Descriptors for the Cultivated Potato

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DESCRIPTORS FOR THE CULTIVATED POTATO

And for the maintenance and distribution of germplasm collections

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PREFACE

At a Planning Conference on "Utilization of the Genetic Resources of the Potato, II" held 24-28 October 1977, at the International Potato Center (CIP), at which the International Board for Plant Genetic Resources (IBPGR) was present, a Working Group drew up a list of descriptors and descriptor states for the cultivated potato. These were approved by the members of the Planning Conference, whose names are to be found in Appendix II.

The IBPGR recommends this agreed list to the world community of potato workers on the advice of the group which met at CIP. However, the IBPGR strongly advises flexibility in the initial adoption of this list.

Comments and revisions of this document will be welcomed either by CIP or IBPGR.

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Appendix I Descriptors for potato germplasm maintenance, distribution and use

Appendix II Participants at the Planning Conference other than staff members of CIP

INTRODUCTION

One of the main aims of CIP is to safeguard valuable primitive cultivars threatened with extinction due to their rapid replacement by a small number of improved varieties.

To accomplish this goal, a great deal of collecting work has already been done in most Andean regions where the potato has been cultivated for a very long time and where genetic diversity still exists in the indigenous cultivars.

The number of accessions in the CIP collection is large. Moreover the information related to them (which adds greatly to their value) is such that a computerized method of recording, storing, and retrieving data has become necessary.

Methods for computer-assisted data processing require that the information about individual accessions should relate to characteristics (descriptors) and their states. This secures a quick and efficient transfer of data into machine-readable form, space-saving storage of the information and the rapid and selective retrieval of data.

However, the development of an effective international communication of data and information on potato genetic resources will be greatly facilitated if standardization of the descriptive terminology can be agreed upon.

Accordingly CIP, during its Planning Conference on "Utilization of the Genetic Resources of the Potato, II" included a Working Group to draw up a list of descriptors and descriptor states. The Working Group had representation from the IBPGR and the Information Sciences/ Genetic Resources Program of the University of Colorado, Boulder, U.S.A. which is assisting the IBPGR to develop a genetic resources communication, information and documentation system. The IBPGR's aim is to establish a global network of genetic resources activities and CIP has accepted responsibility for the potato within this network.

The terms used by scientists working on genetic resources consist essentially of descriptor names (characteristics), descriptor definitions (methods of measurement) and descriptor states (units or categories of measurement).

The descriptors and their definitions presented in the list represent only a part of all the descriptors which could be applied to cultivated potatoes. A very comprehensive descriptor list was circulated to all CIP scientists dealing with cultivated germplasm and their importance of each descriptor was assessed. The choice of which descriptors to include in a list for final consideration was made on the basis of:

- whether data are available for most of the accessions in the collection
- the feasibility of recording data for all or most of the accession in the collection
- the usefulness for comparison purposes e.g. to maintain the identity of stock, and to identify potential duplicate accession and
- the importance in the use of genetic resources by breeders

The basic lists were drawn up by Messrs. Huaman, Salhuana, Vincent and Ochoa and helpful comments were received from Messrs. Glendinning (Commonwealth Potato Collection, Scottish Plant Breeding Station, U.K.), Hawkes (Department of Plant Biology, Birmingham, U.K.), and Seidewitz (Genebank, Braunschweig – Volkenrode, Federal Republic of Germany). Full cognizance was taken of the pioneer work of Mr. L. Seidewitz who, in 1974, produced a thesaurus for the international standardization of genebank documentation on root and tuber crops.

The Working group submitted a final list to the Planning Conference and the list which follows is one agreed by the breeders and scientists present. Mr. J. Kaltenhauser advised the Working group. The agreed list which follows (pages 7 to 37) includes the essential descriptors for cultivated potatoes. Those marked with a star comprise a minimum list for use in the exchange of information among breeders and others in the field of international data communications.

A data bank at CIP for cultivated germplasm accessions using the attached list of descriptors is only a part of a developing system of documentation on the conservation and use of the genetic resources of the potato. There will clearly be a need for other data banks which will deal with the specialized descriptors being used in each of the research activities at CIP. Future work will require the development of a data bank and data management for:

1 Wild potato germplasm including detailed taxonomic data

2 Detailed evaluation of response to pests and diseases

3 Detailed biochemical evaluation

4 Environmental adaptability

5 Yield components for breeding programmes

The list has been agreed with particular reference to the CIP collection but this does not preclude its use by other institutions. Thus the agronomic evaluation data relate to those obtained at Huancayo where the CIP collection is grown. A computerized documentation system can cope with similar data from other evaluation sites.

In Appendix I a list of descriptor and descriptor states is provided for germplasm maintenance, distribution and use; these relate to the storekeeping activities of the curator of a large germplasm collection.

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NOTES ON FORMAT

The descriptor list was organized according to a descriptor classification scheme similar to those already developed by the Information Sciences/Genetic Resources Program of the University of Colorado at Boulder for maize and wheat. This classification scheme recognizes three levels of descriptor classification:

1. The highest level, the DATA TYPE, is a major function in genetic resources work, i.e. collection, evaluation, maintenance and distribution.

2. The second level in the classification hierarchy is the DATA SUBTYPE which represents a specific operation need for data within a given genetic resources function.

3. The third level within the scheme is the DESCRIPTOR NAME which actually appears in a data bank.

This scheme permits the rapid consideration of descriptors used for a particular function. The definition provided for each of the descriptor are given in full when necessary to avoid confusion; in some cases they are self-explanatory.

The coding of the descriptor states follows that generally acceptable, and as far as possible concurs with that proposed in the standardized format of Mr. L. Seidewitz.

THE DESCRIPTOR LIST

Note:

* Descriptors to be used in a minimum list for exchange purposes

1 ACCESSION IDENTIFIER

An identifier recorded when an accession is entered in a genbank or germplasm collection

*1.1 ACCESSION NUMBER

A number intended to serve as a unique identifier for an accession. This number, once assigned, can never be re-assigned to another accession; even when an accession becomes extinct its assigned accession number is still not available for re-use. Accession numbers are alpha-numeric, composed of a three-letter abbreviation, left justified, followed by up to seven digits, right justified

2 FIELD COLLECTION DATA

Data to be recorded when collections are made in the field

*2.1 COLLECTION NUMBER

Set of data that specifies the person (or organization) responsible for collecting an accession. These identifiers are alpha-numeric, composed of a three-letter abbreviation, left justified, followed by up to seven digits, right justified

2.2 DATE COLLECTED

The date on which a particular accession was collected, expressed numerically as month and year in four digits

2.3 LOCALITY OF COLLECTION

Set of data that specifies the geographic origin and precise site from which a particular accession was collected

*2.3.1 Country

An abbreviation for the country, using United Nations abbreviations

2.3.2 Department/State

Name of the largest territorial division of the country

2.3.3 Province/County

Name of the territorial sub-division of the country

2.3.4 District/Township

Name representing the political sub-division of the country larger than a town

2.3.5 Locality

Specific place within a geographic area such as the town name, village name or, if relevant, area name

***2.3.6 Latitude**
Latitude in degrees (three digits) and minutes (two digits) both right justified within their own spaces. To avoid possible confusion, the latitude, north or south, should also be indicated by an N or an S.

***2.3.7 Longitude**
Longitude in degrees (three digits) and minutes (two digits). To avoid possible confusion, the longitude, east, west, should also be indicated by an E or a W.

***2.3.8 Altitude** [m]
Elevation above sea level expressed in meters above sea level, up to four digits

2.3.9 Collecting Source
Code indicating whether the accession was collected from a:

1 Field
2 Market
3 Farm storage
4 Private collection
5 Other

2.4 VERNACULAR NAME
Name given by the farmers to the sample

2.5 GERMPLASM TYPE
Code indicating the type of germplasm collected, expressed as:

1 Cultivated
2 Wild
3 Weed
4 Undetermined

2.6 LIVING FROM COLLECTED
Code indicating the living plant parts taken by the collectors, expressed as:

1 Tuber
2 Seed
3 Plant
4 Tuber and seed
5 Tuber and plant
6 Seed and plant
7 Tuber, seed and plant

2.7 NON-LIVING FROM COLLECTION
Code indicating the non-living form taken by the collectors for record purposes, expressed as:

1 Herbarium species
2 Photograph
3 Herbarium species and photograph

3 TAXONOMIC AND MORPHOLOGICAL EVALUATION DATA

Data recorded at Huancayo[1] Peru, on plant characteristics not usually directed related to the yield of the crop.

3.1 TAXONOMIC DATA

Set of data which includes the species name and chromosome number

3.1.1 Species Name

Species name coded with a three--letter abbreviation, left justified. Hybrids to be coded according to the agreed three-letter abbreviations with the symbol (e.g. AND X TUB, STN X AJ" or PHU X STN). Field width of seven spaces is required

3.1.2 Chromosome number

Count of the zygotic (2n) number of chromosomes

3.2 TUBER CHARACTERS

Include data on some of the most important tuber characters. If predominant and secondary colours are approximately equal, the lighter one is recorded as the predominant one

*3.2.1 Predominant Tuber Skin Colour

Code indicating the colour which covers most of the surface of the tuber, expressed as:

1	White-cream
2	Yellow
3	Orange
4	Brownish
5	Pink
6	Red
7	Purplish–red
8	Purple
9	Dark purple-black

[1] Huancayo evaluation data will supersede any data from field collecting forms although the latter will be retained

***3.2.2 Secondary Tuber Skin Colour**
Code describing a secondary colour on the surface of the tuber, expressed as:

0 Absent
1 White–cream
2 Yellow
3 Orange
4 Brownish
5 Pink
6 Red
7 Purplish–black
8 Purple
9 Dark purple–black

***32.23 Distribution of Secondary Tuber Colour**
Code representing the pattern of distribution of the secondary colour in the tuber, expressed as:
(See figure 1)

0 Absent
1 Eyes – when the secondary colour is confined to the eyes only
2 Eyebrows – when the secondary colour is present in the eyebrows only
3 Splashed – when the secondary colour is fined to areas around the eyes
4 Scattered – when the secondary colour is distributed at random in one or more areas around the tuber
5 Spectacled – when areas around the eyes do not show secondary colour and the reminder of the tuber is pigmented.
6 Stippled – when the surface of the tuber is more or less uniform covered with spots
7 Other

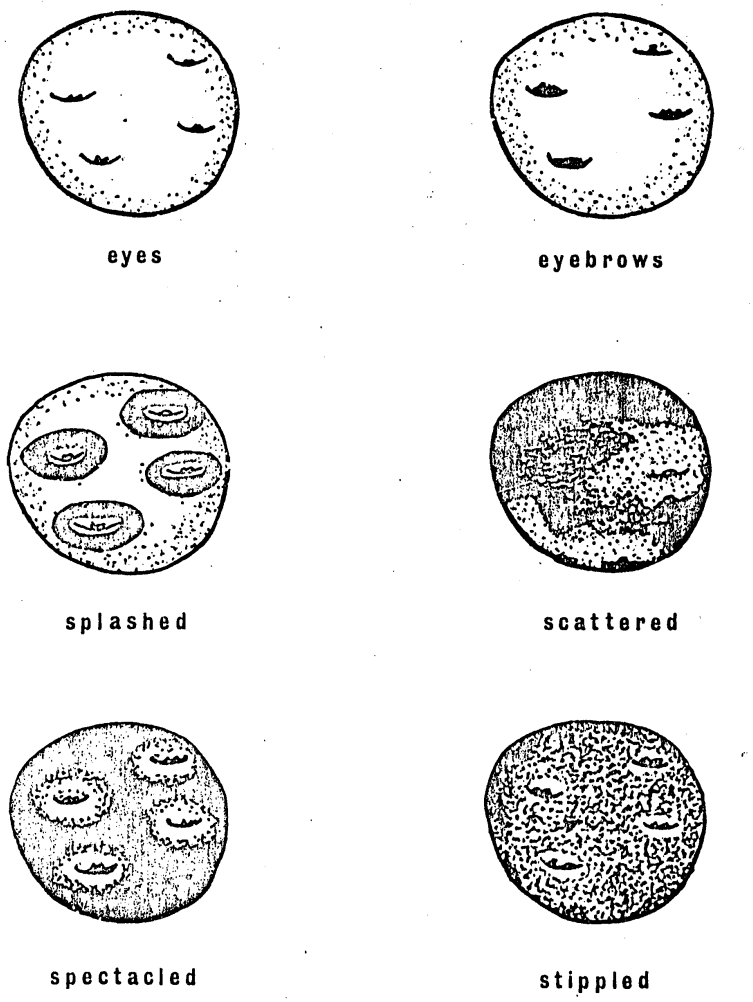
***3.2.4 Tuber Skin Type**
Code stating the type of tuber skin, expressed as:

1 Smooth
2 Rough (flaky)
3 Partially netted
4 Totally netted
5 Very heavily netted
6 Other

***3.2.5 Predominant Tuber Flesh Colour**

Code indicating the flesh colour present in most of the tuber, expressed as:

1 White
2 Cream
3 Yellow – cream
4 Yellow
5 Red
6 Violet
7 Purple
8 Other



Fig, 1 Distribution of secondary tuber colour

***3.2.6 Secondary Tuber Flesh Colour**

Code representing a secondary flesh colour in the tuber, expressed as:

0 Absent
1 White
2 Cream
3 Yellow – cream
4 Yellow
5 Red
6 Violet
7 Purple
8 Other

***3.2.7 Distribution of Secondary Tuber Flesh Colour**

Code stating the pattern of distribution of the secondary flesh colour, expressed as:
(See Figure 2)

0 Absent
1 Scattered spots
2 Scattered areas
3 Narrow vascular ring
4 Broad vascular ring
5 Vascularring medulle (pith)
6 All flesh exept medulla (pith)
7 Other

3.2.8 General Tube shape

Code describing the tuber outline, expressed as:
(See figure 3)

1 Compressed (oblate) - major axis is the shortest axis.
2 Round - an almost circular outline.
3 Ovate - an outline resembling an egg. The broadest part is within 1/3 of the distance from the stolon end.
4 Obovate - an outline which is inversely ovate and broadest within 1/3 of the distance from the apical end (rose or eye end).
5 Elliptic - an outline showing the same breadth when measured at equal distance from both the stolon and apical ends. The outline is slightly acute at each end.
6 Oblong - an almost rectangular outline with the sides nearly parallel but the corners rounded. The length/breadth ratio should not be more than 3/2.
7 Long-Oblong - an oblong outline with a length/breadth ratio closer to 2/1.
8 Elongate - a long rectangular outline with a length/breadth ratio equal to or more than 3/1.

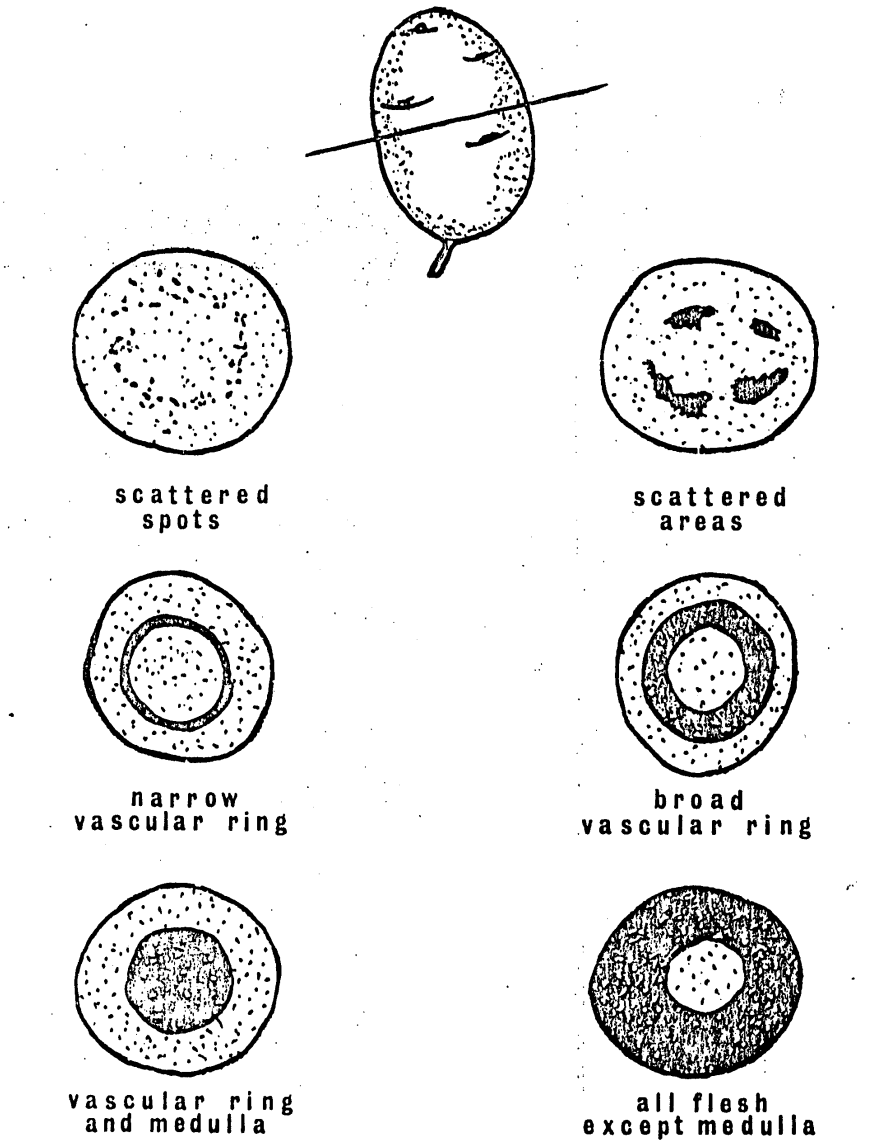


Fig. 2 Distribution of secondary tuber flesh colour

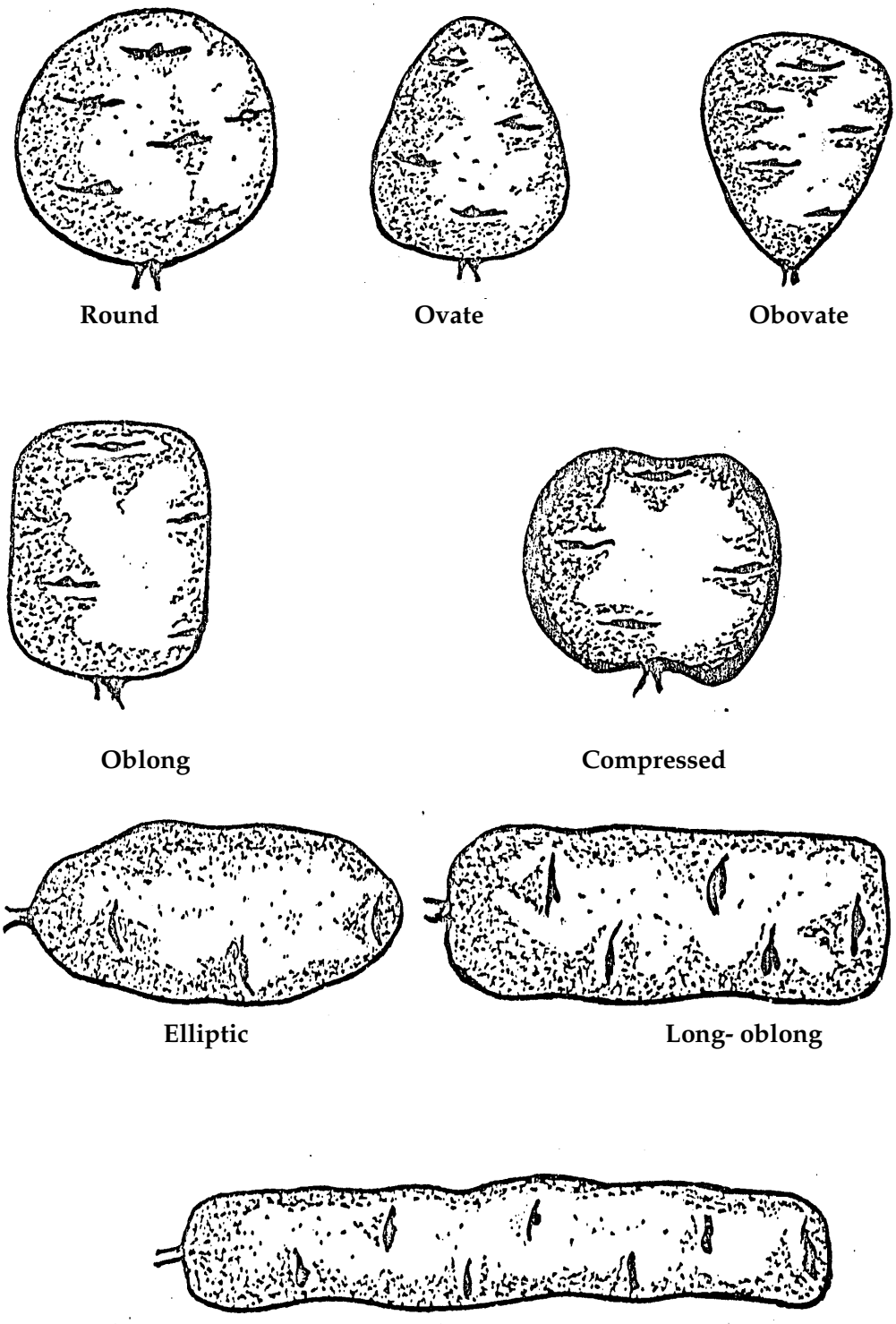


Fig. 3 Tuber shape

3.2.9 Unusual Tuber Shape

Code representing those variants of tuber shape which cannot be described under general tuber shape. It is expressed as follows:
(See figure 4)

0	Absent
1	Flattened - when the length of a transverse section, at any point of the tuber, is more than three times longer than its breadth
2	Clavate - resembling an elongated club, thickened at one end
3	Reniform - shaped like a kidney
4	Fusiform - spindle-shaped, tapering gradually at both ends
5	Falcate - curved or shaped like a sickle or horseshoe
6	Spiral - long and coiled
7	Digitate - resembling a hand or a fist
8	Concertina-shaped - resembling a concertina
9	Tuberosed - covered with few or many small lumps and tubers. It includes those shaped like a pineapple, a cluster of grapes, and raised internodes

*3.2.10 Depth of Tuber Eyes

Code indicating the depth of the eyes in the tuber, expressed as:

1	Protruding
2	Shallow
3	Medium
4	Deep
5	Very deep

*3.2.11 Note of Eyes per Tuber

Code representing the number of eyes per tuber, expressed as:

1	Few (less than 5)
5	Intermediate
9	Many (more than 20)

3.2.12 Distribution of Tuber Eyes

Code representing areas of distribution of eyes, expressed as:

1	Predominantly apical
2	Evenly distributed

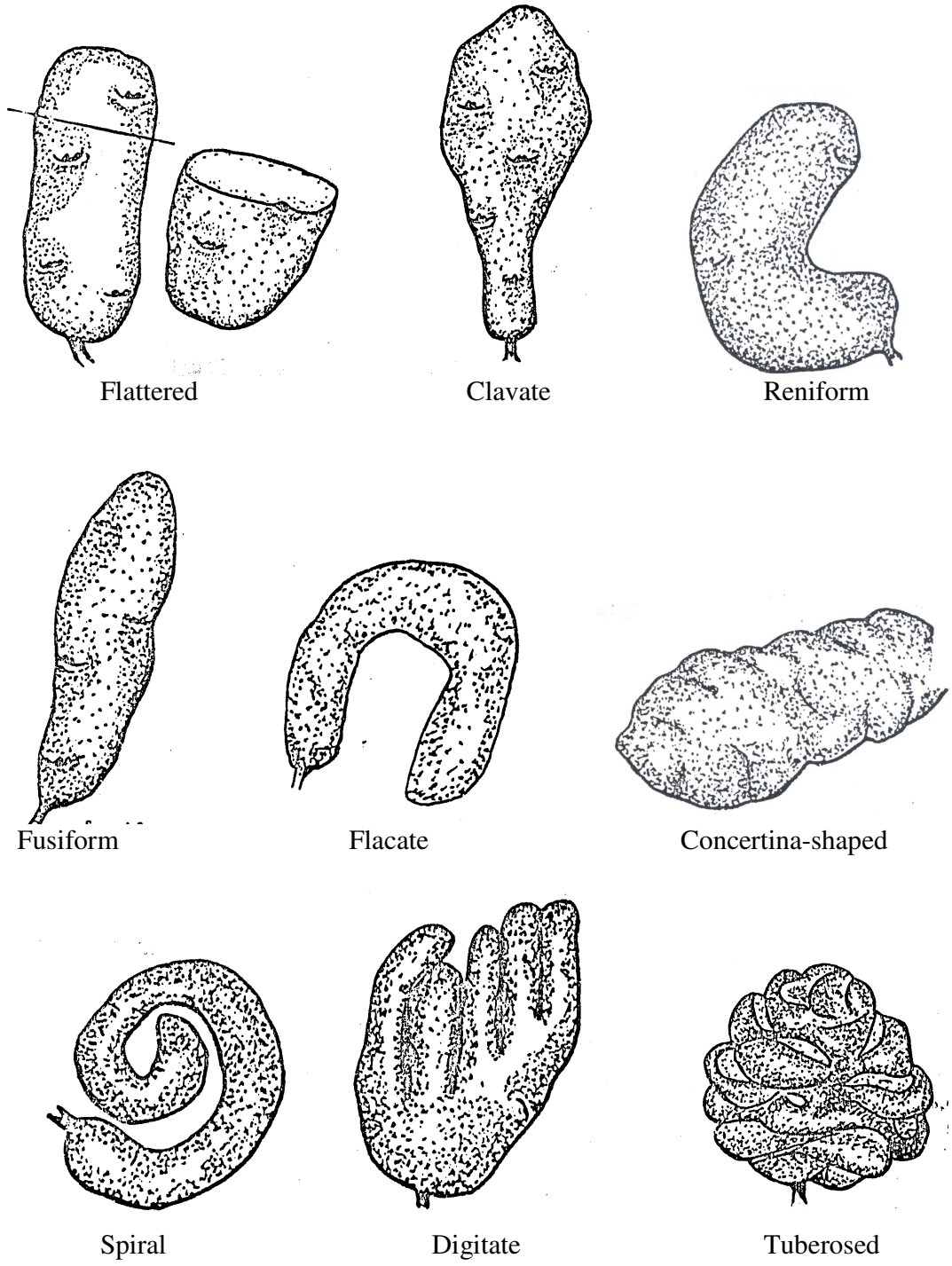


Fig. 4 Unusual tuber forms

3.3 SPROUT AND STEM CHARACTERS

Data on some of the most important sprout and stem characters of an accession assessed according to European practices e.g. as used in the Netherlands Federal Republic of Germany potato collection. If predominant and secondary colours are approximately equal, the lighter one is recorded as the predominant one

3.3.1 Predominant Sprout Colour

Code describing the colour which covers most of the surface of the sprout, expressed as:

1 White-green
2 Pink
3 Red
4 Violet
5 Purple
6 Other

3.3.2 Secondary Sprout Colour

Code which indicates the presence of a secondary colour in the sprout, expressed as:

0 Absent
1 White–green
2 Pink
3 Red
4 Violet
5 Purple
6 Other

3.3.3 Distribution of Secondary Sprout Colour

Code which represents the distribution of the secondary colour in the sprout, expressed as:

0 Absent
1 At the base
2 At the apex
3 Lightly scattered throughout
4 Heavily scattered throughout
5 Other

3.3.4 Stem Colour

Code indicating the colour of the stems, expressed as:

1 Green only
2 Red-brown only
3 Purple only
4 Cream with some red–brown
5 Cream with purple
6 Red–brown with some green
7 Purple with some green
8 Other

3.3.5 Stem Cross Section

Code for shape of stem in traverse section, expressed as:

1 Round
2 Angular

3.3.6 Stem Wing

Code for the presence and shape of the stem wing, expressed as:

0 Absent
1 Straight
2 Undulate
3 Dentate

3.4 LEAF CHARACTERS

Data on some of the most important leaf characters of an accession

3.4.1 Leaf Dissection

(See figures 5 and 6)

Code describing the degree of leaf dissection, expressed as:

1 Undissected – entire leaves
2 Pinnatilobed – leaves with lobes extending almost to the midribs
3 Scarcely dissected-leaves with terminal and primary lateral leaflet only
4 Weakly dissected-leaves with terminal and primary lateral leaflets and some secondary interjected leaflets on the rachis
5 Medium dissected-leaves with terminal ad primary lateral leaflet and interjected leaflets from the second to the fifth order on the rachis
6 Strongly dissected-leaves with terminal and primary lateral leaflet, interjected leaflets of the second, third etc. Order on the rachis and one to three interjected leaflets on the petiolules
7 Very strong dissected-leaves with terminal and primary lateral leaflets, interjected leaflets of the second, third, etc. order on the rachis and more than three interjected leaflets on the petiolules and/or rachidules
8 Other

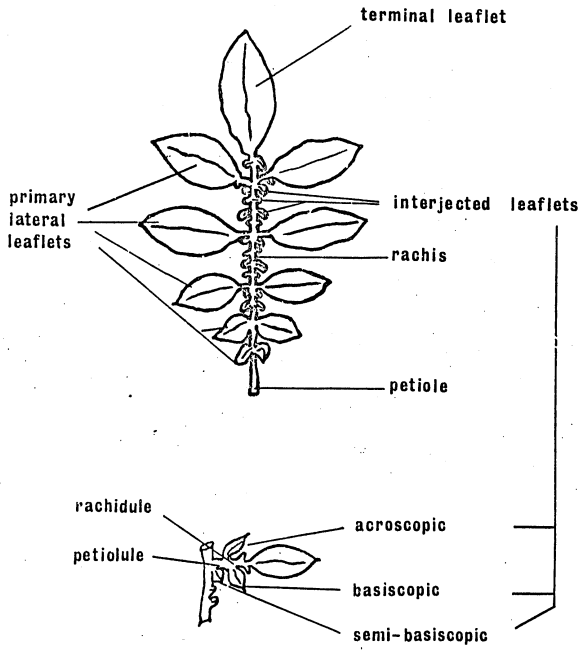


Fig. 5 Leaf Dissection

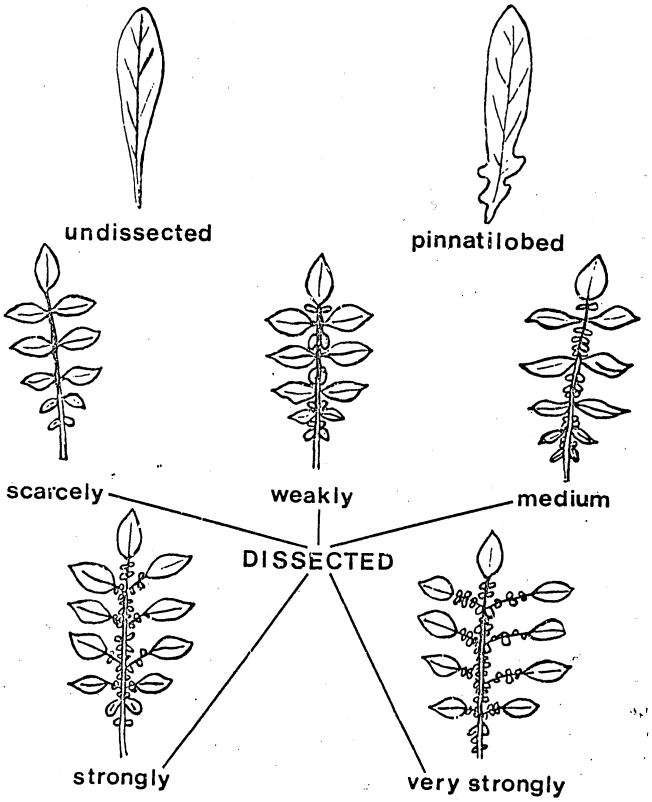


Fig. 6 Leaf dissection cont'd

3.4.2 Abaxial Leaf Pubescence

Code representing the degree to which the lower surfaces of the leaves are covered by hairs (trichomes), expressed as:

0 Glabrous - when hairs are absent
1 Glabrescent – when the pubescence is very sparse
2 Pubescence
3 Strongly pubescent

3.4.3 Adaxial Leaf Pubescence

Code representing the degree to which the upper surfaces of the leaves are covered by hairs (trichomes), expressed as:

0 Glabrous - when hairs are absent
1 Glabrescent – when the pubescence is very sparse
2 Pubescence
3 Strongly pubescent

3.4.4 Type of Hairs (trichomes)

Code describing the type of hairs in the lower surface of the leaves, expressed as:

0 Absent
1 Simple – simple trichomes
2 Simple and glandular – simple trichomes and glandular trichomes bearing a sticky four 0 – lobed head
3 Simple and glandular - simple trichomes and glandular trichomes with a sticky droplet at the tip
4 Simple and glanular – simple trichomes and both types of glandular trichomes present
5 Other

3.5 FLOWER AND FRUIT CHARACTERS

3.5.1 Calyx Colour

Code representing the calyx colour, expressed as:

1 Green only
2 Red only
3 Purple
4 Green with some red
5 Green with some purple
6 Red with some green
7 Purple with some green

3.5.2 Calyx symmetry

(See figure 7)

1 Irregular
9 Regular

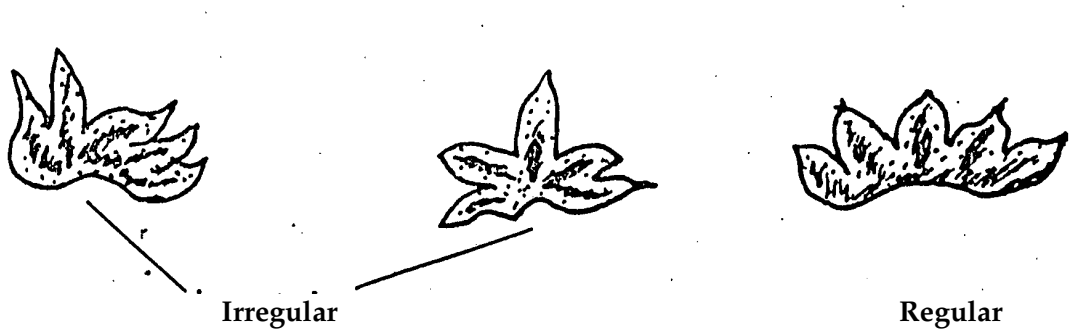
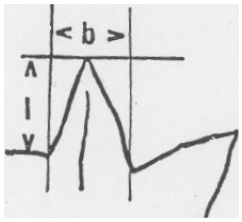


Fig. 7 Calyx Symmetry

3.5.3 Corolla Shape

(See figure 8)



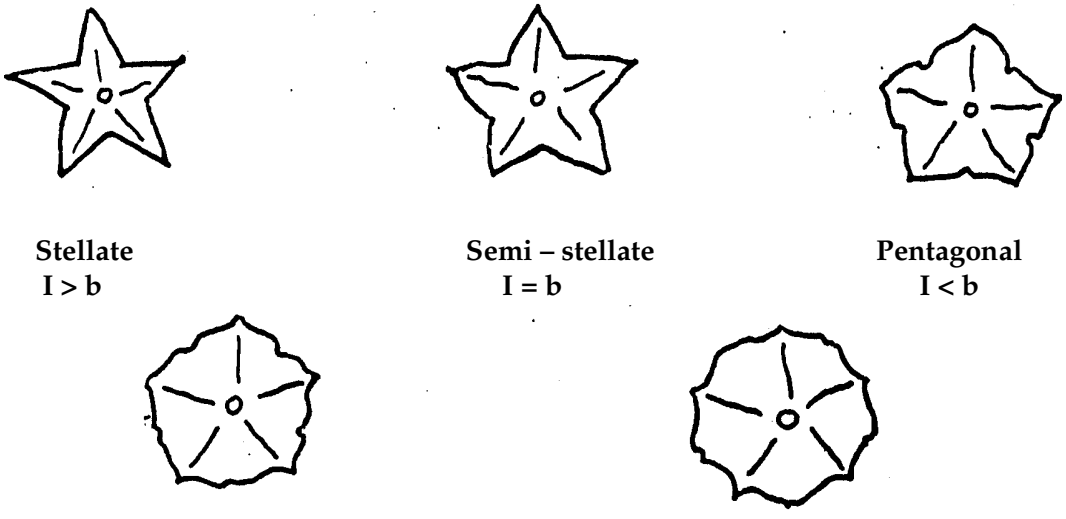


Fig. 8 Corolla shape

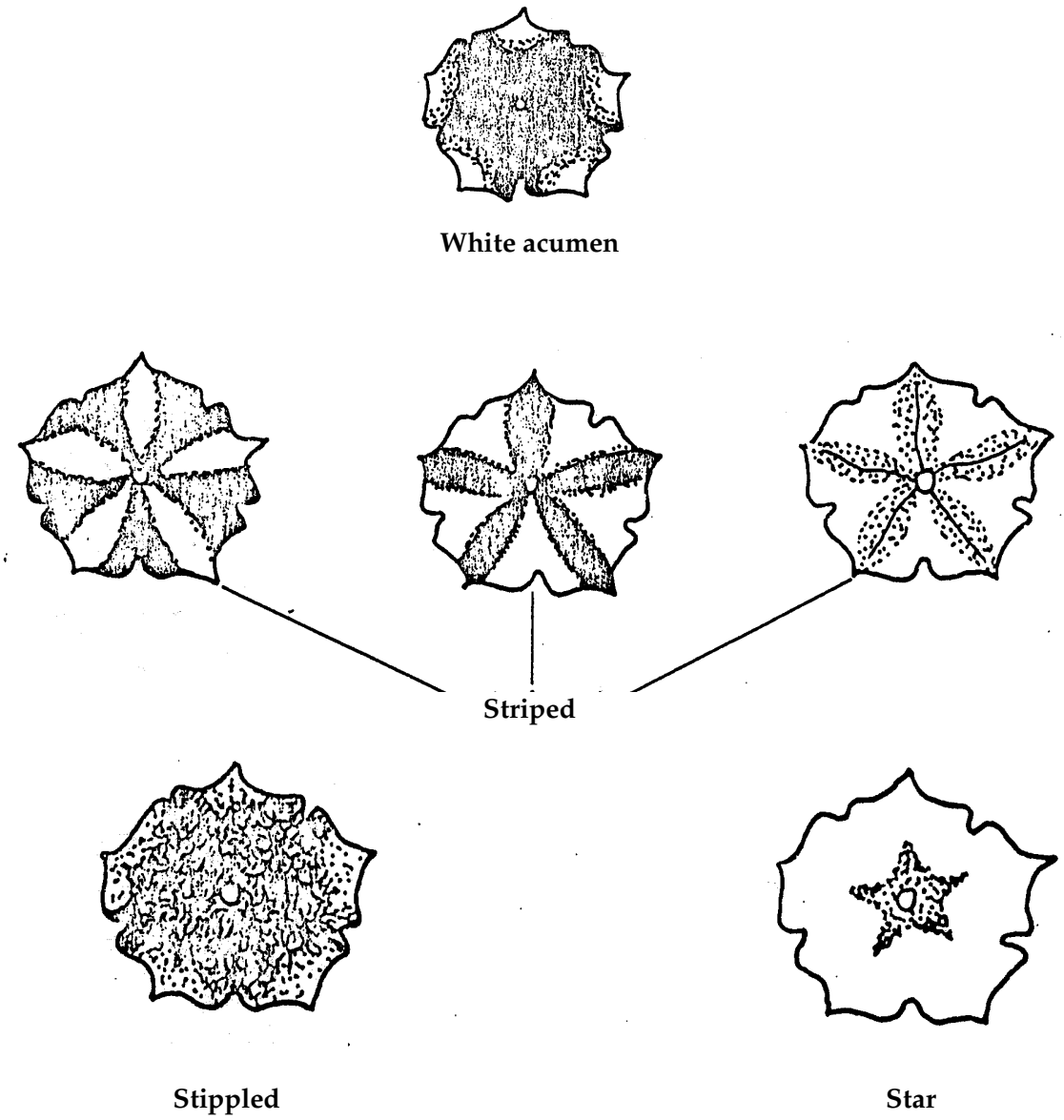


Fig. 9 Distribution of secondary flower colour

3.5.4 Predominant Flower Colour

Code indicating the colour present in most of the corolla, expressed as:

1 White
2 Light red
3 Intense red
4 Light blue
5 Intense blue
6 Light purple
7 Intense purple
8 Yellow

3.5.5 Secondary Flower Colour

Code indicating the presence of a secondary colour in the corolla, expressed as:

0 Absent
1 White
2 Light red
3 Intense red
4 Light blue
5 Intense blue
6 Light purple
7 Intense purple

3.5.6 Distribution of Secondary Flower Colour

Code which indicates the pattern of distribution of the secondary flower colour, expressed as:
(See figure 9)

0 Absent
1 White acumen – adaxial surface
2 White acumen – abaxial surface
3 White acumen or both surfaces
4 Star – adiaxal surface
5 Stripe – adaxial surface
6 Stripe – abaxial surface
7 Stripe – both surfaces
8 Stippled
9 Other

3.5.7 Anther Pigments

Code describing the presence of red or blue anthocyanin pigments in the anthers, expressed as:

0 Absent
1 Pigmented anther stripe (AS)
2 Pigmented anther tip (PA)
3 AS and PA
4 Other

3.5.8 Stamen Formation

(See figure 10)

1 Normal
2 Shrivelled
3 Partly fused column
4 Free and divergent column

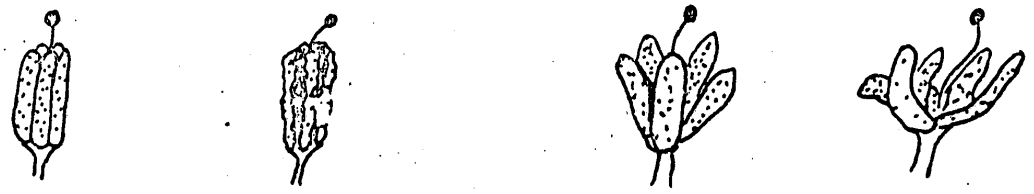


Fig. 10 Stamen formation

***3.5.9 Pollen production**

0 None
1 Little
2 Abundant

3.5.10 Pistil Pigments

Code representing the presence of red or blue anthocyanin pigments in some parts of the pistil. Pigmented ovary walls are determined in transverse section of the ovary. The pigment is expressed as:

0 Absent
1 Pigmented stigma (PS)
2 Pigmented ovary (PO)
3 Pigmented ovary wall (OW)
4 PS and PO
5 PS and OW
6 PO and OW
7 PS, PO and OW
8 Other (e.g. pigmented style)

3.5.11 Pistil Morphology

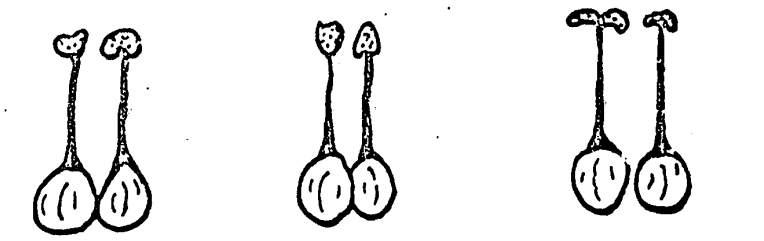
1 Normal
2 Irregular appearance
3 Fusion of pistil with anther

3.5.12 Styler length

1 Shorter than another and straight
2 Shorter than another and S shaped
3 Equal to anther
4 Longer the anther
5 Much longer than anther

3.5.13 Stigma Shape
(See figure 11)

1 Capitate
2 Clavate
3 Bilobed (or split apart)



Capitate **Clavate** **Bilobed**

Fig. 11 Stigma shape

***3.5.14 Degree of Flowering**
Code describing the degree of flowering which should be recorded at the peak of the flowering period, expressed as:

0 No buds
1 Bud abortion
3 Flowering scarce
5 Flowering moderate
7 Flowering profuse

3.5.15 Premature Flower Abscission

0 No
1 Yes

***3.5.16 Duration of Flowering**

3 Short
2 Medium
7 Long

3.5.17 Number of Flowers per Inflorescence

1 Single
2 Few (2 – 5)
3 Intermediate number
4 Many (more than 20)

3.5.18 Pedicel Articulation Position

1 Below the middle
2 At the middle
3 Above the middle

3.5.19 Pigment at Pedicel Articulation

0 Absent
1 Present

3.5.20 Self Compatibility

0 No
1 Yes
2 Undetermined

3.5.21 Fruit Shape

1 Round
2 Oval
3 Short conical
4 Long conical
5 Pyriform

3.5.22 Fruit Colour

0 Green
1 With white spots
2 With white streaks
3 Verrucose
4 Green with pigmented spots
5 Green with pigmented streaks
6 Predominantly

3.5.23 Number of Fruits

0 None
3 Low
5 Medium
7 High

***3.5.24 Seed Set**

0 None
3 Low
5 Medium
7 High

3.5.25 Seed pigment

Code indicating the distribution of the pigmented present in the botanical seed, expressed as:

0 Absent
1 Small pigmented spot
2 Large pigmented spot
3 Pigmented embryo
4 Whole seed completely pigmented
5 Other

3.6 GROWTH HABIT

3.6.1 Growth Habit Type

Code indicating the type of growth habit at the beginning of flowering of the accession being evaluated, expressed as:

1 Erect
2 Semi–erect
3 Decumbent, when the stems trail on the ground but rise at the apex
4 Prostrate, when the stems trail on the ground
5 Semi–rosette
6 Rosette, when all or most leaves arranged at the base of the stem close to the soil surface

3.6.2 Branching Habit

1 Single
2 Branching

*3.6.3 Number of the Primary Stem

1 Single
2 Few (1 – 3)
5 Medium
7 Many

3.6.4 Plant Height at Flowering Stage

3 Short
5 Medium
7 Tall

4 AGRONOMIC EVALUATION DATA

For the CIP collection the data will be recorded at Huancayo, Peru. Nevertheless these descriptors are of interest to all curators of collections for evaluation of agronomic characteristics

4.1 WEEKS TO TUBER DORMANCY

Counted as the number of weeks from harvest date to the sprouting of tubers, and recorded in at least 50% of the tubers stored in paper bags at room temperature (ca. 20^{o}C) and when the length of the sprouts is at least 5 mm

4.2 WEEKS TO FLOWERING

Counted as the number of weeks from emergence to flowering and recorded when 50% of the plants of an accession are flowering

4.3 WEEKS TO HARVEST

Recorded when 50% of the plants of an accession are ready for harvest, and indicated by the senescence of vines against a standard local commercial variety

3 Early
5 Medium
7 Late

4.4 TUBER CHARACTERISTICS

***4.4.1 Tuber Set**

Number of tubers per hill

3 Low
5 Medium
7 High

***4.4.2 Tuber Size**

3 Small
5 Medium
7 Large

4.4.3 Tuber Defects

***4.4.3.1 Crack**

0 Absent
1 Present

***4.4.3.2 Secondary growth**

0 Absent
1 Present

***4.4.3.3 Hollow heart**

0 Absent
1 Present

***4.4.3.4 Internal necrosis**

0 Absent
1 Present

***4.4.3.5 Lenticels**

0 Absent
1 Present

***4.4.4 Uniformity of Tuber Size**

3 Low
5 Medium
7 High

***4.4.5 Stolon Length**

3 Short
5 Medium
7 Long

4.4.6 Specific Gravity at Harvest

1 > 1.050
2 1.050 - 1.059
3 1.060 - 1.069
4 1.070 – 1.079
5 1.080 – 1.089
6 1.090 – 1.099
7 1.100 – 1.109
8 1.110 – 1.119
9 < 1.120

4.4.7 Commercial Acceptability

3 Low
5 Medium
7 High

5 ENVIRONMENTAL ADAPTABILITY

Set of data that specifies the types of environments in which an accession may be grown by reference to reaction to particular environmental parameters

5.1 REACTION TO FROST

5.1.1 Reaction to Frost in Field Conditions

Accessions are evaluated by planting late in the season in localities where frosts are known to occur (generally above 3600 m). Reaction to frost of –3 to –5 °C for one to three
Hours on flowering plants or during fruit setting, measured in terms of damaged or "burned" leaves, are coded as follows:

1 Highly resistant
3 Resistant
5 Slightly resistant
7 Susceptible
9 Extremely susceptible

5.1.2 Reaction to Frost in Laboratory Tests

Reaction to frost measured in detached leaves at -3 °C in a cold bath, coded as follows:

1 Highly resistant
3 Resistant
5 Slightly resistant
7 Susceptible

5.2 REACTION TO DROUGH

The method of evaluating is in the process of being defined and the following descriptor states are expected to be used:

1 Highly tolerant
3 Tolerant
5 Intermediate or slightly tolerant
7 Non-tolerant

5.3 REACTION TO HIGH TEMPERATURES

The method of evaluating is in the process of being defined and the following descriptor states are expected to be used:

1 Highly tolerant
3 Tolerant
5 Intermediate or slightly tolerant
7 Non-tolerant

6 DISEASE AND PEST REACTION DATA

Data representing measures of reaction to particular organisms, recorded during evaluation. This category includes the Data Subtypes: Reaction to Fungi, Reaction to Bacteria, Reaction to Viruses, Viroids and Mycroplasma, Reaction to Nematodes. The data bank should contain only the most up-to–date reactions recorded. If an accession is recorded as resistant, data can be supplied on the race of the pathogen

*6.1 REACTION TO FUNGI

Descriptors in this class describe the degree of reaction to particular fungal species, recorded by the amount of the plant organ infected and coded as follows:

1 Extremely resistant
2 Highly resistant
3 Very resistant
4 Resistant
5 Moderately resistant
6 Slightly resistant – slightly susceptible
7 Moderately susceptible
8 Susceptible
9 Extremely susceptible but adapted as necessary to each specific disease

6.1.1 Foliar Blights

6.1.1.1 *Phytophthora* vine blight

6.1.1.2 *Alternaria* early blight

6.1.1.3 *Phoma* blight

6.1.1.4 ***Seotoria*** **blight**

6.1.2 Wilts

6.1.2.1 ***Verticillium*** **wilt**

6.1.2.2 ***Fusarium*** **wilt**

6.1.2.3 ***Rhiroctonia*** **wilt**

6.1.3 Tuber Disease

6.1.3.1 ***Phytophthora*** **tuber rot**

6.1.3.2 ***Phytophthora*** **pink rot**

6.1.3.3 ***Synchytrium*** **wart**

6.1.3.4 ***Fusarium*** **dry rot**

6.1.3.5 ***Theaphora*** **smut**

6.1.3.6 ***Streptomyees*** **scab**

6.1.3.7 ***Rhinoctonia*** **scurf**

6.1.3.8 ***Spongoespora*** **powdery scab**

6.1.3.9 Selerotium

***6.2 REACTION TO BACTERIA**

Descriptors in this class describe the reaction of an accession to a particular bacterial species; recorded and coded as for reaction to fungi (see 6.1)

6.2.1 Erwina soft rot

6.2.2 Pseudomonas Wilt

6.2.3 Erwina Black Leg

***6.3 REACTION TO VIRUSES, VIROIDS AND MYCROPLASMA**

Descriptors in this class describe the reaction of an accession and are coded in two ways either using a 1-9 scale or the HIRST system

6.3.1 Potato Leaf Roll

1	Highly resistant
2	Very resistant
3	Resistant
1	Moderately resistant
2	Slightly resistant
3	Scarcely resistant
4	Susceptible
5	Very susceptible
6	Extremely susceptible

6.3.2 Aster Yellow or Purple Top

1	Highly resistant
2	Very resistant
3	Resistant
4	Moderately resistant
5	Slightly resistant
6	Scarcely resistant
7	Susceptible
8	Very susceptible
9	Extremely susceptible

6.3.3 Potato Virus X

H	Hypersensitive
I	Immune
R	Resistant
S	Susceptible
T	Tolerant

6.3.4 Potato Virus Y

H	Hypersensitive
I	Immune
R	Resistant
S	Susceptible
T	Tolerant

6.3.5 Potato Virus A

H	Hypersensitive
I	Immune
R	Resistant
S	Susceptible
T	Tolerant

***6.4 REACTION TO NEMATODES**

Set of data which specifies the reaction of an accession to various nematodes

6.4.1 *Globodera rostochiensis*[2]

Reaction of an accession to various *Globodera* species (potato cyst nematodes) is based on the number of developing mature female nematodes in the "root ball" of the plants grown in pots. Potato tubers are planted in 8–10 cm clay pots and inoculated with 30 – 35 cysts (5000 - 6000 eggs). Eight to ten weeks later pots are turned over to remove the root ball system and the number of cysts per root ball recorded. The reaction is coded as follows:

3 Resistant (0–5 cysts/root ball)
5 Intermediate or moderately resistant (6–30 cysts/root ball)
7 Susceptible (more than 30 cysts / root balls)

6.4.2 *Globodera pallida*[3]

3 Resistant (0 – 5 cysts / root ball)
5 Intermediate or moderately resistant (6 – 30 cysts / root ball)
7 Susceptible (more than 30 cysts / root balls)

6.4.3 Root- knot Nematode in Roots

Reaction of potato accession to *Meloidogyne* species[4] is based on the ability of the nematode to reproduce or develop galls on the host plant. Tests can be conducted under glasshouse conditions in 8 – 10 cm pots or in the field

Potato tubers are planted in a uniform infested field or 8 – 10 cm clay pots inoculated with chopped *Meloidogyne* infected roots or 3000 fresh hatched larvae or 5000 eggs. In the field they are allowed to grow almost to maturity whereas in the pots a two – month period is sufficient for evaluation

6.4.3 Root – Knot Nematode in Roots (Cont'd)

The reaction of the plants is coded as follows:

1 Immune–no root galling and/or nematode reproduction
2 Resistant–trace of root galling and/or trace of nematode reproduction

[2] The CIP collection will be evaluated with a race RIB of the CIP system = Ro4 in the European System
[3] The CIP collection will be evaluated with races P3A, P4A and P5A of the CIP system, P5A =Pa3 in the European system

[4]The species of *Meloidogynec* should be recorded

3 Moderately resistant–moderate root galling and/or moderate nematode reproduction
4 Susceptible–severe root galling and/or a very high nematode reproduction
5 Very susceptible –very severe root galling and/or a very high nematode reproduction

Plants showing a root galling of 1 or 2 should be tested again to avoid possibility of escape

6.4.4 Root–Knot Nematode in Tubers

Reactions of tubers to root-knot nematode are coded as follows:

1 Resistant – no external galling and no evidence of nematode presence inside tuber
2 Moderately resistant – no external galling but evidence of nematode presence inside tubers
3 Susceptible – external galling and deformation of tubers

6.4.5 False Root – Knot Nematode

Reaction of potatoes to *Nacobbus* species is based on the ability of the nematode to produce galls on the root systems. Tests are conducted either in an infested field or in 8 – 10 cm pots in a glass-house. Potato tubers are planted in fields or in 8 –10 cm clay pots inoculated with chopped infected roots or 2000 – 3000 larvae or eggs. Plants grown in the field are evaluated 10 – 12 weeks after planting. Roots are removed from the soil and in most cases washed and coded as follows:

1 Immune – no root galling
3 Resistant – trace of root galling
5 Intermediate – moderate root galling
7 Susceptible – severe root galling
9 Very susceptible – very severe root galling

6.4.6 Other Nematodes

0 No date available
1 Other data available

7 DRY MATTER AND BIOCHEMICAL EVALUATION DATA

7.1 TUBER DRY MATTER CONTENT

Measure of the dry matter content of the tubers grown at Huancayo, Peru. Fresh tubers are weighed, then dried and weighted again. The result is expressed as dry weight over fresh weight in percent

*7.2 TOTAL TUBER NITROGEN CONTENT

Measure of the total nitrogen content of tubers grown at Huancayo, Peru, using the Micro–Kjeldahl method. The result is expressed as a percentage

7.3 RELATIVE NUTRITIVE VALUE

Measure in the laboratory with reference to casein = 100. Entered as up to three figures right justified

7.4 TOTAL TUBER GLYCO–ALKALOIDS (TGA)

Measured as mg/100g fresh weight

8 GERMPLASM MAINTENANCE

Data recorded for the purpose of maintaining a collection of accession

8.1 STATUS OF COLLECTION

Set of data normally recorded for these accessions currently maintained by vegetative propagation

8.1.1 Date Received

The date an accession was received expressed numerically as day, month, year, in six digits

8.1.2 Donor Identifier

Set of data which identifies the donor of an accession. These are alpha – numeric, three-letter abbreviation followed by number up to seven digits, right justified

8.1.3 Status

Code indicating the status of an accession, expressed as:

1 Active
2 Lost
3 Eliminated

8.1.4 Cause of Loss or Elimination

If an accession is lost or eliminated the reason should be stated. Possible reasons for loss are field diseases, storage diseases, dehyd rated tubers, etc. Possible reasons for elimination are duplication, leaf roll virus infection, or other diseases, etc.

8.1.5 Year Loss/ Eliminated

Year in which an accession was lost or eliminated, in two digits

8.1.6 Synonym Group Number

The number assigned to a duplicate accession which indicates the synonym group to which it belongs. Each synonym group is expected to have at least one accession in active status

8.2 FORM MAINTAINED

Code indicating in which form the accession is currently maintained, expressed as:

1 None
2 Tuber

3 Seed
4 Tissue culture
5 Tube/seed
6 Tuber/tissue culture
7 Seed/tissue culture
8 Tuber/seed/tissue culture
9 Other

8.3 STORAGE LOCATION

Set of data indicating the precise location of an accession within the storage facility, still to be coded

8.4 SEED STOCKS

Set of data indicating the number of seeds available, their viability etc.

8.4.1 Present Number of Seeds

Amount of a particular accession currently in storage, expressed as the number of seeds

8.4.2 First Germination Test

Data stating the percentage germination in the first test

8.4.3 Date of First Germination Test

Date on which the first germination test was carried out, expressed as month and year in four digits

8.4.4 Current Germination Test

Data stating the percentage germination in the most recent test

8.4.5 Date of Current Germination Test

Date on which the most recent germination test was carried out, expressed as month and year in four digits

8.4.6 Site of Seed Increase

Name of the place at which seed increase of an accession took place

8.4.7 Seed Harvest Date

Date on which an accession was harvest for the purpose of seed increase, expressed as month and year in four digits

8.4.8 Quantity of Seeds Harvested

Amount of Seeds of an accession harvested, expressed as a count of the total number of seeds obtained

8.4.9 Number of Times Regenerated

Expressed numerically

8.4.10 Type of Pollinating Method Used

Code indicating the method of pollination used for seed increase, expressed as:

1 Self-pollination
2 Sib-mating
3 Bulk-pollination
4 Open-pollination

8.4.11 Number of Mother Plants

Data stating the number of mother plants from which fruits seed were harvested

9 GERMPLASM DISTRIBUTION AND USE

Data recorded on the distribution of tubers, seed, etc. of accession which are requested for evaluation and/or use in breeding

9.1 DISTRIBUTION IDENTIFIER

Set of data indicating details on each transaction

9.1.1 Recipient's Name

Name of the scientist/institution to whom an accession(s) was supplied

9.1.2 Recipient's Address

Address of the scientist/institution to whom an accession(s) was supplied

9.1.3 Purpose of Request

Set of data indicating the use to which the accession(s) will be put by the recipient

9.1.4 Number of Accession Requested

Data indicating the number of accession requested by the recipient

9.1.5 Number of Accession Supplied

Data indicating the number of accession supplied

9.1.6 Transaction Number

Data indicating the number of the communication sent to the recipient. A copy of the communication will contain all the relevant information on the transaction

APPENDIX I

DESCRIPTORS FOR POTATO GERMPLASM MAINTENANCE, DISTRIBUTION AND USE

The descriptors in this Appendix are those which will be used by CIP for its collections. The full codes for the descriptor states have not yet been finalized but the Appendix is included for the information of other gene bank curators

APPENDIX II

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