

STUDYING MORPHOLOGICAL CHARACTERISTICS OF AVAILABLE VARIETIES OF FRUIT CROPS

Exercise

Studying morphological characteristics of available varieties in fruit crops.

Objectives

- To Study the morphological characteristics of available varieties in fruit crops

Delivery schedule: 02 period

Student expectations/learning objectives

- To know the different types of varieties available in fruit crops.
- To get familiar with different types of varieties on the basis of their morphological characters.

Handouts/material/equipment's & tools required: Paper sheet and pen to note down the morphological characters of different varieties.

Pre-learning required: Pre-requisite knowledge of some of the commonly grown varieties in the locality.

Introduction

Morphological characterization is the one of the method accepted for registration and protection of new cultivars in each crop. The cultivar identification is traditionally based on the observation of morphological characteristics whose expression is largely influenced by developmental, environmental and cultivation factors. Furthermore, it is necessary to find morphological descriptors that are able to distinguish among different cultivars. The morphological characters will be able to distinguish between the varieties of each crop. Before knowing detail descriptors for fruit crop, we would like to get familiar with some of the terms related to this practical exercise.

Useful terms

Descriptor: Within the plant genetic resources community, a *descriptor* is defined as an attribute, characteristic or measurable trait that is observed in an accession of a genebank. It is used to facilitate data classification, storage, retrieval, exchange and use. Example: accession number, flower colour, plant height etc.

Descriptor list: It is a set of individual descriptors used for the description of germplasm of a particular crop or species.

Descriptor elements: Each descriptor consists of a *descriptor name*, a *descriptor state*, and a *descriptor method* explaining how the descriptor should be measured and recorded. A descriptor state could be a quality, measurable attribute or code.

Example:

Stem pubescence	(descriptor name)
Observed at the stem base	(descriptor method)
3 Sparse	(descriptor state)
5 Intermediate	(descriptor state)
7 Dense	(descriptor state)

In above Example, 'stem pubescence' is the descriptor name; 'observed at the stem base' is the descriptor method and 'sparse; intermediate; dense' are the descriptor states, with corresponding numbering codes (3, 5, 7) assigned to descriptor states for ease of documentation.

Descriptor names: The descriptor should have a full *name* that is *descriptive, unambiguous* and as *compact* as possible. Descriptor names are frequently composed of an *object* or item, and a characteristic or *attribute* name. When choosing a descriptor name, it is essential to verify that the technical terms are correct and that they are generally accepted and understood by other users.

For teachers...

- Arrange visit of fruit orchards and ask students to study morphological characters of different fruit

Example:

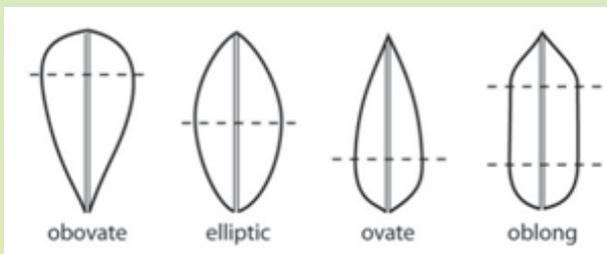
- Accession number
- Species name
- Leaf colour
- Flowering habit
- Soil fertility

Descriptor states: For a number of qualitative and quantitative descriptors, a *descriptor state* is a clearly definable state of expression to define a characteristic and harmonize descriptions. It represents the variation in the observations or measurements made on a particular descriptor. Each descriptor is allocated a corresponding numeric code for ease of data recording and exchange. Reference materials can be used to help define the various states of expression of traits, and recommended resources include drawings, check cultivars, colour charts, phenological scales, illustrations, and lists of possible values or codes (if applicable). Examples of such reference material are given in the following sections.

Example:

Leaf shape

- 1 Obovate (descriptor state)
- 2 Elliptic (descriptor state)
- 3 Oblong (descriptor state)
- 4 Ovate (descriptor state)



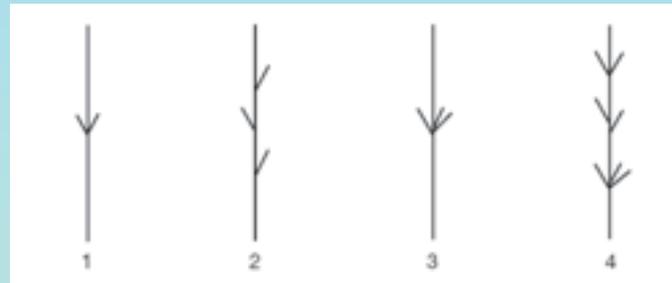
Drawings: Since collections of the plant genetic resources of a crop could be sited any where, and large in number, a collection may not have access to a standard reference, so simple line drawing or pictures of stem

branching, for example, are easier to refer to and will help users to select states of expression of a trait, avoiding confusion with environmental effects. Figure captions should be brief, but complete, and should contain the name of the relevant descriptor. If a figure is taken from or based on another source, a full bibliographic reference to the source should be included in an appendix of the descriptor list.

Example:

Stem branching

- 1 Opposite
- 2 Alternate
- 3 Ternate
- 4 Mixed



Reference standards and parameters

When a descriptor state is open to interpretation or difficult to explain, reference standards or specific parameters can be used to clarify it. Reference standards provide an objective baseline against which measurements and comparisons can be made. They provide the means to make observations more consistent and comparable. Often, a common cultivar is used as a standard and the standard reference is then used as a check. Check cultivars and standard references also provide useful corollary information to gauge the performance of the accessions being tested. Check cultivars should be widely available and known.

Example:

- Blade shape of mature leaf*
- rounded Leaf*
- Reniform*
- Cordate*



Colour charts

A fruit colour descriptor that describes different shades of a colour would benefit greatly from the use of a colour chart or reference standard, if available. Without a reference for comparison, descriptor states such as 'light green', 'green' and 'dark green' cannot be scored consistently and objectively.

Fruit colour RHS colour code (RHS, 1986)

- 1 Light green 145A
- 2 Green 146A
- 3 Dark green 147A

Parameters

It is strongly recommended to use actual measurements (cm, g, mm) for making good use of quantitative data (i.e. continuous variation) for genetic diversity analysis. Actual measured values can also give us statistical data to assess variation within an accession. Character states as listed below should be used only when measuring is very difficult. For instance, a fruit length descriptor should specify relevant ranges of

measurements to avoid misinterpretation by different users. Without these ranges, descriptor states cannot be scored consistently or objectively.

Example:

(WRONG)

Fruit length

- 1 Very short
- 2 Very short to short
- 3 Short
- 4 Short to intermediate
- 5 Intermediate
- 6 Intermediate to long
- 7 Long
- 8 Long to very long
- 9 Very long

(RIGHT)

Fruit length

- 1 Very short (<2 cm)
- 2 Very short to short (>2 – 4 cm)
- 3 Short (>4 – 6 cm)
- 4 Short to intermediate (>6 – 8 cm)
- 5 Intermediate (>8 – 10 cm)
- 6 Intermediate to long (>10 – 12 cm)
- 7 Long (>12 – 14 cm)
- 8 Long to very long (>14 – 16 cm)
- 9 Very long (>16 cm)

Descriptor methods

A *descriptor method* describes in detail how and under what conditions a descriptor is measured or scored. The description method facilitates accurate interpretation of results and provides a protocol to be universally and consistently applied.

Example:

Plant height (cm)

Recorded at maturity, measured from ground level to a feet high (or) one meter. Average of 3.5 randomly selected plants. It is important to use technically correct terminology in descriptions. If possible, record any bibliographical references consulted and list them in an appendix to the descriptor list. This will allow others to verify the terminology and methodology.

Descriptor method elements comprise:

- an *Object*
- a *Condition*
- a *Sampling procedure*

Object: This defines the exact part (s) of the plant to be observed or measured. A measurement of plant height that does not specify exactly between which points the measurement should be taken is incorrect, because different people may use different measuring points. In the case of quantitative descriptors, a unit of measurement should be defined. It is recommended to use only the system International d'Unités (SI) and to include the units to be applied in square brackets following the descriptor name.

Condition: This defines the conditions under which the observation is made, such as duration, plant growth stage, phenological condition, temperature, humidity, 'priming' (pre-observation treatments), and specifications of particular equipment if required. In the above example 'fully developed' is the condition.

Sampling: The number of samples on which the observation is based should be given, thus providing an indication of data accuracy within the method. The type of method used for sample selection (random, stratified, etc.) should also be indicated. When variation of a characteristic within the accession is prevalent, it is essential to describe how the samples are to be selected and how many samples are needed.

Familiarized with above terms and procedure now it will be easy to describe the varieties morphologically, considering all above points.

Morphological description of mango varieties

S. No.	Characters	Varieties		
		(Alphonso)	(Amrapali)	(Mulgoa)
Leaf characteristics				
1.	Leaf shape	Lanceolate	Lanceolate	Lanceolate
2.	Leaf length (cm)	32	24	19.5
3.	Leaf width (cm)	7	3	2.5
4.	Petiole length (cm)	6.5	0.6	0.9
5.	Colour of fully developed leaf	Medium green	Dark green	Pale green
6.	Leaf tip	Acuminate	Acuminate	Acute
7.	Leaf margin	Twisted	Wavy	Entire
Fruit characteristics				
1.	Fruit length (cm)	10.5	13.7	14.3
2.	Fruit thickness (cm)	8.4	7.5	24
3.	Fruit weight (g)	293	335	365.95
4.	Fruit shape	Obovoid	Elliptical	Oblong
5.	Colour of ripen fruit	Yellow	Yellow	Greenish Yellow
Secondary characteristics				
1.	Eating quality	Excellent	Excellent	Good
2.	Fruit attractiveness	Excellent	Good	Average
3.	Basal cavity	Shallow	Absent	Shallow
4.	Beak type	Perceptible	Perceptible	Perceptible
5.	Sinus type	Absent	Absent	Shallow
6.	Slope of shoulders	Rising and then rounded	Sloping abruptly downward	Sloping gradually in a long curve
7.	Apex	Abtuse	Obtuse	Obtuse
8.	Fruit stalk attachment	Strong	Intermediate	Intermediate

From the above table we can see the difference in their morphological characters between the three varieties. Likewise variety may vary in its morphological characteristic i.e, the characters are variety specific.

Students Activities

- The students can use the above descriptors and try with different varieties of guava, papaya , apple or any available fruit crops in a particular locality.
- The descriptors may vary according to the crop, based upon morphology
- Student can make a visit to nearby locality and practice to score different fruit crops in their locality

Study Material

- Bioversity International (2007). Guidelines for the development of crop descriptor lists. Bioversity Technical Bulletin Series. Bioversity International, Rome, Italy.
- Morphological Description of Mango Varieties under Agro-climatic Conditions of Gujarat, 2013 Pub. AICRP(STF), CISH, Lucknow, India.