



DESCRIPTORS FOR SWEET POTATO

CIP
AVRDC
IBPGR

Z. Huamán (ed.)

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DESCRIPTORS FOR **SWEET POTATO**

Z. Huamán (ed.)

CIP/AVRDC/IBPGR 1991

El Centro Internacional de la Papa (CIP) es una institución científica, autónoma y sin fines de lucro, dedicada a desarrollar y diseminar conocimientos sobre la papa y otros cultivos de tubérculos y raíces, para lograr su mayor utilización como alimentos básicos en los países en desarrollo. El CIP fue establecido mediante convenio con el Gobierno del Perú y es apoyado por el Grupo Consultivo sobre Investigaciones Agronómicas Internacionales (GCIAl) cuyos miembros proveen fondos para el desarrollo agrícola internacional

El Centro Asiático para el Desarrollo y la Investigación relativos a los Vegetales (AVRDC), es un centro dedicado a la investigación y el desarrollo de los cultivos vegetales de los trópicos húmedos y subhúmedos. Establecido en 1971, sus actividades incluyen la recolección de germoplasma, su conservación y desarrollo; mejora varietal; mejora de tecnologías de producción; estudios nutricionales y ambientales; transferencia de tecnologías; capacitación de personal de los programas nacionales y publicación de tecnologías de investigación

La función básica del IBPGR es la promoción y coordinación de la recolección, conservación, documentación, evaluación y utilización de recursos fitogenéticos, y en consecuencia contribuir a elevar el nivel de vida y el bienestar de la población de todo el mundo. Prestan apoyo financiero al programa básico los Gobiernos de Alemania, Australia, Austria, Bélgica, Canadá, China, Dinamarca, España, Estados Unidos, Francia, India, Italia, Japón, Noruega, Países Bajos, Reino Unido, Suecia y Suiza, así como el UNEP y el Banco Mundial

The International Potato Center (CIP) is a scientific, autonomous, and non-profit institution dedicated to develop and disseminate knowledge for greater use of the potato and other tuber and root crops as basic foods in the developing world. CIP was established by agreement with the Government of Peru and is supported by the Consultative Group on International Agricultural Research (CGIAR), whose members provide funding for international agricultural development

The Asian Vegetable Research and Development Center (AVRDC) is an international centre mandated for the research and development of vegetable crops in the humid and subhumid tropics. Established in 1971, its activities include: germplasm collection, storage and enhancement; varietal improvement; production technology improvement; environmental and nutritional studies; technology transfer; training for national programme personnel; and publication of research-based technologies

The basic function of IBPGR is to promote and coordinate an international network of genetic resources centres to further the collection, conservation, documentation, evaluation and use of plant germplasm and thereby contribute to raising the standard of living and welfare of people throughout the world. Financial support for the core programme is provided by the Governments of Australia, Austria, Belgium, Canada, China, Denmark, France, Germany, India, Italy, Japan, the Netherlands, Norway, Spain, Sweden, Switzerland, the UK and the USA, as well as the United Nations Environment Programme and the World Bank

Le Centre International de la Pomme de terre (CIP) est une institution scientifique autonome à but non lucratif dédié au développement et à la dissémination des connaissances pour une plus grande utilisation des Pommes de terre et autres racines et tubercules dans l'alimentation de base des pays en voie de développement. Le CIP a été établi avec l'accord du gouvernement de Pérou et est supporté par le Groupe Consultatif pour la Recherche Agricole Internationale (CGIAR) dont les membres procurent des financements pour le développement agricole international

Le Centre Asiatique de Recherche et de Développement des Légumes (AVRDC) est un centre international mandaté pour la recherche et le développement des plantes maraîchères dans les tropiques humides et subhumides. Etabli en 1971, ses activités incluent la collecte de germplasm, la conservation et le développement du germplasm ; l'amélioration variétale ; l'amélioration des technologies de production ; des études nutritionnelles et environnementales ; le transfert de technologies ; la formation du personnel des programmes nationaux et la publication des technologies de la recherche

La fonction de base de l'IBPGR est de promouvoir et de coordonner un réseau international des centres de ressources génétiques pour la mise en valeur de la collecte, la conservation, la documentation, l'évaluation et l'utilisation de germplasm des plantes et ainsi contribuer à élever le niveau de vie et le bien-être des peuples à travers le monde. Le support financier aux programmes est fourni par les gouvernements de l'Allemagne, l'Australie, l'Autriche, la Belgique, le Canada, la Chine, le Danemark, la France, l'Inde, l'Italie, le Japon, les Pays-Bas, la Norvège, l'Espagne, la Suède, la Suisse, le Royaume-Uni et les Etats-Unis, aussi bien que le Programme des Nations Unies pour l'Environnement et la Banque Mondiale

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PREFACE

Descriptors for sweet potato (Ipomoea batatas) was developed by Dr. Z. Huamán of the International Potato Center (CIP), Lima, Peru. This list is a revised version of the publication "Huamán, Z. 1988. Descriptors for the characterization and evaluation of sweet potato genetic resources. pp. 331-355. In: *Exploration, Maintenance and Utilization of Sweet Potato Genetic Resources, Report of the First Sweet Potato Planning Conference, February 1987. Lima, Peru: International Potato Center. 369 p.*". Appendix I lists those that contributed to the improvement of this list. This publication replaces "Descriptors for Sweet Potato" published by IBPGR in 1981. The 1981 descriptor numbers are given in parentheses beside the present descriptors for cross-referencing purposes.

IBPGR encourages the collection of data on the first four categories of this list: 1. Accession, 2. Collection; 3. and 4. Characterization and preliminary evaluation. IBPGR endorses the information in categories 1-4 as the minimum that ideally should be available for any one accession. Other descriptors are given in categories 5 onwards that will enable the simple encoding of further characterization and evaluation data and which can serve as examples for the creation of additional descriptors in the IBPGR format by any user.

Although the suggested coding should not be regarded as the definitive scheme, this format has the full backing of IBPGR and is promoted worldwide. The descriptor list given here provides an international format and thereby produces a universally understood 'language' for all plant genetic resources data. The adoption of this scheme for all data encoding, or at least the production of a transformation method to convert other schemes to the IBPGR format, will produce a rapid, reliable and efficient means for information storage, retrieval and communication. This will greatly assist the utilization of germplasm throughout the international plant genetic resources network. It is recommended, therefore, that information should be produced by closely following the descriptor list with regard to: ordering and numbering descriptors; using the descriptors specified, and using the descriptor states recommended.

Any suggestions for modifications will be welcomed by CIP, AVRDC and IBPGR.

DEFINITIONS AND USE OF THE DESCRIPTORS

IBPGR now uses the following definitions in genetic resources documentation:

- (i) passport (accession identifiers and information recorded by collectors);
- (ii) characterization (consists of recording those characters which are highly heritable, can be easily seen by the eye and are expressed in all environments);
- (iii) preliminary evaluation (consists of recording a limited number of additional traits thought desirable by a consensus of users of the particular crop);
- (iv) further evaluation (consists of recording a number of additional descriptors thought to be useful in crop improvement).

Characterization and preliminary evaluation will be the responsibility of genebank curators, while further characterization and evaluation will typically be carried out elsewhere (by a multidisciplinary team of scientists). The data from further evaluation should be fed back to the genebank which will maintain a data file.

The following internationally accepted norms for the scoring and recording of descriptor states should be followed as indicated below:

- (a) blanks are used for information not yet available;
- (b) many quantitative characters which are continuously variable are recorded on a 1-9 scale where:

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

is the expression of a character. If the character is not expressed, '0' should be recorded (see also (d)). The authors of this list have sometimes described only a selection of the states, e.g. 3, 5 and 7 for such descriptors. Where this has occurred the full range of codes is available for use by extension of the codes given or by interpolation between them - e.g. in Section 8. Biotic stress susceptibility 1 = very low susceptibility and 8 = high to very high susceptibility;

- (c) presence/absence of characters are scored as

+	Present
0	Absent

- (d) when the descriptor is inapplicable, '0' is used as the descriptor value, e.g. if an accession does not have a central leaf lobe, '0' would be scored for the following descriptor:

Shape of central leaf lobe

3	Toothed
5	Elliptic
7	Linear

- (e) for accessions which are not generally uniform for a descriptor (e.g. mixed collection, genetic segregation) the mean and standard deviation could be reported where the descriptor is continuous or where the descriptor is discontinuous up to three codes in the order of frequency can be recorded;
- (f) standard colour charts, e.g. Royal Horticultural Society Colour Chart, Methuen Handbook of Colour, Munsell Color Charts for Plant Tissues are strongly recommended for all ungraded colour characters (the precise chart used should be specified in the NOTES descriptor, 11);
- (g) measurements are made according to the SI system. The units to be applied are given in square brackets following the descriptor;
- (h) dates should be expressed numerically in the format DDMMYYYY, where

DD	-	2 digits to represent the day
MM	-	2 digits to represent the month
YYYY	-	4 digits to represent the year

PASSPORT

1. ACCESSION DATA

1.1 ACCESSION NUMBER (1.1)

This number serves as a unique identifier for each accession and is assigned by the curator when an accession is entered into the collection. 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 re-use. Letters should be used before the number to identify the genebank or national system (e.g. MG indicates an accession from the genebank at Bari, Italy, PI indicates an accession within the USA system)

1.2 DONOR NAME

Name of institution or individual responsible for donating the germplasm

1.3 DONOR IDENTIFICATION NUMBER

Number assigned to the accession by the donor

1.4 OTHER NUMBERS ASSOCIATED WITH THE ACCESSION

Any other identification number known to exist in other collections for this accession, e.g. USDA Plant Introduction number (not a COLLECTOR'S NUMBER, see 2.1)

1.4.1 Other number 1

1.4.2 Other number 2

1.5 SCIENTIFIC NAME (1.2)

1.5.1 Genus (1.2.1)

1.5.2 Species (1.2.2)

1.6 PEDIGREE

Parentage or nomenclature and designations assigned to breeders' material

1.7 CULTIVAR NAME

Either a registered or other formal cultivar designation given to the accession

1.8 ACQUISITION DATE

The date on which the accession entered the collection (in the format DDMMYYYY)

1.9 TYPE OF MAINTENANCE

Advanced cultivars, native cultivars and breeding lines with valuable gene combinations should be maintained vegetatively

- 1 Vegetative in the field
- 2 Vegetative in tissue culture
- 3 Vegetative in the field and tissue culture
- 4 Seed
- 5 Vegetative in the field and seed
- 6 Vegetative in tissue culture and seed
- 7 Vegetative in the field plus tissue culture and seed

1.10 DATE OF LAST REGENERATION OR MULTIPLICATION

(in the format DDMMYYYY)

1.11 ACCESSION SIZE

Approximate number of seeds of an accession in the genebank

1.12 NUMBER OF PLANTS USED IN REGENERATION

2. COLLECTION DATA

2.1 COLLECTOR'S NUMBER (2.2)

Original number assigned by the collector(s) of the sample. It is normally composed of an abbreviation of the last name(s) followed by the number. The collector's number is essential for identifying duplicates held in different collections and should be unique and always accompany subsamples wherever they are sent

- 2.2 COLLECTING INSTITUTE(S) (2.1)
 Institute(s) and/or people collecting/sponsoring the sample collection
- 2.3 DATE OF COLLECTION OF ORIGINAL SAMPLE (2.3)
 (in the form DDMMYYYY)
- 2.4 COUNTRY OF COLLECTION (2.4)
 Use the three letter abbreviations supported by the Statistical Office of the United Nations. Copies of these abbreviations are available from IBPGR and have been published in the *FAO/IBPGR Plant Genetic Resources Newsletter*, number 49
- 2.5 DEPARTMENT/STATE
 Name of the primary political subdivision of the country in which the sample was collected
- 2.6 PROVINCE/COUNTY
 Name of the secondary political subdivision of the country in which the sample was collected
- 2.7 COLLECTION SITE (2.7)
 Distance in kilometres from the nearest town, village or map grid reference point (e.g. 15 km from Satipo to La Merced, Rio Negro)
- 2.8 LATITUDE OF COLLECTION SITE (2.5)
 Degrees and minutes followed by N(orth) or S(outh)
- 2.9 LONGITUDE OF COLLECTION SITE (2.6)
 Degrees and minutes followed by E(ast) or W(est)
- 2.10 ALTITUDE OF COLLECTION SITE [m] (2.8)
 Elevation above sea level

2.11 COLLECTION SOURCE (2.9)

- 1 Wild habitat
- 2 Farmland
- 3 Farm store
- 4 Backyard
- 5 Village market
- 6 Commercial market
- 7 Institute
- 8 Other (specify in the NOTES descriptor, 2.16)

2.12 TYPE OF SAMPLE (2.10)

- 1 Storage roots
- 2 Stem cuttings
- 3 *In vitro* culture
- 4 Seed
- 5 Vegetative and seed

2.13 STATUS OF SAMPLE (2.11)

- 1 Wild
- 2 Weedy
- 3 Landrace/native cultivar
- 4 Advanced cultivar
- 5 Breeder's line
- 6 Other (specify in the NOTES descriptor, 2.16)

2.14 HERBARIUM SPECIMEN

Was a herbarium specimen collected? If so, provide any identification number in the NOTES descriptor, 2.16

- 0 No
- + Yes

2.15 PREVAILING STRESSES

Information on associated biotic and abiotic stresses

2.16 NOTES (2.12)

Some collectors will record ecological and soil information, cultural methods, months of planting and harvesting, uses of the plant, habitat of wild plants, etc.

CHARACTERIZATION AND PRELIMINARY EVALUATION

3. SITE DATA

3.1 COUNTRY OF CHARACTERIZATION AND PRELIMINARY EVALUATION
(See instruction in COUNTRY OF COLLECTION, 2.4)

3.2 SITE (RESEARCH INSTITUTE) (3.1)

3.2.1 Latitude
(See format under 2.8)

3.2.2 Longitude
(See format under 2.9)

3.2.3 Altitude [m]

3.2.4 Name of farm or institute

3.3 EVALUATOR(S) NAME AND ADDRESS (3.3)

3.4 PLANTING DATE (3.4)
(in the form DDMMYYYY)

3.5 HARVEST DATE (3.5)
(in the form DDMMYYYY)

3.6 EVALUATION ENVIRONMENT

Environment in which characterization/preliminary evaluation was carried out

- 1 Field
- 2 Screenhouse
- 3 Glasshouse
- 4 Laboratory
- 5 Other (specify in the NOTES descriptor, 3.16)

3.7 PERCENTAGE SEED GERMINATION [%]

3.8 NUMBER OF DAYS TO 50% FIELD EMERGENCE

3.9 PLANTING SITE IN FIELD

Give block, strip and/or row/plot number as applicable

3.10 FIELD SPACING

3.10.1 Distance between plants in a row [cm]

3.10.2 Distance between rows [cm]

3.11 SOIL TAXONOMIC CLASSIFICATION

As detailed a classification as possible should be given. This may be taken from a soil survey map. State name (e.g. Alfisol, Podisol, Fluvisol, etc.)

3.12 WATERING

- 1 Irrigated
- 2 Rainfed
- 3 Both/alternate

3.13 FERTILIZER

(specify name and dose)

3.14 PLANT PROTECTION

(specify pesticides used and dose of each)

3.15 CLIMATE

- 1 Temperature [°C]
- 2 Rainfall [mm]
- 3 Sunshine hours

3.16 NOTES

Any other site-specific information

4. PLANT DATA

The collection to be evaluated should be grown in the same environment, at the same plant density, and in the most favourable season for good plant development. All plant characters should be recorded at about 90 days from planting or 10 days before harvest in early maturing cultivars.

Descriptor states related to length or size should be scored as the average value of measurements made on several plants of each accession.

Vine and leaf characters should be recorded as the average expression of the character observed in a section of the main stem located in the middle portion of several main stems.

Data for new accessions should be obtained in a similar season to that used to describe the main collection. The descriptor states should be checked with the expressions of previously described cultivars growing in the same field and representing each plant type, stem thickness, leaf shape, etc. This will allow comparisons to be made between data recorded in different years

4.1 GROSS MORPHOLOGY

4.1.1 Twining (4.1)

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

4.1.2 Plant type (4.2)

Length of the main vines

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

4.1.3 Ground cover

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%)

4.1.4 Vine internode

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

4.1.4.1 Vine internode length (4.4)

- 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)

4.1.4.2 Vine internode diameter

- 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)

4.1.5 Vine pigmentation (4.5)

Anthocyanin (purple) pigmentation present in the vines besides the green colour. The predominant colour should be evaluated considering the whole vine from base to tip. The secondary colour is more easily evaluated using younger vines

4.1.5.1 Predominant vine colour

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

4.1.5.2 Secondary vine colour

- 0 Absent
- 1 Green base
- 2 Green tip
- 3 Green nodes
- 4 Purple base
- 5 Purple tip
- 6 Purple nodes
- 7 Other (specify in the NOTES descriptor, 4.4)

4.1.6 Vine tip pubescence (4.6)

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

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

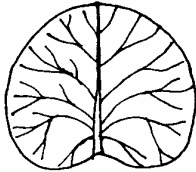
4.1.7 Mature leaf shape

Described from leaves located in the middle section of the vine

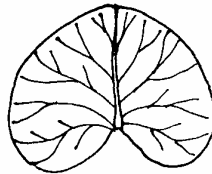
4.1.7.1 General outline of the leaf

See Fig. 1

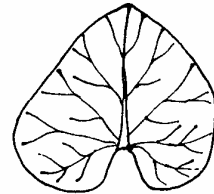
- 1 Rounded
- 2 Reniform (kidney-shaped)
- 3 Cordate (heart-shaped)
- 4 Triangular
- 5 Hastate (trilobular and spear-shaped with the basal lobes more or less divergent)
- 6 Lobed
- 7 Almost divided



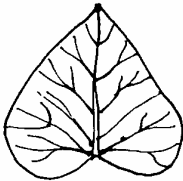
1 Rounded



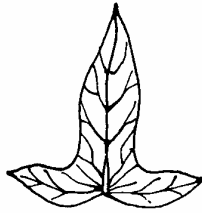
2 Reniform



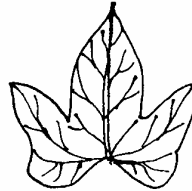
3 Cordate



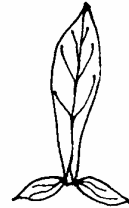
4 Triangular



5 Hastate



6 Lobed



7 Almost divided

Fig. 1. General outline of the leaf

4.1.7.2 Leaf lobes type

(4.7)

See Fig. 2

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

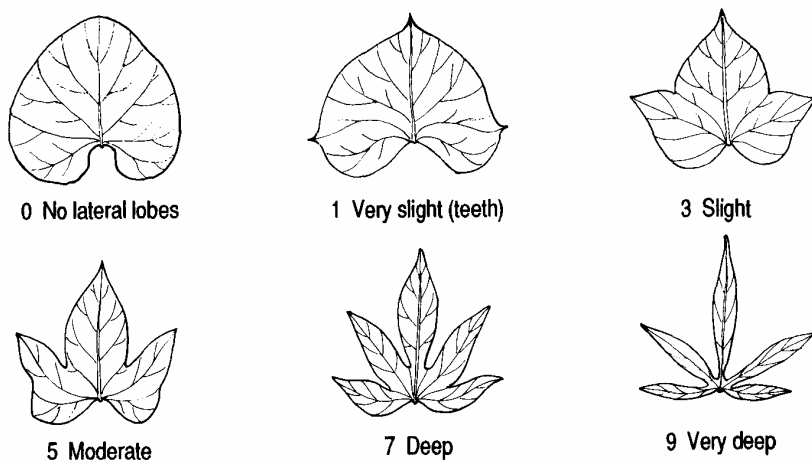


Fig. 2. Leaf lobes type

4.1.7.3 Leaf lobe number

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 totally rounded this number is 0. See Fig. 3

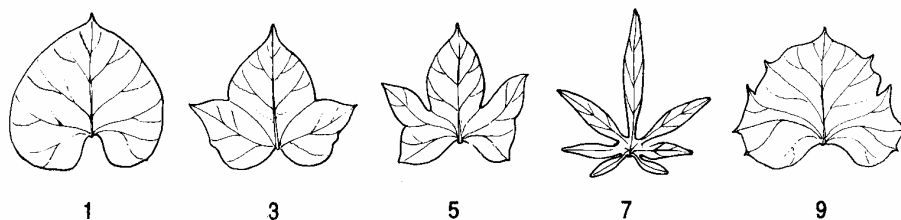
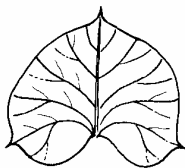


Fig. 3. Leaf lobes number

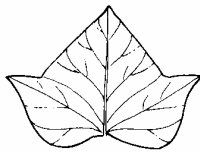
4.1.7.4 Shape of central leaf lobe

See Fig. 4

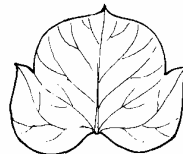
- 0 Absent
- 1 Toothed
- 2 Triangular
- 3 Semi-circular
- 4 Semi-elliptic
- 5 Elliptic
- 6 Lanceolate
- 7 Oblanceolate
- 8 Linear (broad)
- 9 Linear (narrow)



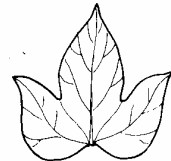
1 Toothed



2 Triangular



3 Semi-circular



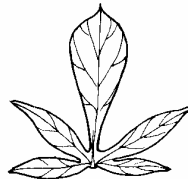
4 Semi-elliptic



5 Elliptic



6 Lanceolate



7 Oblanceolate



9 Linear (narrow)

Fig. 4. Shape of central leaf lobe

4.1.8 Mature leaf size (4.8)

Length from the basal lobes to the tip of the leaves. Record the average expression of at least 3 leaves located in the middle section of the vine. See Fig. 5

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

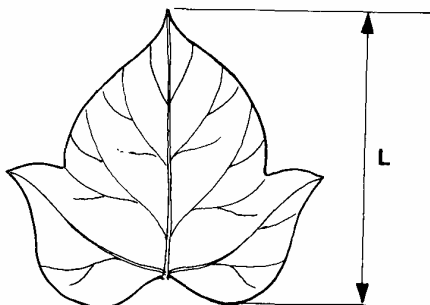


Fig. 5. Mature leaf size

4.1.9 Abaxial leaf vein pigmentation (4.11)

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

4.1.10 Foliage colour

Describe the overall foliage colour considering the colour of fully expanded mature and immature leaves of several plants. The variegation in leaf colour due to virus symptoms should not be recorded

4.1.10.1 Mature leaf colour (4.9)

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

4.1.10.2 Immature leaf colour (4.10)

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

4.1.11 Petiole length (4.12)

Average petiole length, from the base to the insertion with the blade, of at least 3 leaves in the middle portion of a main vine. See Fig. 6

- 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)

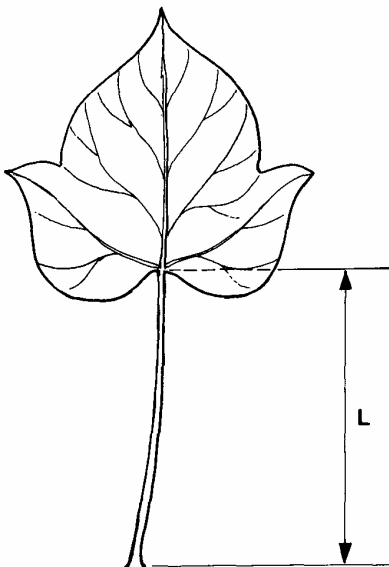


Fig. 6. Petiole length

4.1.12 Petiole pigmentation (4.13)

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, others green
- 9 Totally or mostly purple

4.2 STORAGE ROOT

Record all storage root descriptors considering the most representative expression of the character shown in medium- to large-sized storage roots of several plants

4.2.1 Storage root shape

Storage root outline shown in longitudinal section. See Fig. 7

- 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 to 1
- 9 Long irregular or curved

4.2.2 Storage root surface defects

See Fig. 8

- 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
- 8 Other (specify in the NOTES descriptor, 4.4)

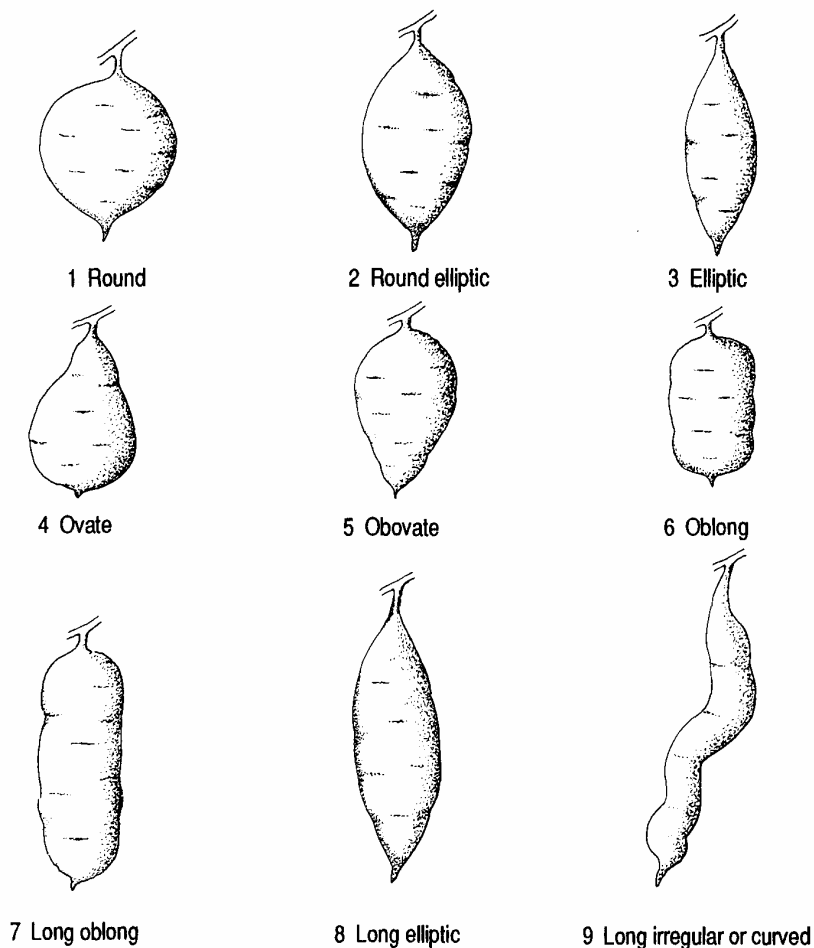


Fig. 7. Storage root shape

4.2.3 Storage root cortex thickness

- 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)

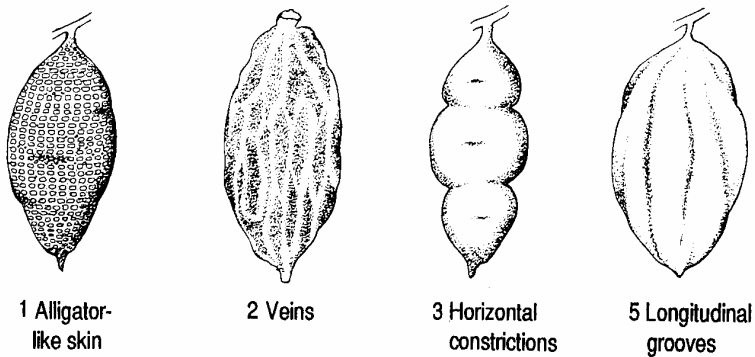


Fig. 8. Storage root surface defects

4.2.4 Storage root skin colour (4.14)

Many freshly harvested storage roots should be washed and dried prior to evaluation. The most representative skin colour observed in the cultivar should be recorded. The equivalent values of a Munsell Color Chart are given in Appendix II for the colours used in these evaluations

4.2.4.1 Predominant skin colour (4.16)

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

4.2.4.2 Intensity of predominant skin colour (4.15)

- 1 Pale
- 2 Intermediate
- 3 Dark

4.2.4.3 Secondary skin colour

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

4.2.5 Storage root flesh colour

Describe from cross and longitudinal sections made about the middle of freshly harvested storage roots

4.2.5.1 Predominant flesh colour

- 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

4.2.5.2 Secondary flesh colour

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

4.2.5.3 Distribution of secondary flesh colour

See Fig. 9

- 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

4.3 INFLORESCENCE

Although characters related to the flower are very important and not influenced by environmental conditions, there are strong differences among cultivars in their flowering ability. Flowering can be stimulated by water stress or trellis-work. However, in difficult cases grafting or chemical treatment might be needed

4.3.1 Flowering habit (4.18)

- 0 None
- 3 Sparse
- 5 Moderate
- 7 Profuse

4.3.2 Flower colour (4.19)

- 1 White
- 2 White limb with purple throat
- 3 White limb with pale purple ring and purple throat
- 4 Pale purple limb with purple throat
- 5 Purple
- 6 Other (specify in the NOTES descriptor, 4.4)

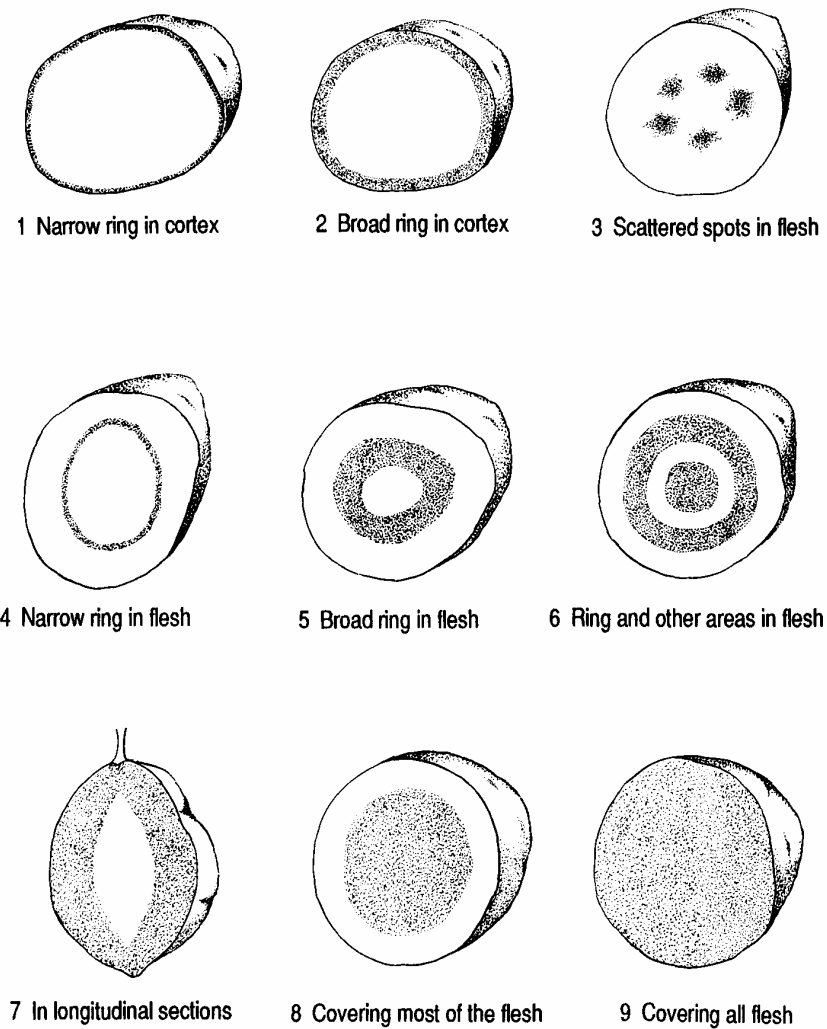


Fig. 9. Distribution of secondary flesh colour

4.3.3 Flower size

See Fig. 10

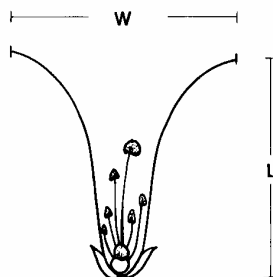


Fig. 10. Flower size

4.3.3.1 Flower length [cm]

4.3.3.2 Flower width [cm]

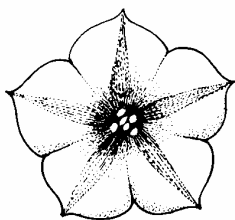
4.3.4 Shape of limb

See Fig. 11

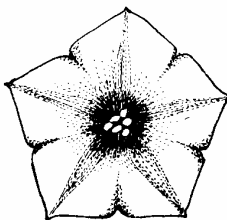
3 Semi-stellate

5 Pentagonal

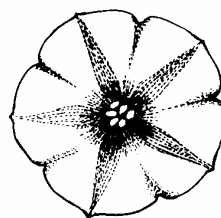
7 Rounded



3 Semi-stellate



5 Pentagonal



7 Rounded

Fig. 11. Shape of limb

4.3.5 Equality of sepal length (4.22)

- 1 Outer two shorter
- 2 Equal

4.3.6 Number of sepal veins (4.23)

Number of veins observed in the sepals. Record the most frequent number in ten typical flowers

4.3.7 Sepal shape (4.24)

See Fig. 12

- 1 Ovate
- 3 Elliptic
- 5 Obovate
- 7 Oblong
- 9 Lanceolate

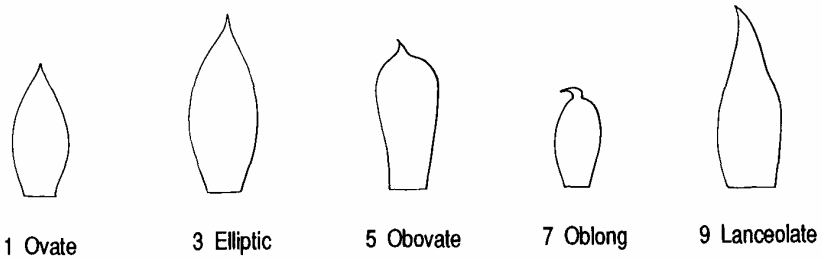


Fig. 12. Sepal shape

4.3.8 Sepal apex (4.25)

See Fig. 13

- 1 Acute
- 3 Obtuse
- 5 Acuminate
- 7 Caudate

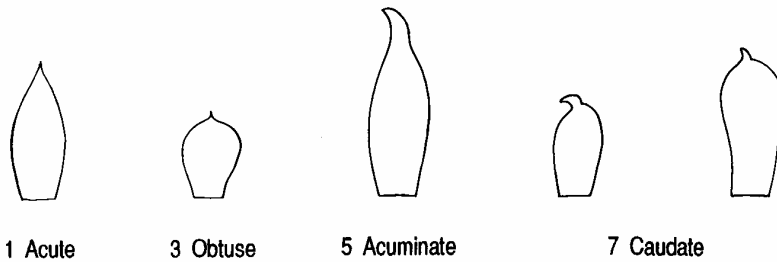


Fig. 13. Sepal apex

4.3.9 Sepal pubescence

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

4.3.10 Sepal colour

- 1 Green
- 2 Green with purple edge
- 3 Green with purple spots
- 5 Green with purple areas
- 6 Some sepals green, others purple
- 7 Totally pigmented - pale purple
- 9 Totally pigmented - dark purple

4.3.11 Colour of stigma

- 1 White
- 5 Pale purple
- 9 Purple

4.3.12 Colour of style

- 1 White
- 3 White with purple at the base
- 5 White with purple at the top
- 7 White with purple spots throughout
- 9 Purple

4.3.13 Stigma exertion

The relative position of the stigma as compared to the highest anther. See Fig. 14

- 1 Inserted (shorter than longest anther)
- 3 Same height as highest anther
- 5 Slightly exerted
- 7 Exerted (longer than longest anther)

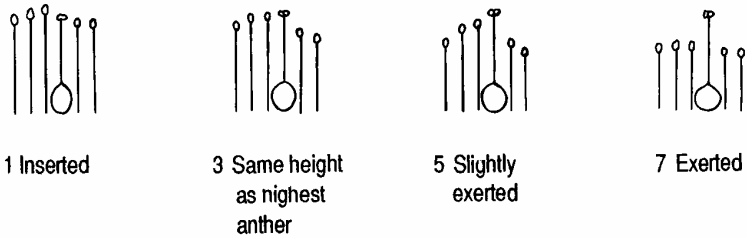


Fig. 14. Stigma exertion

4.3.14 Seed capsule set

(4.26)

- 0 None
- 1 Scarce
- 3 Sparse
- 5 Moderate
- 7 Profuse

4.4 NOTES

Any other information that could clarify plant description

FURTHER CHARACTERIZATION AND EVALUATION

5. SITE DATA

5.1 COUNTRY OF FURTHER CHARACTERIZATION AND EVALUATION

(See instruction in COUNTRY OF COLLECTION, 2.4)

5.2 SITE (RESEARCH INSTITUTE)

5.2.1 Latitude

(See format under 2.8)

5.2.2 Longitude

(See format under 2.9)

5.2.3 Altitude [m]

5.2.4 Name of farm or institute

5.3 EVALUATOR(S) NAME AND ADDRESS

5.4 PLANTING DATE

(in the form DDMMYYYY)

5.5 HARVESTING DATE

(in the form DDMMYYYY)

5.6 EVALUATION ENVIRONMENT

Environment in which further characterization/ evaluation was carried out

- 1 Field
- 2 Screenhouse
- 3 Glasshouse
- 4 Laboratory
- 5 Other (specify in the NOTES descriptor, 5.16)

5.7 PERCENTAGE SEED GERMINATION [%]

5.8 NUMBER OF DAYS TO 50% FIELD EMERGENCE

5.9 PLANTING SITE IN FIELD

Give block, strip and/or row/plot number as applicable

5.10 FIELD SPACING

5.10.1 Distance between plants in a row [cm]

5.10.2 Distance between rows [cm]

5.11 SOIL TAXONOMIC CLASSIFICATION

As detailed as classification as possible should be given. This may be taken from a soil survey map. State name (e.g. Alfisol, Podisol, Fluvisol, etc.)

5.12 WATERING

- 1 Irrigated
- 2 Rainfed
- 3 Both/alternate

5.13 FERTILIZER

(specify name and dose)

5.14 PLANT PROTECTION

(specify pesticides used and dose of each)

5.15 CLIMATE

- 1 Temperature [°C]
- 2 Rainfall [mm]
- 3 Sunshine hours

5.16 NOTES

Any other site- and/or experiment-specific information

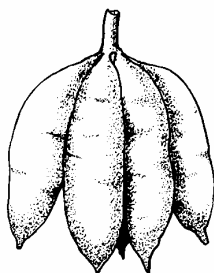
6. PLANT DATA

6.1 STORAGE ROOT

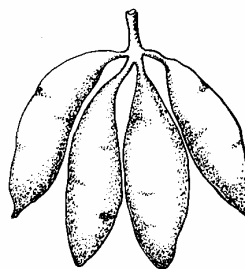
6.1.1 Storage root formation

Arrangement of the storage roots on the underground stems. See Fig. 15

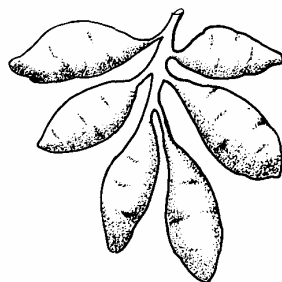
- 1 Closed cluster
- 3 Open cluster
- 5 Dispersed
- 7 Very dispersed



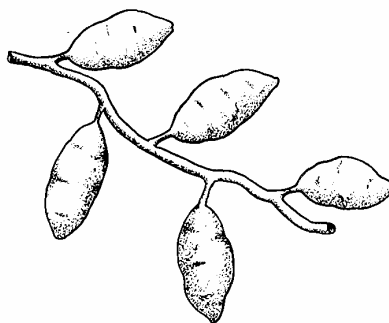
1 Closed cluster



3 Open cluster



5 Dispersed



7 Very dispersed

Fig. 15. Storage root formation

6.1.2 Storage root stalk

Length of stalk joining the storage roots to the stems

- 0 Sessile or absent
- 1 Very short (<2 cm)
- 3 Short (2-5 cm)
- 5 Intermediate (6-8 cm)
- 7 Long (9-12 cm)
- 9 Very long (>12 cm)

6.1.3 Number of storage roots per plant (5.3)

Average of ten plants

6.1.4 Variability of storage root shape (5.4)

- 3 Uniform
- 5 Slightly variable
- 7 Moderately variable

6.1.5 Variability of storage root size (5.5)

- 3 Uniform
- 5 Slightly variable
- 7 Moderately variable

6.1.6 Storage root cracking

Average cracking shown in ten plants. Consider all cracks caused by growth and/or water stress. Specify reference or reference cultivar

- 0 Absent
- 3 Few cracks
- 5 Medium number of cracks
- 7 Many cracks

6.1.7 Latex production in storage roots

Amount of latex observed after cross sectioning medium-sized storage roots

- 3 Little
- 5 Some
- 7 Abundant

6.1.8 Oxidation in storage roots

Amount of browning due to oxidation observed 5-10 seconds after storage roots are cut in cross section. Specify reference or reference cultivar

- 3 Little
- 5 Some
- 7 Abundant

6.2 QUALITY CHARACTERISTICS

6.2.1 Storage root dry matter content [%] (6.1)

6.2.2 Storage root nitrogen content [%] (6.2)

Use the Kjeldahl Method

6.2.3 Storage root crude fibre [% fresh weight] (6.3)

Reference for suggested methodology:

Hammett, H.L., Hernandez, T.P., and Miller, J.C. 1966. Inheritance of fiber content in the sweet potato *Ipomoea batatas* (L) Lamb. Proc. Amer. Soc. Hort. Sci. 88:486-490

6.2.4 Storage root starch content [% dry weight] (6.4)

References for suggested methodology:

Pharr, D.M. and Sox, H.N. 1982. Changes in carbohydrate and enzyme levels during the sink to source transition of leaves of *Cucumis sativus* L., a stachyose translocator. *Plant Sci. Lett.* 35:187-193

Jones, M.G.K. *et al.* 1977. Enzymic assay of 10^{-7} to 10^{-14} moles of sucrose in plant tissues (Broadbeans). *Plant Physiol.* 60: 379-383

6.2.5 Storage root total alcohol soluble sugar content [%] (6.5)

The phenol-sulphuric method is suggested

The reference is:

Hodge, J.E. and Hofreiter, B.T. 1972. In: Whistler, R.L. and Wolfrom, M.L. (eds.). *Methods in Carbohydrate Chemistry*, Vol. I. Academic Press, N.Y., p. 380

6.2.6 Storage root carotene content [mg/100g fresh weight] (6.6)

The reference for the suggested method is:

Reddy, N.N. and Sistrunk, W.A. 1981. Effect of cultivar, size, storage, and cooking method on carbohydrates and some nutrients of sweet potatoes, *Ipomoea batatas*. *J. Food Sci.* 45: 682-684

6.2.7 Keeping quality of stored storage roots (6.7)

3 Poor
5 Medium
7 Good

6.2.8 Sprouting ability (6.8)

Evaluate medium-sized storage roots after 30 days of storage. Record number of sprouts per root on ten average roots

6.2.9 Boiled storage root

Description of these characters should be made on commercial size storage roots of approximately the same dimensions. Roots should be totally immersed in boiling water for approximately the same time for all the accessions compared. The average score of at least 3 people should be recorded

6.2.9.1 Consistency of boiled storage root

- 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

6.2.9.2 Undesirable colour of boiled storage root

- 0 None
- 1 Some beige
- 2 Much beige
- 3 Slightly green or grey
- 4 Green
- 5 Grey
- 6 Beige and green
- 7 Beige and grey
- 8 Beige and purple
- 9 Purple

6.2.9.3 Texture of boiled storage root flesh

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

6.2.9.4 Sweetness of boiled storage root flesh

- 1 Not at all sweet
- 3 Slightly sweet
- 5 Moderately sweet
- 7 Sweet

7. ABIOTIC STRESS SUSCEPTIBILITY

To be scored on a 1-9 scale where:

- 1 Very low
- 3 Low
- 5 Intermediate
- 7 High
- 9 Very high

7.1 REACTION TO DROUGHT

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

7.2 REACTION TO FLOODING

Late season flooding during storage root formation. The environmental conditions could consist of about 2 weeks' flooding (water-saturated soil) in a heavy soil

7.3 REACTION TO HEAT

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

7.4 REACTION TO SALINITY

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

7.5 REACTION TO SHADE

Shade conditions that reduce solar energy by about 30%. The yield comparisons could be versus yields obtained under full light

7.6 REACTION TO SOIL pH BELOW 5.0

In acid and heavy soils with pH below 5.0. The yield comparisons could be versus yields obtained under the same soil with supplemental calcium to raise the pH to a favourable level

7.7 REACTION TO HIGH SOIL TEMPERATURE

During a hot season with day temperatures with peaks of more than 40°C. The yield comparisons could be versus yields obtained under cooler conditions

8. BIOTIC STRESS SUSCEPTIBILITY

These are coded on a susceptibility scale from 1 to 9 viz.:

- 1 Very low
- 3 Low
- 5 Intermediate
- 7 High
- 9 Very high

The incidence and therefore the importance of each pest or disease varies within and between each country. The following list includes those that have been reported as the most important ones

References used:

Clark, C.A. and Moyer, J.W. 1988. *Compendium of Sweet Potato Diseases*. The American Phytopathological Society Press, St. Paul, Minn., USA

Schalk, J.M. and Jones, A. 1985. Major insect pests. In: Bouwkamp, J.C. (ed.). *Sweet Potato Products: A Natural Resource for the Tropics*. CRC Press Inc. Boca Raton, Florida, pp. 59-78

8.1 INSECTS

	Latin name	Common name
8.1.1	<u><i>Cylas formalis</i></u> Faust <u><i>Cylas formicarius</i></u> Fabricius <u><i>Cylas formicarius elegantulus</i></u> Summers <u><i>Cylas puncticollis</i></u> Boheman <u><i>Cylas</i></u> sp.	Sweet potato weevil
8.1.2	<u><i>Euseceps postfasciatus</i></u> Fairmaire	West Indian sweet potato weevil
8.1.3	<u><i>Alcidodes dentipes</i></u> Oliver <u><i>Alcidodes waltoni</i></u> Boheman	Striped sweet potato weevil
8.1.4	<u><i>Conoderus falli</i></u> Lane <u><i>Conoderus vespertinus</i></u> Fabricius	Sweet potato wire worms
8.1.5	<u><i>Melanotus</i></u> sp.	Wire worms
8.1.6	<u><i>Chaetocnema confinis</i></u> Crotch	Sweet potato flea beetles
8.1.7	<u><i>Systema blanda</i></u> Melsheimer <u><i>Systema elongata</i></u> Fabricius <u><i>Systema frontalis</i></u> Fabricius	Flea beetles
8.1.8	<u><i>Typophorus nigrinus nitidulus</i></u> F. <u><i>Typophorus nigrinus viridicyaneus</i></u> Crotch	Sweet potato leaf beetles
8.1.9	<u><i>Diabrotica adelpha</i></u> Harold <u><i>Diabrotica balteata</i></u> LeConte <u><i>Diabrotica undecimpunctata howardi</i></u> Barber <u><i>Diabrotica</i></u> sp. <u><i>Aspidomorpha</i></u> sp. <u><i>Calasposoma dauricum</i></u> Mennerheim	Beetles or rootworms
8.1.10	<u><i>Phyllophaga ephilida</i></u> Say <u><i>Phyllophaga</i></u> sp. <u><i>Plectris aliena</i></u> Chapin	Grubworm
8.1.11	<u><i>Agrius cingulatus</i></u> Fabricius <u><i>Acraea acerata</i></u>	Hornworm Defoliating caterpillar

	Latin name	Common name
8.1.12	<u><i>Aphis gossypii</i> Glov.</u> <u><i>Myzus persicae</i> Sulzer</u>	Aphids
8.1.13	<u><i>Bemisia tabaci</i> Gennadius</u>	Sweet potato whytefly
8.1.14	<u><i>Herse convolvuli</i> L.</u>	Sweet potato moth
8.1.15	<u><i>Bedellia sommulentella</i> Zellar</u> <u><i>Brachmia macroscopa</i> Meyrick</u> <u><i>Prodenia litura</i> F.</u>	Moth
8.1.16	<u><i>Omphisa anastomasalis</i> Guerne</u>	Sweet potato stem borer
8.1.17	<u>Other</u> (specify in the NOTES descriptor, 11)	
8.2	NEMATODES	
8.2.1	<u><i>Meloidogyne incognita</i></u> <u>(Kofoid & White) Chitwood</u> <u><i>Meloidogyne javanica</i> (Treub.) Chitwood</u> <u><i>Meloidogyne hapla</i> Chitwood</u>	Root-knot nematode
8.2.2	<u><i>Rotylenchulus reniformis</i></u> <u>Linford and Oliveira</u>	Reniform nematode
8.2.3	<u><i>Belonolaimus longicaudatus</i> Rau</u> <u><i>Belonolaimus gracilis</i> Steiner</u>	Sting nematode
8.2.4	<u><i>Ditylenchus dipsaci</i> (Kühn)</u> <u>Filipjev</u> <u><i>Ditylenchus destructor</i> Thorne</u>	Brown ring rot
8.2.5	<u><i>Pratylenchus coffeae</i> (Zimmermann)</u> <u>Goodey</u>	Root lesion nematode
8.2.6	<u>Other</u> (specify in the NOTES descriptor, 11)	

8.3 FUNGI

	Causal organism	Disease name
8.3.1	<u><i>Fusarium oxysporum</i> f. sp. <i>batatas</i> (Wr.) (Synd. & Hans.)</u>	<i>Fusarium</i> wilt or stem rot
8.3.2	<u><i>Fusarium oxysporum</i> Schlecht.</u>	<i>Fusarium</i> surface rot
8.3.3	<u><i>Fusarium solani</i> (Mart.) Appel & Wr.</u>	<i>Fusarium</i> root rot
8.3.4	<u><i>Sclerotium rolfsii</i> Sacc.</u>	Sclerotial blight and circular spot
8.3.5	<u><i>Ceratocystis fimbriata</i> Ell. & Halst</u>	Black rot
8.3.6	<u><i>Monilochaetes infuscans</i> Ell. & Halst. ex. Harter</u>	Scurf
8.3.7	<u><i>Rhizopus stolonifer</i> (Ehr. ex. Fr.) (Lind.)</u> <u>Other <i>Rhizopus</i> species</u>	Soft rot
8.3.8	<u><i>Diplodia gossypina</i> (Cke.)</u>	Java black rot
8.3.9	<u><i>Diaporthe batatatis</i> Harter & Field</u>	<i>Diaporthe</i> dry rot
8.3.10	<u><i>Elsinoe batatas</i> (Saw.) Viegas & Jenkins</u>	Scab or spot anthracnose
8.3.11	<u><i>Phyllosticta batatas</i> (Thuem.) Cbe.</u> <u><i>Cercospora batatae</i> Zimm.</u> <u><i>Septoria bataticola</i> Taub.</u>	Leaf spot
8.3.12	<u><i>Albugo ipomoeae-panduratae</i> (Schw.) Swing</u>	White rust
8.3.13	<u><i>Plenodomus destruens</i> Harter</u>	Foot rot
8.3.14	<u><i>Macrophomina phaseoli</i> (Maubl.) Ashby</u>	Charcoal rot
8.3.15	<u>Other (specify in the NOTES descriptor, 11)</u>	

8.4 BACTERIA

	Causal organism	Disease name
8.4.1	<u><i>Streptomyces ipomoea</i> (Person & W.J. Martin) (Waksm & Henrici)</u>	Pox or soil rot
8.4.2	<u><i>Erwinia chrysanthemi</i> Dupes</u>	Bacterial stem and root rot
8.4.3	<u><i>Pseudomonas solanacearum</i> C.F. Smith</u>	Bacterial wilt
8.4.4	<u>Other</u> (specify in the NOTES descriptor, 11)	

8.5 VIRUSES

	Disease or common name
8.5.1	<u>Feathery mottle (SPFMV)</u>
	<u>Common strain</u>
	<u>Russet crack strain</u>
	<u>Internal cork strain</u>
8.5.2	<u>Mild mottle virus (SPMMV)</u>
8.5.3	<u>Vein mottle virus (SPVMV)</u>
8.5.4	<u>Sweet potato virus disease (SPVD complex)</u>
8.5.5	<u>Other</u> (specify in the NOTES descriptor, 11)

8.6 MYCOPLASMA

8.6.1	<u>Witches broom</u>
8.6.2	<u>Other</u> (specify in the NOTES descriptor, 11)

9. ALLOZYME COMPOSITION

10. CYTOLOGICAL CHARACTERS AND IDENTIFIED GENES

11. NOTES

Any other additional information may be specified here

APENDICE I

APPENDIX I

ANNEXE I

CONTRIBUYENTES

CONTRIBUTORS

COLLABORATEURS

CIP's First Sweet Potato Planning Conference
Held on February 23-27, 1987
Lima, Peru

Invited Participants:

Dr D.F. Austin (USA)
Dr Paul Beetham (Australia)
Dr Christopher Clark (USA)
Dr Wanda Collins (USA)
Dr George Fernandez (AVRDC)
Dr Sylvia K. Green (AVRDC)
Dr Robert Jarret (USA)
Dr Alfred Jones (USA)
Dr Franklin Martin (Puerto Rico)
Dr James W. Moyer (USA)
Dr Ramon T. Opeña (AVRDC)
Dr H.W. Rossel (IITA)
Dr F. Saladaga (Philippines)
Dr Satoshi Sakamoto (Japan)
Dr Itaru Shiotani (Japan)
Dr Hiroko Takagi (AVRDC)
Dr Lu Shuy Yun (China)

CIP Participants:

Dr P. Accatino
Dr H. Beaufort-Murphy
Dr S. Bo Fu
Dr F. De la Puente
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Dr H. Mendoza
Dr K.V. Raman
Dr L. Salazar
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US Sweet Potato Crop Advisory Committee
Meeeting held on January 31, 1988
New Orleans, Louisiana, USA

Mr M. Bohning
Dr J. Bouwkamp
Dr C. Clark
Dr W. Collins

Dr M. Hall
Dr A. Jones
Dr L. Rolston
Dr J. Schalk

APPENDIX II

MUNSELL COLOR CHART EQUIVALENTS
FOR STORAGE ROOT SKIN AND FLESH COLOUR

MUNSELL COLOR CHART EQUIVALENT

COLOUR	PALE	INTERMEDIATE	DARK
Cream	8.5 Y 9/3	5.5 Y 9/3	3 Y 9/3
Yellow	2.5 Y 9/9	2.5 Y 8/12	2.5 Y 7/10
Orange	5 YR 8/7	5 YR 7/11	5 YR 6/11
Brownish orange	2.5 YR 6/12	2.5 YR 5/9	2.5 YR 4/7
Pink	10 RP 8/5	10 RP 7/8	10 RP 6/12
Red	5 R 5/13	5 R 4/12	5 R 3/7
Purple-red	5 RP 1/10	2.5 RP 4/10	10 P 3/9
Dark purple	5 P 5/9	5 P 4/9	5 P 3/9

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