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|  | LOTUS  UPOV Code(s): NELUM  *Nelumbo* Adans. | \* |

GUIDELINESFOR THE CONDUCT OF TESTS  
FOR DISTINCTNESS, UNIFORMITY AND STABILITY

prepared by an expert from China

to be considered by the

Technical Working Party for Ornamental Plants and Forest Trees at its fifty-seventh session,

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Disclaimer: this document does not represent UPOV policies or guidance

Alternative Names:\*

| *Botanical name* | *English* | *French* | *German* | *Spanish* |
| --- | --- | --- | --- | --- |
| *Nelumbo* Adans. | Lotus | Lotus | Lotus | Loto |

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.

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# Subject of these Test Guidelines

These Test Guidelines apply to all varieties of *Nelumbo* Adans..

# 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 rhizome propagules or seeds.

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

A sufficient amount of seeds or rhizome propagules to produce at least 10 plants

In the case of seed, 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.

In the case of rhizome propagule, a standard propagule (meeting market requirement) should be fresh and healthy, and each should have two internodes with healthy shoots.  
  
A standard propagule with two expanded internodes



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.

# Method of Examination

## 3.1  Number of Growing Cycles

3.1.1 The minimum duration of tests should normally be a single growing cycle.

3.1.2 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

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.

3.3.3 Because daylight varies, color determinations made against a color chart should be made either in a suitable cabinet providing artificial daylight or in the middle of the day in a room without direct sunlight. The spectral distribution of the illuminant for artificial daylight should conform with the CIE Standard of Preferred Daylight D 6500 and should fall within the tolerances set out in the British Standard 950, Part I. These determinations should be made with the plant part placed against a white background. The color chart and version used should be specified in the variety description.

## 3.4  Test Design

3.4.1 In the case of rhizome propagated varieties, each test should be designed to result in a total of at least 10 plants.

3.4.2 In the case of seed propagated varieties, each test should be designed to result in a total of at least 10 plants.

3.4.3 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.

# 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.

To assess distinctness of hybrids, the parent lines and the formula may be used according to the following recommendations:

(i) description of parent lines according to the Test Guidelines;

(ii) check of the originality of the parent lines in comparison with the variety collection, based on the characteristics in Chapter 7, in order to identify similar parent lines;

(iii) check of the originality of the hybrid formula in relation to the hybrids in the variety collection, taking into account the most similar lines; and

(iv) assessment of the distinctness at the hybrid level for varieties with a similar formula.

Further guidance is provided in documents TGP/9 "Examining Distinctness" and TGP/8 "Trial Design and Techniques Used in the Examination of Distinctness, Uniformity and Stability".

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

In the case of vegetatively propagated varieties, unless otherwise indicated, for the purposes of distinctness, all observations on single plants should be made on 9 plants or parts taken from each of 9 plants and any other observation 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 1.

In the case of seed-propagated varieties, unless otherwise indicated, for the purposes of distinctness, all observations on single plants should be made on 9 plants or parts taken from each of 9 plants and any other observation 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 1.

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 The assessment of uniformity for cross-pollinated should be according to the recommendations for cross-pollinated varieties in the General Introduction.

4.2.4 The assessment of uniformity for hybrid varieties depends on the type of hybrid and should be according to the recommendations for hybrid varieties in the General Introduction.

4.2.5 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 10 plants, 1 off-type is 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 or plant stock to ensure that it exhibits the same characteristics as those shown by the initial material supplied.

# 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: height of foliage (characteristic 1)

(b) Leaf blade: variegation (characteristic 5)

(c) Flower: position relative to leaf (characteristic 20)

(d) Flower: type (characteristic 21)

(e) Flower: shape (characteristic 23)

(f) Flower: color (characteristic 24)

(g) Carpel: status of development (characteristic 41)

(h) Expanded rhizome: thickness (characteristic 60)

(i) Main expanded rhizome: shape of internode (characteristic 62)

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”.

# 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)-(x) See Explanations on the Table of Characteristics in Chapter 8.1

7 Growth stage key (if applicable) See Explanations on the Table of Characteristics in Chapter 8.3

# Table of Characteristics/Tableau des caracteres/Merkmalstabelle/Tabla de caracteres

|  | | English | | français | | deutsch | español | Example Varieties  Exemples  Beispielssorten  Variedades ejemplo | Note/  Nota |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **1.** | **(\*)** | **QN** | **MS/VG** | **(+)** |  | **30** |  |  |  |
|  | | **Plant: height of foliage** | |  | |  |  |  |  |
| very short | |  | |  |  | Chuzi Luo | 1 |
| very short to short | |  | |  |  |  | 2 |
| short | |  | |  |  | Xing Huo | 3 |
| short to medium | |  | |  |  |  | 4 |
| medium | |  | |  |  | Yijian Lian | 5 |
| medium to tall | |  | |  |  |  | 6 |
| tall | |  | |  |  | Yellow Bird | 7 |
| tall to very tall | |  | |  |  |  | 8 |
| very tall | |  | |  |  | Fen Bawang | 9 |
| **2.** | **(\*)** | **QN** | **MG/MS/VG** | **(+)** |  | **30** |  |  |  |
|  | | **Plant: height at flowering** | |  | |  |  |  |  |
| very short | |  | |  |  | Chuzi Luo | 1 |
| very short to short | |  | |  |  |  | 2 |
| short | |  | |  |  | Yanzhi Wan | 3 |
| short to medium | |  | |  |  |  | 4 |
| medium | |  | |  |  | Bo Ai | 5 |
| medium to tall | |  | |  |  |  | 6 |
| tall | |  | |  |  | Zhizun Qianban | 7 |
| tall to very tall | |  | |  |  |  | 8 |
| very tall | |  | |  |  | Fen Bawang | 9 |
| **3.** |  | **QN** | **MG/MS/VG** |  | **(a)** | **30** |  |  |  |
|  | | **Leaf: number** | |  | |  |  |  |  |
| absent | |  | |  |  | Ai Xiangsi Hong | 1 |
| few | |  | |  |  | Zhongshan Hongtai | 2 |
| medium | |  | |  |  | Honghu Hong | 3 |
| many | |  | |  |  | Qian Ban | 4 |
| very many | |  | |  |  | Hong Sijuan | 5 |
| **4.** | **(\*)** | **QN** | **MS/VG** | **(+)** | **(a)** | **30** |  |  |  |
|  | | **Leaf blade: size** | |  | |  |  |  |  |
| very small | |  | |  |  | Chuzi Luo | 1 |
| very small to small | |  | |  |  |  | 2 |
| small | |  | |  |  | Yanzhi Wan | 3 |
| small to medium | |  | |  |  |  | 4 |
| medium | |  | |  |  | Jiuhua Haoyue | 5 |
| medium to large | |  | |  |  |  | 6 |
| large | |  | |  |  | Qian Ban | 7 |
| large to very large | |  | |  |  |  | 8 |
| very large | |  | |  |  | Fen Bawang | 9 |
| **5.** | **(\*)** | **QL** | **VG** | **(+)** | **(a)** | **20-30** |  |  |  |
|  | | **Leaf blade: variegation** | |  | |  |  |  |  |
| absent | |  | |  |  | Cai Xia | 1 |
| present | |  | |  |  | Nelumbo 'Furong Sajin' | 9 |
| **6.** | **(\*)** | **PQ** | **VG** | **(+)** | **(a)** | **20-30** |  |  |  |
|  | | **Leaf blade: main color** | |  | |  |  |  |  |
| light or medium green | |  | |  |  |  | 1 |
| dark green | |  | |  |  | Yellow Bird | 2 |
| yellow green | |  | |  |  | Baiyangdian Bai | 3 |
| **7.** | **(\*)** | **PQ** | **VG** | **(+)** | **(a)** | **20-30** |  |  |  |
|  | | **Leaf blade: shape** | |  | |  |  |  |  |
| rounded or nearly rounded | |  | |  |  | Yellow Bird | 1 |
| elliptic | |  | |  |  |  | 2 |
| narrow elliptic | |  | |  |  |  | 3 |
| **8.** |  | **PQ** | **VG** | **(+)** | **(a)** | **20-30** |  |  |  |
|  | | **Leaf blade: shape in longitudinal section** | |  | |  |  |  |  |
| strongly concave | |  | |  |  |  | 1 |
| moderately concave | |  | |  |  | Dan Sajin | 2 |
| weakly concave | |  | |  |  |  | 3 |
| flat | |  | |  |  | Jia Jingying | 4 |
| concave center with dropping edge | |  | |  |  | Elian 1 | 5 |
| **9.** | **(\*)** | **QN** | **VG** | **(+)** | **(a)** | **20-30** |  |  |  |
|  | | **Leaf blade: texture of upper surface** | |  | |  |  |  |  |
| very smooth | |  | |  |  | Yellow Bird | 1 |
| smooth | |  | |  |  | Fenhong Lingxiao | 2 |
| medium | |  | |  |  |  | 3 |
| rough | |  | |  |  | Honghu Hong | 4 |
| very rough | |  | |  |  | Daye Chi | 5 |
| **10.** |  | **QN** | **VG** | **(+)** | **(a)** | **20-30** |  |  |  |
|  | | **Leaf blade: depth of concavity** | |  | |  |  |  |  |
| absent or very shallow | |  | |  |  | Yellow Bird | 1 |
| shallow | |  | |  |  | Honghe Zhanchi | 2 |
| medium | |  | |  |  | Danban Jinxia | 3 |
| deep | |  | |  |  |  | 4 |
| **11.** |  | **QL** | **VG** | **(+)** | **(a)** | **20-30** |  |  |  |
|  | | **Leaf blade: red line of margin** | |  | |  |  |  |  |
| absent | |  | |  |  |  | 1 |
| present | |  | |  |  |  | 9 |
| **12.** |  | **QN** | **MG/VG** | **(+)** | **(a)** | **20-40** |  |  |  |
|  | | **Leaf blade: gap of nose** | |  | |  |  |  |  |
| absent or very narrow | |  | |  |  | Jia Jingying | 1 |
| narrow | |  | |  |  | Honghu Hong | 2 |
| medium | |  | |  |  | Yijian Lian | 3 |
| broad | |  | |  |  | Yellow Bird | 4 |
| **13.** |  | **QN** | **MG/MS** | **(+)** | **(a)** | **30** |  |  |  |
|  | | **Petiole: thickness** | |  | |  |  |  |  |
| very thin | |  | |  |  | Chuzi Luo | 1 |
| thin | |  | |  |  | Hong Sijuan | 2 |
| medium | |  | |  |  |  | 3 |
| thick | |  | |  |  | Honghu Hong | 4 |
| very thick | |  | |  |  | Fen Bawang | 5 |
| **14.** |  | **QN** | **VG** | **(+)** | **(a)** | **20-40** |  |  |  |
|  | | **Petiole: density of spines** | |  | |  |  |  |  |
| absent or very sparse | |  | |  |  | Yellow Bird | 1 |
| sparse | |  | |  |  | Bian Lian | 2 |
| medium | |  | |  |  | Honghu Hong | 3 |
| dense | |  | |  |  | Jia Jingying | 4 |
| **15.** | **(\*)** | **PQ** | **VG** | **(+)** |  | **20-30** |  |  |  |
|  | | **Flower bud: shape** | |  | |  |  |  |  |
| ovoid | |  | |  |  | Fenhong Lingxiao, Nelumbo 'Xiao Hong Dan' | 1 |
| ovoid-conic | |  | |  |  | Da Sajin | 2 |
| conic | |  | |  |  | Honghu Hong | 3 |
| narrow conic | |  | |  |  | Tan Kong | 4 |
| globose | |  | |  |  | Piaocheng Fanying | 5 |
| ellipsoid | |  | |  |  | Jin Fuwa | 6 |
| **16.** | **(\*)** | **PQ** | **VG** |  |  | **20-30** |  |  |  |
|  | | **Flower bud: color** | |  | |  |  |  |  |
| green | |  | |  |  | Baiyangdian Bai | 1 |
| green with purple-red edge | |  | |  |  | Furong Qipa | 2 |
| green yellow | |  | |  |  |  | 3 |
| green red | |  | |  |  | Jiangnan Mingzhu | 4 |
| purple red | |  | |  |  | Zhongshan Hongtai | 5 |
| grey purple | |  | |  |  | Yinxiang Xihu | 6 |
| **17.** |  | **QN** | **MG** | **(+)** |  | **30** |  |  |  |
|  | | **Flowering: time of starting to bloom** | |  | |  |  |  |  |
| early | |  | |  |  | Jiuhua Haoyue | 1 |
| medium | |  | |  |  | Honghu Hong | 2 |
| late | |  | |  |  | Fenhong Lingxiao | 3 |
| **18.** |  | **QN** | **MG** | **(+)** |  | **30** |  |  |  |
|  | | **Flowering time** | |  | |  |  |  |  |
| very short | |  | |  |  |  | 1 |
| short | |  | |  |  |  | 2 |
| medium | |  | |  |  | Yijian Lian | 3 |
| long | |  | |  |  | Bian Lian | 4 |
| very long | |  | |  |  | Fenhong Lingxiao | 5 |
| **19.** | **(\*)** | **QN** | **MS/VG** |  |  | **30** |  |  |  |
|  | | **Flower: number** | |  | |  |  |  |  |
| absent or very few | |  | |  |  | Elian 1 | 1 |
| few | |  | |  |  | Bo Ai | 2 |
| medium | |  | |  |  | Zhongshan Hongtai | 3 |
| many | |  | |  |  | Hong Sijuan | 4 |
| very many | |  | |  |  | Xing Huo | 5 |
| **20.** | **(\*)** | **QN** | **VG** | **(+)** | **(b)** | **30** |  |  |  |
|  | | **Flower: position relative to leaf** | |  | |  |  |  |  |
| below | |  | |  |  |  | 1 |
| same level | |  | |  |  | Zhongshan Hongtai | 2 |
| slightly above | |  | |  |  | Hong Sijuan | 3 |
| moderately above | |  | |  |  | Honghu Hong | 4 |
| strongly above | |  | |  |  | Bian Lian | 5 |
| **21.** | **(\*)** | **PQ** | **MG/VG** | **(+)** | **(b)** | **30** |  |  |  |
|  | | **Flower: type** | |  | |  |  |  |  |
| single | |  | |  |  | Honghu Hong | 1 |
| semi-double | |  | |  |  | Cai Xia | 2 |
| double | |  | |  |  | Dan Sajin | 3 |
| dual-layered | |  | |  |  | Hongtai Lian | 4 |
| thousand-petalled | |  | |  |  | Qian Ban | 5 |
| **22.** | **(\*)** | **QN** | **MG/MS/VG** |  | **(b)** | **30** |  |  |  |
|  | | **Flower: diameter** | |  | |  |  |  |  |
| very small | |  | |  |  | Chuzi Luo | 1 |
| small | |  | |  |  | Hong Sijuan | 2 |
| medium | |  | |  |  | Yijian Lian | 3 |
| large | |  | |  |  | Honghu Hong | 4 |
| very large | |  | |  |  | Fen Bawang | 5 |
| **23.** | **(\*)** | **PQ** | **VG** | **(+)** | **(b)** | **30** |  |  |  |
|  | | **Flower: shape** | |  | |  |  |  |  |
| cup-shaped | |  | |  |  | Furong Qipa | 1 |
| bowl-shaped | |  | |  |  | Honghu Hong | 2 |
| plate-shaped | |  | |  |  | Jin Se | 3 |
| Irregularly shaped | |  | |  |  | Chenshan Feiyan | 4 |
| head-shaped | |  | |  |  | Zhizun Qianban | 5 |
| ball-shaped | |  | |  |  | Nelumbo 'Xiao Hong Dan' | 6 |
| **24.** | **(\*)** | **PQ** | **VG** |  | **(b)** | **30** |  |  |  |
|  | | **Flower: color** | |  | |  |  |  |  |
| white | |  | |  |  | Baiyangdian Bai | 1 |
| green | |  | |  |  | Pujin Diecui | 2 |
| yellow | |  | |  |  | Yellow Bird | 3 |
| orange | |  | |  |  | Xingse Chunshan | 4 |
| pink purple | |  | |  |  | Hongtai Lian | 5 |
| red purple | |  | |  |  | Weifang Mohong | 6 |
| purple | |  | |  |  | Nelumbo 'Chenshan Zihe' | 7 |
| **25.** | **(\*)** | **QL** | **VG** | **(+)** | **(b)** | **30** |  |  |  |
|  | | **Tepal: pattern of secondary color** | |  | |  |  |  |  |
| solid | |  | |  |  | Honghu Hong | 1 |
| flushed | |  | |  |  | Dan Sajin | 2 |
| **26.** | **(\*)** | **QN** | **VG** |  |  | **30** |  |  |  |
|  | | **Flower: fading of color with age** | |  | |  |  |  |  |
| absent or very weak | |  | |  |  | Yijian Lian | 1 |
| medium | |  | |  |  | Yi Xian | 2 |
| strong | |  | |  |  | Bian Lian | 3 |
| **27.** | **(\*)** | **QN** | **MG/MS/VG** | **(+)** | **(b)** | **30** |  |  |  |
|  | | **Tepal: number** | |  | |  |  |  |  |
| very few | |  | |  |  | Xianxian Yuzhi | 1 |
| very few to few | |  | |  |  |  | 2 |
| few | |  | |  |  | Honghu Hong | 3 |
| few to medium | |  | |  |  |  | 4 |
| medium | |  | |  |  | Jin Se | 5 |
| medium to many | |  | |  |  |  | 6 |
| many | |  | |  |  | Zhongshan Hongtai | 7 |
| many to very many | |  | |  |  |  | 8 |
| very many | |  | |  |  | Youyi Mudan | 9 |
| **28.** | **(\*)** | **PQ** | **VG** | **(+)** | **(c)** | **30** |  |  |  |
|  | | **Tepal: shape** | |  | |  |  |  |  |
| broad obovate | |  | |  |  | Jiuhua Haoyue | 1 |
| obovate | |  | |  |  |  | 2 |
| oblanceolate | |  | |  |  | Yijian Lian | 3 |
| narrow oblanceolate | |  | |  |  | Tan Kong | 4 |
| spatulate | |  | |  |  | Jiangnan Mingzhu | 5 |
| **29.** | **(\*)** | **QN** | **MS/VG** | **(+)** | **(c)** | **30** |  |  |  |
|  | | **Tepal: size** | |  | |  |  |  |  |
| very small | |  | |  |  | Chuzi Luo | 1 |
| small | |  | |  |  | Yanzhi Wan | 2 |
| medium | |  | |  |  | Yijian Lian | 3 |
| large | |  | |  |  | Honghu Hong | 4 |
| very large | |  | |  |  | Fen Bawang | 5 |
| **30.** | **(\*)** | **PQ** | **VG** | **(+)** | **(c)** | **30** |  |  |  |
|  | | **Tepal: main color on the inner side** | |  | |  |  |  |  |
| RHS Colour Chart (indicate reference number) | |  | |  |  |  |  |
| **31.** | **(\*)** | **PQ** | **VG** | **(+)** | **(c)** | **30** |  |  |  |
|  | | **Tepal: distribution of main color** | |  | |  |  |  |  |
| throughout | |  | |  |  | Yijian Lian | 1 |
| distal three quarters | |  | |  |  | Yanzhi Wan | 2 |
| distal half | |  | |  |  | Pink Starburst | 3 |
| basal half | |  | |  |  |  | 4 |
| basal three quarters | |  | |  |  | Taohua Mian | 5 |
| **32.** | **(\*)** | **PQ** | **VG** |  | **(c)** | **30** |  |  |  |
|  | | **Only varieties with two or more color:Tepal: secondary color** | |  | |  |  |  |  |
| RHS Colour Chart (indicate reference number) | |  | |  |  |  |  |
| **33.** | **(\*)** | **PQ** | **VG** |  | **(c)** | **30** |  |  |  |
|  | | **Only varieties with two or more color:Tepal: distribution of secondary color** | |  | |  |  |  |  |
| at tip | |  | |  |  |  | 1 |
| distal quarter | |  | |  |  |  | 2 |
| distal half | |  | |  |  |  | 3 |
| distal three quarters | |  | |  |  |  | 4 |
| basal three quarters | |  | |  |  |  | 5 |
| throughout | |  | |  |  |  | 6 |
| basal half | |  | |  |  |  | 7 |
| basal quarter | |  | |  |  |  | 8 |
| at base | |  | |  |  |  | 9 |
| at margin | |  | |  |  |  | 10 |
| irregular | |  | |  |  |  | 11 |
| **34.** | **(\*)** | **PQ** | **VG** |  | **(c)** | **30** |  |  |  |
|  | | **Tepal: shape of apex** | |  | |  |  |  |  |
| acute | |  | |  |  |  | 1 |
| acuminate | |  | |  |  | Xianxian Yuzhi | 2 |
| obtuse | |  | |  |  | Honghu Hong | 3 |
| rounded | |  | |  |  | Jiuhua Haoyue | 4 |
| retuse | |  | |  |  | Jingshui Guanyin | 5 |
| **35.** |  | **QN** | **VG** | **(+)** | **(c)** | **30** |  |  |  |
|  | | **Tepal: conspicuousness of abaxial veins** | |  | |  |  |  |  |
| absent or weak | |  | |  |  | Zhongri Youyi | 1 |
| medium | |  | |  |  | Honghu Hong | 2 |
| strong | |  | |  |  | Taikong 36 | 3 |
| **36.** |  | **QN** | **MG/MS/VG** | **(+)** |  | **30** |  |  |  |
|  | | **Stamen: number** | |  | |  |  |  |  |
| absent | |  | |  |  | Zhizun Qianban | 1 |
| very few | |  | |  |  | Piaocheng Fanying | 2 |
| few | |  | |  |  | Zhongshan Hongtai | 3 |
| medium | |  | |  |  | Hong Sijuan | 4 |
| many | |  | |  |  | Yijian Lian | 5 |
| very many | |  | |  |  | Jianxuan 17 | 6 |
| **37.** | **(\*)** | **QL** | **VG** |  | **(b)** | **30** |  |  |  |
|  | | **Anther: color** | |  | |  |  |  |  |
| yellow | |  | |  |  |  | 1 |
| orange | |  | |  |  |  | 2 |
| **38.** | **(\*)** | **PQ** | **VG** |  | **(b)** | **30** |  |  |  |
|  | | **Stamen appendage: color** | |  | |  |  |  |  |
| white | |  | |  |  | Baiyangdian Bai | 1 |
| white with purple-pink spotted apex | |  | |  |  | Hong Mudan | 2 |
| light-yellow | |  | |  |  | Yellow Bird | 3 |
| purple-pink | |  | |  |  | Yijian Lian | 4 |
| purple-red | |  | |  |  | Gudu Jiangfang | 5 |
| dark-brown in upper part | |  | |  |  |  | 6 |
| **39.** |  | **PQ** | **VG** | **(+)** | **(b)** | **30** |  |  |  |
|  | | **Stamen appendage: shape** | |  | |  |  |  |  |
| long-ellipsoid | |  | |  |  |  | 1 |
| obovoid | |  | |  |  |  | 2 |
| long-obovoid | |  | |  |  |  | 3 |
| hastiform | |  | |  |  | Jiangnan Mingzhu | 4 |
| **40.** |  | **QN** | **MS/VG** |  | **(b)** | **30** |  |  |  |
|  | | **Stamen appendage: length** | |  | |  |  |  |  |
| very short | |  | |  |  |  | 1 |
| short | |  | |  |  | Fenhong Lingxiao | 2 |
| medium | |  | |  |  | Honghu Hong | 3 |
| long | |  | |  |  |  | 4 |
| very long | |  | |  |  | Jin Fuwa | 5 |
| **41.** | **(\*)** | **PQ** | **VG** | **(+)** |  | **20-30** |  |  |  |
|  | | **Carpel: status of development** | |  | |  |  |  |  |
| normal | |  | |  |  | Honghu Hong | 1 |
| partially bubbled | |  | |  |  |  | 2 |
| completely bubbled | |  | |  |  | Qinhuai Yueye | 3 |
| partially petaloid | |  | |  |  | Huang Lingyang | 4 |
| completely petaloid | |  | |  |  | Zhizun Qianban | 5 |
| **42.** | **(\*)** | **QN** | **MG** |  |  | **20-40** |  |  |  |
|  | | **Carpel: number** | |  | |  |  |  |  |
| absent | |  | |  |  | Qian Ban | 1 |
| very few | |  | |  |  | Hong Sijuan | 2 |
| few | |  | |  |  | Chuzi Luo | 3 |
| medium | |  | |  |  | Yi Xian | 4 |
| many | |  | |  |  | Taikong 36 | 5 |
| very many | |  | |  |  | Jianxuan 17 | 6 |
| **43.** |  | **PQ** | **VG** |  | **(b)** | **30** |  |  |  |
|  | | **Receptacle: color of top surface** | |  | |  |  |  |  |
| yellow | |  | |  |  |  | 1 |
| green-yellow | |  | |  |  |  | 2 |
| yellow-green | |  | |  |  |  | 3 |
| green | |  | |  |  | Cuixin Xiangyang | 4 |
| **44.** | **(\*)** | **QN** | **VG** | **(+)** |  | **20-30** |  |  |  |
|  | | **Receptacle: degree of degeneration** | |  | |  |  |  |  |
| absent | |  | |  |  |  | 1 |
| partial degeneration | |  | |  |  | Hongtai Lian | 2 |
| complete degeneration | |  | |  |  | Zhizun Qianban | 3 |
| **45.** |  | **PQ** | **VG** | **(+)** | **(d)** | **30-40** |  |  |  |
|  | | **Seedpod: shape** | |  | |  |  |  |  |
| trumpet-shaped | |  | |  |  | Hong Sijuan | 1 |
| obconical | |  | |  |  | Jin Furong 2 | 2 |
| cup-shaped | |  | |  |  | Jin Fuwa | 3 |
| bowl-shaped | |  | |  |  | Perry`s Giant Suburst | 4 |
| oblate | |  | |  |  |  | 5 |
| umbrella-shaped | |  | |  |  | Thai Hongyuan | 6 |
| **46.** |  | **PQ** | **VG** | **(+)** | **(d)** | **30-40** |  |  |  |
|  | | **Seedpod: color of top surface** | |  | |  |  |  |  |
| grey-green | |  | |  |  | Cuixin Xiangyang | 1 |
| green | |  | |  |  | Honghu Hong | 2 |
| green-yellow | |  | |  |  |  | 3 |
| purple-red | |  | |  |  | Cai Xia | 4 |
| **47.** |  | **PQ** | **VG** | **(+)** | **(d)** | **30-40** |  |  |  |
|  | | **Seedpod: shape of top surface** | |  | |  |  |  |  |
| concave | |  | |  |  | Jin Furong 2 | 1 |
| plate-like concave | |  | |  |  |  | 2 |
| flat | |  | |  |  |  | 3 |
| slightly convex | |  | |  |  |  | 4 |
| convex | |  | |  |  |  | 5 |
| **48.** |  | **QN** | **VG** | **(+)** | **(d)** | **30-40** |  |  |  |
|  | | **Seedpod: groove depth of margin** | |  | |  |  |  |  |
| absent or very shallow | |  | |  |  | Jianxuan 17 | 1 |
| shallow | |  | |  |  |  | 2 |
| medium | |  | |  |  | Jiuhua Haoyue | 3 |
| deep | |  | |  |  |  | 4 |
| **49.** | **(\*)** | **QN** | **VG** |  | **(d)** | **30-40** |  |  |  |
|  | | **Fruit: rate of fruit setting** | |  | |  |  |  |  |
| absent | |  | |  |  | Zhizun Qianban | 1 |
| very low | |  | |  |  |  | 2 |
| low | |  | |  |  | Moling Qiuse | 3 |
| medium | |  | |  |  | Jiuhua Haoyue | 4 |
| high | |  | |  |  | Jin Furong 2 | 5 |
| very high | |  | |  |  | Honghu Hong | 6 |
| **50.** |  | **QN** | **MG/VG** | **(+)** | **(d)** | **30-40** |  |  |  |
|  | | **Fruit: position relative to top surface of seedpod** | |  | |  |  |  |  |
| below | |  | |  |  |  | 1 |
| same level | |  | |  |  |  | 2 |
| weakly above | |  | |  |  |  | 3 |
| moderately above | |  | |  |  |  | 4 |
| strongly above | |  | |  |  |  | 5 |
| **51.** | **(\*)** | **PQ** | **VG** | **(+)** |  | **30-40** |  |  |  |
|  | | **Fruit: shape** | |  | |  |  |  |  |
| ovoid | |  | |  |  |  | 1 |
| narrow ovoid | |  | |  |  |  | 2 |
| globose | |  | |  |  | Jiuhua Haoyue | 3 |
| ellipsoid | |  | |  |  | Honghu Hong | 4 |
| narrow ellipsoid | |  | |  |  |  | 5 |
| obovoid | |  | |  |  |  | 6 |
| narrow obovoid | |  | |  |  |  | 7 |
| **52.** | **(\*)** | **QN** | **VG** | **(+)** | **(d)** | **30-40** |  |  |  |
|  | | **Fruit: anthocyanin coloration of endocarp** | |  | |  |  |  |  |
| absent | |  | |  |  |  | 1 |
| weak | |  | |  |  | Dan Sajin | 2 |
| medium | |  | |  |  | Honghu Hong | 3 |
| strong | |  | |  |  | Yijian Lian | 4 |
| **53.** | **(\*)** | **QN** | **MG/MS/VG** | **(+)** | **(e)** | **30-40** |  |  |  |
|  | | **Fruit: size** | |  | |  |  |  |  |
| very small | |  | |  |  | Chuzi Luo | 1 |
| small | |  | |  |  |  | 2 |
| medium | |  | |  |  | Honghu Hong | 3 |
| large | |  | |  |  | Jiuhua Haoyue | 4 |
| very large | |  | |  |  | Jianxuan 17 | 5 |
| **54.** |  | **PQ** | **VG** | **(+)** | **(e)** | **30-40** |  |  |  |
|  | | **Fruit: color** | |  | |  |  |  |  |
| brown | |  | |  |  | Yellow Bird | 1 |
| grey brown | |  | |  |  |  | 2 |
| grey | |  | |  |  | Honghu Hong | 3 |
| black or dark brown | |  | |  |  | Jiuhua Haoyue | 4 |
| **55.** | **(\*)** | **QN** | **VG** | **(+)** | **(e)** | **30-40** |  |  |  |
|  | | **Fruit: waxy powder** | |  | |  |  |  |  |
| absent or weak | |  | |  |  | Honghu Hong | 1 |
| medium | |  | |  |  | Yanzhi Wan | 2 |
| strong | |  | |  |  | Perry`s Giant Suburst | 3 |
| **56.** |  | **QN** | **VG** | **(+)** | **(e)** | **30-40** |  |  |  |
|  | | **Fruit: glossiness** | |  | |  |  |  |  |
| absent or weak | |  | |  |  | Yingquan Xike | 1 |
| medium | |  | |  |  | Jiuhua Haoyue | 2 |
| strong | |  | |  |  |  | 3 |
| **57.** | **(\*)** | **QN** | **VG** | **(+)** | **(e)** | **30-40** |  |  |  |
|  | | **Fruit: conspicuousness of longitudinal stripes** | |  | |  |  |  |  |
| absent or weak | |  | |  |  | Honghu Hong | 1 |
| medium | |  | |  |  | Jiuhua Haoyue | 2 |
| strong | |  | |  |  |  | 3 |
| **58.** |  | **PQ** | **VG** | **(+)** |  | **30-40** |  |  |  |
|  | | **Expanded rhizome: color** | |  | |  |  |  |  |
| white | |  | |  |  | Elian 1 | 1 |
| yellow brown | |  | |  |  |  | 2 |
| brown red | |  | |  |  |  | 3 |
| **59.** |  | **QN** | **VG** |  |  | **40** |  |  |  |
|  | | **Expanded rhizome: time of maturity** | |  | |  |  |  |  |
| early | |  | |  |  | Elian 7 | 1 |
| medium | |  | |  |  | Elian 6 | 2 |
| late | |  | |  |  | Elian 8 | 3 |
| **60.** | **(\*)** | **QN** | **MG/MS/VG** |  |  | **40-50** |  |  |  |
|  | | **Expanded rhizome: thickness** | |  | |  |  |  |  |
| very thin | |  | |  |  | Fenhong Lingxiao | 1 |
| thin | |  | |  |  | Bian Lian | 2 |
| medium | |  | |  |  | Hong Sijuan | 3 |
| thick | |  | |  |  | Wu Fei | 4 |
| very thick | |  | |  |  | Elian 1 | 5 |
| **61.** |  | **QN** | **MG/MS/VG** |  |  | **40-50** |  |  |  |
|  | | **Main expanded rhizome: number of internodes** | |  | |  |  |  |  |
| absent or very few | |  | |  |  | Fenhong Lingxiao | 1 |
| few | |  | |  |  |  | 2 |
| medium | |  | |  |  |  | 3 |
| many | |  | |  |  | Elian 1 | 4 |
| **62.** | **(\*)** | **PQ** | **VG** |  |  | **40-50** |  |  |  |
|  | | **Main expanded rhizome: shape of internode** | |  | |  |  |  |  |
| ovoid or ellipsoid | |  | |  |  |  | 1 |
| short tubular | |  | |  |  |  | 2 |
| medium tubular | |  | |  |  | Elian 1 | 3 |
| long tubular | |  | |  |  | Zhongshan Hongtai | 4 |
| very long tubular | |  | |  |  |  | 5 |
| **63.** |  | **QN** | **MS/VG** |  |  | **40-50** |  |  |  |
|  | | **Expanded rhizome: number of branches (for rhizome lotus only)** | |  | |  |  |  |  |
| few | |  | |  |  |  | 1 |
| medium | |  | |  |  |  | 2 |
| many | |  | |  |  |  | 3 |
| **64.** | **(\*)** | **QN** | **MG/MS/VG** | **(+)** |  | **40-50** |  |  |  |
|  | | **Rhizome propagule: number** | |  | |  |  |  |  |
| absent or very few | |  | |  |  | Fenhong Lingxiao | 1 |
| few | |  | |  |  | Zhongshan Hongtai | 2 |
| medium | |  | |  |  |  | 3 |
| many | |  | |  |  |  | 4 |
| very many | |  | |  |  |  | 5 |
| **65.** | **(\*)** | **QL** | **VG** | **(+)** |  | **40-50** |  |  |  |
|  | | **Terminal internode: shape of apex (for rhizome lotus only)** | |  | |  |  |  |  |
| acute | |  | |  |  |  | 1 |
| obtuse | |  | |  |  |  | 2 |
| **66.** |  | **PQ** | **VG** |  |  | **40-50** |  |  |  |
|  | | **Rhizome shoot: color** | |  | |  |  |  |  |
| white | |  | |  |  | Anhui Piaohua | 1 |
| light-yellow | |  | |  |  |  | 2 |
| purple-red | |  | |  |  |  | 3 |
| light-brown | |  | |  |  | Jinghua Dabai | 4 |
| **67.** |  | **QL** | **VG** |  |  | **40-50** |  |  |  |
|  | | **Expanded rhizome: texture of surface (for rhizome lotus only)** | |  | |  |  |  |  |
| smooth | |  | |  |  | Anhui Piaohua | 1 |
| rough | |  | |  |  |  | 2 |
| **68.** | **(\*)** | **PQ** | **VG** |  |  | **40-50** |  |  |  |
|  | | **Expanded rhizome: texture of flesh (for rhizome lotus only)** | |  | |  |  |  |  |
| crispy | |  | |  |  | Elian 1 | 1 |
| intermediate | |  | |  |  | Elian 4 | 2 |
| starchy | |  | |  |  | Elian 5 | 3 |

# 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) Lotus usually has both floating leaves and standing leaves. The floating leaf has soft petiole with leaf blade floating on water surface. The standing leaf has erect petiole with leaf blade above water (arrow indicates in figure). All observations on leaves should be made on standing leaves and the later mentioned characteristics related to leaves are only associated with the varieties with standing leaves.

A close-up of a flower

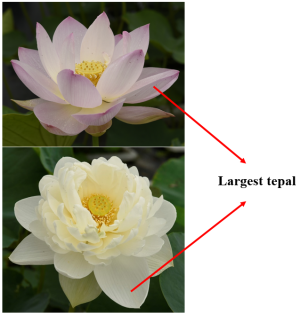
Description automatically generated

(b) For flower, all characteristics are observed and measured on day 2 flower around 8:00–10:00 am (7:00-9:00 am in hot summer) except a few of special varieties, because a flower, particularly single and semidouble flower types, starts to open in the early morning and completely closes afternoon from day 1 to day 3. One flower usually lasts for only four days and then its tepals fall off on the 5th day or afternoon of the 4th day. For most of varieties, the second day flower has the best appearance.

Flowering time of a flower



(c) Since the shape, size and color may change much from outer to inner whorls of tepals, therefore, only the largest or nearly largest tepal of flower based on (a) is used for comparison in shape, size and color.  The largest or nearly largest tepal is located at around the position where the half number of total tepals of a flower is counted for a single form flower.  For double form flower, it is treated as single form flower without considering petaloid petals.



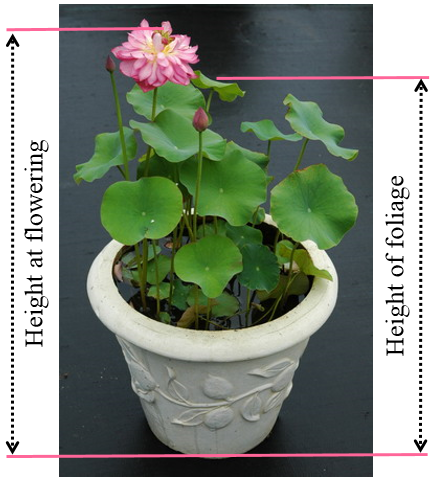
(d) Observations should be made on the seedpod near mature or completely mature before fruit color starting change.

(e) Observations should be made on dried mature fruits.

## 8.2  Explanations for individual characteristics

Ad. 1: Plant: height of foliage

Plant height of lotus is defined by the height of the tallest leaf or flower, and it must be measured from the base of petiole (or stalk) to the top of leaf blade (or flower) to meet DUS test requirement. Lotus plant usually can not reach the tallest before flowering peak, therefore plant height must be measured right after flowering peak.   
  
      
Measurement of plant height of foliage and plant height at flowering  
     
  
Ad. 2: Plant: height at flowering



See Ad.1

Ad. 4: Leaf blade: size

Size of leaf blade can be calculated by (Length + Width)/2 cm.

Ad. 5: Leaf blade: variegation

|  |  |
| --- | --- |
| A close-up of a lily pad  Description automatically generated | |
| 1 | 9 |
| absent | present |

Ad. 6: Leaf blade: main color

A collage of different types of leaves

Description automatically generated

Ad. 7: Leaf blade: shape

|  |  |  |
| --- | --- | --- |
|  | | |
| rounded or nearly rounded | elliptic | narrow elliptic |

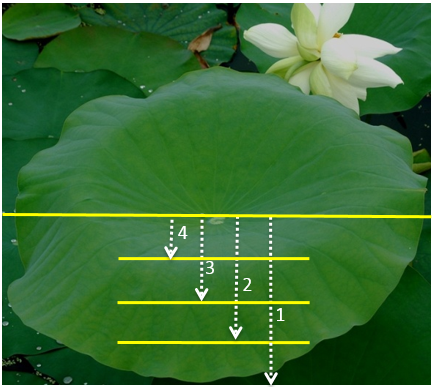
Ad. 8: Leaf blade: shape in longitudinal section

The longitudinal section of leaf blade should be based on observation of mature standing leaves.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | | | |
| strongly concave | moderately concave | weakly concave | flat | concave center with dropping edge |

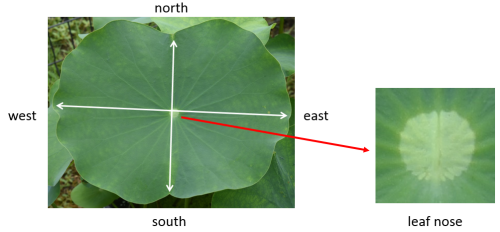
Ad. 9: Leaf blade: texture of upper surface

The adaxial surface texture of mature leaf can be identified by finger touch based on rough or smooth area, and degree of roughness or smoothness.   
1. Very smooth: fully smooth  
2. Smooth: 3/4 or more leaf area is smooth  
3. Medium : half leaf area is smooth (or half leaf area is rough)  
4. Rough: 1/4 or less leaf area is smooth (or 3/4 or more leaf area is rough)   
5. Very rough: fully rough



Ad. 10: Leaf blade: depth of concavity

Definition on direction of leaf blade: actually the lotus leaf is bilaterally symmetricconsidering shape of both blade and its nose (leaf center). It is convenient for describing leaf apex by defining direction of blade side like photo showing below. For leaf edge, usually the middle position of northern side (upper side) is more concave than that of southern side (lower side). Therefore, for shape of leaf apex, only the northern side is observed for comparison.



|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | | | |
| absent or very shallow | shallow | medium | deep |  |

Ad. 11: Leaf blade: red line of margin

A close-up of a leaf

Description automatically generated

Ad. 12: Leaf blade: gap of nose

Definition: leaf nose is the nose-shaped structure located at the center of leaf. The distance between two halves of nose is defined as nose gap. The wild American lotus and some hybrid of American-Asian lotus have the widest gap, Asian lotus have the narrowest gap, and most of Asian-American hybrids have intermediate gap.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | | | |
| absent or very narrow | narrow | medium | broad |  |

Ad. 13: Petiole: thickness

The diameter of petiole should be measured from the middle position of petiole for mature leaf.

Ad. 14: Petiole: density of spines

Spine density is observed based on the middle position of petiole since it is not evenly distributed from base to top of petiole.

A diagram of a cylindrical object

Description automatically generated with medium confidence

Ad. 15: Flower bud: shape

The shape of flower buds should be observed at least two days before opening.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | | | | | |
| ovoid | ovoid-conic | conic | narrow conic | globose | ellipsoid |

Ad. 17: Flowering: time of starting to bloom

Defined by 30% plants starting to bloom.

Ad. 18: Flowering time

Defined by the period from when 30% plants started to bloom and to whan 30% plants remain flowers near the end of flowering season.

Ad. 20: Flower: position relative to leaf

      The position of flower in relation to leaf is based on the relative height of a flower and its accompanying leaf for comparability. For the varieties without flowers, this data is not collected.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | | | |
| below | same level | slightly above | moderately above | strongly  above |

Ad. 21: Flower: type

Definition of flower type  
1. Single type: flower without petaloidity of stamens.  
2. Semidouble type: flower with petaloidity of partial stamens.  
3. Double type: tepal number usually over 40 with petaloidity of partial or all stamens.  
4. Dual-layered type: a special type of double flower, its petaloid carpels form another layer of flower tepals which is separated from normal tepal layer by stamens.  
5. Thousand-petalled type: a very unique type of double flower, in which, both stamens and carpls are not only completely petaloid, the petaloid tissue continues developing into numerous petals during flower opening. The total number of tepals (petals) is at least more than one thousand.



Ad. 23: Flower: shape

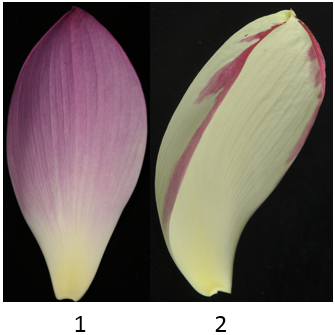
Definition and classification on flower shape  
1. Cup-shaped: for the first day flower of most lotus cultivars, it can not fully open and looks like a cup. For a very few of cultivars, the second day flower also can not fully open.  
2. Bowl-shaped: the second day flower can be usually fully open like a bowl.  
3. Plate-shaped: the fully open flower looks like a plate, with nearly horizontally arranged tepals.  
4. Irregularly shaped: a special flower shape of usually single flower, with irregularly arranged tepals.  
5. Head-shaped: the head-shaped and fully double flower with numerous tepals, most of which come from petaloid stamens and carpels.  
6. Ball-shaped: for a very few cultivars, some or most of the flower buds can not open and remain a ball shape.



Ad. 25: Tepal: pattern of secondary color

The pattern of secondary color distribution on flower is observed on the tepals of outer whorls, excluding tepal base.

solid flushed



Ad. 27: Tepal: number

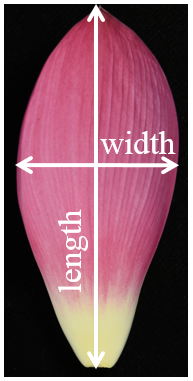
The number of tepals cound be counted between the small bud stage and day 2 flower as all tepals remain. All tepals should be counted, including the outermost ones.

Ad. 28: Tepal: shape

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | | | |
| broad obovate | obovate | oblanceolate | narrow oblanceolate | spatulate |

Ad. 29: Tepal: size

     The size of tepal is defined by calculation according to (length x width)/2 cm2.



Ad. 30: Tepal: main color on the inner side

The main color is measured by RHS Color Chart during 8:00 am and 10:00 am (7:00 - 9:00 am in peak summer) based on the largest tepal of the day 2 flower.

Ad. 31: Tepal: distribution of main color

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | | | |
| throughout | distal three quarters | distal half | basal half | basal three quarters |

Ad. 35: Tepal: conspicuousness of abaxial veins

     The longitudinal veins on tepal should be observed on abaxial surface of tepal (largest one or nearly so).

A close-up of a flower

Description automatically generated

Ad. 36: Stamen: number

The number of stamens can be counted between bud stage and day 3 flower as all stamens remain on the flower bud or flower.

Ad. 39: Stamen appendage: shape

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | | | |
| long-ellipsoid | obovoid | long-obovoid | hastiform |  |

Ad. 41: Carpel: status of development

The development status of carpels can be observed at the stages between day 1 flower and mature seedpod.  
1. Normal: all carpels develop normally;  
2. Partially bubbled: part of carpels become bubbled (degerated) and could not develop into the fruits;  
3. Completely bubbled: all carpels become bubbled and could not develop into the fruits;  
4. Partially petaloid: part of carpels become petaloid;  
5. Completely petaloid: all carpels become petaloid.



Ad. 44: Receptacle: degree of degeneration



Ad. 45: Seedpod: shape

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | | | | | |
| trumpet-shaped | obconical | cup-shaped | bowl-shaped | oblate | umbrella-shaped |

Ad. 46: Seedpod: color of top surface

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | | | |
| grey-green | green | green-yellow | purple-red |  |

Ad. 47: Seedpod: shape of top surface

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | | | |
| concave | plate-like concave | flat | slightly convex | convex |

Ad. 48: Seedpod: groove depth of margin

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | | | |
| absent or very shallow | shallow | medium | deep |  |

Ad. 50: Fruit: position relative to top surface of seedpod



Ad. 51: Fruit: shape

The shape of fruits can be observed based on fresh or dried mature fruits.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
|  | | | | | | |
| ovoid | narrow ovoid | globose | ellipsoid | narrow ellipsoid | obovoid | narrow obovoid |

Ad. 52: Fruit: anthocyanin coloration of endocarp

For some varieties, the color may be different in two halves of endocarp, and in such case, the characteristic should be based on the half with deeper color. 

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | | | |
| absent | weak | medium | strong |  |

Ad. 53: Fruit: size

The size of dried fruit is calculated by (Length X Width)/2.

Ad. 54: Fruit: color

The color of dried fruits should be observed after the white waxy powder of fruit surface is removed.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | | | |
| brown | grey brown | grey | black or dark brown |  |

Ad. 55: Fruit: waxy powder

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | | | |
| absent or weak | medium | strong |  |  |

Ad. 56: Fruit: glossiness

Glossiness of the dried fruits should be observed on the mature fruits, on which the waxy powder should be wiped off.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | | | |
| absent or weak | medium | strong |  |  |

Ad. 57: Fruit: conspicuousness of longitudinal stripes

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | | | |
| absent or weak | medium | strong |  |  |

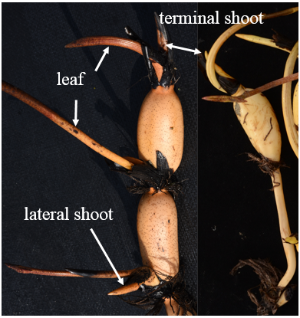
Ad. 58: Expanded rhizome: color

Since the color of expanded rhizome may be different between early developing stage and late mature stage, it should be observed after lotus entered into dormancy in the fall.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| A close up of a banana  Description automatically generated | | | | |
| white | yellow brown | brown red |  |  |

Ad. 64: Rhizome propagule: number

The number of rhizome propagules is based on count of the standard rhizome propagule which consists of two internodes (usually two or one expanded) with terminal shoot at least.



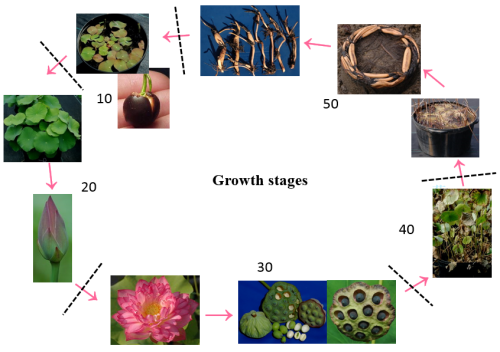
Ad. 65: Terminal internode: shape of apex (for rhizome lotus only)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | | | | |
| acute | obtuse |  |  |  |

## 8.3  Additional Explanations on the Table of Characteristics

Growth stages

10 Growth of shoots, coin leaves and floating leaves after planting in spring;  
20 Growth of emerging leaves and flower buds before flowering in early summer;  
30 Flowering, fruit setting, fruit maturation and rhizome expansion between summer and fall;  
40 Leaf aging, yellowing, and died after end of flowering in fall;  
50 Plant dormancy in winter.



During growth season, some of the flowers and mature fruits along with seedpods will he collected for observation or measurement, but it has no influence on plant development and growth. At the end of growth cycle, the underground rhizomes during dormancy may be collected for observation of shoot shape, measurement of expanded rhizome diameter and counting of propagule number.  
  
  
Type of lotus: based on its main use, lotus is commonly divided into three types: rhizome lotus, seed lotus and flower lotus.

(1) The rhizome lotus is mainly used for production of rhizome as vegetable or starch source. It rarely blooms or has fewer flowers but thicker rhizome than seed lotus and flower lotus.

(2) The seed lotus is mainly used for production of seeds as source of fruits or starch. Its fruits are larger than those of both rhizome lotus and flower lotus. The seed lotus is also considered as flower lotus due to its many beautiful flowers.

(3) The flower lotus, also called ornamental lotus, is mainly used for flower appreciation. It is easy to bloom but many varieties of this type lotus may be sterile.

# Literature

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Agricultural Department of China. 2016. Descriptor for Lotus Germplasm Resources. Standards of Agricultural Industry of China (NY/T 2937—2016）. . China Agriculture Press, Beijing, China, 17pp.  
  
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Tian DK. 2020. Application to Register a Cultivar of Nelumbo. 8pp.  https://iwgs.org/nymphaea-and-nelumbo-registration/ (2023-2-26 accessed).  
  
Wang QC, Zhang XY. 2005. Colored Illustration of Lotus Cultivars in China. China Forestry Press, Beijing, China, 306pp.

# 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  In the case of hybrid varieties which are the subject of an application for plant breeders' rights, and where the parent lines are to be submitted as a part of the examination of the hybrid variety, this Technical Questionnaire should be completed for each of the parent lines, in addition to being completed for the hybrid variety. | | | |
| 1. Subject of the Technical Questionnaire | | | |
| 1.1.1 Botanical name | *Nelumbo* Adans. | |  |
|  |  | |  |
| 1.1.2 Common name | Lotus | |  |
| 2. Applicant | | | |
| Name |  | |  |
|  |  | |  |
| Address |  | |  |
|  |  | |  |
| Telephone No. |  | |  |
|  |  | |  |
| Fax No. |  | |  |
|  |  | |  |
| E-mail address |  | |  |
|  |  | |  |
| Breeder (if different from  applicant) |  | |  |
|  |  | |  |

|  |  |  |  |
| --- | --- | --- | --- |
| TECHNICAL QUESTIONNAIRE | Page {x} of {y} | Reference Number: | |
|  | | | |
| 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 variety)  (…………………..……………..…) x (……………..…………………..…)  female parent male parent  (b) partially known cross [ ]  (please state 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) |

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

|  |
| --- |
| 4.2 Method of propagating the variety  4.2.1 Seed-propagated varieties  (a) Cross-pollination [ ]  (b) Hybrid [ ]  (i) Single hybrid [ ]  (c) Inbred line [ ]  (i) Male sterile line [ ]  (ii) Male fertile line [ ]  (d) Apomictic Variety [ ]  (e) Other (please provide details) [ ]  4.2.2 Vegetative propagation  (a) In vitro propagation [ ]  (b) Division [ ]  (c) Rhizomes [ ]  (d) Other (state method) [ ]  4.2.3 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: height of foliage** | |  | |  |
|  | very short | | Chuzi Luo | | 1 [ ] |
|  | very short to short | |  | | 2 [ ] |
|  | short | | Xing Huo | | 3 [ ] |
|  | short to medium | |  | | 4 [ ] |
|  | medium | | Yijian Lian | | 5 [ ] |
|  | medium to tall | |  | | 6 [ ] |
|  | tall | | Yellow Bird | | 7 [ ] |
|  | tall to very tall | |  | | 8 [ ] |
|  | very tall | | Fen Bawang | | 9 [ ] |
| **5.2**  **(9)** | **Leaf blade: texture of upper surface** | |  | |  |
|  | very smooth | | Yellow Bird | | 1 [ ] |
|  | smooth | | Fenhong Lingxiao | | 2 [ ] |
|  | medium | |  | | 3 [ ] |
|  | rough | | Honghu Hong | | 4 [ ] |
|  | very rough | | Daye Chi | | 5 [ ] |
| **5.3**  **(12)** | **Leaf blade: gap of nose** | |  | |  |
|  | absent or very narrow | | Jia Jingying | | 1 [ ] |
|  | narrow | | Honghu Hong | | 2 [ ] |
|  | medium | | Yijian Lian | | 3 [ ] |
|  | broad | | Yellow Bird | | 4 [ ] |
| **5.4**  **(20)** | **Flower: position relative to leaf** | |  | |  |
|  | below | |  | | 1 [ ] |
|  | same level | | Zhongshan Hongtai | | 2 [ ] |
|  | slightly above | | Hong Sijuan | | 3 [ ] |
|  | moderately above | | Honghu Hong | | 4 [ ] |
|  | strongly above | | Bian Lian | | 5 [ ] |
|  |  | |  | |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| TECHNICAL QUESTIONNAIRE | | Page {x} of {y} | | Reference Number: | |
|  | |  | |  | |
|  | Characteristics | | Example Varieties | | Note |
| **5.5**  **(21)** | **Flower: type** | |  | |  |
|  | single | | Honghu Hong | | 1 [ ] |
|  | semi-double | | Cai Xia | | 2 [ ] |
|  | double | | Dan Sajin | | 3 [ ] |
|  | dual-layered | | Hongtai Lian | | 4 [ ] |
|  | thousand-petalled | | Qian Ban | | 5 [ ] |
| **5.6**  **(23)** | **Flower: shape** | |  | |  |
|  | cup-shaped | | Furong Qipa | | 1 [ ] |
|  | bowl-shaped | | Honghu Hong | | 2 [ ] |
|  | plate-shaped | | Jin Se | | 3 [ ] |
|  | Irregularly shaped | | Chenshan Feiyan | | 4 [ ] |
|  | head-shaped | | Zhizun Qianban | | 5 [ ] |
|  | ball-shaped | | Nelumbo 'Xiao Hong Dan' | | 6 [ ] |
| **5.7**  **(24)** | **Flower: color** | |  | |  |
|  | white | | Baiyangdian Bai | | 1 [ ] |
|  | green | | Pujin Diecui | | 2 [ ] |
|  | yellow | | Yellow Bird | | 3 [ ] |
|  | orange | | Xingse Chunshan | | 4 [ ] |
|  | pink purple | | Hongtai Lian | | 5 [ ] |
|  | red purple | | Weifang Mohong | | 6 [ ] |
|  | purple | | Nelumbo 'Chenshan Zihe' | | 7 [ ] |
| **5.8**  **(29)** | **Tepal: size** | |  | |  |
|  | very small | | Chuzi Luo | | 1 [ ] |
|  | small | | Yanzhi Wan | | 2 [ ] |
|  | medium | | Yijian Lian | | 3 [ ] |
|  | large | | Honghu Hong | | 4 [ ] |
|  | very large | | Fen Bawang | | 5 [ ] |
|  |  | |  | |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| TECHNICAL QUESTIONNAIRE | | Page {x} of {y} | | Reference Number: | |
|  | |  | |  | |
|  | Characteristics | | Example Varieties | | Note |
| **5.9**  **(41)** | **Carpel: status of development** | |  | |  |
|  | normal | | Honghu Hong | | 1 [ ] |
|  | partially bubbled | |  | | 2 [ ] |
|  | completely bubbled | | Qinhuai Yueye | | 3 [ ] |
|  | partially petaloid | | Huang Lingyang | | 4 [ ] |
|  | completely petaloid | | Zhizun Qianban | | 5 [ ] |
| **5.10**  **(51)** | **Fruit: shape** | |  | |  |
|  | ovoid | |  | | 1 [ ] |
|  | narrow ovoid | |  | | 2 [ ] |
|  | globose | | Jiuhua Haoyue | | 3 [ ] |
|  | ellipsoid | | Honghu Hong | | 4 [ ] |
|  | narrow ellipsoid | |  | | 5 [ ] |
|  | obovoid | |  | | 6 [ ] |
|  | narrow obovoid | |  | | 7 [ ] |
| **5.11**  **(52)** | **Fruit: anthocyanin coloration of endocarp** | |  | |  |
|  | absent | |  | | 1 [ ] |
|  | weak | | Dan Sajin | | 2 [ ] |
|  | medium | | Honghu Hong | | 3 [ ] |
|  | strong | | Yijian Lian | | 4 [ ] |
| **5.12**  **(56)** | **Fruit: glossiness** | |  | |  |
|  | absent or weak | | Yingquan Xike | | 1 [ ] |
|  | medium | | Jiuhua Haoyue | | 2 [ ] |
|  | strong | |  | | 3 [ ] |
| **5.13**  **(60)** | **Expanded rhizome: thickness** | |  | |  |
|  | very thin | | Fenhong Lingxiao | | 1 [ ] |
|  | thin | | Bian Lian | | 2 [ ] |
|  | medium | | Hong Sijuan | | 3 [ ] |
|  | thick | | Wu Fei | | 4 [ ] |
|  | very thick | | Elian 1 | | 5 [ ] |
|  |  | |  | |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| TECHNICAL QUESTIONNAIRE | | Page {x} of {y} | | Reference Number: | |
|  | |  | |  | |
|  | Characteristics | | Example Varieties | | Note |
| **5.14**  **(62)** | **Main expanded rhizome: shape of internode** | |  | |  |
|  | ovoid or ellipsoid | |  | | 1 [ ] |
|  | short tubular | |  | | 2 [ ] |
|  | medium tubular | | Elian 1 | | 3 [ ] |
|  | long tubular | | Zhongshan Hongtai | | 4 [ ] |
|  | very long tubular | |  | | 5 [ ] |
| **5.15**  **(63)** | **Expanded rhizome: number of branches (for rhizome lotus only)** | |  | |  |
|  | few | |  | | 1 [ ] |
|  | medium | |  | | 2 [ ] |
|  | many | |  | | 3 [ ] |
| **5.16**  **(64)** | **Rhizome propagule: number** | |  | |  |
|  | absent or very few | | Fenhong Lingxiao | | 1 [ ] |
|  | few | | Zhongshan Hongtai | | 2 [ ] |
|  | medium | |  | | 3 [ ] |
|  | many | |  | | 4 [ ] |
|  | very many | |  | | 5 [ ] |
| **5.17**  **(68)** | **Expanded rhizome: texture of flesh (for rhizome lotus only)** | |  | |  |
|  | crispy | | Elian 1 | | 1 [ ] |
|  | intermediate | | Elian 4 | | 2 [ ] |
|  | starchy | | Elian 5 | | 3 [ ] |
|  |  | |  | |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 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 | | | | | | |

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| #7. Additional information which may help in the examination of the variety  7.1 In addition to the information provided in sections 5 and 6, are there any additional characteristics which may help to distinguish the variety?  Yes [ ] No [ ]  (If yes, please provide details)  7.2 Are there any special conditions for growing the variety or conducting the examination?  Yes [ ] No [ ]  (If yes, please provide details)  7.3 Other information | | | |

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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”.  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  9.3 Has the plant material to be examined been tested for the presence of virus or other pathogens?  Yes [ ]  (please provide details as specified by the Authority)  No [ ] | | | |
| 10. I hereby declare that, to the best of my knowledge, the information provided in this form is correct: | | | |
| Applicant’s name |  | | |
| Signature |  | Date |  |
|  | [End of document] | | |