



These Test Guidelines have been superseded by a later version. The latest adopted version of Test Guidelines can be found at [http://www.upov.int/test\\_guidelines/en/list.jsp](http://www.upov.int/test_guidelines/en/list.jsp)

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Ces principes directeurs d'examen ont été remplacés par une version ultérieure. La version adoptée la plus récente des principes directeurs d'examen figure à l'adresse suivante : [http://www.upov.int/test\\_guidelines/fr/list.jsp](http://www.upov.int/test_guidelines/fr/list.jsp)

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Diese Prüfungsrichtlinien wurden durch eine neuere Fassung ersetzt. Die neueste angenommene Fassung von Prüfungsrichtlinien ist unter [http://www.upov.int/test\\_guidelines/de/list.jsp](http://www.upov.int/test_guidelines/de/list.jsp) zu finden.

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Las presentes directrices de examen han sido reemplazadas por una versión posterior. La versión de las directrices de examen de más reciente aprobación está disponible en [http://www.upov.int/test\\_guidelines/es/list.jsp](http://www.upov.int/test_guidelines/es/list.jsp).


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**INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS**  
GENEVA

**SPINACH**

UPOV Code: SPINA\_OLE

*Spinacea oleracea* L.

\*

**GUIDELINES**

**FOR THE CONDUCT OF TESTS**

**FOR DISTINCTNESS, UNIFORMITY AND STABILITY**

Alternative Names:\*

| <i>Botanical name</i>       | <i>English</i> | <i>French</i> | <i>German</i> | <i>Spanish</i> |
|-----------------------------|----------------|---------------|---------------|----------------|
| <i>Spinacea oleracea</i> L. | Spinach        | Épinard       | Spinat        | Espinaca       |

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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\* 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](http://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 *Spinacea oleracea* 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 make sure that all customs formalities and phytosanitary requirements are complied with.

2.2 The material is to be supplied in the form of seed.

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

20,000 seeds.

The seed should meet the minimum requirements for germination, species and analytical purity, health and moisture content, specified by the competent authority.

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*

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

### 3.2 *Testing Place*

Tests are normally conducted at one place. In the case of tests conducted at more than one place, guidance is provided in TGP/9 “Examining Distinctness”.

### 3.3 *Conditions for Conducting the Examination*

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

3.3.2 The recommended method of observing the characteristic is indicated by the following key in the second column of the Table of Characteristics:

MG: single measurement of a group of plants or parts of plants

MS: measurement of a number of individual plants or parts of plants

VG: visual assessment by a single observation of a group of plants or parts of plants

VS: visual assessment by observation of individual plants or parts of plants

### 3.4 *Test Design*

3.4.1 Each test should be designed to result in a total of 100 single spaced plants, which should be divided between 2 replicates.

3.4.2 The design of the tests should be such that plants or parts of plants may be removed for measurement or counting without prejudice to the observations which must be made up to the end of the growing cycle.

### 3.5 *Number of Plants / Parts of Plants to be Examined*

Unless otherwise indicated, all observations on single plants should be made on 60 plants or parts taken from each of 60 plants and any other observations made on all plants in the test.

### 3.6 *Additional Tests*

Additional tests, for examining relevant characteristics, may be established.

## 4. Assessment of Distinctness, Uniformity and Stability

### 4.1 *Distinctness*

#### 4.1.1 General Recommendations

It is of particular importance for users of these Test Guidelines to consult the General Introduction prior to making decisions regarding distinctness. However, the following points are provided for elaboration or emphasis in these Test Guidelines.

#### 4.1.2 Consistent Differences

The differences observed between varieties may be so clear that more than one growing cycle is not necessary. In addition, in some circumstances, the influence of the environment is not such that more than a single growing cycle is required to provide assurance that the differences observed between varieties are sufficiently consistent. One means of ensuring that a difference in a characteristic, observed in a growing trial, is sufficiently consistent is to examine the characteristic in at least two independent growing cycles.

#### 4.1.3 Clear Differences

Determining whether a difference between two varieties is clear depends on many factors, and should consider, in particular, the type of expression of the characteristic being examined, i.e. whether it is expressed in a qualitative, quantitative, or pseudo-qualitative manner. Therefore, it is important that users of these Test Guidelines are familiar with the

recommendations contained in the General Introduction prior to making decisions regarding distinctness.

## 4.2 *Uniformity*

4.2.1 It is of particular importance for users of these Test Guidelines to consult the General Introduction prior to making decisions regarding uniformity. However, the following points are provided for elaboration or emphasis in these Test Guidelines:

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

4.2.3 Hybrids: For the assessment of uniformity of hybrid varieties, a population standard of 2% and an acceptance probability of at least 95% should be applied. In the case of a sample size of 100 plants, 5 off-types are allowed. In addition, a population standard of 3% and an acceptance probability of at least 95% should be applied for inbred plants obviously resulting from the selfing of a parent line. In the case of a sample size of 100 plants, 6 inbred plants are allowed.

## 4.3 *Stability*

4.3.1 In practice, it is not usual to perform tests of stability that produce results as certain as those of the testing of distinctness and uniformity. However, experience has demonstrated that, for many types of variety, when a variety has been shown to be uniform, it can also be considered to be stable.

4.3.2 Where appropriate, or in cases of doubt, stability may be tested, either by growing a further generation, or by testing a new seed stock to ensure that it exhibits the same characteristics as those shown by the previous material supplied.

## 5. Grouping of Varieties and Organization of the Growing Trial

5.1 The selection of varieties of common knowledge to be grown in the trial with the candidate varieties and the way in which these varieties are divided into groups to facilitate the assessment of distinctness are aided by the use of grouping characteristics.

5.2 Grouping characteristics are those in which the documented states of expression, even where produced at different locations, can be used, either individually or in combination with other such characteristics: (a) to select varieties of common knowledge that can be excluded from the growing trial used for examination of distinctness; and (b) to organize the growing trial so that similar varieties are grouped together.

5.3 The following have been agreed as useful grouping characteristics:

- (a) Leaf blade: intensity of green color (characteristic 3)
- (b) Leaf blade: blistering (characteristic 4)
- (c) Proportion of monoecious plants (characteristic 13)
- (d) Proportion of female plants (characteristic 14)
- (e) Proportion of male plants (characteristic 15)
- (f) Time of start of bolting (for spring sown crops, 15% of plants) (characteristic 16)
- (g) Resistance to *Peronospora farinosa* f. sp. *spinaciae* (characteristic 18)

5.4 Guidance for the use of grouping characteristics, in the process of examining distinctness, is provided through the General Introduction.

## 6. Introduction to the Table of Characteristics

### 6.1 *Categories of Characteristics*

#### 6.1.1 Standard Test Guidelines Characteristics

Standard Test Guidelines characteristics are those which are approved by UPOV for examination of DUS and from which members of the Union can select those suitable for their particular circumstances.

#### 6.1.2 Asterisked Characteristics

Asterisked characteristics (denoted by \*) are those included in the Test Guidelines which are important for the international harmonization of variety descriptions and should always be examined for DUS and included in the variety description by all members of the Union, except when the state of expression of a preceding characteristic or regional environmental conditions render this inappropriate.

### 6.2 *States of Expression and Corresponding Notes*

States of expression are given for each characteristic to define the characteristic and to harmonize descriptions. Each state of expression is allocated a corresponding numerical note for ease of recording of data and for the production and exchange of the description.

### 6.3 *Types of Expression*

An explanation of the types of expression of characteristics (qualitative, quantitative and pseudo-qualitative) is provided in the General Introduction.

### 6.4 *Example Varieties*

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

## 6.5 *Legend*

(\*) Asterisked characteristic – see Chapter 6.1.2

QL: Qualitative characteristic – see Chapter 6.3

QN: Quantitative characteristic – see Chapter 6.3

PQ: Pseudo-qualitative characteristic – see Chapter 6.3

MG, MS, VG, VS: See Chapter 3.3.2

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

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

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

|                                       | English    | français                                                  | Deutsch                                                              | español                                                      | Example Varieties<br>Exemples<br>Beispielssorten<br>Variedades ejemplo | Note/<br>Nota                     |   |
|---------------------------------------|------------|-----------------------------------------------------------|----------------------------------------------------------------------|--------------------------------------------------------------|------------------------------------------------------------------------|-----------------------------------|---|
| <b>1.</b>                             | <b>VG</b>  | <b>Seedling: length of cotyledon</b>                      | <b>Plantule: longueur du cotylédon</b>                               | <b>Sämling: Länge des Keimblatts</b>                         | <b>Plántula: longitud del cotiledón</b>                                |                                   |   |
| <b>QN</b>                             |            | short                                                     | court                                                                | kurz                                                         | corto                                                                  | Nores                             | 3 |
|                                       |            | medium                                                    | moyen                                                                | mittel                                                       | medio                                                                  |                                   | 5 |
|                                       |            | long                                                      | long                                                                 | lang                                                         | largo                                                                  | Breedblad Scherpzaad, Resistoflay | 7 |
| <b>2.</b><br><b>(*)</b><br><b>(+)</b> | <b>VG</b>  | <b>Leaf: anthocyanin coloration of petioles and veins</b> | <b>Feuille : pigmentation anthocyanique du pétiole et des veines</b> | <b>Blatt: Anthocyanfärbung des Blattstiels und der Adern</b> | <b>Hoja: pigmentación antocianica del pecíolo y de los nervios</b>     |                                   |   |
| <b>QL</b>                             | <b>(a)</b> | absent                                                    | absentes                                                             | fehlend                                                      | ausentes                                                               | Resistoflay, Nores                | 1 |
|                                       |            | present                                                   | présentes                                                            | vorhanden                                                    | presentes                                                              | Red Cardinal, Reddy               | 9 |
| <b>3.</b><br><b>(*)</b>               | <b>VG</b>  | <b>Leaf blade: intensity of green color</b>               | <b>Limbe: intensité de la couleur verte</b>                          | <b>Blattspreite: Intensität der Grünfärbung</b>              | <b>Limbo: intensidad del color verde</b>                               |                                   |   |
| <b>QN</b>                             | <b>(a)</b> | very light                                                | très claire                                                          | sehr hell                                                    | muy claro                                                              |                                   | 1 |
|                                       |            | light                                                     | claire                                                               | hell                                                         | claro                                                                  | Monet, Viroflay, Winterreuzen     | 3 |
|                                       |            | medium                                                    | moyenne                                                              | mittel                                                       | medio                                                                  | Butterflay, Monnopa               | 5 |
|                                       |            | dark                                                      | foncée                                                               | dunkel                                                       | oscuro                                                                 | Imola, Lavewa, Nores              | 7 |
|                                       |            | very dark                                                 | très foncée                                                          | sehr dunkel                                                  | muy oscuro                                                             | Lorelay, Mystic                   | 9 |
| <b>4.</b><br><b>(*)</b>               | <b>VG</b>  | <b>Leaf blade: blistering</b>                             | <b>Limbe: cloqure</b>                                                | <b>Blattspreite: Blasigkeit</b>                              | <b>Limbo: abullonado</b>                                               |                                   |   |
| <b>QN</b>                             | <b>(a)</b> | absent or very weak                                       | absente ou très faible                                               | fehlend oder sehr gering                                     | ausente o muy débil                                                    | Matador                           | 1 |
|                                       |            | weak                                                      | faible                                                               | gering                                                       | débil                                                                  | Polka, Tarpay                     | 3 |
|                                       |            | medium                                                    | moyenne                                                              | mittel                                                       | medio                                                                  | Butterflay, Koala, Mystic         | 5 |
|                                       |            | strong                                                    | forte                                                                | stark                                                        | fuerte                                                                 | Giraffe, Rhythm                   | 7 |
|                                       |            | very strong                                               | très forte                                                           | sehr stark                                                   | muy fuerte                                                             | Menorca, Revolver                 | 9 |

|                   | English    | français                    | Deutsch                         | español                      | Example Varieties<br>Exemples<br>Beispielssorten<br>Variedades ejemplo | Note/<br>Nota           |   |
|-------------------|------------|-----------------------------|---------------------------------|------------------------------|------------------------------------------------------------------------|-------------------------|---|
| <b>5. (*) (+)</b> | <b>VG</b>  | <b>Leaf blade: lobing</b>   | <b>Limbe: découpure du bord</b> | <b>Blattspreite: Lappung</b> | <b>Limbo: lobulado</b>                                                 |                         |   |
| <b>QN</b>         | <b>(a)</b> | absent or very weak         | absente ou très faible          | fehlend oder gering          | sehr ausente o muy débil                                               | 1                       |   |
|                   |            | weak                        | faible                          | gering                       | débil                                                                  | Butterflay, Giraffe     | 3 |
|                   |            | medium                      | moyenne                         | mittel                       | medio                                                                  | Mystic                  | 5 |
|                   |            | strong                      | forte                           | stark                        | fuerte                                                                 | Parrot                  | 7 |
| <b>6. (*) (+)</b> | <b>VG</b>  | <b>Petiole: attitude</b>    | <b>Pétiole: port</b>            | <b>Blattstiel: Haltung</b>   | <b>Pecíolo: porte</b>                                                  |                         |   |
| <b>QN</b>         | <b>(a)</b> | erect                       | dressé                          | aufrecht                     | erecto                                                                 | Grappa                  | 1 |
|                   |            | semi-erect                  | demi-dressé                     | halbaufrecht                 | semi-erecto                                                            | Monnopa, Parrot         | 3 |
|                   |            | horizontal                  | horizontal                      | waagerecht                   | horizontal                                                             | Comte, Lavewa           | 5 |
| <b>7. (*) (+)</b> | <b>VG</b>  | <b>Petiole: length</b>      | <b>Pétiole: longueur</b>        | <b>Blattstiel: Länge</b>     | <b>Pecíolo: longitud</b>                                               |                         |   |
| <b>QN</b>         | <b>(a)</b> | short                       | court                           | kurz                         | corto                                                                  | Imola, Mystic           | 3 |
|                   |            | medium                      | moyen                           | mittel                       | medio                                                                  | Butterflay, Giraffe     | 5 |
|                   |            | long                        | long                            | lang                         | largo                                                                  | Grappa, Resistoflay     | 7 |
| <b>8. (*) (+)</b> | <b>VG</b>  | <b>Leaf blade: attitude</b> | <b>Limbe: port</b>              | <b>Blattspreite: Haltung</b> | <b>Limbo: porte</b>                                                    |                         |   |
| <b>QN</b>         | <b>(a)</b> | erect                       | dressé                          | aufrecht                     | erecto                                                                 |                         | 1 |
|                   |            | semi-erect                  | demi-dressé                     | halbaufrecht                 | semi-erecto                                                            | Grappa, Monnopa, Rhythm | 3 |
|                   |            | horizontal                  | horizontal                      | waagerecht                   | horizontal                                                             | Lavewa, Mystic          | 5 |
|                   |            | semi-pendulous              | demi-retombant                  | halbhängend                  | semi-colgante                                                          | Giraffe, Medania        | 7 |

|                   | English                                          | français                                             | Deutsch                                             | español                                          | Example Varieties<br>Exemples<br>Beispielssorten<br>Variedades ejemplo | Note/<br>Nota |
|-------------------|--------------------------------------------------|------------------------------------------------------|-----------------------------------------------------|--------------------------------------------------|------------------------------------------------------------------------|---------------|
| <b>9. VG (*)</b>  | <b>Leaf blade: shape (excluding basal lobes)</b> | <b>Limbe: forme (à l'exclusion des lobes basals)</b> | <b>Blattspreite: Form (Basallappen ausgenommen)</b> | <b>Limbo: forma (excluyendo lóbulos basales)</b> |                                                                        |               |
| <b>PQ</b>         | <b>(a)</b>                                       |                                                      |                                                     |                                                  |                                                                        |               |
|                   | triangular                                       | triangulaire                                         | dreieckig                                           | triangular                                       | Grappa, Maracas                                                        | 1             |
|                   | medium ovate                                     | ovale                                                | eiförmig                                            | oval                                             | Lavewa, Resistoflay                                                    | 2             |
|                   | broad ovate                                      | ovale large                                          | breit eiförmig                                      | oval ancha                                       | Butterfly                                                              | 3             |
|                   | medium elliptic                                  | elliptique moyen                                     | mittel elliptisch                                   | elíptica media                                   |                                                                        | 4             |
|                   | broad elliptic                                   | elliptique large                                     | breit elliptisch                                    | elíptica ancha                                   | Nores                                                                  | 5             |
|                   | circular                                         | circulaire                                           | rund                                                | circular                                         | Giraffe                                                                | 6             |
| <b>10. VG</b>     | <b>Leaf blade: curving of margin</b>             | <b>Limbe: courbure du bord</b>                       | <b>Blattspreite: Biegung des Randes</b>             | <b>Limbo: curvado del margen</b>                 |                                                                        |               |
| <b>QN</b>         | <b>(a)</b>                                       |                                                      |                                                     |                                                  |                                                                        |               |
|                   | incurved                                         | incurvé                                              | eingebogen                                          | incurvado                                        |                                                                        | 1             |
|                   | flat                                             | plan                                                 | flach                                               | plano                                            | Resistoflay                                                            | 2             |
|                   | recurved                                         | récurvé                                              | umgebogen                                           | recurvado                                        | Imola                                                                  | 3             |
| <b>11. VG (*)</b> | <b>Leaf blade: shape of apex</b>                 | <b>Limbe: forme de la pointe</b>                     | <b>Blattspreite: Form der Spitze</b>                | <b>Limbo: forma del ápice</b>                    |                                                                        |               |
| <b>QN</b>         | <b>(a)</b>                                       |                                                      |                                                     |                                                  |                                                                        |               |
|                   | acute                                            | aigue                                                | spitz                                               | agudo                                            | Grappa, Rhythm                                                         | 1             |
|                   | obtuse                                           | obtuse                                               | stumpf                                              | obtusos                                          | Resistoflay                                                            | 2             |
|                   | rounded                                          | arrondie                                             | abgerundet                                          | redondeado                                       | Imola, Nores                                                           | 3             |
| <b>12. VG (*)</b> | <b>Leaf blade: shape in longitudinal section</b> | <b>Limbe: forme en section longitudinale</b>         | <b>Blattspreite: Form im Längsschnitt</b>           | <b>Limbo: forma en sección longitudinal</b>      |                                                                        |               |
| <b>QN</b>         | <b>(a)</b>                                       |                                                      |                                                     |                                                  |                                                                        |               |
|                   | concave                                          | concave                                              | konkav                                              | cóncava                                          |                                                                        | 1             |
|                   | flat                                             | plat                                                 | flach                                               | plana                                            | Mystic, Resistoflay                                                    | 2             |
|                   | convex                                           | convexe                                              | konvex                                              | convexa                                          | Grappa, Lazio                                                          | 3             |

|                              | English                                    | français                                   | Deutsch                                | español                                     | Example Varieties<br>Exemples<br>Beispielssorten<br>Variedades ejemplo | Note/<br>Nota |
|------------------------------|--------------------------------------------|--------------------------------------------|----------------------------------------|---------------------------------------------|------------------------------------------------------------------------|---------------|
| <b>13. VS<br/>(*<br/>(+)</b> | <b>Proportion of<br/>monoecious plants</b> | <b>Proportion de<br/>plantes monoïques</b> | <b>Anteil monözischer<br/>Pflanzen</b> | <b>Proporción de<br/>plantas monoicas</b>   |                                                                        |               |
| <b>QN</b>                    | absent or very low                         | absente ou très faible                     | fehlend oder sehr gering               | ausente o muy baja                          | Medania                                                                | 1             |
|                              | low                                        | faible                                     | gering                                 | baja                                        | Matador                                                                | 3             |
|                              | medium                                     | moyenne                                    | mittel                                 | media                                       | Figo                                                                   | 5             |
|                              | high                                       | grande                                     | hoch                                   | alta                                        | Giraffe, Lazio                                                         | 7             |
|                              | very high                                  | très grande                                | sehr hoch                              | muy alta                                    | Monnopa                                                                | 9             |
| <b>14. VS<br/>(*<br/>(+)</b> | <b>Proportion of<br/>female plants</b>     | <b>Proportion de<br/>plantes femelles</b>  | <b>Anteil weiblicher<br/>Pflanzen</b>  | <b>Proporción de<br/>plantas femeninas</b>  |                                                                        |               |
| <b>QN</b>                    | absent or very low                         | absente ou très faible                     | fehlend oder sehr gering               | ausente o muy baja                          | Monnopa                                                                | 1             |
|                              | low                                        | faible                                     | gering                                 | baja                                        | Giraffe                                                                | 3             |
|                              | medium                                     | moyenne                                    | mittel                                 | media                                       | Figo, Medania                                                          | 5             |
|                              | high                                       | grande                                     | hoch                                   | alta                                        | Parrot                                                                 | 7             |
|                              | very high                                  | très grande                                | sehr hoch                              | muy alta                                    |                                                                        | 9             |
| <b>15. VS<br/>(*<br/>(+)</b> | <b>Proportion of male<br/>plants</b>       | <b>Proportion de<br/>plantes mâles</b>     | <b>Anteil männlicher<br/>Pflanzen</b>  | <b>Proporción de<br/>plantas masculinas</b> |                                                                        |               |
| <b>QN</b>                    | absent or very low                         | absente ou très faible                     | fehlend oder sehr gering               | ausente o muy baja                          | Monnopa, Parrot                                                        | 1             |
|                              | low                                        | faible                                     | gering                                 | baja                                        |                                                                        | 3             |
|                              | medium                                     | moyenne                                    | mittel                                 | media                                       | Medania                                                                | 5             |
|                              | high                                       | grande                                     | hoch                                   | alta                                        |                                                                        | 7             |
|                              | very high                                  | très grande                                | sehr hoch                              | muy alta                                    |                                                                        | 9             |







|                   | English                                                  | français                                                             | Deutsch                                                | español                                                          | Example Varieties<br>Exemples<br>Beispielssorten<br>Variedades ejemplo | Note/<br>Nota |
|-------------------|----------------------------------------------------------|----------------------------------------------------------------------|--------------------------------------------------------|------------------------------------------------------------------|------------------------------------------------------------------------|---------------|
| <b>18.15</b>      | <b>Race Pfs: 16</b>                                      | <b>Race Pfs: 16</b>                                                  | <b>Pathotyp Pfs: 16</b>                                | <b>Raza Pfs: 16</b>                                              |                                                                        |               |
| <b>QL</b>         | absent                                                   | absente                                                              | fehlend                                                | ausente                                                          | Meerkat                                                                | 1             |
|                   | present                                                  | présente                                                             | vorhanden                                              | presente                                                         | Caladonia                                                              | 9             |
| -----             |                                                          |                                                                      |                                                        |                                                                  |                                                                        |               |
| <b>18.16</b>      | <b>Race Pfs: 17</b>                                      | <b>Race Pfs: 17</b>                                                  | <b>Pathotyp Pfs: 17</b>                                | <b>Raza Pfs: 17</b>                                              |                                                                        |               |
| <b>QL</b>         | absent                                                   | absente                                                              | fehlend                                                | ausente                                                          | Pigeon                                                                 | 1             |
|                   | present                                                  | présente                                                             | vorhanden                                              | presente                                                         | Hydrus                                                                 | 9             |
| <b>19. VG (+)</b> | <b>Resistance to<br/>Cucumber mosaic<br/>virus (CMV)</b> | <b>Résistance au virus<br/>de la mosaïque du<br/>concombre (CMV)</b> | <b>Resistenz gegen<br/>Gurkenmosaikvirus<br/>(CMV)</b> | <b>Resistencia al virus<br/>del mosaico del<br/>pepino (CMV)</b> |                                                                        |               |
| <b>QL</b>         | absent                                                   | absente                                                              | fehlend                                                | ausente                                                          | Polka                                                                  | 1             |
|                   | present                                                  | présente                                                             | vorhanden                                              | presente                                                         | Symphony                                                               | 9             |

8. Explanations on the Table of Characteristics8.1 *Explanations covering several characteristics*

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

- (a) observations on the leaf blade should be made on the seventh to tenth leaves of the adult not bolted plant. The shape of the leaf blade in longitudinal section should be observed on central leaves.

8.2 *Explanations for individual characteristics*Ad. 2: Leaf: anthocyanin coloration of petioles and veins

1  
absent



9  
present

Ad. 5: Leaf blade: lobing

1  
absent or very weak



3  
weak

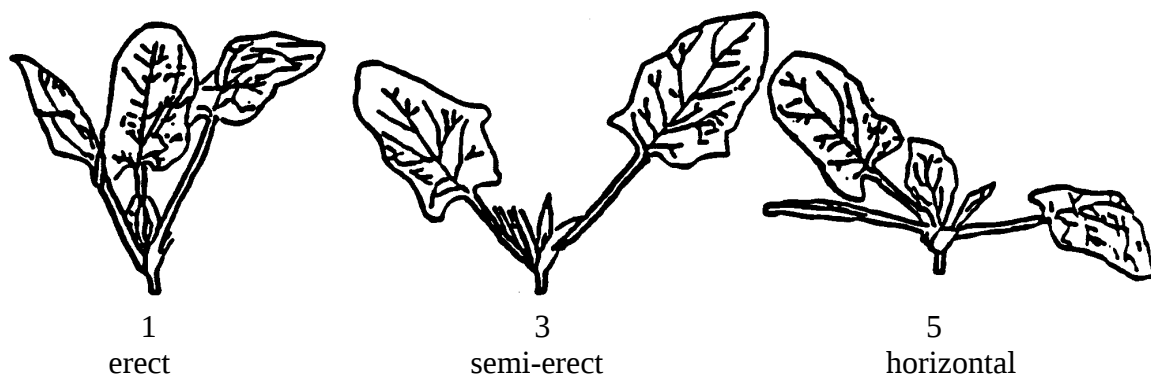


5  
medium



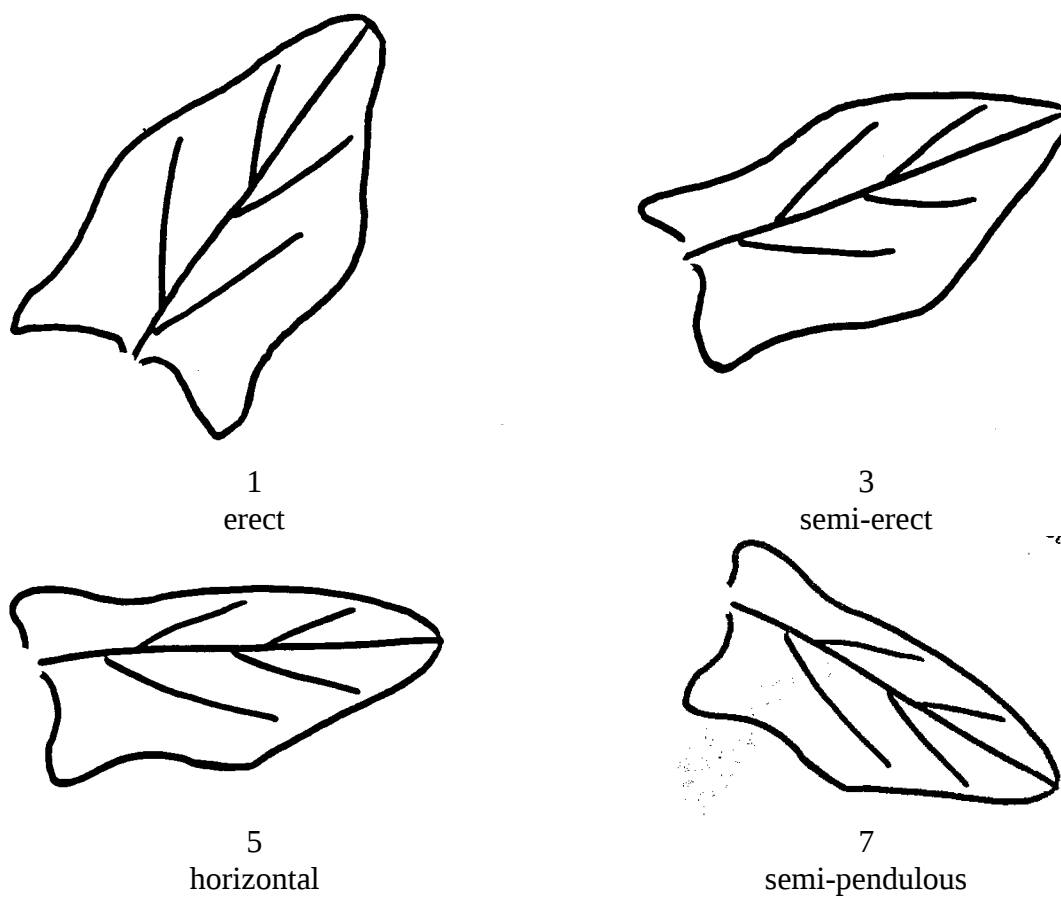
7  
strong

Ad. 6: Petiole: attitude



Ad. 8: Leaf blade: attitude

To be observed in relation to the horizontal, independent of the attitude of the petiole (characteristic 5).



Ad. 13: Proportion of monoecious plantsAd. 14: Proportion of female plantsAd. 15: Proportion of male plants

Observations on the proportion of monoecious, female or male plants should be made at the beginning of seed setting. The three groups are defined as follows:

Monoecious plants: plants which have both male flowers and female flowers (seeds clearly visible);

Female plants: plants which have only female flowers (seeds clearly visible);

Male plants: plants which have only male flowers.

|                    | <u>Note</u> | <u>Approximate percentage</u> |
|--------------------|-------------|-------------------------------|
| absent or very low | 1           | < 10%                         |
|                    | 2           | 20%                           |
| low                | 3           | 30%                           |
|                    | 4           | 40%                           |
| medium             | 5           | 50%                           |
|                    | 6           | 60%                           |
| high               | 7           | 70%                           |
|                    | 8           | 80%                           |
| very high          | 9           | > 90%                         |

Ad. 16: Time of start of bolting (for spring sown crops, 15% of plants)

The time of bolting of a plant is when the central flowering stem appears through stretching of the internodes.

Ad. 17: Seed: spines (harvested seed)

1  
absent



9  
present

Ad. 18: Resistance to *Peronospora farinosa* f. sp. *spinaciae*

Maintenance of races

Type of medium: Living host plants, obtainable from:  
Naktuinbouw  
P.O. Box 40  
NL-2370 AA Roelofarendsveen  
Netherlands  
www.naktuinbouw.com  
or plant material with spores stored at -20° C for a maximum  
of one year

Execution of test

Growth stage of plants: First cotyledons/leaf, eleven-day-old plants

Temperature: 15°C during day/12°C during night

Light: 15 hours per day, after emergence

Growing method: In soil in pots or trays in a glasshouse or growth chamber

Method of inoculation: Sporulating leaves, taken from host plants that were infected seven days before, are thoroughly rinsed with sterile tap water (maximum 150 ml water per 224 plants). The spore suspension is filtered through cheesecloth and sprayed on test plants until the inoculum covers the leaves but does not run off. 150 ml of suspension is enough for up to 3 x 224 plants. Spore density should be 20,000 to 100,000 conidia/ml water. The spore suspension should be used fresh.

Remarks: Spinach downy mildew is wind-borne. Sporulating plants should be kept in closed containers or isolated chambers to prevent any cross-contamination. Resistant controls are needed in each multiplication and in each test to ensure the race identity.

Light and humidity conditions during seedling development and incubation are critical. Optimal humidity of approximately 80-90% RH allows plant growth and fungal growth; strong light inhibits spore germination and infection.

The test should be carried out in wintertime with protection against direct sunshine. After inoculation, the plants should remain under plastic for three days. After this time, the plastic should be slightly raised during the daytime.

Duration of test

|                           |                                         |
|---------------------------|-----------------------------------------|
| - Multiplication          | harvest spores 7 days after inoculation |
| - Sowing to inoculation:  | 11 days                                 |
| - Inoculation to reading: | 10 days                                 |

Number of plants tested at least 20 plants

Evaluation of infection: Resistance is usually complete; sometimes necrotic spots are visible as a result of infection. Some varieties may have a slightly lower level of resistance, showing for example a slight tip sporulation. In the table this is/these varieties are indicated by (R).  
Susceptible plants show varying degrees of sporulation. Sporulation is visible as a grey covering on leaves, starting on the more humid abaxial side.

Disease resistance reactions of spinach downy mildew races on differentials of the International Working Group on *Peronospora* (IWGP)

Races Pfs: 1-8 and 10-17 of *Peronospora farinosa* f. sp. *spinaciae* are defined with a standard set of differentials according to the following table:

Differentials and isolates are available at Naktuinbouw:

Naktuinbouw  
P.O. Box 40  
NL-2370 AA Roelofarendsveen  
Netherlands  
[www.naktuinbouw.com](http://www.naktuinbouw.com)

| Race - Pfs:   |   |   |   |     |   |     |     |   |     |    |    |     |    |     |    |     |
|---------------|---|---|---|-----|---|-----|-----|---|-----|----|----|-----|----|-----|----|-----|
| Differentials | 1 | 2 | 3 | 4   | 5 | 6   | 7   | 8 | 10  | 11 | 12 | 13  | 14 | 15  | 16 | 17  |
| Viroflay      | S | S | S | S   | S | S   | S   | S | S   | S  | S  | S   | S  | S   | S  | S   |
| NIL 5         | R | R | S | S   | S | S   | S   | S | S   | S  | S  | S   | S  | S   | S  | S   |
| NIL 3         | R | S | R | S   | R | S   | S   | R | S   | R  | R  | S   | R  | S   | R  | S   |
| NIL 4         | R | R | R | R   | S | S   | S   | S | S   | S  | S  | S   | S  | R   | S  | S   |
| NIL 6         | R | S | R | R   | R | S   | R   | S | S   | R  | S  | (R) | S  | R   | R  | S   |
| NIL 1         | R | R | R | R   | R | R   | R   | S | S   | R  | S  | R   | S  | R   | R  | S   |
| Whale         | R | R | R | (R) | R | (R) | (R) | R | (R) | R  | R  | S   | R  | (R) | R  | S   |
| Pigeon        | R | R | R | R   | R | R   | R   | R | R   | R  | R  | R   | S  | R   | S  | S   |
| Caladonia     | R | R | R | R   | R | R   | R   | R | R   | R  | R  | R   | R  | S   | R  | S   |
| Meerkat       | R | R | R | R   | R | R   | R   | R | R   | R  | R  | R   | R  | R   | S  | (R) |
| Hydrus        | R | R | R | R   | R | R   | R   | R | R   | R  | R  | R   | R  | R   | R  | R   |

Legend: S = susceptible, R or (R) = resistant

(Courtesy of ISF, table available under <http://www.worldseed.org>)

## Ad. 19: Resistance to Cucumber mosaic virus (CMV)

### Maintenance and propagation of isolates

|                     |                                                                                                                                                                                                                                              |
|---------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Storage of medium:  | on leaves in freezer or desiccated over CaCl <sub>2</sub>                                                                                                                                                                                    |
| Special conditions: | Isolates NL 16 and SP 43 which can be obtained from:<br>PRI (Plant Research International)<br>Prime Diagnostics<br>P.O. Box 16<br>NL-6700 AA Wageningen<br>Netherlands<br><a href="http://www.primediagnosics.nl">www.primediagnosics.nl</a> |
| Propagation:        | on susceptible cucumber plants                                                                                                                                                                                                               |

### Execution of test

|                          |                                                                                                                                                                                 |
|--------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Growth stage of plants:  | when two or three true leaves are present                                                                                                                                       |
| Temperature:             | 20°C during the day, 18°C during the night                                                                                                                                      |
| Light:                   | at least 16 hours per day                                                                                                                                                       |
| Growing method:          | plants grown in 5 x 5 cm module (potting soil)                                                                                                                                  |
| Preparation of inoculum: | a mixture of isolates is ground in water (dilution 1:10)                                                                                                                        |
| Method of inoculation:   | plants are dusted with carborundum powder on two or three leaves and then rubbed with a sponge soaked in inoculum. After inoculation, the plants are lightly rinsed with water. |
| Remarks:                 | due to climatic conditions, the test is best carried out from February to June (Northern Hemisphere).                                                                           |

### Observations

|                      |                                                          |
|----------------------|----------------------------------------------------------|
| Time of observation: | 7 to 9 days after inoculation                            |
| Symptoms:            |                                                          |
| resistant plant:     | no symptoms                                              |
| sensitive plant:     | dwarf growth, mosaic symptoms in the heart of the plants |

### Differential host varieties to be used

|                      |          |
|----------------------|----------|
| susceptible variety: | Polka    |
| resistant variety:   | Symphony |

## 9. Literature

Dressler, O., 1973: Erfahrungen bei der Vermehrung und Züchtung monöischer Spinatsorten (*Spinacea oleracea* L.). Zeitschrift für Pflanzenzüchtung 70, Paul Parey Verlag, Berlin und Hamburg, DE, pp. 108-128.

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Irish, B.M., Correll, J.C., Koike S.T., Schafer J., Morelock T.E., 2003: Identification and cultivar reaction to the three new races of the spinach downy mildew pathogen from the United States and Europe. Plant Disease 87: 567-572

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Ryder, E.J., 1979: Leafy Salad Vegetables. AVI Publishing Company Inc., Westport, Connecticut, US.

Sneep, J., 1962: Spinat. In: Handbuch der Pflanzenzüchtung, 2. Auflage, Band 6, Züchtung von Gemüse, Obst, Reben und Forstpflanzen. Herausgeber: Kappert, H. und Rudolf, W., Paul Parey Verlag, Berlin und Hamburg, DE.

Shinohara, S., 1984: Vegetable Seed Production Technology of Japan. Elucidated with respective variety development histories, Particulars. Vol I, 1984, SAACEO, Tokyo, JP.

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Wiebe, H.-J., 1987: Einfluß der Tageslänge auf Entwicklung, Wachstum und Nitratgehalt von Spinatsorten. Gartenbauwissenschaft, 53(3), 103-108.

10. Technical Questionnaire

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

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

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

4.1 Breeding scheme

4.1.1 Crossing

a) controlled cross [    ]  
(please state parent varieties)

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

(c) unknown cross [    ]

4.1.2 Mutation [    ]  
(please state parent variety)

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

4.1.4 Other [    ]  
(please provide details)

4.2 Breeding scheme

(a) Hybrid [    ]  
(please state parent varieties)

(b) open-pollinated variety [    ]  
(please state known parent variety(ies))

(c) 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: |
|-------------------------|-----------------|-------------------|

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 |
|---------------------------------------------------------------|----------------------------------|------|
| <b>5.1 Leaf blade: intensity of green color</b><br><b>(3)</b> |                                  |      |
| very light                                                    |                                  | 1[ ] |
| light                                                         | Monet, Viroflay,<br>Winterreuzen | 3[ ] |
| medium                                                        | Butterflay, Monnopa              | 5[ ] |
| dark                                                          | Imola, Lavewa, Nores             | 7[ ] |
| very dark                                                     | Lorelay, Mystic                  | 9[ ] |
| <b>5.2 Leaf blade: blistering</b><br><b>(4)</b>               |                                  |      |
| absent or very weak                                           | Matador                          | 1[ ] |
| weak                                                          | Polka, Tarpy                     | 3[ ] |
| medium                                                        | Butterflay, Koala, Mystic        | 5[ ] |
| strong                                                        | Giraffe, Rhythm                  | 7[ ] |
| very strong                                                   | Menorca, Revolver                | 9[ ] |
| <b>5.3 Leaf blade: shape of apex</b><br><b>(11)</b>           |                                  |      |
| acute                                                         | Grappa, Rhythm                   | 1[ ] |
| obtuse                                                        | Resistoflay                      | 2[ ] |
| rounded                                                       | Imola, Nores                     | 3[ ] |

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

| Characteristics                                                                 | Example Varieties         | Note |
|---------------------------------------------------------------------------------|---------------------------|------|
| <b>5.4 Proportion of monoecious plants (13)</b>                                 |                           |      |
| absent or very low                                                              | Medania                   | 1[ ] |
| low                                                                             | Matador                   | 3[ ] |
| medium                                                                          | Figo                      | 5[ ] |
| high                                                                            | Giraffe, Lazio            | 7[ ] |
| very high                                                                       | Monnopa                   | 9[ ] |
| <b>5.5 Proportion of female plants (14)</b>                                     |                           |      |
| absent or very low                                                              | Monnopa                   | 1[ ] |
| low                                                                             | Giraffe                   | 3[ ] |
| medium                                                                          | Figo, Medania             | 5[ ] |
| high                                                                            | Parrot                    | 7[ ] |
| very high                                                                       |                           | 9[ ] |
| <b>5.6 Proportion of male plants (15)</b>                                       |                           |      |
| absent or very low                                                              | Monnopa, Parrot           | 1[ ] |
| low                                                                             |                           | 3[ ] |
| medium                                                                          | Medania                   | 5[ ] |
| high                                                                            |                           | 7[ ] |
| very high                                                                       |                           | 9[ ] |
| <b>5.7 Time of start of bolting (for spring sown crops, 15% of plants) (16)</b> |                           |      |
| very early                                                                      | Figo, Maracas             | 1[ ] |
| early                                                                           | Bandola, Viroflay         | 3[ ] |
| medium                                                                          | Matador, Monnopa          | 5[ ] |
| late                                                                            | Grappa, Medania, Revolver | 7[ ] |
| very late                                                                       | Chica, Lavewa             | 9[ ] |

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

6. Similar varieties and differences from these varieties

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

| Denomination(s) of variety(ies) similar to your candidate variety | Characteristic(s) in which your candidate variety differs from the similar variety(ies) | Describe the expression of the characteristic(s) for the <b>similar</b> variety(ies) | Describe the expression of the characteristic(s) for <b>your</b> candidate variety |
|-------------------------------------------------------------------|-----------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|------------------------------------------------------------------------------------|
| <i>Example</i>                                                    | <i>proportion of male plants</i>                                                        | <i>absent or very low</i>                                                            | <i>medium</i>                                                                      |
|                                                                   |                                                                                         |                                                                                      |                                                                                    |
|                                                                   |                                                                                         |                                                                                      |                                                                                    |

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

(a) Variety use:

|                                        |                          |
|----------------------------------------|--------------------------|
| – only in glasshouse                   | <input type="checkbox"/> |
| – only in the open                     | <input type="checkbox"/> |
| – in the open <u>and</u> in glasshouse | <input type="checkbox"/> |

(b) Resistance to pests and diseases (specify)

(i) Resistance to *Peronospora farinosa* f. sp. *spinaciae*

|              |            |             |                |
|--------------|------------|-------------|----------------|
| Race Pfs: 1  | [ ] absent | [ ] present | [ ] not tested |
| Race Pfs: 2  | [ ] absent | [ ] present | [ ] not tested |
| Race Pfs: 3  | [ ] absent | [ ] present | [ ] not tested |
| Race Pfs: 4  | [ ] absent | [ ] present | [ ] not tested |
| Race Pfs: 5  | [ ] absent | [ ] present | [ ] not tested |
| Race Pfs: 6  | [ ] absent | [ ] present | [ ] not tested |
| Race Pfs: 7  | [ ] absent | [ ] present | [ ] not tested |
| Race Pfs: 8  | [ ] absent | [ ] present | [ ] not tested |
| Race Pfs: 10 | [ ] absent | [ ] present | [ ] not tested |
| Race Pfs: 11 | [ ] absent | [ ] present | [ ] not tested |
| Race Pfs: 12 | [ ] absent | [ ] present | [ ] not tested |
| Race Pfs: 13 | [ ] absent | [ ] present | [ ] not tested |
| Race Pfs: 14 | [ ] absent | [ ] present | [ ] not tested |
| Race Pfs: 15 | [ ] absent | [ ] present | [ ] not tested |
| Race Pfs: 16 | [ ] absent | [ ] present | [ ] not tested |
| Race Pfs: 17 | [ ] absent | [ ] present | [ ] not tested |

(ii) Resistance to Cucumber mosaic virus (CMV)

[ ] absent                      [ ] present

# 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 <input type="checkbox"/> | No <input type="checkbox"/> |
| (b) Chemical treatment (e.g. growth retardant, pesticide) | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| (c) Tissue culture                                        | Yes <input type="checkbox"/> | No <input type="checkbox"/> |
| (d) Other factors                                         | Yes <input type="checkbox"/> | No <input type="checkbox"/> |

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