Guidelines

For the Conduct of Tests for

Distinctiveness, Uniformity and Stability

On

Coriander

(*Coriandrum sativum* L.)

Protection of Plant Varieties & Farmers' Rights Authority

(PPV & FRA)

Government of India

Contents

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

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 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	50	MG
18. (*)	(weight of 1000 seeds at 7-8 % moisture content)	Low (<15g) Medium(15 -20g) High (>20 g)	3 5 7	Azad Dahnia-1, Hisar Sugandh , Pant Haritma, RCr-435, Rajendra Swathi , JD-1 and RCr-446 RCr-20, RCr-41, ACr-1, CO-1, GCr-1, GCr-2, RCr-436, RCr-684, Swathi, Sadhana, Hisar Anand and Hisar Surbhi CO-4, CO-2, and CO-3, Sudha and 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	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-20, Hisar suvrna RCr-41, RCr-435, ACr 1, JD-1, GCr-1, GCr-2, CO-1, CO-2, CO-3, CO-4, RCr- 684, Swathi	60	VG

VIII. Explanations of Table of characteristics

Characteristic 1. Number of basal leaves

3

Low

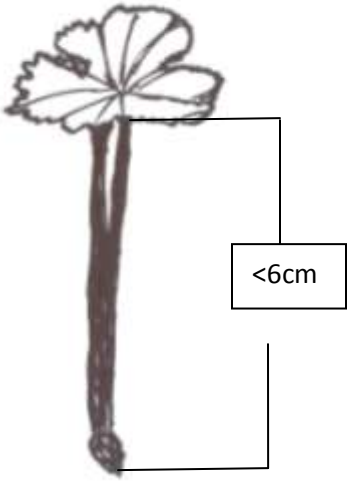
5

Medium

7

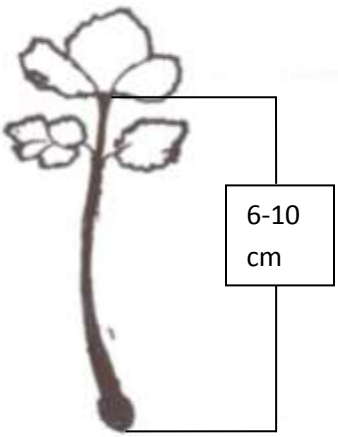
High

Characteristic 2. Length of the longest basal leaf



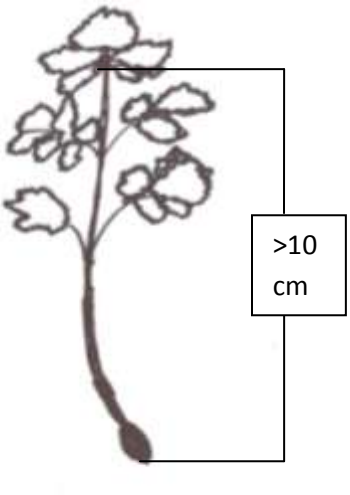
3

Short



5

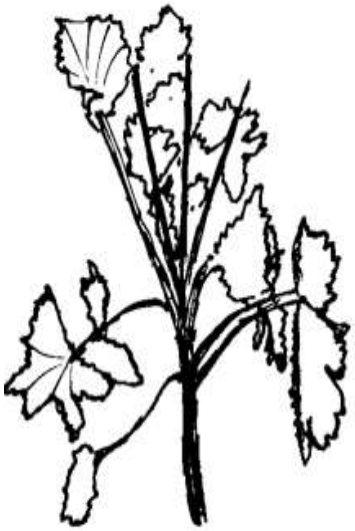
Medium



7

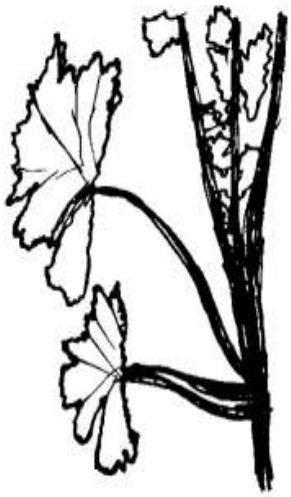
Long

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

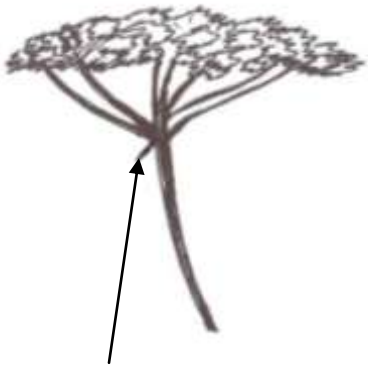
9

Present

Characteristic 9. Involucer:

1

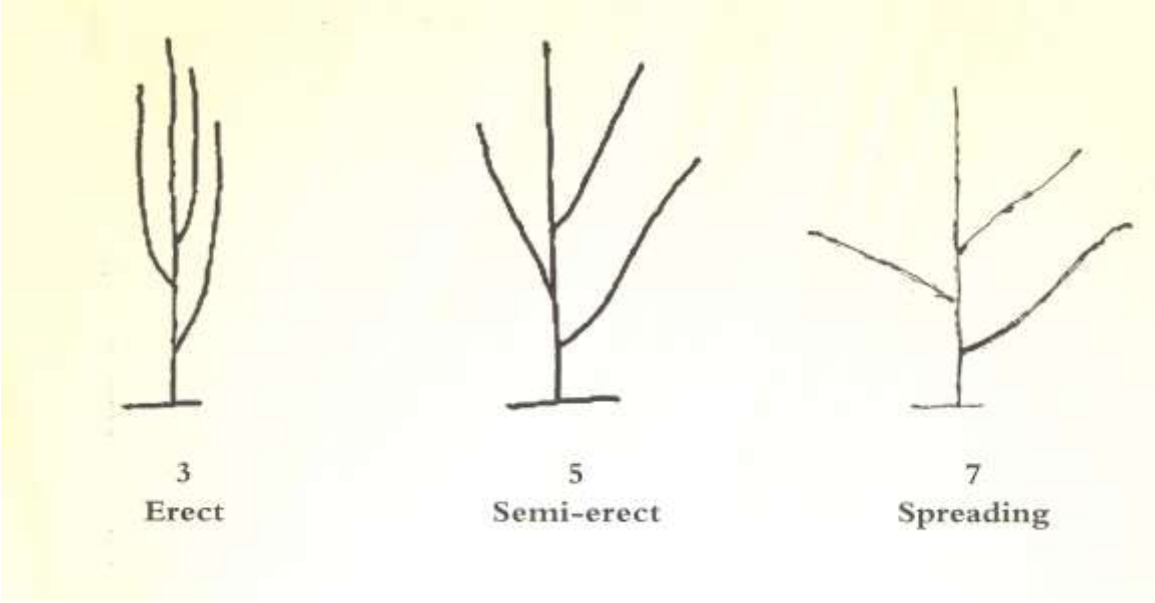
Absent



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. Working group details

These test guidelines have been developed by National Research Centre on Seed Spices, Ajmer, in consultation with the Task Force No. 5/2012 constituted by the PPV&FR Authority.

Members of the Task Force

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Names of the DUS testing Centers

Nodal Centre : National Research Centre on Seed Spices, Tabiji, Ajmer-305206, Rajasthan

Other Centre: DMAP, Anand, Gujarat