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

on

Palak / Spinach beet
(*Beta vulgaris var. bengalensis* Roxb.)

Protection of Plant Varieties and Farmers' Rights Authority (PPV&FRA)

Government of India

New Delhi-110002

CONTENTS

	Particulars	Page
I.	Subject	
II.	Seed Material Required	
III.	Conduct of Tests	
IV.	Methods and Observations	
V.	Grouping of Varieties	
VI.	Characteristics and Symbols	
VII.	Table of Characteristics	
VIII.	Explanation on the Table of Characteristics	
IX.	Working Group Details	
X.	DUS Testing Centres	

Palak / Spinach beet (*Beta vulgaris var. bengalensis* Roxb.)

I. Subject

These test guidelines shall apply to all varieties of Palak (Spinach beet).

II. Material required

1. The Protection of Plant Varieties and farmers Rights Authority (PPV&FRA) shall decide when, where and in what quantity and quality of the seed material required for testing the variety, is to be delivered. Applicants submitting material from a country other than India shall make sure that all customs and phytosanitory formalities are complied with.

2. The minimum quantity of seed to be supplied by the applicant shall be:

   Varieties : 250 g (in one submission only).

3. The seed material shall meet the minimum germination percentage (80%), moisture content (<8%), physical purity (98%) and genetic purity (100%) as prescribed for seed certification in India. Especially for storage, which requires a higher standard, the applicant shall state the actual germination percentage, which shall be as high as possible.

4. The planting material must not have undergone any treatment unless the competent authority allow or reject 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 shall normally be two independent but similar growing seasons with reference to the ecosystem of the variety submitted for DUS testing.

2. The test shall normally be conducted at two test locations. If any essential characteristic of the variety cannot be observed at these places, the variety may be tested at an additional place.

3. The test shall be carried out under conditions ensuring normal growth. The size of the plot shall be such that plants or parts of plant may be removed for measuring and counting without prejudice to the observations which must be made up to the end of the growing period. Each test shall 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.

4. Test Plot Design

Number of rows	:	5
Row length	:	2 m
Plant to plant distance	:	20 cm
Row to Row distance	:	50 cm
Number of replications	:	3

5. Observations shall not be recorded on plants in border rows.

6. Observation shall be recorded from 10 plants from each replication.

IV. Methods and observations

1. The characteristics described in the table of characteristics (see Section VII) shall be used for the testing of varieties for DUS

2. For the assessment of distinctiveness and stability, observation shall be made on 30 plants or parts of plants, which shall be divided among 3 replications (10 plants in each replication).

3. For the assessment of Uniformity of characteristics in the plot as a whole (visual assessment by a single observation of a group of plants or parts of plants), a population standard of 1% with an acceptance probability of at least 95% should be applied. In case of a sample size of 150 plants, the number of off-types should not exceed 2.

4. For the assessment of all colour characteristics, Royal Horticultural Society (RHS) Colour Chart shall be used.

5. Observations on the leaf blade shall be made on the seventh to tenth leaves from base of the adult, not bolted plant.

6. Stage of recording observation on specific characteristic shall be as follows

Description	**Code**
a. Cotyledons completely unfolded	10
b. Leaves attaining harvestable maturity	20
c. 50% of the flowering stage	30
d. Full seed maturity	40

V. Grouping of varieties

1. The selected varieties to be grown in the trial shall be divided into groups to facilitate the assessment of distinctness. Characteristics, which are suitable for grouping purpose, are those which are known from experience not to vary, or to vary only to lesser extent, within a variety. The states of expression (even produced at different locations) shall be fairly and evenly distributed throughout the collection.

2. It is recommended that the competent authorities use the following characteristics for grouping of Palak / Spinach beet varieties.

    a. Leaf : Leaf blade: intensity of green color (characteristic 7)
    b. Leaf : Leaf blade: anthocyanin coloration (characteristic 11)
    c. Petiole : Petiole: color (characteristic 14)
    d. Petiole : Petiole: width (characteristic 16)
    e. Plant : Plant: time of bolting (characteristic 18)
    f. Seed : Seed : spines (characteristic 19)

VI. Characteristics and symbols

1. To assess Distinctiveness, Uniformity and Stability, the characteristics and their states as given in the Table of Characteristics shall be used.

2. Notes (1-9) shall be used for the purpose of recording and electronic processing of data. Each state of expression is allotted a corresponding numerical note (1-9) for the different characteristics.

3. Legend

(*) Characteristics that shall be used every growing season for the examination of all the varieties and shall always be included in the description of the variety, except when the states of expression of any of these characters is rendered impossible by a preceding characteristic or by the environmental conditions of the testing region. Under such exceptional situation, adequate explanation shall be provided.

(+) See explanation on the Table of Characteristic in Section VIII

4. Type of assessment of characteristics indicated in column 7 of Table of Characteristics 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

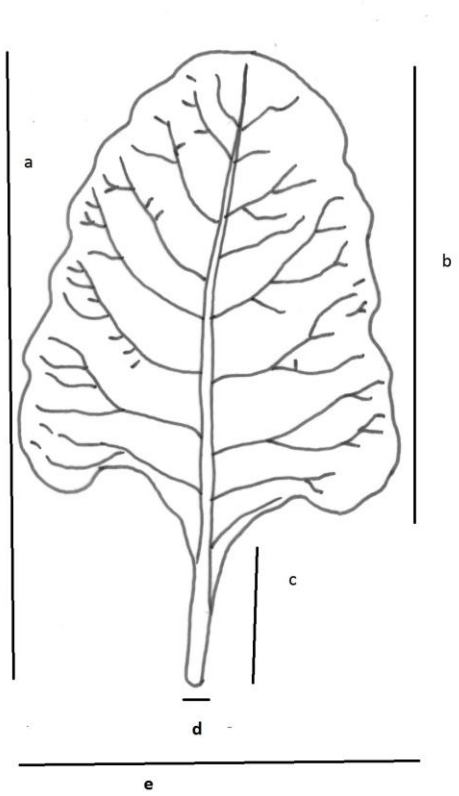
Sl.No	Traits	States	Note	Example Varieties	Stage of Observation	Type of assessment
1. (*)	Seedling: anthocyanin coloration	Absent	1	Pusa Harit, All Green, Co-1	10	VG
		Present	9	Arka Anupama, Pusa Bharathi, HS-23		
2.	Seedling: intensity of anthocyanin coloration	Weak	3	Pusa Bharathi, Pusa Harit	10	VG
		Medium	5	Arka Anupama, HS-23		
		Strong	7	-		
3. (*) (+)	Leaf: length	Short (<20 cm)	3	-	20	MS
		Medium (20.1-30 cm)	5	Arka Anupama, Pusa Bharathi, All Green, Co-1		
		Long (>30 cm)	7	Pusa Harit, HS-23		
4. (*)	Leaf: attitude	Erect	1	Arka Anupama, All Green, HS-23	20	VG
		Semi-erect	2	Pusa Harit, Co-1		
		Prostate	3	-		
5. (*) (+)	Leaf blade: length	Short (<10 cm)	3	-	20	MS
		Medium (10.1-15 cm)	5	-		
		Long (>15 cm)	7	Arka Anupama, Pusa Bharathi, Pusa Harit, All Green, HS-23		
6. (*) (+)	Leaf blade: width	Narrow(<8 cm)	3	-	20	MS
		Medium (8.1-9 cm)	5	Arka Anupama, Co-1		
		Broad (>9 cm)	7	Pusa Bharathi, Pusa Harit, HS-23		
7. (*)	Leaf blade: intensity of green color	Light	3	-	20	VG
		Medium	5	Pusa Bharathi, HS-23, Co-1		
		Dark	7	Arka Anupama, Pusa Harit		
8. (*)	Leaf blade: glossiness	Dull	3	Pusa Harit	20	VG
		Medium	5	Pusa Bharathi, HS-23, All Green		
		Bright	7	Co-1		
9.	Leaf blade:	Weak	3	HS-23	20	VG

(*)	blistering	Medium	5	Pusa Bharathi, Co-1		
		Strong	7	Arka Anupama, Pusa Harit		
10. (*) (+)	Leaf blade: lobing	Very weak	1	Pusa Bharathi, HS-23	20	VG
		Weak	3	Arka Anupama, All Green		
		Medium	5	-		
		Strong	7	-		
11. (*)	Leaf blade: anthocyanin coloration	Absent	1	Arka Anupama, Pusa Bharathi, Pusa Harit, Co-1, HS-23, All Green	20	VG
		Present	9	-		
12. (*) (+)	Leaf blade: shape (excluding basal lobes)	Triangular	1	-	20	VG
		Medium ovate	2	Pusa Bharathi, Pusa Harit, All Green, HS-23		
		Broad ovate	3	Arka Anupama, Co-1		
		Medium elliptic	4	-		
		Broad elliptic	5	-		
13. (*) (+)	Leaf blade: shape of apex	Acute	1	HS-23	20	VG
		Obtuse	2	Pusa Bharathi, All Green		
		Rounded	3	Arka Anupama		
14. (*)	Petiole: color	White	1	-	20	VG
		Green	2	Arka Anupama, Pusa Bharathi, Pusa Harit, Co-1, HS-23, All Green		
		Pink	3	-		
		purple	4	-		
15. (*) (+)	Petiole: length (cm)	Short (<10 cm)	3	-	20	MS
		Medium (10.1-12 cm)	5	Arka Anupama, All Green		
		Long (>12 cm)	7	Pusa Bharathi, Pusa Harit, HS-23		
16. (*) (+)	Petiole: width (cm)	Narrow (< 0.6)	3	Pusa Bharathi	20	MS
		Medium (0.61-0.8)	5	Arka Anupama, All Green, HS-23		
		Broad (> 0.8)	7	-		

17. (+)	Petiole: attitude	Erect	1	Arka Anupama, Pusa Harit, Co-1	20	VG
		Semi -erect	2	Pusa Bharathi, HS-23		
		Horizontal	3	-		
18. (*) (+)	Time of bolting	Early (<65 days)	3	Arka Anupama	30	VG
		Medium (65.1-70 days)	5	All Green, HS-23, Co-1		
		Late (>70 days)	7	Pusa Bharathi, Pusa Harit		
19. (*) (+)	Seed: spines (harvested seed)	Absent	1	Arka Anupama, Pusa Bharathi, Pusa Harit, Co-1, HS-23, All Green	40	VG
		Present	9	-		
20.	Resistance to *Cercospora sps (Specify the infestation or infection using any 1-9 scale)*	Very low or no visible sign of susceptibility	1	-	40	VG
		Low	3	Arka Anupama		
		Intermediate	5	Pusa Bharathi, All Green		
		High	7	-		
		Very high	9	-		

VIII. Explanations on the Table of Characteristics

Characteristic 3 Leaf: Length (a)
Characteristic 5 Leaf blade: Length (b)
Characteristic 6. Leaf blade: Width (e)
Characteristic 15. Petiole: Length (c)
Characteristic 16. Petiole: Width (d)



Characteristic 10. Leaf blade: Lobing

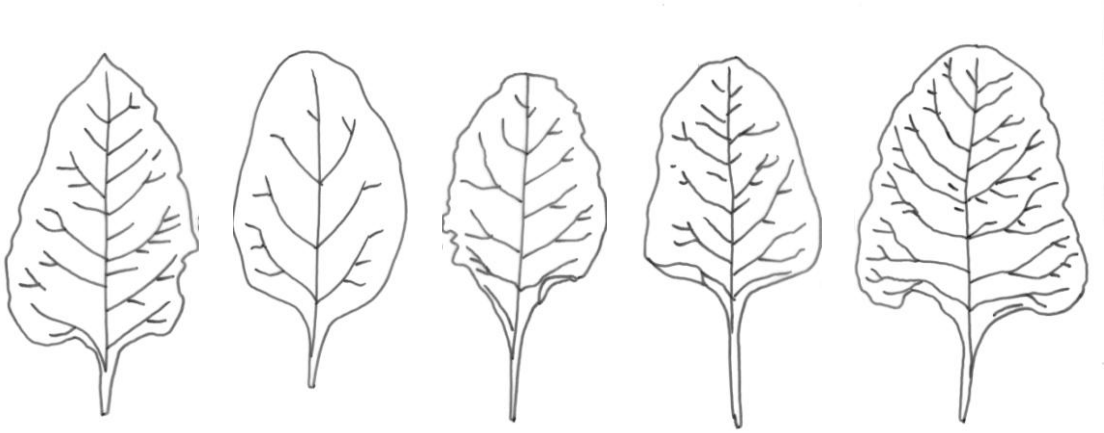
1
Absent or very weak

3
Weak

5
Medium

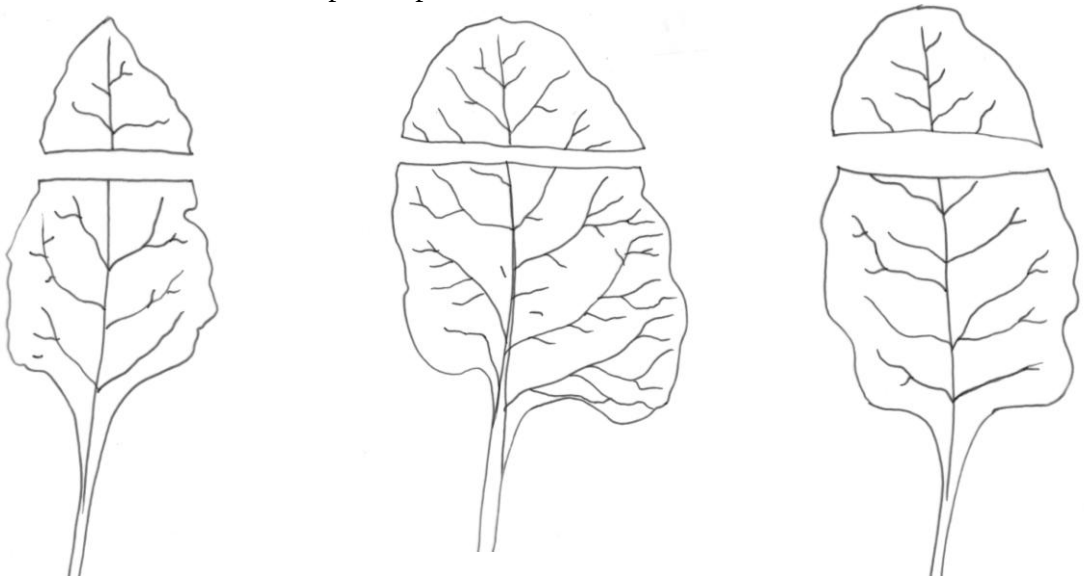
7
Strong

Characteristic 12. Leaf blade: Shape (excluding basal lobes)



1	2	3	4	5
Triangular	Medium ovate	Broad ovate	Medium elliptic	Broad elliptic

Characteristic 13. Leaf blade: Shape of apex



1	2	3
Acute	Obtuse	Rounded

Characteristic 17. Petiole: Attitude

1	2	3
Erect	Semi -erect	Horizontal

Characteristic 18. Plant: Time of bolting
The time of bolting of a plant is when the central flowering stem appears through stretching of the internodes

Characteristic 19. Seed: Spines

1
Absent

9
Present

IX. Working Group Details

The Test Guidelines developed by the IIHR, Bangalore was finalized by the Task Force Committee (10/2014) constituted by the PPV & FR Authority.

The Members of the Task Force (10/2014)

1. Dr. D.L. Maheswar **Chairman**
Vice-Chancellor, University of Horticultural Sciences,
Udyanagiri, Near Seemekeri Cross, Hubli Bypass Road,
Navanagar, Bagalkot-587103

2. Dr. B. Singh **Member**
Director, & Project Coordinator (Vegetables)
Indian Institute of Vegetable Research,
Post Box No. 1, P.O. Jakhini, Varanasi- 221005

3. Dr. P. S. Sirohi **Member**
Ex-Head, Division of Vegetable Science, IARI, EA-172,
Near Arya Samaj Mandir, Inderpuri, New Delhi-110012

4.	**Dr. B. Varalakshmi** Principal Scientist & PI, Nodal Centre, Division of Vegetable crops, Indian Institute of Horticultural Research, Hessaraghatta Lake Post, Bangalore-560089	**Member**
5.	**Dr. N. K. Biradar Patil** Prof. & Head (Seed Science & Technology) and Special Officer(Seeds), UAS, Dharwad- 580005, Karnataka	**Special Invitee**
6.	**Dr. T. R. Shashidhar** Assistant Prof. (Seed Science & Technology) Prof. of Horticulture, UAS, Dharwad- 580005, Karnataka	**Special Invitee**
7.	**Dr. Revanappa** Professor &Head, Dept. of Vegetable Science, UHS, Bagalkot-587103	**Special Invitee**
8.	**Dr. Ravi Prakash** Registrar, PPV & FRA, New Delhi	**Member Secretary**

Nodal Officer

Dr B. Varalakshmi, Principal Scientist (Hort.), Division of Vegetable Crops, Indian Institute of Horticultural Research, Hessarghatta, Lake Post, Bengaluru-560089 (Karnataka).

Co-Nodal Officer

Dr T. K. Behera, Principal Scientist (Hort.), Division of Vegetable Science, Indian Agricultural Research Institute, Pusa, New Delhi-110012

IX. DUS testing centers

Nodal Centre	**Other Centre**
Dr B. Varalakshmi Indian Institute of Horticultural Research, Hessarghatta Lake Post, Bengaluru-560089 (Karnataka).	Dr T. K. Behera Indian Agricultural Research Institute, Pusa, New Delhi-110012