



PROTOCOL FOR TESTS ON DISTINCTNESS, UNIFORMITY AND STABILITY

***Brassica oleracea* L. var *italica* Plenck**

BROCCOLI

UPOV Code: BRASS_OLE_GBC

Adopted on 11/04/2024

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1. SUBJECT OF THE PROTOCOL AND REPORTING

1.1 Scope of the technical protocol

This Technical Protocol applies to all varieties of *Brassica oleracea* L. var. *italica* Plenck.

The botanical difference between broccoli and cauliflower is that broccoli produces heads bearing clusters of developed flower buds, whereas cauliflower produces curds consisting of a tightly-packed mass of undifferentiated tissue which in an advanced stage will develop into flower buds.

The protocol describes the technical procedures to be followed in order to meet the requirements of Council Regulation 2100/94 on Community Plant Variety Rights. The technical procedures have been agreed by the Administrative Council and are based on documents agreed by the International Union for the Protection of New Varieties of Plants (UPOV), such as the General Introduction to DUS (UPOV Document TG/1/3 http://www.upov.int/export/sites/upov/resource/en/tg_1_3.pdf), its associated TGP documents (<http://www.upov.int/tgp/en/>) and the relevant UPOV Test Guideline TG/151/5 dated 30/10/2018 (*The reference and link will be updated after publication of the TG*) for the conduct of tests for Distinctness, Uniformity and Stability.

1.2 Entry into Force

The present protocol enters into force on **15.01.2024**. Any ongoing DUS examination of candidate varieties started before the aforesaid date will not be affected by the approval of the Technical Protocol. Technical examinations of candidate varieties are carried out according to the TP in force when the DUS test starts. The starting date of a DUS examination is considered to be the due date for submitting of plant material for the first test period.

In cases where the Office requests to take-over a DUS report for which the technical examination has either been finalized or which is in the process to be carried out at the moment of this request, such report can only be accepted if the technical examination has been carried out according to the CPVO TP which was in force at the moment when the technical examination started.

1.3 Reporting between Examination Office and CPVO and Liaison with Applicant

1.3.1 Reporting between Examination Office and CPVO

The Examination Office shall deliver to the CPVO a preliminary report ("the preliminary report") no later than two weeks after the date of the request for technical examination by the CPVO.

The Examination Office shall also deliver to the CPVO a report relating to each growing period ("the interim report") and, when the Examination Office considers the results of the technical examination to be adequate to evaluate the variety or the CPVO so requests, a report relating to the examination ("the final report").

The final report shall state the opinion of the Examination Office on the distinctness, uniformity and stability of the variety. Where it considers those criteria to be satisfied, or where the CPVO so requests, a description of the variety shall be added to the report.

If a report is negative the Examination Office shall set out the detailed reasons for its findings.

The interim and the final reports shall be delivered to the CPVO as soon as possible and no later than on the deadlines as laid down in the designation agreement.

1.3.2 Informing on problems in the DUS test

If problems arise during the course of the test the CPVO should be informed immediately so that the information can be passed on to the applicant. Subject to prior permanent agreement, the applicant may be directly informed at the same time as the CPVO particularly if a visit to the trial is advisable.

1.3.3 Sample keeping in case of problems

If the technical examination has resulted in a negative report, the CPVO shall inform the Examination Office as soon as possible in case that a representative sample of any relevant testing material shall be kept.

2. MATERIAL REQUIRED

2.1 Plant material requirements

Information with respect to the agreed closing dates and submission requirements of plant material for the technical examination of varieties can be found on <https://public.plantvarieties.eu/publication> in the special issue S2 of the Official Gazette of the Office. General requirements on submission of samples are also to be found following the same link.

2.2 Informing the applicant of plant material requirements

The CPVO informs the applicant that

- he is responsible for ensuring compliance with any customs and plant health requirements.
- the plant material supplied should be visibly healthy, not lacking in vigour, nor affected by any important pest or disease.
- 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.

2.3 Informing about problems on the submission of material

The Examination Office shall report to the CPVO immediately in cases where the test material of the candidate variety has not arrived in time or in cases where the material submitted does not fulfil the conditions laid down in the request for material issued by the CPVO.

In cases where the examination office encounters difficulties to obtain plant material of reference varieties the CPVO should be informed.

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" http://www.upov.int/edocs/tgpdocs/en/tgp_9.pdf.

3.3 Conditions for Conducting the Examination

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

The optimum stage of development for the assessment of each characteristic is indicated by a number in the third column of the Table of Characteristics. The stages of development denoted by each number are described in Chapter 8.4.

3.4 Test design

Each test should be designed to result in a total of at least 60 plants, which should be divided between at least 2 replicates.

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 Special tests for additional characteristics

In accordance with Article 23 of Implementing Rules N° 874/2009 an applicant may claim either in the Technical Questionnaire or during the test that a candidate has a characteristic which would be helpful in establishing distinctness. If such a claim is made and is supported by reliable technical data, a special test may be undertaken providing that a technically acceptable test procedure can be devised.

Special tests will be undertaken, with the agreement of the President of CPVO, where distinctness is unlikely to be shown using the characters listed in the protocol.

3.6 Constitution and maintenance of a variety collection

The process for the constitution and the maintenance of a variety collection can be summarized as follows:

Step 1: Making an inventory of the varieties of common knowledge

Step 2: Establishing a collection ("variety collection") of varieties of common knowledge which are relevant for the examination of distinctness of candidate varieties

Step 3: Selecting the varieties from the variety collection which need to be included in the growing trial or other tests for the examination of distinctness of a particular candidate variety.

3.6.1 Forms of variety collection

The variety collection shall comprise variety descriptions and living plant material, thus a living reference collection. The variety description shall be produced by the EO unless special cooperation exists between EOs and the CPVO. The descriptive and pictorial information produced by the EO shall be held and maintained in a form of a database.

3.6.2 Living Plant Material

The EO shall collect and maintain living plant material of varieties of the species concerned in the variety collection.

3.6.3 Range of the variety collection

The living variety collection shall cover at least those varieties that are suitable to climatic conditions of a respective EO.

3.6.4 Making an inventory of varieties of common knowledge for inclusion in the variety collection

The inventory shall include varieties protected under National PBR (UPOV contracting parties) and Community PBR, varieties registered in the Common Catalogue, the OECD list, the Conservation variety list and varieties in trade or in commercial registers for those species not covered by a National or the Common Catalogue.

3.6.5 Maintenance and renewal/update of a living variety collection

The EO shall maintain seeds in conditions which will ensure germination and viability, periodical checks, and renewal as required. For the renewal of existing living material the identity of replacement living plant material shall be verified by conducting side-by-side plot comparisons between the material in the collection and the new material.

4. ASSESSMENT OF DISTINCTNESS, UNIFORMITY AND STABILITY

The prescribed procedure is to assess distinctness, uniformity and stability in a growing trial.

4.1 Distinctness

4.1.1 General recommendations

It is of particular importance for users of this Technical Protocol to consult the UPOV-General Introduction to DUS (link in chapter 1 of this document) and TGP 9 'Examining Distinctness' (http://www.upov.int/edocs/tgpdocs/en/tgp_9.pdf) prior to making decisions regarding distinctness. However, the following points are provided for elaboration or emphasis in this Technical Protocol.

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 Technical Protocols are familiar with the recommendations contained in the UPOV-General Introduction to DUS prior to making decisions regarding distinctness.

4.1.4 Number of plants/parts of plants to be examined

Unless otherwise indicated, for the purposes of distinctness, all observations on single plants should be made on 40 plants or parts taken from each of 40 plants and any other observations made on all plants in the test, disregarding any off-type plants.

4.1.5 Method of observation

The recommended method of observing the characteristic for the purposes of distinctness is indicated by the following key in the third column of the Table of Characteristics (see document TGP/9 "Examining Distinctness", Section 4 "Observation of characteristics"):

MG: single measurement of a group of plants or parts of plants
MS: measurement of a number of individual plants or parts of plants
VG: visual assessment by a single observation of a group of plants or parts of plants
VS: visual assessment by observation of individual plants or parts of plants

Type of observation: visual (V) or measurement (M)

"Visual" observation (V) is an observation made on the basis of the expert's judgment. For the purposes of this document, "visual" observation refers to the sensory observations of the experts and, therefore, also includes smell, taste and touch. Visual observation includes observations where the expert uses reference points (e.g. diagrams, example varieties, side-by-side comparison) or non-linear charts (e.g. colour charts). Measurement (M) is an objective observation against a calibrated, linear scale e.g. using a ruler, weighing scales, colorimeter, dates, counts, etc.

Type of record: for a group of plants (G) or for single, individual plants (S)

For the purposes of distinctness, observations may be recorded as a single record for a group of plants or parts of plants (G), or may be recorded as records for a number of single, individual plants or parts of plants (S). In most cases, "G" provides a single record per variety and it is not possible or necessary to apply statistical methods in a plant-by-plant analysis for the assessment of distinctness.

In cases where more than one method of observing the characteristic is indicated in the Table of Characteristics (e.g. VG/MG), guidance on selecting an appropriate method is provided in document TGP/9, Section 4.2.

4.2 **Uniformity**

4.2.1 It is of particular importance for users of this Technical Protocol to consult the UPOV-General Introduction to DUS (link in chapter 1 of this document) and TGP 10 'Examining Uniformity' (http://www.upov.int/edocs/tgpdocs/en/tgp_10.pdf) prior to making decisions regarding uniformity. However, the following points are provided for elaboration or emphasis in this Technical Protocol:

4.2.2 This Technical Protocol has been developed for the examination of cross-pollinated varieties. For varieties with other types of propagation the recommendations in the UPOV-General Introduction to DUS and document TGP/13 "Guidance for new types and species", Section 4.5 "Testing Uniformity" should be followed.

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

4.2.4 For the assessment of uniformity of inbred lines and hybrid varieties, a population standard of 1% and an acceptance probability of at least 95% should be applied. In the case of a sample size of 60 plants, 2 off-types are allowed. In addition, for hybrids, 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 60 plants, 4 inbred plants are allowed.

4.3 **Stability**

4.3.1 It is of particular importance for users of this Technical Protocol to consult the UPOV-General Introduction to DUS (link in chapter 1 of this document) and TGP 11 'Examining Stability' (http://www.upov.int/edocs/tgpdocs/en/tgp_11.pdf)

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

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

5. GROUPING OF VARIETIES AND ORGANISATION 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 organise the growing trial so that similar varieties are grouped together.
- 5.3** The following have been agreed as useful grouping characteristics:
- a) Only Calabrese type varieties: Head: level of main head in relation to plant height (characteristic 13)
 - b) Head: colour (characteristic 17)
 - c) Time of harvest maturity (characteristic 23)
 - d) Male sterility (characteristic 24)

Firstly, the collection should be divided according to the two growth types in 8.3: Explanations covering several characteristics: Calabrese type and Sprouting type. In case of doubt to which growth type a variety belongs, it should be tested in both growth types.

- 5.4** If other characteristics than those from the Technical Protocol are used for the selection of varieties to be included into the growing trial, the EO shall inform the CPVO and seek the prior consent of the CPVO before using these characteristics.
- 5.5** Guidance for the use of grouping characteristics, in the process of examining distinctness, is provided through the UPOV-General Introduction to DUS and document TGP/9 "Examining Distinctness".

6. INTRODUCTION TO THE TABLE OF CHARACTERISTICS

6.1 Characteristics to be used

The characteristics to be used in DUS tests and preparation of descriptions shall be those referred to in the table of characteristics. All the characteristics shall be used, providing that observation of a characteristic is not rendered impossible by the expression of any other characteristic, or the expression of a characteristic is prevented by the environmental conditions under which the test is conducted or by specific legislation on plant health. In the latter case, the CPVO should be informed.

The Administrative Council empowers the President, in accordance with Article 23 of Commission Regulation N°874/2009, to insert additional characteristics and their expressions in respect of a variety.

6.2. States of expression and corresponding notes

In the case of qualitative and pseudo-qualitative characteristics, all relevant states of expression are presented in the characteristic. However, in the case of quantitative characteristics with 5 or more states, an abbreviated scale may be used to minimize the size of the Table of Characteristics. For example, in the case of a quantitative characteristic with 9 states, the presentation of states of expression in the Test Guidelines may be abbreviated as follows:

| State | Note |
|--------|------|
| small | 3 |
| medium | 5 |
| large | 7 |

However, it should be noted that all of the following 9 states of expression exist to describe varieties and should be used as appropriate:

| State | Note |
|---------------------|------|
| very small | 1 |
| very small to small | 2 |
| small | 3 |
| small to medium | 4 |
| medium | 5 |
| medium to large | 6 |
| large | 7 |
| large to very large | 8 |
| very large | 9 |

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

6.3 Example Varieties

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

6.4 Legend

For column 'CPVO N°':

| | | |
|-----|---|------------------|
| G | Grouping characteristic | -see Chapter 5 |
| QL | Qualitative characteristic | |
| QN | Quantitative characteristic | |
| PQ | Pseudo-qualitative characteristic | |
| (+) | Explanations for individual characteristics | -see Chapter 8.2 |

For column 'UPOV N°':

The numbering of the characteristics is provided as a reference to the UPOV guideline.

| | | |
|-----|--------------------------------|--|
| (*) | UPOV Asterisked characteristic | -Characteristics that are important for the international harmonization of variety descriptions. |
|-----|--------------------------------|--|

For column 'Stage, method':

| | |
|----------------|--|
| MG, MS, VG, VS | -see Chapter 4.1.5 |
| (a) | Explanations covering several Characteristics -see Chapter 8.1 |

(s) summer and autumn varieties

(o) overwintering varieties

7. TABLE OF CHARACTERISTICS

| CPVO N° | UPOV N° | Stage, Method | Characteristics | Examples | Note |
|--------------------------------------|-------------------------|--|-----------------------|--|------|
| 1. QN | 1. (*) | MG/VG 1 | Plant: height | | |
| | | | very short | | 1 |
| | | | short | Chronos (s), Packman (s) | 3 |
| | | | medium | Capitano (s), Forester (s), Jeremy (s), Monty (s) | 5 |
| | | | tall | Heraklion (s), Poseidon (s) | 7 |
| | | | very tall | Blaze (s), Burbank (o) | 9 |
| 2. (+) QN | 2. | VG 1 (a) | Leaf: attitude | | |
| | | | erect | Poseidon (s) | 1 |
| | | | semi-erect | Arcadia (s), Capitano (s), Chronos (s) | 3 |
| | | | horizontal | Ember (o), Monflor (s) | 5 |
| 3. (+) QN | 3. (*) | MS/VG 1 (a) | Leaf: length | | |
| | | | short | Emperor (s), Getti e foglie (s), Kanga (s), Kechua (s) | 3 |
| | | | medium | Cresta (o) | 5 |
| | | | long | Cardinal (o), Monclano (s), Monrello (s) | 7 |
| 4. (+) QN | 4. | MS/VG 1 (a) | Leaf: width | | |
| | | | very narrow | | 1 |
| | | | narrow | Arcadia (s) | 3 |
| | | | medium | Cresta (o), Green Belt (s), Marathon (s) | 5 |
| | | | broad | Cardinal (o), Red Fire (o), Monrello (s) | 7 |

| CPVO N° | UPOV N° | Stage, Method | Characteristics | Examples | Note | |
|-------------------------|-------------------------|---------------------------|---|-----------------------------|--------------------------------------|---|
| 5. (+) | 5. (*) | VG | Leaf: number of lobes | | | |
| | | | 1 | absent or very few | Violet Queen (s) | 1 |
| | | | (a) | few | Early White Sprouting (o), Koros (s) | 3 |
| | | | | medium | Chronos (s), Tinman (s) | 5 |
| | | | | many | Burbank (o), Red Fire (o) | 7 |
| | | | | very many | Bordeaux (s) | 9 |
| 6. (*) | VG | Leaf blade: colour | | | | |
| | | 1 | green | Claret (o), Inspiration (s) | 1 | |
| | | (a) | grey green | Capitano (s) | 2 | |
| | | | blue green | Bordeaux (s), Ironman (s) | 3 | |
| 7. (+) | 7. (*) | VG | Leaf blade: intensity of colour | | | |
| | | | 1 | light | | 3 |
| | | | (a) | medium | | 5 |
| | | | | dark | | 7 |
| 8. (+) | 8. (*) | VG | Leaf blade: undulation of margin | | | |
| | | | 1 | absent or very weak | | 1 |
| | | | (a) | weak | Kanga (s) | 3 |
| | | | | medium | Marathon (s) | 5 |
| | | | | strong | Blaze (s) | 7 |
| | | | | very strong | Bonarda (o), Claret (o), Rudolph (s) | 9 |
| 9. (+) | 9. (*) | VG | Leaf blade: dentation of margin | | | |
| | | | 1 | weak | Violet Queen (s) | 3 |
| | | | (a) | medium | Cresta (o) | 5 |
| | | | | strong | Claret (o) | 7 |

| CPVO N° | UPOV N° | Stage, Method | Characteristics | Examples | Note |
|---------------------------------------|--------------------------|--|---|---|------|
| 10. QN | 10. | VG 1 (a) | Leaf blade: blistering | | |
| | | | absent or very weak | Capitano (s) | 1 |
| | | | weak | Blaze (s) | 3 |
| | | | medium | Cumbal (s), Red Arrow (o) | 5 |
| | | | strong | Bonarda (o), Cardinal (o) | 7 |
| | | very strong | Capitano (s) | 9 | |
| 11. QN | 11. | VG 1 (a) | Petiole: anthocyanin coloration | | |
| | | | absent or very weak | Capitano (s), Jeremy (s), Kanga (s) | 1 |
| | | | medium | Early Purple Sprouting (o), Monarda (s) | 3 |
| | | very strong | Mendocino (o), Red Fire (o) | 5 | |
| 12. (+) QN | 12. | MS/VG 1 (a) | Petiole: length | | |
| | | | very short | Violet Queen (s) | 1 |
| | | | short | Kanga (s) | 3 |
| | | | medium | Ramoso Calabrese (s) | 5 |
| | | | long | Groene Calabrese (s), Monflor (s) | 7 |
| | | very long | | 9 | |
| 13. (+) G | 13. (*) | VG 2 | <u>Only Calabrese type varieties:</u> Head: level of main head in relation to plant height | | |
| | | | low | Marathon (s) | 1 |
| | | | medium | | 2 |
| | | high | Sibsey (s), SV0097BL (s) | 3 | |

| CPVO N° | UPOV N° | Stage, Method | Characteristics | Examples | Note |
|--------------------------|--------------------------|---------------|--|--|------|
| 14. (+) | 14. | MS/VG | Only Calabrese type varieties: Head: length of branching at base of main head | | |
| QN | | 2 | very short | Violet Queen (s) | 1 |
| | | | short | Chronos (s), Kanga (s) | 3 |
| | | | medium | Lord (s) | 5 |
| | | | long | Monflor (s) | 7 |
| | | | very long | | 9 |
| 15. (+) | 15. (*) | MS/VG | Head: diameter | | |
| QN | | 2 | very small | Broccolo di Natale (o), Early Purple Sprouting (o), Getti e foglie (s) | 1 |
| | | | small | | 3 |
| | | | medium | Marathon (s) | 5 |
| | | | large | Packman (s) | 7 |
| | | | very large | Violet Queen (s) | 9 |
| 16. (+) | 16. (*) | VG | Only Calabrese type varieties: Head: shape in longitudinal section | | |
| QN | | 2 | circular | Forester (s) | 1 |
| | | | transverse broad elliptic | | 2 |
| | | | transverse medium elliptic | Sibsey (s) | 3 |
| | | | transverse narrow elliptic | Calabria (s) | 4 |
| 17. | 17. (*) | VG | Head: colour | | |
| PQ | | 2 | whitish | Burbank (o), Cresta (o), Early White Sprouting (o) | 1 |
| | | | green | Forester (s) | 2 |
| | | | grey green | Marathon (s) | 3 |
| | | | blue green | Ironman (s), Tirreno (s) | 4 |
| G | | | violet | Bordeaux (s), Early Purple Sprouting (o) | 5 |

| CPVO N° | UPOV N° | Stage, Method | Characteristics | Examples | Note |
|----------------------|---------|---------------|---|--|------|
| 18. (+) QN | 18. | VG 2 | Head: intensity of colour | | |
| | | | light | | 3 |
| | | | medium | | 5 |
| | | | dark | | 7 |
| 19. QN | 19. | VG 2 | <u>Only varieties with Head: colour: whitish, green, grey green or blue green:</u> Head: intensity of anthocyanin coloration | | |
| | | | absent or very weak | Early White Sprouting (o) | 1 |
| | | | weak | | 2 |
| | | | medium | Steel (s) | 3 |
| | | | strong | | 4 |
| 20. (+) QN | 20. | VG 2 | <u>Only Calabrese type varieties:</u> Head: knobbling | | |
| | | | weak | Sibsey (s) | 3 |
| | | | medium | Cumbal (s), Ironman (s), Marathon (s) | 5 |
| | | | strong | Monflor (s) | 7 |
| 21. QN | 21. | VG 2 | Head: diameter of flower bud | | |
| | | | very small | | 1 |
| | | | small | SV0097BL (s) | 3 |
| | | | medium | Kechua (s) | 5 |
| | | | large | Calabria (s), Kanga (s) | 7 |
| | | | very large | | 9 |
| 22. QN | 22. | VG 2 | <u>Only Calabrese type varieties:</u> Plant: development of secondary heads | | |
| | | | absent or very weak | Lord (s), Montop (s) | 1 |
| | | | weak | Chronos (s) | 3 |
| | | | medium | Giotto (s) | 5 |
| | | | strong | Cresta (o) | 7 |

| CPVO N° | UPOV N° | Stage, Method | Characteristics | Examples | Note |
|--------------------|---------------------|--------------------------|---------------------------------|------------------------------|-------------|
| 23. (+) | 23. (*) | MG | Time of harvest maturity | | |
| QN | | 2 | very early | Sibsey (s) | 1 |
| | | | early | Monflor (s), Red Fire (o) | 3 |
| | | | medium | Tinman (s), Mendocino (o) | 5 |
| | | | late | Marathon (s), Burbank (o) | 7 |
| G | | | very late | Hallmark (s) | 9 |
| 24. (+) | 24. (*) | MS/VS | Male sterility | | |
| QL | | 3 | absent | Marathon (s) | 1 |
| G | | | present | Chevalier (s), Parthenon (s) | 9 |
| 25. | 25. | VG | Flower: colour | | |
| | PQ | 3 | white | | 1 |
| | | | whitish | Gujoa | 2 |
| | | | light yellow | Serydan (s) | 3 |
| | | | medium yellow | Monflor (s) | 4 |
| | | | dark yellow | Alletta (s), Sibsey (s) | 5 |

8. EXPLANATIONS ON THE TABLE OF CHARACTERISTICS

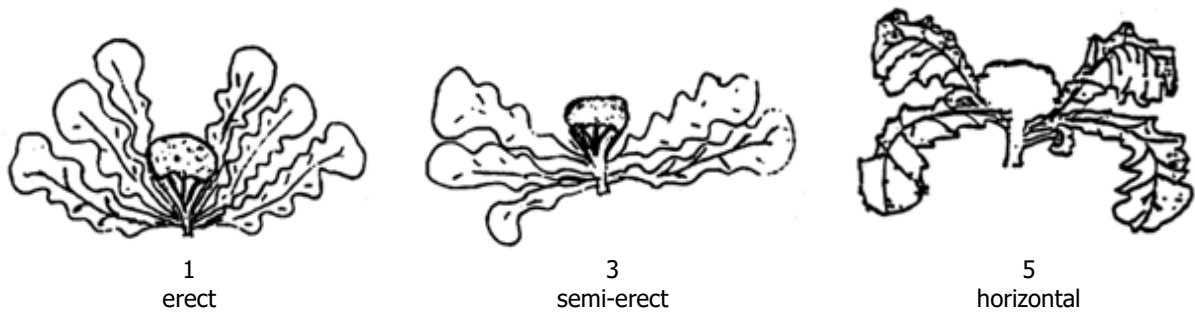
8.1 Explanations covering several characteristics

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

- a) Observations should be made on fully developed leaves in the middle third of the plant.

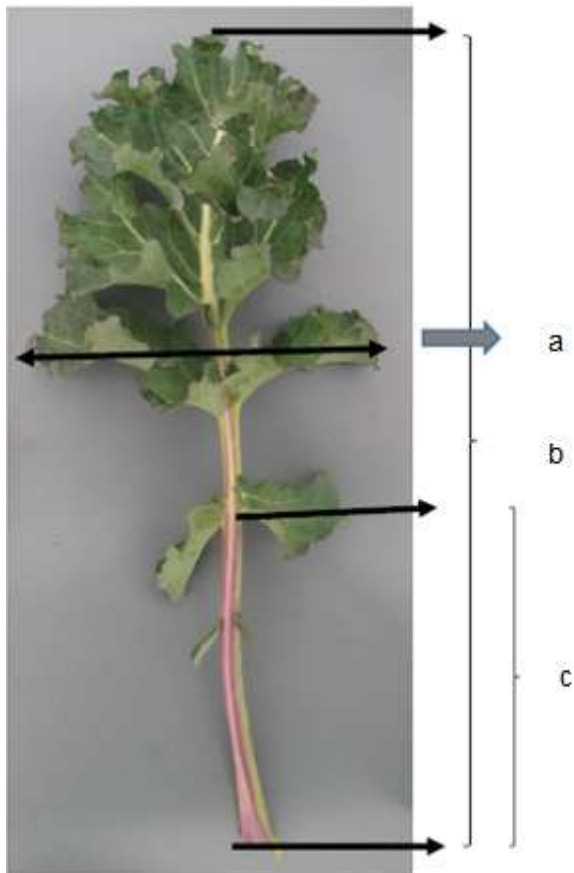
8.2 Explanations for individual characteristics

Ad. 2: Leaf: attitude



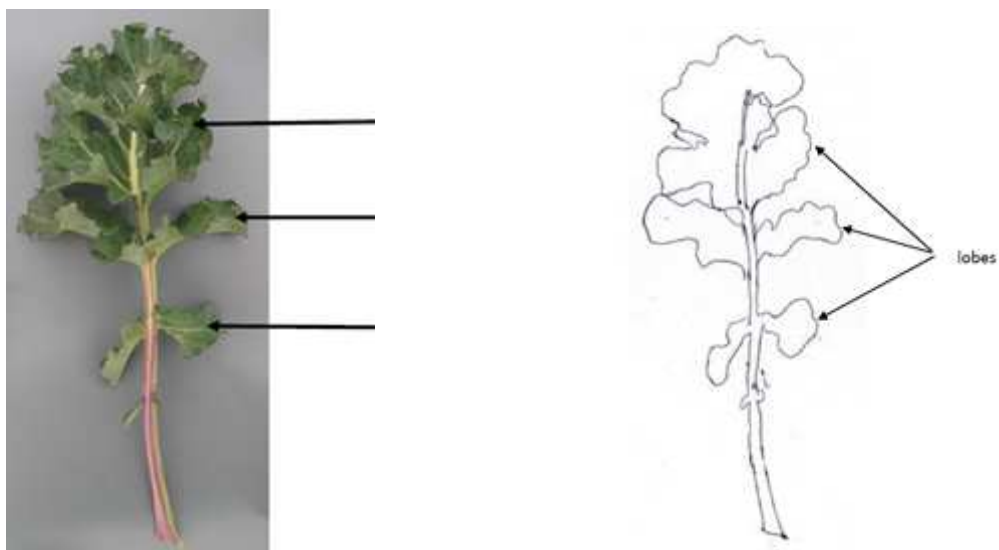
Ad. 3: Leaf: length

Ad. 4: Leaf: width



a = Leaf: length (characteristic 3)
b= Leaf: width (characteristic 4)
c = Petiole: length (characteristic 12)

Ad. 5: Leaf: number of lobes



Parts of the leaf blade are considered as lobes if their length is at least equivalent to the width of the leaf petiole at their point of attachment and if both notches of the blade have at least half the length of the lobe itself.

Ad. 8: Leaf blade: undulation of margin



3
weak



5
medium



7
strong

Ad. 9: Leaf blade: dentation of margin



3
weak



5
medium



7
strong

Ad. 12: Petiole: length

See Ad. 3

Ad. 13: Only Calabrese type varieties: Head: level of main head in relation to plant height



1
low



2
medium

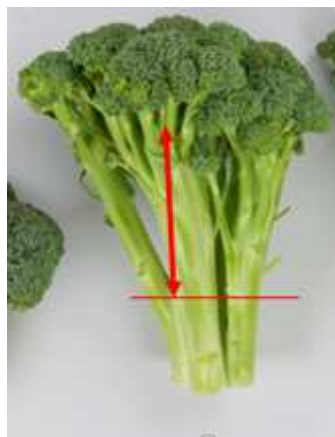


3
high

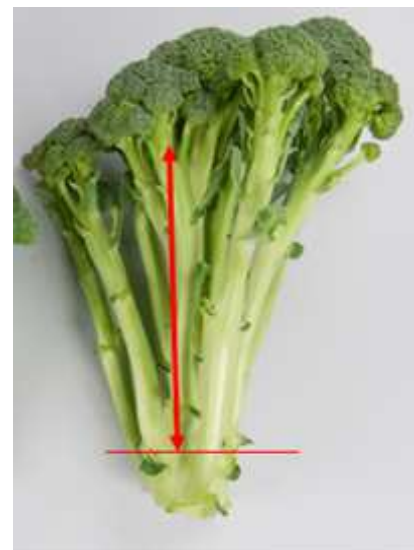
Ad. 14: Only Calabrese type varieties: Head: length of branching at base of main head



3
short



5
medium

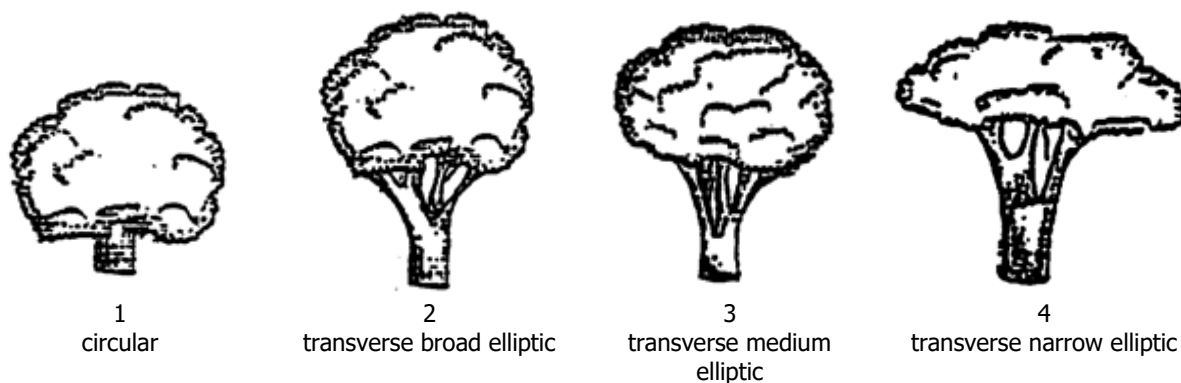


7
long

Ad. 15: Head: diameter

The observation of the diameter of heads of a sprouting type should be made by estimation or measurement of the average diameter of the heads of a plant.

Ad. 16: Only Calabrese type varieties: Head: shape in longitudinal section



Ad. 18: Head: intensity of colour

Observations should be made on green, grey green, blue green and violet heads, excluding whitish heads.

Ad. 20: Only Calabrese type varieties: Head: knobbling



Ad. 23: Time of harvest maturity

Time of harvest maturity is when 50% of the plants have a head (Calabrese type)/ multiple heads (Sprouting type) ready for harvest.

The varieties are divided into two harvest maturity characteristics because the varieties for summer and autumn are never included in the same trial with the overwinter varieties: The overwinter varieties need a much larger amount of cold to develop a head (which is in fact the start of flowering), usually a winter period, whereas the summer and autumn varieties start to develop a head after a little amount of cold. This mechanism is called vernalisation: The induction of flowering by exposure to a certain amount of time of cold temperatures.

In broccoli, time of harvest maturity is strongly influenced by the temperature and the season of growing. Nevertheless, at the same place and for the same growing season, time of harvest maturity is an important characteristic for the assessment of distinctness of varieties. For those reasons, no example varieties are provided in the Test Guidelines and the variety description should always state the place and the season of growing.

Ad. 24: Male sterility

To be tested in a field trial and/or in a DNA marker test¹.

In the case of a field trial, the type of observation is VS. In the case of a DNA marker test, the type of observation is MS.

Field trial:

Observations should be made on fully opened flowers. Tapping or shaking the flowering stem will release pollen, which, if present, can be observed on dark coloured paper or card. The absence of pollen production is an indication of male sterility. The presence of pollen production is an indication of male fertility.



male fertile (pollen present)



male sterile (pollen absent)

DNA marker test:

If the cytoplasmic male sterility (CMS) marker is absent, the variety is expected to have male fertile flowers. If the CMS marker is present, the variety is expected to have male sterile flowers.

In cases where the DNA marker test result does not confirm the declaration in the TQ, a field trial should be performed to observe whether the variety has male fertile or male sterile flowers due to another mechanism.

¹ The description of the method to test male sterility for *Brassica* (CMS marker) is covered by a trade secret. The owner of the trade secret, Syngenta Seeds B.V., has given its consent for the use of the CMS marker solely for the purposes of examination of Distinctness, Uniformity and Stability (DUS) and for the development of variety descriptions by UPOV and authorities of UPOV members. Syngenta Seeds B.V. declares that neither UPOV, nor authorities of UPOV members that use the CMS marker for the above purposes will be held accountable for possible (mis)use of the CMS marker by third parties. Please contact Naktuinbouw, Netherlands, to obtain the method and information on the CMS marker for the purposes mentioned above.

8.3 Types of Broccoli



Calabrese type: One main head and no or small secondary heads that develop in the axils, usually later than the main head



Sprouting type: Multiple heads, the main head is of the same size as the heads in the axils and all develop at the same time

8.4 Growth stages

- 1 = just before harvest maturity
- 2 = at harvest maturity
- 3 = at full flowering

9. LITERATURE

- Gray, 1982: Taxonomy and Evolution of Broccoli (*Brassica oleracea* var. *italica*). *Economic Botany* 36, pp. 397-410
- Gray, 1989: Taxonomy and Evolution of Broccoli and Cauliflower. *Baileya* 23(1), pp. 28-46.
- Helm, J., 1960: Brokkoli und Spargelkohl. *Der Züchter* 30, pp. 223-241
- Marshall, B., Thompson, R., 1987: A Model of the Influence of Air Temperature and Solar Radiation on the Time of Maturity of Calabrese *Brassica oleracea* var. *italica*. *Annals of Botany* 60, pp. 513-519
- Miller, C.H., Konster, T.R., and Lamont, W.J., 1985: Cold Stress Influence on Premature Flowering of Broccoli. *HortScience* 20(2), pp. 193-195
- Wiebe, H.J., 1975: The morphological development of cauliflower and broccoli cultivars depending on temperature. *Sci. Hort.* 3, pp. 95-101

10. TECHNICAL QUESTIONNAIRE

The Technical Questionnaire is available on the CPVO website under the following reference:
CPVO-TQ/151/2-Rev.3 – *Brassica oleracea* L. var. *italica* Plenck – broccoli

Link to e-TQ:

<https://online.plantvarieties.eu/backOfficeFormQuestions?viewFormId=14714&viewFormType=TQ&viewFormLang=EN&speciesName=brassica&status=1,2>