

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

Buckwheat (*Fagopyrum sp.*)



Protection of Plant varieties and Farmer's Rights Authority

Government of India

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BUCKWHEAT

I. Subject

These test guidelines will be applied to all varieties of cultivated Buckwheat (*Fagopyrum* sp.). Out of the 23 species, *F. esculentum* and *F. tataricum* are the two cultivated species.

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 500 gram.
1. The seed material should meet the minimum germination percentage (80%), moisture content (not more than 10%), 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.
2. The plant material supplied should be visibly healthy, not lacking in vigor, nor affected by any important pest or disease.
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 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

Details of Experiment	
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

2. The characteristics described in the Table of characteristics shall be used for the testing of varieties for DUS (Section VII).
3. 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).
4. 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. In the case of a sample size of 100 plants, five off-types are allowed.
5. For the assessment of colour characteristics, Royal Horticulture Society (RHS) colour chart be used.
6. All the observations on plant parts should be made as follows:
 - (a) all observations on leaves should be observed on leaves from the middle part of the plant
 - (b) all observations on inflorescence should be observed from the middle part of the inflorescence/ cyme.
 - (c) all observations on seeds should be observed on ripened seeds from the upper part of the plant

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 Buckwheat:

- (a) Leaf shape (characteristic 6)
- (b) Flower: colour (characteristic 9)
- (c) Stem colour (characteristic 14)
- (e) Seed colour (characteristic 15)
- (f) Seed shape (characteristic 16)

VI. Introduction to Table of 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

Asterisked Characteristics

Asterisked Characteristics (denoted by *) 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.

(+) See Explanation on the Table of Characteristic in Section VIII B.

(a)- (f) See Explanations on the Table of Characteristics in Chapter VIII A.

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:

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

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

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. color 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)

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

Code	Description
10	Observations on the seedling which should be made 3-6 days after emergence (see Ad. Characteristic 1)
20	Observations should be made at full flowering: about 50% of the flowers open (see Ad. Characteristic 9)
30	Observations should be made at physiological maturity: 80% of seeds mature (see Ad. Characteristic 13)
40	Observations should be made on matured seed: Seed shows fully-ripe color
50	Observations should be made on Senescence: Harvested product (see Ad. Characteristic 17)

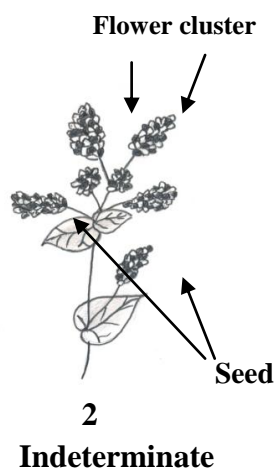
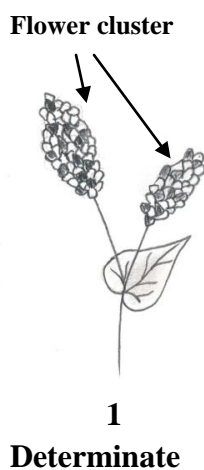
VII. Table of Characteristics

S. N	Characteristics	States	No te	Example variety/ line	Stage of observat ion	Type of assessme nt
1. (* QL	Seedling: anthocyanin coloration	Absent	1	Himpriya	10	VG
		Present	9	PRB 1		
2. (+ QL	Plant: growth type	Determinate	1	-	20	VG
		Indeterminate	2	PRB 1		
3. QN	Leaf blade: length (cm)	Short (<6 cm)	3	Sangla B 214	20	VG/MS
		Medium (6 - 10 cm)	5	Himpriya		
		Long (>10 cm)	7	PRB 1		
4. QN	Leaf blade: width (cm)	Narrow (<5.0 cm)	3	Sangla B 5	20	VG/MS
		Medium (5 -8 cm)	5	PRB 1, VL7		
		Broad (>8 cm)	7	Shimla B 1, Himpriya		
5. QL	Leaf blade colour	Green	3	Himpriya	20	VG
		Pink	5	-		
6. (* (+ QL	Leaf blade: shape	Sagittate	1	Sangla B 118	20	VG
		Hastate	2	VL 7, PRB 1		
		Cordat	3	Himpriya		
		Ovate	4	IC109729		
7. QL	Leaf margin colour	Green	3	IC 14889, IC 412722	20	VG
		Pink (<i>Red-Purple group N57A</i>)	5	PRB 1		
8. (+ QN	Petiole length (cm)	Short (<5 cm)	3	Sangla B 129	20	VG/MS
		Medium (5 - 8 cm)	5	PRB 1, VL 7		
		Long (>8 cm)	7	Himpriya		
9. (* (+ PQ	Flower colour	White (<i>White group NN155C</i>)	1	Himpriya, VL 7	20	VG
		Greenish yellow (<i>Green-White Group 157C</i>)	3	Shimla B 1		
		Pink (<i>Red-Purple group 68A, N74A</i>)	5	PRB 1, IC 17371		
10. (* (+ QN	Days to 50% flowering	Early (<45 days)	1	VL 7	20	MG
		Medium (45-65 days)	5	PRB 1, Sangla B 1		
		Late (>65 days)	7	Himpriya		
11. (* (+ QN	Plant height (cm)	Short (<90 cm)	3	Sangla B 214	20	MG
		Medium (90 -110 cm)	5	PRB1, Himpriya		
		Tall (>110 cm)	7	Shimla B 1		
12. (+ QN	Inflorescence: Cyme length (cm)	Short (<5 cm)	1	IC 202226, IC 274426	20	VG/MS
		Medium (5-8 cm)	2	Himpriya, VL 7		
		Long (>8 cm)	3	PRB 1		
13. (* (+ QN	Days to 80 % maturity (days)	Early (<90 days)	3	VL 7	30	MG
		Medium (90-110 days)	5	Shimla B 1		
		Late (>110 days)	7	Himpriya		
14.	Stem: colour	Green (<i>Green group</i>)	3	Shimla B 1	30	VG

(*) (+) QL		<i>142A</i>				
		Pink (<i>Red purple group N66A</i>)	5	Sangla B1		
		Red (<i>Red group 43A,C, 41A</i>)	7	PRB 1, VL 7		
15. (*) (+) QL	Seed colour	Grey (<i>Greyey-Green group 197C</i>)	3	Himpriya	50	VG
		Brown (<i>Grey-Brown group N199B,C</i>)	5	PRB 1		
		Black (<i>Black group 202A</i>)	7	VL 7		
16. (*) (+) PQ	Seed: shape	Elliptic	1	Himpriya	50	VG
		Ovate	2	Shimla B1		
		Trullate	3	VL 7		
17. (*) (*) QN	Seed: 1000 seed weight (g)	Low (<15 g)	3	EC323730	50	MG
		Medium (15-20 g)	5	PRB 1		
		High (>20 g)	7	VL 7		

VIII. Explanation for the table of characteristics:

Characteristics 2: Plant: Growth type



Characteristic 3: Leaf blade length



Short (3)

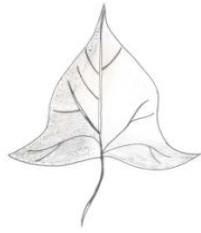
Medium (5)

Long (7)

Characteristics 6: Leaf blade: shape



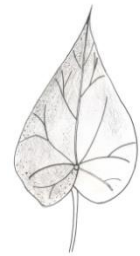
1
Sagittate



2
Hastate



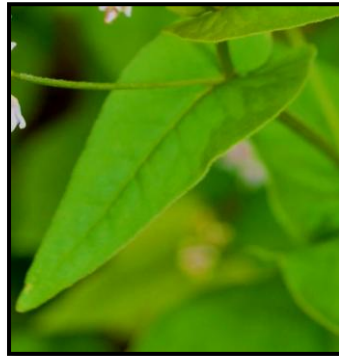
3
Cordate



4
Ovate



Hastate (2)



Sagittate (3)



Cordate (4)

Characteristic 7: Leaf margin colour



Green (3)



Pink (5)

Characteristics 8: Petiole length

Petiole length should be measured in centimetre when the plant was in full bloom.



Short (3)



Medium (5)



Long (7)

Characteristic 9: Flower colour



White (1)



Greenish Yellow (3)



Pink (5)

Characteristics 10: Days to 50% flowering

Observations should be taken at the time when 10% of plants have at least one open flower.

Characteristics 11: Plant height

Plant height should be measured from base of the plant to tip of the inflorescence.



Short (3)



Medium (5)



Long (7)

Characteristics 12: Inflorescence: Cyme length

Cyme length should be measured from base of pedicel of first flower to the top flower.

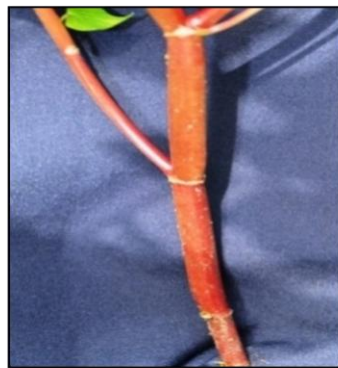
Characteristics 13: Days to 80% maturity

It should be measured at the time when 80% of seeds show fully-ripe color.

Characteristic 14: Stem colour



Green (3)



Red (7)

Characteristic 15: Seed colour



Grey (3)



Brown (5)



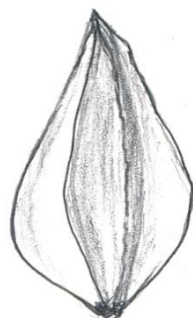
Black (7)

Characteristics 16: Seed Shape



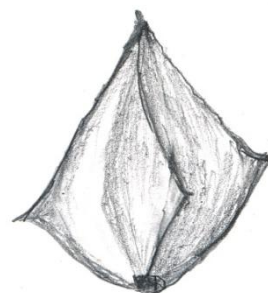
1

Elliptic



2

Ovate



3

Trullate

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
(Member)

J C Rana
(Member)

B S Phogat
(Member)

Rashmi Yadav
(Nodal Officer)

Dipal Roy Chaudhury
(Member Secretary)

X. Name of DUS Test Centre(s):

Nodal DUS Centre	Other DUS Centre(s)
National Bureau of Plant Genetic Resources, New Delhi-110012	NBPGR, Regional Station, Phagli, Shimla (H.P.)

