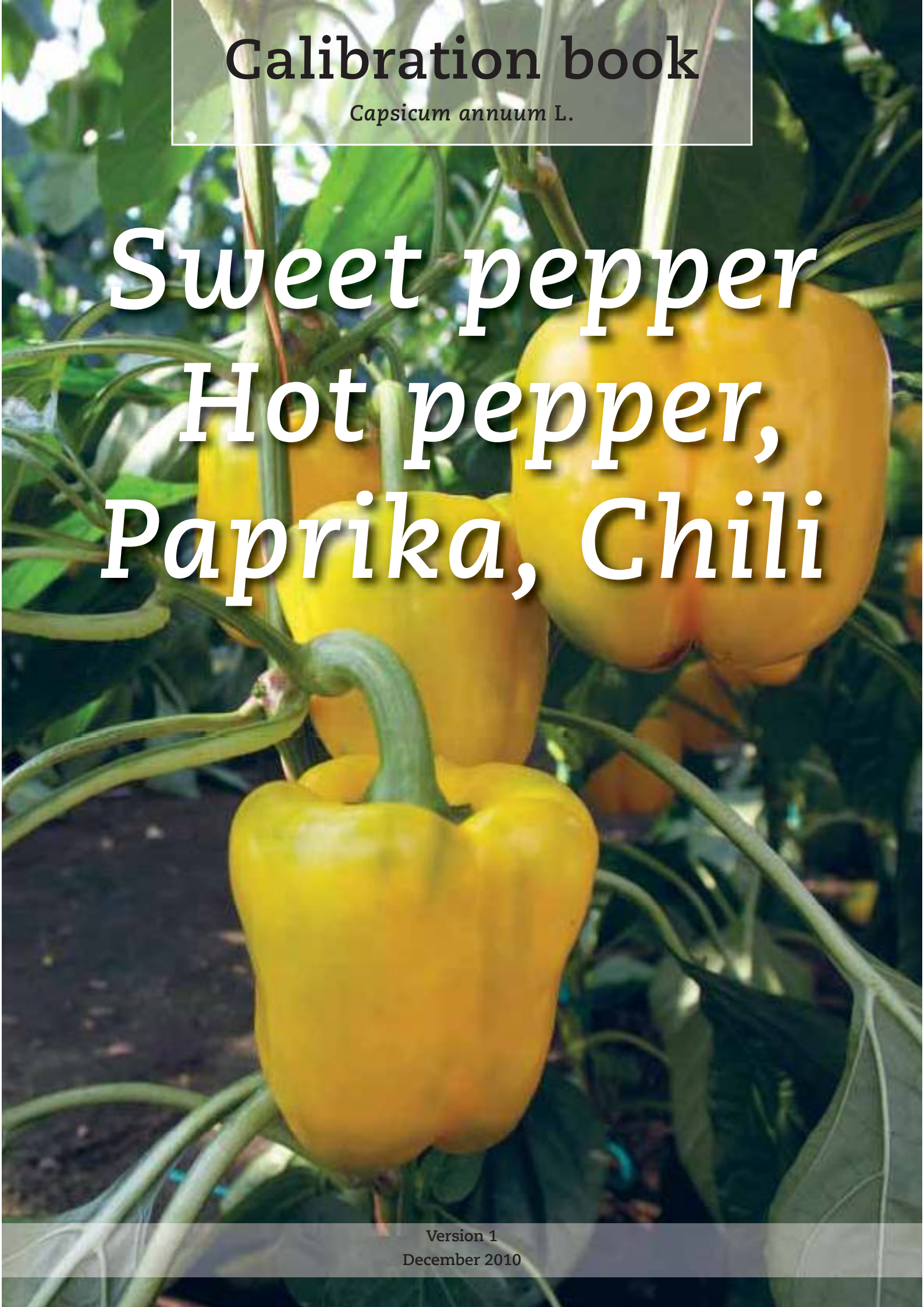
# Calibration book

*Capsicum annuum* L.



# Sweet pepper
# Hot pepper, Paprika, Chili

Version 1
December 2010

# Naktuinbouw calibration book

*Capsicum annuum* L.

## sweet pepper, hot pepper, paprika, chili

Version 1

## Introduction

In front of you, you find the Naktuinbouw calibration book for pepper. This book may be used as guidance for the completion of application forms, the describing of varieties or the understanding of variety descriptions. This book can not replace the skill needed to make a variety description, but may serve as support.

**Sources used**
The basis for this book is the CPVO protocol CPVO-TP/076/2 which in turn is based on UPOV Guideline TG/76/8. Please also use these sources for reference when using this calibration book.
The application of this calibration book is based on the general UPOV principles on the definitions and use of characteristics of variety descriptions (UPOV TG/1/3)

**Application methodology**
The UPOV system is based on the expression of characteristics that are related to the expression values of example varieties. In the calibration book you find two types of characteristics; visually assessed characteristics and measured characteristics.
The value of the visually assessed characteristics can be compared with the visual value of the expression of example varieties. In the calibration book you may find drawings or pictures to assist in the decision on the applicable expression.
For measured characteristics this is more complicated as in many cases the value of the measurements is depending on the (climatical) conditions of the trials. The use of example varieties in these cases is indispensable. The same applies for those visually assessed characteristics that are prone to influence by climate (e.g. anthocyanin coloration). In this calibration book these example varieties are only included for the characteristics that appear in the Technical Questionnaire. Others are not included as many prefer their own set of example varieties, but may be found in the relevant CPVO protocol.

**Example varieties**
If example varieties are mentioned in characteristics that apply for white and red cabbage, the varieties are linked to the relevant species using (W) and (R) respectively.

**Website**
The CPVO and UPOV documents mentioned above can be found on the Naktuinbouw website (*http://www.naktuinbouw.nl/onderwerp/kalibratieboeken*). On this website you can also find announcements of possible modifications of the published calibration books.

**Helpdesk**
For possible remarks, suggestions and questions on the calibration books and the website, you may contact Naktuinbouw at our email address: kalibratieboek@naktuinbouw.nl

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## 1 Seedling: anthocyanin coloration of hypocotyl

**Grouping characteristic:** yes.

**Type of characteristic**: **QL** – Qualitative characteristic.

**Type of observation**: **VG** – Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Stage of observation:** 10 to 14 days after sowing.

**Method of observation:** Visual observation of the cotyledon. The anthocyanin coloration of hypocotyl is sometimes difficult to assess. Varieties without anthocyanin coloration of hypocotyl, would most of the time (but not always) have no antocyanin coloration in anther (characterisctic 19). Anthocyanin coloration of nodes (characterisctic 7 and 8) will often be absent or very week. If in doubt, verify later with regard to coloration of nodes.

**Notes, states of expression and example varieties:**
1: absent Albareria, Albena
9: present Lamuyo

## 1 Seedling: anthocyanin coloration of hypocotyl

1: absent 9: present

## 2 Plant: length of stem

**Grouping characteristic:** no.

**Type of characteristic**: **QN** – Quantitative characteristic.

**Type of observation: MS/VG** – Choice between
**-** Calculated average of the measurement of 20 plants or parts of plants and
- Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Stage of observation:** Before maturity on fully developed plants.

**Method of observation:** Visual observation. Calibrate using example varieties in the same trial.

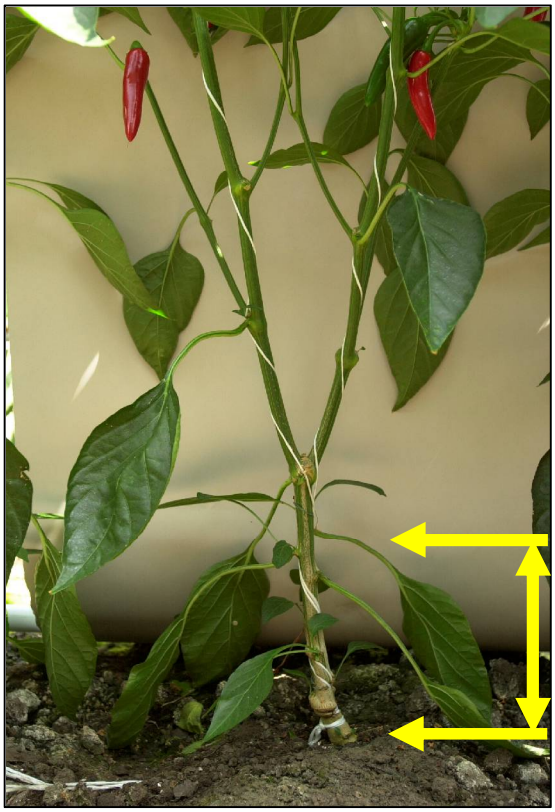
**Notes and states of expression:**
1: very short
2: very short to short
3: short
4: short to medium
5: medium
6: medium to long
7: long
8: long to very long
9: very long

**CPVO explanation:**

The length of stem is measured from the cotyledons to the first flower branch.

## 2 Plant: length of stem

3: short



5: medium

7: long

**These images serve only to illustrate the variation present in the crop and should not be used as an absolute reference.**

## 3 Plant: shortened internodes (in upper part)

**Grouping characteristic:** yes.

**Type of characteristic**: **QL** – Qualitative characteristic.

**Type of observation**: **VG** – Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Stage of observation:** Before maturity on fully developed plants.

**Notes, states of expression and example varieties:**
1: absent California wonder, De Cayenne
2: present Fehér, Kalocsai 601, Kalocsai 702

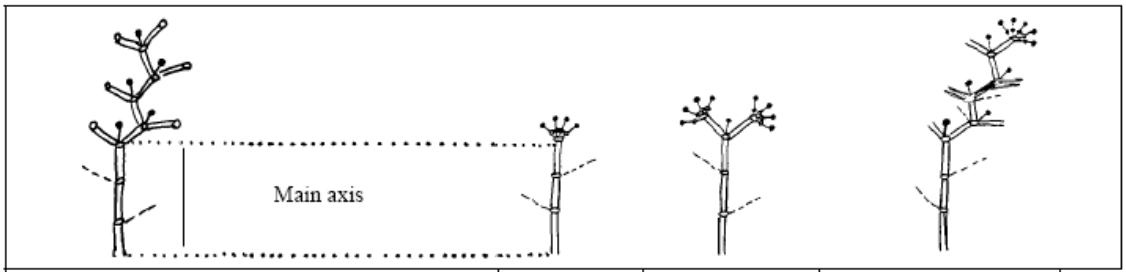
**Method of observation: according to CPVO explanation**.
The tests should be done on plants which have not been pruned. The shoot system of pepper consists of main stems, which are branched off from the main axis and side shoots. Two growth types of the main stems can be distinguished:

Growth type A: the main stems grow indeterminately; one or two flowers develop per node and shortened internodes never develop.

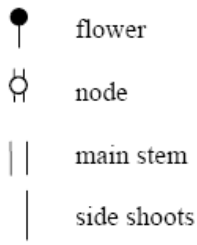
Growth type B: after the first branching of the main axis, shorter internodes appear and the growth of the main stem ends in a bunch of flowers (it appears as if there are more than two flowers per node). Side shoots develop from the nodes on the main axis and on the main stems.

Growth type A Growth type B

| Char. 3: Plant: shortened internodes (in upper part) | |
|---|---|
| absent | present |




| Char. 4: Varieties with shortened internodes only: Plant: number of internodes between the first flower and shortened internodes | none (1) | one to three (2) | more than three (3) |
|---|---|---|---|



## 4 Varieties with shortened internodes only: Plant: number of internodes between the first flower and shortened internodes

**Grouping characteristic:** no.

**Type of characteristic**: **QN** – Quantitative characteristic.

**Type of observation: MS** – Calculated average of the measurement of 20 plants or parts of plants.

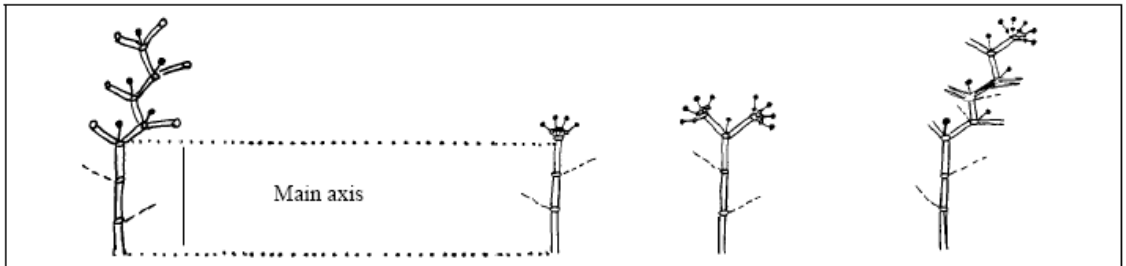
**Stage of observation:** Before maturity on fully developed plants.

**Notes, states of expression and example varieties:**
1: none Kalocsai 601
2: one to three Fehér
3: more than three Kalocsai 702

**Method of observation: according to CPVO explanation:**
The tests should be done on plants which have not been pruned.

Growth type A Growth type B

| Char. 3: Plant: shortened internodes (in upper part) | |
|---|---|
| absent | present |




| Char. 4: Varieties with shortened internodes only: Plant: number of internodes between the first flower and shortened internodes | none (1) | one to three (2) | more than three (3) |
|---|---|---|---|

flower
node
main stem
side shoots

## 5 <u>Varieties without shortened internodes only:</u> Plant: length of internode (on primary side shoots)

**Grouping characteristic:** no.

**Type of characteristic**: **QN** – Quantitative characteristic.

**Type of observation: MS/VG** – Choice between
**-** Calculated average of the measurement of 20 plants or parts of plants and
- Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Stage of observation:** Before maturity on fully developed plants.

**Method of observation:** The length of internodes can be strongly influenced by environment and both, longer and shorter internodes can be present on the same plant (primary side shoots). Estimate the average length of nodes in the middle of the third part of the plant. Calibrate using example varieties.

**Notes and states of expression:**
1: very short
2: very short to short
3: short
4: short to medium
5: medium
6: medium to long
7: long
8: long to very long
9: very long

## 6 Plant: anthocyanin coloration of nodes

**Grouping characteristic:** no.

**Type of characteristic:** QL – Qualitative characteristic.

**Type of observation: VG** – Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Stage of observation:** Before maturity on fully developed plants.

**Method of observation:** Visual observation of nodes of examples varieties in the same trial and comparison with application variety. Note: The expression of coloration of nodes is genetically determined. However, the degree of anthocyanin coloration can be influenced by number of factors like temperature, the length of day and light intensity.

**Notes and states of expression:**
1: absent
2: present


1: absent


9: present

## 7 Stem: intensity of anthocyanin coloration of nodes

**Grouping characteristic:** no.

**Type of characteristic: QN** – Quantitative characteristic.

**Type of observation: VG** – Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Stage of observation:** Before maturity on fully developed plants.

**Method of observation:** Visual observation of the nodes. Estimate the average intensity of antocyanin of nodes in the middle of third section of the plant and compare with intensity of examples varieties in the same trial. Note: The intensity of coloration of nodes can be influenced by number of environmental factors like temperature, the length of day and light intensity.

**Notes and states of expression:**
1: very weak
2: very weak to weak
3: weak
4: weak to medium
5: medium
6: medium to strong
7: strong
8: strong to very strong
9: very strong


1: very weak


5: medium


9: very strong

**These images serve only to illustrate the variation present in the crop and should not be used as an absolute reference.**

## 8 Stem: hairiness of nodes

**Grouping characteristic:** no.

**Type of characteristic**: **QN** – Quantitative characteristic.

**Type of observation**: **VG** – Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Stage of observation:** Before maturity on fully developed plants.

**Method of observation:** Visual observation in the middle of third section of the plant. Calibrate with examples varieties. Note: Avoid observation by bright sunlight as this characteristic may be sometimes difficult to assess. Generally, in varieties resistant to TSWV, hairiness of nodes is more prominent.

**Notes and states of expression:**
1: absent or very weak
2: very weak to weak
3: weak
4: weak to medium
5: medium
6: medium to strong
7: strong
8: strong to very strong
9: very strong

## 8 Stem: hairiness of nodes

3: weak Jiminy

7: strong Carnation

9: very strong Heron J

## 9 Plant: height

**Grouping characteristic:** no.

**Type of characteristic**: **QN** – Quantitative characteristic.

**Type of observation: MS/VG** – Choice between
- Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant and
**-** Calculated average of the measurement of 20 plants or parts of plants.

**Stage of observation:** Before maturity on fully developed plants.

**Method of observation:** Visual observation. Calibrate using example varieties.

**Notes and states of expression:**
1: very short
2: very short to short
3: short
4: short to medium
5: medium
6: medium to tall
7: tall
8: tall to very tall
9: very tall

**CPVO explanation:**

To be observed after a fruit set on several nodes. Poor fruit set may influence the vigour and thus the height of the plant.

## 10 Leaf: length of blade

**Grouping characteristic:** no.

**Type of characteristic**: **QN** – Quantitative characteristic.

**Type of observation: MS/VG** – Choice between
**-** Calculated average of the measurement of 20 plants or parts of plants and
- Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Stage of observation:** Before maturity on fully developed plants.

**Method of observation:** Visual assessment by measurements and observations of fully developed leaves on the main stem in the middle of third section of the plant. Calibrate with examples varieties.

**Notes and states of expression:**
1: very short
2: very short to short
3: short
4: short to medium
5: medium
6: medium to long
7: long
8: long to very long
9: very long

## 10 Leaf: length of blade

1: very short 3: short De Cayenne 5: medium 7: long

## 11 Leaf: width of blade

**Grouping characteristic:** no.

**Type of characteristic**: **QN** – Quantitative characteristic.

**Type of observation: MS/VG** – Choice between
**-** Calculated average of the measurement of 20 plants or parts of plants and
- Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Stage of observation:** before maturity on fully developed plants.

**Method of observation:** Visual assessment by measurements and observations of fully developed leaves on the main stem in the middle of third section of the plant.

**Notes and states of expression:**
1: very narrow
2: very narrow to narrow
3: narrow
4: narrow to medium
5: medium
6: medium to broad
7: broad
8: broad to very broad
9: very broad

## 11 Leaf: width of blade

1: very narrow | 3: narrow De Cayenne | 5: medium | 7: broad

## 12 Leaf: intensity of green colour

**Grouping characteristic:** no.

**Type of characteristic**: **QN** – Quantitative characteristic.

**Type of observation**: **VG** – Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Stage of observation:** Before maturity on fully developed plants.

**Method of observation:** Visual assessment by observations of fully developed leaves on the main stem in the middle of third section of the plant. This characteristic should be observed under cloudy conditions and direct sunlight should be avoided.

**Notes and states of expression varieties:**
1: very light
2: very light to light
3: light
4: light to medium
5: medium
6: medium to dark
7: dark
8: dark to very dark
9: very dark

## 13 Leaf: shape

**Grouping characteristic:** no.

**Type of characteristic**: **PQ** – Pseudo-qualitative characteristic.

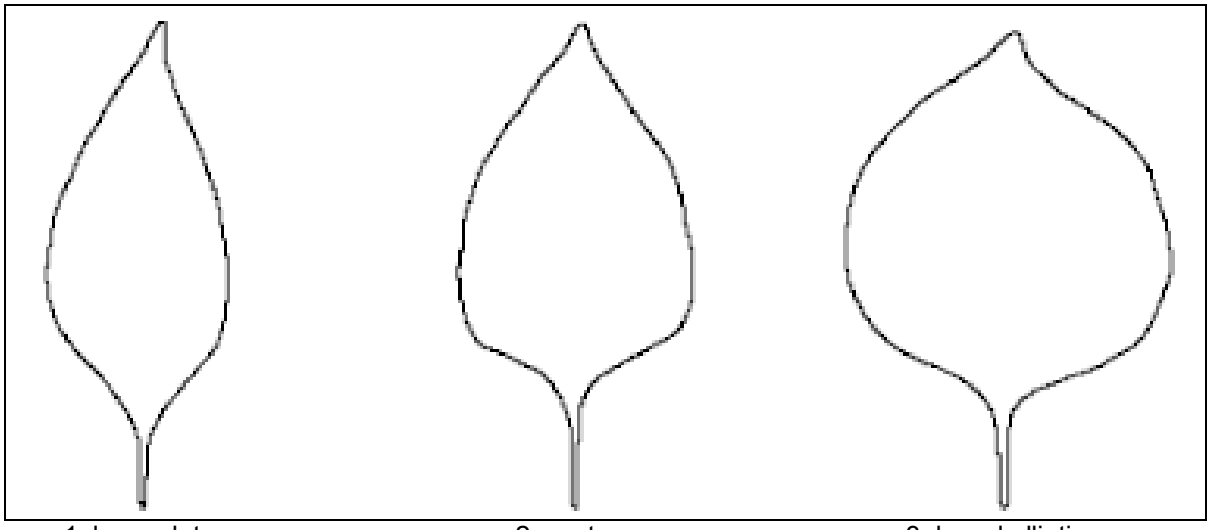
**Type of observation**: **VG** – Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Stage of observation:** Before maturity on fully developed plants.

**Method of observation:** Visual assessment by measurements and observations of fully developed leaves on the main stem in the middle of third section of the plant. Calibrate with examples varieties.

**Notes and states of expression:**
1: lanceolate
2: ovate
3: broad elliptic

**CPVO explanation:**



1: lanceolate 2: ovate 3: broad elliptic

## 13 Leaf: shape

1: lanceolate Lavico 2: ovate Anaheim 3: broad elliptic Sympathy

## 14 Leaf: undulation of margin

**Grouping characteristic:** no.

**Type of characteristic**: **QN** – Quantitative characteristic.

**Type of observation**: **VG** – Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Stage of observation:** Before maturity on fully developed plants.

**Method of observation:** Visual assessment by measurements and observations of fully developed leaves on the main stem in the middle of third section of the plant. Calibrate with examples varieties.

**Notes and states of expression:**
1: very weak
2: very weak to weak
3: weak
4: weak to medium
5: medium
6: medium to strong
7: strong
8: strong to very strong
9: very strong

| 1: very weak | 3: weak | 5: medium | 7: strong | 9: very strong |
|---|---|---|---|---|
| Cornago | Polara | Carnation | BSS 518 | Helga |

## 15 Leaf: blistering

**Grouping characteristic:** no.

**Type of characteristic**: **QN** – Quantitative characteristic.

**Type of observation**: **VG** – Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Stage of observation:** Before maturity on fully developed plants.

**Method of observation:** Visual assessment by measurements and observations of fully developed leaves on the main stem in the middle of third section of the plant. Calibrate with examples varieties.

**Notes and states of expression:**
1: very weak
2: very weak to weak
3: weak
4: weak to medium
5: medium
6: medium to strong
7: strong
8: strong to very strong
9: very strong

## 16 Leaf: profile in cross section

**Grouping characteristic:** no.

**Type of characteristic**: **QN** – Quantitative characteristic.

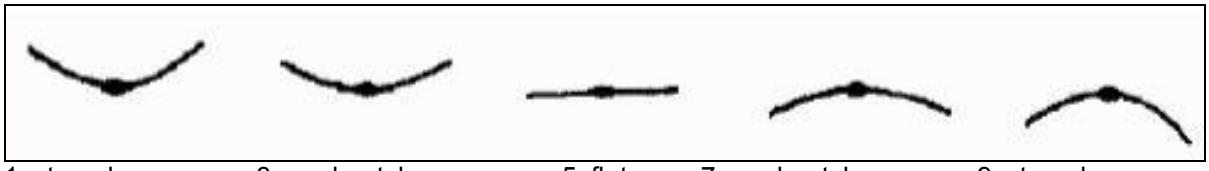
**Type of observation**: **VG** – Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Stage of observation:** Before maturity on fully developed plants.

**Method of observation:** Visual assessment by measurements and observations of fully developed leaves on the main stem in the middle of third section of the plant. Calibrate with examples varieties.

**Notes and states of expression:**
1: strongly concave
2: strongly concave to moderately concave
3: moderately concave
4: moderately concave to flat
5: flat
6: flat to moderately convex
7: moderately convex
8: moderately convex to strongly convex
9: strongly convex

**CPVO explanation:**



1: strongly concave 3: moderately concave 5: flat 7: moderately convex 9: strongly convex

## 17 Leaf: glossiness

**Grouping characteristic:** no.

**Type of characteristic**: **QN** – Quantitative characteristic.

**Type of observation**: **VG** – Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Stage of observation:** Before maturity on fully developed plants.

**Method of observation:** Visual assessment by observations of fully developed leaves on the main stem in the middle of third section of the plant. This characteristic should be observed under cloudy conditions and direct sunlight should be avoided.

**Notes and states of expression:**
1: very weak
2: very weak to weak
3: weak
4: weak to medium
5: medium
6: medium to strong
7: strong
8: strong to very strong
9: very strong

3: weak 5: medium 7: strong

## 18 Peduncle: attitude

**Grouping characteristic:** no.

**Type of characteristic**: **QN** – Quantitative characteristic.

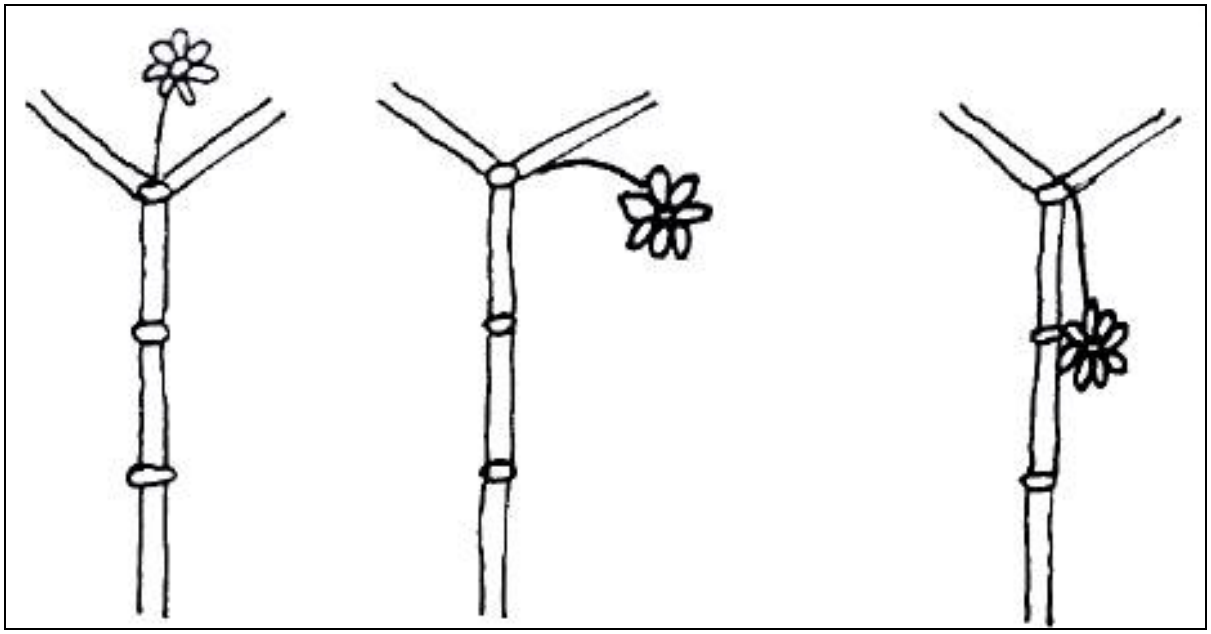
**Type of observation**: **VG** – Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Stage of observation:** Before a fruit set on fully developed plants.

**Method of observation:** Visual observation of predominated attitude of peduncles in relation to the side shoots. Calibrate with examples varieties.

**Notes and states of expression varieties:**
1: erect
2: semi-drooping
3: drooping

**CPVO explanation:**



1: erect 2: semi-drooping 3: drooping

## 19 Flower: anthocyanin coloration in anther

**Grouping characteristic:** no.

**Type of characteristic**: **QL** – Qualitative characteristic.

**Type of observation**: **VG** – Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Stage of observation:** On fully developed flowering plant.

**Method of observation:** Visual observation of the anther of fully opened flower. Calibrate using example varieties with and without anthocyanin coloration in anther. Check if characteristic 1: Seedling: anthocyanin coloration of hypocotyl is correctly filled in.

**Note:** Varieties without anthocyanin coloration of hypocotyl, would most of the time (but not always) have no anthocyanin coloration in anther (characteristic 19) and anthocyanin coloration of nodes (characteristic 7 and 8) will often be absent or very week.

**Notes and states of expression:**
1: absent
9: present

1: absent 2: present



1: absent 2: present

## 20 Fruit: colour (before maturity)

**Grouping characteristic:** yes.

**Type of characteristic**: **PQ** – Pseudo-qualitative characteristic.

**Type of observation**: **VG** – Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Stage of observation:** Before maturity, i.e. before the first colour change.

**Method of observation:** Visual assessment by a single observation of a group of plants or parts of plants.

**Note:** Depending on environmental influences like day length and light intensity, fruit colour greenish white and yellow (before maturity) can sometimes be difficult to tell apart. Calibrate therefore with examples varieties. Be aware of the fact that some varieties remain green at maturity.

**Notes, states of expression and example varieties:**

| | |
|---|---|
| 1: greenish white | Blanc d'Espagne |
| 2: yellow | Fehér, Sweet banana |
| 3: green | California wonder, Lamuyo |
| 4: purple | Nigra |

## 20 Fruit: colour (<u>before</u> maturity)

1: greenish white 2: yellow 3: green 4: purple

1: greenish white

2: yellow

## 21 Fruit: intensity of colour (before maturity)

**Grouping characteristic:** no.

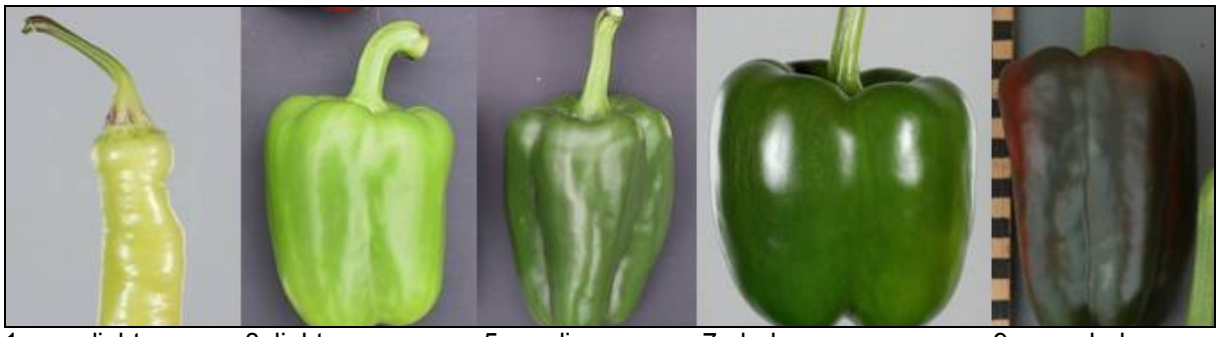
**Type of characteristic**: **QN** – Quantitative characteristic.

**Type of observation**: **VG** – Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Stage of observation:** Before maturity i.e. before the first colour change.

**Method of observation:** Visual assessment by a single observation of a group of plants or parts of plants. This characteristic should be observed under cloudy conditions and direct sunlight should be avoided. Calibrate with examples varieties.

**Notes and states of expression:**
1: very light
2: very light to light
3: light
4: light to medium
5: medium
6: medium to dark
7: dark
8: dark to very dark
9: very dark



1: very light 3: light 5: medium 7: dark 9: very dark

## 22 Fruit: anthocyanin coloration (before maturity)

**Grouping characteristic:** no.

**Type of characteristic**: **QL** – Qualitative characteristic.

**Type of observation**: **VG** – Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Stage of observation:** Before maturity, e.g. before the first colour change.

**Method of observation:** Visual observation. When anthocyanin is present in fruit (before maturity), it is also present at the base of the stalk. Varieties with purple fruit (before maturity) belong to class 9: anthocyanin present.

**Notes and states of expression:**
1: absent
9: present

1: absent Borsa 9: present Avana 9: present Zorro

## 23 Fruit: attitude

**Grouping characteristic: no.**

**Type of characteristic**: **QN** – Quantitative characteristic.

**Type of observation**: **VG** – Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Stage of observation:** At maturity, e.g. after the time of the first colour change.

**Method of observation:** Visual observation. Fruit attitude may vary within one plant. Establish the predominant attitude of fruit within a sample. You may indicate that the score is just between two classes; for example: 2 to 3. Calibrate with examples varieties.

**Notes and states of expression:**
1: erect
2: horizontal
3: drooping


1: erect


2: drooping

## 24 Fruit: length

**Grouping characteristic:** no.

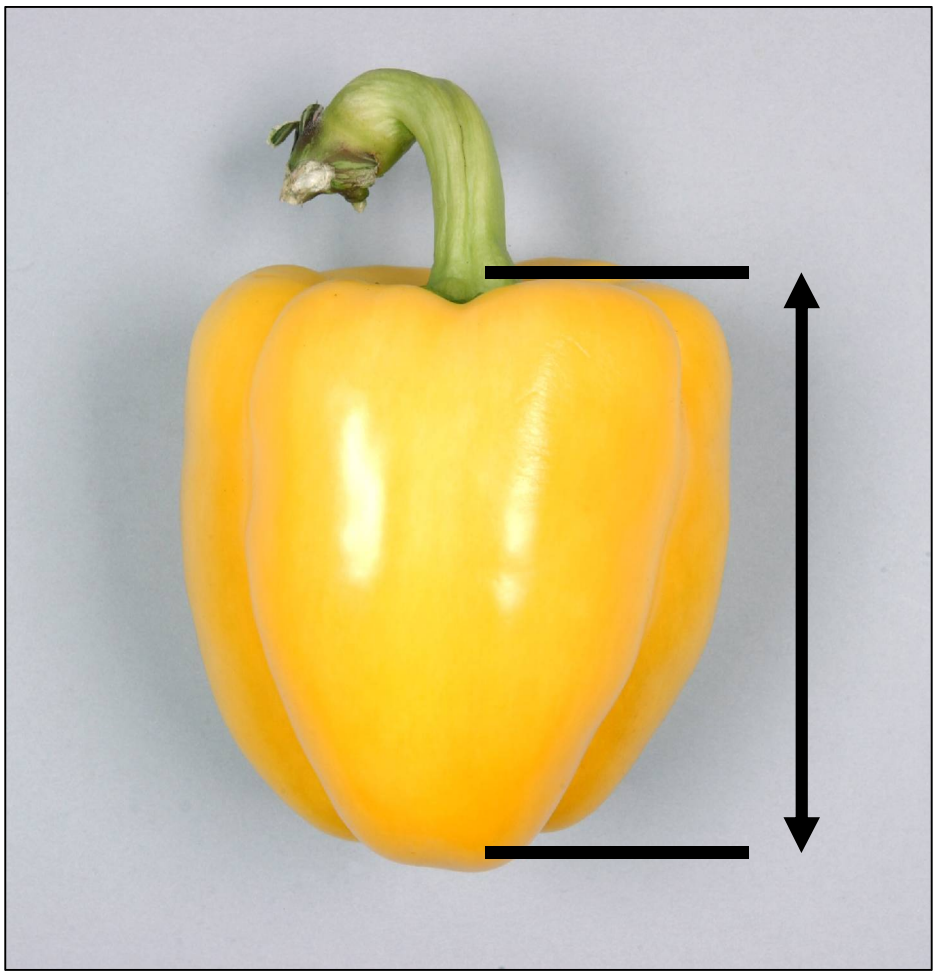
**Type of characteristic**: **QN** – Quantitative characteristic.

**Type of observation: MS/VG** – Choice between
**-** Calculated average of the measurement of 20 plants or parts of plants and
- Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Stage of observation:** At maturity, within 2-3 days after harvest.

**Method of observation:** Measure the length of the most representative fruits using the ruler.

**Notes and states of expression:**
1: very short
2: very short to short
3: short
4: short to medium
5: medium
6: medium to long
7: long
8: long to very long
9: very long



## 25 Fruit: diameter

**Grouping characteristic:** no.

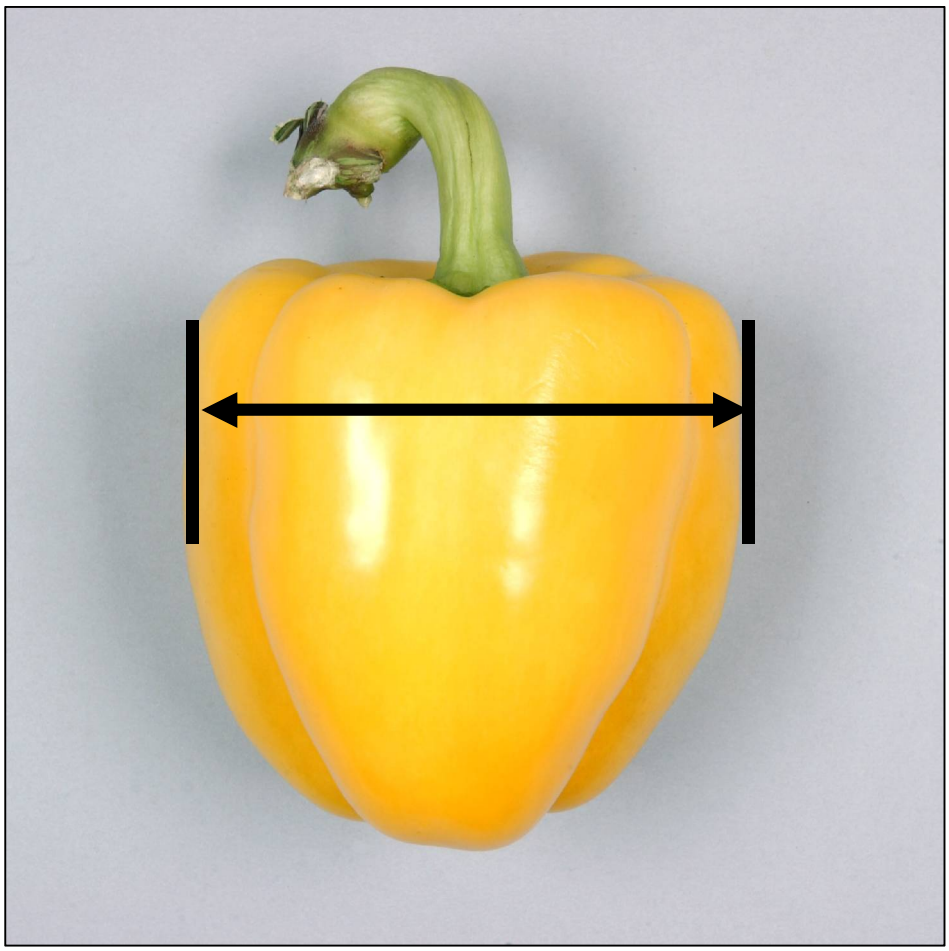
**Type of characteristic**: **QN** – Quantitative characteristic.

**Type of observation: MS/VG** – Choice between
**-** Calculated average of the measurement of 20 plants or parts of plants and
- Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Stage of observation:** At maturity, within 2-3 days after harvest.

**Method of observation:** Measure the diameter in the middle part of the most representative fruits using the ruler.

**Notes and states of expression:**
1: very narrow
2: very narrow to narrow
3: narrow
4: narrow to medium
5: medium
6: medium to broad
7: broad
8: broad to very broad
9: very broad



## 26 Fruit: ratio length / diameter

**Grouping characteristic:** no.

**Type of characteristic**: **QN** – Quantitative characteristic.

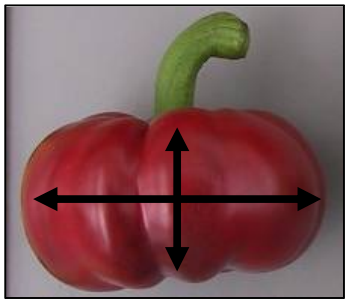
**Type of observation: MS** – Calculated average of the measurement of 20 plants or parts of plants.

**Stage of observation:** At maturity, within 2-3 days after harvest.

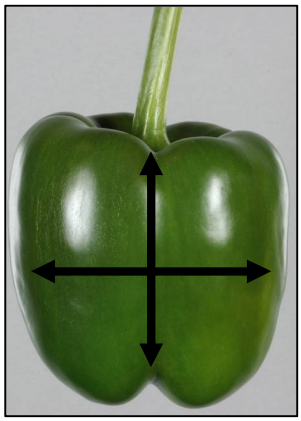
**Method of observation:** Use the length and diameter number figures to calibrate with example varieties.

**Notes and states of expression:**
1: very small
2: very small to small
3: small
4: small to medium
5: medium
6: medium to large
7: large
8: large to very large
9: very large

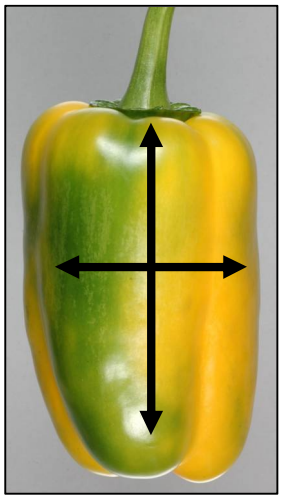
## 26 Fruit: ratio length / diameter



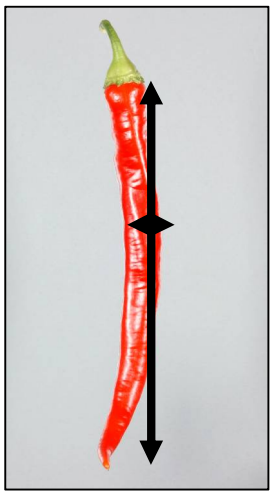
1: very small



5: medium



7: large



9: very large

## 27 Fruit: shape in longitudinal section

**Grouping characteristic:** yes.

**Type of characteristic**: **PQ** – Pseudo-qualitative characteristic.

**Type of observation: VG** – Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

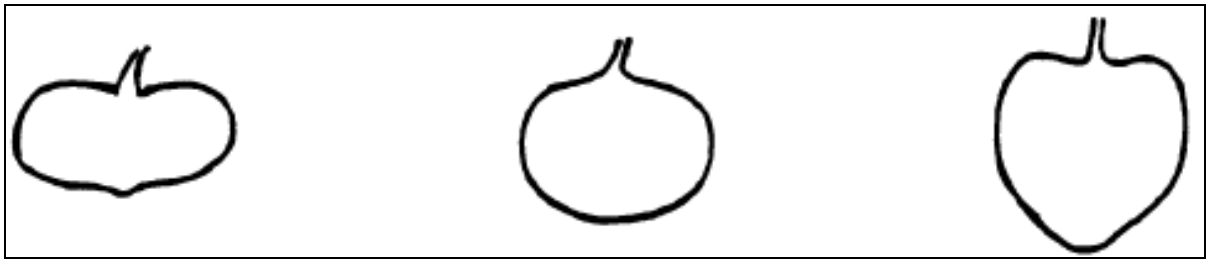
**Stage of observation:** At maturity, within 2-3 days after harvest.

**Method of observation:** Visual assessment. Calibrate with example varieties.

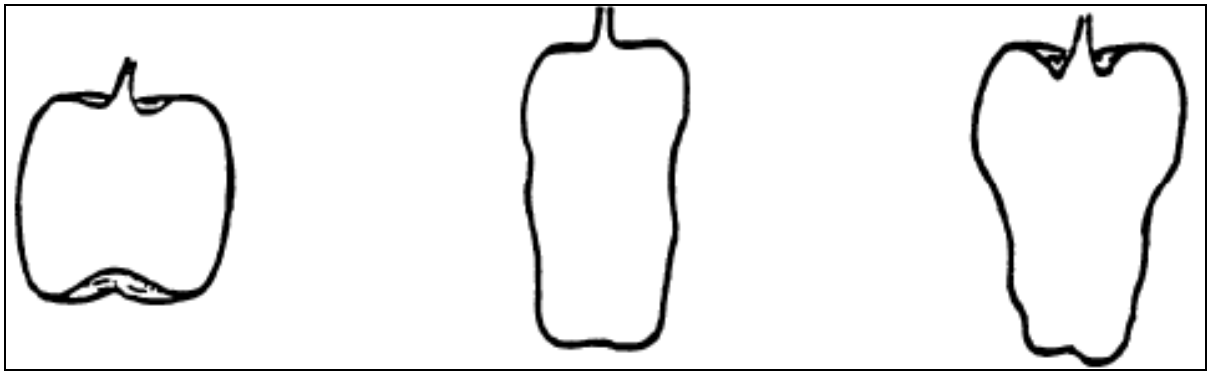
**Notes, states of expression and example varieties:**

| | |
|---|---|
| 1: oblate | Liebesapfel, PAZ szentesi, Topepo rosso |
| 2: circular | Cherry Sweet |
| 3: cordate | Daniel |
| 4: square | Delphin, Yolo Wonder |
| 5: rectangular | Clovis, Nocera rosso |
| 6: trapezoidal | Delta, Piperade |

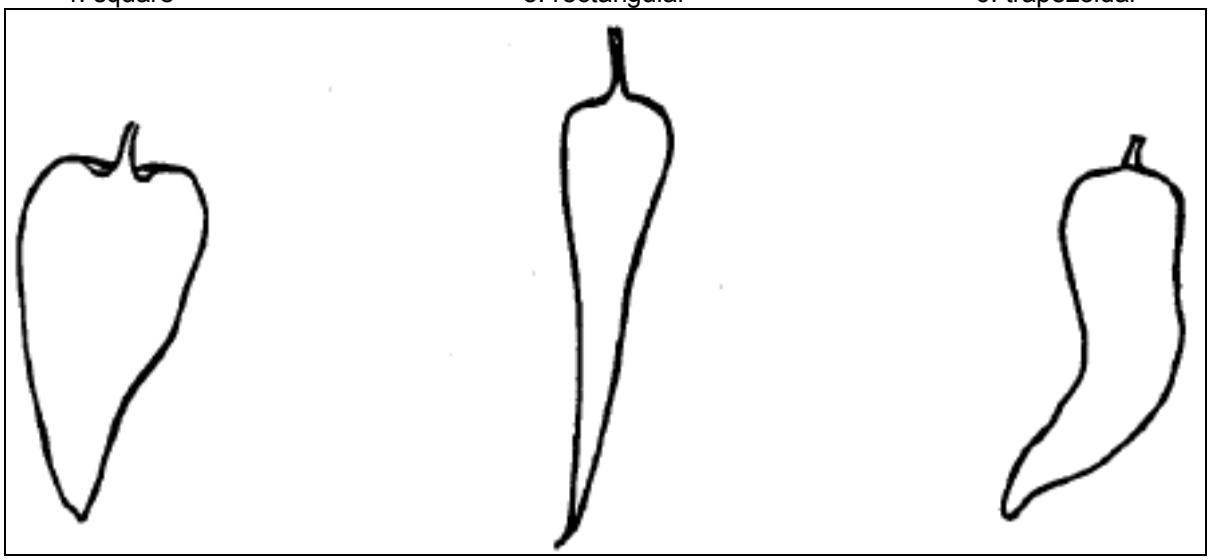
**CPVO explanation:**



1: oblate 2: circular 3: cordate



4: square 5: rectangular 6: trapezoidal



7: moderately triangular 8: narrowly triangular 9: horn shaped

## 28 Fruit: shape in cross section (at level of placenta)

**Grouping characteristic:** no.

**Type of characteristic**: **PQ** – Pseudo-qualitative characteristic.

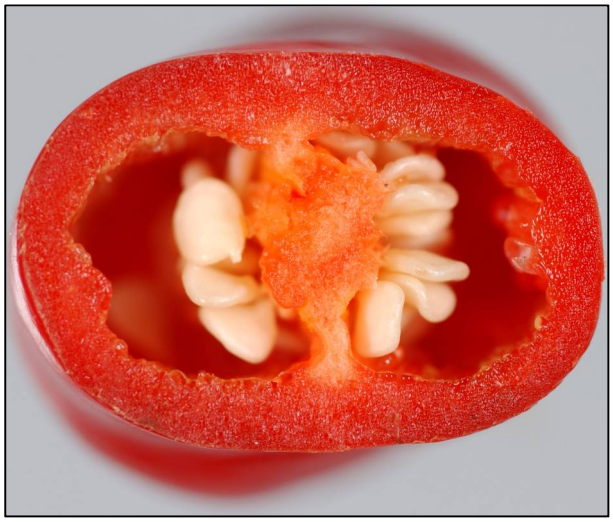
**Type of observation: VG** – Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Stage of observation:** At maturity, within 2-3 days after harvest.

**Method of observation:** Visual observation of the shape on several fruit cut at level of placenta. Calibrate with examples varieties.

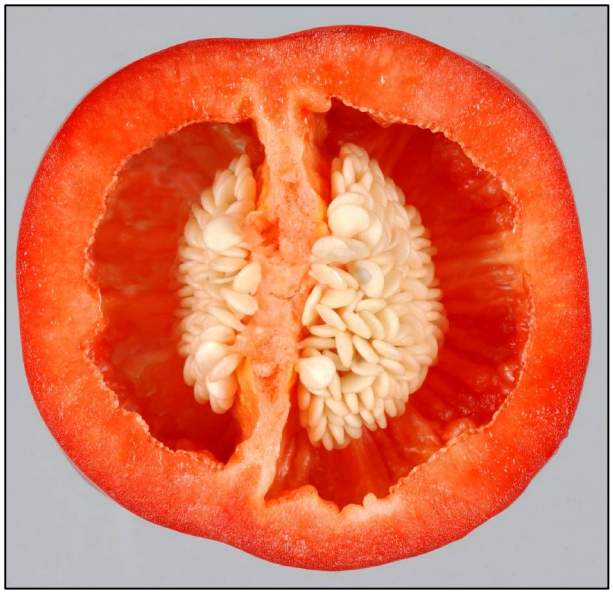
**Notes and states of expression:**
1: elliptic
2: angular
3: circular

## 28 Fruit: shape in cross section (at level of placenta)



1: elliptic

2: angular



3: circular

## 29 Fruit: sinuation of pericarp at basal part

**Grouping characteristic:** no.

**Type of characteristic**: **QN** – Quantitative characteristic.

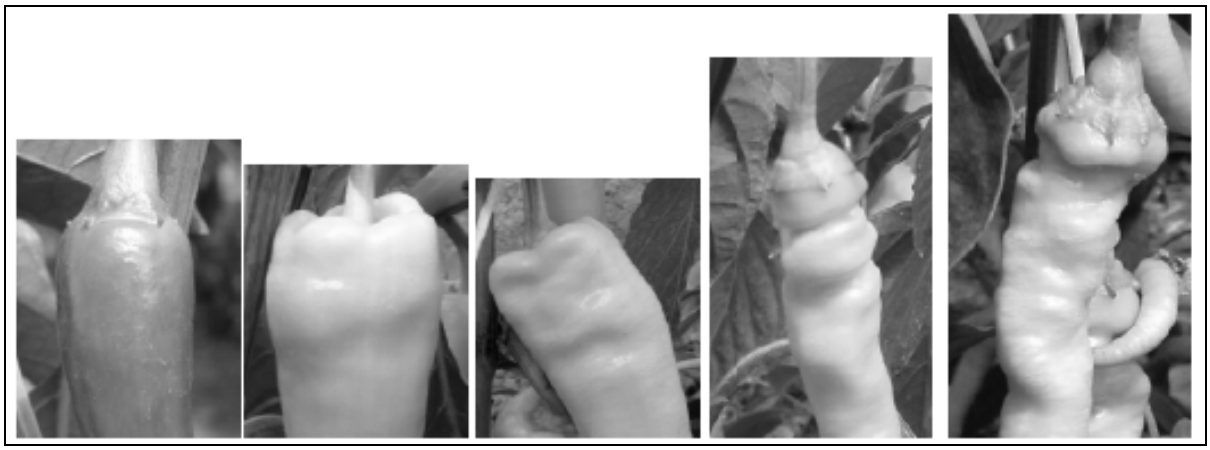
**Type of observation: VG** – Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Stage of observation:** At maturity, within 2-3 days after harvest.

**Method of observation:**
Visual observation according to CPVO explanation. Calibrate with examples varieties.

**Notes and states of expression:**
1: absent or very weak
2: very weak to weak
3: weak
4: weak to medium
5: medium
6: medium to strong
7: strong
8: strong to very strong
9: very strong

**CPVO explanation:**



1: absent or very weak | 3: weak | 5: medium | 7: strong | 9: very strong

## 30 Fruit: sinuation of pericarp excluding basal part

**Grouping characteristic:** no.

**Type of characteristic**: **QN** – Quantitative characteristic.

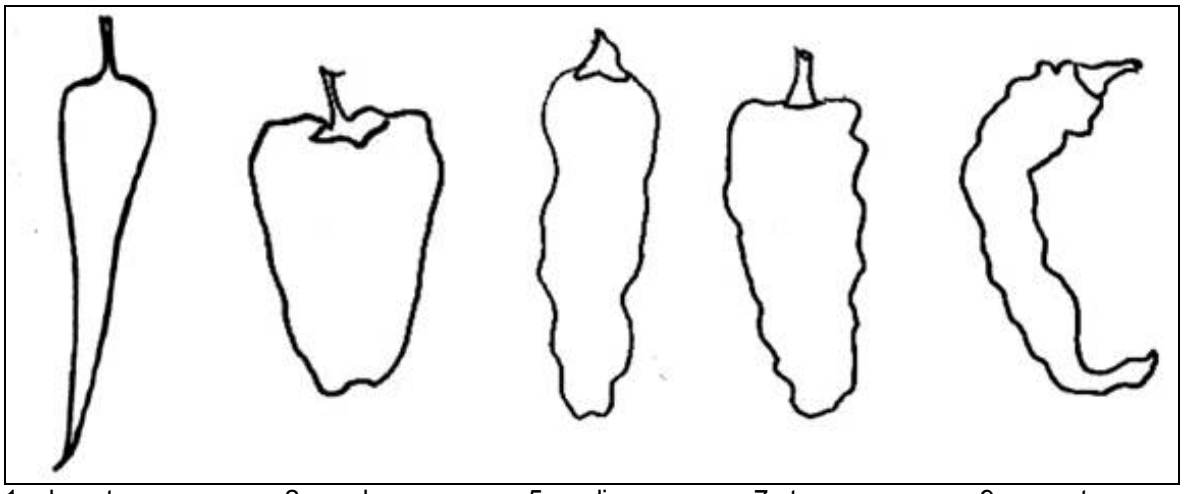
**Type of observation: VG** – Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Stage of observation:** At maturity, within 2-3 days after harvest.

**Method of observation:**
Visual observation according to CPVO explanation. Calibrate with examples varieties.

**Notes and states of expression:**
1: absent or very weak
2: very weak to weak
3: weak
4: weak to medium
5: medium
6: medium to strong
7: strong
8: strong to very strong
9: very strong

**CPVO explanation:**



1: absent or very weak | 2: weak | 5:medium | 7:strong | 9: very strong

## 30 Fruit: sinuation of pericarp excluding basal part

| 1: absent or very weak | 3: weak | 5: medium | 7: strong |
|---|---|---|---|
| Heron | Snooker | Fuego | De Cayenne |

## 31 Fruit: texture of surface

**Grouping characteristic:** no.

**Type of characteristic**: **QN** – Quantitative characteristic.

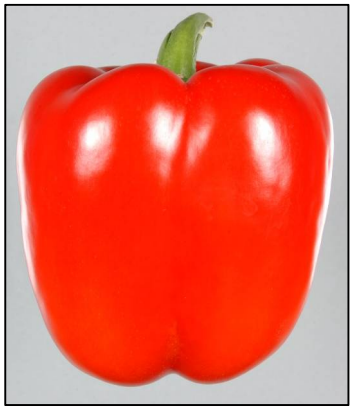
**Type of observation: VG** – Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Stage of observation:** At maturity, within 2-3 days after harvest.

**Method of observation:** Visual observation of absence or presence of indentions on the fruit surface. Calibrate with examples varieties.

**Notes and states of expression:**
1: smooth or very slightly wrinkled
2: slightly wrinkled
3: strongly wrinkled

## 31 Fruit: texture of surface



1: smooth or very slightly winkled

2: slightly wrinkled

3: strongly wrinkled

## 32 Fruit: colour (at maturity)

**Grouping characteristic:** yes.

**Type of characteristic**: **PQ** – Pseudo-qualitative characteristic.

**Type of observation**: **VG** – Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Stage of observation:** At maturity, i.e. after the time of the first colour change.

**Method of observation:** Visual assessment. Be aware of the fact that for some varieties (example: Green6203) colour before and at maturity is the same (green).

**Notes, states of expression and example varieties:**

| | |
|---|---|
| 1: yellow | Golden calwonder, Heldor |
| 2: orange | Ariane |
| 3: red | Fehér, Lamuyo |
| 4: brown | Bruba, Negral |
| 5: green | Green6203 |

## 32 Fruit: colour (at maturity)

1: yellow 2: orange

3: red 4: brown 5: green

## 33 Fruit: intensity of colour (at maturity)

**Grouping characteristic:** no.

**Type of characteristic: QN** – Quantitative characteristic.

**Type of observation: VG** – Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

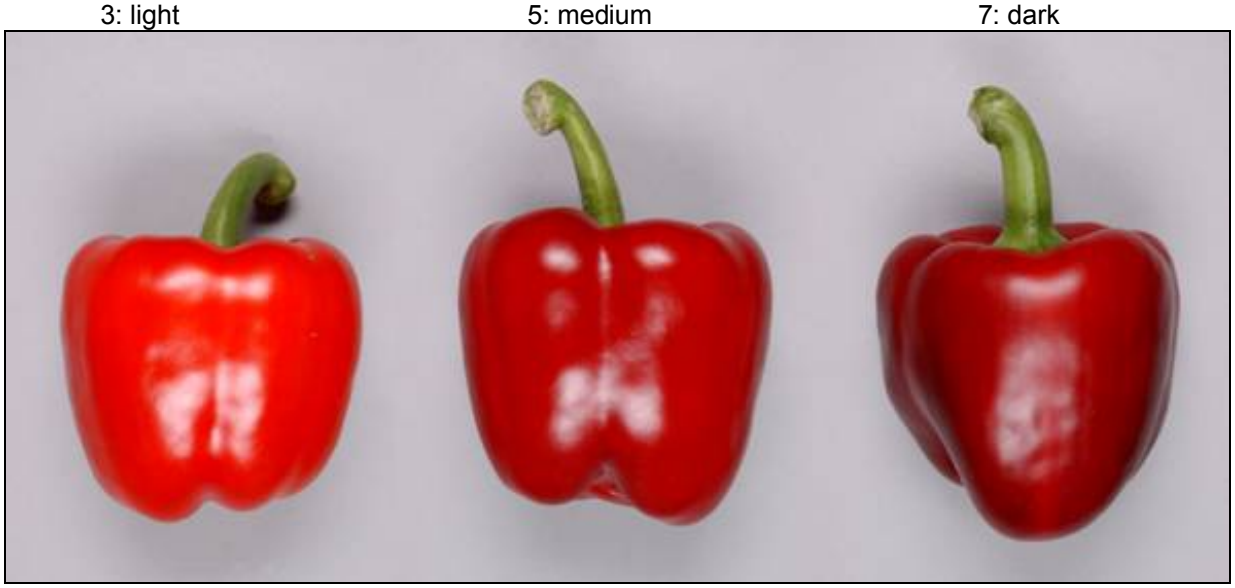
**Stage of observation:** At maturity i.e. after the time of first colour change.

**Method of observation:** Visual assessment. This characteristic should be observed under cloudy conditions and direct sunlight should be avoided. Calibrate with examples varieties.

**Notes and states of expression:**
1: very light
2: very light to light
3: light
4: light to medium
5: medium
6: medium to dark
7: dark
8: dark to very dark
9: very dark

## 33 Fruit: intensity of colour (at maturity)

3: light 5: medium 7: dark



3: light 5: medium 7: dark

## 34 Fruit: glossiness

**Grouping characteristic:** no.

**Type of characteristic**: **QN** – Quantitative characteristic.

**Type of observation**: **VG** – Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Stage of observation:** At maturity, within 2-3 days after harvest.

**Method of observation:** Visual assessment preferably under cloudy conditions. Direct sunlight should be avoided.

**Notes, states of expression and example varieties:**
1: very weak
2: very weak to weak
3: weak
4: weak to medium
5: medium
6: medium to strong
7: strong
8: strong to very strong
9: very strong

9: very strong Kappy

## 35 Fruit: stalk cavity

**Grouping characteristic:** no.

**Type of characteristic**: **QL** – Qualitative characteristic.

**Type of observation: VG** – Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Stage of observation:** At maturity.

**Method of observation:**
Visual observation on the level of stalk cavity. This may vary within one plant. Establish the most predominant situation within the sample.

**Notes and states of expression:**
1: absent
9: present

1: absent 9: present

## 36 Fruit: depth of stalk cavity

**Grouping characteristic:** no.

**Type of characteristic**: **QN** – Quantitative characteristic.

**Type of observation: VG** – Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Stage of observation:** At maturity.

**Method of observation:** Visual observation on the level of stalk cavity. This characteristic is being defined by the space between stalk cavity and the upper part of fruit. Calibrate with examples varieties.

**Notes and states of expression:**
1: very shallow
2: very shallow to shallow
3: shallow
4: shallow to medium
5: medium
6: medium to deep
7: deep
8: deep to very deep
9: very deep

## 36 Fruit: depth of stalk cavity

1: very shallow

3: shallow

5: medium

7: deep

9: very deep

## 37 Fruit: shape of apex

**Grouping characteristic:** no.

**Type of characteristic**: **PQ** – Pseudo-qualitative characteristic.

**Type of observation: VG** – Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Stage of observation:** At maturity.

**Method of observation:** Visual observation of apex. Shape of apex may vary slightly within one plant. Establish the predominant shape within a sample. Calibrate with examples varieties.

**Notes and states of expression:**
1: very acute
2: moderately acute
3: rounded
4: moderately depressed
5: very depressed

1: very acute 3: rounded 4: moderately depressed

## 38 Fruit: depth of interloculary grooves

**Grouping characteristic:** no.

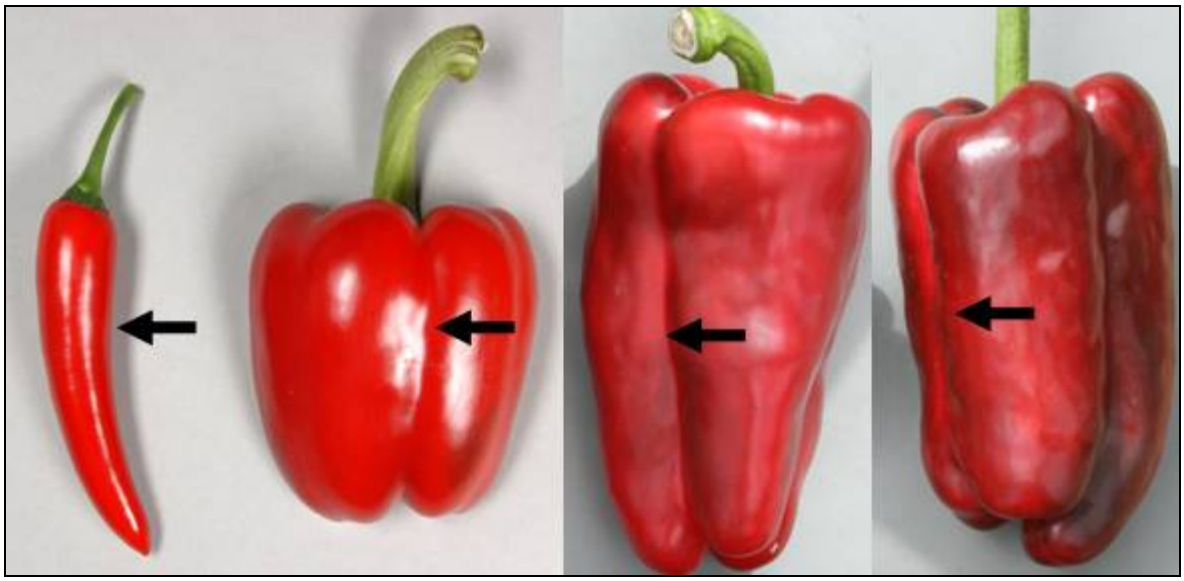
**Type of characteristic**: **QN** – Quantitative characteristic.

**Type of observation: VG** – Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Stage of observation:** At maturity.

**Method of observation:** Visual observation using examples varieties. To be observed in the middle part of the fruit.

**Notes and states of expression:**
1: absent or very shallow
2: absent or very shallow to shallow
3: shallow
4: shallow to medium
5: medium6: medium to deep
7: deep
8: deep to very deep
9: very deep



1: absent or very shallow | 3: shallow | 5: medium | 7:deep

## 39 Fruit: number of locules

**Grouping characteristic:** yes

**Type of characteristic**: **QN** – Quantitative characteristic.

**Type of observation**: **MG** – Single measurement of a group of plants or parts of plants; in practice a single measurement of an average single plant or part of plant.

**Stage of observation:** At maturity.

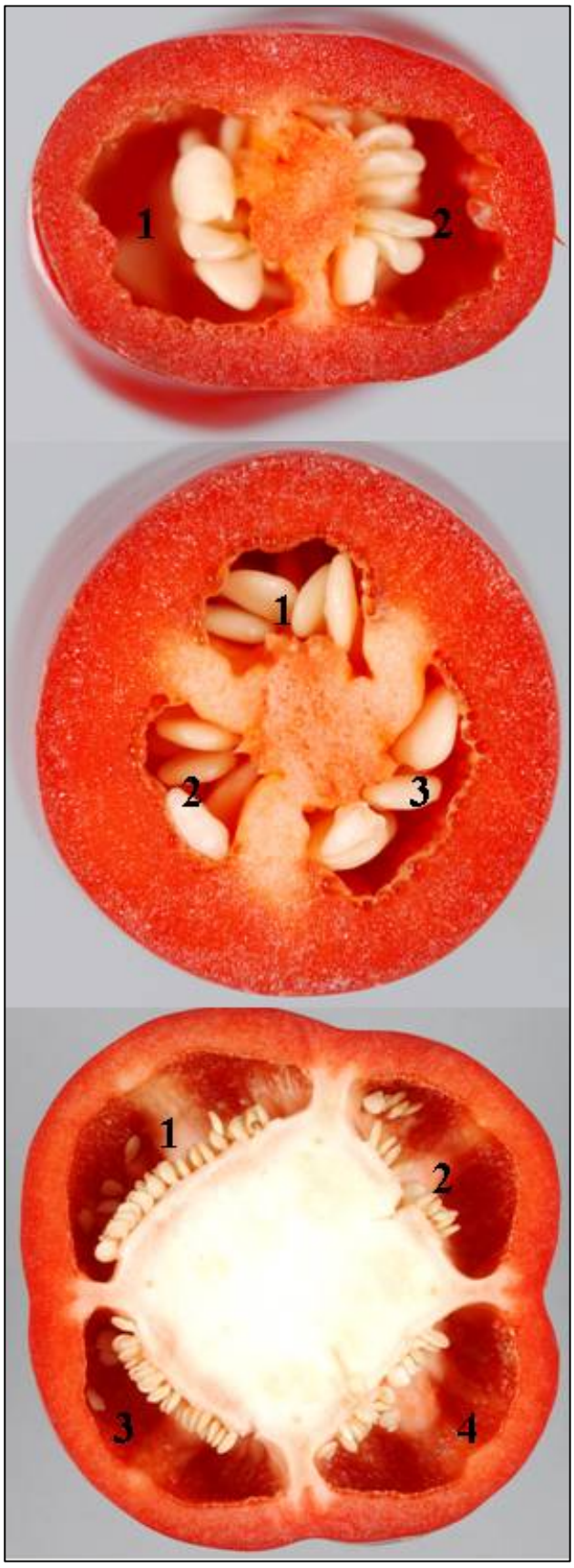
**Method of observation:** Visual observation. Cut fruits at the level of placenta and count the number of locules. Calibrate with examples varieties.

**Note:** The number of locules should be the same as stated in the Technical Questionnaire and should be uniform. However, due to some environmental factors influencing growth, the number of locules may slightly vary within the variety or even the same plant. Use example varieties to validate (to verify) the results. In case of discrepancies check the plants for off types fruit.

**Notes, states of expression and example varieties:**

| | |
|---|---|
| 1: predominantly two | De Cayenne |
| 2: equally two and three | Fehér |
| 3: predominantly three | Century |
| 4: equally three and four | Lamuyo, Sonar |
| 5: predominantly four and more | Palio, PAZ szentesi |

## 39 Fruit: number of locules




1: predominantly two

3: predominantly three

4: (+3) equally three and four

## 40 Fruit: thickness of flesh

**Grouping characteristic:** no.

**Type of characteristic**: **QN** – Quantitative characteristic.

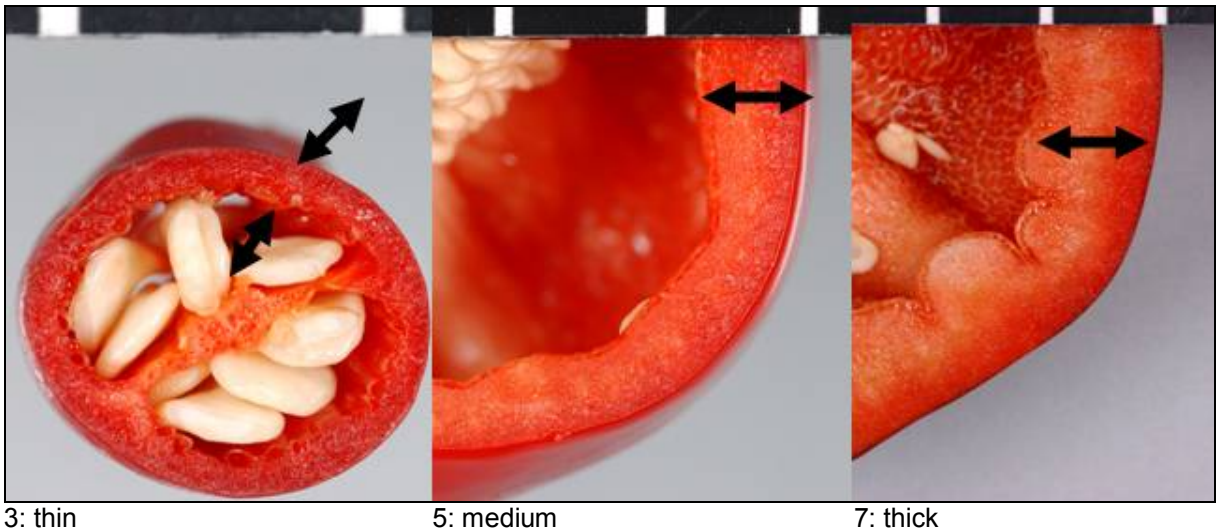
**Type of observation: VG** – Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Stage of observation:** At maturity.

**Method of observation:** Visual observation of flesh on fruits cut at level of placenta. Calibrate with examples varieties.

**Notes and states of expression:**
1: very thin
2: very thin to thin
3: thin
4: thin to medium
5: medium
6: medium to thick
7: thick
8: thick to very thick
9: very thick

**Note:** scale of these pictures differs; see ruler on top of the pictures.



3: thin 5: medium 7: thick

## 41 Stalk: length

**Grouping characteristic:** no.

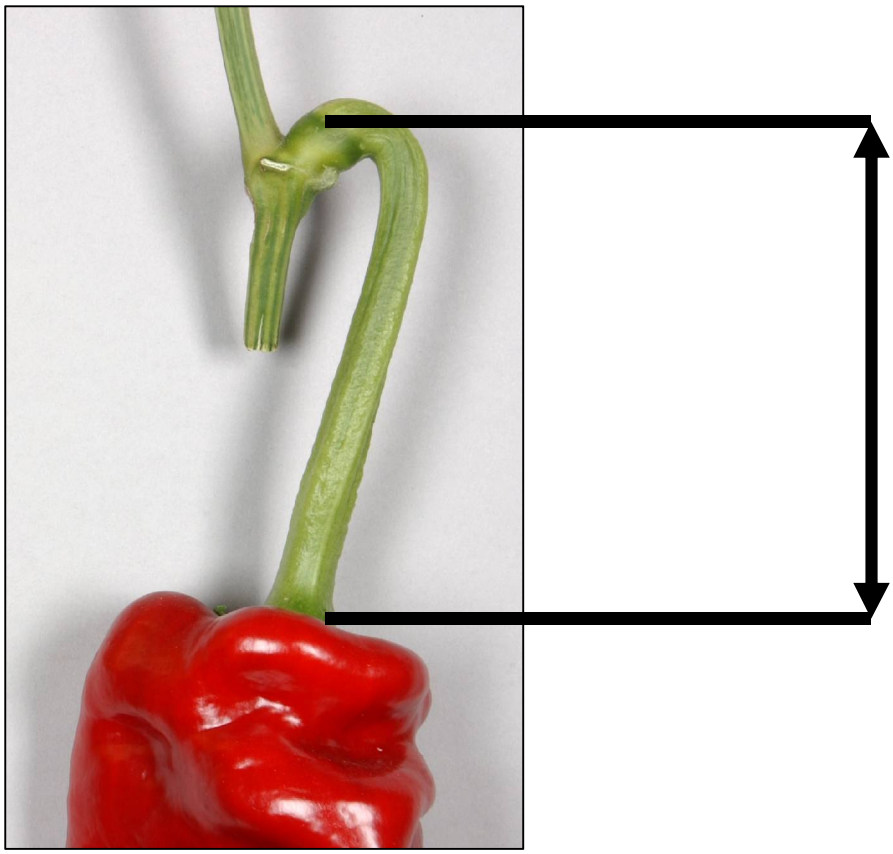
**Type of characteristic**: **QN** – Quantitative characteristic.

**Type of observation: MS/VG** – Choice between
**-** Calculated average of the measurement of 20 plants or parts of plants and
- Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Stage of observation:** At maturity.

**Method of observation:** Observations of the stalk on harvested fruit. Make sure stalks remain undamaged during harvesting, as the length is measured from the calyx to the place the stalk has been attached to the node. Calibrate with examples varieties.

**Notes and states of expression:**
1: very short
2: very short to short
3: short
4: short to medium
5: medium
6: medium to long
7: long
8: long to very long
9: very long



## 41 Stalk: length

1: very short 3: short 5: medium 7: long 9: very long

## 42 Stalk: thickness

**Grouping characteristic:** no.

**Type of characteristic**: **QN** – Quantitative characteristic.

**Type of observation: MS/VG** – Choice between
**-** Calculated average of the measurement of 20 plants or parts of plants and
- Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Stage of observation:** At maturity.

**Method of observation:** Observations of stalk on harvested fruit. Make sure stalks remain undamaged by harvesting. Measure the thickness in the middle of the stalk.

**Notes and states of expression:**
1: very thin
2: very thin to thin
3: thin
4: thin to medium
5: medium
6: medium to thick
7: thick
8: thick to very thick
9: very thick

## 42 Stalk: thickness

1: very thin 3: thin 5: medium 7: thick 9: very thick

## 43 Calyx: aspect

**Grouping characteristic:** no.

**Type of characteristic**: **QL** – Qualitative characteristic.

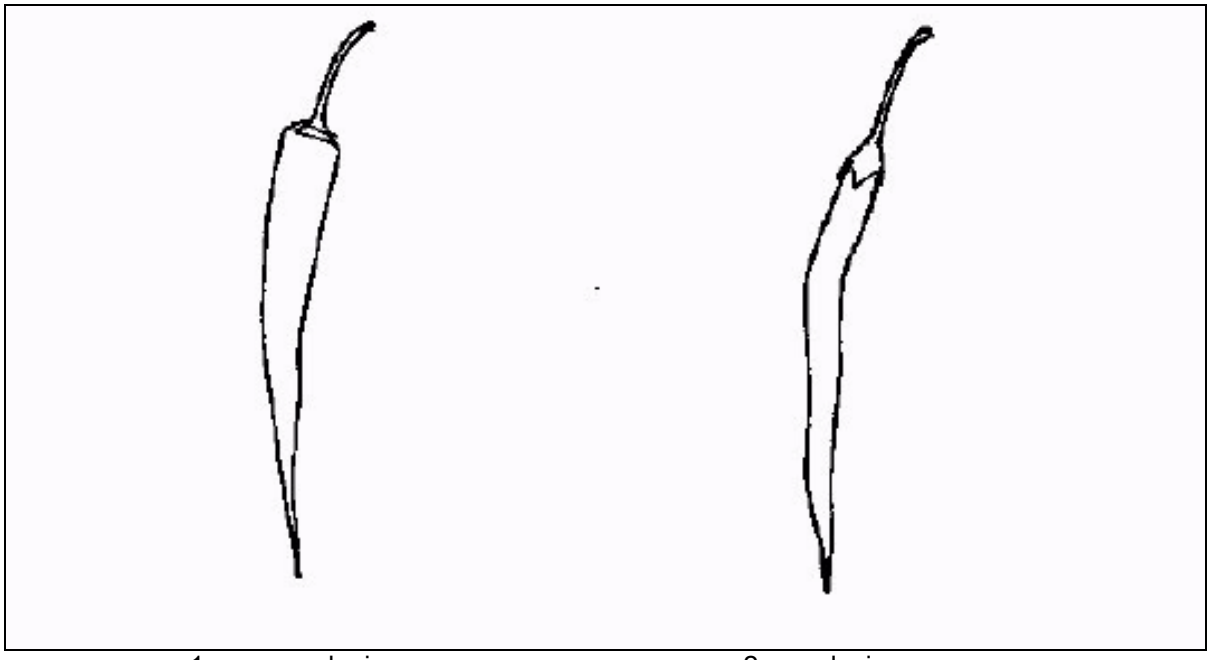
**Type of observation: VG** – Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Stage of observation:** At maturity.

**Method of observation:** Visual observations of calyx on harvested fruit according to CPVO explanation.

**Notes and states of expression:**
1: non enveloping
2: enveloping

**CPVO explanation:**



1: non enveloping 2: enveloping

## 43 Calyx: aspect

1: non enveloping 2: enveloping

## 44 Fruit: capsaicin in placenta

**Grouping characteristic:** yes.

**Type of characteristic**: **QL** – Qualitative characteristic.

**Type of observation: VG** – Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Stage of observation:** At maturity.

**Method of observation:** The presence of capsaicin is observed by tasting the pepper flesh in the placenta area. This characteristic is genetically determined. However, the intensity of capsaicin may be influenced by environment and may in some varieties be less prominent.

**Notes and states of expression:**

| | |
|---|---|
| 1: absent | Sonar |
| 2: present | De Cayenne |

## 45 Time of beginning of flowering (first flower on second flowering node)

**Grouping characteristic:** no.

**Type of characteristic**: **QN** – Quantitative characteristic.

**Type of observation**: **VG** – Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Stage of observation:** From the appearance of he first flower.

**Method of observation:** Visual observation of flowering plants 2-3 times per week till all varieties has flowered. Calibrate with example varieties.

**Notes and states of expression:**
1: very early
2: very early to early
3: early
4: early to medium
5: medium
6: medium to late
7: late
8: late to very late
9: very late

## 46 Time of maturity

**Grouping characteristic:** no.

**Type of characteristic**: **QN** – Quantitative characteristic.

**Type of observation**: **VG** – Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Stage of observation:** From the time of first colour change on fruit.

**Method of observation:** Visual observation of colour changing, scored 2-3 times per week till fruit on 50% of the plants has changed colour. Calibrate with example varieties.

**Notes and states of expression:**
1: very early
2: very early to early
3: early
4: early to medium
5: medium
6: medium to late
7: late
8: late to very late
9: very late

## 47 Resistance to Tobamovirus

**Grouping characteristic:** yes.

**Type of characteristic**: **QL** – Qualitative characteristic.

**Type of observation**: **VG: -** Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Method of observation:** Observe using explanation.

### 47.1. Resistance to Pathotype 0 (Tobacco Mosaic Virus (0))

**Notes, states of expression and example varieties:**
1: absent Doux italien, Piperade
9: present Lamuyo, Sonar, Yolo Wonder

### 47.2. Resistance to Pathotype 1 (Tobacco Mosaic Virus (1))

**Notes, states of expression and example varieties:**
1: absent Piperade, Yolo Wonder
9: present 'Tabasco' (*C. frutescens*)

### 47.3. Resistance to Pathotype 1-2 (Pepper Mild Mottle Virus (1-2))

**Notes, states of expression and example varieties:**
1: absent Piperade, Yolo Wonder
9: present Delgado, Festos, Novi, Orion

### 47.4. Resistance to Pathotype 1-2-3 (Pepper Mild Mottle Virus (1-2-3))

**Notes, states of expression and example varieties:**
1: absent Piperade, Yolo Wonder
9: present Cuby, Tasty

## 47 Resistance to Tobamovirus

Maintenance of pathotypes

Type of medium: On plants or dehydrated leaves (in deep-freezer or method BOS)

Special conditions: Regeneration of the virus on plant material before inoculum preparation

Execution of test

Growth stage of plants: When cotyledons are fully developed or at “first leaf” stage

Temperature: 20-25°C

Growing method: Sowing and raising of seedlings in boxes or soil blocks in glasshouse

Method of inoculation: Rubbing of cotyledons with a virus suspension

Duration of test

- Sowing to inoculation: 10 to 15 days

- Inoculation to reading: 10 days

Number of plants tested: 15 to 30 plants

Genetics of virus pathotypes and resistant genotypes:

The genetic resistance to Tobamoviruses is controlled by 5 alleles located on the same locus. The table below shows the relationship between virus pathotypes and resistance genotypes:

Pepper Genotype reactions to Tobamovirus Pathotypes

| | Pepper Tobamovirus Pathotypes | | |
|---|---|---|---|
| Virus: | TMV | ToMV | PMMoV |
| Strain: | U1<br>Feldman | P11<br>Obuda Pepper Mosaic Virus | P14<br>Samsun latens |
| Genotype / mark | $P_0$ | $P_{1-2}$ | $P_{1-2-3}$ |
| $L^-L^-$ | S | S | S |
| $L^1L^1$ | R | S | S |
| $L^3L^3$ | R | R | S |
| $L^4L^4$ | R | R | R |

Legend:
S = susceptible
R = resistant
TMV = Tobacco Mosaic Virus
ToMV = Tomato Mosaic Virus
PMMoV = Pepper Mild Mottle Virus

## 48 Resistance to Potato Virus Y

**Grouping characteristic:** yes.

**Type of characteristic**: **QL** – Qualitative characteristic.

**Type of observation**: **VG: -** Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Method of observation:** Observe using explanation.

## 48.1. Resistance to Pathotype 0

**Notes and states of expression:**

| | |
|---|---|
| 1: absent | Yolo Wonder |
| 9: present | Yolo Y |

## 48.2. Resistance to Pathotype 1

**Notes and states of expression:**

| | |
|---|---|
| 1: absent | Yolo Wonder, Yolo Y |
| 9: present | Florida VR2 |

## 48.3. Resistance to Pathotype 1-2

**Notes and states of expression:**

| | |
|---|---|
| 1: absent | Florida VR2, Yolo Wonder, Yolo Y |
| 9: present | Serrano Criollo de Morenos |

## 48 Resistance to Potato Virus Y

Maintenance of pathotypes

Type of medium: On susceptible plants

Special conditions: For the strain PVY(0): use the line TO72(A)
For the strain PVY(1): use the line Sicile 15
For the strain PVY(1-2): use the line SON41

Execution of test

Growth stage of plants: Young plants at the stage of developed cotyledons - first pointing leaf

Temperature: 18-25°C

Growing method: Raising of plants in glasshouse

Method of inoculation: Rubbing of cotyledons with a virus solution
Composition of the solution:
inoculum: 4 ml extraction solution for 1 g infected leaves + 80 g activated carbon + 80 mg carborundum;
extraction solution: buffer solution diluted 1/20 with 0.2% diethyl dithiocaremate of sodium (DIECA);
buffer solution: (for 100 ml sterile water) 10.8 g $NA_2HPO_4$ + 1.18 g $K_2HPO_4$ at pH 7.1-7.2

Duration of test

Sowing to inoculation: 10 to 15 days

Inoculation to reading: 3 weeks (2 weeks minimum, 4 weeks maximum)

Number of plants tested: 60 plants

Remarks: The test should not be conducted at high temperatures.

| Standard varieties: | Pathotype 0 | Pathotype 1 | Pathotype 1-2 |
|---|---|---|---|
| Sensitive varieties: | Yolo Wonder | Yolo Wonder, Yolo Y | Florida VR2,* Yolo Wonder, Yolo Y |
| Resistant varieties: | Yolo Y | Florida VR2 | Serrano Criollo Morenos |

* Florida VR2 can exhibit diffused and very late symptoms.

## 49 Resistance to *Phytophthora capsici*

**Grouping characteristic:** no.

**Type of characteristic**: **QL** – Qualitative characteristic.

**Type of observation**: **VG: -** Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Method of observation:** Observe using explanation.

**Notes and states of expression:**
1: absent
9: present

## 49 Resistance to *Phytophthora capsici*

Scoring must be carried out under conditions of controlled infection:

Maintenance of inoculum

| | |
|---|---|
| Inoculum and type of medium: | *Phytophthora capsici* strain 101, to be cultivated on V8 juice-agar (1%) in Petri's dishes. |

Conduct of test

| | |
|---|---|
| Growth stage of plants: | around eight-week old plants, grown in greenhouse (stage: first flower bud) |
| Temperature: | 22°C |
| Light: | 12 hours/day |
| Method of inoculation: | Plants are cut just below the point of first branching. A disc of mycelium of 4 mm-diameter should be used as inoculum. The disc is placed on the freshly cut stem. The top of the stem is wrapped with a piece of aluminium foil, to keep it wet. Infected plants are transferred to a growth chamber kept at 22°C. |

Duration of test:

| | |
|---|---|
| From sowing to inoculation: | between 6 and 8 weeks |
| From inoculation to scoring: | first scoring: 7 days<br>second scoring: 14 days<br>final scoring: 21 days |
| Number of plants tested: | 20 plants |
| Scoring: | The length of necrosis on the stem, induced by the fungus development, is recorded once a week during 3 weeks, on each plant. The aluminium foil on the top of the stem should be removed 7 days after the inoculation. The first reading should take place immediately after the removal of the aluminium foil. Subsequent scoring should be made on the 14$^{th}$ and 21$^{st}$ day counting from the day of inoculation. The distance (in mm) between the lowest point reached by the necrosis and the top of the stem should be recorded. |
| Standard varieties: | Susceptible: Yolo Wonder<br>Resistant: Chistera, Favolor, Solario, Phyo 636 (given in the order of their level of resistance) |

## 50 Resistance to Cucumber Mosaic Virus (CMV)

**Grouping characteristic:** no.

**Type of characteristic**: **QL** – Qualitative characteristic.

**Type of observation**: **VG: -** Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Method of observation:** Observe using explanation.

**Notes and states of expression:**
1: absent
9: present

## 50 Resistance to Cucumber Mosaic Virus (CMV)

Maintenance of pathotypes

| | |
|---|---|
| Strain: | Fulton |
| Type of medium: | On susceptible plants: *Vinca rosea* |
| Special conditions: | - |
| Inoculum production: | Crushing of 1g of fresh leaves of *Vinca rosea* in 4 ml of Phosphate buffer 0.03M pH 7 + DIECA (diethyl dithiocaremate de sodium) (1 for 1000) + 300 mg of activated carbon + 80 mg of carborundum |

Execution of test:

| | |
|---|---|
| Growth stage of plants: | Young plants at the stage of developed cotyledons. First leaf non pointing |
| Number of plants: | 50 plants |
| Growing conditions: | 22°C, 12 hours of light |
| Growing method: | Raising of plants in climatised room |
| Method of inoculation: | Mechanical rubbing of cotyledons with a virus solution, the plants are kept in darkness for 48 hours |

Duration of test:

| | |
|---|---|
| From sowing to inoculation: | 12 to 13 days |
| From inoculation to reading: | 3 readings at 10, 15 and 21 days after inoculation |

Standard varieties:

| | |
|---|---|
| Susceptible variety: | Yolo Wonder |
| Tolerant (T) or resistant (R) varieties: | Milord (T)<br>Vania (R) |

## 51 Resistance to Tomato Spotted Wilt Virus (TSWV)- race P0

**Grouping characteristic:** no.

**Type of characteristic**: **QL** – Qualitative characteristic.

**Type of observation**: **VG: -** Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Method of observation:** Observe using explanation.

**Notes and states of expression:**
1: absent
9: present

## 51 Resistance to Tomato Spotted Wilt Virus (TSWV)- race P0

Maintenance of patothypes:

| | |
|---|---|
| Type of medium: | Pepper fruit in deep-freezer (-70 °C) |
| Special condition: | Regeneration of the virus on *Nicotiana rustica* or *Nicotiana benthamiana* plants before inoculation |

Execution of test:

| | |
|---|---|
| Growth stage of the plants: | Two leaves expanded |
| Temperature: | 20 - 22 °C |
| Light: | Extra light in winter |
| Growing method: | Sowing in greenhouse |
| Method of inoculation: | Mechanical, rubbing on cotyledons, inoculum suspension 10 °C |

Duration of test:

from sowing to inoculation: 20 days
from inoculation to reading: 14 days

Number of tested plants: 20 plants

Standard varieties.

| | |
|---|---|
| Susceptible: | Lamuyo |
| Resistant: | Galileo, Jackal, Jackpot |

## 52 Resistance to *Xanthomonas campestris* pv. *vesicatoria*

**Grouping characteristic:** no.

**Type of characteristic**: **QL** – Qualitative characteristic.

**Type of observation**: **VG: -** Single visual assessment of a group of plants or parts of plants; in practice a single assessment of an average single plant or part of plant.

**Method of observation:** Observe using explanation.

**Notes and states of expression:**
1: absent
9: present

## 52 Resistance to *Xanthomonas campestris* pv. *vesicatoria*

Maintenance of pathotypes

Type of medium: PDA (Potato, Dextrose, Agar ) medium

Special conditions: 48 hours *Xanthomonas campestris* pv. *vesicatoria* culture. Adjusting inoculum concentration of bacteria-cellular $10^7$ .

Execution of test

Growth stage of plants: 6th to 8th true leaves

Temperature: 24 °C night, 25°C day

Relative humidity: 80%

Light: 30 000 lx, day length 16 hours

Growing method: Sowing in boxes in climate chamber or in glasshouse

Method of inoculation: Infiltration into abaxial surface of a leaf in 13-15 mm diameter spots

Duration of the test: 10-14 days

Number of plants tested: 15 to 30 plants

Remarks

Genetics of bacteria pathotypes and resistant genotypes:

Resistant varieties: Aladin, Camelot, ECR-20R, Kaldóm, Kalorez, Lancelot, Pasa

## Notes

## Notes

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