# Muskmelon (*Cucumis melo* L.)

## I. Subject

These test guidelines apply to all varieties, hybrids and parental lines of muskmelon (*Cucumis melo* L.) including *C. melo* L. subsp. *cantalupensis* and *C. melo* L. subsp. *reticulatus*.

## II. Seed 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 seed material from a country other than India must make sure that all customs and formalities are complied with.
2. The minimum quantity of seed of varieties, hybrids and parental lines to be supplied by the applicant should be:
    - For open field cultivation: 100 g seeds (in one submission only).
3. The seed should meet the minimum requirement for germination capacity (80%), moisture content should not be more than 8% and physical purity (98%) prescribed for certified seed in India. Especially for storage, which requires a higher standard, the applicant should state the actual germination capacity, which should be as high as possible. The seed supplied should be visibly healthy, not lacking in vigour or affected by any important pest or disease.
4. The seed material must not have undergone any treatment unless the competent authorities 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 test should normally be two independent but similar growing seasons (summer).
2. The test should normally be conducted at two different locations. If any essential characteristic of the variety can not be observed at these places, the variety may be tested at an additional place.
3. The test should 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 prejudice to the observations which must be made upto the end of the growing period. Each test shall include 105 plants for open field cultivation, which should be divided among 3 replications. Separate plots for observations and for measuring can only be used if they have been subjected to similar environmental conditions.
4. Test plot design

Number of rows : 5

| | | |
|---|---|---|
| Row length | : | 5.6 m |
| Row to row distance | : | 2.5 m |
| Plant to plant distance | : | 0.8 m |
| Number of replications | : | 3 |

5. Observations should not be recorded on plants in border rows.
6. 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 (Section VII) should be used for the testing of varieties for DUS.
2. For the assessment of Distinctiveness and Stability, observations should be made on 30 plants or parts of plants selected randomly, which should 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 105 plants, the number of off-types should not exceed 2.
4. Observations on the cotyledon should be made just before the development of the first true leaf.
5. All observations on the leaf should be made on fully developed but not old leaves, preferably between the $5^{th}$ and $8^{th}$ node when the plant has at least one fruit set.
6. All observations on the fruit should be made on $1^{st}$ or $2^{nd}$ well developed mature fruit.
7. All observations on the ovary shall be recorded on the day of anthesis.
8. All observations on width shall be recorded at the maximum point of width of the part concerned.
9. All observations on the seeds should be made on fully developed, matured and dry seeds, after washing and drying.
10. Stage of recording of different observations will be as follows:

| | **Description** | **Code** |
|---|---|---|
| a. | Cotyledons completely unfolded | 10 |
| b. | Active vegetative growth | 20 |
| c. | Flowering stage: appearance of first perfect/ pistillate flower in 50% plants from date of sowing | 30 |
| d. | Commercial harvest stage (harvest maturity) | 40 |

V. Grouping of Varieties

1. The collection of varieties to be grown should be divided into groups to facilitate the assessment of Distinctiveness. Characteristics which are suitable for grouping purposes are those, which are known from experience not to vary, or to vary only slightly, within a variety. Their various states of expression should be fairly evenly distributed throughout the collection.
2. It is recommended that the competent authorities use the following characteristics for grouping of muskmelon varieties:

| | | |
|---|---|---|
| a. | Inflorescence: sex expression (at full flowering) | Characteristic 10 |
| b. | Fruit: shape in longitudinal section | Characteristic 17 |
| c. | Fruit: rind colour | Characteristic 18 |
| d. | Fruit: sutures | Characteristic 25 |
| e. | Fruit: surface netting | Characteristic 27 |
| f. | Fruit: flesh colour | Characteristic 29 |

**VI. Characteristics and Symbols**

1. To assess Distinctiveness, Uniformity and Stability, the characteristics and their states as given in the Table of Characteristics should be used.
2. Notes (1-9) should 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 should be used in every growing season on all 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 the Explanation on the Table of Characteristics in Section VIII.
4. Type of assessment of characteristics indicated in Section VII 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 observations 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. | Cotyledon: length (cm) | Short (<2.75) | 3 | Punjab Sunehri | 10 | MS |
| | | Medium (2.75-3.25) | 5 | Arka Jeet | | |
| | | Long (>3.25) | 7 | RM-50, Pusa Madhuras | | |
| 2. | Cotyledon: width (cm) | Narrow (<1.5) | 3 | Kashi Madhu, Durgapura Madhu | 10 | MS |
| | | Medium (1.5-1.75) | 5 | GMM-3, RM-43 | | |
| | | Broad (>1.75 ) | 7 | Pusa Madhuras | | |
| 3. | Leaf blade: length (cm) | Short (<8) | 3 | RM-43 | 20 | MS |
| | | Medium (8-10) | 5 | Kashi Madhu | | |
| | | Long (>10) | 7 | MHY-3, Durgapura Madhu | | |
| 4. | Leaf blade: width (cm) | Narrow (<11) | 3 | GMM-3, RM-43 | 20 | MS |
| | | Medium (11-13 ) | 5 | Kashi Madhu | | |
| | | Broad (>13) | 7 | Pusa Madhuras | | |
| 5. (+) | Leaf blade: depth of lobes (depth of terminal lobe) | Weak | 3 | MHY-3 | 20 | VG |
| | | Medium | 5 | GMM-3 | | |
| | | Strong | 7 | RM-50 | | |
| 6. (+) | Leaf blade: length of | Short (<2.5) | 3 | - | 20 | MS |
| | | Medium (2.5- | 5 | Kashi Madhu | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | terminal lobe (cm) | 4.5) | | | | |
| | | Long (>4.5) | 7 | RM-50 | | |
| 7. (+) | Leaf blade: dentation of margin | Weak | 3 | RM- 43 | 20 | VG |
| | | Strong | 7 | Kashi Madhu, RM-50 | | |
| 8. | Leaf blade: petiole length (cm) | Short (<7) | 3 | RM-43, Durgapura Madhu | 20 | MS |
| | | Medium (7-9) | 5 | Pusa Madhuras, MHY-5 | | |
| | | Long (>9) | 7 | RM-50, Hara Madhu | | |
| 9. | Appearance of first perfect/ pistillate flower in 50% plants from date of sowing (days) | Early (<45) | 3 | Durgapura Madhu | 30 | MG |
| | | Medium (45-50) | 5 | MHY-3, RM-43, Kashi Madhu | | |
| | | Late (>50) | 7 | - | | |
| 10. (*) | Sex expression (at full flowering) | Monoecious | 1 | - | 30 | VG |
| | | Andro-monoecious | 2 | Kashi Madhu, Pusa Madhuras, Hara Madhu, Durgapura Madhu | | |
| | | Others | 9 | - | | |
| 11. | Male sterility | Absent | 1 | Kashi Madhu, Pusa Madhuras, Hara Madhu, Durgapura Madhu | 30 | VG |
| | | Present | 9 | - | | |
| 12. | Ovary: length (cm) | Short (<1) | 3 | Punjab Sunehri | 30 | MS |
| | | Medium (1-1.5) | 5 | MHY-5 | | |
| | | Long (>1.5) | 7 | Durgapura Madhu, RM-50 | | |
| 13. | Ovary: width (cm) | Narrow (<0.6) | 3 | Kashi Madhu | 30 | MS |
| | | Medium (0.6- | 5 | Hara Madhu | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | 0.8) | | | | |
| | | Broad (>0.8) | 7 | MHY-5 | | |
| 14. | Ovary: pubescence | Sparse | 1 | Arka Jeet | 30 | VG |
| | | Dense | 2 | Kashi Madhu | | |
| 15. | Fruit: length (cm) | Short (<10) | 3 | Arka Jeet | 40 | MG |
| | | Medium (10-15) | 5 | Pusa Madhuras | | |
| | | Long (>15) | 7 | Durgapura Madhu | | |
| 16. | Fruit: diameter (cm) | Narrow (<9) | 3 | RM-43, Arka Jeet | 40 | MG |
| | | Medium (9-12) | 5 | RM-50 | | |
| | | Broad (>12) | 7 | GMM-3, Kashi Madhu | | |
| 17. (*) (+) | Fruit: shape in longitudinal section | Ovate | 1 | MHY-5 | 40 | VG |
| | | Oval | 2 | - | | |
| | | Elongated globe | 3 | Arka Rajhans | | |
| | | Round | 4 | - | | |
| | | Oblate (Flat globe) | 5 | GMM-3, Kashi Madhu | | |
| | | Obovate | 6 | Durgapura Madhu | | |
| | | Cylindrical | 7 | - | | |
| 18. (*) | Fruit: rind colour | Creamy white | 1 | - | 40 | VG |
| | | Yellow | 2 | Kashi Madhu | | |
| | | Yellow Green | 3 | Durgapura Madhu | | |
| | | Orange | 4 | Arka Jeet | | |
| | | Others | 9 | - | | |
| 19. | Fruit: patches | Absent | 1 | Arka Jeet, MHY-3 | 40 | VG |
| | | Present | 9 | Kashi Madhu, GMM-3 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| 20. | Fruit: peduncle at maturity | Slipable | 1 | Kashi Madhu | 40 | VG |
| | | Non-slipable | 9 | Hara Madhu | | |
| 21. (+) | Fruit: shape at peduncle end | Pointed | 1 | Durgapura Madhu | 40 | VG |
| | | Rounded | 2 | Hara Madhu, Pusa Madhuras | | |
| | | Truncate | 3 | Kashi Madhu | | |
| 22. (+) | Fruit: shape at blossom end | Pointed | 1 | Durgapura Madhu | 40 | VG |
| | | Intermediate | 2 | - | | |
| | | Truncate | 3 | Kashi Madhu | | |
| 23. | Fruit: diameter of blossom end scar (cm) | Small (<1) | 3 | Arka Jeet, Durgapura Madhu | 40 | MS |
| | | Medium (1-2) | 5 | Pusa Madhuras | | |
| | | Large (>2) | 7 | Kashi Madhu | | |
| 24. | Fruit: surface | Smooth | 1 | Arka Jeet, MHY-3 | 40 | VG |
| | | Grooved | 9 | RM-43, Kashi Madhu | | |
| 25. (*) | Fruit: sutures | Absent | 1 | Arka Jeet, MHY-3 | 40 | VG |
| | | Present | 9 | Hara Madhu, Kashi Madhu | | |
| 26. | Fruit: suture colour | Creamy | 1 | Arka Rajhans | 40 | VG |
| | | Green | 2 | Kashi Madhu, Hara Madhu | | |
| | | Others | 9 | - | | |
| 27. (*) | Fruit: surface netting | Absent | 1 | Arka Jeet, MHY-5 | 40 | VG |
| | | Moderate | 2 | RM-50, Punjab Sunehri | | |
| | | Dense | 3 | - | | |
| 28. | Fruit: flesh thickness at | Thin (<2) | 3 | Arka Jeet | 40 | MS |
| | | Medium (2-3) | 5 | MHY-5 | | |

| | | | | | | |
|---|---|---|---|---|---|---|
| | position of maximum fruit diameter (cm) | Thick (>3) | 7 | GMM-3 | | |
| 29. (*) | Fruit: flesh colour | Creamish white | 1 | Arka Jeet | 40 | VG |
| | | Grey orange | 2 | GMM-3 | | |
| | | Yellowish green | 3 | Durgapura Madhu | | |
| | | Green | 4 | Hara Madhu | | |
| | | Orange | 5 | Kashi Madhu | | |
| 30. | Fruit: flesh texture | Mealy | 3 | Hara Madhu | 40 | VS |
| | | Intermediate | 5 | - | | |
| | | Crispy | 7 | Kashi Madhu | | |
| 31. | Fruit : flavour | Mild | 3 | Arka Rajhans | 40 | VG |
| | | Medium | 5 | Kashi Madhu, Durgapura Madhu | | |
| | | Strong | 7 | - | | |
| 32. | Seed: length (cm) | Short (<1) | 3 | Kashi Madhu, Hara Madhu | 40 | MS |
| | | Long (>1) | 5 | Pusa Madhuras | | |
| 33. | Seed: width (cm) | Narrow (<0.4) | 3 | Durgapura Madhu | 40 | MS |
| | | Broad (>0.4) | 5 | Pusa Madhuras | | |
| 34. | Seed: colour | Creamy white | 1 | Kashi Madhu, Arka Jeet | 40 | VG |
| | | Yellowish | 2 | Durgapura Madhu, Hara Madhu | | |

## VIII. Explanation on the Table of Characteristics

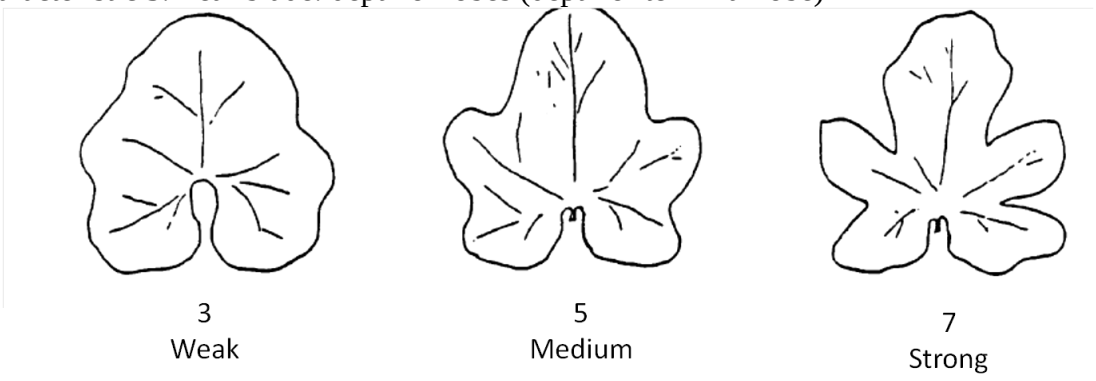
1. Explanation covering several characteristics

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

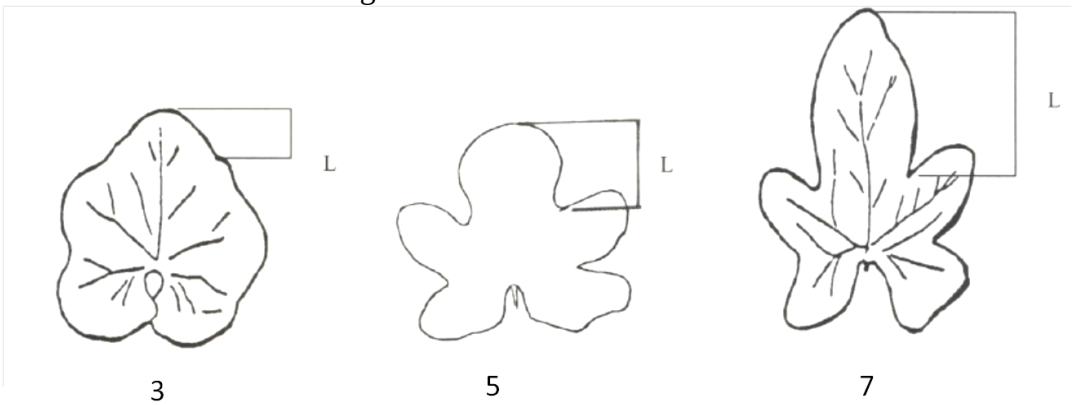
| | | |
|---|---|---|
| a. | Seedling | All observations on the seedling should be made just before the development of the first true leaf. |
| b. | Leaf blade | All observations on the leaf blade should be made on fully developed but not old leaves, preferably between the 5$^{th}$ and 8$^{th}$ node when the plant has at least one fruit set. |
| c. | Fruit | The flesh colour should be measured at least one day after the harvest. |
| d. | Seed | All observations on the seed should be made on fully developed, matured and dry seeds, after washing and drying in the shade. |

2. Explanation for individual characteristic

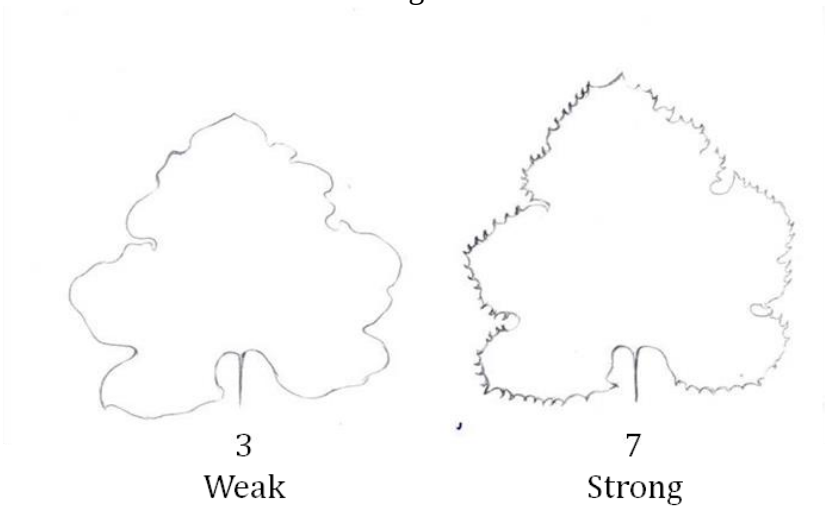
Characteristic 5. Leaf blade: depth of lobes (depth of terminal lobe)



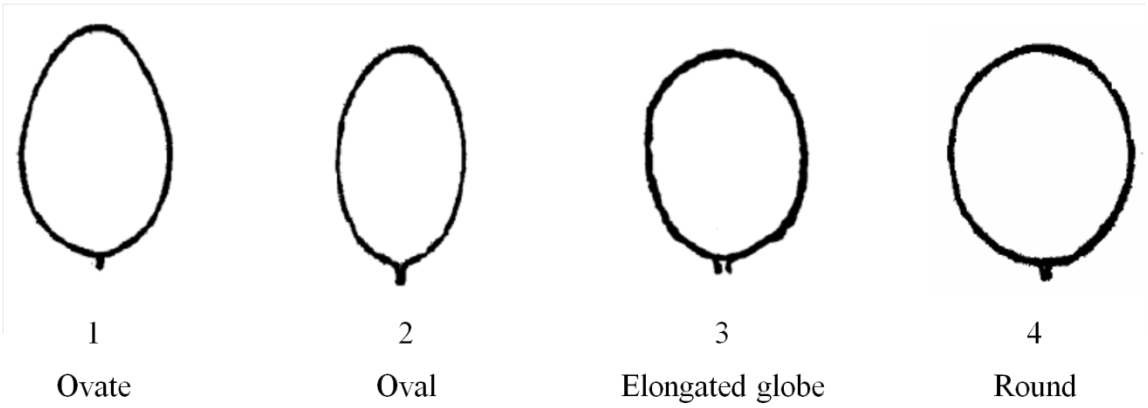
Characteristic 6. Leaf blade: length of terminal lobe

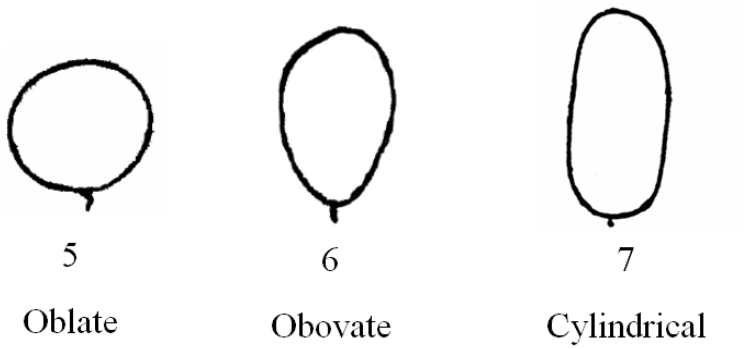



Characteristic 7. Leaf blade: dentation of margin

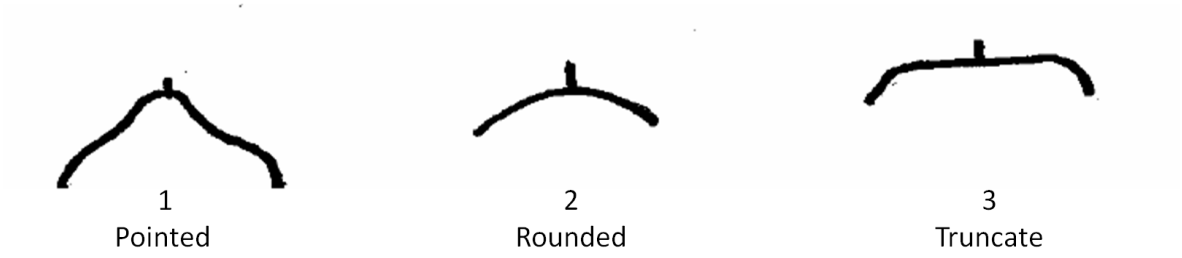



Characteristic 17. Fruit: shape in longitudinal section

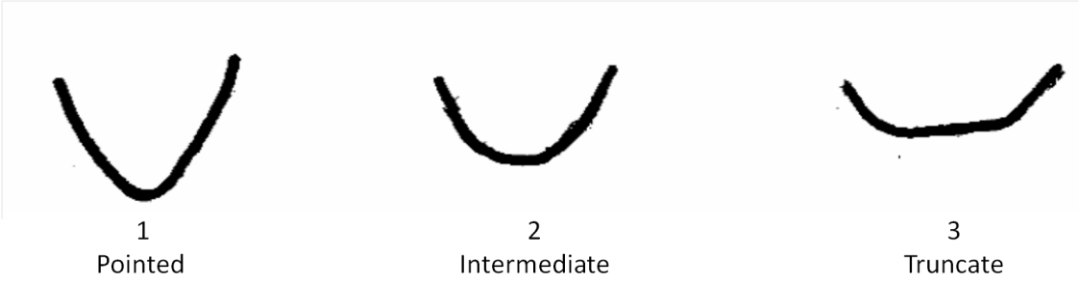





Characteristic 21. Fruit: shape at peduncle end




Characteristic 22. Fruit: shape at blossom end



## IX. Working Group Details

The Test guidelines were developed by the Task Force (12/2011) constituted by the PPV&FR Authority, New Delhi in consultation with the Director, Indian Institute of Vegetable Research (IIVR), Varanasi, Project Coordinator (Vegetable Crops), Nodal Officer and Co-Nodal Officers of DUS testing centres.

**Nodal officer**

Dr. S.K. Sharma, Director, Central Institute for Arid Horticulture, Sri Ganganagar Highway, Beechwal, Industrial Area P.O., Bikaner-334006 (Rajasthan).

**Co-Nodal officer**

Dr. Sudhakar Pandey, Senior Scientist, Division of Crop Improvement, Indian Institute of Vegetable Research, P.B. No.- 01, P.O.-Jakhini (Shahanshahpur), Varanasi-221305 (U.P.).

Dr. B.R. Choudhary, Scientist, Division of Crop Improvement, Central Institute for Arid Horticulture, Sri Ganganagar Highway, Beechwal, Industrial Area P.O., Bikaner-334006 (Rajasthan).

Dr. E. Sreenivas Rao, Senior Scientist, Division of Vegetable Science, Indian Institute of Horticultural Research, Hessarghatta, Lake Post, Bengaluru-560089 (Karnataka).

## X. DUS Testing Centres

| **Nodal Centre** | **Other Centre** |
|---|---|
| Central Institute for Arid Horticulture, Sri Ganganagar Highway, Beechwal, Industrial Area P.O., Bikaner-334006 (Rajasthan). | Punjab Agricultural University, Ludiana, Punjab. |