भारत सरकार
GOVERNMENT OF INDIA

भारतीय पौधा किस्म जरनल

PLANT VARIETY JOURNAL OF INDIA

खण्ड – 07, अंक – 05, मई 01, 2013
Vol. - 07, No. – 05, May 01, 2013

पौधा किस्म और कृषक अधिकार संरक्षण प्राधिकरण
एनएएससी काम्प्लैक्स, डीपीएस मार्ग, निकट टोडापुर गांव, नई दिल्ली–110012

PROTECTION OF PLANT VARIETIES & FARMERS' RIGHTS AUTHORITY
NASC COMPLEX, DPS MARG, Opp. Todapur Village, New Delhi-110012

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भारतीय पौधा किस्म जरनल, खण्ड 07, अंक 05
मई 01, 2013 / चैत्र–कृष्ण 05 शक् 1935

Plant Variety Journal of India, Vol. 07, No. 05
May 01, 2013 / Chaitra-Krishna 06, Saka 1935

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'भारतीय पौधा किस्म जरनल पौधा किस्म और कृषक अधिकार संरक्षण प्राधिकरण (पौ.कि.कृ.अ.सं.प्रा.) का आधिकारिक जरनल है। पीपीवी और एफआर अधिनियम, 2001 तथा पीपीवी और एफआर नियमावली, 2003 के नियम 2 (जी) के अंतर्गत अध्यक्ष, पीपीवी और एफआरए, एस.2, ए ब्लाक, एनएएससी काम्प्लैक्स, डीपीएस मार्ग, निकट टोडापुर गांव, नई दिल्ली–110012 की ओर से प्राधिकरण के रजिस्ट्रार द्वारा प्रकाशित किया जा रहा है।

Plant Variety Journal of India is the Official Journal of the Protection of Plant Varieties and Farmers' Rights Authority (PPV & FRA) published by the Registrar on behalf of the Chairperson, PPV & FRA, S-2 A Block, NASC Complex, DPS Marg, Opp. Todapur Village, New Delhi-110012 under the PPV & FR Act, 2001 and Rule 2 (g) of the PPV & FR Rules, 2003.

PUBLIC NOTICE

Sub: Notice is given under Rule 29 (8 and 9) of the PPV & FR Rules, 2003.

As a requirement under Rule 29 (8 and 9) of the PPV & FR Rules, 2003, it is hereby informed that the specific DUS test guidelines for Barley (*Hordeum vulgare* L.), Coriander (*Coriandrum sativum* L.) and Fenugreek (*Trigonella foenum graecum* L.) are hereby published in 'Plant Variety Journal of India', Vol. 07, No. 05, May 01, 2013. Interested parties may read these guidelines and act accordingly.

Barley (*Hordeum vulgare* L.)

I Subject

These test guidelines shall apply to all varieties, hybrids and parental lines of Barley (*Hordeum vulgare* L.)

II Material required

1. The Protection of Plant Varieties and Farmers' Rights Authority (PPV & FRA) shall decide where and in what quantity and quality of the seed material are required for testing a variety denomination applied for registration under the Protection of Plant Varieties and Farmers' Rights Authority (PPV & FR Act), 2001. Applicants submitting such seed material from a country other than India shall make sure that all customs and quarantine requirements stipulated under relevant national legislation are complied with. The minimum quantity of seed to be provided by the applicant shall be 1500 grams in the case of the candidate variety or hybrid and 1000 grams for each of the parental lines of the hybrid. Each of these seed lots shall be packed and sealed in ten equal weighing packets and submitted in one lot.
2. At least 100 spikes, each representing the normal spike size and drawn from the main tiller of the candidate variety shall be submitted. The spikes shall be individually packed and submitted along with the said seed lot.
3. The seed and spikes submitted shall have at least 95% germination, 98% physical purity, highest genetic purity, uniformity, sanitary and phytosanitary standard. In addition the moisture content of the seed shall not exceed 8% to meet the safe storage requirement. The applicant shall submit along with the seed a certified data on germination test made not more than one month prior to the date of submission.
4. The seed material shall not be subjected to chemical and biophysical treatment.

III Conduct of tests

1. The minimum duration of the DUS tests for the new varieties shall normally be at least two independent similar growing seasons.
2. The test shall normally be conducted at least at two locations. If any essential characteristic of the candidate variety is not expressed for visual observation at these locations, the variety shall be considered for further examination at another appropriate test site or under special test protocol on expressed request of the applicant.

3. The field tests shall be carried out under conditions favoring normal growth and expression of all test characteristics. The size of the plots shall be such that plants or parts of plants could be removed for measurement and observation without prejudicing the other to the observations on the standing plants until the end of the growing period. Each test shall include about 500 plants, in the plot size and planting space specified below across three replications. Separate plots for observation and for measuring 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	:	4
Row length	:	4 m
Row to row distance	:	30 cm
Plant to plant distance	:	10 cm
Expected plants/replication	:	160
Number of replications	:	3

5. Observations should not be recorded on plants in border rows
6. Additional test protocols for special test 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, inbred lines and hybrids for their DUS
2. For the assessment of distinctiveness and stability observation shall be made on 30 plants or parts of 30 plants, which shall be equally divided among 3 replications (10 plants per replication).
3. For the assessment of uniformity of characteristics on the plot as a whole, this shall be done on simple visual observation of a group of plants or parts of plant. During such observation the entry shall be deemed uniform when the number of aberrant or odd plants or parts of plant shall not be exceeding 2 in 500.
4. For the assessment of uniformity of characteristics on single spike-rows, plants or parts of plant shall be visually observed on all individual spike-rows, plants or parts of plants. A spike-row having at least one aberrant or odd plant or parts of plant is dealt as an aberrant

row. A variety shall be deemed uniform when the number of such aberrant spike-rows shall not exceed 2 in 100.

5. For the assessment of color characteristics, the latest Royal Horticultural Society (RHS) color chart shall be used.

V. Grouping of varieties

1. The candidate varieties for DUS testing shall be divided into groups to facilitate the assessment of Distinctiveness. Characteristics, which are known from experience not to vary or to vary only slightly, within a variety and which in their various states are fairly evenly distributed across all varieties in the collection, are suitable for grouping purposes.
2. The following characteristics are proposed to be used for grouping barley varieties:
   a) Stem: Basal pigmentation (Characteristic 2)
   b) Auricle: Anthocyanin pigmentation (Characteristic 3)
   c) Spike emergence (Characteristic 7)
   d) Spike type (row number) (Characteristic 8)
   e) Plant height (Characteristic 20)
   f) Spike density (Characteristic 25)
   g) Grain hullness (Characteristic 26)
   h) Grain: colour (Characteristic 27)

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) shall be used.
2. Scale 1 to 9 is used to describe the state of each character for the purpose of digital data processing.
3. The optimum stage for taking the observation of each characteristic during the plant growth and development is indicated by a decimal code. The Zadoks system being the most universally accepted is described here. It is applicable to any small grain, and its stages are easy to identify in the field. The Zadoks system is a two-digit code where the first digit refers to the principal stage of development beginning with germination and ending with kernel ripening. The second digit (between 0 and 9) subdivides each principal growth stage. The relevant growth corresponding to the decimal code number are described in section VII, column 5.

4. Legend :

(*) Characteristics that should be observed during every growing period on all varieties and should always be included in the description of the variety, except when the state of expression of any of these characters is rendered impossible by a preceding phenological characteristic or by the environmental conditions of the testing region. Under such exceptional situation, adequate explanation should be provided.

(+) See Explanations on the table of characteristics in Chapter VIII.

5. Type of assessment of characteristics indicated in the table 2 of characteristics is as follows:

MG: Measurement by a single observation 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 on a group of plants or parts of plants

VS: Visual assessment by observations of individual plants or parts of plants

VII Table of characteristics

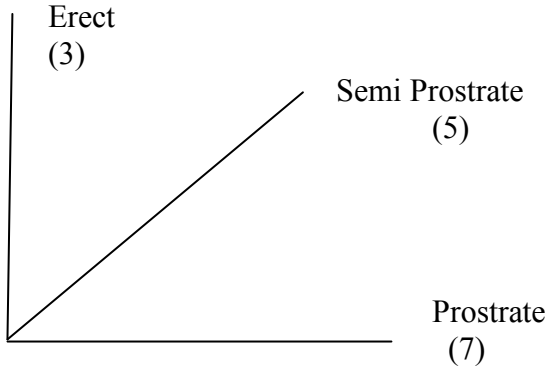
S.NO (1)	Characteristics (2)	State (3)	Note (4)	Stage of observation (5)	Example variety (6)	Type of assessment (7)
1. * (+)	Growth habit	Erect Semi-prostrate Prostrate	3 5 7	23-25	Amber Alfa93 ---	VG
2. *	Stem: Basal pigmentation	Absent Present	1 9	25-33	Amber Alfa93	VG
3. *	Auricle (Flag leaf): Anthocyanin Pigmentation	Absent Present	1 9	49-59	Amber Alfa93	VG
4. *	Upper node Pigmentation	Absent Present	1 9	49-59	Amber Alfa93	VG
5. * (+)	Flag leaf attitude	Erect Semi-erect Drooping	1 5 9	51-59	Amber BCU73 Alfa93	VG
6. *	Flag Leaf: Waxiness of sheath	Absent Present	1 9	51-59	Ratna Alfa93	VG
7. *	Spike emergence	Very early (<65 days) Early (65-75 days) Medium (76-86days)	1 3 5 7	51-59	----- BCU73 Amber Dolma	MG

		Late (87-96 days) Very late (> 96days)	9		Alfa93	
8. * (+)	Spike type	Two-row Six-row	3 7	59-69	Alfa93 Amber	VG
9. (+)	Lateral florets (Two-row barley)	Rudimentary Developed	1 9	59-69	DWRB73 Alfa93	VG
10. *	Spike: Waxiness	Absent Present	1 9	59-85	BCU73 Alfa93	VG
11.	Spike: colour	Pale green Green Dark green	1 2 3	69-77	DWR28 Alfa93 DWRUB64	VG
12. *	Spike: attitude	Erect Semi-erect Drooping	3 5 7	69-77	Amber BHS169 Alfa93	VG
13.	Awn: roughness	Smooth Rough	3 7	69-77	BH393 Alfa93	VG
14	Flag leaf length	Short (<10cm) Medium (10-14 cm) Long (> 14 cm)	3 5 7	71-85	Alfa93 Amber Ratna	MS
15.	Flag leaf breadth	Narrow (<1.0 cm) Medium (1.0-1.5 cm) Wide (>1.5 cm)	3 5 7	71-85	Alfa93 Amber BH75	MS
16.	Awn: Tip pigmentation	Absent Present	1 9	73-87	Amber BH393	VG
17.	Spike: basal sterility	Absent Present	1 9	73-89	Alfa93 RD2715	VS
18.	Lemma: pigmentation	Absent Nerve pigmented Present	3 5 7	75-87	Dolma Alfa93 DWRB91	VG
19.	Spike: length	Small (< 7cm) Medium (7.1-10cm) Long (>10cm)	3 5 7	75-89	Ratna BH75 Alfa93	MS
20. *	Plant: height	Very short (< 75.0 cm) Short (75.1-85.0 cm) Medium (85.1-95.0 cm) Tall (95.1-105.0 cm) Very tall (> 105.0 cm)	1 3 5 7 9	75-89	---- BCU73 Alfa93 BHS169 Amber, Jyoti	MG
21.	Peduncle: length	Short (<22.0 cm) Medium (22.0 -27.0 cm) Long (> 27.0 cm)	3 5 7	75-89	Alfa93 Amber Dolma	MS

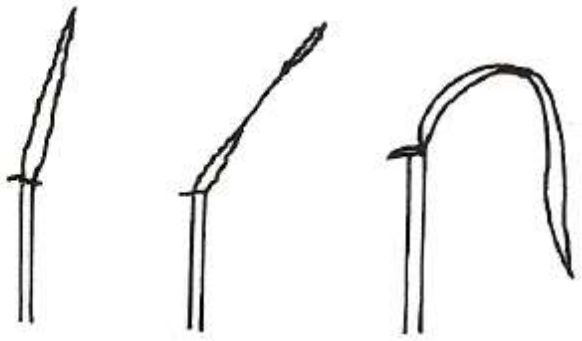
22.	Awns	Absent Present	1 9	83-87	---- Alfa93	VG
23. * (+)	Awns: type	Hooded Awnletted Normal	1 3 5	83-87	--- --- Alfa93	VG
24.	Awn: length	Short (< 8.0 cm) Medium (8.0-11.0 cm) Long (>11.0 cm)	3 5 7	83-87	BH75 BHS169 Alfa93	MS
25. * (+)	Spike: density	Lax Intermediate Dense	3 5 7	83-89	Azad, Jyoti Alfa93 Ratna	VG
26.	Grain: hullness	Naked (hulless) Covered (Hulled)	1 9	87-92	Dolma Alfa93	VS
27. *	Grain: color	White Yellow Purple Black	1 2 3 4	92	Dolma Alfa93 Bilara2, Jyoti ----	VG
28. * (+)	Grain: shape	Oval Oblong Elliptical	1 5 7	92	Alfa93 BHS169 Amber	VG
29. *	Grain: size (1000 grain weight)	Small (<30g) Medium (30-40g) Large (41-50g) Very large (>50g)	1 3 5 7	92	Dolma Alfa93 Amber BCU73	MS
30.	Grain: surface	Smooth Wrinkled	1 9	92	Amber JB58	VG
31. (+)	Rachilla hairs	Rudimentary Prominent	1 9	92	Alfa93 BHS46	VS
32. * (+)	Grain: Crease width	Narrow Intermediate Wide	3 5 7	92	BHS169 Alfa93 -----	VS

VIII. Explanations on the Table of characteristics.

Characteristic 1: Growth habit

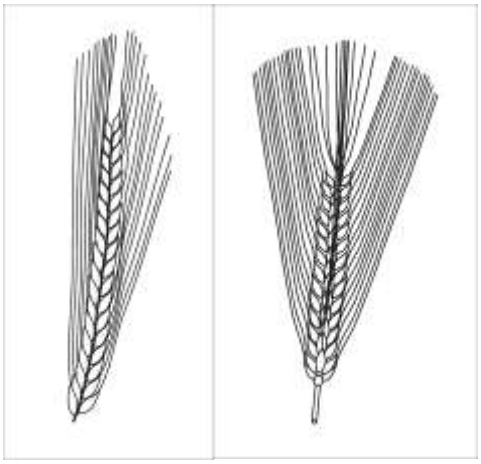


Characteristics 5: Flag leaf attitude



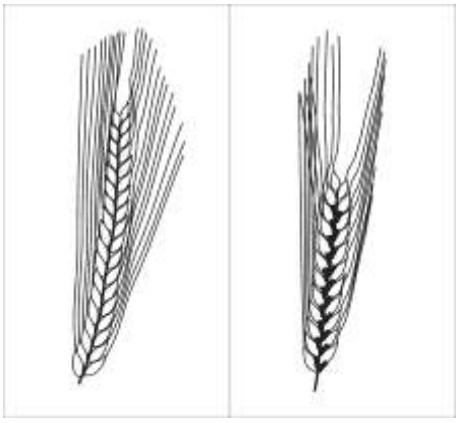
Erect (1) | Semi erect (5) | Drooping (9)

Characteristics 8: Spike type



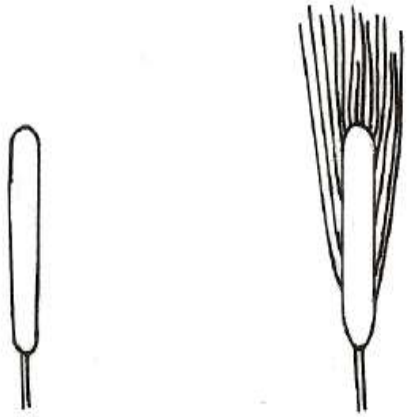
Two-row (3) | Six-row (7)

Characteristics 9: Lateral florets (Two-row barley)



Rudimentary (1) | Developed (9)

Characteristics 22: Awns



Absent (1)

Present (9)

Characteristics 23: Awns: Type

Hooded (1)

Awnletted (3)

Normal (5)

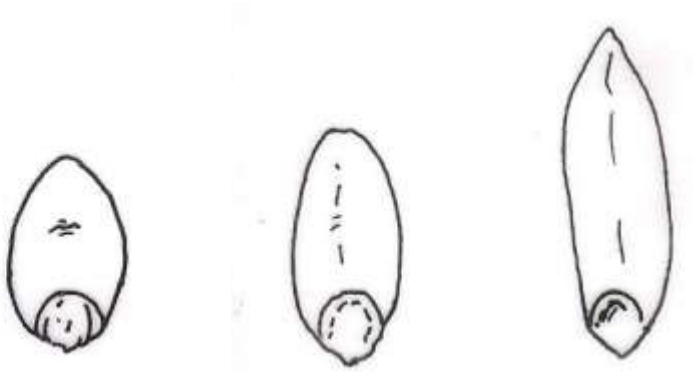
Characteristics 25: Spike: density

Lax (3)

Intermediate (5)

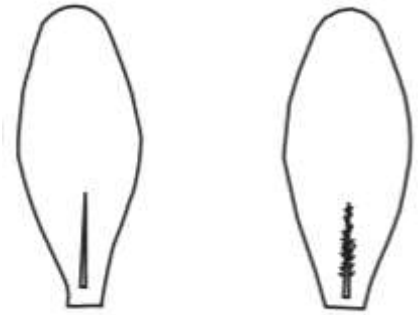
Dense (7)

Characteristics 28: Grain: Shape



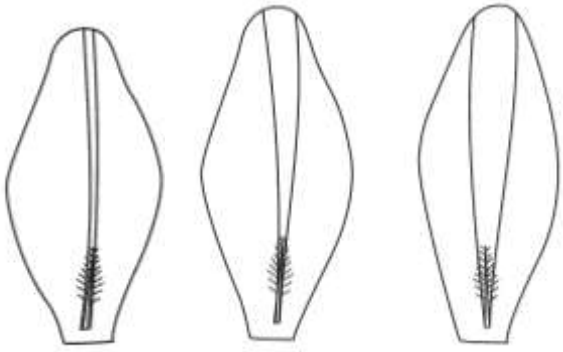
Oval (1) | Oblong (5) | Elliptical (7)

Characteristics 31: Rachilla hairs



Rudimentary (1) | Prominent (9)

Characteristics 32: Grain crease width



Narrow (3) | Intermediate (5) | Wide (7)

IX. Biochemical characters (Additional character)

1.	Hordein Profile	Electrophoretic profile of the candidate variety to be generated for A, B, C and D sub units of the hordein storage protein using the mature grains harvested from the experiments.

Procedure for estimation of hordein profile:

Hordeins are the major storage proteins of barley endosperm. They are extremely heterogeneous in composition in the different barley cultivars, allowing the differentiation of genotypes by their protein electrophoretic patterns. In general, barley hordeins are divided into A, B, C and D groups on the basis of the molecular weight differences due to their amino acid compositions. Since hordein composition is normally not affected by environmental factors (e.g. growing location, soil types, fertilization level, etc.), hordein electrophoretic composition could be used as genetic character for cultivar identification. By far, poly-acrylamide gel electrophoresis (PAGE) is the most common methods for the protein separation, characterization and varietal identification in barley (Laemmli, 1970).

X. DUS Test Centres

Nodal DUS centre	**Co-Nodal centre(s)**
Directorate of Wheat Research (ICAR), Karnal, Haryana	Narendra Dev University of Agriculture & Technology, Faizabad, U.P.
	Agriculture Research Station, (Swami Keshwanand Rajasthan Agriculture University), Durgapura, Jaipur, Rajasthan

Annexure-I System for growth stages in barley

Zadok's code		Description
Principal stage	**Secondary stage**	
0		Germination
	0	Dry kernel
	1	Start of imbibition (water absorption)
	5	Radical emerged
	7	Coleoptile emerged
	9	Leaf just at coleoptile tip
1		Seeding development
	0	First leaf through coleoptile
	1	First leaf at least 50% emerged
	2	Second leaf at least 50% emerged
	3	Third leaf at least 50% emerged
	4	Fourth leaf at least 50% emerged
	5	Fifth leaf at least 50% emerged
2		Tillering
	0	Main shoot only
	1	Main shoot plus 1 tiller visible
	2	Main shoot plus 2 tillers
	3	Main shoot plus 3 tillers
	4	Main shoot plus 4 tillers
	5	Main shoot plus 5 tillers
3		Stem elongation
	1	First node detectable
	2	Second node detectable
	3	Third node detectable
	7	Flag leaf just visible
	9	Flag leaf collar just visible
4		Boot
	1	Flag leaf sheath extending
	3	Boot just beginning to swell
	5	Boot swollen
	7	Flag leaf sheath opening
	9	First awns visible
5		Head emergence
	1	First spikelet of head just visible
	3	One-fourth of head emerged
	5	One-half of head emerged
	7	Three-fourths of head emerged
	9	Head emergence complete
6		Flowering (not readily visible in barley)
	1	Beginning of flowering
	5	Half of florets have flowered
	9	Flowering complete
7		Milk development in kernel
	1	Kernel watery ripe
	3	Early milk
	5	Medium milk
	7	Late milk
8		Dough development in kernel
	3	Early dough
	5	Soft dough
	7	Hard dough, head losing green color
	9	Approximate physiological maturity
9		Ripening
	1	Kernel hard (difficult to divide with thumbnail)
	2	Kernel cannot be dented by thumbnail, harvest ripe

Coriander (*Coriandrum sativum* L.)

I. Subject

These test guidelines shall apply to all varieties/parental lines/ hybrids of Coriander (*Coriandrum sativum* L.)

II. Seed material required

1. The Protection of Plant Varieties and Farmers's Right Authority (PPV&FRA) shall decide when, where and in what quantity and quality of the seed material are required for testing a variety denomination applied for registration under the Protection of Plant Variety and Farmer's Rights (PPV& FR) Act, 2001. Applicants submitting such 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 the seed to be provided by the applicant shall be 250 g. Each of these seed lots shall be packed, sealed properly labeled with details in ten equal weighing packets and submitted in one lot. Parental lines should be packed separately in one packet
2. The seed submitted shall have at least 80% germination, 98% physical purity, highest genetic purity, uniformity, sanitary and phyto-sanitary standards. In addition the moisture content of the seed shall not exceed 8-9% to meet the safe storage requirement. 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 submitted shall not have been subjected to any chemical or bio-physical treatment.

III. Conduct of test

1. The minimum duration of the DUS tests shall normally be at least two independent similar growing seasons.
2. The test shall normally be conducted at least at two test locations. If any essential characteristics of the candidate variety are not expressed for visual observation at these locations, the variety shall be considered for further examination at another appropriate test site or under special test protocol on expressed request of the applicant.
3. The field test shall be carried about under conditions favouring normal growth and expression of all test characteristics. The size of the plot shall be such that plants or parts of plants could be removed for measurement and observation without prejudicing the other

observation on the standing plants until the end of the growing period. Each test shall include about 500 plants, in the plot size and planting space specified below across three replications. Separate plots for observations 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 locations.

4. Test plot design

Number of rows	:	6
Row length	:	2 m
Row to row distance	:	50 cm
Plant to plant distance	:	20 cm
Number of replications	:	3
Expected plants/replication	:	200

5. Observation should not be recorded on plants in border rows.

6. Additional test protocols for special test shall be established by the PPV&FR Authority.

IV. Methods and observation

1. The characteristics described in the Table of characteristics (see section VII) shall be used for the testing of variety/pure lines/hybrids for their DUS.
2. For the assessment of Distinctiveness and Stability, observations shall be made on 30 plants or parts of plants, which shall be equally divided among 3 replications (10 plants per replications).
3. For the 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 plants), a population standard of with, an acceptance probability of at least 95% should be applied. In the case of same size of 100 plants, the number of off type allowed shall not exceed 5%.
4. All observations on growth habit shall be made at the time of appearance of king umbel. (Excluding basal leaf)
5. All observation on the seed shall be made on harvested dry seeds.
6. For the assessment of all colour characteristics the latest Royal Horticultural Society (RHS colour chart) shall be used.

V. Grouping of varieties based on characters

1. The candidate varieties for DUS testing shall be divided into groups to facilitate the assessment of Distinctiveness. Characteristics, which are known from experience not to vary, or to very only slightly within a variety and which in their various states are fairly evenly distributed across all varieties in the collection are suitable for grouping purposes.
2. The following characteristics shall be used for grouping of coriander varieties.

    i. Number of basal leaves
    ii. Length of longest basal leaf
    iii. Growth habit
    iv. Involucer
    v. Seed per umbel
    vi. Umbellate per umbel
    vii. 1000 -seed weight
    viii. Seed shape

VI. Characteristics and symbols

1. To assess Distinctiveness, Uniformity and Stability, the characteristics and their states as given in the Table of characteristics (section VIII) shall be used.
2. Note (1 to 9) shall be used to describe the state of each character for the purpose of digital data processing and this note is given against the states of each characteristic.

    Legend

    (*) Characteristics that shall be observed during every growing season on all varieties and shall always be included in the description of the variety, except when the state of expression of any of these characters is rendered impossible by preceding phenological characteristics or by the environmental conditions of the testing region. Under such exceptional situation, adequate explanation should be provided.

    (+) See Explanations on the Table of characteristics in Section VIII. It is to be noted that for certain characteristics, the plant parts on which observation to be taken are given in the explanation of figure(s) for clarity and not the colour variation.
4. A decimal code number in the sixth coloum of table of characteristics indicates the optimum stage of observation of each characteristic during the growth and development of plant. The relevant growth stages corresponding to those decimal codes numbers are described below:

Decimal code for the growth stages

Decimal Code	Growth Stage
10	At the initiation of flowering
20	Anthesis on main umbel
30	Full bloom of main umbel
40	At time of main umbel maturity
50	At time of maturity
60	After the harvesting and drying of mature seed

5. Type of assessment of characteristics indicated in column seven of Table of characteristics is as follows:

   MG: Measurement by a single observation 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

VII. Table of Characteristics

S.No	Characteristics	States	Note	Example varieties	Stage of observation	Type of assessment
1	2	3	4	5	6	7
1. (*) (+)	No. of basal leaves	Low (1-3)	3	Sudha, Sindhu, Sadhana, CO-1, CO-2, CO-3, CO-4	10	MS
		Medium (4-6)	5	GCr-2, GCr-1, RCr-436, RCr-435, RCr-446 , JD-1, RCr-20, RCr-41, Rajendra Swathi, Swathi		
		High (> 6)	7	Hisar Surbhi, Hisar Sugandh, Hisar Anand, Pant Haritma, ACr-1, Azad Dhania-1, RCr-684		
2. (*) (+)	Length of the longest basal leaf	Short (<6 cm)	3	Sindhu, Sadhana, Swathi, Sudha , CO-2, RCr-436	10	MS
		Medium (6 -10 cm)	5	RCr-20, RCr-684, RCr-435, Hisar Sugandh, Hisar Anand, Rajendra Swathi, CO-4, CO-1, CO-2, GCr-1, GCr-2,JD-1, RCr-446		
		Long (>10 cm)	7	RCr-41, ACr-1, Hisar Surbhi, Azad Dhania, Pant Haritma		
3. (*) (+)	Habitus of basal leaves	Very flat or prostrate	3	GCr-1, RCr-435, RCr-436, Hisar Surbhi Hisar Sugandh RCr-41, Pant Haritma, RCr-446, and ACr-1	10	VG
		Raised with an arcus of 45^0	5	JD-1, Rajendra Swathi, CO-1, CO-2, CO-3, CO-4, RCr-684, GCr-2, RCr-20, Azad Dahnia-1, Hisar Anand		
		very erect	7	Sudha, Sindhu, Sadhana, Swathi		
4. (*)	Leaf Luster of longest basal leaf	Non Shiny	3	Sudha, Rajendra Swathi, CO-1, CO-2, CO-3, CO-4, GCr-1, RCr-20, RCr-435, RCr-436, RCr-684, Hisar Sugandh, Pant Haritma, Azad Dahnia-1, Swathi, RCr-446	10	VG
		Shiny	5	JD-1, Sindhu, Sadhana, GCr-2, Hisar Surbhi, Hisar Ananad, RCr-41, ACr-1		
5. (*) (+)	Leaf margin of longest basal leaf	Deeply Serrated	3	JD-1, Sindhu, Sadhana, CO-1, CO-2, CO-4, RCr-20, RCr-436, RCr-41, Azad Dahnia-1, Swathi RCr-446, Pant Haritma, Sudha	10	VG

		Serrated	5	Rajendra Swathi, CO-3, GCr-1, GCr-2, RCr-435, RCr-684, Hisar Sugandh, Hisar Surbhi, Hisar Anand, ACr-1		
6. (*)	Leaf colour of longest basal leaf	Green	3	Sudha, Sindhu, Sadhana, CO-1, CO-3, CO-4, RCr-436, RCr-41, ACr-1, Azad Dhania-1, Swathi, RCr-446, Pant Haritma	10	VG
		Dark Green	5	JD-1, Rajendra Swathi, CO-2, GCr-1, GCr-2, RCr-20, RCr-435, RCr-684, Surbhi, Hisar Sugandh, Hisar Anand		
7.	Stem Colour (Pigmentation)	Absent	1	JD-1, Sudha, Rajendra Swathi, Sindhu, GCr-1, RCr-435, RCr-684, Hisar Anand, RCr-41, Swathi, Hisar Sugandh, RCr-446	20	VG
		Present	9	Sadhna, CO-1, CO-2, CO-3, CO-4, GCr-2, RCr-20, RCr-436, Hisar Surbhi, Pant Haritma, ACr-1, Azad Dhania-1		
8. (+)	Nodal pigmentation	Absent	1	CO-4, Swathi	20	VG
		Present	9	RCr-684, RCr-41, Sadhana, Sindhu, CO-2, RCr-20, ACr-1, Sudha, Hisar Surbhi, , Hisar Anand, Rajendra Swathi, Azad Dhania RCr-436, RCr-435, GCr-2, CO-1, CO-3, Hisar Sugandh, Pant Haritma, JD-1, RCr-446		
9. (*) (+)	Involucer	Absent	1	Sadhna, CO-2, CO-3, CO-4, GCr-1, GCr-2, RCr-435, RCr-436, Hisar Surbhi, Pant Haritma, ACr-1, Azad Dhania-1, Swathi, RCr-446	30	VG
		Present	9	JD-1, Sudha, Rajendra Swathi, Sindhu, CO-1, RCr-20, RCr-41,RCr-446, Hisar Sugandh, Hisar Anand		
10. (*) (+)	Growth habit	Erect	3	JD-1, Sudha, CO-1, CO-2, CO-3, CO-4, Rajendra Swathi, GCr-1, GCr-2, RCr-20, RCr-435, RCr-684, Surbhi, Hisar Sugandh, Pant Haritma, Azad Dhania, Swathi	40	VG
		Semi-erect	5	Sindhu, Sadhana, RCr-436, ACr-1, RCr-446		
		Spreading	7	Hisar Anand, RCr-41		
11. (*)	Primary Branches (Nos)	Less (<3)	3	Sudha,, Rajendra Swathi, Sindhu, Sadhana, CO-1, CO-2, CO-3, CO-4, GCr-2, RCr-436, RCr-435, RCr-684, Swathi, GCr-1		MS
		Medium (4-6)	5	JD-1, RCr-20, Hisar Sugandh, Hisar Anand, RCr-41		

		More (>6)	7	Surbhi, Pant Haritma, ACr-1, Azad Dhania		
12. (*) (+)	Angle of Primary branch	Narrow ($<35^0$)	3	JD-1, Sudha, Rajendra Swathi, CO-1, CO-2, CO-3, CO-4, GCr-2, GCr-1, RCr-20, RCr-436, RCr-684 Surbhi, Hisar Sugandh, Pant Haritma, Azad Dhania, Swathi	50	MS
		Medium (36^0 -40^0)	5	Sadhana, Sindhu, RCr-435, ACr-1, RCr-446		
		Wide ($>40^0$)	7	Hisar Anand , RCr-41		
13.	Secondary Branches	Less (<20)	3	RCr-684, RCr-41, Sadhana, Sindhu, CO-2	50	MS
		Medium (21-30)	5	RCr-20, ACr-1, Swathi, Sudha, Hisar Surbhi, , Hisar Anand, Rajendra Swathi, Azad Dhania RCr-436, RCr-435, GCr-2, CO-1, CO-3, CO-4, RCr-446, GCr-1		
		More (>30)	7	Hisar Sugandh, Pant Haritma, JD-1		
14.	Angle of Secondary branch	Narrow ($<35^0$)	3	JD-1, Sudha, CO-1, CO-2, CO-4,RCr-20, RCr-436, Hisar Sugandh,RCr-41, Azad Dhania, Swathi, Rajendra Swathi, Sindhu, , CO-3, GCr-2, GCr-1, RCr-435, RCr-684, Surbhi, , Hisar Anand, Pant Haritma, ACr-1, RCr-446	50	MS
		Wide ($>35^0$)	5	Sadhana		
15.	Plant height (Up to top)	Short (<30 cm)	3	RCr-684, Sadhana, Sindhu, RCr-436	50	MS
		Medium (31-40 cm)	5	RCr-20, Swathi, Sudha, Hisar Surbhi, Rajendra Swathi, GCr-1, Gcr-2, CO-1		
		Tall (>40cm)	7	RCr-41, ACr-1, Hisar Sughand, Hisar Anand, RCr-435, Azad Dahnia-1, CO-2, CO-3, CO-4, Pant Haritma, JD-1, RCr-446		

16. (*) (+)	Umbellates per umbel	Low (<4) Medium (4-5) High (>5)	3 5 7	RCr-684, Sadhana, Swathi, Sudha, CO-2 Sindhu, RCr-20, RCr-436, GCr-2, CO-1, CO-3, CO-4, RCr-446 Hisar Surbhi, Hisar Sugandh, Hisar Anand, RCr-435, Rajendra Swathi, Azad Dhania, GCr-1, Pant Haritma, JD-1, RCr-41, ACr-1	50	MG
17. (*) (+)	Seeds per Umbellate	Average (<5) Good (>5)	3 5	Sadhana, Sindhu, Swathi, Sudha, CO-1, CO-2, CO-4, CO-3 RCr-20, RCr-684, RCr-41,RCr-435, ACr-1, Hisar Surbhi, Hisar Sugandh, Hisar Anand, Rajendra Swathi, Azad Dhania, GCr-1, Pant Haritma, JD-1, RCr-446, RCr-436, GCr-2	50	MG
18. (*)	1000 seeds weight at 7-8 % moisture content	Low (<12g) Medium(12 -16g) High (>16 g)	3 5 7	RCr-435, RCr-436, Azad Dahnia-1, RCr-41, ACr-1, Pant Haritma, Hisar Surbhi , Rajendra Swathi, JD-1, GCr-2 Hisar Sugandh , RCr-446, RCr-20, CO-1, GCr-1, RCr-684, Sadhana, Hisar Anand and CO-4, CO-3, Sudha CO-2, Swathi, Sindhu	60	MG
19. (*)	Seed Colour	Light-brown Brown	3 5	RCr-684, Azad Dhania-1, RCr-20, RCr-435, RCr-41, Hisar Surbhi, GCr-1, Sudha Hisar Anand, Sadhana, Sindhu, CO-4, CO-1, RCr-436, Swathi, Hisar Sugandh, Pant Haritma, GCr-2, ACr-1, RCr-446, CO-3, CO-2, Rajendra Swathi, JD-1	60	VG
20. (*) (+)	Seed Shape	Slightly Round Ablong Oval	3 5 7	Pant Haritma, Azad Dhania -1 Hisar Surbhi, Hisar Anand, , Rajendra swathi, Sindhu, Sudha, Sadhna, RCr-436, RCr-446, RCr-446, Hisar sugandh RCr-41, RCr-435, ACr 1, JD-1, GCr-1, GCr-2, CO-1, CO-2, CO-3, CO-4, RCr- 684, Swathi, RCr-20	60	VG

VIII. Explanations of Table of characteristics

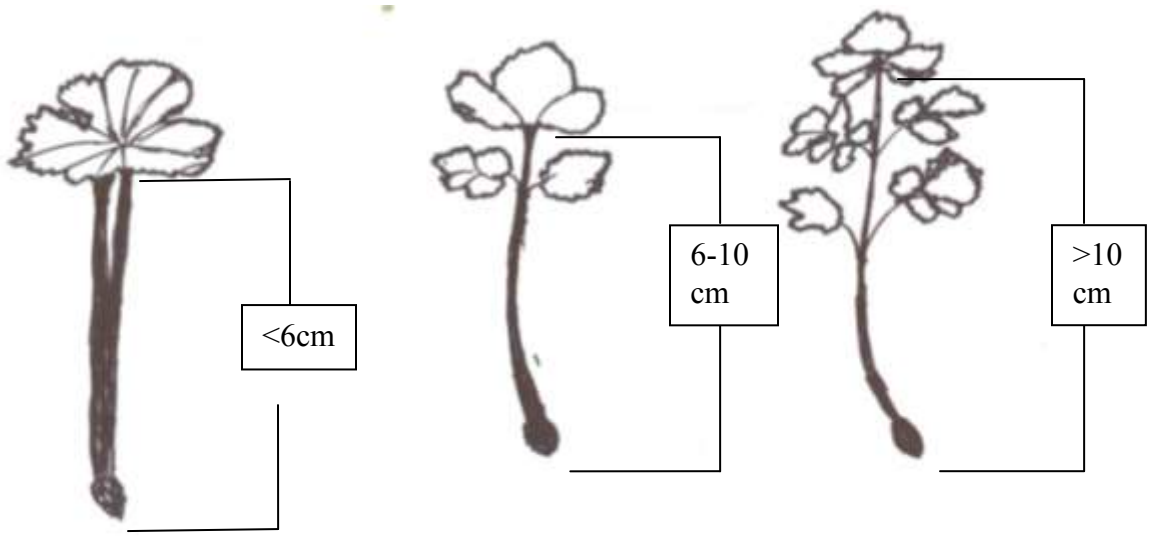
Characteristic 1. Number of basal leaves

3
Low

5
Medium

7
High

Characteristic 2. Length of the longest basal leaf

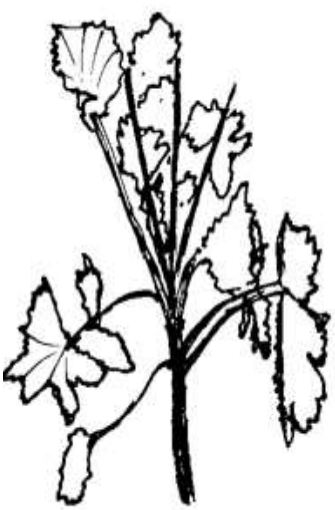


3
Short

5
Medium

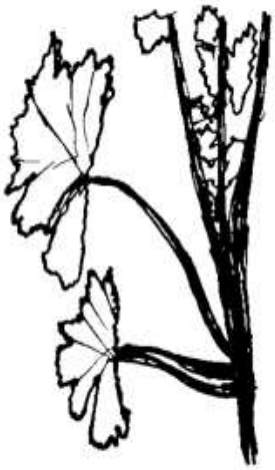
7
Long

Characteristic 3. Habitus of basal leaves



3

Very flat or prostrate



5

Raised an arc of 45^0

7

Very erect

Characteristic 5. Leaf margin of longest basal leaf

3

Deeply Serrated

5

Serrated

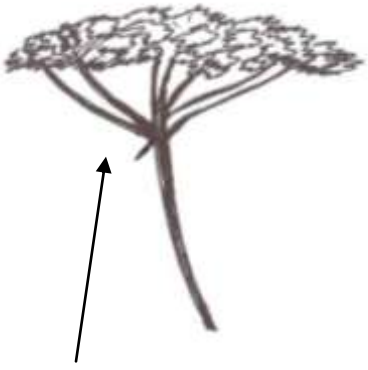
Characteristic 8. Nodal pigmentation

1
Absent

9
Present

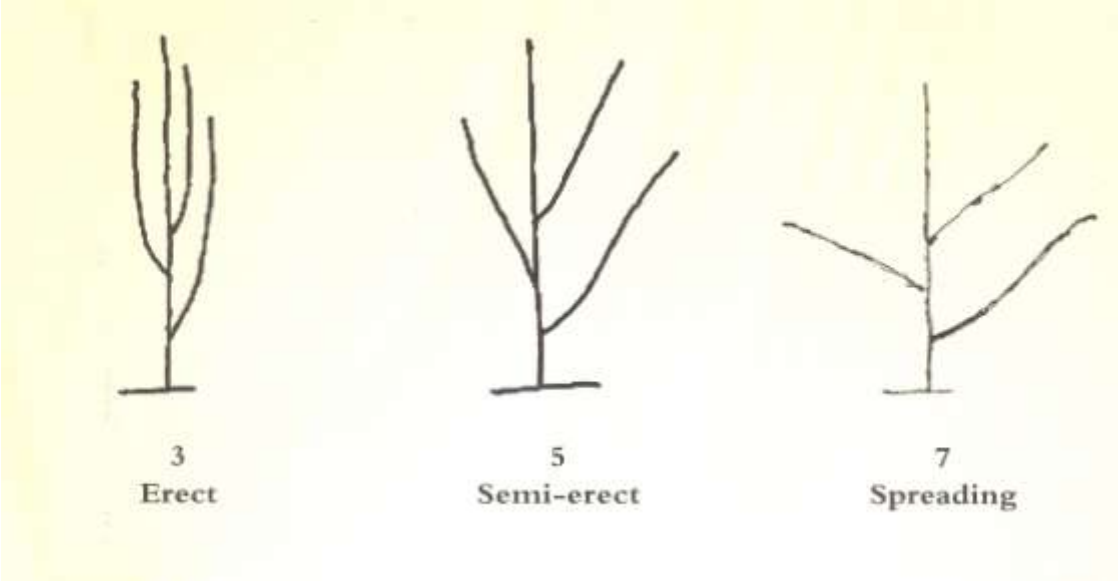
Characteristic 9. Involucer

1
Absent



9
Present

Characteristic 10. Growth habit



Characteristic 12. Angle of primary branches

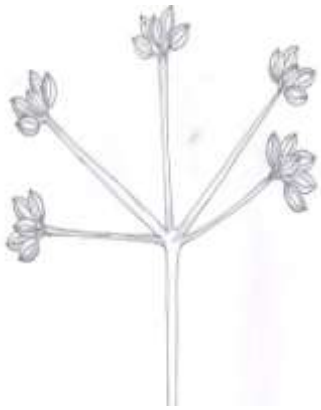
3
Narrow

5
Medium

7
Wide

Characteristic 16. Umbellates per umbel

3
Low



5
Medium

7
High

Characteristic 17. Seeds per umbellate

3
Average

5
Good

Characteristic 20. Seed Shape

3
Slightly Round

5
Ablong

7
Oval

IX. Names of the DUS testing Centers

Nodal DUS centre	**Co-Nodal centre(s)**
National Research Centre on Seed Spices, Tabiji, Ajmer-305206, Rajasthan	Directorate of Medicinal and Aromatic Plants, Anand, Gujarat

Fenugreek (*Trigonella foenum graecum* L.)

I. Subject

These test guidelines shall apply to all varieties/parental lines/ hybrids of Fenugreek (*Trigonella foenum graecum* L.)

II. Seed material required

1. The Protection of Plant Varieties and Farmers's Right Authority (PPV&FRA) shall decide when, where and in what quantity and quality of the seed material are required for testing a variety denomination applied for registration under the Protection of Plant Variety and Farmer's Rights (PPV& FR) Act, 2001. Applicants submitting such 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 the seed to be provided by the applicant shall be 250 g. Each of these seed lots shall be packed, sealed properly labeled with details in ten equal weighing packets and submitted in one lot. Parental lines should be packed separately in one packet
2. The seed submitted shall have at least 80% germination, 98% physical purity, highest genetic purity, uniformity, sanitary and phyto-sanitary standards. In addition the moisture content of the seed shall not exceed 8-9% to meet the safe storage requirement. 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 submitted shall not have been subjected to any chemical or bio-physical treatment.

III. Conduct of test

1. The minimum duration of the DUS tests shall normally be at least two independent similar growing seasons.
2. The test shall normally be conducted at least at two test locations. If any essential characteristics of the candidate variety are not expressed for visual observation at these locations, the variety shall be considered for further examination at another appropriate test site or under special test protocol on expressed request of the applicant.

3. The field test shall be carried about under conditions favouring normal growth and expression of all test characteristics. The size of the plot shall be such that plants or parts of plants could be removed for measurement and observation without prejudicing the other observation on the standing plants until the end of the growing period. Each test shall include about 540 plants, in the plot size and planting space specified below across three replications. Separate plots for observations 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 locations.

4. Test plot design

Number of rows	:	6
Row length	:	2 m
Row to row distance	:	50 cm
Plant to plant distance	:	20 cm
Number of replications	:	3
Expected plants per replication	:	200

5. Observation should not be recorded on plants in border rows.

6. Additional test protocols for special test shall be established by the PPV&FR Authority.

IV. Methods and observation

1. The characteristics described in the Table of characteristics (see section VII) shall be used for the testing of variety/pure lines/hybrids for their DUS.
2. For the assessment of Distinctiveness and Stability, observations shall be made on 30 plants or parts of plants, which shall be equally divided among 3 replications (5 plants per replications).
3. For the 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 plants), a population standard of with, an acceptance probability of at least 95% should be applied. In the case of same size of 100 plants, the number of off type allowed shall not exceed 5%.
4. All observations on growth habit shall be made at the time of appearance of king umbel. (Excluding basal leaf)

5. All observation on the seed shall be made on harvested dry seeds.
6. For the assessment of all colour characteristics the latest Royal Horticultural Society (RHS colour chart) shall be used.

V. Grouping of varieties based on characters

1. The candidate varieties for DUS testing shall be divided into groups to facilitate the assessment of Distinctiveness. Characteristics, which are known from experience not to vary, or to very only slightly within a variety and which in their various states are fairly evenly distributed across all varieties in the collection are suitable for grouping purposes.
2. The following characteristics shall be used for grouping of fenugreek varieties.

1. Apex shape of first leaf blade (Characteristics No. 2)
2. Size of leaf on first primary branches axis for length and width (L/W) (Characteristics No. 3)
3. Apex shape of leaf blade on first primary branch (Characteristics No. 5)
4. Size of leaf on first pod axis for length and width (L/W) (Characteristics No. 1)
5. Size of leaf on fully grown terminal leaf for length and width (L/W) (Characteristics No. 9)
6. Apex shape of leaf blade on fully grown terminal leaf (Characteristics No. 11)
7. Number of primary branches (Characteristics No. 12)
8. Plant growth pattern (Characteristics No. 13)
9. Plant growth habit (Characteristics No. 14)
10. Pod length (Characteristics No. 17)
11. Pod curvature (Characteristics No. 18)
12. 1000 seed test weight (Characteristics No. 19)

VI. Characteristics and symbols

1. To assess Distinctiveness, Uniformity and Stability, the characteristics and their states as given in the Table of characteristics (section VIII) shall be used.
2. Note (1 to 9) shall be used to describe the state of each character for the purpose of digital data processing and this note is given against the states of each characteristic.
3. Legend

   (*) Characteristics that shall be observed during every growing season on all varieties and shall always be included in the description of the variety, except when the state of expression of any of these characters is rendered impossible by preceding phenological

characteristics or by the environmental conditions of the testing region. Under such exceptional situation, adequate explanation should be provided.

(+) See Explanations on the Table of characteristics in Section VIII. It is to be noted that for certain characteristics, the plant parts on which observation to be taken are given in the explanation of figure(s) for clarity and not the colour variation.

4. A decimal code number in the sixth coloum of table of characteristics indicates the optimum stage of observation of each characteristic during the growth and development of plant. The relevant growth stages corresponding to those decimal codes numbers are described below:

Decimal code for the growth stages

Decimal Code	Growth Stage
10	At the emergence of first leaf
20	At the 50% flowering
30	At the time of pod initiation
40	At the time of Maturity
50	After the harvesting and drying of mature seed

5. Type of assessment of characteristics indicated in column seven of Table of characteristics is as follows:

MG: Measurement by a single observation 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

VII. Table of Characteristics

S.No	Characteristics	States	Note	Example varieties	Stage of observation	Type of assessment
1	2	3	4	5	6	7
1. (+)	Basal shape of first leaf blade	Acute	3	RMt-351, Pant Ragini	10	MS
		Obtuse	5	GM-2, RMt-1,RMt-143, AFg-1, GM-1, CO-2, Hisar Sonali, AFg-2, Rajendra Kanti, RMt-305		
		Rounded	7	Hisar Madhavi, Hisar Suvarna, Hisar Mukta, Azad Methi-1, RMt-303, Lam Selection-1		
2. (*) (+)	Apex shape of first leaf blade	Obtuse	3	RMt-1, Hisar Suvarna, Hisar Mukta, RMt-305	10	MS
		Rounded	5	GM-2, RMt-351, Hisar Madhavi, Azad Methi-1, RMt-143, RMt-303, AFg-1, GM-1, CO-2, Hisar Sonali, AFg-2, Rajendra Kanti, Lam Selection-1, Pant Ragini		
3. (*)	Size of leaf on first primary branches axis for length and width (L/W)	Small in length & width	3	GM-2, RMt-1, RMt-351	30	MG
		Small in length but wider	5	Hisar Madhavi, Hisar Suvarna, Azad Methi-1		
		Large length but narrow	7	Hisar Mukta, RMt-143, RMt-303, AFg-1, GM-1, CO-2		
		Larger & wider	9	Hisar Sonali, AFg-2, Rajendra Kanti, Lam Selection-1, RMt-305, Pant Ragini		
4. (+)	Basal shape of leaf blade on first primary branch axis	Acute	3	GM-2, Hisar Sonali, Hisar Suvarna, RMt-305, AFg-1, Pant Ragini, AFg-2, GM-1, Lam Selection-1, CO-2,	30	MS
		Obtuse	5	Azad Methi-1, Hisar Mukta, RMt-143, RMt-303, RMt-		

				1,Hisar Madhavi, RMt-351,Rajendra Kanti,		
5. (*) (+)	Apex shape of leaf blade on first primary branch axis	Acute Obtuse Rounded	3 5 7	GM-1 GM-2, Rajendra Kanti, CO-2 Hisar Suvarna, RMt-351, Hisar Sonali, AFg-2,Lam Selection-1, RMt-305, Azad Methi-1, Pant Ragini, Hisar Mukta, RMt-143, RMt-303, AFg-1, RMt-1,HisarMadhavi	30	MS
6.	Size of leaf on first pod axis for length and width (L/W)	Small in length & width Small in length but wider Large length but narrow Large & wider	3 5 7 9	Hisar Mukta Hisar Suvarna, RMt-303, AFg-1, RMt-351, Pant Ragini, Rajendra Kanti Hisar Madhavi, GM-1, Hisar Sonali, AFg-2, RMt-143 GM-2, RMt-305, CO-2, RMt-1, Lam Selection-1, Azad Methi-1	40	MG
7. (+)	Basal shape of leaf blade on first pod axis	Acute Obtuse	3 5	Hisar Mukta, RMt-143, RMt-303, GM-1 RMt-305, CO-2, Pant Ragini, AFg-1, RMt-1, Lam Selection-1, Hisar Madhavi, GM-2, Hisar Sonali, RMt-351, Hisar Suvarna, AFg-2, Azad Methi-1, Rajendra Kanti	40	MS
8. (+)	Apex shape of leaf blade on first pod axis	Acute Obtuse Rounded	3 5 7	RMt-305, CO-2, Pant Ragini, AFg-1, RMt-1, Lam Selection-1, GM-2, Hisar Sonali, RMt-351, AFg-2, Azad Methi-1, Rajendra Kanti Hisar Madhavi, Hisar Suvarna, RMt-143, RMt-303 Hisar Mukta, GM-1	40	MS

9. (*)	Size of leaf on fully grown terminal leaf for length and width (L/W)	Small in length & width Small in length but wider Large length but narrow Large & wider	3 5 7 9	Hisar Mukta, LamSelection-1, RMt-1, Hisar Sonali, AFg-2, RMt-305, RMt-351 RMt-143, GM-2, Pant Ragini, Hisar Madhavi Hisar Suvarna, RMt-303, Rajendra Kanti, AFg-1, GM-1, CO-2, Azad Methi-1	20	MG
10. (+)	Basal shape of leaf blade on fully grown terminal leaf	Acute Obtuse	3 5	RMt-305, GM-1, CO-2,Lam Selection-1, Azad Methi-1, Pant Ragini, Hisar Sonali, Hisar Madhavi, RMt-351, RMt-1, RMt-143, GM-2, Hisar Suvarna, RMt-303, Rajendra Kanti, AFg-1 AFg-2, Hisar Mukta	20	MS
11. (*) (+)	Apex shape of leaf blade on fully grown terminal leaf	Acute Obtuse	3 5	CO-2, AFg-2, Hisar Sonali,Hisar Madhavi, Hisar Mukta, RMt-1, RMt-143, GM-2, Rajendra Kanti, RMt-351, Pant Ragini, Lam Selection-1, GM-1, AFg-1, Azad Methi-1, Hisar Suvarna, RMt-303, RMt-305	20	MS
12. (*)	Number of Primary Branches	Less (<6) More (>6)	3 5	Hisar Sonali, GM-2, GM-1, Hisar Mukta, AFg-1 RMt-143, RMt-303, RMt-305, Rajendra Kanti, CO-2, AFg-2, Hisar Suvarna, Lam Selection-1, Azad Methi-1, Pant Ragini, RMt-1, Hisar Madhavi, RMt-351and	40	MG

13. (*) (+)	Plant Growth Pattern	V type U type	3 5	AFg-1, RMt-305, AFg-2, GM-2, RMt-143, RMt-351, GM-1 and Hisar Madhavi, Lam Selection-1, RMt-1, RMt-303, Rajendra kanti, CO-2, Hisar Mukta and Hisar Suvarna Hisar Sonali, Azad Methi-1, Pant Ragini,	20	VG
14. (*)	Plant Growth habit	Determinate Indeterminate	3 5	RMt-305 AFg-1, AFg-2, RMt-143, Hisar Sonali, Azad Methi-1, Lam Selection-1, CO-2, Pant Ragini, RMt-351, Hisar Suvarna, RMt-1, Hisar Mukta, RMt-303, Rajendra kanti, GM-1, GM-2 and Hisar Madhavi	40	MG
15.	Plant height	Short (<45 cm) Tall (>45cm)	3 5	Hisar Sonali, RMt-305, Lam Selection-1, Pant Ragini, RMt-351, Hisar Mukta, Rajendra kanti, GM-2, RMt-1 RMt-143, Hisar Madhavi, AFg-2, Hisar Suvarna, GM-1, Azad Methi-1, RMt-303, CO-2, AFg-1	40	MG
16.	Pod/plant	Low(<50) High (>50)	3 5	GM-2 and Hisar Sonali, RMt-303, Rajendra kanti, CO-2, AFg-1, Hisar Suvarna, Pant Ragini, RMt-143, RMt-351 and RMt-1 Hisar Madhavi, AFg-2, GM-1, Hisar Mukta, Azad Methi-1, RMt-305, Lam Selection-1	40	MG
17. (*)	Pod length (cm)	Short (<11) Medium (11-12) Long (>12)	3 5 7	Hisar Suvarna, RMt-351 RMt-303, RMt-305, Rajendra kanti, AFg-2, Lam Selection-1, and RMt-1, Azad Methi-1, Pant Ragini Hisar Sonali, Hisar Madhavi, RMt-143, GM-2, GM-1, Hisar Mukta, CO-2, AFg-1,	40	MG

18. (*) (+)	Pod curvature	Moderately curved Strongly Curved	3 5	Azad Methi-1, RMt-305, Lam Selection-1, CO-2, Pant Ragini, Hisar Suvarna, RMt-1, RMt-303, Rajendra kanti, GM-1, RMt-143, Hisar Sonali, Hisar Madhavi, AFg-2, GM-2, RMt-351, Hisar Mukta, AFg-1	40	MS
19. (*)	1000 seed weight	Low (<16g) Medium(16-18g) High (>18g)	3 5 7	Rajendra kanti, Lam Selection-1, RMt-351, RMt-303, GM-1, Pant Ragini, RMt-1, Hisar Sonali, AFg-2, Hisar Suvarna, Azad Methi-1, CO-2, Hisar Madhavi, RMt-305, Hisar Mukta, GM-2, RMt-143, AFg-1,	50	MG

VIII. Explanations of Table of characteristics

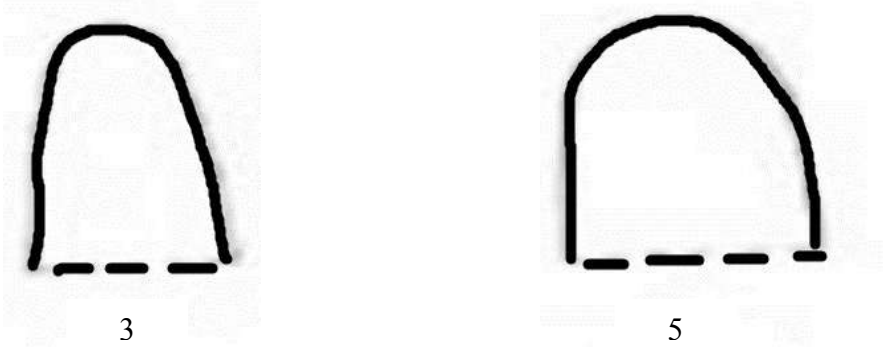
Characteristic 1. Basal shape of first leaf blade

3
Acute

5
Obtuse

7
Rounded

Characteristic 2. Apex shape of first leaf blade



3
Obtuse

5
Rounded

Characteristic 4. Basal shape of leaf blade on first primary branch axis

Characteristic 7. Basal shape of leaf blade on first pod axis

Characteristic 10. Basal shape of leaf blade on fully grown terminal leaf

3

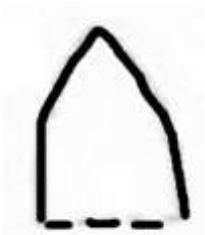
Acute

5

Obtuse

Characteristic 5. Apex shape of leaf blade on first primary branch axis

Characteristic 8. Apex shape of leaf blade on first pod axis

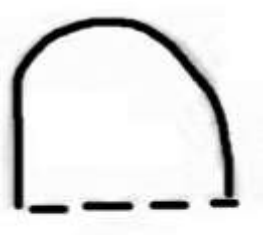


3

Acute

5

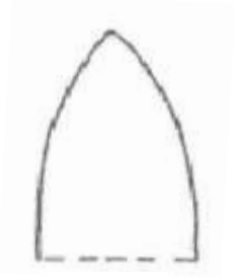
Obtuse



7

Rounded

Characteristic 11. Apex shape of leaf blade on fully grown terminal leaf



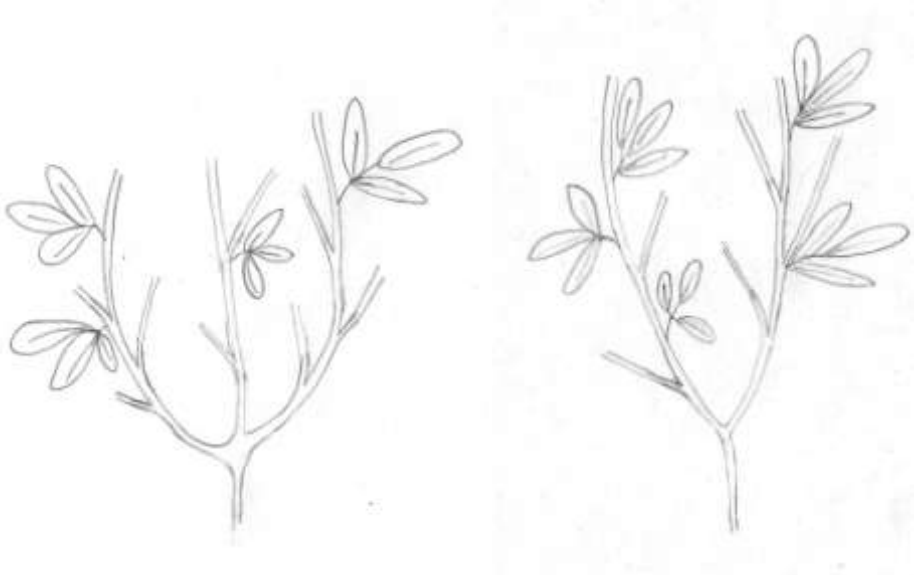
3

Acute

5

Obtuse

Characteristic 13. Plant Growth Pattern



U Shape V Shape

Characteristic 18. Pod curvature

3
Moderately Curved

5
Strongly curved

Names of the DUS testing Centers

Nodal DUS centre	**Co-Nodal centre(s)**
National Research Centre on Seed Spices, Tabiji, Ajmer-305206, Rajasthan	Directorate of Medicinal and Aromatic Plants (DMAP), Anand, Gujarat