

Guidelines for the conduct of tests for Distinctiveness, Uniformity and Stability

Faba bean (*Vicia faba* L. var. *major* Harz)



**Protection of Plant varieties and Farmer's Rights Authority
Government of India**

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Faba Bean

I. Subject

These test guidelines will be applied to all varieties of faba bean (*Vicia faba* L. var. *major* Harz.) grown for grain production. Faba bean (*Vicia faba* L.) also known as broad bean, fava bean, horse bean, Windsor bean or tick bean is coarse, upright annual herb.

II. Seed Material required

1. The Protection of Plant Variety and Farmers' Right Authority (PPV&FRA) shall decide when, where and in what quantity and quality the seed material required for testing of the variety for registration under PPV&FR Act, 2001. Applicants submitting seed material from a country other than India shall make sure that all customs and quarantine requirements stipulated under relevant national legislations and regulations are complied with. The minimum quantity of seed to be supplied by the applicant shall be 150 gram.
2. The seed material should meet the minimum germination percentage (70%), moisture content (not more than 9%), physical purity (98%) and highest genetic purity as prescribed for seed certification in India. The applicant shall also submit along with the seed, a certified data on germination test made not more than one month prior to the date of submission.
3. The seed material shall not have undergone any treatment unless the competent authority 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 DUS tests should normally be at least two independent but similar growing seasons.
2. The test should normally be conducted at two test locations. If any essential characteristic of the candidate variety is not expressed for visual observation at one place, the variety may be tested at another test site.
3. The field test shall be carried out under conditions ensuring normal growth. The size of the plot should be such that plants or parts of plant may be removed for measuring and counting without prejudicing of the observations on standing crop plants or parts of plants until the end of the growing period. Each test should include a minimum of 150 plants, which should be divided among 3 replications. Separate plots for observation and for measurement, can only be used if they have been subjected to similar environmental conditions. All the replications shall be sharing similar environmental conditions of the test location.

4. Test Plot Design

Number of rows	:	6
Row length	:	2 m
Plant to plant distance	:	20 cm
Row to Row distance	:	45 cm
Number of replications	:	3

5. Observations should not be recorded on plants in border rows.
6. Observation should be recorded from 10 plants from each replication.
7. Additional test protocols for special purpose shall be established by the PPV&FR, Authority.

IV. Methods and observations

1. The characteristics described in the Table of characteristics shall be used for the testing of varieties for DUS (Section VII).
2. For the assessment of distinctiveness, uniformity and stability, observation should be made on 30 plants or parts of plants, which should be divided among 3 replications (10 plants in each replication).
3. For assessment of uniformity of characteristics on the plot as a whole (visual assessment by a single observation of a group of plants or parts of plant), 30 plants (a population standard of 0.5% with an acceptance probability of at least 95% should be applied) are considered for observations and any other observations should be made on all plants in the test.
4. For the assessment of colour characteristics, Royal Horticulture Society (RHS) colour chart be used.

V. Grouping of varieties

Grouping characteristics are those, which are known from experience not to vary, or to vary only to lesser extent, within a variety, can be used to divide the candidate varieties for DUS testing into different groups to facilitate the examination of Distinctiveness. The states of expression (even produced at different locations) should be fairly and evenly distributed throughout the collection.

The following will be the useful grouping characteristics for faba bean:

- a) Plant: growth type (characteristic 2)
- b) Wing: melanin spot (characteristic 6)

- c) Dry seed: colour of testa (characteristic 31)
- d) Dry seed: pigmentation of hilum (characteristic 32)

VI. Characteristics and symbols

1. To assess Distinctiveness, Uniformity and Stability, the characteristics and their states as given in the table of characteristics (Section VII) should be used.
2. Notes (1 to 9) which are given against the states of the different characteristics at column 4 shall be used to describe the state of each character for the purpose of electronic data processing.
3. Legend
 - (*) Characteristics that shall be observed during every growing period for the examination of all the varieties and shall always be included in the description of the variety, except when the state of expression of a preceding characteristic or regional environmental conditions render this impossible.

(10)- (100) See Explanation on the Table of Characteristic in Section VIII A.

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

QL: Qualitative characteristic
QN: Quantitative characteristic
PQ: Pseudo-qualitative characteristic

4. The optimum stage of plant growth for assessment of each characteristic is given in the column 6 of Table of Characteristic (Section VII).
5. Example Varieties: Where appropriate, example varieties are provided to clarify the states of expression of each characteristic.
6. Type of assessment of characteristics indicated in column 7 of Table of Characteristics (Section VII) is as follows:

MG: Measurement by a single observation on a group of plants or parts of plants
MS: Measurement on a number of individual plant or parts of plants
VG: Visual assessment by a single observation on a group of plants or parts of plants
VS: Visual assessment by observation on individual plant or parts of plants

VII. Table of Characteristics

Table characteristics of Faba bean (*Vicia faba*):

S.N	Characteristics	States	Note	Example variety/ line	State of observation	Type of assessment
1. (+) QN	Seed: tannin	Absent	1	-	100	VG
		Present	9	Vikrant		
2. (* QL	Plant: growth habit	Determinate	1	-	70	VG
		Semi determinate	2	Vikrant		
		Indeterminate	3	-		
3. (* (+) QN	Plant height (cm)	Short (<65)	3	IC593709	70	MG
		Medium (65-95)	5	Patna 3		
		Tall (>95)	7	PRT 12		
4. (* QN	Plant: number of stems (including tillers more than half the length of the main stem)	Few (<8)	3	IC593700	70	MS
		Medium (8-10)	5	Vikrant		
		Many (>10)	7	PRT 12		
5. (* QN	Stem: number of nodes up to and including first flowering node	Few (<20)	3	IC-593682	70	MS
		Medium (20-30)	5	Vikrant		
		Many (>30)	7	IC593667		
6. (* QL	Stem: anthocyanin coloration	Absent	1	-	60	VS
		Present	9	Vikrant, PRT 12		
7. (+) QN	Leaflet: length (cm)	Short (<6.5)	3	IC593670	70	VG/MS
		Medium (6.5-9)	5	Vikrant		
		Long (>9)	7	IC593717		
8. (+) QN	Leaflet: width (cm)	Narrow (<2.5)	3	IC593702, IC593670	70	VG/MS
		Medium (2.5-3.5)	5	Patna 6		
		Broad (>3.5)	7	Vikrant		
9. (+) QL	Leaflet shape	Narrow (Elongate)	1	IC593702	70	VG
		Intermediate (Sub eleptic)	2	Vikrant		
		Rounded (Sub orbicular)	3	RFB 2		
10. (* QN	Raceme: number of flowers	Few (<10)	3	IC593670	70	MG
		Medium (10-20)	5	Patna 3		
		Many (>20)	7	PRT 12		
11. (* (+) QN	Time of 50% flowering (50% of the plants with at least one flower)	Early (<52 days)	3	RFB2	-	VG
		Medium (52-60 days)	5	Vikrant		
		Late (>60 days)	7	PRT 12		

12. QL	Flower ground colour	White	1	Vikrant	70	VG
		Yellow	2	-		
		Violet	3	-		
		Pink	4	-		
		Red	5	-		
		Brown	6	-		
		Others	99	-		
13. (* PQ)	Wing: melanin spot	Absent	1	-	70	VG
		Present	9	Vikrant		
14. (*)	Wing: colour of melanin spot	Greenish Yellow	1	-	70	VG
		Brown	2	Vikrant		
		Black	3	-		
15. (* QL)	Standard: anthocyanin coloration	Absent	1	-	70	VG
		Present	9	Vikrant		
16. (+ QN)	Standard: extent of anthocyanin coloration	Low	3	IC593701	70	MG
		Medium	5	Vikrant		
		High	7	PRT 12		
17. (+ QN)	Pods: number of pods per nod	Few (<2)	3	IC593697	80	MG
		Medium (2-4)	5	Vikrant		
		Many (>4)	7	-		
18. (* (+ QN)	Pod: length (without beak)	Short (<4.5 cm)	3	IC593697	90	MS
		Medium (4.5- 6 cm)	5	Patna 3		
		Long (>6 cm)	7	RFB 2		
19. (* QN)	Pod: width (from suture to suture)	Narrow (<8mm)	3	IC 593668	90	MG
		Medium (8-10 mm)	5	Patna 2		
		Broad (>10mm)	7	Vikrant		
20. (+ QL)	Pod: degree of curvature at green shell stage	Absent or very weak	1	Vikrant	90	VG
		Weak	3	-		
		Medium	5	-		
		Strong	7	-		
21. QL	Pod attitude/angle	Erect	1	Vikrant	90	VG/MG
		Horizontal	2	-		
		Pendent	3	-		
22. QN	Pod: number of ovules (including seeds)	Few (<3)	3	IC593697	90	VG
		Medium (3-4)	5	Vikrant		
		Many (>4)	7	-		
23. (* QL)	Dry seed: color of testa (immediately after harvest)	White	1	-	100	VS
		Yellow	2	-		
		Green	3	-		
		Grey	4	-		
		Light Brown	5	Vikrant		

		Dark brown	6	-		
		Red	7	-		
		Violet	8	-		
		Black	9	-		
24. (* QN	Time of full development of pod (first fully developed pods)	Early (<150 days)	3	Patna 1	80	MG
		Medium (150-160)	5	Vikrant		
		Late (>160 days)	7	Patna 6		
25. (* (+ QN	Dry seed: 100 Seed weight (g)	Low (<20)	3	Patna 3	80	MG
		Medium (20-30)	5	Vikrant		
		High (>30)	7	RFB 2		
26. QL	Seed Shape	Flattened	1	Vikrant	100	VG
		Round	2	-		
		Angular	3	-		
27. QL	Dry seed: black pigmentation of hilum	Absent	1	-	100	VS
		Present	9	Vikrant		

VIII. Explanations on the Table of Characteristics

VIII A. Explanations covering several characteristics

Characteristics containing the following key in the column 6 of the Table of Characteristics should be examined as indicated below:

Code	Description
10	Germination
20	Leaf development: Young plant with 8-10 leaves
30	Formation of side shoots: 8-10 side shoots detectable
40	Stem elongation: 9 or more visible extended internodes developed
50	Vegetative growth stage
60	Inflorescence emergence: First petal visible, many individual flower buds still closed
70	Flowering: Flower open on 5 racemes per plant
80	Development of fruit: 80% of pods have reached final length (see Ad. 25)
90	Ripening: 80% of pods ripe & dark, seeds dry and hard
100	Senescence: Plant 50% of stem brown or black, dead and dry (see Ad. 25)

VIII B. Explanations for individual characteristics

Ad. Characteristic 1: Seed tannin

The 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 seed tannin content should be tested by removing a piece of the testa from the seed. 1 or 2 drops of the test reagent place upon testa piece. If tannin is present in testa then a bright pink colour will be developed. (Reagents: A = 50% ethanol; B = 1% vanillin in concentrated (33-37% weight by volume) HCl. Mix reagent A and B in 1:1 ratio for use. Naturally, the seeds that are yellowish in colour turn brown or dark brown immediately after harvest if they contain tannin.

Ad. Characteristic 3: Plant height

To be measured near maturity from the base of the plant to the tip of the plant.



Short (3)



Tall (7)

Ad. Characteristic 7 & 8: Leaflet: length & width (cm)

To be observed on fully expanded leaves at intermediate flowering nodes.

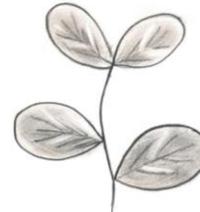
Ad. Characteristic 9: Leaflet shape



3
Narrow (Elongate)



5
Intermediate (Sub elliptic)



7
Rounded (Sub orbicular)



(1)
Narrow (Elongate)



(2)
Intermediate (Sub elliptic)



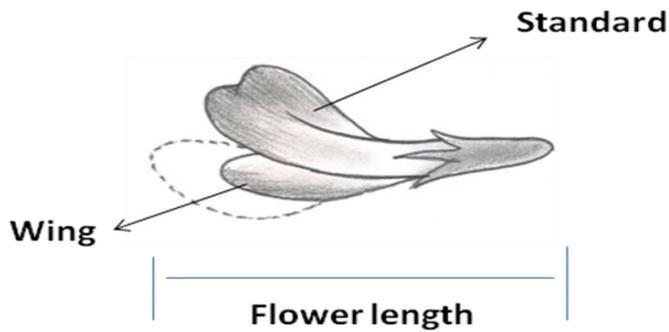
(3)
Rounded (Sub orbicular)

Ad. Characteristic 11: Time of flowering

The time of flowering is when 50 % of the plants have a panicle approximately 5 cm long, showing open flowers in its middle parts with separate stamens and with the stigma completely visible.

Ad. Characteristic 16: Standard: extent of anthocyanin coloration

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



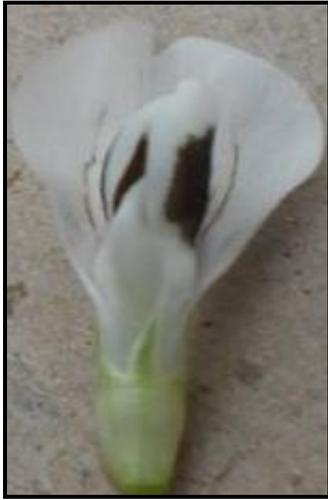
3
Low



5
Medium



7
High



Low (3)



Medium (5)



High (7)

Ad. Characteristic 17: Pods: number of pods per nod



Few(3)



Medium (5)



Many (7)

Ad. Characteristic 18: Pod Length



Short (3)

Medium (5)

Long (7)

Ad. Characteristic 20 Pod: degree of curvature at green shell stage



**1
Absent**



**2
Medium**



**3
Strong**

Ad. Characteristic 25: 100 seed weight (g)

The 100 dry seed weight should be measured by weighing the largest seed from the largest pod for each plant sampled, at moisture of 10%.

IX. Working Group details:

These guidelines developed by the National Core Committee in consultation with the Project Coordinator (Underutilized Crops), the Nodal Officer, DUS testing, NBPGR, New Delhi and the Task Force (4-10/12) constituted by the PPV&FR Authority.

The Members of the Task Force:

Prem N Mathur
(Chairman)

M Dutta
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J C Rana
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B S Phogat
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Dipal Roy Chaudhury
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X. Name of DUS Test Centre(s):

Nodal DUS Centre	Other DUS Centre(s)
National Bureau of Plant Genetic Resources, New Delhi-110012	-