# Guidelines
# for the Conduct of Test for
# Distinctiveness, Uniformity and Stability
# on
# Sapota (*Achras zapota* L.)


**Protection of Plant Varieties and Farmers' Rights Authority (PPV & FRA)**
**Government of India, New Delhi**

# Contents

# Sapota (*Achras zapota* L.)

**I. Subject**

These test guidelines shall apply to all varieties of sapota (*Achras zapota* L).

## II. Material required

1. The Protection of Plant Varieties and Farmers' Rights Authority (PPV & FRA) Shall decide on the quantity and quality of the planting material(s) required for testing the variety and when and where it is to be delivered for registration under the Protection of Plant Varieties and Farmers' Rights (PPV & FRA) Act, 2001. Applicants submitting such planting material(s) 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.

2. The minimum number of planting material to be supplied by the applicants or his/her nominee/assignee during July-August shall be 05 (five) for grafted plants from each centre.

3. The planting materials supplied shall be healthy, not lacking in vigour or nutrition as well as free from pests or diseases or any mechanical damage.

4. The planting material(s) shall not have undergone any treatment (chemical/bio-physical or others) which would affect the expression of the characteristics of the variety, unless the Competent Authority allow or request for such treatment. If it has been treated, full details of the treatment must be mentioned explicitly.

**III. Conduct of tests**

1. The minimum duration of the DUS tests shall normally be at least two fruiting seasons in two calendar years for same season. locations.

**3. Test design**

The design of the tests should be such that plants or parts of plants may be removed for measurement or observation without prejudice to the observations which must be made up to the end of the growing cycle. The additional test protocol for special purpose may be established by PPV & FRA. As the minimum, each test shall include five plants per location, planted at test centre, with a spacing of 6m x 6m.

***Testing at DUS testing centre***

The tests shall normally be carried out at the DUS testing center's for the recommended period of years. However, looking into the perennial nature of the crop, provision has been made for on- site DUS testing with prior precautions as mentioned below.

***Testing on-site***

The applicant or his/her nominee on his/her behalf shall submit a request to the Authority for conducting a reliable trial according to Test Guidelines and the instructions from Authority before on-site examination of the candidate variety.

The applicant or his/her nominee shall submit a request to the Authority for on-site examination prior to start of growing cycle as mentioned in Test Guidelines for site examination of the candidate variety. On-site testing may be conducted at the places specified by the applicant. The age of the trees at on-site shall be minimum 5 years. As a minimum, 05 trees planted in uniform spacing should be available for inspection and examination for 'on site' DUS testing. The trees must be healthy and free from pest & disease and raised under standard and uniform management practices. For farmer's variety or landraces, the authority may notify suitable guidelines on the number of plant(s) and season(s), if any.

On-site examination shall be arranged during the fruiting season, when distinguishing characteristics of candidate variety can easily be seen. The characteristics of the candidate variety can be examined and compared with those of the comparative varieties as per the Test guidelines.

The Expert Committee shall be authorized to inspect on-site testing and validation of recorded DUS characters. Applicant shall supply the Expert Committee with summary of distinct characteristics supported by photographs. The Expert Committee shall take notes and observations on distinctness and shall confirm preliminary data and/or summary of distinctness from applicant to the authority.

## IV. Methods and observations

**1.** The characteristics described in the Table of characteristics (Section VII) shall be used for testing the varieties for their DUS.

**2.** For the assessment of Distinctiveness and Uniformity, observations shall be made on five plants or relevant parts taken from each plant, randomly. In the case of parts of plants, the minimum number to be taken from each plant should be two.

**3.** Observation on colour of newly opened leaf should be taken first leaf is 30% of its full size (BBCH Scale 113).

**4**. Select mature, fully expanded main shoot leaves attained full size, appearing light green colour corroborating with BBCH scale 119.

**6**. Observations on the mature fruit should be recorded when style shed, brown scales from skin disappeared, skin become smoother, latex secretion ceased.

**8**. The ripe consumable fruit stage reached when harvestable mature fruits stored for one week at ambient room temperature. The ripen fruit becomes soft, uniformly brown in color, juicy, sweet, latex-free pulp.

**9.** Seeds should be manually extracted from fully ripened fruits and uniform size should be selected, thoroughly washed to remove pulp and debris

The optimum stage for assessment of each characteristic is given in the sixth column of the Table of characteristics are described below:

| S.No | Time of Observation | Code |
|---|---|---|
| 1 | When newly first leaf is 30% of its full size | a |
| 2. | Leaves on mature fully expanded main shoot free from senescence or damage | b |
| 3. | The harvestable mature fruits (300-334 days from flower bud initiation stage) when it develops a dull orange or potato colour. | c |
| 4 | Mature ripen fruits after 6–8 days after harvest when they are soft, uniformly brown, juicy, sweet, with latex-free pulp | d |
| 5 | Seeds extracted manually from fully ripened fruit and uniform size should be selected, thoroughly washed to remove pulp and debris, and dried in shade. | e |

## V. Grouping of varieties

The characteristics described in the Table of characteristics (section VII) shall be used for the testing varieties for their DUS.

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 purpose.

The following characteristics are to be used for **grouping sapota** varieties:

1. Leaf Variegation (Characteristics 6)
2. Fruit Shape (Characteristics 12)
3. Fruit Base (Characteristics 13)
4. Fruit Apex shape (Characteristics 14)
5. Ridge on fruit surface (Characteristics 15)
6. Fruit Skin Texture (Characteristics 17)
7. Pulp Color (Characteristics 19)

## VI. Characteristics and symbols

**1.** The characteristics described in the Table of characteristics (see section VII) shall be used for the testing varieties for their DUS.

**2.** To assess Distinctiveness, Uniformity and Stability, the characteristics and their states as given in the Table of characteristics (Section VII) shall be used.

**3.** Notes (l to 9) shall be given for each state of expression for different characteristics for the purpose of electronic data processing.

## 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 a preceding phenological 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 characteristics in Section VII. It is to be noted that for certain characteristics, the plant parts on which observations to be taken are given in the explanation or figure(s) for clarity and not the colour variation.

**4.** Type of assessment of characteristics indicated in column seven of Table of Characteristics are as follow:

MG: Measurement by single observation of a group of plants or part of plants.

MS: Measurement by a single observation of individual plants or part 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 plant or part of plants.

# VII. Table of Characteristics

| Sr.No | Characteristics | States | Note | Example Varieties | Stage | Type |
|---|---|---|---|---|---|---|
| 1 (*) | Color of newly opened leaves | Yellow Green<br><br>144A | 3 | Bhuripatti, PKM-1, PKM-5 | a | VG |
| | | Greyed orange<br><br>166 B | 5 | Cricket Ball, DHS-2 | | |
| | | Grey brown N199A | 7 | Singapore | | |
| 2 (*)<br>(+) | Leaf shape | Oval | 1 | PKM-3, PKM-4 | b | VG |
| | | Lanceolate | 9 | DHS-2, PKM-5 | | |
| 3 (*)<br>(+) | Shape of leaf base | Acute | 3 | Bhuripatti, , Cricket Ball, Kalipatti | b | VG |
| | | Obtuse | 5 | DHS-2 | | |
| 4 (*)<br>(+) | Leaf tip shape | Acute | 3 | Cricket Ball, PKM-5, Bhuripatti, | b | VG |
| | | Obtuse | 5 | PKM-3, PKM-4, CO-3, | | |
| 5 (*)<br>(+) | Leaf margin | Entire | 1 | Bhuripatti, CO-2, Cricket Ball, | b | VG |
| | | Wavy | 9 | CO-1, PKM-5 | b | VG |
| 6 (*)<br>(+) | Leaf variegation | Present | 5 | Variegated Sapota | b | VG |
| | | Absent | 7 | Kalipatti | | |
| 7 (*) | Leaf length (cm) | Short (=<9.0cm) | 1 | PKM-2, PKM-4, PKM-5 | b | MS |
| | | Long (>9.0cm) | 9 | CO-3, DHS-1, Kalipatti | | |
| 8 (*) | Leaf width (cm) | Narrow (<3.5 cm) | 1 | Pilipatti, CO-1 | b | MS |
| | | Broad (3.5 cm and above) | 9 | CO-2, CO-3, DHS-2, Kalipatti, | | |
| 9 (*) | Petiole length (cm) | Short (<2.0 cm) | 3 | CO-2, PKM-1 | b | MS |
| | | Long (=> 2.0 cm) | 7 | Chala collection-1 | | |
| 10(*) | Mature leaf color | Green | 3 | Cricket Ball, DHS-1, PKM-3 | b | VG |
| | | Dark Green | 5 | Bhuripatti, CO-1 | | |
| 11 (*) | Petiole color | Green<br><br>143A | 3 | CO-1, CO-3, Kalipatti | b | VG |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | Yellow-Green 144 A | 5 | CO-2, PKM-2 | | |
| 12 (*) (+) | Fruit shape | Elliptic | 3 | PKM-4 | c | VG |
| | | Round | 5 | CO-1, CO-3, Kalipatti, 2, CO-2 | | |
| | | Oval | 7 | PKM-1, Bhuripatti, Singapore, PKM-3, Mohangooti | | |
| 13 (*) (+) | Fruit base | Depressed | 3 | CO-1, Cricket Ball | c | VG |
| | | Inflated | 5 | Bhuripatti, Kalipatti, PKM-1 | | |
| | | Flattened | 9 | CO-2, CO-3, DHS-1, | | |
| 14 (*) (+) | Fruit apex shape | Acute | 3 | PKM-3, PKM-4 | c | VG |
| | | Obtuse | 5 | Bhuripatti, PKM-1, Cricket Ball | | |
| | | Round | 7 | CO-1, DHS-2, Kalipatti, | | |
| 15 (*) | Ridges on fruit surface | Absent | 1 | CO-1, CO-2, DHS-2 | c | VG |
| | | Present | 9 | Kalipatti, PKM-1 | | |
| 16 (*) | Fruit skin color | Light brown | 3 | Kalipatti, CO-1, CO-2, | c | VG |
| | | Brown | 5 | Bhuripatti, CO-3 | | |
| 17 (*) | Fruit skin texture | Smooth | 3 | Bhuripatti, PKM-1 | d | VG |
| | | Rough | 7 | Kalipatti, CO-1 | | |
| 18 (*) | Fruit skin thickness | Thin | 1 | Kalipatti, Bhuripatti, DHS-1, | d | VG |
| | | Thick | 9 | CO-1, PKM-2 | | |
| 19 (*) | Pulp color | Creamy | 1 | Kalipatti, PKM-2 | d | VG |
| | | Brown | 5 | Bhuripatti, CO-1 | | |
| | | Orange red | 7 | Red Sapota | | VG |
| 20 (*) | Ripe Fruit weight (g) | Small (<80) | 3 | Kalipatti, PKM-1, PKM-4, Mohangooti | d | MS |
| | | Medium (80–120) | 5 | Bhuripatti, CO-1 | | |
| | | Large (>120) | 7 | Cricket Ball, DHS-1, DHS-2 | | |
| 21(*) | Total no. of seeds/fruit | Low (<2) | 3 | Kalipatti, Bhuripatti, | e | MS |
| | | Medium (2–4) | 5 | PKM-1, DHS-2 | | |
| | | High (>4) | 7 | DHS-1, Cricket Ball | | |

# VIII. Explanation for Table of Characteristics

**Characteristic: 1.** Leaf Shape

Oval

Lanceolate

**Characteristic: 2.** Shape of leaf base

**Acute**

**Abtuse**

**Characteristic: 3.** Shape of leaf tip

**Acute**

**Obtuse**

**Characteristic: 4.** Shape of leaf margin

**Entire**

**Wavy**

**Characteristic: 5.** Leaf variegation

**Present**

**Absent**

**Characteristic: 6.** Shape of Fruit

**Elliptic**

**Round**

**Oval**

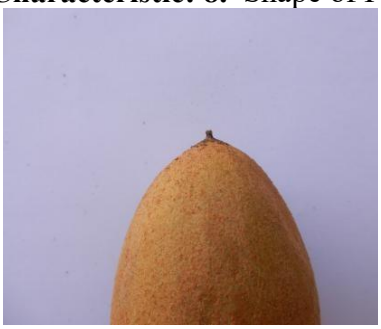
**Characteristic: 7.** Shape of Fruit base

**Depressed**

**Inflated**

**Flated**

**Characteristic: 8.** Shape of Fruit apex



**Acute**

**Obtuse**

**Round**

**Characteristic: 9.** Ridges on fruit

**Absent**

**Present**

## IX. Working Group details

The Test Guidelines developed by the Task Force (4/2024) constituted by the PPV&FR Authority.

## The Members of the Task Force (4/2024)

| | | |
|---|---|---|
| 1. | Dr. S. Rajan<br>Former Director<br>ICAR-Central Institute for Sub Tropical Horticulture, Rehmankhera,<br>P.O. Kakori, Lucknow UP-227107 | Chairman |
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| 4. | Dr. A. Nagraja<br>Principal Scientist, ICAR-Indian Institute of Horticulture Research, Hesaraghatta Lake<br>Post, Bengaluru-560089 | Member |
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## X. DUS testing centers

Navsari Agricultural University, Eru
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