

Inventory of plants utilized in oral hygiene in South-western Nigeria

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ABSTRACT

The study involved a survey of four hundred (40 respondents per LGA) randomly selected respondents from four Local Government Areas in Ogun (Abeokuta South, Yewa South, Ijebu-Ode and Obafemi Owode) and six Local Government Areas in Oyo (Egbeda, Kajola, Ibarapa Central, Ibadan North/East, Ogbomoso South and Saki East) states of South-western Nigeria. These were interviewed through the use of a Checklist administered through oral interviews and focus group discussions with major stakeholders such as collectors, processors and users of chewing sticks to collect necessary information. Data generated were analyzed and presented using descriptive statistics. Seventy (70) plant species belonging to thirty six (36) families of which the principal ones are Euphorbiaceae (17.81%), Combrataceae and Leguminosae:ceasapinioideae (8.22% each), Asteraceae, Malvaceae, Leguminosae: Mimosoideae, Apocynaceae (4.11% each) were found to be utilized as chewing stick in the study area. Most (85.71%) of the species are sourced from the wild. Some of the identified plants are used for other medicinal purposes including malaria treatment (*Azadirachta indica* A. Juss, *Mangifera indica* Linn., *Anacardium occidentale* Linn., *Ocimum gratissimum* Linn., *Mezoneuron benthamianum* Baillon), rheumatism and scorpion bites (*Alstonia bonnei*), etc. The study concludes that chewing stick materials are used for both oral hygiene maintenance and treatment of other ailments in the study area though various unsustainable methods of harvesting are used. Education and enforcement of sustainable methods of harvesting are recommended to prevent the extinction of the chewing stick plants.

Keywords: Chewing Stick, Non-Timber Forest Product, Inventory, Oral Hygiene

INTRODUCTION

The forest is a store house of many products including chewing sticks (Inyang, 2000) obtained from wild populations of indigenous plants (Sole and Wilson, 1995). Some of them help in cleaning the teeth, disinfect the mouth and strengthen dental gums. Common and popular chewing sticks include *Garcinia mannii*, *Glyphaea brevis*, *Rothmannia longiflora* *Acioa barteri*, *Massularia acuminata* and

Homalium letestui. Others are *Napoleana imperialis*, *Fagara zanthoxyloides*, *Carpolobia lutea*, *Carapa procera*, *Rehloria heudelotii* and *Baphia nitida*. A previous study by Olawumi, Oluwalana and Oyekale (2014) had established the presence certain chemical constituents like Saponins, Alkaloids, Glycosides, Flavonoids, Phlobatanins and Cardiac-glycosides in selected chewing stick plants in Southwestern Nigeria. About 70 species

of woody plants are used in Ghana as chewing sticks, but the best quality sticks come from “twea pea” (*Garcinia kola*) and “Nskoar” (*Garcinia epunctata*) trees. These two species grow wild in the South-West Ghana particularly in wet evergreen and semi-deciduous forests. Plant medicines (e.g. chewing sticks) are generally collected by the user or by a traditional doctor but urban migrants usually seek the traditional cures to which they no longer have access, thus creating an urban market demand (Kengne, 1987).

One plant medicine which is widely used for dental care throughout the entire West African region is the chewing stick. Conservation by cultivation faces obstacles including a lack of available land on which to plant, unwillingness to plant, apathy, lack of practical knowledge, inadequate security and provision of protection from domestic animals as well as low family income (CTA, 2006).

The Western type of health institutions are not within the reach of most people in terms of distance and costs, especially at the village setting (Elujoba, *et al.*, 2005). For many households in Africa, Caribbean and the Pacific (ACP), the traditional medicines are the only form of health care available especially oral health care via the use of chewing sticks (Technical Centre for Agricultural and Rural Cooperation (CTA), 2006). Hollist (2004) listed ten different oral/dental conditions treatable with chewing stick plants in traditional health practice as toothache or decay, gingivitis, mouth ulcers, oral thrush, tonsillitis, angular stomatitis, swollen tonsil and black tongue.

There are widespread uses of antibiotics in dental practice in these regions and micro-organisms are now developing resistance to a broad spectrum of antibiotics (Ndukwe, Okeke, Lamikanra, Adesina and Aboderin, 2005). The need to conserve antibiotics in order to prevent the infection

of antibiotics-resistant organisms has now been recognized (Levy, Darout and Skaug, 2001) and there is, therefore, the need to look for non-antibiotic substances with proven antimicrobial activity which can be used in the treatment of microbial infection including those that are encountered in dental practice.

In view of the established and growing importance of chewing stick in oral hygiene among households in Southwest of Nigeria, this study attempted to identify and offer an inventory of the various plant species commonly used as chewing stick in the study area with a view to indicating their sources, purpose of use, part used and methods of harvesting in order to offer necessary policy recommendations for their sustainable use.

MATERIALS AND METHODS

The study was carried out in Ogun and Oyo states of South-western Nigeria where the use and trade in chewing sticks are widely acknowledged (Larinde and Aiyeloja, 2009). Four Local Government Areas (LGAs): Abeokuta South, Yewa South, Ijebu-Ode and Obafemi Owode) in Ogun State and six Local Government Areas: Egbeda, Kajola, Ibarapa Central, Ibadan North/East, Ogbomoso South and Saki East in Oyo state were purposively selected; representing 20 percent of the 20 and 30 LGAs in Ogun State and Oyo State respectively. In each of these LGAs, 40 respondents were randomly selected to give a sample size of 400. These were interviewed through the use of a questionnaire administered through oral interviews and focus group discussions with major stakeholders such as collectors, processors and users of chewing sticks to secure information on the species used, purpose of use, method of use, benefits of use, occurrence/abundance of species, source of chewing sticks materials used, etc. Responses from the respondents were thereafter collated for necessary analysis and presentation.

RESULTS

Seventy (70) plant species were reported by the respondents as having their stems and/or roots utilized as chewing sticks in the study area. The common and scientific names of the plant species and the specific parts reported as being utilized as chewing stick in the study area are shown in Table 1. It is the stems of the plant species that are generally used as chewing stick; 58 out of 70 (82.86%). Usage of the roots/stem accounted for 10 out of the 70 cases (10%). Only about 6% (4 out of 70) of the entire plant species have their root being used as chewing sticks while just 1.43% of the species have their bark/fruit used as chewing stick in the study area. In terms of habitat, about 39% of the species grow in the forest, 33.58% grow in the savannah, equal percentage of 9.49% and 4.38% each grows on fallow land or farmland and riverbanks or home garden respectively. Table 3 reveals that the seventy plant species identified as chewing stick in the study area belongs to thirty six (36) families of which the principal ones are Euphorbiaceae (17.81%), Combretaceae and Leguminosae: Caceasalpinioideae (8.22% each), Asteraceae, Malvaceae, Leguminosae: Mimosoideae, Apocynaceae (4.11% each). Similarly, in terms of forms, majority (58.90%) of the plant species are trees, about 32% are shrubs, 4.11% are hedges, and 2.73% are climbers while 1.37% each are large rattan and lianes. Most (85.71%) of the species are sourced from the wild (including the predominantly utilized and traded species like *Massularia acuminata* and *Garcinia kola*), only 14.29% are sourced through cultivation as presented in Table 5. The

method of harvesting as presented in Table 4 is generally stem cutting/logging (74.03%), bark ringing (7.79%), uprooting (6.05%), leaf cutting/root cutting (3.90% each) while the case of fruit collection account for 1.30%. Nature of occurrence/abundance showed 61.43% of the plant species to be common while about 39% are reported to be rare/scarce.

Majority (67.13%) of the species are consumed by old and young people while about 33.00% are solely utilized by old people. Apart from their use as chewing sticks for mouth cleaning and oral hygiene some of the identified plants are used for other medicinal purposes including malaria treatment (*Azadirachta indica* A. Juss, *Mangifera indica* Linn., *Anacardium occidentale* Linn., *Occimum gratissimum* Linn., *Mezoneuron benthamianum* Baillon), rheumatism and scorpion bites (*Alstonia bonnei*), diabetes (*Vernonia amygdalina* Del.) pile treatment (*Adansonia digitata* Linn.), reduction of plague and gingival inflammation (*Canarium schweinfurthii* Enzi), epilepsy, diarrhoea, dysentary, rheumatism, high blood pressure (*Terminalia schipierianum* Hochst), blood tonic (*Laccosperma secudiflorum* P.Beauv.) O.ktze), cough and head ache (*Olex subscorpiodea* Oliv.), cough and ring worm expellant (*Theobroma cacao* Linn.), dermatitis, guinea worm, jaundice, arthritis, snake bites (*Tetraptera tetraptera* Schum.&Thonn.)Taubert) and some others as shown in Table 2. The method of use is generally chewing and brushing apart from those that are used in specific therapeutic preparations other than chewing sticks as reflected in Table 2.

Table 1: List of Plants used as chewing sticks in the study area

S/N	Local Name	English Name	Botanical Name	Family Name	Form	Part Used	Nature of Occurrence	Source	User: Old or Young	Habitat
1	Ira		<i>Bridelia ferruginea</i> Benth.	Euphorbiaceae	S	St	R	Wild	O/Y	Savannah / Fallow land
2	Ata	Senegal Pricklyas	<i>Zanthoxylum zanthoxyloides</i> (Lam.) Zepernick & Timler	Rutaceae	T	St	R	Wild	O	Forest/savannah
3	Orunpa		<i>Hymenocardia acida</i> Tul.	Hymenocardiaceae	Shrub	St	R	Wild	O/Y	Savannah
4	Aayan	African satinwood	<i>Distemonanthus benthamianus</i> Baillon	Leguminosae : Ceasapinioidae	T	St/Rt	R	Wild	O/Y	Forest
5	Arunje		<i>Harungana madagascariensis</i>	Harungaceae	T	St	R	Wild	O/Y	Forest/ Savannah
6	Ewuro	Bitter leaf	<i>Vernonia amygdalina</i> Del.	Asteraceae	S	St /Rt	Com	Wild	O/Y	Home garden/ Farmland
7	Ayin/orin odan		<i>Anogeissus leiocarpa</i> (DC.) Guill.& Perr.	Combretaceae	T	St	Com	Wild	O	Forest/ Savanna
8	Pako Ijebu/Pako Calabar	Kolanut	<i>Massularia acuminata</i> (G.Don) Bullock & Hoyle	Rubiaceae	S	St	R	Wild	O/Y	Forest/ Riverbanks
9	Orogbo	Bitter Kola	<i>Garcinia kola</i> Heckel	Clusiaceae:guttiferae	T	St	R	Wild	O/Y	Forest
10	Emi gbegiri		<i>Pseudocedrela kotshyi</i> (Schweinf.) Harms	Meliaceae	T	St	Com	Wild	O	Forest/ Savanna
11	Eemi	Shea Butter	<i>Vitellaria paradoxa</i> Gaern.f.	Sapotaceae	T	St	R	Wild	O/Y	Forest/ Savanna
12	Idi/orin pupa		<i>Terminalia schiperianm</i> Hochst.	Combretaceae		St	Com	Wild	O	Forest/ Savanna
14	Dongoyaro	Neem	<i>Azadirachta indica</i> A.Juss.	Meliaceae	T	St	Com	Cultivated/Wild	O/Y	Savannah/ Farmland
15	Ose	Baobab	<i>Adansonia digitata</i> Linn.	Bombacaceae	T	Rt/St	R	Wild	O	Forest/ Fallowland
16	Botuje/Lapal apa funfun	Psychic Plant	<i>Jatropha curcas</i> Linn.	Euphorbiaceae	S	St	Com	Cultivated/Wild	O/Y	Savannah/ Home garden
17	Botuje/Lapal apa pupa	Psychic Plant	<i>Jatropha gossypifolia</i> Linn.	Euphorbiaceae	S	St	Com	Cultivated/Wild	O/Y	Savannah/ Home garden
18	Egbesi		<i>Nauclea latifolia</i>	Rubiaceae	T	Rt	Com	Wild	O/Y	Forest/Savannah
19	Kasia		<i>Senna siamea</i>	Fabaceae	T	St/Rt	Com	Cultivated/Wild	O/Y	Forest/

20	Kaju	Cashew	<i>Anacardium occidentale</i> Linn.	Anacardiaceae	T	St	Com	Cultivated/Wild	O/Y	Savanna Farmland/ Forest
21	Igi osan/ Agbalumo		<i>Chrysophllum albidum</i> G.Don	Sapotaceae	T	St	Com	Cultivated/Wild	O/Y	Farmland/ Forest
22	Guafa	Guava	<i>Psidium guajava</i> Linn.	Myrtaceae	T	St	Com	Cultivated/Wild	O/Y	Forest/ Farmland
23	Abafe		<i>Piliostigma thonningii</i> (Schum.) Mine-Redhead	Leguminosae :Ceasapinioideae		St	Com	Wild	O/Y	Savanna
24	Igi abo		<i>Annona senegalensis</i> Pers.	Anonaceae	T/S	St	R	Wild	O	Savannah/ Forest
25	Efirin		<i>Ocimum gratissimum</i> Linn.	Labiatae	S	St/Rt	Com	Cultivated/Wild	O/Y	Farmland/ Homegarden
26	Afara dudu		<i>Khaya ivorensis</i> A. Chev.	Meliaceae	T	Rt/St	Com	Cultivated/Wild	O/Y	Forest/ Farmland
27	Mangoro	Mango	<i>Mangifera indica</i> Linn.	Anacardiaceae		St	Com	Cultivated/Wild	O	Forest/ Savannah/ Farmland
28	Igi agunmaniye	Gliricidia	<i>Gliricidia sepium</i> (Jacq.)Walp.	Fabaceae	S	St	Com	Cultivated/Wild	O	Savannah/ Farmland
29	Erunju		<i>Uvaria chamae</i> P.Beauv.	Annonaceae	S	St	Com	Cultivated/Wild	O	Forest/ Fallowland
30	Egbo asofeyeje		<i>Rauvolfia vomitoria</i> Afzel.	Apocynaceae	S/T	Rt	R	Wild	O/Y	Forest
31	Igi igba	African locust bean	<i>Parkia biglobosa</i> (Jacq.) R.Br.ex G.Don	Leguminosae: Mimosoideae	T	St	R	Wild	O	Forest/ Savannah/ Farmland
32	Bombomu	Swallow wort	<i>Calotropis procera</i> (Ait.) Ait. F.	Asclepiadaceae	S	Rt	R	Wild	O	Farmland/ Fallowland/ Degraded soil
33	Koko	Cocoa	<i>Theobroma cacao</i> Linn.	Sterculiaceae	T	Rt	R	Cultivated	O	Farmland
34	Isekotu		<i>Sida acuta</i> Burm.f.	Malvaceae	H	St	Com	Wild	O	Farmland/ Fallowland/ Degraded soil/ Riverbanks
35	Ahun		<i>Alstonia booneii</i> De wild.	Apocynaceae	T	St/Ft	Com	Wild	O/Y	Forest/Savannah/ Farmland
36	Jenifihan		<i>Mezoneuron benthamianum</i> Baillon	Leguminosae : ceasapinioideae	S/C	St	R	Wild	O/Y	Forest

37	Okuuku		<i>Laccosperma secundiflorum</i> (P. Beauv.) O.Ktze.	Palmae	LR	St	R	Wild	O/Y	Forest/ Savannah
39	Ifon		<i>Olax subscorpioidea</i> Oliv.	Olacaceae	T	St	Com	Wild	O/Y	Forest/ Savannah
40	Ayidan/ Aridan		<i>Tetraptera</i> <i>tetraptera</i> (Schum.& Thonn.) Taubert	Leguminoceae:mimos oideae	T	St	Com	Wild	O/Y	Forest/ Savannah
41	Akoko		<i>Newbouldia laevis</i> (P.Beauv.) Seeman ex Bureau	Bignoniaceae	T	St	Com	Wild	O/Y	Forest/ Savannah
42	Ayinre	Minosa/ Silk tree	<i>Albizia zyagia</i> Welw.ex Oliv.	Leguminoceae:mimos oideae	T	St	Com	Wild	O/Y	Forest/ Savannah
43	Anikantanwo	African elemi/ Canarium nut	<i>Canarium schweinfurthii</i> Enzi	Burseraceae	T	St	Com	Wild	O/Y	Forest/ Savannah
44	Otupe		<i>Carpolobia lutea</i> G.Don	Polygalaceae	S	St	Com	Wild	O/Y	Forest/ Savannah
45	Orokoro		<i>Mallotus oppositifolus</i> (Geisel.) Muell.	Euphorbiaceae	S/T	St	Com	Wild	O/Y	Forest/ Savannah
46	Otomporo		<i>Sida garckeana</i> Polak	Malvaceae	S	St	Com	Wild	O/Y	Forest/ Savannah
47	Ogan		<i>Combrentum</i> <i>racemosum</i> P.Beauv.	Combretaceae	S/L	St	Com	Wild	O/Y	Forest/ Savannah
48	Orombo lemonu		<i>Citrus aurantium</i> Linn.	Rutaceae	T	St	Com	Cultivated/ Wild	O/Y	Farmland/ Homegarden/ Fallowland
49	Iya/Pepe		<i>Alchornea laxiflora</i> (Benth.) Pax & K.Hoffm.	Euphorbiaceae	S	St	Com	Wild	O/Y	Forest/ Savannah
50	Ito		<i>Milletia thonningii</i> (Schum. & Thonn.) Bak.	Leguminoceae: Papilionoidaeae	T	St	Com	Wild	O/Y	Forest/ Savannah
51	Eesinin		<i>Alchornea cordifolia</i> Mull.Arg.	Euphorbiaceae	S/T	St	Com	Wild	O/Y	Forest/ Savannah
52	Egun eja		<i>Occimum gratissimum</i> Linn.	Ebenaceae	T	St	Com	Wild	O	Forest/ Savannah
53	Atori		<i>Glyhaea brevis</i> (Spreng.)	Tiliaceae	S	St	Com	Wild	O	Forest/

			Monachino							Savannah
54	Atampara		<i>Phaulopsis imbricata</i> (Forsk.) Sweet	Acomthaceae	H	St	Com	Wild	O	Forest/ Savannah
55	Arumutaba		<i>Cynometra vogelii</i> Hook.f.	Leguminosae: caesalpinioiodeae	T	St	Com	Wild	O	Forest/ Savannah/ Fallowland
56	Arusa/Araasa		<i>Bridelia micrantha</i> (Hochst.) Baill.	Euphorbiaceae	S/T	St	Com	Wild	O	Forest/ Savannah
57	Afefe		<i>Trema orientalis</i> (Linn.) DC.	Ulmaceae	S/T	St	Com	Wild	O	Forest/ Savannah
58	Alofera		<i>Aloe vera</i>	Asphodelaceae	-----	St	Com	Cultivated/ Wid	O/Y	Farmland/ Homegarden
60	Apado		<i>Berlinia grandiflora</i> (Vahl) Hutch.&Dalz	Leguminosae: caesalpinioiodeae	T	St	R	Wild	O/Y	Forest/ Savannah
61	Igangan		<i>Dioscorea cayenensis</i> Lam.	Dioscoreaceae	C	St	R	Wild	O	Forest
62	Okuta		<i>Garcinia mannii</i> Oliv.	Guttiferae	T	St	R	Wild	O	Forest
63	Ewuro Oko	Rotula aquatica	<i>Vernonia colorata</i> (Wild.) Drake	Asteraceae	S/T	St	R	Wild	O	Riverbanks
65	Madunmaro		<i>Gongronema latifolia</i> Decne	Asclepiadaceae	C	St	R	Wild	O/Y	Forest/ Riverbanks
67		Saltbush/ Toothbrus h tree	<i>Salvadora persica</i> Linn.	Salvadoraceae	S/T	St	Com	Wild	O/Y	Pond edges/Riverbanks
68	Isin eye		<i>Blighia sapida</i> Konig	Sapindaceae	T	St	Com	Wild	O	Forest
69	Iranje		<i>Securinega virosa</i> (Roxb.ex Willd.) Baill.	Euphorbiaceae	T	St	Com	Wild	O/Y	Disturbed soil/Fallowland
70	Pia		<i>Persea Americana</i>	Lauraceae	S	St	Com	Cultivated	O/Y	Farrmland/ Home garden

Key: T=Tree, S=Shrubs, H=Hedges, C=Climbers, L=Liane, LR=Large Rattan, St= Stem, Rt= Root, Ft= Fruit, O=Old, Y=Young, Com=Common, R= Rare

Table 2: Utilization and mode of administration of chewing stick plants in the study area

S/No	Local Name	Botanical Name	Method of Use	Reason for Use
1	Ira	<i>Bridelia ferruginea</i> Benth.	Chewing and brushing	Mouth cleaning/hygiene
2	Ata	<i>Zanthoxylum zanthoxyloides</i> (Lam.) Zepernick & Timler	Chewing and brushing	Mouth cleaning
3	Orunpa	<i>Hymenocardia acida</i> Tul.	Chewing and brushing	Mouth cleaning/hygiene
4	Aayan	<i>Distemonanthus benthamianus</i> Baillon	Chewing and brushing	Killing molar microbes
5	Arunje	<i>Harungana madagascariensis</i>	Chewing and brushing; boiling leaf and bark.	Tooth decay; Diarrhea, Dysentery
6	Ewuro	<i>Vernonia amygdalina</i> Del.	Chewing and brushing	Tooth decay, Diabetes
7	Ayin/orin odan	<i>Anogeissus leiocarpa</i> (DC.) Guill.& Perr.	Chewing and brushing	Killing molar microbes
8	Pako Ijebu/Pako Calabar	<i>Massularia acuminata</i> (G.Don) Bullock & Hoyle	Chewing and brushing	Mouth cleaning
9	Orogbo	<i>Garcinia kola</i> Heckel	Chewing and brushing	Mouth cleaning
10	Emi gbegiri	<i>Pseudocedrela kotschy</i> (Schweinf.) Harms	Chewing and brushing	Molar treatment
11	Eemi	<i>Vitellaria paradoxa</i> Gaern.f.	Chewing and brushing	Mouth cleaning
12	Idi/orin pupa	<i>Terminalia schipierianm</i> Hochst.	Chewing and brushing	Tooth decay, Epilepsy, Diarrhea, Dysentery, Rheumatism, High blood pressure, etc.
14	Dongoyaro	<i>Azadirachta indica</i> A.Juss.	Chewing, brushing and swallowing. Boiling of leaves	Mouth cleaning; Malaria treatment.
15	Ose	<i>Adansonia digitata</i> Linn.	Chewing and brushing; Squeezing juice mixing with water and salt	Mouth cleaning; Pile treatment.
16	Botuje/Lapalapa funfun	<i>Jatropha curcas</i> Linn.	Chewing and brushing	Mouth cleaning
17	Botuje/Lapalapa pupa	<i>Jatropha gossypifolia</i> Linn.	Chewing and brushing	Tooth decay
18	Egbesi	<i>Nauclea latifolia</i>	Chewing, brushing and swallowing of	Molar treatment.

19	Kasia	<i>Senna siamea</i>	juice	Tooth decay
20	Kaju	<i>Anacardium occidentale</i> Linn.	Chewing and brushing	Mouth cleaning; Malaria treatment.
21	Igi osan/ Agbalumo	<i>Chrysophyllum albidum</i> G.Don	Chewing and brushing	Mouth cleaning
22	Guafa	<i>Psidium guajava</i> Linn.	Chewing and brushing	Mouth cleaning
23	Abafe	<i>Piliostigma thonningii</i> (Schum.) Mine-Redhead	Chewing and brushing	Mouth cleaning
24	Igi abo	<i>Annona senegalensis</i> Pers.	Chewing and brushing	Mouth cleaning
25	Efirin	<i>Ocimum gratissimum</i> Linn.	Chewing and brushing	Mouth cleaning; leaves for tooth decay, Malaria treatment.
26	Afara dudu	<i>Khaya ivorensis</i> A. Chev.	Chewing and brushing	Mouth cleaning
27	Mangoro	<i>Mangifera indica</i> Linn.	Chewing and brushing	Mouth cleaning; Malaria treatment.
28	Igi agunmaniye	<i>Gliricidia sepium</i> (Jacq.) Walp.	Chewing and brushing	Mouth cleaning
29	Erunku	<i>Uvaria chamae</i> P.Beauv.	Chewing and brushing	Mouth cleaning
30	Egbo asofeyeje	<i>Rauvolfia vomitoria</i> Afzel.	Chewing and brushing; bark boiling	Mouth cleaning; malaria treatment.
31	Igi igba	<i>Parkia biglobosa</i> (Jacq.) R.Br.ex G.Don	Chewing and brushing	Mouth cleaning
32	Bombomu	<i>Calotropis procera</i> (Ait.) Ait. F.	Chewing and brushing	Mouth cleaning
33	Koko	<i>Theobroma cacao</i> Linn.	Chewing and brushing, latex extraction.	Mouth cleaning; cough, ring worm.
34	Isekotu	<i>Sida acuta</i> Burm.f.	Chewing and brushing	Mouth cleaning, molar treatment
35	Ahun	<i>Alstonia boonei</i> De wild.	Chewing and brushing; bark boiling	Mouth cleaning; scorpion stings, rheumatism.
36	Jenifihan	<i>Mezoneuron benthamianum</i> Baillon	Chewing and brushing	Mouth cleaning; malaria fever.
37	Okuuku	<i>Laccosperma secundiflorum</i> (P. Beauv.) O.Ktze.	Chewing and brushing; bark boiling	Mouth cleaning; blood tonic.
39	Ifon	<i>Olex subscorpioidea</i> Oliv.	Chewing and brushing; bark boiling; fruit	Mouth cleaning; bark for cough, headache, gonorrhea, fruit for dysentery, leaf for epilepsy, fever, edema.
40	Ayidan/ Aridan	<i>Tetraptera tetraptera</i> (Schum.& Thonn.) Taubert	Chewing and brushing; root boiling; root and leaf boiling; stem and leaf boiling.	Mouth cleaning; dermatitis; guinea worm; fever, jaundice, arthritis, snake bites, etc.

41	Akoko	<i>Newbouldia laevis</i> (P.Beauv.) Seeman ex Bureau	Chewing and brushing	Mouth cleaning
42	Ayinre	<i>Albizia zyagia</i> Welw.ex Oliv.	Chewing and brushing	Gum maintenance, prevents decay and plaque formation.
43	Anikantanwo	<i>Canarium schweinfurthii</i> Enzi	Chewing and brushing	Reduces plaque and gingival inflammation.
44	Otupe	<i>Carpolobia lutea</i> G.Don	Chewing and brushing	Removes food particles and bacterial plaques
45	Orokoro	<i>Mallotus oppositifolus</i> (Geisel.) Muell.	Chewing and brushing	Mouth cleaning
46	Otomporo	<i>Sida garckeana</i> Polak	Chewing and brushing	Mouth cleaning
47	Ogan	<i>Combretum racemosum</i> P.Beauv.	Chewing and brushing	Mouth cleaning
48	Orombo lemonu	<i>Citrus aurantium</i> Linn.	Chewing and brushing	Mouth cleaning
49	Iya/Pepe	<i>Alchornea laxiflora</i> (Benth.) Pax & K.Hoffm.	Chewing and brushing	Mouth cleaning
50	Ito	<i>Milletia thonningii</i> (Schum. & Thonn.) Bak.	Chewing and brushing	Mouth cleaning
51	Eesin	<i>Alchornea cordifolia</i> Mull.Arg.	Chewing and brushing	Mouth cleaning
52	Egun eja	<i>Occimum gratissimum</i> Linn.	Chewing and brushing	Mouth cleaning
53	Atori	<i>Glyhaea brevis</i> (Spreng.) Monachino	Chewing and brushing	Mouth cleaning
54	Atampara	<i>Phaulopsis imbricata</i> (Forsk.) Sweet	Chewing and brushing	Mouth cleaning
55	Arumutaba	<i>Cynometra vogelii</i> Hook.f.	Chewing and brushing	Mouth cleaning
56	Arusa/ Araasa	<i>Bridelia micrantha</i> (Hochst.) Baill.	Chewing and brushing	Mouth cleaning
57	Afefe	<i>Trema orientalis</i> (Linn.) DC.	Chewing and brushing	Antimicrobial actions
58	Alofera	<i>Aloe vera</i>	Chewing and brushing	Mouth cleaning, antimicrobial actions
60	Apado	<i>Berlinia grandiflora</i> (Vahl) Hutch.&Dalz	Chewing and brushing	Mouth cleaning
61	Igangan	<i>Dioscorea cayenensis</i> Lam.	Chewing and brushing	Mouth cleaning

62		<i>Garcinia mannii</i> Oliv.	Chewing and brushing	Mouth cleaning
63	Okuta Ewuro Oko	<i>Vernonia colorata</i> (Wild.) Drake	Chewing and brushing	Mouth cleaning; tooth decay
65	Madunmaro	<i>Gongronema latifolia</i> Decne	Chewing and brushing	Mouth cleaning; white teeth; prevents gum infection
67		<i>Salvadora persica</i> Linn.	Chewing and brushing	Oral hygiene
68	Isin eye	<i>Blighia sapida</i> Konig	Chewing and brushing	Mouth cleaning
69	Iranje	<i>Securinega virosa</i> (Roxb.ex Willd.) Baill.	Chewing and brushing	Mouth cleaning
70	Pia	<i>Persea Americana</i>	Chewing and brushing	Mouth cleaning

Table 3: Distribution of chewing stick species based on family and form

S/No	Family	Form					Total	%
		Tree	Shrubs	Hedge	Climber	Large rattan with smooth stem		
1	Acanthaceae			1			1	1.37
2	Anacardiaceae	2					2	2.74
3	Annonaceae	1	1				2	2.74
4	Apocynaceae	2	1				3	4.11
5	Asclepiadaceae		1				1	1.37
6	Asphodelaceae			1			1	1.37
7	Asteraceae	1	2				3	4.11
8	Bignoniaceae	1					1	1.37
9	Bombacaceae	1					1	1.37
10	Burseraceae	1					1	1.37
11	Clusiaceae: guttiferæ	1					1	1.37
12	Combretaceae	4	1				6	8.22
13	Dioscoreaceae				1		1	1.37
14	Ebenaceae	1					1	1.37
15	Euphorbiaceae	5	7				13	17.81
16	Fabaceae	1	1				2	2.74
17	Guttiferae	1					1	1.37
18	Labiatae		1				1	1.37
19	Lauraceae		1				1	1.37
20	Leguminosae: ceasapinioideae	4	1		1		6	8.22

Table 3 continued

21	Leguminosae: mimosoideae	3						3	4.11
22	Leguminosae: papilionoidae	1						1	1.37
23	Malvaceae	1	1	1				3	4.11
24	Meliaceae	1						1	1.37
25	Olacaceae	1						1	1.37
26	Palmae					1		1	1.37
27	Polygalaceae	1	1					2	2.74
28	Rubiaceae	1	1					2	2.74
29	Rutaceae	2						2	2.74
30	Salvadoraceae	1	1					2	2.74
31	Sapindaceae	1						1	1.37
32	Sapotaceae	1						1	1.37
33	Solanaceae	1						1	1.37
34	Sterculiaceae	1						1	1.37
35	Tiliceae		1					1	1.37
36	Ulmaceae	1	1					2	2.74
Total		43	23	3	2	1	1	73*	
%		58.90	31.51	4.11	2.73	1.37	1.37		100.00

Table 4: Distribution of chewing stick species according to method of harvesting

Method of harvesting	Frequency	%
Stem Cutting/logging	57	74.03
Uprooting	5	6.05
Debarking	6	7.79
Leaf cutting	3	3.90
Latex extraction	2	2.60
Root cutting	3	3.90
Fruit collection	1	1.30
Total	77*	100.00

*Greater than 70 due to multiple responses

Table 5: Distribution of chewing stick materials based on their sources

Source	Frequency	%
Wild/ Uncultivated	96	85.71
Cultivated	16	14.29
Total	112*	100.00

*Greater than 70 due to multiple responses

DISCUSSION

Majority (67.13%) of the species identified in this study are consumed by old and young people while about 33.00% are solely utilized by old people which confirms the fact that chewing sticks are one of the most important non timber forest products in the western region of Nigeria (Falconer, 1990) and have provided the primary form of dental and oral care for people in the region as well as adjudged to be a major contributory factor for the good conditions of people's teeth and health (Falconer, 1990, Ugoji, *et al*, 2000). Also, chewing stick is popularly used in Africa, South America, Asia, the middle east including Saudi Arabia and other Islamic countries (Wu, *et al*, 2001, Darout, *et al*, 2005).

Campbell and Luckert (2002) had indicated that millions of men, women and children across the dry forest and woodland countries of sub-Saharan African enter the forests and woodlands surrounding their villages to procure an array of wild natural resources (including chewing sticks) for home consumption and sale. These Non wood forest products (NWFPs) have long formed a vital part of

the people's everyday livelihood needs, providing energy, food, medicines and raw materials for building, crafts, tools and implements.

The forest trees and shrubs are the principal forms used as chewing sticks in the study area and needs to be sustainably managed to ensure continued availability. This study identified seventy plants used as chewing sticks in the study area just as Kengne, (1987) identified 70 plant species as chewing sticks in Southern Ghana while Rotimi, *et al*, (2000) identified 49 species of plants used as chewing stick in Nigeria; this implies that more plants have been identified and are currently being utilized as chewing sticks in Nigeria which is in consonance with the assertion of Sole and Wilson (1995) that Chewing sticks obtained from a variety of selected plants are used as traditional method of mechanical oral hygiene by up to 80-90% of Nigerians. In this study 82.86% of respondents used stems as chewing sticks which is in line with the predominant practice of sourcing chewing sticks from branches of shrubs and trees; a practice considered to be bio-conservation friendly, because it is unlikely to threaten survival

of the plants used (Katende, Bukenya-Ziraba, Kakudidi, and Lye, 1998).

Apart from their use as chewing sticks for mouth cleaning and oral hygiene some of the identified plants are used for other medicinal purposes just as the Baganda ethnic boil and drink extracts from the roots of *R. vulgaris* as remedy for pregnancy-related abdominal pain (Katende, *et al.*, 1998), hypertension, and sugar disease (Mwebaza, 2005). The use of plant roots as a medicinal source threatens species' survival and this may explain the present scarcity of some plants. Popular species for commercial purposes are *Garcinia mannii*, *Rothmannia longiflora* and *Dacryodes edulis* are also chewed for buccal hygiene but primarily for the treatment of recalcitrant cough (Inyang, 2000).

About 8% of the respondents do bark ringing/debarking of stems and roots which had earlier been identified as one of the highest destructive extractive technique commonly observed in Nigeria (Fasola and Egunyomi, 2002). Studies by Cunningham (1988) also revealed that debarking often kill plant species. In another vein, Wong, (1999) stated that the harvesting method usually employed in sourcing chewing stick is extremely destructive involving cutting down the entire tree.

In terms of occurrence/abundance about 39% of identified chewing stick plants are reported to be rare/scarce, this is in line with Holbech (2000) that the resource base for chewing stick is seriously declined due to over exploitation especially in the case of *Garcinia spp* in Liberia and Cote d'Ivoire. Most (85.71%) of the species are sourced from the wild (including the predominantly utilized and traded species like *Massularia acuminata* and *Garcinia kola*) which is in agreement with Redford (1992) that the uncontrolled extraction of NWFPs can seriously affect the

populations being exploited, particularly in the context of wild gathering as the case of chewing sticks and market expansion and, hence, the promotion of commercial uses of NWFPs can then be viewed as a double-edged sword, with potential benefits and risks.

In another vein, only 14.29% are sourced through cultivation and the reasons for non- cultivation as listed by CTA (2006) are lack of available land on which to grow medicinal plants, unwillingness to get involved in planting, apathy, lack of practical knowledge, inadequate security and protection from domestic animals. It thus implies that unless sustainable harvesting is advocated and enforced, the loss of essential biodiversity is imminent.

CONCLUSION

The study concludes that chewing stick materials are used for both oral hygiene maintenance and treatment of other ailments in the study area though various unsustainable methods are currently being utilized for harvesting. The study recommends education and enforcement of sustainable methods of harvesting of the chewing stick plants to prevent the extinction of these very useful trees and shrubs in the study area by concerned agencies.

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