

Key access and utilization descriptors for sweet potato genetic resources

This list consists of an initial set of characterization and evaluation descriptors for sweet potato (*Ipomoea batatas*) genetic resources utilization. This strategic set of descriptors, together with passport data, will become the basis for the global accession level information portal being developed by Bioversity International with the financial support of the Global Crop Diversity Trust (GCDT). It will facilitate access to and utilization of sweet potato accessions held in genebanks and does not preclude the addition of further descriptors, should data subsequently become available.

Based on the comprehensive list 'Descriptors for Sweet potato' published by the International Potato Center (CIP), the Asian Vegetable Research and Development Center (AVRDC) and IBPGR (now Bioversity International) in 1991, the list was subsequently compared with a number of sources¹.

A worldwide distribution of experts was involved in an online survey to define a first priority set of descriptors to describe, to access and to utilize sweet potato genetic resources. This key set was afterwards validated by a Core Advisory Group (see 'Contributors') led by Dr David Tay and Dr Genoveva Rossel of CIP.

Biotic and abiotic stresses included in the list were chosen because of their wide geographical occurrence and significant economic impact at a global level.

Numbers in parentheses on the right-hand side are the corresponding descriptor numbers listed in the 1991 publication. Descriptors with numbers ending in 'letters' are either modified or are new descriptors that were added during the development of the list below.

1 (a) Main output of the Germplasm Characterization National Workshop held on January 24-26, 2006 at the Philippine Root Crop Research and Training Center (PhilRootcrops) in Leyte, Central Philippines
(b) Basic list of descriptors for Sweet Potato, drawn from Guarino, L. and Jackson, G.V.H. 'Describing and documenting root crops in the South Pacific'. Suva, Fiji, 1986. FAO. RAS/83/001, Field document 12
(c) 'Global Strategy for *Ex-Situ* Conservation of Sweetpotato Genetic Resources' (GCDT, 2007)
(d) Descriptors that were awarded funds for further research by the GCDT in 2008 Evaluation Awards Scheme (EAS)
(e) Criteria for evaluating sweet potato cultivars drawn from the Report on the ACIAR sweet potato workshop, held in Madang, PNG on 28-29 June 2006
(f) Important descriptors mentioned in the CIP website
(g) 'Descriptors for Characterization and Evaluation of Sweet potato' (National Institute of Agrobiological Sciences, Genebank of Japan)
(h) 'Descriptors for SWEETPOTATO' (USDA, ARS, GRIN)

PLANT DATA

Twining (ability) (4.1.1)

Ability of vines to climb adjacent stakes placed in those accessions showing twining characteristics

- 0 Non-twining
- 3 Slightly twining
- 5 Moderately twining
- 7 Twining
- 9 Very twining

Plant growth habit (type) (4.1.2)

Length of the main vines

- 3 Erect (<75cm)
- 5 Semi-erect (75-150 cm)
- 7 Spreading (151-250 cm)
- 9 Extremely spreading (>250 cm)

Ground cover (4.1.3)

Estimated percentage of ground cover recorded 35-40 days after planting

- 3 Low (<50%)
- 5 Medium (50-74%)
- 7 High (75-90%)
- 9 Total (>90%)

Vine internode length (4.1.4.1)

Average length of at least three internodes located in the middle section of the vine

- 1 Very short (<3 cm)
- 3 Short (3-5 cm)
- 5 Intermediate (6-9 cm)
- 7 Long (10-12 cm)
- 9 Very long (>12 cm)

Vine internode diameter (4.1.4.2)

Average diameter of at least three internodes located in the middle section of the vine

- 1 Very thin (<4 mm)
- 3 Thin (4-6 mm)
- 5 Intermediate (7-9 mm)
- 7 Thick (10-12 mm)
- 9 Very thick (>12 mm)

Predominant vine colour (4.1.5.1)

- 1 Green
- 2 Green with few purple spots
- 3 Green with many purple spots
- 4 Green with many dark purple spots
- 5 Mostly purple
- 6 Mostly dark purple
- 7 Totally purple
- 8 Totally dark purple

Secondary vine colour (4.1.5.2)

- 0 Absent
- 1 Green base
- 2 Green tip
- 3 Green nodes
- 4 Purple base
- 5 Purple tip
- 6 Purple nodes
- 99 Other (specify in the descriptor **Notes**)

Vine tip pubescence (4.1.6)

Degree of hairiness of immature leaves recorded at the apex of the vines

- 0 Absent
- 3 Sparse
- 5 Moderate
- 7 Dense

General outline of the leaf (4.1.7.1)

- 1 Rounded
- 2 Reniform (kidney-shaped)
- 3 Cordate (heart-shaped)
- 4 Triangular
- 5 Hastate (trilobular and spear-shaped with the basal lobes more or less divergent)
- 6 Lobed
- 7 Almost divided

Leaf lobes type (4.1.7.2)

- 0 No lateral lobes (entire)
- 1 Very slight (teeth)
- 3 Slight
- 5 Moderate
- 7 Deep
- 9 Very deep

Leaf lobe number (4.1.7.3)

Most leaves of sweet potatoes have two basal lobes and they should not be counted. Record the predominant number of lateral and central leaf lobes observed on the leaves located in the middle section of the vine.

Generally sweet potatoes have 1, 3, 5, 7 or 9 leaf lobes. If the leaf has no lateral lobes but shows a central tooth this number is 1. If the apical portion of the leaf is rounded this number is 0

Shape of central leaf lobe (4.1.7.4)

- 0 Absent
- 1 Toothed
- 2 Triangular
- 3 Semi-circular
- 4 Semi-elliptic
- 5 Elliptic
- 6 Lanceolate
- 7 Oblanceolate
- 8 Linear (broad)
- 9 Linear (narrow)

Mature leaf size (4.1.8)

Length from the basal lobes to the tip of the leaves. Record the average expression of at least three leaves located in the middle section of the vine

- 3 Small (<8 cm)
- 5 Medium (8-15 cm)
- 7 Large (16-25 cm)
- 9 Very large (>25 cm)

Abaxial leaf vein pigmentation (4.1.9)

Describe the most frequent expression of the distribution of anthocyanin (purple) pigmentation shown in the veins of the lower surface of leaves

- 1 Yellow
- 2 Green
- 3 Purple spot in the base of main rib
- 4 Purple spots in several veins
- 5 Main rib partially purple
- 6 Main rib mostly or totally purple
- 7 All veins partially purple
- 8 All veins mostly or totally purple
- 9 Lower surface and veins totally purple

Mature leaf colour (4.1.10.1)

- 1 Yellow-green
- 2 Green
- 3 Green with purple edge
- 4 Greyish-green (due to dense pubescence)
- 5 Green with purple veins on upper surface
- 6 Slightly purple
- 7 Mostly purple
- 8 Green upper surface, purple lower surface
- 9 Purple on both surfaces

Immature leaf colour (4.1.10.2)

- 1 Yellow-green
- 2 Green
- 3 Green with purple edge
- 4 Greyish-green (due to dense pubescence)
- 5 Green with purple veins on upper surface
- 6 Slightly purple
- 7 Mostly purple
- 8 Green upper surface, purple lower surface
- 9 Purple on both surfaces

Petiole length (4.1.11)

Average petiole length, from the base to the insertion with the blade, of at least three leaves in the middle portion of a main vine

- 1 Very short (<10 cm)
- 3 Short (10-20 cm)
- 5 Intermediate (21-30 cm)
- 7 Long (31-40 cm)
- 9 Very long (>40 cm)

Petiole pigmentation (4.1.12)

Distribution of anthocyanin (purple) pigmentation in the petioles of leaves. Indicate the most predominant colour first

- 1 Green
- 2 Green with purple near stem
- 3 Green with purple near leaf
- 4 Green with purple at both ends
- 5 Green with purple spots throughout petiole
- 6 Green with purple stripes
- 7 Purple with green near leaf
- 8 Some petioles purple, some others green
- 9 Totally or mostly purple

Storage root shape (4.2.1)

Storage root outline shown in longitudinal section

- 1 Round – almost a circular outline with a length to breadth (L/B) ratio of about 1:1
- 2 Round elliptic – a slightly circular outline with acute ends. L/B ratio not more than 2:1
- 3 Elliptic – symmetrical outline with about the maximum breadth at equal distance from both ends which are slightly acute. L/B ratio not more than 3:1
- 4 Ovate – outline resembling the longitudinal section of an egg. The broadest part is at the distal end (i.e. away from the root stalk)
- 5 Obovate – inversely ovate outline. The broadest part is at the proximal end (i.e. close to the root stalk)
- 6 Oblong – almost rectangular outline with sides nearly parallel and corners rounded. L/B ratio about 2:1
- 7 Long oblong – oblong outline with a L/B ratio of more than 3:1
- 8 Long elliptic – elliptic outline with a L/B ratio of more than 3:1
- 9 Long irregular or curved

Storage root surface defects (4.2.2)

- 0 Absent
- 1 Alligator-like skin
- 2 Veins
- 3 Shallow horizontal constrictions
- 4 Deep horizontal constrictions
- 5 Shallow longitudinal grooves
- 6 Deep longitudinal grooves
- 7 Deep constrictions and deep grooves
- 99 Other (specify in the descriptor **Notes**)

Storage root cortex thickness (4.2.3)

- 1 Very thin (<1 mm)
- 3 Thin (1-2 mm)
- 5 Intermediate (2-3 mm)
- 7 Thick (3-4 mm)
- 9 Very thick (>4 mm)

Predominant storage root skin colour (4.2.4.1)

- 1 White
- 2 Cream
- 3 Yellow
- 4 Orange
- 5 Brownish orange
- 6 Pink
- 7 Red
- 8 Purple-red
- 9 Dark purple

Intensity of predominant storage root skin colour (4.2.4.2)

- 1 Pale
- 2 Intermediate
- 3 Dark

Secondary storage root skin colour (4.2.4.3)

- 0 Absent
- 1 White
- 2 Cream
- 3 Yellow
- 4 Orange
- 5 Brownish orange
- 6 Pink
- 7 Red
- 8 Purple-red
- 9 Dark purple

Predominant storage root flesh colour (4.2.5.1)

- 1 White
- 2 Cream
- 3 Dark cream
- 4 Pale yellow
- 5 Dark yellow
- 6 Pale orange
- 7 Intermediate orange
- 8 Dark orange
- 9 Strongly pigmented with anthocyanins

Secondary storage root flesh colour (4.2.5.2)

- 0 Absent
- 1 White
- 2 Cream
- 3 Yellow
- 4 Orange
- 5 Pink
- 6 Red
- 7 Purple-red
- 8 Purple
- 9 Dark purple

Distribution of secondary storage root flesh colour (4.2.5.3)

- 0 Absent
- 1 Narrow ring in cortex
- 2 Broad ring in cortex
- 3 Scattered spots in flesh
- 4 Narrow ring in flesh
- 5 Broad ring in flesh
- 6 Ring and other areas in flesh
- 7 In longitudinal sections
- 8 Covering most of the flesh
- 9 Covering all flesh

Storage root dry matter content [%] (6.2.1)

Storage root nitrogen content [%] (6.2.2)

Use the Kjeldahl Method

Storage root starch content [% DW] (6.2.4)

Storage root total alcohol soluble sugar content [%] (6.2.5)

The phenol-sulphuric method is suggested

Storage root carotene content [mg/100g FW] (6.2.6)

Consistency of boiled storage root (6.2.9.1)

- 1 Watery
- 2 Extremely soft
- 3 Very soft
- 4 Soft
- 5 Slightly hard
- 6 Moderately hard
- 7 Hard
- 8 Very hard
- 9 Very hard and non-cooked

Texture of boiled storage root flesh (6.2.9.3)

- 1 Dry
- 3 Somewhat dry
- 5 Intermediate
- 7 Moist
- 9 Very moist

ABIOTIC STRESSES**Reaction to drought** (7.1)

Observed after six weeks without irrigation or rainfall in a soil without subsurface water and in a season of high evaporation (4-6 mm per day)

Reaction to flooding (7.2)

Late season flooding during storage root formation. The environmental conditions could consist of about two weeks' flooding (water-saturated soil) in a heavy soil

Reaction to heat (7.3)

Hot season with night temperatures of more than 22°C. The yield comparisons could be versus yields obtained under cooler conditions

Reaction to salinity (7.4)

In a soil with salinity levels of more than 8 mmhos/cm. The yield comparisons could be versus yields obtained in soils with less than 2 mmhos/cm

BIOTIC STRESSES**Sweet potato weevil** (*Cylas* spp.) (8.1.1)**Root-knot nematode** (*Meloidogyne* spp.) (8.2.1)**Fusarium wilt or stem rot** (*Fusarium oxysporum* f. sp. *batatas*) (8.3.1)**Black rot** (*Ceratocystis fimbriata*) (8.3.5)**Java black rot** (*Diplodia gossypina*) (8.3.8)**Scab or spot anthracnose** (*Elsinoe batatas*) (8.3.10)**Charcoal rot** (*Macrophomina phaseoli*) (8.3.14)**Bacterial stem and root rot** (*Erwinia chrysanthemi*) (8.4.2)**Sweet potato virus disease** (SPVD complex) (8.5.4)**Sweet potato chlorotic stunt virus** (SPCSV) (8.5.X)**NOTES**

Any additional information may be specified here, particularly that referring to the category '99=Other' present in some of the descriptors above.

CONTRIBUTORS

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CORE ADVISORY GROUP

Genoveva Rossel, International Potato Center (CIP), Peru

David Tay, International Potato Center (CIP), Peru

Danny Hunter, Bioversity International, Italy

Grahame Jackson, Australia

Robert Jarret, United States Department of Agriculture, Agricultural Research Service (USDA, ARS), USA

Ana Panta, International Potato Center (CIP), Peru

Ramanatha Rao, Bioversity International, India

Ivo Sias Costa, Empresa Brasileira de Pesquisa Agropecuária (EMBRAPA), Brazil

Luis Antônio Suita de Castro, Empresa Brasileira de Pesquisa Agropecuária (EMBRAPA), Brazil

REVIEWERS

Argentina

Carla Marcela Arizio, Instituto Nacional de Tecnología Agropecuaria (INTA)

Australia

Michael Hughes, Department of Employment, Economic Development and Innovation (DEEDI), Queensland - Primary Industries and Fisheries

Gunnar Kirchhof, University of Queensland

China

Qinghe Cao, Xuzhou Sweet Potato Research Centre

Kaiyun Xie, International Potato Center (CIP), Liaison Office China

Kenya

Sammy Agili Makanginya, International Potato Center (CIP)

India

Dindo Campilan, International Potato Center (CIP)

S.K. Naskar, Central Tuber Crops Research Institute

Indonesia

Muhammad Jusuf Yakub, Indonesian Legumes and Tuber Crops Research Institute

Malawi

Felistus Chipungu, Department of Agricultural Research Services

Nigeria

Malachy Akoroda, Sweetpotato Promotion Group

Papua New Guinea

Joseph Kapis, World Vision

Tom Okpul, Papua New Guinea University of Technology

Philippines

Teresita H. Borromeo, University of the Philippines Los Baños

Hidelisa de Chavez, International Potato Center (CIP-UPWARD)

Proceso H. Manguiat, University of the Philippines Los Baños

Algerico M. Mariscal, Philippine Root Crop Research and Training Center (PhilRootcrops)

Tanzania

Stephen Kuoko Sebastiani, Horticulture Research Institute (HORTI Tengeru)