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## Varietal identification key of the cultivated yams (*Dioscorea cayenensis* / *Dioscorea rotundata* complex) of Benin Republic

A. Dansi<sup>1</sup>, H.D. Mignouna<sup>2</sup>, J. Zoundjihékon<sup>3</sup>, A. Sangaré<sup>4</sup>, R. Asiedu<sup>2</sup> and F.M. Quin<sup>2</sup>

<sup>1</sup> International Institute of Tropical Agriculture (IITA), 08 BP 0932, Cotonou, Benin. Tel: +229-350188; Fax: +229-350556; Email: adansi@syfed.bj.refer.org

<sup>2</sup> International Institute of Tropical Agriculture (IITA), PMB 5320, Ibadan, Nigeria

<sup>3</sup> World-wide fund for Nature (WWF), 08 BP 1776, Abidjan 08, Côte d'Ivoire

<sup>4</sup> UFR Biosciences, Faculté des Sciences et Techniques, 22 BP 582, Abidjan 22, Côte d'Ivoire

### Summary

Based upon IBPGR (IPGRI) morphologic descriptors, 560 accessions of Benin Republic's cultivated yams (*Dioscorea cayenensis* / *Dioscorea rotundata* complex) were morphologically characterized. Ninety morphotypes were identified and accessions were classified into 26 varietal groups according to their morphological similarities. To ease the varietal identification within each varietal group, a practical identification key was constructed and a general directory of the Benin Republic cultivated yams belonging to the complex *Dioscorea cayenensis* / *Dioscorea rotundata* (guinea yams) was prepared.

### Introduction

Yam belonging to the complex *D. cayenensis* / *D. rotundata* (Guinea yams) is an important tuber crop, mainly in West Africa and has been, until recently, underresearched and even neglected by the development programmes in rural areas. Today, yam (an ancient plant and future crop) is gaining more attention. The little amount of scientific information available on yam genetic resources and the multiplicity of the vernacular names given to the same variety had been the major limiting factors for the intensification of research activities on this crop. For these reasons, in 1996 we carried out germplasm explorations and collecting throughout the Benin Republic and an important collection of 560 accessions was established (Dansi *et al.* 1997). As farmers' traditional knowledge can be used profitably by geneticists and breeders (IPGRI 1993), during the exploration we had fruitful discussions with many farmers, which allowed us to gather useful information on each collected accession.

Based upon yams' descriptors (IBPGR 1980)<sup>1</sup>, a complete morphological characterization has been carried out and all the different morphotypes (varieties) existing in the germplasm were identified. In addition, the correspondence between the different names given to the same variety has been established. The different morphotypes have been clustered into 26 varietal groups based on their morphological similarities and an identification key proposed for each group. Moreover, the geographical distribution of the varietal group as well as their affinities with their wild relatives have been reported (Dansi *et al.* 1998).

In spite of these recently conducted studies, it is still quite difficult to identify, knowing the name of a given variety (when this name is not the one chosen for a given morphotype), the varietal group and thereby the morphotype to which it belongs. Also, although the

present yam collection is almost exhaustive, it is clear that not all villages in the country were covered and therefore all the synonyms of a given variety might not have been collected. An intragroup identification key is then required.

In this paper, we present a practical varietal identification key for all the morphological polymorphic groups. A directory of the Benin Republic cultivated yams containing all the different names collected throughout the country is available from the authors on request.

### Material and methods

The germplasm studied consisted of 560 accessions of yams belonging to *D. cayenensis* / *D. rotundata* complex, collected in 1996 and 1997 in different localities of Benin Republic, and maintained as field collection at the International Institute of Tropical Agriculture at Cotonou (Dansi *et al.* 1997).

By 15 February of each year, tuber sets were planted in a randomized block design with three to six plants per accession and per block, depending on the availability of tuber seeds for each accession. Aerial vegetative parts were monitored between March and August. Tubers were harvested only once, in December, for both early (two-harvest) and late (one-harvest) maturing varieties and were described from December to January. The distance between two mounds was fixed at 2 m to avoid the mixture of branches.

The descriptors used (Dansi *et al.* 1998) are mostly the ones selected by Hamon (1987) as the most pertinent for the identification and description of the cultivated yams in West Africa and which are among those recommended by Martin and Rhodes (1978) and IBPGR (1980). Some additional characters such as tuber striping or streaking, presence of specific figures on the tuber, etc., which are frequently used by the farmers for varietal identification, were also considered.

<sup>1</sup> The yam descriptors were revised in 1997. See 'Descriptors for yam (*Dioscorea* spp.)', 1997. IITA, Ibadan, Nigeria/IPGRI, Rome, Italy. [in English, French, Spanish]

## Results and discussions

The different morphotypes identified in the germplasm (90 in total), each with its reference number, are listed in Table 1.

The 26 varietal groups obtained by clustering the identified morphotypes on the basis of their morphological similarities as well as their reference number are indicated in Table 2.

In the directory all the different vernacular names (268 names in total) collected throughout the country for the cultivated yam belonging to *D. cayeuensis* / *D. rotundata* complex are presented (a copy is available from the authors). Each individual is represented by the number of its varietal group (G) and the number of the morphotype (M) to which it belongs. Information (as reported by the farmers who have a good knowledge of "their yams") related to the

earliness of the tuber, the number of tubers produced per mound, the post-harvest storage quality, the quality of chips (dried yam) and the quality of the pounded yam are also indicated for each of them.

For the monomorphic varietal groups (printed in bold in Table 2), there is of course no varietal identification key apart from the one constructed for the group (Dansi *et al.* 1998).

For each of the most diverse varietal groups, which are KOKOROGBANOU, MONDJI and SOUSSOU a schematic key (Figs. 1, 2, 3) is proposed. For each of the less polymorphic varietal groups (e.g. containing less than six varieties), an identification key is presented (Table 3). The validity of the identification keys was tested for each varietal group and all the tested individuals were easily identified.

Table 1. Different yam varieties identified in Benin Republic's germplasm and their identification number

No.	Name	No.	Name	No.	Name
M01	Agangan	M31	Gnawounkoko	M61	Oroutanai
M02	Agogo	M32	Gnidou	M62	Orou yinsingué
M03	Ahimon	M33	Gnifokpado	M63	Ossoukpana
M04	Akpazin	M34	Guiéna	M64	Ourtchoua
M05	Alakissa	M35	Guirissa	M65	Ouwonpèotina
M06	Ala n'kojèwoué	M36	Hounbonon	M66	Piédjè
M07	Androki	M37	Ihdonou	M67	Porchèhchim
M08	Ankpoloman	M38	Issou agatou	M68	Singou
M09	Antawororou	M39	Kagourou	M69	Soagona
M10	Assaboné	M40	Kangni	M70	Sobasson
M11	Baniakpa	M41	Kée	M71	Sogodo
M12	Baniouré bagarou	M42	Kinkérékou	M72	Soussouka
M13	Baniouré Montogué	M43	Kokoné	M73	Soussounin
M14	Baniouré oloukobi	M44	Kokouma	M74	Soussou souanbou
M15	Baridjo	M45	Kologo	M75	Tabané
M16	Boki	M46	Kouragouroko	M76	Tam-sam
M17	Bonakpo	M47	Kpanhoura	M77	Terlounto
M18	Brizi	M48	Kpirou kpika	M78	Terkokonou
M19	Danwari	M49	Kponan	M79	Tognibo
M20	Déba	M50	Kratchi	M80	Walassi
M21	Djatouba	M51	Laboko	M81	Wamai
M22	Djikpiri	M52	Makpawa	M82	Wolouchahabim
M23	Djiladja	M53	Marétassou	M83	Woussou
M24	Dikpiri	M54	Monji	M84	Yahou
M25	Douba yéssirou	M55	Nonforwou	M85	Yaka
M26	Doundoua	M56	Nindouin	M86	Yakarango
M27	Efourou	M57	Morokorou	M87	Yoblè
M28	Féni	M58	Noualaye	M88	Youbè
M29	Gbèra	M59	Ofègui	M89*	Youéyouédota
M30	Gnalabo	M60	Omoya	M90	Yorou tassou

Table 2. Varietal groups identified in the Benin Republic's yam germplasm and their identification number

No.	Varietal group	No.	Varietal group	No.	Varietal group
G1	AGOGO	G10	GNIDOU	G19	NOUALAYE
G2	AHIMON	G11	KOKOROGBANOU	G20	OURTCHOUA
G3	ALAKISSA	G12	KPANHOURA	G21	PORCHEHBIM
G4	ANTAWOROROU	G13	KPONAN	G22	SOUSSOU
G5	BANIOURE	G14	KRATCHI	G23	TABANE
G6	BARIDJO	G15	MAKPAWA	G24	TAM SAM
G7	DIKPIRI	G16	MONDJI	G25	TERKOKONOU
G8	DOUBA YESSIROU	G17	MOROKOROU	G26	TOGNIBO
G9	GNALABO	G18	NONFORWOU		

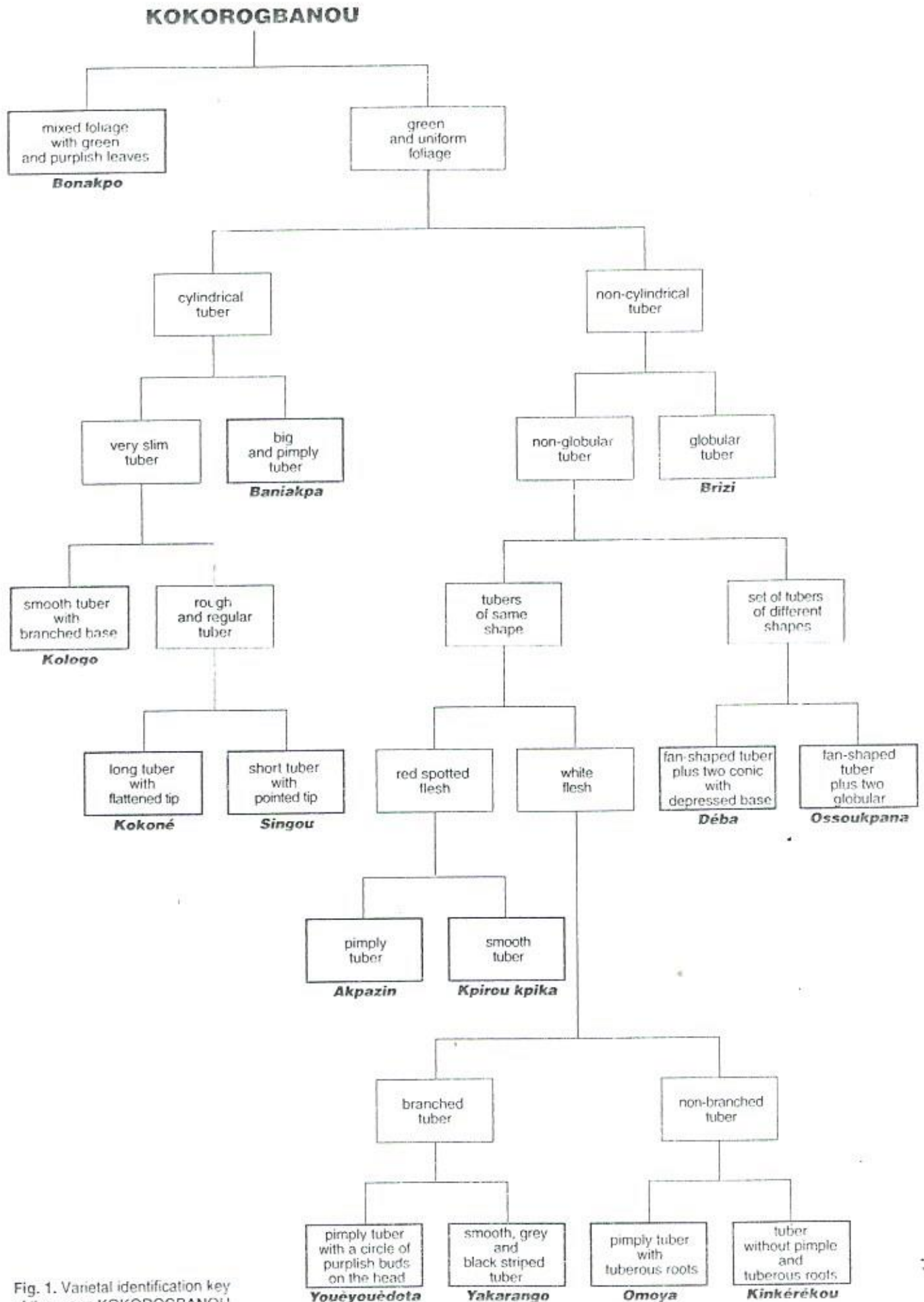


Fig. 1. Varietal identification key of the group KOKOROGBANOU

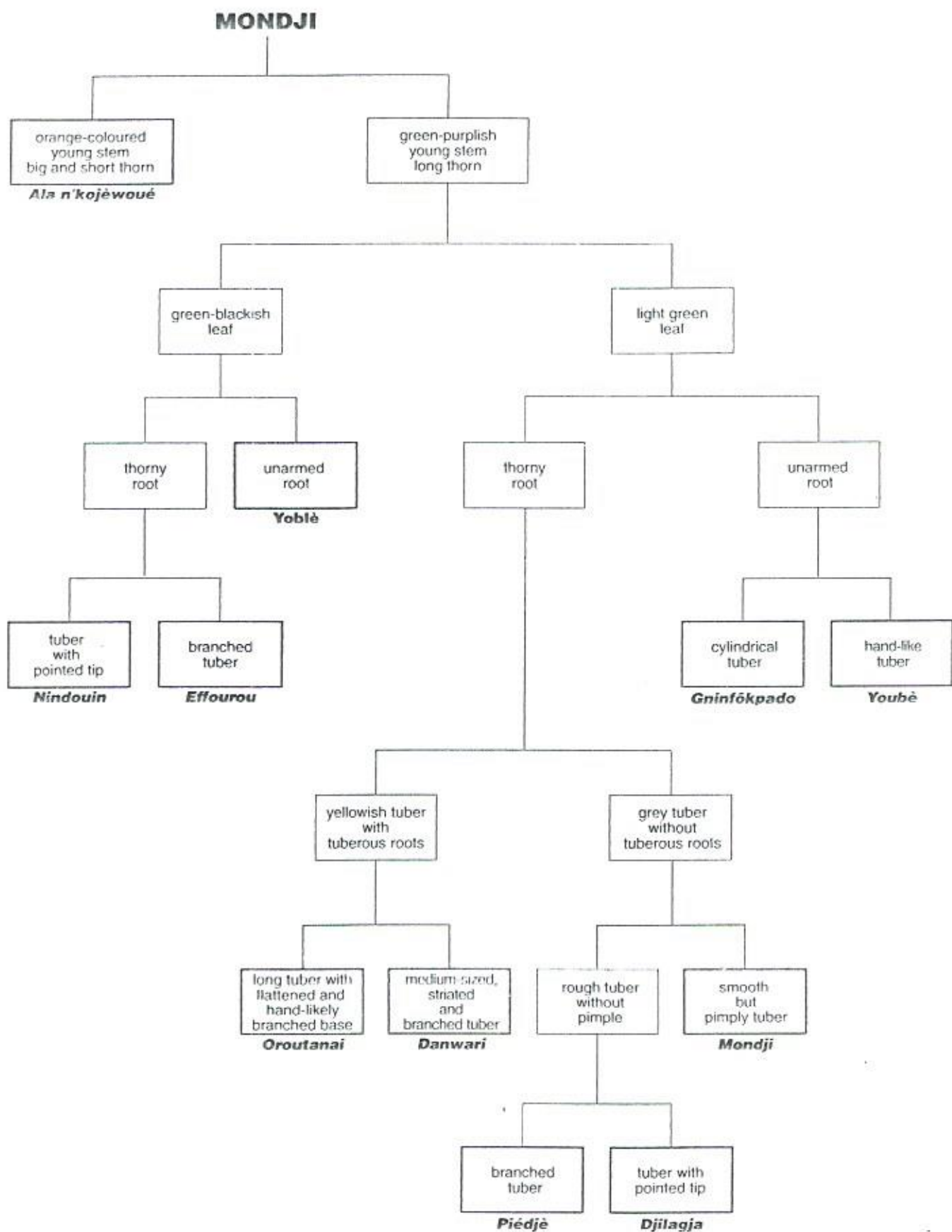


Fig. 2. Varietal identification key of the group MONDJI

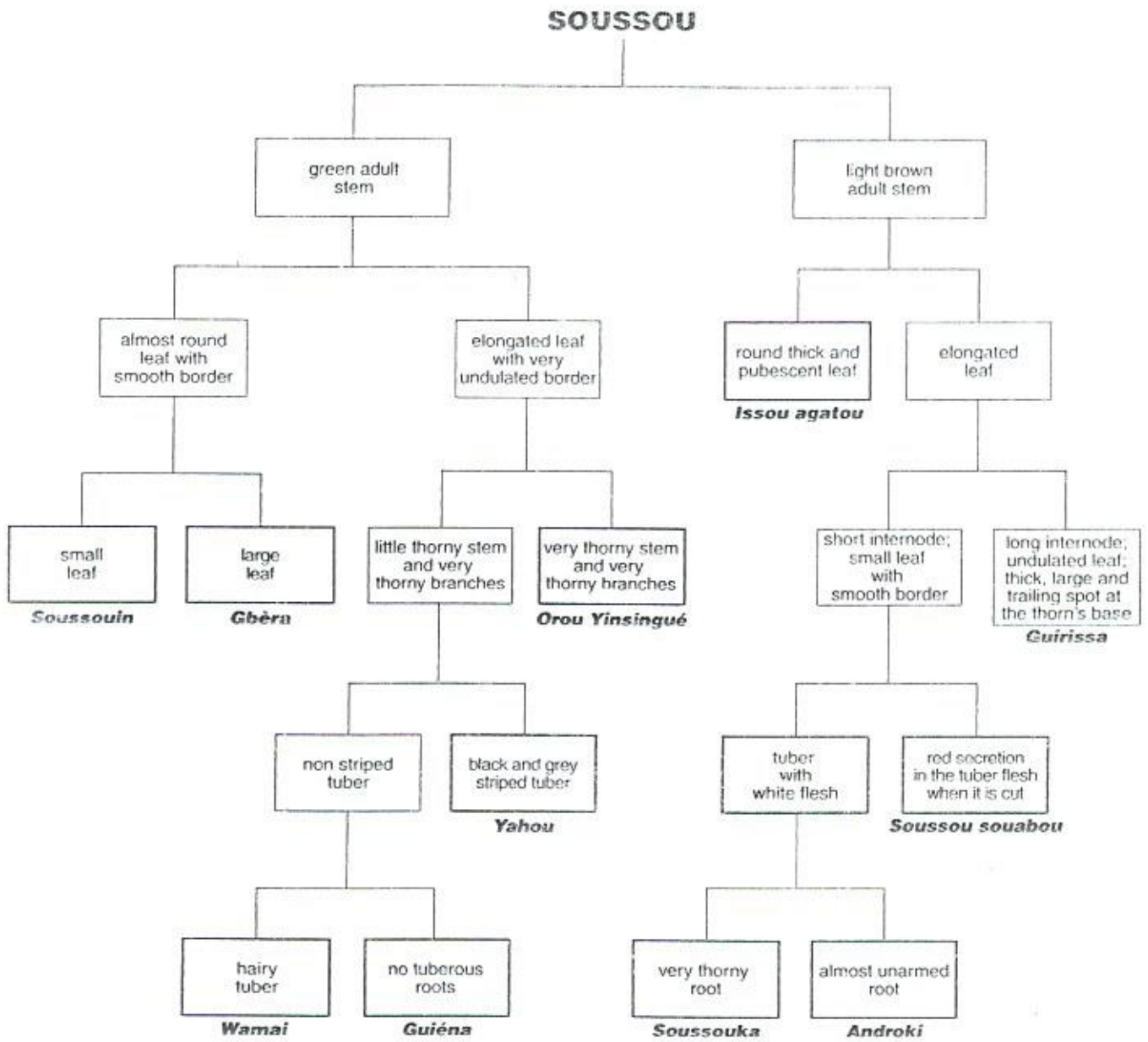


Fig. 3. Varietal identification key of the group SOUSSOU

Table 3. Varietal identification key for the less polymorphic groups

<b>Group AGOGO</b>	
Tuber with internal cavity .....	Agogo
Tuber without internal cavity	
Entirely rough and longitudinally striated stem .....	Soagona
Roughness only at the base of the stem	
Entirely hairy and blackish tuber .....	Wossou
Tuber without tuberous roots .....	Gnanwoukoko
<b>Group AHIMON</b>	
Medium sized and branched tuber	
White flesh .....	Ahimon
Red spotted flesh .....	Fèni
Long tuber with bumpiness and always pointed tips .....	Kee
<b>Group ALAKISSA</b>	
Green stem .....	Agangan
Blackish stem	
Black bowed tuber with big ligneous corn and numerous latent buds .....	Alakissa
Long and cylindrical tuber branched at its base, little corn without latent buds .....	Doundoua
<b>Group ANTAWOROROU</b>	
Small leaf, short and longitudinally grey and black striped tuber .....	Marétassou
Large leaf, long and uniformly coloured tuber	
Black tuber with bumpiness .....	Antawororou
Grey tuber without bumpiness .....	Djikpiri
<b>Group BANIOURE</b>	
Flattened stem	
Appearance of red and blue secretions in the tuber flesh when cut .....	B. Montougè
White tuber flesh	
Long and bowed tuber .....	B. Oloukobi
Long and cylindrical tuber branched sometimes at its base .....	B. Bagarou
Regular stemWalassi	
<b>Group BARIDJO</b>	
Very thorny roots .....	Ofègui
Unnamed roots	
Long and branched tuber with numerous tuberous roots and very thin skin .....	Baridjo
Flattened, smooth and branched tuber bearing some discontinuity belts .....	Ouwonpèotina
<b>Group DOUBA YESSIROU</b>	
Black tuber, cylindrical at the top, flattened and branched at the base .....	Douba Yèssirou
Grey, very pimply and very branched tuber with very thin skin .....	Ankpoloman
<b>Group GNALABO</b>	
Slender stem, very short internode, small and bright yellow cataphylls, conic tuber .....	Gnalabo
Vigorous stem, cylindrical tuber	
Large and dark-green leaf with round lobes .....	Terlounto
Small and pale-green leaf with pointed lobes .....	Assaboné
<b>Group KPONAN</b>	
Elongated, medium-sized and never branched tuber with blanched and pointed tip .....	Laboko
Big, elongated and branched tuber with round tip .....	Kponan
<b>Group KRATCHI</b>	
Tuber with big head .....	Kratchi
Tuber with small head .....	Gangnin
<b>Group MAKPAWA</b>	
Dense foliage with small and blackish leaves; branched tuber with white-yellowish flesh .....	Sogodo
Sparse foliage, medium-sized and light green leaf; branched tuber with yellow flesh .....	Makpawa
<b>Group MOROKOROU</b>	
Dark green leaf, pointed lobes; tuber of small head .....	Morokorou
Light green leaf, orange-coloured veins and petiole, round lobes; tuber of big head .....	Kokouma

Group **NONFORWOU**

Tuber bearing numerous hexagonal geometric figures	
Tuber massive and cylindrical at its half top, curved, flattened and branched at the base	Nonforwou
Very thorny roots, long tuber with pointed tip and longitudinal bumpiness	Boki
Tuber skin without any particular figures	
Very spiny roots, cylindrical and medium-sized tuber	Djatouba
Unarmed roots, elongated and branched tuber	Yorou tassou

Group **OURTCHOUA**

Very little thorny stem, elongated leaf and elongated tuber	kouragouroko
Very thorny stem, non-elongated leaf, short tuber	
Tuber without tuberous roots	Sobasson
Finely striated tuber with thorny tuberous roots	Ourtchoua

Group **PORCHEHBIM**

Small, cylindrical and never branched tuber	Porchèbim
A big and cylindrical tuber carrying on its length other small tubers	Wolouchahabim

Group **TABANE**

Cylindrical and elongated tuber	Kagourou
Flattened and pimply tuber with numerous tuberous roots	Hounbonon
Conic tuber with a small head and deeply depressed base	
Rough, longitudinally black and grey striped tuber	Yaka
Black and grey finely spotted tuber with pimply top	Ih-donou
Smooth and grey uniformly coloured tuber	Tabané

From the analysis of the different identification keys, it emerges that, contrary to the varietal groups identification for which the morphological characters of the aerial part of the plant (stem and leaves) plays the major role, the identification of the morphotypes or varieties remains mainly based on the morphological characters of the underground part of the plant (tuber and roots).

For about 80% of the farmers we met during the surveys, the strictly late-maturing yams known under the common name of "kokoro" in some countries (Benin, Togo, Nigeria) of the African Yam Belt, appeared the most important and the most preferred for an eventual intensive yam production. According to the discussions we had with them, the reasons for choosing *kokoro* yams are multiple:

- they are not only high-yielding varieties but also the most adapted yams to the different environments (varied soils and climate) and the less susceptible to nematodes and diseases. One could therefore understand their wide distribution throughout the country even in the mountainous zones of the northeast as shown by Dansi *et al.* (1998).
- they give a high quality pounded yam or foutou, the major traditional food of yams in the subregion.
- each plant can produce an important number (3-12) of tubers and moreover, during the planting each tuber can be cut into two or three sets without any negative impact on the germination rate (this is not the case with the other varieties in which cutting the tuber can lead to a high rate of rot) which is about 100%. It appears therefore that with *kokoro* yams, the availability of tuber seed for planting does not constitute a problem for farmers.

- they have the best post-harvest storage ability.
- they produce some small or medium-sized tuber of regular shape (rarely branched) making them the better-adapted varieties for the production of yam chips. Chips of *kokoro* yams give a good quality of "amala" (paste obtained with the chip's powder) and can be stored for long time.

Almost all the *kokoro* yams flower profusely (male) and owing to the above-mentioned traits constitute a useful pool for the genetic improvement of yams.

### Conclusion

The present results, supported by previously published results, open an avenue for an intensification of the research activities on yam in Benin Republic and will enhance extension of research to other countries where no sound characterization on yam germplasm has been reported to date. A special computerized database of both cultivated and wild species of Benin Republic is being prepared using the most widely used PGR (Plant Genetic Resources) database management system, MS ACCESS.

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## References

- Dansi, A., H.D. Mignouna, J. Zoundjhekpon and F.M. Quin, 1998. Morphological diversity, cultivar groups and possible descent in the cultivated yams (*Dioscorea cayenensis*/*Dioscorea rotundata* complex) of Benin Republic. Genet. Resour. Crop Evol. (in press).
- Dansi, A., J. Zoundjhekpon, H.D. Mignouna and F.M. Quin, 1997. Collecte d'ignames cultivées du Complexe *Dioscorea cayenensis-rotundata* au Bénin. Plant Genet. Resour. News, 112:81-85.
- Hamon, P., 1987. Structure, origine génétique des ignames cultivées du complexe *Dioscorea cayenensis-rotundata* et domestication des ignames en Afrique de l'Ouest. Thèse de Doctorat es Sciences, Université Paris XI, Centre d'Orsay.
- IBPGR, 1980. Descriptors for yams (*Dioscorea* sp.). IBPGR/29/53, Rome, Italy.
- IPGRI, 1993. Geneflow. Une publication sur les ressources phytogénétiques de la terre. Institut International des Ressources Phytogénétiques, Rome, Italy.
- Martin, F.W. and A.M. Rhodes, 1978. The relationships of *Dioscorea cayenensis* and *Dioscorea rotundata*. Trop. Agric. (Trinidad), 55: 3:193-206.

## Résumé

*Cle d'identification variétale des ignames (complexe *Dioscorea cayenensis* / *Dioscorea rotundata*) cultivées de la République du Bénin*  
 En se basant sur les descripteurs morphologiques de l'IBPGR (IPGRI), 560 accessions d'ignames cultivées de la République du Bénin ont été caractérisées morphologiquement. Quarante-deux morphotypes ont été identifiés et les accessions ont été classifiées en 26 groupes variétaux, en se basant sur leurs similarités morphologiques. Pour faciliter l'identification variétale à l'intérieur de chaque groupe variétal, une clé d'identification pratique a été développée et un répertoire général des ignames cultivées de la République du Bénin appartenant au complexe *Dioscorea cayenensis* / *Dioscorea rotundata* a été préparé.

## Resumen

*Clave de identificación varietal de los ñames cultivados (de la serie *Dioscorea cayenensis* / *Dioscorea rotundata*) de la República de Benin*  
 En base a los descriptores morfológicos del IBPGR (IPGRI) fueron caracterizadas morfológicamente 560 accesiones de ñames cultivados (de la serie *Dioscorea cayenensis* / *Dioscorea rotundata*) de la República de Benin. Noventa morfotipos fueron identificados y las accesiones fueron clasificadas en 26 grupos varietales de acuerdo con sus semejanzas morfológicas. A fin de facilitar la identificación varietal dentro de cada grupo varietal, se construyó una clave de identificación práctica y se preparó un directorio general de los ñames cultivados pertenecientes a la serie *Dioscorea cayenensis* / *Dioscorea rotundata* (ñames de Guinea).