

LESSER-KNOWN AFRICAN TUBER CROPS AND THEIR ROLE IN PREHISTORY

WORK IN PROGRESS

Roger Blench
Mallam Dendo
8, Guest Road
Cambridge CB1 2AL
United Kingdom
Voice/Answerphone/Fax. 0044-(0)1223-560687
E-mail R.Blench@odi.org.uk
http://homepage.ntlworld.com/roger_blench/RBOP.htm

28 December 2004

TABLE OF CONTENTS

TABLE OF CONTENTS	1
1. INTRODUCTION AND BACKGROUND	1
2. THE LINGUISTIC PREHISTORY OF CENTRAL AFRICA	1
2.1 Introduction	1
2.2 The Adamawa-Ubangian languages.	2
3. LESSER-KNOWN TUBER CROPS OF WEST-CENTRAL AFRICA	3
3.1 The Dioscoreaceae.	3
3.1.1 Aerial yam, <i>Dioscorea bulbifera</i> L.	3
3.1.2 The three-leaved yam, <i>Dioscorea dumetorum</i> (Kunth) Pax.....	4
3.1.3 Other yams	4
3.2 The Labiatae	5
3.2.1 Introduction	5
3.2.2 <i>Solenostemon rotundifolius</i> (Poir.) J.K.Morton.	5
3.2.3 <i>Plectranthus esculentus</i> NE Br.	5
4. THE COMPARATIVE DISTRIBUTION OF TUBER CULTIGENS IN AFRICA	6
5. CONCLUSION	7
BIBLIOGRAPHY	7

Orthography has been normalised throughout to conform to modern linguistic standards. Thus 'Oubangui' appears as 'Ubangi' etc.

Acronyms

AU	Adamawa-Ubangian
JATBA	Journal de L'Agriculture Tropicale et Botanique appliquée
PBC	Proto-Benue-Congo
SELAF	Société de l'Étude de Linguistique et Anthropologique française.

ABSTRACT

This paper explores the relationship between some of Africa's lesser known subsistence crops and the presumed linguistic prehistory of Central Africa. It describes some the lesser-known tuber crops in Africa, in particular the aerial and three-leaved yams and the cultivated Labiatae (the 'Hausa potato'). It describes their traditional cultivation and use, and argues that until recently, these plants played a much more important role in traditional agriculture. This has the consequence for prehistory that reconstructions based on 'reading-back' from present cultigen distribution can be misleading.

It describes recent studies of the Benue-Congo and Bantu language groupings and then relates them to a presumed eastward expansion of Adamawa-Ubangian speakers. The paper argues that the data on the cultivated Labiatae in the Central Sudanic region suggest that these crops were the major staples of the Adamawa-Ubangian peoples until recently, and that they were carried eastward as a result of their spread. This movement is argued to predate iron technology and is tentatively dated to 4000 BP.

1. Introduction and Background

Ethnobotanical research into crop plants in Africa has tended to focus on cultigens considered most significant in world commerce. Thus, although there exists a substantial body of research on the taxonomy and local uses of plantains or guinea-yams, in contrast, cereals such as fonio and iburu, and tubers like the aerial yam and the 'Hausa potato' remain almost unknown. This leads to an unbalanced picture of the cultigen repertoires in traditional agriculture, and a tendency to underestimate the significance of 'minor' crops in prehistory (Blench 1997).

Related to this is the persistent attempt to read back into prehistory patterns that reflect the present distribution of staples. The sort of ethnography that relates yam-growing to matrilineality or state-systems (e.g. Coursey, 1967;197 ff.) may well derive ultimately from a widespread stereotype of the conservatism of African farmers, despite the contrary evidence provided by the rapid adoption of the 'American complex' food-plants (Blench 1998). Indeed the almost universal adoption of cassava across Central Africa during this century has acted to completely obscure the cropping patterns previously in place throughout the region.

The question -what were the staples of the peoples of Central Africa before this period?, was posed by Jones (1959:71) but he was unable to offer any satisfactory response. In part, this is an attempt to answer this question. This paper¹ attempts to link the distribution of certain of the lesser known African tuber crops with this pattern of languages. It argues that since the major 'textbook' African crops are not grown in these key regions of Central Africa we must assume that other crops once had considerably greater importance. The paper begins with a botanical and agronomic description of the tubers and then suggests the role they could have played in the eastwards expansion of Adamawa-Ubangian speakers.

2. The linguistic prehistory of Central Africa

2.1 Introduction

In the 1960s, scholars were more confident in their understanding of the linguistic patterns of Central African languages than they at present. In a review by Vansina (1979,80) of the history of the study of Bantu languages, he details the original proposals by Greenberg that were disputed by Guthrie and partly revindicated by Heine. A conference on the Bantu expansion in 1977 (Bouquiaux *et al.* 1980) made clear the difficulties of fitting Cameroun languages into the pattern, and the problems of the relation between the noun-class languages of Nigeria, the Benue-Congo languages, and classic Bantu.

Although Letouzey (1976) argued that botanical vocabulary recorded among dispersed groups of pygmoid Twa, preserves traces of the original language of these people, but this has found no confirmation in other studies (e.g. Blench 1999). Even those who accept the primordality of pygmoid groups have been hard put to it to produce evidence of these vanished languages (e.g. Bahuchet 1992, 1993). Generally, the pygmies speak the languages of their 'patrons', agriculturists, with whom they exchange forest produce for food. Ubangian languages are spoken throughout the whole of Eastern Nigeria, adjacent Cameroun, CAR and Western Sudan, with outliers stretching across the Shari into Northern Zaire. South of this line, Bantu languages are spoken.

There are, broadly speaking, two major language groups in Central Africa, the Benue-Congo/Bantu languages and the Adamawa-Ubangian languages. Work on the languages of Central Africa (Bouquiaux et

¹ I would like to thank the people who have assisted me with the preparation of this paper, in particular Colin Leakey for discussions on some aspects of this paper, and for obtaining for me some of the more recondite bibliographic items. Botanical nomenclature is in accordance with the new edition of 'The Useful Plants of West Tropical Africa' currently in preparation at The Herbarium, Royal Botanic gardens, Kew. I am grateful to Dr. Richard Wrangham for discussions on the toxicity of yams in Zaire.

al. 1980), suggests that there may have been a large-scale migration from west to east prior to the more well-known Bantu expansion. The Adamawa-Ubangian (AU) [originally 'Adamawa Eastern'] language family (Greenberg, 1966), as its name implies, seems to have originated in Adamawa (the borderland of present-day Nigeria and Cameroon). Bennett (1983) has shown that the links of the westernmost groups point to connections with Gur languages. Adamawa-Ubangian languages are distributed along the northern edge of the Zairean rain-forest in a way that may reflect an eastward expansion in the pre-Iron Age period.

The Benue-Congo languages are largely confined to present-day Nigeria and may be said to radiate outwards from the Niger-Benue confluence (Blench, 1989, Williamson, 1989). They gave rise the Bantu languages in the Nigeria-Cameroon borderland via processes that are still poorly described. The Bantu then expanded south and east, rapidly covering the equatorial forest and eventually reaching the coasts of eastern and southern Africa.

2.2 The Adamawa-Ubangian languages.

Adamawa-Ubangian (AU) was first characterised by Greenberg (1966:9 ff.) as a co-ordinate branch of Niger-Congo. More recently, Bennett & Sterk (1977) have argued that Kru, Gur and Adamawa language families should be aligned. A detailed study by Bennett (1983) shows that some of the westernmost Adamawa languages are more closely linked to Gur, in Burkina Faso. Of all the branches of Niger-Congo, Adamawa-Ubangian (AU) has undoubtedly attracted the least work, in part because of its broad geographic expanse and inaccessibility. Early comparative work by Strümpell (1922) has not been followed up until recently. A tentative reconstruction of Proto-Ubangian has been made by Boyd (1978) and monographs on individual languages have been synthesised into a more general account (Bouquiaux & Thomas, 1980). Boyd (1989) has published an overview of Adamawa-Ubangian and Moñino (1988) a comparative lexicon of Ubangian.

The AU languages stretch from Adamawa in Eastern Nigeria across northern Cameroun, Southern Chad, CAR and into Western Sudan and Uganda. On the basis of comparative studies, Bouquiaux and Thomas concluded that the original homeland of its speakers must have been eastern Nigeria, in view of its affinity with Niger-Congo. On glottochronological grounds they postulate that the original expansion eastwards must have taken place >3000 BP, that is, earlier than the Bantu expansion. Although such calculations would be viewed with considerable scepticism at present, it is the case that Adamawa-Ubangian is much more internally fragmented than Bantu, and it can still be argued that it represents an earlier expansion.

The most notable feature of the eastward expansion of the AU speakers is their avoidance of the forest, by comparison with their Bantu neighbours to the South. This suggests that they may either have lacked iron tools to deal with the forest effectively, or else the wet-zone crops most suitable for intensive forest agriculture. If we accept the dating for the expansion proposed above, then neither of these resources would have been available to them. Iron probably did not reach West Africa until 2,500 BP, while the Indo-Pacific 'tropical food kit' came even later (Murdock, 1959). It would therefore make sense to expand into the wetter savannah of the Ubangi-Shari region.

3. Lesser-known tuber crops of West-Central Africa

3.1 The Dioscoreaceae.

3.1.1 Aerial yam, *Dioscorea bulbifera* L. English vernacular names; up yam, air potato.

The literature on the aerial yam has been reviewed by Martin (1974) and Burkill (1985:657 ff.), but the paucity of material permits few firm conclusions about its ethnobotany. There appear to be wild forms in both Africa and India, and both Burkill (1911) and Chevalier (1936) argued that it has been taken into domestication independently in both continents. The variety of cultivars, and the major morphological distinction between the quadrangular African forms and the ovoidal Indian types combine to strongly suggest this.

The aerial yam is unusual among the Dioscoreaceae in that it is cultivated not for its tubers but for the bulbils that develop at the leaf axils of the vine. The tubers are generally small and fibrous, and in some cases have disappeared entirely. As the aerial yam flowers freely, selection for the numerous cultivars may have occurred early in the history of its domestication (Martin, 1974:11).

Although Martin (1974:14) remarks that conditions for growing are much the same as other yams, in practice these are rather different. Because the root stays in the ground, the plant is cropped every year without replanting. In many parts of West Africa, the vine is allowed to climb a tree at the edge of fields where other crops are planted. When the bulbils are ready, they can be picked like fruit. The tree acts as a natural stake, and the dead leaves at its base trap sufficient moisture to permit fallen bulbils to germinate. As the aerial bulbil is exposed to animal predators, it has evolved defences, notably toxicity and a fibrous skin. Underground tubers of the aerial yam can be extremely toxic, and the bulbils may be as well. Improved races are generally less toxic than wild ones.

Martin attributes its low ranking in a table of world yam production to these undesirable features. Although clearly the aerial yam cannot compete with the greater yam, its annual production may be underestimated, since it rarely comes to market, as it is a low-status food grown as a diet supplement. Moreover, since there is no commercial interest in the plant, areas where it is grown in abundance are rarely assessed for production figures. Parts of Nigeria, Cameroun and Gabon do produce large quantities, but these are entirely for domestic consumption, and are never traded beyond very local markets, they generally pass unnoticed.

Chevalier (1936) classified six of the principal types as separate species, and although this is now considered taxonomically unsound, the differences between clones that this underlines are undoubtedly important. Hladik (p.c.) has recently suggested that even the apparently ancient forms of *D. bulbifera* may ultimately of Indian origin -the aerial yam would then join the complex of plants that apparently travelled between India and West Africa in an unknown prehistoric era; cowpeas, sesame, tamarind and finger-millet.

The African distribution of the aerial yam has never been adequately mapped, but Chevalier (1936:524-9) describes a large number of varieties. He claims that the Indian types, *D. bulbifera* var. *birmanica* were brought to the East coast by the Arabs and to the West coast by the Portuguese. This view is echoed in Maundu et al. (1999: 117) who give the name var. *sativa* to the re-introduced Indian cultivars. These are distinct from *D. latifolia* Chev. the African aerial yam. This is found all across the continent in the forest belt, but the greatest number of clones is in 'Haut-Oubangui' -the region North of the Ubangi-Shari region in Central Africa. Apart from a large number of edible types, there is a remarkable toxic cultivar, named by Chevalier var. *contralatrones* because it is planted around the edge of fields to deter thieves. Wildeman (1938) reports on a mass poisoning of an army contingent brought about by the accidental consumption of poisonous varieties of aerial yam. According to Maundu et al. (1999: 117) the western edge of the cultivated zone is in Western Kenya where it is grown by the Luhya people.

Glosses for 'aerial yam' in African languages are too sparse to determine the original area of domestication. Recent work on the reconstruction of Proto-Benue-Congo (PBC) (Blench, 1989 and Williamson, 1993),

suggests that the term for aerial yam, **-dum*, reconstructs to the proto-language and is broadly attested in all branches. The aerial yam is cultivated throughout the present area occupied by Benue-Congo speakers. Williamson (1993) records a number of traditions concerning the aerial yam in Southern Nigeria suggesting that it had an important role in a variety of cultures and has only recently been displaced.

Armstrong (1983) has argued that the centre of dispersal of the PBC was the Niger-Benue confluence. If this is the case, then it is likely that the aerial yam was first 'noticed' and transplanted or protected in this area. From the confluence, the practice of exploiting it was carried in all directions; -perhaps with the three-leaved yam. The development of full-scale cultivation is hard to date, as there is no significant linguistic discontinuity that would indicate this.

3.1.2 The three-leaved yam, *Dioscorea dumetorum* (Kunth) Pax

The three-leaved or cluster yam is found throughout Africa between 15° North and 15° South (Coursey, 1967:50). The trifoliate leaves are highly distinctive, but methods of cultivation are similar to other African yams. It is normally considered to be part of the indigenous flora although Hladik (p.c.) has recently suggested that similarities with the Indian three-leaf yam, *Dioscorea hispida*, cannot be accidental. Whether this implies *D. dumetorum* was carried to or from India in prehistoric times remains to be seen (cf. Blench 2003).

In its wild form, *D. dumetorum* is highly poisonous, due to a large amount of dihydrodioscorine, used in some areas to make arrow poison. In times of famine it can be used for food if soaked for some days in water and well cooked (Maundu et al. 1999: 118). According to Chevalier (1936:529-31), cultivated forms are not known west of the Benin republic. The most important area of their cultivation appears to be Southeast Nigeria (Okigbo, 1980), Cameroun (Ardener, 1954) and Gabon (Walker & Sillans, 1961:151-2). Chevalier also reports three-leaf yams throughout the Ubangi-Shari region [i.e. modern CAR]. Among the Bondjo people on the Ubangi River he notes the 'proto-cultivation' of the three-leaved yam. When a patch of *D. dumetorum* is found in the bush, the tubers that are not eaten are dug up and replanted next to the home site, illustrating the fluid boundary between 'wild' and 'cultivated' when dealing with some cultigens.

The three-leaf yam also seems to be deeply embedded in the culture of certain areas. Palayer (1977, II:27) notes that among the Sar of Chad, it '*intervient dans de nombreux rites*'. Ardener (1954) discussing Kpe-speakers of coastal Cameroun, remarks that the three-leaf yam is the most ritually embedded cultigen, and cocoyam and water-yam, by contrast, seem to be late-comers. It is extremely widespread in Nigeria, cultivated throughout the Niger Delta and eastwards to the border of Cameroun, on the Jos Plateau, in Southern Zaria and in the montane regions of Adamawa.

3.1.3 Other yams

Hamon et al. (1995) constitutes a monographic description of the wild yams of West Africa. Evidence for the sporadic cultivation of some of these other Dioscoraceae has been reviewed by Alexander & Coursey (1969) and Burkill (1985: 654 ff.). The literature suggests that other species of yam, toxic in their wild forms, may occasionally be cultivated in parts of the continent. *Dioscorea abyssinica*, *D. hirtiflora*, *D. lecardii*, *D. minutiflora* (see account in Maundu et al. 1999: 119), *D. odoratissima*, *D. praehensilis*, *D. sagittifolia*, *D. sansibarensis* and *D. smilacifolia* are all mentioned in this respect. None have been described or mapped in sufficient detail, but it clear that their cultivation is disappearing.

3.2 The Labiatae

3.2.1 Introduction

Some cultivated tubers which are not Dioscoreaceae are two members of the Labiatae known colloquially as the 'Hausa potato' and the 'Livingstone potato'. Toponymic designations of this type are of dubious value as their geographic adjectives change from area to area. Thus, in Ghana, the Hausa potato becomes the Salaga potato. Even more confusing is the plethora of Latin names. Due to the separation of herbaria in the colonial period a dichotomy in the taxonomy of cultivated species arose. In French sources, these plants are normally all regarded as *Coleus* spp. while in English sources the terms *Coleus*, *Plectranthus* and *Solenostemon* co-exist. *Coleus sensu stricto* is not found in West Africa.

Botanically, these are erect or decumbent herbs up to 90 cm. tall, with rare yellow flowers and lumpy edible tubers. Both spontaneous and cultivated, they are found from Senegambia to Natal in savannas and on forest and swamp margins. Chemical composition is reported in Chevalier & Perrot (1905:140-1) and Busson (1965) and yields for the various cultivated species in the same source (op. cit. 145-7). The taste resembles the Irish potato, and most sources report that these tubers can be simply boiled. There are a number of edible *Coleus* spp. reported from Ethiopia (Lemordant, 1971:2223) and *Coleus edulis* or *Plectranthus edulis* is clearly an important cultigen in the southwest. Taxonomic work has yet to clarify the relation between these species and other cultivated Labiatae in Africa (though see a recent summaries in Burkill 1995, Schippers 2002).

3.2.2 *Solenostemon rotundifolius* (Poir.) J.K.Morton.

Vernacular names; Hausa potato, Salaga or Fra-Fra potato, Sudan potato, Madagascar potato.

Synonyms; *Coleus dysentericus*, *C. rotundifolius*, *Plectranthus Coppini*, *P. ternatus*.

This is the most widespread of the cultivated Labiatae, found throughout Africa, on Madagascar and in India, Java and Sri Lanka (Chevalier 1953). According to Chevalier & Perrot (1905) was first noted by Rumphius in Volume 5 (p. 372) of *Herbarium Amboinense* (published in 1750 but apparently compiled in 1695). A specimen collected in the Transvaal in 1884 was successfully grown in Paris and then redistributed by Thollon in the Western parts of Equatorial Africa in the 1880s, leading to some confusion about the 'real' distribution of the various races (Codd 1975). The first proposal that the Indian *Coleus* spp. were related to those in Africa appears to date back to Anon (1894). Its cultivation is not recorded in any intervening locations between East Africa and India. Like the aerial yam, the Hausa potato can be cultivated with very little attention. Once it has begun to yield, if a few pieces of the tuber are left in the ground when it is cropped each year, it will regrow without further attention.

3.2.3 *Plectranthus esculentus* NE Br.

Vernacular names; Livingstone potato, finger potato, umbondive, dazo.

Synonyms; *Coleus dazo*, *C. esculentus*, *C. floribundus* var. *longipes*, *Plectranthus floribundus*, *Englerastrum floribundus*.

Described first by Amman (1904) and in more detail in Chevalier & Perrot (1905) and Burkill (1995:30), this is also found from Senegambia to Natal, and is economically more important than *Solenostemon*. Its cultivation is more exacting than *Solenostemon* but yields are correspondingly larger. It is normally cultivated in small mounds like yam-hills. The tubers are sliced into pieces for planting, rather than relying on chance fragments remaining in the ground. Chevalier gives its common area of cultivation as between the 4th and 8th parallel North, from Adamawa to Western Sudan. He also remarks that it is commonly called Dazo or some variant in the Ubangian and Bantu languages in this area.

An interesting race reported by Chevalier from the confluence of the Kwango and Ubangi rivers is cultivated by the Langbase [Chev. Langouassi] people. Named by him *Coleus langouassiensis* this is a type of *Plectranthus* with large multiple tubers (op. cit. Fig. 15) and high yields. Chevalier estimated these were of the order of fifteen to twenty metric tons per hectare. Although there is no firm support for this, these reports suggest *C. langouassiensis* is similar to the long cylindrical tubers of *C. edulis* from the Ethiopian highlands, and it may be worth speculating whether there is a connection between the two.

4. The comparative distribution of tuber cultigens in Africa

The cultivated tubers most economically significant in Africa today are generally of external origin. The sweet potato, *Ipomoea batatas*, the water-yam, *Dioscorea alata*, cassava, *Manihot esculenta*, and the old and new cocoyams, *Colocasia esculenta* and *Xanthosoma mafaffa*. Three of these, cassava, sweet potato and the new cocoyam are part of the 'American complex' introduced by the Portuguese on the West African coast in the seventeenth century. The old cocoyam and the water-yam are of Indo-Pacific origin and reached Africa by an unknown route at an unknown period. I have suggested elsewhere (Blench, ined) that our historical models for the introduction of these crops are inadequate, but it is not disputed that their introduction post-dated the establishment of agriculture in West Central Africa.

Of indigenous tubers, only the guinea-yam has remained of major commercial significance. Our appreciation of the importance of the other tubers has been distorted by the intrusion and acceptance of cassava as a staple throughout Central Africa. Cassava, or manioc, (*Manihot esculenta*) was introduced by the Portuguese on the coast in the sixteenth century (Jones, 1959:62), but seems to have made little impact in the interior at this time, as it was grown mainly as a cheap staple to feed slaves on the transatlantic run. Although cassava is nutritionally poor, it has the advantage that it demands low labour inputs, and grows in exhausted soil. These advantages seem to have made themselves felt at the end of the nineteenth century, for at this period it becomes a co-staple with plantain throughout most of the central African rain-forest.

Some of the other indigenous tubers may be more widely cultivated than is recognised by agronomy textbooks, but it is hard to dispute that 'foreign' tubers, particularly cassava, are dominant throughout the centre of the continent. Chevalier (1952) noted the complete replacement of indigenous yams in the Shari region between his first visit there in 1902 and his visit in 1951. Throughout Zaire, Congo Republic and the Ubangi-Shari region, cassava is presently the single most important staple. Tables in Jones (1959:125 ff.) show that in Zaire cassava contributes as much as 80% of the carbohydrate in an average diet. In many areas of West Africa it has begun to replace the guinea-yam, because it will yield well on the exhausted soils that now surround many of the cities.

This asks us to speculate on the pattern of tuber use in 'pre-Indo-Pacific' times. With none of the principal tuber cultigens now in use available, indigenous tubers must have been considerably more important. The guinea-yam and its more toxic relatives presumably dominated the wet forest zones of West Africa, but without irrigation techniques, these are unlikely to have been cultivated north of the forest belt, except in exceptional high rainfall zones, such as the Jos Plateau. Tubers in the savannah zones were presumably *Solenostemon* and *Plectranthus*, and to a lesser extent *Dioscorea bulbifera* and *D. dumetorum*. The adaptability of the Labiatae has meant that they are widespread in the continent, as also the aerial yam.

But *Dioscorea rotundata*, the guinea-yam, is little cultivated beyond Eastern Nigeria. This is something of a puzzle as this frontier certainly does not reflect an ecological discontinuity -the water-yam and three-leaved yam flourish in Central Africa, while the guinea-yam has apparently recently been successfully introduced into Gabon. Its zone of distribution must therefore be bound up in some way with the peopling of central Africa. Assuming the scenario of an eastward expansion of AU speakers north of the forest in pre-Bantu times is correct, and also assuming they were indeed cultivators, they must have had a food-kit of indigenous African domesticates. The crops discussed here are linked by certain features, toxicity, low yields, high labour inputs in most cases, to make semi-wild plants edible. This seems to correlate with the casual approach to cultivation that obtained through much of this area. Clearly, when a more reliable crop, cassava,

became available, it was adopted with alacrity. But at a crucial stage in the prehistory of central Africa these 'forgotten' crops had an important role to play.

5. Conclusion

The thrust of this paper is to show that although they are considered of minor importance today, certain cultivated tubers must once have played a much more major role in the cultigen repertoire of West-Central Africa. All these plants have features in common -relatively high toxicity and a low degree of ennoblement, compared with cassava or guinea-yam.

Unfortunately, their lack of present commercial significance has largely lead them to be passed over by researchers, linguists, botanists and prehistorians. Linguistics is probably the best tool for gaining a more adequate understanding of the process and spread of domestication. Obviously, these recommendations do not only apply to tubers -cereals, herbs, spices and oilseeds clearly deserve similar attention.

Bibliography

- Alexander, J. and Coursey, D. 1969. The origins of yam cultivation. In Ucko, P.J. & Dimbleby, G.W. *The domestication and exploitation of plants and animals*. Duckworth, London.
- Ammann, E. 1904. Note sur une nouvelle plante alimentaire de L'Afrique Centrale. *Agric. Prat. Pays Chaud*, 104-106.
- Bahuchet, Serge. 1992. *Histoire d'une civilisation forestière. I: dans la forêt d'Afrique centrale, les Pygmées Aka et Baka*. Louvain: Peeters.
- Bahuchet, Serge. 1993. *Histoire d'une civilisation forestière. II: La rencontre des agriculteurs. Les Pygmées parmi les peuples d'Afrique Centrale*. Louvain: Peeters.
- Blench, R.M. 1989. New Benue-Congo: A Definition and Proposed Internal Classification. *AAP*, 17:115-147.
- Blench, R.M. 1993. Recent developments in African language classification and their implications for prehistory. In *The Archaeology of Africa. Food, Metals and Towns* eds. Shaw, T., Sinclair, P., Andah, B. and Okpoko, A. 126-138. Routledge, London.
- Blench, R.M. 1997. *Neglected species, livelihoods and biodiversity in difficult areas: how should the public sector respond?* Natural Resource Briefing Paper 23. London: Overseas Development Institute. <http://www.oneworld.org/odi/nrp/23.html>.
- Blench, R.M. 1998. The diffusion of New World Cultigens in Nigeria. In: *Plantes et paysages d'Afrique*. M. Chastenot. ed. 165-210. Paris: Karthala.
- Blench, R.M. 1999. Are the African Pygmies an ethnographic fiction? In: *Central African hunter-gatherers in a multi-disciplinary perspective: challenging elusiveness*. K. Biesbrouck, S. Elders & G. Rossel eds. 41-60. Leiden: CNWS.
- Blench, R.M. 2003. The movement of cultivated plants between Africa and India in prehistory. In: K. Neumann, A. Butler & S. Kahlhaber (eds.) *Proceedings of the 3rd Workshop of African Archaeobotany*. Köln: Heinrich-Barth-Institut.
- Blench, R.M. (ined) *Ancient Connections between Africa and Indonesia in the light of recent ethnobotanical evidence*. ms.
- Bouquiaux, L. & Thomas, J.M-C. 1980. Le peuplement Oubangien. In: *L'Expansion Bantoue*. SELAF, Paris.
- Boyd, R. 1989. Adamawa-Ubangian. in *Niger-Congo*. ed. J. Bendor-Samuel, Universities Press of America.
- Burkill, H.M. 1985. *The Useful Plants of West Tropical Africa. (Vol. 1, Families A-D)*. Royal Botanic Gardens, Kew.
- Burkill, H.M. 1995. *The Useful Plants of West Tropical Africa. (Vol. 3, Families J-L)*. Royal Botanic Gardens, Kew.
- Burkill, I.H. 1939a. Notes on the genus *Dioscorea* in the Belgian Congo. *Bull. Jard. Bot. Etat. Brux.* 15(4):345-92.
- Burkill, I.H. 1939b) Two notes on *Dioscorea* in the Congo. *Proc. Linn. Soc.* 151(2):57-61.

- Burkill, I.H. 1911. The polarity of the bulbils of *Dioscorea bulbifera*. *Linn. Journ. Proc. Asiat. Soc. Bengal* (n.s.),7:467-9.
- Chevalier, A. 1930. Une plante vivrière africaine: le *Coleus floribundus* et ses variétés. *Rev. Bot. Appl.* :254.
- Chevalier, A. 1936. Contribution a l'étude de quelques espèces africaines du genre *Dioscorea*. *Bull. Mus. natn. Hist. nat. Paris*, 2eme Ser. 8(6):520-551.
- Chevalier, A. 1946. Nouvelles recherches sur les ignames cultivées. *Rev. Int. Bot. Appl. Agric. Trop.* 26:26-31.
- Chevalier, A. 1947. Une igname d'Afrique employée dans les empoisonnements criminels. *Rev. Int. Bot. Appl. Agric. Trop.* 27:56-7.
- Chevalier, A. 1952. De quelques *Dioscorea* d'Afrique Equatoriale toxique dont plusieurs varietés sont alimentaires. *Rev. Int. Bot. Appl. Agric. Trop.* 32:14-19.
- Chevalier, A. 1953. Labiées du Genre *Coleus Loureiro* cultivées dans le pays tropicaux de l'Ancien Monde. *Revue Internationale d'Agriculture Tropicale et Botanique appliquée* 33, 1953:334-341.
- Chevalier, A. & E. Perrot 1905. *Les végétaux utiles de L'Afrique tropicale. I: Coleus*. Paris: Depot des publications.
- Codd, L.E. 1975. Plectranthus (Labiatae) and allied genera in Southern Africa. *Bothalia*,11,4:371-422.
- Corkill, N.L. 1948. The poisonous wild cluster yam, *Dioscorea dumetorum* Pax. as a famine food in the Anglo-Egyptian Sudan. *Ann. Trop. Med. Parasit.* 42:278-87.
- Coursey, D.G. 1967. *Yams*. Longmans, London.
- Dalziel, J.M. 1937. *The useful plants of West Tropical Africa*. Crown Agents, London.
- Garnier, P. 1977. *L'Ethnobotanique Baulé*. École des Hautes Études, Marseille.
- Hamon, P. et al. 1995. *Les ignames sauvages d'Afrique de L'Ouest*. Paris: ORSTOM.
- Heckel, E. 1901. L'Ousonifing. *Rev. Cult. Colon.* 164-7.
- Jones, W.O. 1959. *Manioc in Africa*. Stanford, California.
- Lemordant, D. 1971. Contribution a L'Ethnobotanique Ethiopienne. *Journal d'Agriculture Traditionnelle et de Botanique Appliquée*, 18:1-35.
- Letouzey, R. 1976. *Contribution de la Botanique au problème d'une éventuelle langue Pygmée*. Bibliotheque de la SELAF, 57-8.Paris.
- Martin, F.W. 1974. *Tropical yams and their potential. Part 2. Dioscorea bulbifera*. USDA, Handbook 466.
- Maundu, P.M., Ngugi, G.W. & C.H.S. Kabuye 1999. *Traditional food plants of Kenya*. Nairobi: National Museums of Kenya.
- Miége, J. 1952. L'importance économique des ignames en Côte d'Ivoire. *Rev. Int. Bot. Appl. Agric. Trop.* 32:144-155.
- Miége, J. 1958. Deux ignames ouest-africaines à tubercules vivaces. *Bull. IFAN, Ser. A*, 20:39-55.
- Miége, J. 1950. Caractères du *Dioscorea minutiflora* Engl. *Rev. Int. Bot. Appl. Agric. Trop.* 30:428-432.
- Moñino, Y. 1988. *Lexique Comparatif des Langues Oubanguiennes*. Geuthner, Paris.
- Palayer, P. 1977. *Lexique de plantes du pays Sar*. (Vol.II) C.E.L., College Charles Lwanga, Sarh, Chad.
- Perrier de la Bathie 1925. Ignames cultivées et sauvages de Madagascar. *Rev. Int. Bot. Appl. Agric. Trop.*, 5:417-28.
- Phillips T.A. 1956. *An agricultural notebook*. Longmans, Green.
- Schippers, R. 2002. *African indigenous vegetables: an overview of the cultivated species 2002*. CD-ROM. Aylesford: NR International.
- Strümpell, F. 1922. Worterverzeichnis der Heidensprachen des Mandara-Gebirges (Adamaua). *Zeit. fur Eingebor. Sprache*, XIII:47-74 & 109-149.
- Terry, E.R., Oduro, K.A. & Caveness, F. eds. 1981. *Tropical root crops: Research strategies for the 1980s*. IDRC, Ontario.
- Vergiat, A.M. 1970. Plantes magiques et médicinales des Féticheurs de l'Oubangui, Part IV. *Journal d'Agriculture Traditionnelle et de Botanique Appliquée*, 17:60-91.
- Watt, J.M. & Breyer-Brandwijk M.G. 1962. *The medicinal and poisonous plants of Southern and Eastern Africa*. Livingstone, London and Edinburgh.
- Wester, L.T. 1929. *Food plants of the Philippines*.
- Westphal, E.O. 1975. *Useful Plants of Ethiopia*. Wageningen.
- Wildeman E. de 1920. Les ignames du Mayumbe. In *Mission Forestière et Agricole du Compte Jacques de Briey au Mayumbe*. 267- 288. Reynaert, Bruxelles.

-
- Wildeman E. de 1938. *Dioscorea alimentaires et toxiques*. *Mem. Inst. Roy. Colon. Belge*. G. van Campenhout, Bruxelles.
- Williamson, K. 1993. Linguistic evidence for the use of some tree and tuber food plants in Southern Nigeria. pp. 104-116 in *The Archaeology of Africa. Food, Metals and Towns*. eds. Shaw, T., Sinclair, P., Andah, B. and Okpoko, A. Routledge, London.