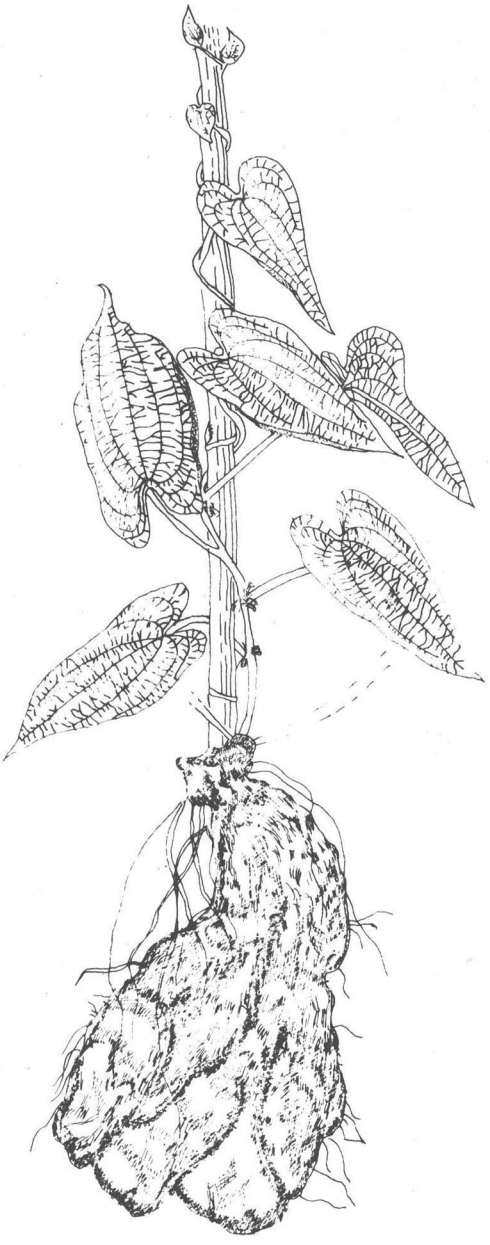

DESCRIPTORS for YAMS

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INTERNATIONAL BOARD FOR PLANT GENETIC RESOURCES

REGIONAL COMMITTEE FOR SOUTHEAST ASIA

Descriptors for Yam (*Dioscorea* sp.)

IBPGR SECRETARIAT
Rome, 1980

The International Board for Plant Genetic Resources (IBPGR) is an autonomous, international, scientific organization under the aegis of the Consultative Group on International Agricultural Research (CGIAR). The IBPGR, which was established by the CGIAR in 1974, is composed of 15 members from 13 countries; its Executive Secretariat is provided by the Food and Agriculture Organization of the United Nations. The basic function of the IBPGR, as defined by the Consultative Group, is to promote 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. The Consultative Group mobilizes financial support from its members to meet the budgetary requirements of the Board.

022574

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10 SEP. 1980

PREFACE

The IBPGR has supported a cooperative regional programme in Southeast Asia since 1977. This programme has been guided by a Committee with representatives from Indonesia, Malaysia, Papua New Guinea, Philippines and Thailand under the chairmanship of Dr. Setijati Sastrapradja, Director, National Biological Institute, Bogor, Indonesia (until July 1979) and thereafter under Dr. Narong Chomchalow, Applied Scientific Research Corporation, Bangkok, Thailand.

The Regional Committee has identified a list of crops for priority action in the region. One of these is yam. A meeting of the Committee in July 1979 agreed to convene a Working Group to decide on a minimum list of descriptors for this crop. The Working Group met in September 1979 and this report summarizes the discussions.

The IBPGR recommends the use of the list of descriptors. Any suggestions for modifications would be welcomed by the IBPGR Secretariat.

AN INTRODUCTORY NOTE ON THE YAMS

by

D.G. Coursey

Yams are traditional food crops of great antiquity grown in many parts of the tropics but of greatest importance in West Africa, Melanesia and parts of Polynesia, and in the Caribbean. Related species have recently become economically important as sources of steroids for pharmaceutical use (Coursey, 1967). They are members of the genus *Dioscorea*, which is the type genus, and by far the largest genus, of Dioscoreaceae, which in turn is the principal family of the Dioscoreales, an order close to the Liliales, which includes also several monotypic or very small satellite genera (Burkill, 1960; Ayensu, 1972), given in Table 1.

The genus *Dioscorea* contains several hundred species, distributed throughout the tropics of both Old and New Worlds, with a few members in temperate or montane regions. Asian, African and American species are quite distinct from each other, morphological differences between American and Old World species being greater than between African and Asian. The species of the Old World have chromosome numbers based on x = 10, while those American species studied so far have counts based on x = 9 (Coursey, 1976).

The Dioscoreales are classified among the Monocotyledons, but show several morphological features typical of the Dicotyledons, some species even having a non-emergent second cotyledon. They appear to be among the most primitive of the Angiosperms.

The yams, although perennial plants, are adapted to an annual cycle of growth and dormancy, and as crop plants are normally grown as annuals, propagated vegetatively by tuber sets. The organ of dormancy is a rhizome in a few species, but most develop one or more tubers; those tubers are annually renewed in the edible yams but in some species the tuber is a perennial organ, increasing in size and becoming increasingly lignified from year to year. In the typical *Dioscorea*, stems are produced annually at the onset of the rainy season, and are initially erect, but soon commence to twine, extending often for many metres through trees or undergrowth. In cultivation, artificial support is usually provided.

A few minor species, however, have a dwarf habit. Leaves are borne on long petioles, are usually simple, cordate or acuminate, but in some species lobed or palmate. Flowers are individually small and borne in long racemes, male and female flowers always being separate and usually borne on separate plants. The floral

pattern is either $K_3\ C_3\ A_{3+3}\ \bar{G}_3$ or $K_3\ C_3\ A_{3+0}\ \bar{G}_3$. The female flowers are followed by dehiscent trilocular capsules, each capsule containing two seeds, which in most species are winged for wind dispersal. Some species produce aerial bulbils in addition to subterranean tubers.

No modern, complete taxonomic monograph on yams and related plants exists, the latest full treatments being those of Knuth (1924, 1930) although the earlier works of Pax (1889) and Uline (1898) should also be mentioned. The recent anatomical study of Ayensu (1972) contains much information ot taxonomic value, though not all species are covered, while the classical paper of Burkill (1960) is also of the greatest importance in the study of yams. The *Dioscorea* of Asia have been fairly thoroughly described by Prain and Burkill (1936, 1939) and Burkill (1951): those of Africa have been less satisfactorily covered, but a substantial amount of information is provided by Chevalier (1936) and Burkill (1939). Of the American species, those of Mexico have been adequately treated by Matuda (1953), and those of the Argentine by Hauman (1916) but no general descriptive work exists on those from Central and Southern America, which is especially unfortunate as here there is the greatest degree of speciation.

Probably some 50 or 60 *Dioscorea* species are of some economic value, and most of these are discussed by Coursey (1967). Only a much smaller number are regularly grown as food crops to any significant degree: these are listed in Table 2. The greater part of the world's production of yams for food is, in fact, derived from *D. rotundata, D. cayenensis, D. alata and D. esculenta.*

The principal species exploited for medicinal purposes are given in Table 3. Many others find occasional use in traditional medicine in various parts of the world.

Table 1

Classification within the order Dioscoreales
(after Ayensu 1972)

Order	Family	Genus
Dioscoreales	Dioscoreaceae	*Avetra*
		Dioscorea
		Rajania
		Stenomeris
		Tamus
	Trichopodiaceae	*Trichopus*
	Roxburghiaceae	*Croomia*
		Stenoma
		Stichoneuron

Table 2

Major food yam species

	Africa	Asia	America
Major economic sp.	*D. rotundata* Poir [a]	*D. alata* L.	
	D. cayenensis Lam.[a]	*D. esculenta* (Lour.) Burk.	*D. trifida* L.f.
Secondary sp.	*D. bulbifera* L.[b]	*D. bulbifera* L.[b]	*D. convolvulacea* Cham et Schlecht.
	D. preussii Pax.	*D. hispida* Dennst.	
	D. praehensilis Benth.	*D. pentaphylla* L.	*Rajania cordata* L.
	D. sansibarensis Pax.	*D. nummularia* Lam.	
	D. dumetorum (Kunth) Pax.	*D. opposita* Thunb.[c]	
		D. japonica Thunb.[c]	

a
Some authors regard *D. rotundata* as only a subspecies of *D. cayenensis*.

b
D. bulbifera is the only species common to both Africa and Asia. The African form is, however, quite distinct and is sometimes regarded as a separate species, *D. latifolia* Benth.

c
These are often incorrectly together known as *D.batatas* Decne and are temperate species native to China and Japan.

Table 3

Major yam species used as sources of pharmaceuticals

D. sylvatica Eckl.	*D. deltoidea* Wall	*D. mexicana* Hemsl.
D. elephantipes (l'Her) Engl.	*D. balcanica* Kosanin	*D. composita* Hemsl.
		D. floribunda Mart. et Gal.
		D. spiculiflora Hemsl.
		D. friedrichsthalii R. Knuth

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THE DESCRIPTOR LIST

1. COLLECTION DESCRIPTORS

Data to be recorded when material is collected in the field.

1.1 COLLECTION NUMBER

An identifier composed of a three-letter abbreviation for the collector's name, followed by up to seven numbers.

1.2 LOCAL NAME (Vernacular name)

Romanized local name of the cultivar used by the farmers of the region where the sample was collected. Where necessary the ethnic group should be stated.

1.3 COLLECTION DATE

The month (two digits) and the year (last two digits) of collection (e.g. 0979 for September, 1979).

1.4 COUNTRY OF COLLECTION 1/

Self-explanatory an abbreviation can be used, using United Nations abbreviations.

1.5 PROVINCE/STATE

Self-explanatory name of the largest territorial division of the country.

1.6 COLLECTION SITE

Direction and number of kilometres from nearest town or village and its name.

1.7 ALTITUDE

Elevation above sea level expressed in metres above sea level.

1/ A note should be made on whether the sample is believed to be native or has been introduced. If introduced the probable geographical origin should be noted.

1.8 LONGITUDE

Longitude in degrees (two digits) and minutes (two digits). To avoid possible confusion, the longitude, East or West, should also be indicated by an E or W.

1.9 LATITUDE

Latitude in degrees (three digits) and minutes (two digits). To avoid possible confusion, the latitude, North or South, should also be indicated by an N or an S.

1.10 SOURCE OF COLLECTION

The place where the original collection was made

1 Roadside
2 Shifting cultivation
3 Farm land
4 Backyard
5 Market
6 Bush, forest
7 Through another investigator or institution
8 Other (specify)

1.11 GERMPLASM TYPE

Code indicating the type of germplasm collected, expressed as:

1 Cultivated
2 Wild
3 Weedy
4 Undetermined

1.12 LIVING FORM COLLECTED

Code indicating the living plant parts taken by the collector, expressed as:

1 Tuber
2 Aerial bulbil
3 Seed
4 Stem/vine
5 Tuber and seed
6 Tuber and plant
7 Seed and plant
8 Tuber, seed and stem/vine

2. TAXONOMIC AND MORPHOLOGICAL DATA

2.1 SPECIES NAME

Species name coded with a three-letter abbreviation

2.2 CHROMOSOME NUMBER

Count of the zygotic (2n) number of chromosomes

2.3 HABIT

2.3.1 Tuber

1 Annual
2 Perennial

2.3.2 Maturity of tuber

1 Early maturity (7 months or less)
2 Medium maturity (more than 7 but less than 10 months)
3 Late maturity (more than 10 months)

2.3.3 Stolon Formation

1 Absent
2 Present

2.3.4 Dormancy

1 Short
2 Long
3 Specify months of dormancy if possible

2.4 STEM CHARACTERISTICS

2.4.1 Twining habit

1 Non-twining
2 Twining

2.4.2 Direction of twining

1 Clockwise (defined as climbing to the left)
2 Anticlockwise (defined as climbing to the right)

2.4.3 Plant type

1 Dwarf
2 Shrub like (with stiff stem)
3 Climbing

2.4.4 Branching

1 Few branches
2 Many branches

2.4.5 Cross section of stem

1 Circular (round)
2 Square or polygonal
3 Circular with definite sides
4 Angles of stem extended as thorns
5 Angles of stem extended as wings

2.4.6 Density of spines

1 Spines absent
2 Few spines
3 Many spines

2.4.7 Sites of spines

1 Base of old stem only
2 Entire stem

2.4.8 Hairiness of stem

1 None
2 Some
3 Profuse

2.4.9 Pigmentation of stem at emergence

A recognized colour chart should be used and which one stated.

2.4.10 Secondary sprouting (production of sprout after main vine is fully developed)

1 Absent
2 Present

2.5 LEAVES

2.5.1 Onset of Leafing (in relation to vine growth)

1 Early
2 Late

2.5.2 Phyllotaxy (state to be decided but an illustration is useful)

2.5.3 Leaf type

1 Simple, entire, shallowly lobed
2 Deeply lobed (50% or more)
3 Compound

2.5.4 Length/breadth ratio (mature leaf)

2.5.5 Leaf Shape (states to be decided but an illustration is iseful)

2.5.6 Hairiness of upper surface

1 None
2 Some
3 Profuse

2.5.7 Hairiness of lower surface

1 None
2 Some
3 Profuse

2.5.8 Waxiness of upper surface

1 Non-waxy
2 Waxy

2.5.9 Waxiness of lower surface

1 Non-waxy
2 Waxy

2.5.10 Pigmentation of veins (young leaf)

1 Absent
2 Present

2.5.11 Pigmentation between veins (young leaf)

1 Absent
2 Present

2.5.12 Corrugation

1 Absent
2 Present

2.5.13 Spininess of petiole

1 Absent
2 Present

2.5.14 Spininess of lamina

1 Absent
2 Present

2.5.15 Lamina/petiole length ratio

2.5.16 Petiole coloration (colour chart)

2.5.17 Petiole cross section (provide diagram)

2.5.18 Petiole pulvinus

1 Absent
2 Small
3 Large

2.6 STIPULES

2.6.1 Stipules

1 Absent
2 Present

2.6.2 Shape (provide diagram)

2.6.3 Hairiness

1 None
2 Some
3 Profuse

2.6.4 Waxiness

1 Non-waxy
2 Waxy

2.6.5 Tip

1 Short
2 Long

2.7 INFLORESCENCES

2.7.1 Flowering

1 No
2 Yes

2.7.2 Sex

1 ♀
2 ♂
3 ♀ and ♂ (predominantly ♀)
4 ♂ and ♀ (predominantly ♂)

2.7.3 Length of inflorescence

1 <10 cm
2 10 - 25 cm
3 >25 cm

2.7.4 Number of inflorescence/plant

1 Few
2 Average
3 Many

2.7.5 Number of flowers/inflorescence

1 <25
2 26 - 100
3 >100

2.7.6 Flower colour (colour chart)

2.7.7 Flower length ♀

1 <2.5 cm
2 2.5 - 5 cm
3 >5 cm

2.7.8 Flower diameter ♂

1 < 2 mm
2 2 - 5 mm
3 >5 mm

2.7.9 Time to flowering after emergence

1 Early
2 Medium
3 Late

2.8 FRUITS

2.8.1 Fruit formation

1 Absent
2 Present

2.8.2 Fruit shape (provide diagram)

2.8.3 Fruit size (diameter)

1 <3 cm
2 >3 cm

2.8.4 Fruit length/width ratio

2.8.5 Hairiness

1 None
2 Some
3 Profuse

2.8.6 Waxiness

1 Non-waxy
2 Waxy

2.8.7 Seed wing structure (provide diagram)

2.9 AERIAL TUBERS

2.9.1 Aerial tuber formation

1 Absent
2 Present

2.9.2 Aerial tuber shape (provide diagram)

2.9.3 Skin colour of aerial tubers (colour chart)

2.9.4 Flesh colour of aerial tubers (colour chart)

2.9.5 Surface texture of aerial tubers

1 Smooth
2 Rough

2.9.4 Skin thickness of aerial tubers

1 Thin
2 Thick

2.10 UNDERGROUND TUBERS

2.10.1 Number of tubers per stand

1 Normally one
2 Few (2 - 5)
3 Several (>5)

2.10.2 Relationship of tubers

1 Completely separate and distant
2 Completely separate, in close cluster
3 Tubers fused at neck

2.10.3 Corm (head) shape (provide diagram)

2.10.4 Corm size in relation to tuber size

1 Small
2 Medium
3 Large

2.10.5 Tuber shape (provide diagram)

2.10.6 Tuber length

1 1 - 5 cm
2 6 - 20 cm
3 21 - 100 cm
4 >100 cm

2.10.7 Tuber skin thickness

1 Thin (<1 mm)
2 Thick (>1 mm)

2.10.8 Texture of the tuber skin

1 Smooth
2 Rough

2.10.9 Hairiness of surface roots

1 Absent
2 Few
3 Profuse

2.10.10 Cortex colour at the head of the tuber (colour chart)

2.10.11 Flesh colour on central transverse cross section (colour chart)

2.10.12 Mucilagenous

1 Little
2 Much

2.10.13 Browning of flesh when freshly out

1 None
2 Some
3 Severe

2.10.14 Proximal dominance

1 Weak
2 Strong

2.10.15 Starch granule size at dormant stage (length of largest granules)

2.10.16 Total Nitrogen as percentage of dry weight

2.10.17 Bitterness (Juvenile tip tissue)

1 Negligible
2 Moderate
3 High

2.10.18 Bitterness (mature tissue)

1 Negligible
2 Moderate
3 High

2.10.19 Wound healing

There is a technical question concerning the nature of wound healing. May be drying out, not suberization.

1 Quick
2 Delayed

2.11 ROOTS

2.11.1 Spininess

1 None
2 Some
3 Profuse

2.11.2 Anchor roots

1 Absent
2 Present

2.12 DISEASE SUSCEPTIBILITY (use of a scale of 1 to 9) where 1 is very resistant and 9 is very susceptible. Where possible identify the pathogens and part(s) infected

2.12.1 Yam virus

2.12.2 Anthracnose or leafspot

2.12.3 Fusarium on *D. esculenta*

2.12.4 Others (specify)

2.13 PEST SUSCEPTIBILITY (use a scale of 1 to 9) where 1 is very resistant and 9 is very susceptible. Where possible identify the pathogens and part(s) attacked.

2.13.1 Root knot nematode

2.13.2 Scutellonema nematode

2.13.3 Other (specify)

2.14 OTHER CHARACTERS (for example toxicity, diosgenin, nutritional value, etc.)

2.15 COMMENTS ON LOCAL USAGE (for example use as staple food, occasional food, famine reserve food, medicinal, ceremonial, etc.)

APPENDIX I

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