose, Kenmochi	2 [ ]
	acute triangular	Wasemidori	3 [ ]
	spindle shaped	Negoyatakasuke	4 [ ]
5.4 (13)	**Branch: color**		
	light gray	Ichinose	1 [ ]
	grayish brown	Mizusawaguwa	2 [ ]
	greenish brown	Shin-Ichinose	3 [ ]
	yellowish brown	Fukushimaoha	4 [ ]
	reddish brown	Ichibei	5 [ ]
	medium brown	Rohachi	6 [ ]
	dark brown	Kenmochi	7 [ ]

	Characteristics	Example Varieties	Note
5.5 (16)	**Leaf: phyllotaxis**		
	one half	Chijimiguwa, Negoyatakasuke	1 [ ]
	one third		2 [ ]
	two fifth	Ichinose, Kenmochi	3 [ ]
	three eighth	Wasemidori	4 [ ]
	five thirteenth		5 [ ]
5.6 (21)	**Leaf blade: shape of apex**		
	caudate	Fukayuki, Takinokawa	1 [ ]
	acuminate	Kenmochi	2 [ ]
	acute	Ichinose	3 [ ]
	obtuse	Jikunashi	4 [ ]
	retuse	Niken	5 [ ]
5.7 (23)	**Leaf blade: shape of base**		
	cuneate	Popberry	1 [ ]
	truncate	Jumonji, Negoyatakasuke	2 [ ]
	retuse	Kenmochi	3 [ ]
	cordate	Ichinose	4 [ ]
	closed		5 [ ]
5.8 (24)	**Leaf blade: sinus**		
	absent	Rohachi, Takinokawa	1 [ ]
	present	Ichibei, Ichinose, Kenmochi	9 [ ]
5.9 (29)	**Leaf blade: color of upper side**		
	yellow		1 [ ]
	yellowish green	Kibajumonji	2 [ ]
	light green	Kairyo-Roso	3 [ ]
	medium green	Ichinose	4 [ ]
	dark green	Kenmochi, Shin-Kenmochi, Yukiasahi	5 [ ]
5.10 (34)	**Flower: sex expression**		
	staminate	Akameroso, Shimanouchi	1 [ ]
	predominantly staminate	Hayatesakari, Kairyo-Nezumigaeshi	2 [ ]
	hermaphrodite	Akagi, Oshimaso	3 [ ]
	predominantly pistillate	Gorojiwase, Rohachi	4 [ ]
	pistillate	Ichinose, Kenmochi	5 [ ]

	Characteristics	Example Varieties	Note
5.11 (39)	**Fruit: weight**		
	light	Shidareguwa	3 [ ]
	medium	Ichinose, Kenmochi	5 [ ]
	heavy	Lalaberry	7 [ ]
5.12 (40)	**Fruit: shape**		
	globose	Shidareguwa	1 [ ]
	ellipsoid	Lalaberry	2 [ ]
	cylindric	Ichinose, Kenmochi	3 [ ]
	long cylindric		4 [ ]
5.13 (42)	**Fruit: color**		
	white	Ege Beyaz	1 [ ]
	yellowish white		2 [ ]
	pink		3 [ ]
	reddish purple		4 [ ]
	light purple	Kozaemon, Tagowase	5 [ ]
	dark purple		6 [ ]
	black purple	Ichinose, Kenmochi, Lalaberry	7 [ ]
5.14 (47)	**Time of bud burst**		
	early	Ichibei, Wasemidori	3 [ ]
	medium	Ichinose, Kenmochi	5 [ ]
	late	Akagi, Shinziro	7 [ ]
5.15 (48)	**Time of flowering**		
	early	Popberry	3 [ ]
	medium	Ichinose, Kenmochi, Lalaberry	5 [ ]
	late		7 [ ]
5.16 (49)	**Time of ripening**		
	early	Popberry	1 [ ]
	medium	Ichinose, Kenmochi	3 [ ]
	late		5 [ ]

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
Example			

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

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.

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]