TWV/36/8
ORIGINAL: English
DATE: August 16, 2002

UPOV

# INTERNATIONAL UNION FOR THE PROTECTION OF NEW VARIETIES OF PLANTS

GENEVA

## TECHNICAL WORKING PARTY FOR VEGETABLES

## Thirty-Sixth Session
## Tsukuba, Japan, September 9 to 13, 2002

WORKING PAPER ON THE TEST GUIDELINES FOR BROAD BEAN

*Document prepared by experts from the United Kingdom*

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Proposals for change are underlined.

## I. Subject of these Guidelines

These Test Guidelines apply to all varieties of Broad Bean *Vicia faba* L. var. *major*

## II. Material Required

1. The competent authorities decide when, where and in what quantity and quality the seed required for testing the variety is to be delivered. Applicants submitting material from a State other than that in which the testing takes place must make sure that all customs formalities are complied with. The minimum quantity of seed to be supplied by the applicant in one or several samples should be:

2 kg (or at least 2000 seeds)

The seed should at least meet the minimum requirements for germination capacity, moisture content and purity for marketing standard or certified seed in the country in which the application is made. The germination capacity should be as high as possible.

2. The plant material must not have undergone any treatment unless the competent authorities allow or request such treatment. If it has been treated, full details of the treatment must be given.

## III. Conduct of Tests

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

2. The tests should normally be conducted at one place. If any important characteristics of the variety cannot be seen at that place, the variety may be tested at an additional place.

3. The tests should be carried out under conditions ensuring normal growth. The size of the plots should be such that plants or parts of plants may be removed for measurement and counting without prejudice to the observations which must be made up to the end of the growing period. As a minimum, each test should include a total of 160 plants which should be divided between 2 or more replicates. Separate plots for observation and for measuring can only be used if they have been subject to similar environmental conditions.

4. Additional tests for special purposes may be established.

## IV. Methods and Observations

1. All observations determined by measurement or counting should be made on 40 plants or parts of 40 plants.

Proposal by Poland: Align with Field Bean proposal: Replace 40 plants with 60 plants?

2. All plants indicated under Chapter III above should be used for the testing of uniformity. Relative uniformity standards should be applied.

3. Unless otherwise indicated, all observations on the foliage and the pod should be made before green harvest maturity. Leaf, flower and pod measurements should be made at the second flowering node.

4. All observations on the seed should be made on harvested dry seed and the seed weight should be measured by weighing the largest seed from the largest pod for each plant sampled.

## V. Grouping of Varieties

1. The collection of varieties to be grown should be divided into groups to facilitate the assessment of distinctness. Characteristics which are suitable for grouping purposes are those which are known from experience not to vary, or to vary only slightly, within a variety. Their various states of expression should be fairly evenly distributed throughout the collection.

2. It is recommended that the competent authorities use the following characteristics for grouping varieties:

(a) Wing: melanin spot (characteristic 15)

(b) Dry seed: color of testa (immediately after harvest) (characteristic 32)

Proposal by Poland: additional grouping characteristic

(c) Plant: growth type (characteristic xx)

## VI. Characteristics and Symbols

1. To assess distinctness, uniformity and stability, the characteristics and their states as given in the Table of Characteristics should be used. Additional information on the characteristics can be found in Chapter VII.

2. Notes (1 to 9), for the purposes of electronic data processing, are given opposite the states of expression for each characteristic.

Proposal: For each characteristic it is indicated whether measurements on single plants (MS), visual assessments by a single observation of a group of plants or parts of plants (VG), visual assessments by observations of a number of individual plants or plant parts (VS), or a special test (S), should be used.

3. Legend:

(*) Characteristics that should be used on all varieties in every growing period over which the examinations are made and always be included in the variety descriptions, except when the state of expression of a preceding characteristics or regional environmental conditions render this impossible.

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

[1)] The optimum stage of development for the assessment of each characteristic is indicated by a number in the second column. The stages of development denoted by each number are described at the end of Chapter VIII.

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

| | Plot[1)] Parcelle[1)] Parzelle[1)] Parcela[1)] | English | français | deutsch | español | Example Varieties Exemples Beispielssorten Variedades ejemplo | Note/ Nota |
|---|---|---|---|---|---|---|---|
| **1.** **(+)** | **00 S** | **Seed: tanin** | | | | | |
| | | absent or very weak | | | | Driemaal Wit | 1 |
| | | present | | | | Trio | 9 |
| **2.** **(*)** | **200-299 MS** | **Plant: height** | | | | | |
| | | very short | | | | The Sutton | 1 |
| | | short | | | | Arbo, Reina Mora | 3 |
| | | medium | | | | Aquadulce Claudia | 5 |
| | | tall | | | | Dreadnought | 7 |
| | | very tall | | | | Imperial White Windsor | 9 |
| **3.** **(*)** | **200-299 MS** | **Plant: number of stems (including tillers more than half the length of the main stem)** | | | | | |
| | | few | | | | The Sutton | 3 |
| | | medium | | | | Albinette, Arbo | 5 |
| | | many | | | | Reina Blanca | 7 |
| **4.** | **200-299 MS** | **Stem: number of nodes up to and including first flowering node** | | | | | |
| | | few | | | | Driemaal Wit, Metissa | 3 |
| | | medium | | | | Futura, Hedosa | 5 |
| | | many | | | | (Ite) | 7 |

| | Plot[1)] Parcelle[1)] Parzelle[1)] Parcela[1)] | English | français | deutsch | español | Example Varieties Exemples Beispielssorten Variedades ejemplo | Note/ Nota |
|---|---|---|---|---|---|---|---|
| **5.** | **300-399 VG** | **Stem: anthocyanin coloration** | | | | | |
| | | absent or very weak | | | | Driemaal wit, Metissa | 1 |
| | | weak | | | | Futura, Hedosa | 3 |
| | | medium | | | | | 5 |
| | | strong | | | | | 7 |
| | | very strong | | | | | 9 |
| *Proposal from Germany to rename characteristics: Stem intensity of anthocyanin.*<br>*Proposal by the Netherlands can accept the German proposal, but would prefer 1 absent 9 present* | | | | | | | |
| **6.** | **100-399 VG** | **Foliage: color** | | | | | |
| | | green | | | | Metissa | 1 |
| | | bluish green | | | | | 2 |
| | | greyish green | | | | Osnaweiss | 3 |
| *Proposal by The Netherlands: replace with Foliage color: hue on (of?) green color: 1 absent, 2 bluish, 3 greyish* | | | | | | | |
| **7.** | **100-399 VG** | **Foliage: intensity of green** | | | | | |
| | | light | | | | Driemaal wit | 3 |
| | | medium | | | | Express, Hedosa | 5 |
| | | dark | | | | (Gruno) | 7 |
| **8. (*)** | **220-240 MS** | **Leaflet: length (basal pair of leaflets at second flowering)** | | | | | |
| | | short | | | | Metissa | 3 |
| | | medium | | | | Superaguadulce Tézier, Futura | 5 |
| | | long | | | | Lange Hangers, Osnabrücker Markt | 7 |

| | Plot[1)] Parcelle[1)] Parzelle[1)] Parcela[1)] | English | français | deutsch | español | Example Varieties Exemples Beispielssorten Variedades ejemplo | Note/ Nota |
|---|---|---|---|---|---|---|---|
| **9. (*)** | **220-240 MS** | **Leaflet: width (as for 8)** | | | | | |
| | | narrow | | | | The Sutton | 3 |
| | | medium | | | | Optica | 5 |
| | | broad | | | | Osnabrücker Markt | 7 |
| **10. (*)** | **220-240 VG** | **Leaflet: position of maximum width (as for 8)** | | | | | |
| | | towards tip | | | | Zur spitze hin | 1 |
| | | at middle | | | | Mittel | 2 |
| | | towards base | | | | Zur basis hin | 3 |
| **11.** | **220-240 VG** | **Leaflet: folding (along the main vein, terminal pair of leaflets at second fertile node)** | | | | | |
| | | weak | | | | Metissa | 3 |
| | | medium | | | | | 5 |
| | | strong | | | | Minica | 7 |
| **12. (*)** | **220-240 MS** | **Raceme: number of flowers (at 2nd flowering node)** | | | | | |
| | | few | | | | Aguadulce Claudia | 3 |
| | | medium | | | | | 5 |
| | | many | | | | | 7 |
| **13. (*)** | **210 VG** | **Time of flowering (50% of the plants with at least one flower)** | | | | | |
| | | early | | | | Minica, Optica | 3 |
| | | medium | | | | Hedosa | 5 |
| | | late | | | | Osnabrücker Markt | 7 |

| | Plot[1)] Parcelle[1)] Parzelle[1)] Parcela[1)] | English | français | deutsch | español | Example Varieties Exemples Beispielssorten Variedades ejemplo | Note/ Nota |
|---|---|---|---|---|---|---|---|
| **14. (+)** | **220-230 MS** | **Flower: length** | | | | | |
| | | short | | | | Aguadulce Claudia, Sutton | 3 |
| | | medium | | | | Minica | 5 |
| | | long | | | | Green Windsor | 7 |
| **15. (*)** | **210-299 VG** | **Wing: melanin spot** | | | | | |
| | | absent | | | | Driemaal Wit, Metissa | 1 |
| | | present | | | | Hedosa, Trio | 9 |
| **16. (*)** | **210-299 VG** | **Wing: color of melanin spot** | | | | | |
| | | brown | | | | | 1 |
| | | black | | | | Hedosa, Trio | 2 |
| | | greenish yellow | | | | Golda | 3 |
| **17.** | **210-299 VG** | **Standard: melanin spot** | | | | | |
| | | absent | | | | Driemaal wit, Futura | 1 |
| | | present | | | | Felix | 9 |
| **18. (*)** | **210-299 VG** | **Standard: anthocynin coloration** | | | | | |
| | | absent | | | | Driemaal Wit | 1 |
| | | present | | | | | 9 |

*Proposal by Germany and Poland to add new characteristics; the Netherlands consider this characteristics is too climate dependent.*

| | Plot[1)] Parcelle[1)] Parzelle[1)] Parcela[1)] | English | français | deutsch | español | Example Varieties Exemples Beispielssorten Variedades ejemplo | Note/ Nota |
|---|---|---|---|---|---|---|---|
| **18b.** | **210-229 VG** | **Standard: intensity of anthocyanin coloration** | | | | | |
| | | weak | | | | | 3 |
| | | medium | | | | | 5 |
| | | strong | | | | | 7 |
| **19. (+)** | **210-299 VG** | **Standard: extent of anthocyanin coloration** | | | | | |
| | | small | | | | The Sutton, Osnabrücker Markt | 3 |
| | | medium | | | | | 5 |
| | | large | | | | | 7 |
| *Proposal by Poland to add new characteristic* | | | | | | | |
| **19b. (*)** | **>350 VG** | **Plant: growth type** | | | | | |
| | | determinate | | | | Samson, Serf | 1 |
| | | indeterminate | | | | Driemaal Wit | 2 |
| **20. (*)** | **350-360 MS** | **Truss: number of pods** | | | | | |
| | | few | | | | Aguadulce Claudia, Muchamiel | 3 |
| | | medium | | | | Metissa | 5 |
| | | many | | | | | 7 |
| **21. (*)** | **320-399 VG** | **Pod: attitude** | | | | | |
| | | erect | | | | Optica | 1 |
| | | semi-erect | | | | Statissa, The Sutton | 3 |
| | | horizontal | | | | Trio | 5 |
| | | semi-pendulous | | | | Express | 7 |
| | | pendulous | | | | Lange Hangers, Hedosa | 9 |

| | Plot[1)] Parcelle[1)] Parzelle[1)] Parcela[1)] | English | français | deutsch | español | Example Varieties Exemples Beispielssorten Variedades ejemplo | Note/ Nota |
|---|---|---|---|---|---|---|---|
| **22. (*)** | **350-370 MS** | **Pod: length (without beak)** | | | | | |
| | | very short | | | | Arbo | 1 |
| | | short | | | | Green Windsor, Optica | 3 |
| | | medium | | | | Driemaal Wit, Red Epicure | 5 |
| | | long | | | | Dreadnought | 7 |
| | | very long | | | | Hangdown Grünkernig | 9 |
| **23.** | **350-370 MS** | **Pod: width (from suture to suture)** | | | | | |
| | | very narrow | | | | | 1 |
| | | narrow | | | | Felix, Minica | 3 |
| | | medium | | | | Express, Trio | 5 |
| | | broad | | | | Con Amore | 7 |
| | | very broad | | | | Aguadulce Claudia | 9 |
| **24. (*)** | **350-370 MS** | **Pod: width (from suture to suture)** | | | | | |
| | | very narrow | | | | | 1 |
| | | narrow | | | | Felix, Minica | 3 |
| | | medium | | | | Express, Trio | 5 |
| | | broad | | | | Con Amore | 7 |
| | | very broad | | | | Aguadulce Claudia | 9 |

| | Plot[1)] Parcelle[1)] Parzelle[1)] Parcela[1)] | English | français | deutsch | español | Example Varieties Exemples Beispielssorten Variedades ejemplo | Note/ Nota |
|---|---|---|---|---|---|---|---|
| **25. (+)** | **350-370 VG** | **Pod: degree of curvature at green shell stage** | | | | | |
| | | absent or very weak | | | | Optica | 1 |
| | | weak | | | | Metissa | 3 |
| | | medium | | | | Witkiem | 5 |
| | | strong | | | | Groene Hangers, Hedosa | 7 |
| | | very strong | | | | | 9 |
| **26.** | **350-370 VG** | **Pod: intensity of green color** | | | | | |
| | | light | | | | Hedosa | 3 |
| | | medium | | | | Driemaal Wit | 5 |
| | | dark | | | | Statissa | 7 |
| **27. (*)** | **350-370 MS** | **Pod: number of ovules (including seeds)** | | | | | |
| | | few | | | | White Windsor | 3 |
| | | medium | | | | Aquadulce Claudia | 5 |
| | | many | | | | Imperial Green Longpod | 7 |
| **28.** | **350-370 MS?** | **Pod: thickness of pod wall** | | | | | |
| | | thin | | | | Statissa | 3 |
| | | medium | | | | | |
| | | thick | | | | Aguadulce Claudia, Hedosa | 7 |

| | Plot[1)] Parcelle[1)] Parzelle[1)] Parcela[1)] | English | français | deutsch | español | Example Varieties Exemples Beispielssorten Variedades ejemplo | Note/ Nota |
|---|---|---|---|---|---|---|---|
| **29. (*) (+)** | **500 VG** | **Dry seeed: shape of median longitudinal section** | | | | | |
| | | narrow elliptic | | | | Metissa | 1 |
| | | elliptic | | | | | 2 |
| | | broad elliptic | | | | Hedosa | 3 |
| | | circular | | | | | 4 |
| | | square | | | | | 5 |
| | | ovate | | | | | 6 |
| *UK proposes to delete asterisk and deleting states narrow elliptic and elliptic and adding state for obovate* | | | | | | | |
| **30.** | **500 VG** | **Dry seed: shape of cross section** | | | | | |
| | | narrow elliptic | | | | Aguadulce Claudia, Hedosa | 1 |
| | | elliptic | | | | | 2 |
| | | broad elliptic | | | | (Ite) | 3 |
| **31 (*)** | **500 MS?** | **Dry seed: weight** | | | | | |
| | | very low | | | | Albinette, Minica | 1 |
| | | low | | | | Arbo, Felix | 3 |
| | | medium | | | | The Sutton, Trio | 5 |
| | | high | | | | Futura, Red Epicure | 7 |
| | | very high | | | | White Windsor | 9 |
| *France propose to change character to read Dry seed: 100 seed weight – but see Chapter IV 4* | | | | | | | |

| | Plot[1)] Parcelle[1)] Parzelle[1)] Parcela[1)] | English | français | deutsch | español | Example Varieties Exemples Beispielssorten Variedades ejemplo | Note/ Nota |
|---|---|---|---|---|---|---|---|
| **32. (*) (+)** | **500 VG** | **Dry seed: color of testa (immediately after harvest)** | | | | | |
| | | beige | | | | Driemaal Wit, Trio | 1 |
| | | green | | | | Green Windsor | 2 |
| | | red | | | | Red Epicure | 3 |
| | | violet | | | | Reina Mora | 4 |
| | | black | | | | | 5 |
| **33. (+)** | **500 VG** | **Dry seed: black pigmentation of hilum** | | | | | |
| | | absent | | | | Driemaal Wit | 1 |
| | | present | | | | Aquadulce Claudia | 9 |
| **34.** | **500 VG** | **Time of full development of pod (first fully developed pods)** | | | | | |
| | | early | | | | Express | 3 |
| | | medium | | | | Driemaal Wit | 5 |
| | | late | | | | Imperial Green Longpod | 7 |

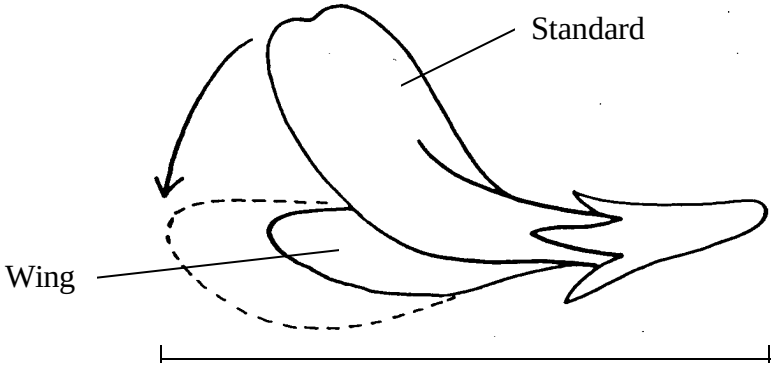
VIII. Explanations on the Table of Characteristics

Ad. 1: Seed: tannin

Tannin content of testa correlates with melanin spot on the flower wing. Maintaining both characteristics is necessary, as observations are made at very different stages and different times. The content of tannin should be tested by removing a piece of the testa from the seed and placing 1 or 2 drops of the test reagent upon its inner surface. A bright pink color will develop within 1 or 2 minutes in the presence of tannins (Reagent: A 50% ethanol; B 1% vanillin in concentrated HCl; A and B mixed 1:1 for use). For the purposes of this test, 'concentrated' is defined as within the range 33-37% weight by volume.

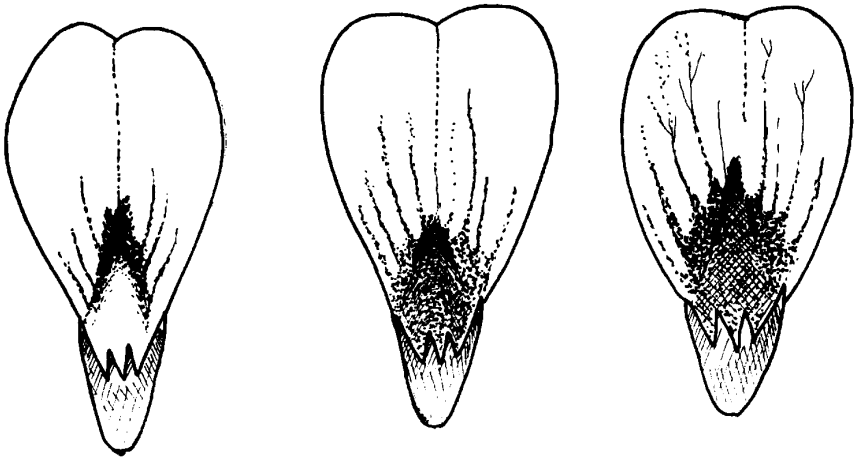
Seeds that are yellowish grey immediately after harvest will turn brown after aging if they contain tannin.

Ad. 14: Flower: length




length

Ad. 19: Standard: extent of anthocyanin coloration



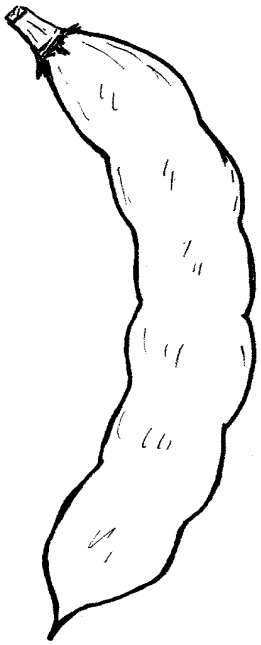
3 small | 5 medium | 7 large

The observation should be made on the inner side of the Standard

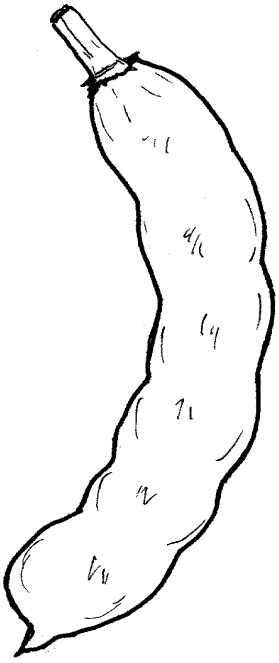
Ad. 25: Pod: degree of curvature at green shell stage

1
absent or very weak

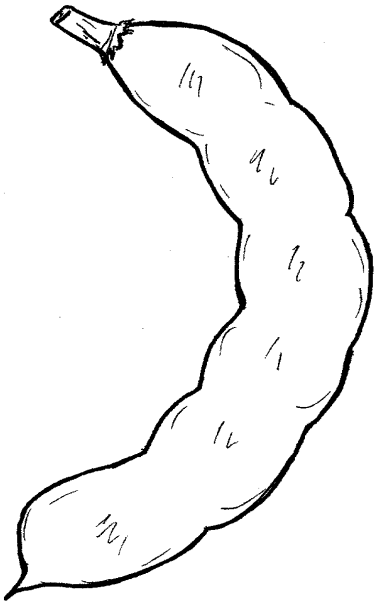
3
weak



5
medium

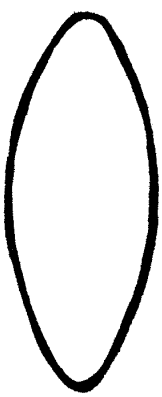


7
strong

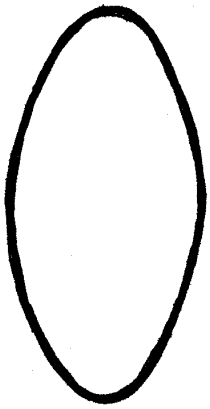


9
very strong

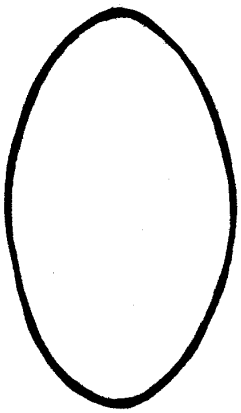
Ad. 29:. Seed: shape of median longitudinal section



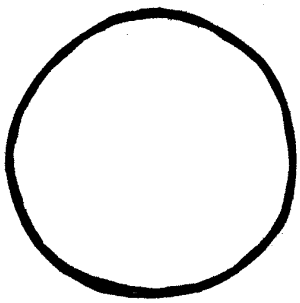
1
narrow elliptic



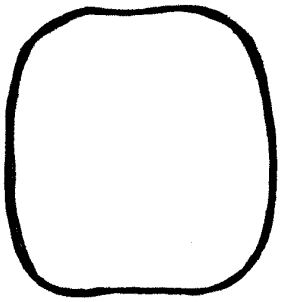
2
elliptic



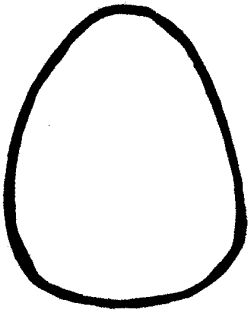
3
broad elliptic



4
circular



5
square



6
ovate

UK proposes to

1. delete states narrow elliptic and elliptic
2. add state obovate

Orientation of seed: hilum bottom right

Ad. 33: Dry seed: black pigmentation of hilum

Certain varieties, which by their genetic structure show segregation in respect of this characteristic, are admissible provided that the breeder is able to ensure stability. However, this characteristic cannot be used for establishing distinctness of varieties mentioned in the previous sentence. For varieties which show segregation, the characteristic should be described in the state "present" and the proportions of the two states of expression should, in each individual case, be included in the description.

Growth Key

| Key | General Description of Growth Stage |
|---|---|
| 00 | Dry seed |
| 01 - 09 | Germination to emergence from soil |

**Seedling Growth**

| | |
|---|---|
| 10 | First scale leaf fully developed (first node) |
| 15 | Second scale leaf fully developed (second node) |
| 20 | First true leaf developing at the third node |
| 25 | First true leaf partially opened, but not fully developed |
| 30 | First true leaf fully developed and opened |
| 40 | Second true leaf fully developed and opened |
| 50 | Third true leaf fully developed and opened |

**Vegetative growth from seedling to flowering**

| | |
|---|---|
| 60 | Fourth true leaf fully developed and opened |
| 70 | Fifth true leaf fully developed and opened |
| 80 | Sixth true leaf fully developed and opened |
| 90 | Seventh true leaf fully developed and opened |
| 100 | Eighth true leaf fully developed and opened |
| 110 | Ninth true leaf fully developed and opened |
| 120 | Tenth true leaf fully developed and opened |
| 130 | Eleventh true leaf fully developed and opened |
| 140 | Twelfth true leaf fully developed and opened |
| 150 | Thirteenth true leaf fully developed and opened |
| 160 | Fourteenth true leaf fully developed and opened |
| 170 | Fifteenth true leaf fully developed and opened |
| 180 | Sixteenth true leaf fully developed and opened |

**Reproductive growth from flowering to podding**

| | |
|---|---|
| 200 | Flower buds visible on the first flowering node |
| 205 | Flower open, but not fully open |
| 210 | First fully open flower on the first raceme |
| 220 | Second fully open flower on the first raceme |
| 230 | Third fully open flower on the first raceme |
| 240 | Fourth fully open flower on the first raceme |
| 250 | Fifth fully open flower on the first raceme |

**Reproductive growth from podset to full pod development**

| | |
|---|---|
| 300 | First pod set |
| 320 | First pod well formed with immature seeds |
| 330 | First pod fully formed with seeds at maximum size |
| 340 | First pod with seeds becoming starchy |
| 360 | Second pod with seeds becoming starchy |
| 370 | Third pod with seeds becoming starchy |
| 380 | Fourth pod with seeds becoming starchy |

**Pod senescence to seed ripening**

| | |
|---|---|
| 400 | Pods beginning to dry out and turn black |
| 425 | 25% of pods dry and black, seeds at lowest nodes becoming rubbery |
| 450 | 50% of pods dry and black, seeds at lowest nodes becoming dry and hard |
| 475 | 75% of pods dry and black, seeds at lowest nodes dry and hard |
| 500 | All pods dry and black, seeds dry and hard |

Proposal by Poland to use the same key as that in the Field Bean guideline (see below)

Phenological growth stages and BBCH-identification keys of
*Vicia faba* L. (Meier, 1997)

Code Description

Principal growth stage 0: Germination
00 Dry seed
01 Beginning of seed imbibition
02 –
03 Seed imbibition complete
04 –
05 Radicle emerged from seed
06 –
07 Shoot emerged from seed (plumule apparent)
08 Shoot growing towards soil surface
09 Emergence shoot emerges through soil surface

Principal growth stage 1: Leaf development[1]
10 Pair of scale leaves visible (may be eaten or lost)
11 First leaf unfolded
12 2 leaves unfolded
13 3 leaves unfolded
1 . Stages continuous till ....
19 9 or more leaves unfolded

Principal growth stage 2: Formation of side shoots
20 No side shoots
21 Beginning of side shoot development: first side shoot detectable
22 2 side shoots detectable
23 3 side shoots detectable
2 . Stages continuous till .....
29 End of side shoot development: 9 or more side shoots detectable

[1] Stem elongation may occur earlier than stage 19; in this case continue with the principal stage 3.

Principal growth stage 3: Stem elongation
30 Beginning of stem elongation
31 One visibly extended internode[2]
32 2 visibly extended internodes
33 3 visibly extended internodes
3 . Stages continuous till ....
39 9 or more visibly extended internodes

[2] First internode extends from the scale leaf node to the first true leaf node.

| Code | Description |
|---|---|
| Principal growth stage 4: ----- | |
| Principal growth stage 5: Inflorescence emergence | |
| 50 | Flower buds present, still enclosed by leaves |
| 51 | First flower buds visible outside leaves |
| 52 – | |
| 53 – | |
| 54 – | |
| 55 | First individual flower buds visible outside leaves but still closed |
| 56 – | |
| 57 – | |
| 58 – | |
| 59 | First petals visible, many individual flower buds, still closed |
| Principal growth stage 6: Flowering | |
| 60 | First flowers open |
| 61 | Flowers open on first raceme |
| 62 – | |
| 63 | Flowers open 3 racemes per plant |
| 64 – | |
| 65 | Full flowering: flowers open on 5 racemes per plant |
| 66 – | |
| 67 | Flowering declining |
| 68 – | |
| 69 | End of flowering |
| Principal growth stage 7: Development of fruit | |
| 70 | First pods have reached final length (“flat pod”) |
| 71 | 10 % of pods have reached final length |
| 72 | 20 % of pods have reached final length |
| 73 | 30 % of pods have reached final length |
| 74 | 40 % of pods have reached final length |
| 75 | 50 % of pods have reached final length |
| 76 | 60 % of pods have reached final length |
| 77 | 70 % of pods have reached final length |
| 78 | 80 % of pods have reached final length |

Principal growth stage 8: Ripening

| | |
|---|---|
| 80 | Beginning of ripening: seed green, filling pod cavity |
| 81 | 10 % of pods ripe, seeds dry and hard |
| 82 | 20 % of pods ripe, seeds dry and hard |
| 83 | 30 % of pods ripe and dark, seeds dry and hard |
| 84 | 40 % of pods ripe and dark, seeds dry and hard |
| 85 | 50 % of pods ripe and dark, seeds dry and hard |
| 86 | 60 % of pods ripe and dark, seeds dry and hard |
| 87 | 70 % of pods ripe and dark, seeds dry and hard |
| 88 | 80 % of pods ripe and dark, seeds dry and hard |
| 89 | Fully ripe: nearly all pods dark, seeds dry and hard |

| Code | Description |
|---|---|

Principal growth stage 9: Senescence

| | |
|---|---|
| 90 – | |
| 91 – | |
| 92 – | |
| 93 | Stems begin to darken |
| 94 – | |
| 95 | 50 % of stems brown or black |
| 96 – | |
| 97 | Plant dead and dry |
| 98 – | |
| 99 | Harvested product. |

IX. Literature

Anon 1995. Faba Bean Breeding. Grain Legumes. 8.

Anon 1995. Field Bean Handbook. Processors and Growers Research Organisation, Peterborough.

Anon. 1990. Pea and bean pests, diseases and disorders. Processors and Growers Research Organisation, Peterborough.

Anon. 1990. Diseases of peas and beans. National Institute of Agricultural Botany. Cambridge.

Bould, A. and Crofton, G.R.A. 1987. Variation in the expression of hilum colour in field bean varieties in relation to seed certification standards. Seed Science and Technology, 15, 651-662.

Cabrera, A. and Martin, A. 1989. Genetics of tannin content and its relationship with flower and testa colours in *Vicia faba*. Journal of Agricultural Science, Cambridge. 113. 93-98.

Chapman, G.P. 1981. Genetic variation within *Vicia faba*. Aleppo: FABIS, ICARDA. 3, Supplement 1-12.

Cooke, R.J., Higgins, J., Morgan, A.G. and Evans, J.L. 1985. The use of a vanillin test for the detection of tannins in cultivars of *Vicia faba* L. J. Natn. Inst. Agric. Bot. 17. 139-143.

Crofton, G.R.A. 1996. A review of pollination and seed setting in Faba beans. Plant Varieties and Seeds 9, 29-36.

Duc, G., Brun, N., Merghem, R. and Jay, M. 1995. Genetic variation in tanning related characteristics in faba bean seeds (*Vicia faba* L.) and their relationship with seed coat colour. Plant Breeding, 114, 272 - 274.

Ebmeyer, E. and Stelling, D. 1994. Genetic structure of three open pollinated faba bean varieties (*Vicia faba* L.) Plant Breeding, 112, 17 - 23.

Erith, A.G. 1930. The inheritance of colour, size and form of seeds and flower colour in *Vicia faba* L.. Genetica, 12, 477-510

Hebblethwaite, P.D. (Ed) 1983. The Faba Bean (*Vicia faba* L.): a basis for improvement. London. Butterworths. ISBN 0-408-10695-6

Higgins, J., Evans, J.L., and Reed, P.J. 1981. Classification of Western European cultivars of *Vicia faba* L. Journ. Natn. Inst. Agric. Bot. 15. 3. 480-487.

Higgins, J. and Evans, J.L. 1983. Description of field bean cultivars (Vicia faba L. (partim.) *Vicia faba* L. J. Natn. Inst. Agric. Bot. 16. 273-277.

Higgins, J. and Evans, J.L. 1984. Standards employed in Distinctness uniformity and stability tests for faba bean cultivars. In Systems for cytogenetic analysis in *Vicia faba* L. Ed. Chapman, G.P. and Tarawali, S.A.. Dordrecht, Martinus Nijhoff.

Higgins, J., Evans, J.L. and Law, J.R. 1988. A revised classification and descriptions of faba bean cultivars (*Vicia faba* L.). Plant Varieties and Seeds. 1. 27-35.

Higgins, J. and Sparks, T.H. 1989. A comparison of single-seed weight and 100-seed weight in faba bean varieties (*Vicia faba* L.). Plant Varieties and Seeds, 2 193-200.

Kaznowski, L. 1923 Studja nad bobikiem (Vicia faba L., V. minor A.) Cz. I. Bobik Nadwislandski. Nadbitka z. Pamietnika panstw., Instytutu Naukowego Gospodarstwa Wiejskiego W Pulawach IV Pt A 50-85. (Polish with French summary).

Knott, C. M. 1990. A key for stages of development of the faba bean (*Vicia faba*). Ann. appl. Biol. 116, 391-404.

Link, W., Ederer, W. Metz, P., Buiel, H. and Melchinger, A.E. 1994. Genotypic and environmental variation for degree of cross-fertilisation in faba bean. Crop Science, 34, 960 - 969.

Mudzana, G., Pickett, A.A., Jarman, R.J., Cooke, R.J. and Keefe, P.D. 1995. Variety discrimination in faba beans (*Vicia faba* L.): an integrated approach. Plant Varieties and Seeds, 8, 135-145.

Muratova, V.S. 1931. Common Beans (*Vicia faba* L.). Bulletin of Applied Botany of Genetics and plant Breeding. 50th supplement. pp 248-285. (English summary)

Picard, J. 1963. La coloration des téguments du grain chez la féverole (*Vicia faba* L.) Etude de l'hérédité des différentes colorations. Annales de l'Amélioration des Plantes, 13, 97-117.

Ricciardi, L., Filippetti, A., De Pace, C. and Marenzo, C.F. 1985. Inheritance of seed coat colour in Broad Bean (*Vicia faba* L.). Euphytica, 34, 43-51.

Sirks, M.J. 1931. Beitrage zu einer genotypischen analyse der Ackerbonne (*Vicia faba* L.) Genetica, 13, 210-631.

Sjodin, J. 1971. Induced morphological variation in *Vica faba* L. Hereditas. 67: 155 - 180.

Smartt, J. 1990. Grain Legumes: evolution and genetic resources. Cambridge University Press. ISBN 0-521-30797 X

Summerfield, R.J. (Ed.) 1988. World Crops: Cool season food legumes. Proceedings of the International Food legume Research Conference on Pea, Lentil, Faba Bean and Chickpea. Spokane, Washington, USA 6-11 July 1986. Current Plant Science and Biotechnology in Agriculture. Kluwer Academic Publishers. ISBN 90-247-3641-2.

Summerfield, R.J. and Roberts, E.H. (Eds.) 1985 Grain Legume Crops. London, Collins.
Simmonds, N.W. and Smartt, J. 1995. Evolution of Crop Plants. Longman. ISBN 0-582-08643-4

Thompson, R. 1981. *Vicia faba*: physiology and breeding. The Hague, Martinus Nijhoff.

Ward, S. and Chapman, G.P. 1986 Third conspectus of genetic variation within *Vicia faba*. FABIS, ICARDA.

X. Technical Questionnaire

| | |
|---|---|
| | Reference Number<br>(not to be filled in by the applicant) |
| | |

TECHNICAL QUESTIONNAIRE
to be completed in connection with an application for plant breeders' rights

| | | |
|---|---|---|
| 1. | Species | Types of *Vicia faba* L. var. *major*<br><br>BROAD BEAN |
| 2. | Applicant (Name and address) | |
| 3. | Proposed denomination or breeder's reference | |

4. Information on origin, maintenance and reproduction of the variety

4.1 Variety type

Open pollinated variety [ ]
Synthetic hybrid [ ]

4.2 Other information

5. Characteristics of the variety to be indicated (the number in brackets refers to the corresponding characteristic in Test Guidelines; please mark the state of expression which best corresponds).

| | Characteristics | Example Varieties | Note |
|---|---|---|---|
| **5.1 (2)** | **Plant: height** | | |
| | very short | The Sutton | 1[ ] |
| | short | Arbo, Reina Mora | 3[ ] |
| | medium | Aquadulce Claudia | 5[ ] |
| | tall | Dreadnought | 7[ ] |
| | very tall | Imperial White Windsor | 9[ ] |
| **5.2 (15)** | **Wing: melanin spot** | | |
| | absent | Driemaal Wit, Metissa | 1[ ] |
| | present | Hedosa, Trio | 9[ ] |

| | Characteristics | Example Varieties | Note |
|---|---|---|---|
| **5.3 (16)** | **Wing: color of melanin spot** | | |
| | brown | | 1 |
| | black | Hedosa, Trio | 2 |
| | greenish yellow | Golda | 3 |
| **5.4 (22)** | **Pod: length (without beak)** | | |
| | very short | Arbo | 1[ ] |
| | short | Green Windsor, Optica | 3[ ] |
| | medium | Drimaal Wit, Red Epicure | 5[ ] |
| | long | Dreadnought | 7[ ] |
| | very long | Handown Grünkernig | 9[ ] |
| **5.5 (31)** | **Dry seed: weight** | | |
| | very low | Abinette, Minica | 1[ ] |
| | low | Arbo, Felix | 3[ ] |
| | medium | The Sutton, Trio | 5[ ] |
| | high | Futura, Red Epicure | 7[ ] |
| | very high | White Windsor | 9[ ] |
| **5.6 (32)** | **Dry seed: color of testa (immediately after harvest)** | | |
| | beige | Driemaal Wit, Trio | 1[ ] |
| | green | Green Windsor | 2[ ] |
| | red | Red Epicure | 3[ ] |
| | violet | Reina Mora | 4[ ] |
| | black | | 5[ ] |

6. Similar varieties and differences from these varieties

| Denomination of similar variety | Characteristic in which the similar variety is different [o)] | State of expression of similar variety | State of expression of candidate variety |
|---|---|---|---|
| | | | |

7. Additional information which may help to distinguish the variety

7.1 Resistance to pests and diseases

7.2 Special conditions for the examination of the variety

7.3 Other information

8. Authorization for release

(a) Does the variety require prior authorization for release under legislation concerning the protection of the environment, human and animal health?

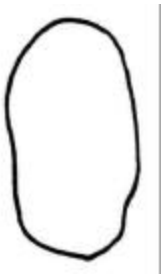
Yes [ ] No [ ]

(b) Has such authorization been obtained?

Yes [ ] No [ ]

If the answer to that question is yes, please attach a copy of such an authorization.

Alternative drawings for characteristic 29.



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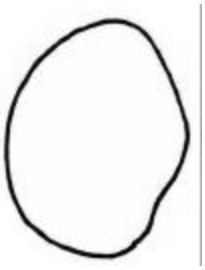

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