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Traditional Food Processing Techniques of *Dioscorea dumetorum* in Nigeria

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Abstract
Little documented information is available on the local names and traditional food processing techniques of the underutilized *Dioscorea dumetorum* (African trifoliate yam) in Nigeria. An eighteen year (1997-2015) study was therefore used to document the vernacular names and traditional food processing methods of cultivated and wild *D. dumetorum* in Nigeria. Results showed that the yam has over a hundred vernacular or local names in 105Nigerian languages or dialects. Though the major traditional processing method for the edible varieties is boiling the freshly harvested tuber to softness, some communities in five South Eastern states of Nigeria (Abia, Imo, Anambra, Enugu and Ebonyi) were found to use traditional detoxifying unit operations to convert the poisonous bitter tubers of the wild variety into storable food material. Varietal differences in African trifoliate yam provide opportunities for its utilization in different food forms. Two localities in the country were found to consider *D. dumetorum* as a food taboo. Important external morphological characteristics of the yam were also shown in the paper for ease of recognition of this plant resource. Furthermore, the identified local vernacular names and processing methods in this investigation would enhance the diffusion of information on the utilization of wild and cultivated *D. dumetorum* in Nigeria as traditional food materials.

1. Introduction

Dioscorea dumetorum Pax is a tropical plant that belongs to the genus *Dioscorea* and family *Dioscoreaceae* (Bhattacharjee *et al*., 2011).The English common names for *Dioscorea dumetorum* include African trifoliate yam, three leafed yam, bitter yam and cluster yam (Degras, 1993; Palaniswami and Peter, 2008;Ukpabi,2014).Though the plant still exists in the wild in the bushes or jungles of sub-Saharan Africa, its cultivated varieties are considered amongst food yams of economic importance (Bhattacharjee *et al*., 2011).Biologically, food yams are found mainly in 10 species of *Dioscorea*, namely *Dioscorea rotundata* Poir., *Dioscorea cayenensis* Lam., *Dioscorea alata* L., *Dioscorea dumetorum* Pax, *Dioscorea hispida* Dennst., *Dioscorea esculenta* Burk., *Dioscorea bulbifera* L., *Dioscorea opposite* Thunb., *Dioscorea trifida* L., *Dioscorea japonica Thunb.* (Ukpabi and Oti, 2010; Bhattacharjee *et al*., 2011; Rees *et al.*, 2012). Amongst these species, only *D. rotundata* (white guinea yam), *D. cayenensis* (yellow guinea yam), *D. alata* (water yam), *D. dumetorum* (trifoliate yam,), *D. bulbifera* (aerial yam) and *D. esculenta* (Chinese yam) are of economic importance as sources of carbohydrate in human diets in Nigeria, West Africa (Ukpabi and Oti, 2010). Food yams should not be confused with sweet potato (*Ipomea batatas*), which is known as yam in some southern states of United States of America (Rees *et al.*, 2012).

Botanists identified *D. rotundata, D. cayanensis* and *D. dumetorum* to be native to West Africa, specifically the "West African yam Belt" that stretches from Cameroon to Ivory Coast (Orkwor and Ikeorgu, 2010; Bhattacharjee *et al*., 2011). Of these three yam species, the latter two could still be found in wild state in West Africa (Degras, 1993; Bhattacharjee *et al*., 2011). Morphologically, food yams are generally climbers with underground starchy tubers (Rees *et al.*, 2012). Depending on the species, the yams produce underground tubers and aerial bulbils that are economically important as human food and pharmaceutical raw-materials (Palaniswami and Peter, 2008; Rees *et al.*, 2012). Yam tubers originate from the hypocotyl, which is a small region of the meristematic cells between the stem and the root (Degras, 1993; Bhattacharjee *et al*., 2011; Rees *et al.*, 2012).*D. dumetorum* tubers are larger than those of *D. esculenta,* and a single plant could produce a cluster of tubers, which may contain a bitter alkaloid, especially in the uncultivated wild variety (Degras, 1993; Palaniswami and Peter, 2008; Bhattacharjee et *al*., 2011). The flesh of the tuber may be white, pale-yellow or dark yellow, with the cultivated variety eaten as food after boiling to softness (Degras, 1993; Afoakwa and Sefa- Dedeh, 2001).

Between the late 1970s and mid-1980s, plant scientists in Nigeria (International Institute of Tropical Agriculture, Ibadan) and Cameroon, succeeded in getting edible clones (hybrids) that have tubers with smooth proximal regions, highly reduced post-harvest hardening (better shelf life) and better nutritional yield (Degras, 1993; IITA, 1995; Afoakwa and Sefa- Dedeh, 2001; Siadjeu *et al.*, 2015). Degras (1993) gave the proximate composition of fresh African trifoliate yam tuber as 79% moisture, 2.78% protein, 0.28% fat, 17% carbohydrate, 0.3% fiber and 0.72% ash. Alozie *et al* (2009) stated that the protein of *D. dumetorum* tuber is more balanced than that of *D. rotundata* or white guinea yam. Amongst the food yam proteins, *D. dumetorium* protein has the highest chemical score for cystine, the limiting amino acid in food yams of economic importance (Degras, 1993). This is in addition to the African trifoliate yam having the highest protein content (on dry matter basis) amongst the food yams (Degras, 1993).

The ascorbic acid content of the trifoliate yam varies from 6.6 mg/100g to 21 mg/100g (Degras, 1993). The values for other vitamins in trifoliate yam tuber) in Nigeria were: 0.8 mg/100g niacin, 0.050 mg/100g riboflavin, 0.14 mg/100g thiamine and 0.020 mg/100g vitamin A (Degras, 1993). In nearby Cameroon, the obtained results per 100g edible portion of fresh *D. dumetorum* tuber were: 127µg thiamine, 64 µg riboflavin, and 0.48 µg niacin, while those for the same mass of the boiled and unpeeled tubers were 108 µg thiamine, 55 µg riboflavin and 0.36 µg niacin (Degras, 1993). The caloric values recorded for dehydrated trifoliate yam tuber in Nigeria and Cameroon were 391.25 Cal/100g and 381 Cal/100g, respectively (Degras, 1993). Like other food yams, African trifoliate yam is regarded as an energy rich food. Energy value obtained for 100g portion of the fresh yam was 101 Calories, and 97 Calories/100g for the boiled unpeeled yam (Degras, 1993).

Even with these remarkable nutritional data, the production of this crop as a food resource in Nigeria has been found to be declining probably due to local importance of other food yams as storable food processing raw materials and articles of inter-state trade (Scott *et al.,* 2000; Ukpabi and Oti, 2010). This is more so as some people consider the plant as an endangered species especially now that many local itinerant farmers and migrants in Nigeria do not know the vernacular names of many indigenous plants that are well adapted to specific agro-ecologies of this large country that has numerous languages and dialects. The objective of this study was to investigate local names, varietal differences and common traditional food processing techniques of *D. dumetorum* in Nigeria as enhanced information diffusion on local food processing and utilization of the tubers using indigenous languages or dialects might assist in boosting its economic importance in the country.

2. Materials and Methods

Relevant tools and techniques of Rapid Rural Appraisal (RRA) method (Schutz, 2000) were used in an eighteen year (1997-2015) survey on local naming and the utilization of African trifoliate yam *(Dioscorea dumetorum)* as food in Nigeria (between 4ºN and 14ºN latitude, and between 3ºE and 14ºE longitude). The tools and techniques used included: review of secondary sources, direct observation, semi-structured interviewing (SSI), group discussions, and construction of diagrams

Respondents in the semi-structured interviews during the survey included farmers' groups in the nine eastern states of Nigeria (Abia, Akwa-Ibom, Anambra, Bayelsa, Cross-River, Ebonyi, Enugu, Imo and Rivers States), agricultural students (from all over Nigeria) on excursion to National Root Crops Research Institute, Umudike, Abia State, National Youth Corpers (graduates) serving at Umudike(from all over Nigeria),agricultural extension officers affiliated to the Nigerian states' Agricultural Development Programs (ADPs), nomadic or migrant farmers, and scientists attending zonal meetings and national conferences of the Nigerian Institute of Food Science and Technology.

Direct field observations and discussions were made at the nine eastern states (in at least one ADP zone per state), and Delta, Edo, Ondo, Oyo, Ogun, Lagos, Kogi, Benue, Nasarawa, Plateau and Kaduna states (along the major roads). The vernacular names of the African trifoliate yam in the different localities in Nigeria's states that the residents grow or consume the yam, with variant spellings in some cases, were recorded.

The interviewees were asked to state how they utilized or used African trifoliate yam as food. They were also asked to explain the unit operations in their processing methods. Photographs and diagrams (where necessary) were used to introduce the plant to interviewees for ease of recognition.

Tuber samples of wild and cultivated African trifoliate yam were also collected in the country and the International Plant Genetic Resources Institute (IPGRI) method for characterization of yams (IPGRI/IITA, 1997) was used to observe and record the major differences between the cultivated and wild yams varieties.

3. Results and Discussion

Personal observations and feed backs during the thematic survey in Nigeria showed that the respondents generally grouped *D. dumetorum* or African trifoliate yam into two broad varieties, viz:- the edible cultivated variety and the toxic wild variety. These respondents belonged to 105 Nigerian ethnic/sub-ethno-linguistic groups that consume African trifoliate yam, and each group had a mean number of 19 respondents.

Tables1-3 shows the vernacular names (with varying spellings) of the edible cultivated variety in these Nigerian communities or ethnic/sub-ethno-linguistic groups that eat the crop. The poisonous bitter alkaloid, which is found largely in the wild variety, is more or less eliminated in the cultivated variety, especially in the improved non-bitter landraces (Dalziel, 1955). Dalziel (1955) gave the Nigerian vernacular names for edible Africantrifoliate yam as *k'osainrogo* (Hausa); *inimbe* (Tiv); *isuru* (Yoruba); *olimehi, owabo, ufua* (Sobo and Benin); *ona, unu, adu, atoka* (Ibo); and *iwa, afiaedidiaiwa*, *obubitiwa, ndesimeiwa* (Efik). For the toxic wild trifoliate yam variety, he gave the following vernacular names: rogon *biri* or *rogwambiri, gursami* (Hausa); *gudugudu* (Yoruba); and *iwamfim* (Efik). In the course of this study, it was found that the major Ibo (Igbo) name for the toxic variety is *ighu* or *iwu* (Table 4) while *adu* given by Dalziel (1955), as the Onitsha Ibo word for edible trifoliate yam is the general Ibo word for aerial yams (*Dioscorea bulbifera*). Fewer vernacular names for wild African trifoliate yam are given in Table 4 as most of the respondents outside Iboland (Igboland) and few other linguistic groups could not give definite local names for the wild variety of *D. dumetorum* outside those given by Dalziel (1955). Recently, Fasaanu, *et al* (2013) also provided *gudugudu* and *esuru-igbo* as the Yoruba names for the wild African trifoliate yam. Toxicity in the wild yam variety is caused by the presence of a bitter alkaloid, dihydrodioscrine (Palaniswami and Peter, 2008). Dihydrodioscorine is a convulsant that is structurally similar, but less potent than the bitter and toxic dioscorine found in the Asiatic trifoliate yam (*Dioscorea hispida*) (Degras, 1993; Palaniswami and Peter, 2008; Bhattacharjee *et al*., 2011; Yannai, 2012).The tubers of the wild variety of *D. dumetorum* are sometimes used as source of poison for hunting animals and fishing (Palaniswami and Peter, 2008). Though these wild tubers can be detoxified through adequate food processing (Degras, 1993; Bhattacharjeeet *al*., 2011), some communities still deliberately plant the wild type with the edible variety of the yam in order to discourage thieves.

Table 1. *Vernacular names of edible Dioscorea dumetorum in south-western Nigeria.*

S/No	Language/Dialect	State(s)	Local name(s)
1.	Yoruba	Oyo, Ogun, Lagos Oshun, Ondo, Kogi, Ekiti, Kwarra	esuuru, esuru, eshuuru, ehuuru, ehuru
2.	Gunu (Egun)	Ogun, Lagos	Ohulu, abote
3.	Bini (Benin)	Edo	Owabo, eruru
4.	Akoko Edo	Edo	Ozillo
5.	Etsako	Edo	Otsino
6.	Ishan (Esan)	Edo	ikhilulu, ihklu, iminna
7.	Igbanke	Edo	Ona, onu
8.	Ika	Delta	onu, ona
9.	Kwale (Ukwuani)	Delta	onu, ona, una
10.	Urhobo	Delta	one-isuusu, ole-isuusu, one-ogbodu
11.	Isoko	Delta	oneghasa, oleghasa, ebiele-esa

Table 2. *Vernacular names of edible Dioscorea dumetorum in south-eastern Nigeria.*

S/No	Language/Dialect	State(s)	Local name(s)
1.	Igbo or Ibo	Abia, Imo, Anambra, Enugu, Ebonyi , Delta, Rivers	una, ona, onu, unu, unanwuna, ono
2.	Yala (Ogoja, Ikom)	Cross River	achua, obiriko
3.	Mbube	‘‘‘‘	Berem
4.	Bekwarra	‘‘‘‘	Inim, Inimbe
5.	Ishibori	‘‘‘‘	Oriem
6.	Igodo (Ogoja)	‘‘‘‘	Oriem
7.	Boki, Bokyi	‘‘‘‘	kirim, kinim, kerin
8.	Nkum	‘‘‘‘	Urim

S/No	Language/Dialect	State(s)	Local name(s)
9.	Bette	““	Kinim
10.	Bendi	““	Kinim
11.	Yakurr	““	Ledem
12.	Mbembe	““	osuco, osuko, oshuko
13.	Adun	““	Osuquo
14.	Bisu	““	Shyeim
15.	Utugwang	““	Ilim
16.	Busu	““	hirim, hirem
17.	Olulumo (Ikom)	““	Radigoh
18.	Basang	““	Hirim
19.	Adim (Biase)	““	abidob, ido
20.	Akpet Central /Akpet 1	““	Adim
21.	Agwagwune (Biase)	““	Bidob
22.	Biakpan/Ikun (Biase)	Cross River	Iromi
23.	Umon	““	bedom, bedong
24.	Ejegham	““	erim, erem
25.	Ojor	““	Ergha
26.	Abini (Biase)	““	Abidoh
27.	Usukpan (Biase)	““	Abidoh
28.	Bahumono	““	Ede
29.	Igboekwurekwu	““	Alum
30.	Itigidi	““	Elom
31.	Efik	Cross River	Edidia-iwa, enem
32.	Agbo	Cross River	Elom
33.	Nde	Cross River	Erem
34.	Edor (Ikom)	Cross River	Eremi
35.	Nkome (Ikom)	Cross River	Rerima
36.	Etung	Cross River	Erim
37.	Ibibio	AkwaIbom	Enem, inam, anem
38.	Annang	““	Enem, anim, anem
39.	Oron	““	Owunni
40.	Eket	““	Anam
41.	Itumbonuso	““	Enem, una
42.	Andoni	Rivers	Enem
43.	Ubani or Igbani (Opobo)	“	Enem
44.	Khana or Ogoni	“	twu, tuu, two
45.	Eleme	“	Ochun
46.	Kalabari	“	Ewurewu
47.	Degema	“	udiowo, adiowo
48.	Abua	“	Odowo, idowo
49.	Ekpeye	“	Ona, una
50.	Ogba	“	Ona, una
51.	Ikwerre	“	Ona
52.	Etche	“	ona,una,ono
53.	Ijaw, Izon (Kolokuma)	Bayelsa	Otumu

Table 3. *Vernacular names of edible Dioscorea dumetorum in northern Nigeria.*

S/No	Language/Dialect	State(s)	Local name(s)
1.	Hausa	Northern-States	rogon-daji,doyandaji,rogon-jeji, doyangwari, dayarjeji, doyardanga
2.	Igala	Kogi	ilayi, ulayi, ulahi
3.	Igbirra (Ebira)	Kogi	enu-esuru,
4.	BassaNge	Kogi	ilayi, asuru
5.	BassaKomo	Kogi	Kelegbe
6.	Idoma	Benue	ulai, ulayi
7.	Igede	"	Inobi
8.	Tiv	Benue, Nasarawa, Taraba	anumbe,inyumbe, animbe
9.	Aho (Afo, Eloyi, Keffi)	Nasarawa	Balayi
10.	Gede	"	Nzweakwaki
11.	Mada	Nasarawa	BombonKiriIkboho
12.	Eggon, Egon	"	Shakata
13.	Birom, Berom	Plateau	Bidong, bentoh
14.	Angas, Ngas	"	Bwir shit, BieurBanga
15.	Mwaghavul (Mangu)	"	Iyanl, dugurijwaak
16.	Afizare	"	Fur
17.	Jarawa	"	Afar
18.	Tarok, Taroh	"	Ivonggashinzam
19.	Nupe	Niger, Kwarra	Ecisuru
20.	Gwari	Niger, Kaduna	Suru
21.	Zuru	Kebbi	Lon chin kade
22.	Adara (Kadara)	Kaduna	Apura
23.	Ham (Jaba)	"	Phosham
24.	Koro	"	Udo
25.	Amo (Lere LGA)	Kaduna	Utawa
26.	Gwong (Jema'a LGA)	Kaduna	Fyaah
27.	Bujju or Bajju (Kaje)	Kaduna	Ahuwankayit
28.	Tyap (Kataf, Atyap)	"	Achi
29.	Ubushi	"	Upbganga
30.	Sayawa	Bauchi	Gyadihur
31.	Tangale	Gombe	Tondo
32.	Tula	"	Yir Kishirin
33.	Cham	"	Gurugante
34.	Waja	Gombe	Kursane
35.	Dadeya	"	Yur
36.	Bura	Borno, Adamawa	Tidere, tidri
37.	Bachama	Adamawa	Atumtu, burmekake
38.	Chamba (Shamba)	Adamawa	Saabi
39.	Higgi	Adamawa	Nifeferi, nififeri
40.	Mumuye	Taraba	Kghara
41.	Fulani (Fufulde)	Northern-States	Dewuro, b'olomjiladde

Table 4. *Vernacular names of bitter wild Dioscorea dumetorum in Nigeria.*

S/No	Language/Dialect	State(s)	Local name(s)
1.	Igbo or Ibo	Abia, Imo, Anambra, Enugu, Ebonyi, Delta, Rivers	Iwu, Ighu, Ewueri
2.	Yoruba	Oyo, Ogun, Lagos Oshun, Ondo, Kogi, Ekiti, Kwarra	Gudugudu, esureko,
3.	Gunu	Ogun, Lagos	Sete
4.	Idoma	Benue	Eere, ere
5.	Tiv	Benue, Taraba, Nassarawa	Anumbeambakuu, anumbekikyo, anumbekoyor
6.	Mada	Nasarawa	Abirko
7.	Eggon	Nasarawa	Avuga
8.	Hausa	Northern-States	Doyanbiri, rogonbiri

The photograph in Figure 1 shows the staked stands of the cultivated edible variety of the plant. In the areas surveyed, it was found that the edible cultivated variety was consumed (as food) mainly through boiling the unpeeled fresh tubers to softness (Table 5). The boiled yam was eaten with vegetable oil (mostly palm oil), or a local sauce. It was observed that stored tubers (of most cultivars of *D. dumetorum*) with harvest wounds, even with adequate curing, were difficult to boil to softness. This is in contrast to *D. rotundata* (white guinea yam) that has both the fresh and stored tubers boiling to softness during cooking. It was also found out that most of the respondents boil both wounded and unwounded *D. dumetorum* within 24hrs of harvest to allow for proper boiling to softness.

Though fresh and stored white guinea yam is widely processed in Nigeria into yam flour ('elubo'), yam chips, fried yam, boiled yam, roasted yam and yam 'fufu' through traditional methods in Nigeria (Ukpabi and Oti, 2010), the study showed that African trifoliate yam was only used for boiled yam, roasted yam and yam soup (Table 5) in the country. Indigenes of AkwaIbom State specifically use a sweet cultivar of *D. dumetorum* in the preparation of the yam soup. Even in Cameroon, where *D. dumetorum* is preferred over other food yams, the viscous starchy 'fufu' (a popular ethnic pasty food in West Africa) made from edible African trifoliate yam does not compare favorably with those of *D. rotundata* (Degras, 1993; Rees *et al.*, 2012).

D. dumetorum starch granules are smaller than those of *D. alata* and *D. rotundata* (with respective diameter of 16-100 and 10-70 microns) and more comparable to the 1-15 microns for *D. esculenta*or Chinese yam (Amani *et al.,* 2001; Amaniet *a*l, 2004;Sahore and Amani, 2007;Palaniswami and Peter, 2008). The starch which has about 15% amylose is heterogeneously distributed in the tuber (Degras, 1993; Fasidi and Bakare, 1995).

In a rheological examination of starch-water paste from *D. rotundata, D. alataand D. dumetorum*, it was found that the sample from *D. dumetorum* had the lowest viscosity and gel strength (with *D. rotundata* and *D. alata* starches having the highest viscosity and highest gel strength respectively) (Amani *et al.,* 2001; Amani *et al*, 2004).

A matter of concern, found during the study, is the fact that the boiled edible tubers were in many instances consumed only by people who lived or grew up in the rural areas. Younger respondents in the survey, especially in the northern states, regarded the crop as a source of food only for their aged parents or grandparents. However, earlier study in Cameroon Republic showed that owing to its texture after cooking, old people with poor teeth favor it even when the boiling or cooking time (processing time) of tubers of some edible cultivars exceed 12 hours (Degra, 1993). In Nigeria on the other hand, the crop was found to be minimally cultivated in the major commercial yam growing areas of Nasarawa, Benue, Ebonyi states; and Anambra river valley of Anambra State. Orkwor and Ikeorgu (2010) reported that the major yam species grown in these areas for interstate trade is *D rotundata*. Scott *et al.* (2000) had predicted that increased yam tuber trade and processing would lead to increase in clonal and species selection (amongst *Dioscorea* species), and subsequently lead to enhanced yam cultivation (at the expense of some endangered yam species), and this finding seems to prove them right.

Homestead processing of the bitter wild trifoliate yam tubers (Figure 2) was observed in some communities in the Ibo (Igbo) states of Imo, Abia, Ebonyi, Anambra and Enugu. Figure 3 shows the flowchart for the general processing/detoxifying methods employed by these indigenous populations, especially during the sunny dry season. The dehydrated trifoliate yam chips produced served as a famine food in most of these communities.

Figure 1. *A plot of cultivated Dioscorea dumetorum.*

Table 5. *Traditional modes of processing edible Dioscorea dumetorum in Nigeria.*

Food Type	Unit/ Sub-unit Operations	State(s)
Boiled yam	Separation of clustered tubers (into single tubers), Washing, boiling (to softness), peeling, size reduction (cutting with knife)	All states
Roasted yam	Separation of clustered tubers (into single tubers), Roasting, peeling (of burnt tubers skin), size reduction	Plateau, Bauchi, Gombe
Sweet yam pepper soup	Separation of clustered tubers (into single tubers), washing, peeling, size reduction, boiling (with condiments)	AkwaIbom

Figure 2. *A cluster of tubers from a plant stand of wild Dioscorea dumetorum.*

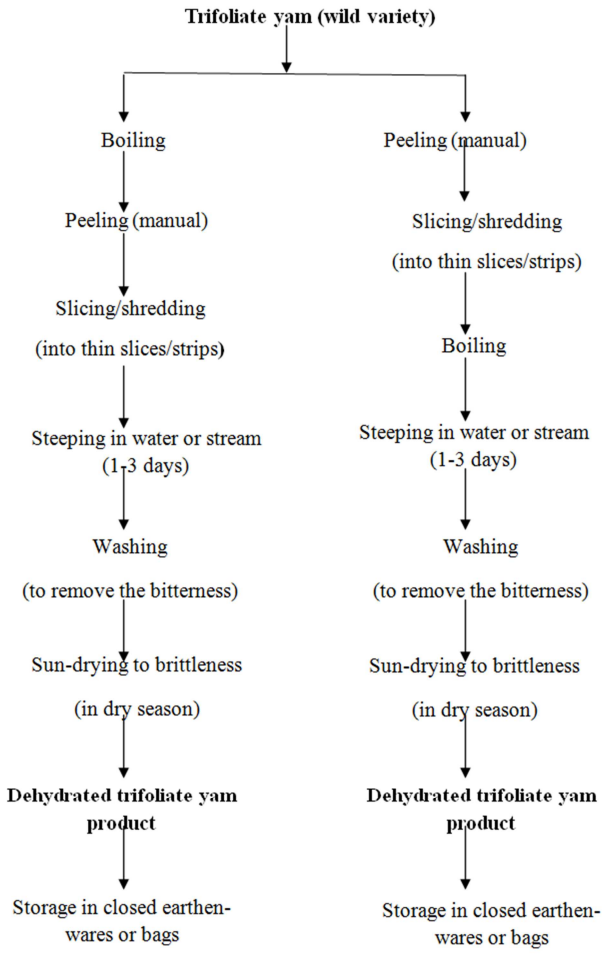

Figure 3. *Flowchart for the local processing of the bitter wild Dioscorea dumetorum (African trifoliate yam) into storable chips.*

Visual observations of *Dioscorea dumetorum* during the study showed that the wild variety generally had more spines (thorns) in the plant's aerial part than the edible cultivated variety, particularly near the stem base (Ukpabi, 2014). After labeling the samples (for photographing) from the wild variety as 'th', it was possible to divide the cultivated varieties or cultivars into three groups (according to their respective level of stem's thorniness or spininess, and smoothness) as follows:'ss'- absence of spines (smooth),'ts' – sparse spininess/no spine (or very few spines) near the stem's base, and'tt' – spiny, but few spines near the stem base. Both the wild and cultivated types had the characteristic trifoliate leaf (Degras, 1993; Palaniswami and Peter, 2008; Bhattacharjee *et al*., 2011). The close resemblance amongst the clustered tubers of the wild trifoliate yam variety *(iwu*or*ighu)* and the edible landraces *(una)* could be seen in Figure 4.Though the wild and cultivated edible varieties of *D. dumetorum* have been found to be closely related, biotechnology tools such as molecular analysis can be used to differentiate local varieties using random amplified polymorphic DNA markers (Ukpabi, 2014) and amplified fragment length polymorphism (Sonibare *et al*., 2010). Other characteristics possessed by both varieties include leaf hairiness, stem color, clustering or branching of tubers. Figure 5 is a photograph of the lower part of wild African trifoliate yam taken in a bush, few (seven-eight) kilometers from Umuahia, the capital city of Abia State, Nigeria.

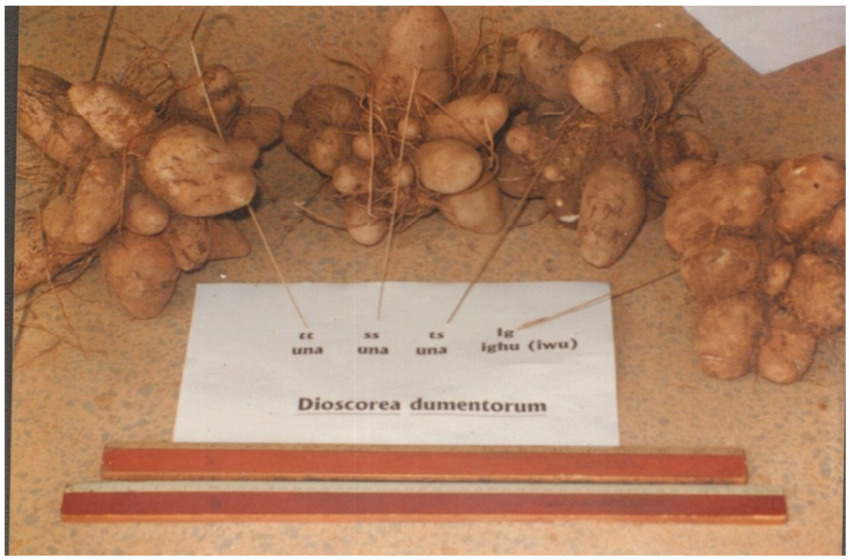

Figure 4. *Tuber clusters of wild variety (right) and three cultivated edible varieties (left) of Dioscorea dumetorum.*

Figure 5. *Lower aerial parts of the wild trifoliate yam with thorny stem.*

The information in this study would be beneficial to crop processors and farmers in pre-harvest and post-harvest selection of African trifoliate yam raw materials all over Nigeria. It should be noted that tubers of some landraces of edible African trifoliate yam, if not cooked within a few days after harvest, harden and are only good for planting (Degras, 1993; Medoua *et al*, 2005). This hardening is caused by the thickening of cellulose and hemicelluloses membranes (Degras, 1993). A determining factor of this flesh hardening is the catabolism of the cellular starch into alcohol-soluble glucids which are reused immediately in the biosynthesis of polymers (such as those involved in lignifications) that are components of the cell walls (Medoua *et al*, 2005). It was observed in this study that the yellow fleshed sweet Una-Nwaonyeukwu cultivar of edible *D.dumetorum* found in Uzuakoli, Ohafia and Okoko-Item towns of Abia state can be boiled to softness even after three months of storage of the wholesome tuber clusters. Further research by biochemists, molecular biologists and geneticists is required to determine the scientific reason for this characteristic difference. This is more so as scientists in Nigeria have recently suggested non-traditional methods of producing yam flour from edible *D. dumetorum* (Owuamanam *et al*, 2013) many years after some scientists had tried to introduce the yam flour in the neighboring Cameroon Republic (Degras, 1993).

Tubers of the wild trifoliate yam are also used as famine food in some parts of Africa that the plant grows - 15 degrees within the equator (Palaniswami and Peter, 2008; Bhattacharjee *et al*., 2011). Bhattacharjee *et al*. (2011) specifically stated that the tubers can be scientifically detoxified by slicing, soaking in water and boiling; frequently with the addition of salt. The slices may subsequently be dried. In the Sudan, the wild trifoliate yam had been detoxified, ground into flour and used as a base for the preparation of beer during crop failures. Shajeela *et al.* (2011) also showed that wild varieties of yam (*Dioscorea* species) in Asia can be processed into food for human nutrition. Unfortunately, *D. dumetorum* was not amongst the yam varieties studied by them.

During this study, it was also found that based on peculiar local traditional belief, the cooked *D. dumetorum* is considered a food taboo in some communities in Nigeria. The identified two indigenous populations involved on this issue were found in areas around Owerri, Imo State and Ika Annang, Akwa Ibom State.

4. Conclusion

The identified local vernacular names and processing methods in this paper will enhance the diffusion of information on the potentials of wild and cultivated *D.dumetorum* in Nigeria as traditional food materials except in areas that consider this plant resource as a food taboo. This is more so as all the 36 states in Nigeria have at least one of their spoken languages or dialects recorded in this extensive investigation.

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