Descriptors for Sponge Gourd
[Luffa cylindrica (L.) Roem.]

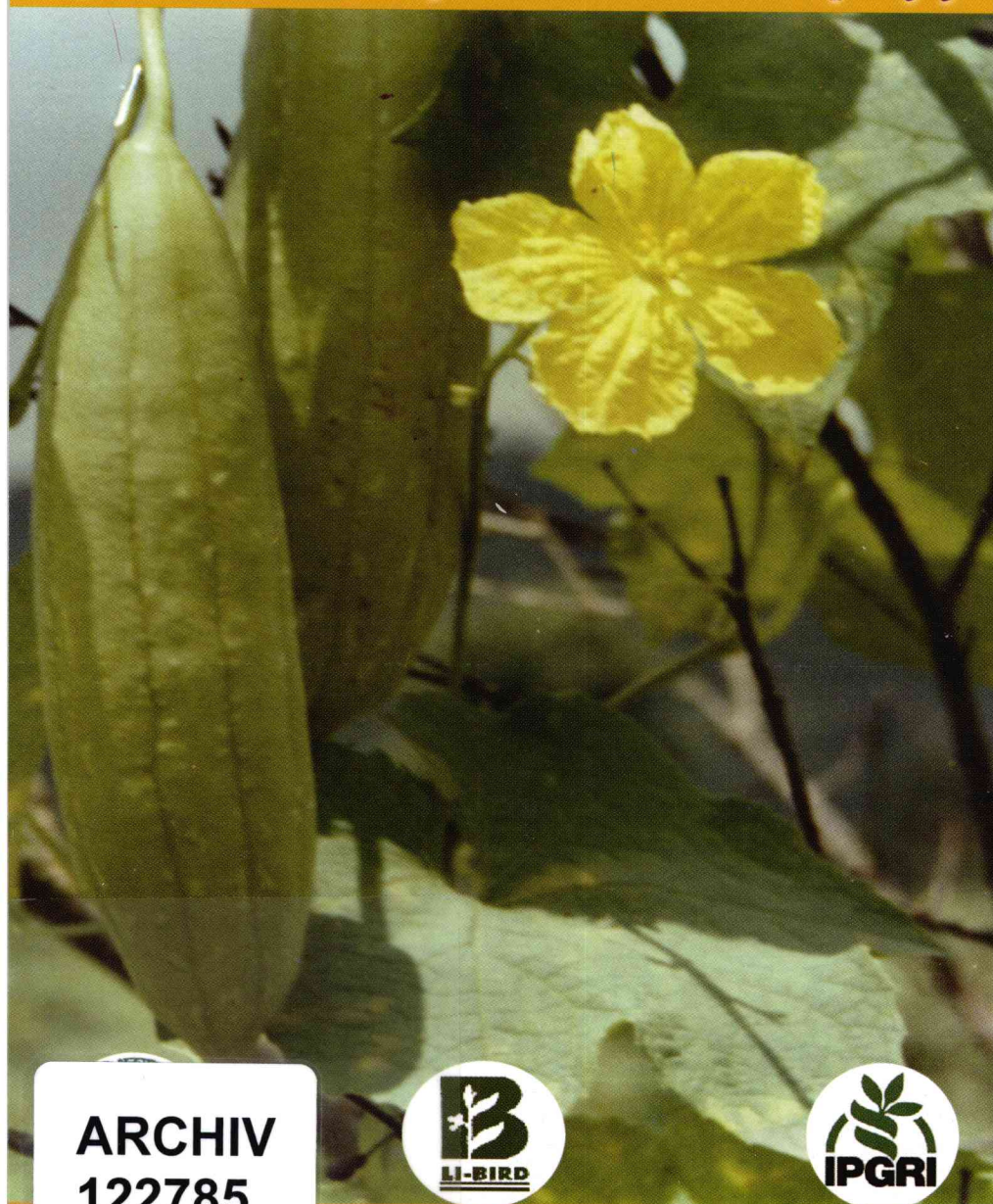Bal K Joshi, Hari B KC, Radha K Tiwari, Madhusudan Ghale, Bhuwan R Sthapit and Madhusudan P Upadhyay

Descriptors for Sponge Gourd [*Luffa cylindrica* (L.) Roem.]

Bal K Joshi, Hari B KC, Radha K Tiwari, Madhusudan Ghale, Bhuwan R Sthapit and Madhusudan P Upadhyay

NARC   LIBIRD   IPGRI

Nepal Agricultural Research Council (NARC)
Kathmandu Nepal

Local Initiatives for Biodiversity, Research and Development (LIBIRD)
Pokhara Nepal

International Plant Genetic Resources Institute (IPGRI)
Rome Italy

Citation
Joshi BK, HB KC, RK Tiwari, M Ghale, BR Sthapit and MP Upadhyay. 2004. Descriptors for sponge gourd (*Luffa cylindrica*). NARC, LIBIRD and IPGRI.

Preface

Standard descriptors for plant genetic resources are necessary to characterize and evaluate them. This descriptor of sponge gourd is developed to standardize the characterization and evaluation of sponge gourd. In addition, this will help to communicate among researchers and development workers. This is an outcome of experiences gained from the Global project, Strengthening the scientific basis of in situ conversation of agricultural biodiversity. Introduction about sponge gourd and descriptor itself are included along with five types of descriptors. Collection form and codes for characterizing and evaluating traits are added for better managing field book during sponge gourd trials. Relevant references are given as supplement resources.

Contents

Sponge Gourd

Luffa (*Luffa cylindrica* (L.) Roem syn *L. aegyptiaca* Mill) commonly called sponge gourd, loofah, vegetable sponge, bath sponge or dish cloth gourd, is a member of cucurbitaceous family. Nepalese farmers called it *Ghiraula* (धिरौला). The number of species in the genus *Luffa* varies from 5 to 7. Only two species *L. cylindrica* and ribbed or ridge gourd (*L. acutangula* (L.) Roxb) (पाटे धिरौला वा तिराई), are domesticated. Two wild species are *L. graveolens* and *L. echinata*. These two cultivated and one wild species, *L. echinata* exist in Nepal. *Luffa* is diploid species with 26 chromosomes (2n = 26) and a cross-pollinated crop.

Ghiraula (NPL) is a sub-tropical plant, which requires warm summer temperatures and long frost-free growing season when grown in temperate regions. It is an annual climbing which produces fruit containing fibrous vascular system. It is summer season vegetable growing from Tarai to high hills in Nepal. Mid hills is most important zone where most of the farmers grow sponge gourd. It is difficult to assign with accuracy the indigenous areas of *Luffa* species. They have a long history of cultivation in the tropical countries of Asia and Africa. Indo-Burma is reported to be the center of diversity for sponge gourd. The main commercial production countries are China, Korea, India, Japan and Central America. Many diversity also exits in Nepal. Different types of landraces eg *Basaune Ghiraula, Hariyo Chhoto, Boso Ghiraula* etc exit in different areas and these are generally part of home garden of most of the Nepalese farmers.

The fibrous vascular system inside the fruit after separating from the skin, flesh and seeds, can be used as a bathroom sponge, as a component of shock absorbers, as a sound proof linings, as a utensils cleaning sponge, as packing materials, for making crafts as a filters in factories and as a part of soles of shoes. Immature fruit is used as vegetables, which is good for diabetes. Oil is also extracted from seeds for industrial use.

. Sponge gourd prefers pH of around 6 to 6.8. High level of K and P is recommended. It also grows well in green house and will grow on many soil types but well drained sandy loams are preferred. Seeds need to be germinated at 25°C and grown on and transplanted when the soil temperature is about 18°C Although *Ghiraula* can be left to grow along the ground, best yields and fruit quality are obtained using a support structure or trellis system. In Nepal it is grown in living trees, dead branches, walls, roofs etc. Whatever the system is used, it must be strong enough to allow the fruit to hang free. Any constriction will result in deformed fruit. Irrigation is essential for good growth during dry periods but excessive water can result in poor growth and root diseases. Generally there have been few pest and disease problems of sponge gourd reported in Nepal. Damping off can be a problem with young seedlings if grown in cool wet conditions, and fruit rots may cause losses if the fruit are allowed to grow on the ground. Problems with aphids and subsequently viruses have been sometimes reported.

One variety, Kantipure was released in 1994 in Nepal. Generally a household grows one to two landraces and commercially it is grown in Tarai areas. Soil data, climatic data and biological data should be integrated during research result analysis from which agronomical practices can be recommended for a particular locality.

Introduction

Characterization and evaluation of plant genetic resources (PGRs) are initial and most important steps for their conservation, utilization and improvement. Standard PGR management system particularly characterization and evaluation, should be followed for effective and efficient information exchange. Development of descriptors for a specific crop species is an important for standardizing the PGR management. There are many descriptors for different crop species developed by International Plant Genetic Resources Institute (IPGRI). But descriptors for sponge gourd are not available. Therefore, this descriptor is developed for use in sponge gourd resources management.

In 1995, IPGRI together with national partners from nine countries covering five regions, Sub Saharan Africa, Central and West Asia and North Africa, Asia the Pacific and Oceania, the Americas and Europe formulated a global project to strengthen the scientific basis of in situ conservation of agricultural biodiversity on farm. This descriptor is an outcome of this project – Nepal component.

For developing descriptors, sponge gourd landraces collected from Kachorwa Bara, Begnas Kaski and PGR Section Agriculture Botany Division, Nepal Agricultural Research Council (NARC), Khumaltar were planted in Agricultural Research Station (Horticulture) Malepatan, Pokhara in 2003. Draft descriptors were developed and tested in this field experiment of sponge gourd. Shape of leaf and fruit observed in the field were sketched. Capturing diversity as much as possible was given due emphasis during genotypes selection. Representative samples from different districts of Nepal were taken.

This descriptor is based on IPGRI format. Five types of descriptors (passport, management, environment, and site characterization and evaluation) are listed. Descriptors to be

selected depend on the objective of researchers. Additional information, guidelines are added in Annex for the simplicity to users. This descriptor list is intended to be comprehensive for the descriptors that it contains. Scheme describe here are subject to change as per the need of users. Descriptors should be used when they are useful to the users.

Definitions and guidelines

Definitions
Descriptors are associated information of a particular species. They are generally used to distinguish, identify, locate, describe and evaluate the genotypes in question. Descriptors listed here are passport, management, environment and site, characterization and evaluation. These are interlinked and some descriptors are overlapped.

Passport descriptors
These are the general management, registration and identification information. Parameters observed during accession collection at original stage are included in this type of descriptors.

Management descriptors
These are the basis for the management of accessions in the gene bank and assist for multiplication and regeneration.

Environment and site descriptors
These are the environmental and site-specific parameters that are important for conducting trials to characterize and evaluate the accessions. Site of accession collection are also described here. These descriptors are useful to interpret the results of trials.

Characterization descriptors
These are the highly heritable traits that help to discriminate the phenotypes. Discontinuous variables that can be seen easily and expressed in all environments are included here. These are used to characterize the accessions.

Evaluation descriptors

These are yield, yield components, agronomical traits, abiotic and biotic stress related, biochemical, molecular and cytological traits. Biochemical, molecular and cytological traits can also be used under characterization descriptors. These are the important traits for crop improvement and require replicated trial over time and space. Because of environment sensitive descriptors, special designs and techniques are needed to assess them.

Guidelines

Internationally accepted norms and system for scoring, coding and recording descriptors should be followed. Some of which are
1. Use SI system for measurement.
2. For color observation use standard color chart eg Royal Horticultural Society Color Chart, Munsell Soil Color Chart and Munsell Color Chart for Plant Tissues.
3. Mark the leaf, fruit or plant for repetitive measurement.
4. Quantitative characters (continuously variable) or intensity can be recorded on a 1-9 scale, which means

1	Very low	6	Intermediate to high
2	Very low to low	7	High
3	Low	8	High to very high
4	Low to intermediate	9	Very high
5	Intermediate		

The users can select some of these eg 3, 5 and 7. Score 0 when the character is not expressed. Use standard scale to score for particular descriptor.
5. Score 0 for absent and 1 (or +) for present of characters.
6. Left dash (-) for information not available.
7. Dates should be expressed numerically in the format DDMMYYYY (2 digits day, month and 4 digits year).
8. Assess descriptors using 3 methods ie observation, measurement and sensory taste. Apply these methods in 3-5 plants and record average results.

PASSPORT DESCRIPTORS

A. Accession

1. *Accession number*
A unique identifier number assigned to each accession when it is registered in a gene bank. Once assigned this number should never be reassigned to another accession in the collection. Even if an accession is lost, its assigned number is still not available for reuse.

2. *Donor name*
Name of institution or individual or farmer responsible for donating the germplasm

3. *Donor number*
Number assigned to an accession by the donor

4. *Scientific name*
Genus
Species
Subspecies
Common name

5. *Pedigree*
Parentage or nomenclature and designations assigned to accession

6. *Cultivar*
1   Cultivar name
2   English meaning
3   Synonyms
Either a registered or other formal cultivar designation given to the accession. Name of variety, cultivar, landrace, strain or line. Provide the meaning of cultivar's name in English along with synonyms.

7. Local language
  Language of name given to accession

8. Breeding method
  1   Mass selection
  2   Selection with progeny testing
  3   Recurrent selection
  4   Farmer's selection
  Mention the method of breeding applied to accession during collection. This should be asked to donor.

9. Acquisition date
  Date on which the accession entered the collection

10. Accession size
  Number or weight of sample of an accession in the gene bank or collection

11. Type of material received
  1   Zygotic embryo
  2   Seed
  3   Plant (including seedling)
  4   Fruit
  5   Shoot/bud
  6   Pollen
  7   *In vitro* propagates
  8   Other (specify)

B. Collection

1. Collecting institute
  Name of institute and people collecting or sponsoring the sample collection

2. Site number
  Number assigned to the physical site by the collector

3. Collecting number

Original number assigned by the collector of the sample, normally composed of the name or initials of the collector followed by a number.

4. Collection date

Actual date of collection of sample from original place

5. Country of collecting

Name of the country in which the sample was collected or bred.

6. Address and location of collecting site

Details address and location of collecting site where the accession was collected. Such information may include distance in kilometre and direction from the nearest town, or village or map grid reference point.

7. Latitude of collecting site

Degrees, minutes and seconds followed by N (North) or S (South) (eg 26-22-38.81N)

8. Longitude of collecting site

Degrees, minutes and seconds followed by E (East) or W (West) (eg 87-15-47.39E)

9. Elevation of collecting site (masl)

Altitude of the collecting point expressed in meter above sea level.

10. Collecting source
- I   Wild habitat
  - 1   Forest / woodland
  - 2   Shrubland
  - 3   Grassland

	II	Farm	
		1	Field
		2	Orchard
		3	Garden
		4	Fallow
		5	Pasture
		6	Store

    II   Farm
- 1 Field
- 2 Orchard
- 3 Garden
- 4 Fallow
- 5 Pasture
- 6 Store

III   Market
- 1 Town
- 2 Village
- 3 Urban
- 4 Hat bazzar

IV   Institute

V   Other (specify)

11. Status of sample
- 1 Wild
- 2 Weedy
- 3 Primitive cultivar or landrace
- 4 Breeder's line
- 5 Advanced cultivar
- 6 Other (specify)

12. Local/ vernacular name

Name given by farmer to crop and cultivar, landrace or weed.

13. Ethnic group

Name of the tribe of the farmer donating the sample or of the people living in the area of collecting site

14. Number of plants sampled (n)

15. Number of seeds collected (n)

Report sample size

16. Plant population density
      3   Low
      5   Intermediate
      7   High
    Provide population density from which the sample is collected

17. Population isolation (km)
    Distance between two adjacent collecting sites.
Report air distance.

18. Cropping system
      1   Monoculture
      2   Intercropped (specify)

19. Culture practices
      1   Sowing date
      2   Transplanting date
      3   First harvest date for vegetable use
      4   Last harvest date for vegetable use
      5   Spacing (cm)
      6   Fertilizer (specify)
      7   Irrigation (specify)

20. Staking
      1   No stake
      2   Living trees
      3   Dead branch
      4   Home roof/ wall
      5   Trellis
      6   Other (specify)

21. Genetic erosion
      3   Slow
      5   Intermediate
      7   Rapid
    Rate of genetic erosion of the species in the region of collecting site

22. *Associated flora*
Major plant species found in and around the collecting site other than sample

23. *Population competition with associated flora*
    3   Low
    5   Intermediate
    7   High
Observe sample growth condition in the field

24. *Uses of the accession*
    Fresh consumption
    Dried consumption
    Industrial
    Medicinal
    Ornamental
    Other (specify)

25. *Photograph*
Whether a photograph is taken or not of the accession or habitat at the time of collection
    0   No
    1   Yes

26. *Herbarium specimen*
Whether a herbarium specimen of the accession was collected or not
    0   No
    1   Yes

27. *Prevailing stresses*
Provide associated biotic and abiotic stresses and the accession's reaction.

28. *Collector's name and notes*
Additional information recorded by the collector or any specific information.

Note: Descriptors of collecting site environment should also be included in passport descriptors. See page 16 for this descriptors.

MANAGEMENT DESCRIPTORS

A. General information

1. Accession number

2. Storage address
Location of storage and building, room, shelf number

3. Storage date

4. Germination at storage (%)

5. Date of last germination test

6. Germination at the last test (%)

7. Moisture content at harvest (%)

8. Moisture content at storage (%)

9. Amount of seeds in storage (g or n)

10. Location of duplicates

B. Multiplication and regeneration

1. Accession number

2. Field plot number

3. Location of field plot

4. Collaborator

5. *Cultural practices*
   1   Sowing date
   2   Transplanting date
   3   Harvest date for seeds
   4   Spacing (cm)
   5   Irrigation (specify)

6. *Staking*
   1   No stake
   2   Living tree
   3   Dead branch
   4   House roof/ wall
   5   Trellis
   6   Other (specify)

7. *Fertilizer application (g/m²)*

8. *Germination in the field (%)*

9. *Seedling vigour*

10. *Plot size (m²)*

11. *Number of established plants per plot*

12. *Number of plants used as seed source for each regeneration*

13. *Number of fruits per plants used as seed source for each regeneration*

14. *Pollination method*
   1   Self-pollinated
   2   Often cross- pollinated
   3   Cross-pollinated

15. Previous multiplication and/or regeneration
    1   Location
    2   Sowing date
    3   Plot number
    4   Biotic stress
           0   Absent
           1   Present

16. Last regeneration or multiplication date

17. Number of times accession regenerated
     Since the date of acquisition

ENVIRONMENT AND SITE DESCRIPTORS

A. General information

1. Institution of characterization and evaluation

2. Georeferences of characterization and evaluation site
      1   Latitude
      2   Longitude
      3   Elevation (masl)
      4   Location

3. Evaluator's name and address

4. Sowing date

5. Nursery system
      1   Green house
      2   Poly bag
      3   Heated bed
      4   Field
      5   Other (specify)

6. Transplanting date

7. First harvest date for vegetable use

8. Last harvest date for vegetable use

9. Harvest date for seeds

10. Evaluation environment
      1   Field
      2   Screen house
      3   Glasshouse
      4   Laboratory
      5   Other (specify)
      Environment in which characterization and evaluation was carried out

11. *Field spacing*
    Plant to plant (m)
    Row to row (m)

12. *Fertilizer*
    Specify types, doses, frequency of each and method
of application

13. *Plant protection*
    Specify pesticides used, doses, frequency of each
and method of application

B. Characterization and evaluation site environment

1. *General physiographic features*

1	Plain	5	Upland
2	Basin	6	Hill
3	Valley	7	Mountain
4	Plateau		

    The landform refers to the shape of the land surface
in the area in which the site is located

2. *Slope (°)*
    Estimate slope of the site

3. *Slope aspect*
    The direction or faces of collecting site. Describe the
direction with symbols N, S, E, W (eg a slope that faces a
north-western direction has an aspect of NW)

4. *Crop agriculture*
        1   Annual field cropping
        2   Perennial field cropping

5. Overall vegetation surrounding and at the site

1   Grassland
2   Forbland
3   Forest
4   Woodland
5   Shrubland
6   Savanna
7   Other (Specify)

(1. Grasses, subordinate forbs, no woody species. 2. Herbaceous plants predominant. 3. Continuous tree layer, crowns overlapping, large number of tree and shrub species in distinct layers. 4. Continuous tree layer, crowns usually not touching, understorey may be present. 5. Continuous layer of shrubs, crowns touching. 6. Grasses with a discontinues layer of trees or shrubs)

6. Soil drainage

3   Poorly drained
5   Moderately drained
7   Well drained

7. Soil salinity

1   <160 ppm dissolved salts
2   160-240 ppm
3   241-480 ppm
4   >480 ppm

8. Soil colour

1	White	9	Yellow
2	Red	10	Reddish yellow
3	Reddish	11	Greenish, green
4	Yellowish red	12	Grey
5	Brown	13	Greyish
6	Brownish	14	Blue
7	Reddish brown	15	Bluish black
8	Yellowish brown	16	Black

The colour of the soil material in the root zone around the accession is recorded in the moist condition

using the notation for hue, value and chroma as given in the Munsell Soil Colour Charts (Munsell 1997). If there is no dominant soil matrix colour, the horizon is described as mottled and two or more colours are given and should be registered under uniform conditions. Early morning and late evening readings are not accurate. Provide depth of measurement (cm).

9. Soil pH
> pH at 10-15 cm
> pH at 16-30 cm
> pH at 31-60 cm

Actual pH value of the soil within the above root depths

10. Soil erosion
3	Low
4	Intermediate
7	High

11. Soil texture classes
1	Clay	12	Coarse sandy loam
2	Loam	13	Loamy sand
3	Clay loam	14	Loamy very fine sand
4	Silt	15	Loamy fine sand
5	Silty clay	16	Loamy coarse sand
6	Silty clay loam	17	Very fine sand
7	Silt loam	18	Fine sand
8	Sandy clay	19	Medium sand
9	Sandy clay loam	20	Coarse sand
10	Sandy loam	21	Sand, unsorted
11	Fine sandy loam	22	Sand, unspecified

12. Water availability
1	Rainfed
2	Irrigated
3	Flooded
4	River banks
5	Other (specify)

13. *Soil fertility*
>   3   Low
>   5   Moderate
>   7   High

General assessment of the soil fertility based on existing vegetation

14. *Climate of the site*
>   Should be assessed as close to the site as possible

15. *Temperature (°C)*
>   Provide either the diurnal (mean, maximum, minimum) or the seasonal (mean, maximum, minimum)

16. *Rainfall (mm)*
>   Annual average or crop season average

17. *Wind velocity (km/s)*
>   Annual average or crop season average

18. *Frost*
>   1   Date of most recent frost
>   2   Lowest temperature (°C)
>   3   Duration of frost (d)

19. *Relative humidity*
>   1   Relative humidity, diurnal range (%)
>   2   Relative humidity, seasonal range (%)

20. *Light*
>   3   Shady
>   7   Sunny

CHARACTERIZATION DESCRIPTORS

A. Vegetative

1. Days to emergence (d)
Number of days between seeding to emergence. Record date of seeding and date of emergence to calculate the days to emergence.

2. Cotyledon size
  1   Small
  2   Medium
  3   Large
  4   Other (specify)
Among the entry cotyledon size can be classified in three classes on visual basis. Observation should be made in 3-5 plants. Cotyledon size can also be measured in unit (cm). It should be length of cotyledons at the first true leaf expanding stage and should be recorded actual size.

3. Cotyledon color
  1   Light green
  2   Intermediate
  3   Dark green
Cotyledon color should be observed in 3-5 plants at the first time leaf expanding stage.

4. Internode length (cm)
Length of internode at the 10th - 15th nodes at the time of the 20th leaf expanding. Measure in 3-5 plants.

5. Stem shape
  1   Rounded
  2   Intermediate
  3   Angular
Record based on observation in 3-5 plants.

6. *Tendrils*
    1   Present
    2   Absent
    Record after observing 3-5 plants. If tendril is present it's length can be measured in cm.

7. *Leaf shape (Figure 1)*
    1   Ovate
    2   Orbicular
    3   Reniform
    4   Rectuse
    Observe in 3-5 plants. Shape of the 6th – 10th leaf at the time of 20th leaf expanding.

8. *Leaf spot color*
    1   Absent
    2   Light green
    3   Silver
    4   Both
    Observed in the 6th – 10th leaf at the time of 20th leaf expanding in 3-5 plants.
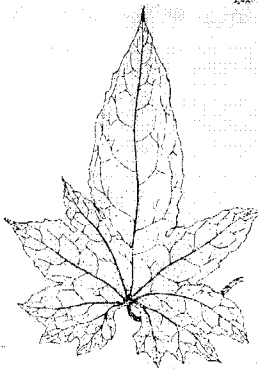
9. *Leaf size*
    1   Small
    2   Intermediate
    3   Large
    Observe in 3-5 plants. Among the entries, leaf size is recorded in the 6th –10th leaf at the time of 20th leaf expanding. Leaf size can also be measured as width in cm.
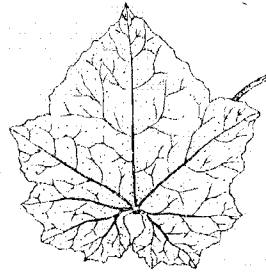
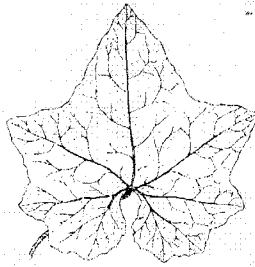10. *Leaf margin*
    1   Smooth
    2   Dented
    Based on 3-5 plants leaf margin should be observed in the 6th – 10th leaf at the time of 20th leaf expanding.

Ovate   Orbicular

Reniform

Figure 1. Leaf shape

11. Leaf lobes
   1 Absent
   2 Shallow
   3 Intermediate
   4 Deep
  Observed in the 6th – 10th leaf at the time of 20th leaf expanding in 3-5 plants.

12. *Dorsal leaf pubescence*
    1   Absent
    2   Low
    3   Intermediate
    4   High

Record base on the observation made in 3-5 plants of 6th – 10th leaf at the time of 20th leaf expanding.

13. *Ventral leaf pubescence*
    1   Absent
    2   Low
    3   Intermediate
    4   High

Degree of pubescence of the 6th – 10th leaf at the time of 20th leaf expanding in 3-5 plants through observation.

14. *Growth habit*
    1   Bushy
    2   Intermediate
    3   Prostrate

Observe at the peak harvest season for vegetable.

15. *Stem thickness (mm)*

Diameter of main stem from the 10th – 15th nodes at the time of 20th leaf expanding. It can be calculated from the perimeter. Measure in 3-5 plants. Verniar calliper maybe used for measurement.

16. *Lateral shoot (n)*

Number of primary lateral shoots from the nodes of the main stem at the first vegetable harvest time. Measure in 3-5 plants.

17. *Stem pubescence*
    1   Absent
    2   Thin
    3   Dense
    4   Very dense

Degree of pubescence at the 10th – 15th nodes of main stem at the time of the 20th leaf expanding. Observe in 3-5 plants.

18. Petiole length (cm)

Length of petiole of the 6th – 10th leaf at the time of the 20th leaf expanding. Measure in 3-5 plants.

B. Inflorescences, fruits and seeds

1. Flower color

    1   White
    2   Light yellow
    3   Yellow
    4   Orange
    5   Other

Observe in 3-5 flowers of different plants

2. Sex type

    1   Androecious
    2   Monoecious
    3   Andromonoecious
    4   Gynomonoecious
    5   Gynoecious
    6   Hermaphroditic

Observe several flowers. (Androecious, only male flower. Monoecious, male and female flower in different flowers at the same plant. Hermaphroditic, flower having anthers and ovaries. Andromonoecious, individuals which have male and hermaphroditic flowers on the same plant. Gynomonoecious, individuals which have female and bisexual flowers. Gynoecious, only female flowers).

3. *Male female flower ratio*
    1   High
    2   Medium
    3   Low
Observe in 3-5 plants

4. *Peduncle shape*
    1   Round
    2   Smoothly angled
    3   Sharply angled
    This is a stalk of fruit and should be observed at the harvest time for vegetable use. Observe in 3-5 fruits of different plants.

5. *Peduncle length (cm)*
    Measure in 3-5 fruit's stems of different plants at the time of harvest for vegetable use.

6. *Peduncle separation from fruit*
    1   Easy
    2   Intermediate
    3   Difficult
    After fruit harvest for vegetable use, evaluate the break strength and peduncle with fruit.

7. *Blossom end fruit shape (Figure 2)*
    1   Depressed
    2   Flattened
    3   Rounded
    4   Pointed
    Observe at the peak harvest season for vegetable use in 3-5 fruits in different plants.

8. *Stem-end fruit shape (Figure 3)*
    1   Depressed
    2   Flattened
    3   Rounded
    4   Pointed

Observe at the peak harvest season for vegetable use in 3-5 fruits in different plants.
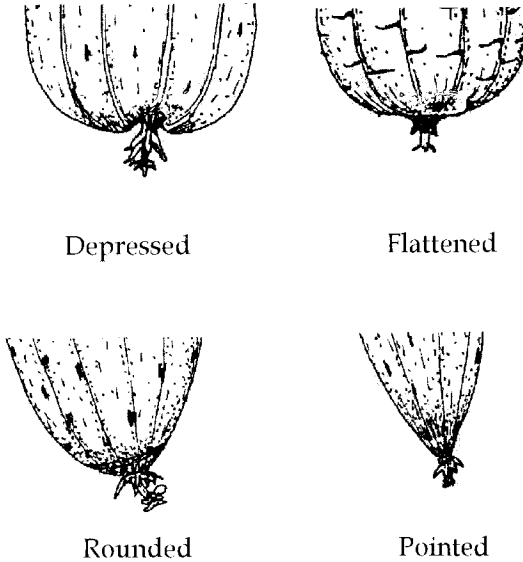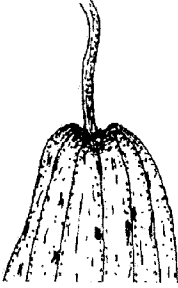

Depressed   Flattened

Rounded   Pointed
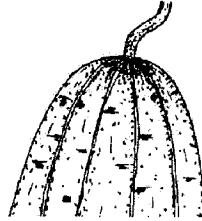
Figure 2. Blossom-end fruit shape

9. Fruit shape (Figure 4)
  1   Oblong blocky
  2   Elongate slim
  3   Elongate blocky
  4   Elliptical
  5   Elongate tapered
  6   Pyriform
  7   Elongate elliptical
Observe at the peak harvest season for vegetable use in 3-5 fruits in different plants.
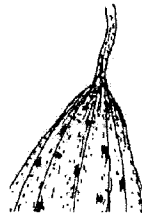
Depressed   Flattened

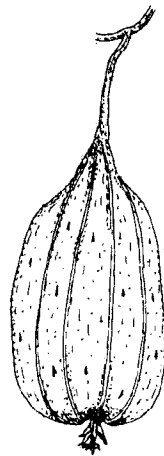Rounded   Pointed
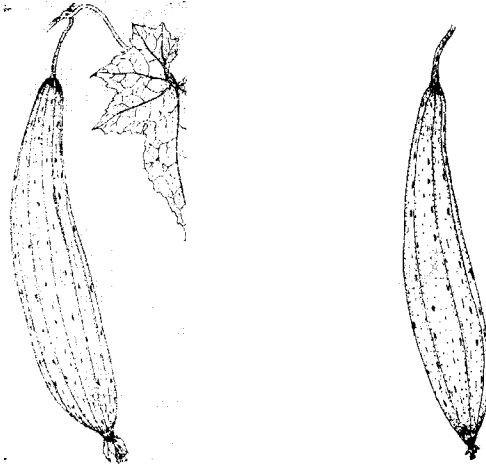
Figure 3. Stem-end fruit shape

Oblong blocky

Elongate slim

Elliptical

Pyriform

Elongate tapered

Elongate elliptical

Figure 4. Fruit shape

10. Fruit ribs
  1　Absent
  2　Superficial
  3　Intermediate
  4　Deep
Intensity of rib in fruit at harvest time for vegetable use. Observe in 3-5 fruits in different plants.

11. Fruit color
  1　Light green
  2　Green
  3　Dark green
  4　White mottled
  5　Blackish
  6　Others
Observe at the peak harvest season for vegetable use in 3-5 fruits in different plants.

12. Fruit skin texture
  1　Smooth
  2　Grainy
  3　Finely wrinkled
  4　Shallowly wavy
  5　Nettled
  6　With warts
  7　Scabrous
Observe in 3-5 fruits of different plants at vegetable purpose harvest time. Hand feeling (sensory taste) with skin of fruit is the way of describing genotypes.

13. Flesh color
  1　White
  2　Cream
  3　Yellow
Observe in 3-5 fruits of different plants at a time of harvest for vegetable use.

14. Flesh flavor
1 Insipid
2 Intermediate
3 Sweet
4 Bitter

Observe in 3-5 fruits of different plants at a time of harvest for vegetable use through sensory taste.

15. Flesh taste
1 No taste
2 Sweet
3 Intermediate
4 Bitter

Taste organolepticallly at the time of harvest for vegetable use.

16. Flesh moisture
1 Low
2 Intermediate
3 High

Observe in 3-5 fruits ready to harvest for vegetable use.

17. Flesh texture
1 Smooth
2 Grainy
3 Spongy
4 Gelatinous
5 Fibrous

Sensory taste in 3-5 fruits ready to harvest for vegetable use.

18. Skin hardness
1 Soft
2 Intermediate
3 Hard

Sensory taste in 3-5 fruits ready to harvest for vegetable use. Feel when it is cut.

19. Fruit size variability
  1   Low
  2   Medium
  3   High
Observe in 3-5 fruits ready to harvest for vegetable use.

20. Seed color
  1   Black
  2   Gray
  3   Brown
  4   White
Observe in seeds of 3-5 matured fruits

21. Seed surface
  1   Smooth
  2   Wrinkled
  3   Slightly pitted
  4   Scaly
  5   Creased
Observe in 3-5 matured seeds

22. Sponge quality
  1   Soft
  2   Intermediate
  3   Hard
Observed in 3-5 sponges of different plants at matured and dried stage

23. Descriptors used by farmers
Report the descriptors of commonly used by farmers to distinguish genotypes.

EVALUATION DESCRIPTORS

A. Plant

1. *Days to first harvest for vegetable use (d)*
    Number of days between seeding and first harvest for vegetable use. For this descriptor, date of seeding and date of first harvest for kitchen purpose should be recorded.

2. *Days to last harvest for vegetable use (d)*
    Number of days between seeding and last harvest for vegetable use. Record date of seeding and last harvest for vegetable use.

3. *Days to maturity period of fruit (d)*
    Number of days between gynoecious flowering date and fruit maturity for seeds. Record date of gynoecious flowering initiation in which fruit is set and date of matured fruit harvest for seeds.

4. *Days to flowering (d)*
    Number of days between seeding and initiation of first flower of any type. Record date of seeding and first flowering to calculate days to flowering.

5. *Lateral shoot (n)*
    Number of primary lateral shorts from the nodes of the main stem at the end of harvesting time. Measure in 3-5 plants.

6. *Fruit length (cm)*
    Measure length in 3-5 fruits of different plants. It is length between blossom and stem end during fruit harvest for vegetable use.

7. *Fruit width (cm)*

Diameter in central part of fruit at harvest time for vegetable use. Measure in 3-5 fruits of different plants. Or measure perimeter of fruit in 3 parts ie petiole end, centre and blossom end and average perimeter is used to calculate diameter {diameter = (perimeter/π)}. Verniar calliper can be used.

8. *Fruit weight (g)*

Weight of single fruit. Weigh 3-5 fruits of different plants during harvest for vegetable use. Take average weight.

9. *Fruit per plant (n)*

Count the number of fruit suitable for vegetable use during crop season. Count in 3-5 plants.

10. *Fruit skin thickness (mm)*

Measure in 3-5 fruits of different plants during harvest for vegetable use.

11. *Flesh thickness (mm)*

Measure in 3-5 fruits of different plants during harvest for vegetable use.

12. *Fruit yield per plant (kg)*

Multiply fruit weight by fruit number per plant and convert unit. This is the weight of fruits for vegetable use per plant. Measure in 3-5 plants

13. *Seed per fruit (n)*

Count matured functional seeds in 3-5 fruits of different plants.

14. *100-seed weight (g)*

Weight of 100 mature functional and dry seeds collected randomly from 3-5 fruits of different plants.

15. Seed length (mm)

Length measured in 3-5 matured functional and dry seeds collected randomly from different fruits.

16. Seed width (mm)

Width measured in 3-5 matured functional and dry seeds collected randomly from different fruits. Measure in the middle part of seed.

17. Matured fruit length (cm)

Length of matured fruit harvested for seeds from blossom end to stem end.

18. Matured fruit width (cm)

Width at central region of matured fruit harvested for seeds. Calculate fruit width from its perimeter {diameter = (perimeter/π)}. Verniar calliper can be used.

19. Matured fruit weight (g)

Weight of matured and dry fruit harvested for seeds.

For evaluation, environmental parameters and soil nutrient contents of experimental site should be reported.

B. Nutrient analysis in fruit for vegetable use

Analyse the nutrients content of fruit and report.

C. Abiotic stress

1. *Low temperature*
2. *High temperature*
3. *Drought*
4. *Salinity*
5. *Acidity*

Score under artificial or natural condition. Code on a susceptibility scale from 1 to 9. If possible report measurement of stress.

D. Biotic stress

1. Insects

SN	Causal organism	Common name	Nepali name
1	Aphis gossypii, A. malvae, Myzus persicae	Aphids	लाहि
2	Lasioptera falcata	Gall fly	गाठे भींगा
3	Sphenarches caffer	Plume moth	-
4	Dacus spp	Fruit fly	फल कुहाउने औंसा
5	Apomecynna saltator, A albogutata, A. histrio, A pertigera, A betotitti	Stem boring longicorn beetles	-

Score infestation intensity on 1 to 9 scales.

2. Diseases

SN	Causal organism	Common name	Nepali name
1	Spaerotheca spp	Powdery mildew	धुले ढुसि
2	Pseudopernospora spp	Downey mildew	सिते ढुसि
3	Virus	Mosaic disease	गुजमुजे रोग

Score infestation intensity on 1 to 9 scales.
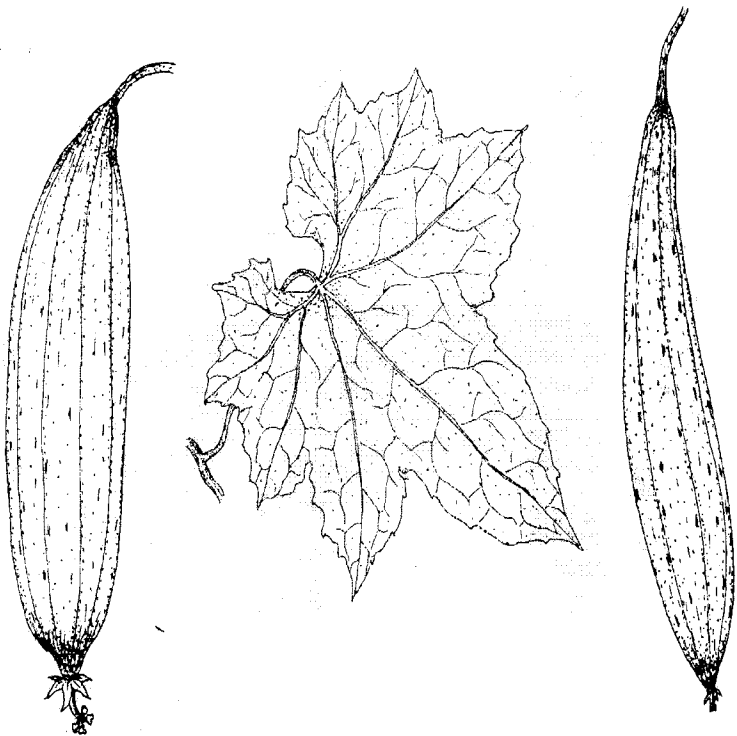
E. Cell biology

1. Biochemical markers
Report zymotype, locus, enzymes and tissue used

2. Molecular markers
Describe primer, probe, product size and fingerprints

3. Cytological characters
Describe chromosome number, ploidy level and chromosome arrangement.

Bibliography

Dutta AC. 1979. A class book of botany. Delhi.

FAO.1990. Guidelines for soil profile description. 3rd ed. Food and Agriculture Organization of the United Nations. Rome.

Heiser CB and EE Schiling. 1988. Phylogeny and distribution of Luffa (Cucurbitaceae). Biotripica 20 (3): 185-191.

MAFF. 1996. Plant genetic resources: Characterization and evaluation. The 4th Ministry of Agriculture, Forestry and Fisheries. International Workshop in Genetic Resources 22-24 Oct 1996 Japan.

Martin FW. 1979. Vegetable for the hot humid tropics. Part 4. Sponge and bottle gourds Luffa and Lagenaria. Science and Educations, Administration, US Department of Agriculture, Louisiona.

Munsell Color. 1975. Munsell soil color chart. Munsell Color, Baltimore USA.

Munsell Color. 1977. Munsell color charts for plant tissues. 2nd ed. Munsell color, Baltimore, USA.

Porterfield WM Jr. 1955. Loofah – the sponge gourd. Econ. Bot. 9: 211-223.

Cruz VMV, MIS Tolentino, NC Altoveros, MLH Villavicencio, LB Siopongco, AC dela Vitia and RP Lande. Correlations among accessions of Southeast Asian Luffa genetic resources and variability estimated by morphological and biochemical methods. Philipp. J. Crop Sci. 22 (3): 131-140.

RHS. 1986. RHS color chart. 2nd ed. Royal Horticultural Society, London.

Sthapit BR, MP Upadhyay, BK Baniya, A Subedi and BK Joshi (eds). 2003. On farm management of agricultural biodiversity in Nepal. Proceedings of a National Workshop, 24-26 April 2001 Lumle, Nepal. NARC, LIBIRD and IPGRI.

Usher G. 1992. A dictionary of botany. SK Jain for CBS Pub. and Dist. Delhi.

IPGRI. 2001. The design and analysis of evaluation trials of genetic resources collections. IPGRI Technical Bulletin No. 4. IPGRI, Rome.

Important URL

http//www.ipgri.cgiar.org
http://www.agroecology.org
http://www.avrdc.org
http://www.hort.purdue.edu
http://www.crop.ori.nz
http://www.griffin.peachnet.edu
http://www.ces.ncsu.edu

Annex A. Plant genetic resources collection form

A. Sample identification
Genus
Species
Subspecies
Collector's number
Collecting institute
Date of collection
Local name

B. Collecting site
I. General
District
Village DC
WNo.
Village
Farmer's name
Latitude   N
Longitude   E
Altitude   (m)
II. Collection source (circle one)
   1. Wild
   2. Farmland
   3. Farm store
   4. Backyard
   5. Village market
   6. Commercial market
   7. Institute
   8. Other (specify)
III. Topography (circle one)
   1. Swamp
   2. Flood plain
   3. Plain level
   4. Undulating
   5. Hilly
   6. Mountainous

   7. Other (specify)
IV. Associated wild and weedy
species and crops (specify)
V. Site (circle one)
   1. Level
   2. Slope
   3. Summit
   4. Depression
VI. Stoniness (circle one)
   1. None
   2. Low
   3. Medium
   4. Rocky
VII. Soil texture (circle one)
   1. Sand
   2. Loam
   3. Clay
   4. Silt
   5. Highly organic
VIII. Drainage (circle one)
   1. Poor
   2. Moderate
   3. Good
   4. Excessive
IX. Other observations

C. Characterization and
management
Sowing month
Harvest month
Usage (specify)
Descriptors used by farmers
Disease and insect pest (specify)

D. Sample

I. Status of sample (circle one)
    1. Wild
    2. Weedy
    3. Breeder's line
    4. Landrace
    5. Cultivar
    6. Other (specify)

II. Number of plants sampled

III Quantity of material (number of seed of plant/sample)

IV. Type of sample (circle one)
    1. Vegetative
    2. Seed
    3. Both

V. Herbarium sample (circle one)
    1. Yes
    2. No

VI. Cultural practices   .

1. Shifting cultivation (circle one)
    1. Yes   2. No

2. Irrigated (circle one)
    1. Yes   2. No

3. Transplanted (circle one)
    1. Yes   2. No

4. Terraced (circle one)
    1. Yes   2. No

Collector's name

Annex B. Coding for preparing field book

Trait	Code
Date of seeding	DOS
Date of first emergence	DFE
Cotyledon size	CotSz
Cotyledon color	CotCol
Date of first harvest for vegetable use	DFH
Date of last harvest for vegetable use	DLH
Date of first flowering	DFF
Date of gynoecious flowering	DGF
Date of fruit matured for seed	DFMS
Internode length	IntL
Stem shape	StSh
Tendrils	Tdl
Leaf shape	LfSh
Leaf spot color	LfSpCol
Leaf size	LfSz
Leaf margin	LfMar
Leaf lobes	LfLb
Dorsal Leaf pubescence	DLfPub
Ventral Leaf pubescence	VLfPub
Growth habit	GrHa
Stem thickness	StThk
Lateral shoot	LtSht
Stem pubescence	StPub
Petiole length	PetL
Flower color	FlCol
Sex type	SxTyp
Male and female flower ratio	M/F
Peduncle shape	PedSh
Peduncle length	PedL
Peduncle separation from fruit	PedSep
Blossom-end fruit shape	BEFrSh
Stem-end fruit shape	StEFrSh
Fruit shape	FrSh
Fruit ribs	FrRib

Fruit color	FrCol
Fruit skin texture	FrSkTx
Fruit length	FrL
Fruit width	FrW
Fruit weight	FrWt
Flesh color	FlsCol
Fruit per plant	Fr/Pl
Flesh moisture	FlsMst
Flesh texture	FlsTxt
Fibrous	Fib
Fruit skin thickness	FrSkThk
Flesh thickness	FlsThk
Flesh flavor	FlsFlv
Fruit yield per plant	FrY/Pl
Seed per fruit	Sd/Fr
Seed color	SdCol
100-seed weight	100SdWt
Seed length	SdL
Seed width	SdW
Matured fruit length	MtFrL
Matured fruit width	MtFrW
Matured fruit weight	MtFrWt
Sponge quality	SpgQu
Skin hardiness	SkHrd
Fruit size variability	FrSzVr
Seed surface	SdSrf

Annex C. Contributor's address
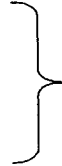
Bal K Joshi   Agriculture Botany Division
Hari B KC, *PhD*   NARC, Khumaltar
Radha K Tiwari   PO Box 1135, Kathmandu
Madhusudan P Upadhyay, *PhD*   Nepal

Madhusudan Ghale, *PhD*
Agricultural Research Station
NARC, Malepatan
Pokhara, Nepal

Bhuwon R Sthapit, *PhD*
Asia, the Pacific and Oceania, IPGRI
3/10 Dharmashila Buddha Marg
Pokhara, Nepal

Artist

BB Tamang
LIBIRD
Pokhara, Nepal