



## Ethnomedicinal survey of medicinal plants used in the management of sickle cell disorder in Southern Nigeria



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### ABSTRACT

**Ethnopharmacological relevance:** The present study entails the medicinal plant species used to manage sickle cell disorder in Southern States of Nigeria.

**Materials and methods:** The ethnomedicinal information was gathered through multistage approach from three geopolitical zones of Southern Nigeria, which were purposively selected. Semi-structured questionnaires were administered on 500 respondents in 125 locations. The ethnomedicinal data collected were analyzed using quantitative value indices such as fidelity level (percentage) and use value. The information got was cross checked using literature search and other related materials.

**Result:** Five hundred respondents comprising 53.12% females and 46.88% males were observed. It was noted that 26.70% were illiterate while 73.30% had formal education. Seventy-nine percent is traditional healers, 27% herb traders and the other 4% are those who have awareness of sickle cell disease. One hundred and seventy five plant species belonging to 70 families, of which Fabaceae made up 26.76% and Euphorbiaceae 16.90% forming the highest occurrence. It was observed that leaves were the most common plant part used (69.10%) followed by root (15%) and stem bark (14%) in the preparation for sickle cell management. Majority (48.57%) of these plants were harvested from wild with 38.86% being trees. *Citrus aurantifolia* and *Newbouldia laevis* had highest use values of 0.69 and 0.64 respectively. Plants with the least use value (0.001) include *Abrus canescens*, *Acacia xanthophloea*, *Aerva lanata* and *Axonopus compressus*. The result of fidelity level values of the plant species for the management of Sickle Cell Disorder (SCD) revealed that *Citrus aurantifolia* had the highest value of 70.2% while *Angraecum distichum* and *Axonopus compressus* had the lowest Fidelity Level value of 0.18%.

**Conclusion:** The study revealed that people in the studied areas were well grounded in the medicinal plants used to manage sickle cell disease. This study reported for the first time 102 plant species having anti-sickling potentials with Fabaceae and Euphorbiaceae as the most dominant plant families. Many of the claimed plants were harvested from the wild showing threat thus providing needs for conservation of plants. The documented plants had high use value and fidelity level that provided quantitative and qualitative ethnomedicinal evaluation within and across the plant families. These give room for further scientific investigations in pharmacological profiles.

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## 1. Introduction

Sickle cell disorder (SCD) or sickle cell anemia is an autosomal recessive genetic blood disorder with over-dominance characterized by red blood cells with abnormal, rigid, sickle shaped. This is one disease afflicting the population living in Africa, South America and Asia. It occurs in other ethnic groups including Mediterranean and Middle Eastern descent (WHO, 2007). Sickling of red blood cells occur because of the polymerization of

deoxygenated Hbs. This abnormality characterized by painful episodes, chronic anemia, enlarged spleen, serious frequent infections and damage to vital organs (Balgir, 2006). The sickled red blood cells have small oxygen contact that increased blood viscosity and impede normal circulation in small blood vessels resulting in ischemia and infarction (Carl and Ashwood, 1996). As a result, micro-vascular occlusion arises which may lead to serious, sometimes fatal crises (Mehanna, 2001). Over 50 million people were affected throughout the world (Diop et al., 2000; Gulbism et al., 2005). African continent remains the most affected by this disease with the highest prevalence in its West and Central parts. In Nigeria, the number of occurrence is believed to be up to four million and at least 12 million people suffer from sickle cell disease

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worldwide (Ibrahim et al., 2007). Treatment of SCD required that one focus on ways of inhibiting sickle cell haemoglobin polymerization and prevention or repair of red cell dehydration. SCD treatment also requires interrupting the interaction of sickle cells with the endothelium (Brugnara et al., 1993; Charache et al., 1995; Kinney et al., 1999; Claster and Vichinsky, 2003; Vadolas et al., 2004). Hydroxyurea is a known inhibitor of sickle cell polymerization and various drugs containing it has an ability to increase fetal hemoglobin concentration (Mcgoron et al., 2000; Sauntharajah et al., 2009).

Veeramuthu (2006) noted that more than 80% of the world population relies on traditional medicine for their primary health care. The World Health Organisation (WHO, 2002) estimated 90% of the population of developing countries relied on medicinal plants to help meet their primary health care needs. In developing countries, medicinal plants used to treat sickle cell crises associated morbidities among the less privileged classes of the society. Treatment and management of diseases such as HIV/AIDS, malaria, diabetes, sickle-cell anemia and mental disorders involve the use of medicinal plants (Elujoba et al., 2005). Medicinal plant extracts were found to have ability to prevent the erythrocytes from deforming and losing its integrity. Adejumo et al. (2010) reported the *in vitro* antisickling activities of crude methanol extracts and aqueous fractions of roots of *Plumbago zeylanica* and *Uvaria chamae*. Result of the antisickling assay of root of *P. zeylanica* and *U. chamae* showed the abilities to inhibit sickling under hypoxia condition. *Terminalia catappa* could be effective antisickling agents that inhibit induced hemolysis of human erythrocytes (Mgbemene

and Ohiri, 1999). Traditional healers and local folks have knowledge of the indigenous and healing properties of various herbs common to their locality. These herbs may not be documented and could be lost in near future. The need to gather knowledge from various geographical areas and collate information necessary for database of medicinal plants used to manage SCD in those areas is the aim of this paper.

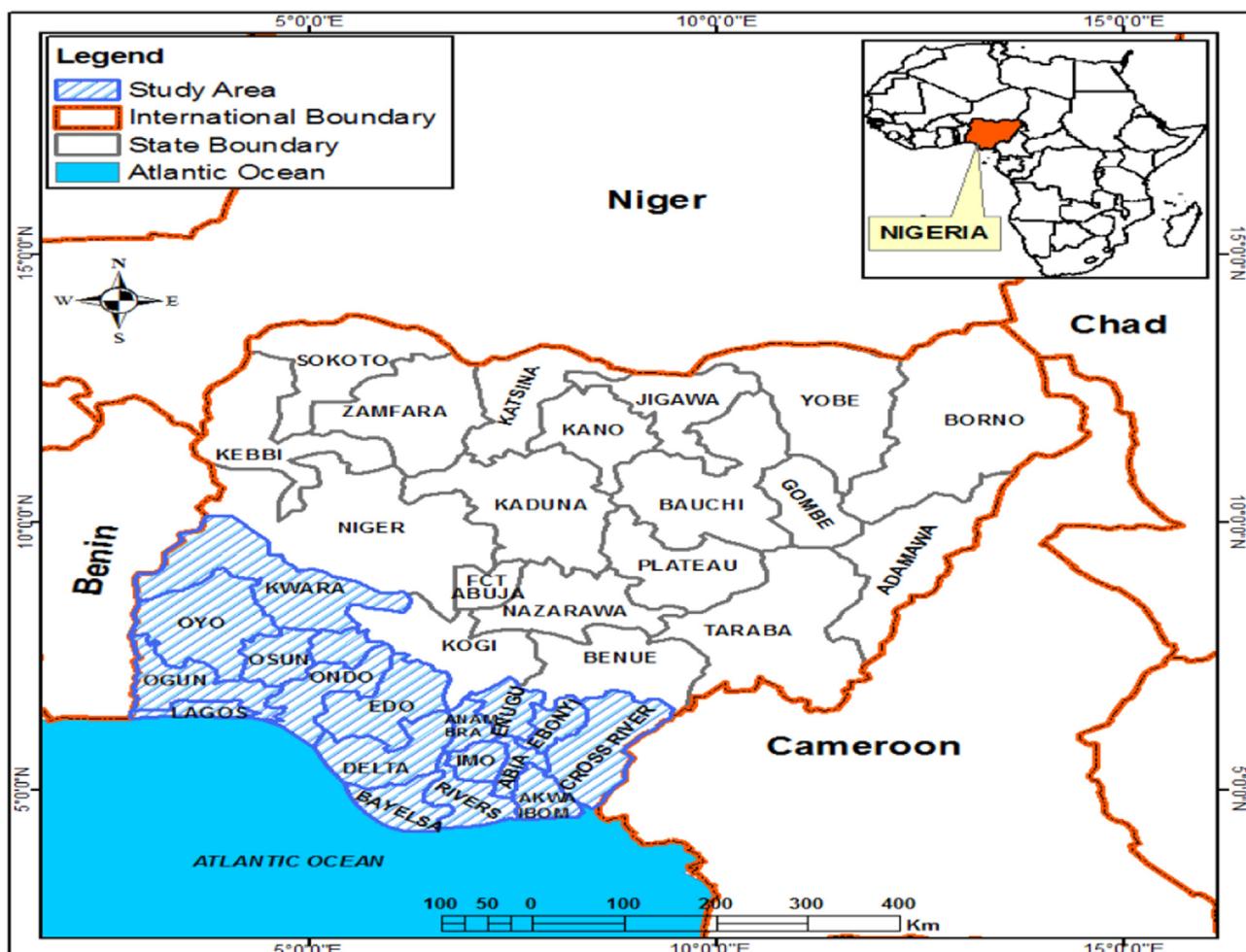
## 2. Materials and methods

### 2.1. Description of the study area

The survey was carried out within the forest agro-ecological region of southern part of Nigeria (Fig. 1). The basic occupation of the people in the study areas are more of agrarian. The selected state includes- Osun, Oyo, Ondo in Southwestern Nigeria, Edo in South South zone of Nigeria, and Enugu State in Southeastern Nigeria. The agro-ecology areas experiences eight months (March–October) of bimodal rainfall and five months (November–March) of dry season each year with irregularity in the rainfall distribution. Vegetation in the study area is rainforest with patches of guinea savanna in Ondo state. The survey covered nine months (July 2014–March 2015).

### 2.2. Ethnomedicinal data collection

Multistage sampling procedure was used to select respondents



**Fig. 1.** Location map of the study area consisting of South West, South East and South South regions of Nigeria (West Africa).

for the study with five states selected from the southern Nigeria. At the second stage, five local government areas, demarcated with five communities for their ethnobotanical involvement in sickle cell management were selected. Lastly, 20 notable individuals from the list generated from each of the selected communities were randomly selected, adding up to 100 per state and 500 respondents from all the states. Structured questionnaire was used to get bio-demographic data, knowledge of SCD such as their level of understanding. Other information gotten were their involvement to manage the disorder, different methods, plant used, source (s) of medicinal plants used, plant parts and their preparations.

### 2.3. Plant collection and identification

Preliminary identification and collection of plant species was done in the field after which samples were taken for further identification and authentication at the Obafemi Awolowo University and University of Benin Herbaria. The photo voucher specimen numbers were obtained for the plants. The plant samples were arranged chronologically based on their families; use value and fidelity level (percentage).

### 2.4. Verification of claims of antisickling plants used in Southern Nigeria

Current study investigated whether claimed ethnomedicinal plants used for SCD had any literature record in Nigeria or other parts of the World, as information obtained was crosschecked using literature search and other related materials.

### 2.5. Statistical analyses of data collected

#### 2.5.1. Biodemographic features of the respondents

Data collected was analyzed using descriptive analyzes and summarized using frequency and percentage to compare the selected socio-economic characteristics of informants across the study areas.

#### 2.5.2. Analysis of collected plants

Statistical analysis of the ethnomedicinal information got from respondent on plants used to manage SCD was calculated using quantitative methods (Use value and Fidelity value (FL%)). Use value (UV) of each species was calculated using  $UV = \sum u/n$  as described by Ferreira et al. (2009). Use value depends on the importance attributed by the respondents and not on the view of the investigators. The values are high when several citations for a plant species showing plant importance and approaching zero with limited citations to its use (Phillips et al., 2002). Fidelity level (FL%) was calculated using  $FL = Np/N \times 100$  as described by Friedman et al. (1986), where Np is the number of respondents, that claimed to use a plant species to treat the disease and N is the total number of respondents who used plants as a medicine to treat any disease.

## 3. Results and discussion

### 3.1. Bio-demographic features of respondents on the plants used to manage sickle cell disease

Table 1 showed the bio-demographic features of the respondents with 53% female and 47% male. Based on age, the respondents were classified into six age groups (20–30, 31–40, 41–50, 51–60, 61–70 and above 70 years having 6.00%, 9.00%, 12.00%, 41.00%, 22.00% and 10.0% occurrence respectively). The age distribution of respondents, less than 50 years of age noted to have

**Table 1**

Demographic features of respondents on the plants used in the management of sickle cell disease. Source: Field Survey 2014.

Demographic features	Frequency	Percentage (%)
<b>Gender</b>		
Male	265	53.00
Female	235	47.00
Total	500	100
<b>Age</b>		
20–30	30	6.00
31–40	45	9.00
41–50	60	12.00
51–60	205	41.00
61–70	110	22.00
Above 70	50	10.0
<b>Level of Education</b>		
Primary	0	0
Secondary	302	60.23
Tertiary	64	13.07
Illiterate	134	26.70
<b>Occupation</b>		
Traditional healers	345	69.03
Herb sellers	134	26.71
Others	21	4.26
<b>Level of understanding</b>		
Respondents with SCD knowledge	420	84
Respondents without SCD knowledge	80	16
<b>Acquisition of knowledge</b>		
Inheritance	328	65.60
Apprenticeship	163	32.60
Other sources	9	1.80

little knowledge of medicinal plant when compared with those above 50 years of age. Eighty-four percent of the respondents have understanding of SCD and management while the rest (16%) have no knowledge of the disease. The majority had secondary school education (60.23%). Based on occupation, the result shows that traditional healers make up 69% of the respondents, 27% herb sellers while others make up 4% of the respondent who have awareness of sickle cell disease showing that traditional healers had good knowledge to manage SCD. On acquisition of knowledge, it was revealed that knowledge gained by inheritance had the highest value (65.60%) followed by those who are under training by apprenticeship (32.60%) on how to manage sickle cell disease and other sources (1.80%). This shows that wealth of indigenous knowledge is still being preserved by oral communication from generation to generation. This implies an urgent need for documenting the antisickling plants in that area.

### 3.2. Ethnomedicinal plants

In this study, the medicinal plants used to manage SCD in southern part of Nigeria are depicted in Table 2. This study reported one hundred and seventy five (175) plant species. Each species of the medicinal plants arranged in alphabetical order had botanical name, family, common name, local name, plant parts used, plant source and growth habit. The plants belong to 70 families with Fabaceae (26.70%) and Euphorbiaceae (16.90%) as most dominating families (Fig. 2). This is in line with earlier reports of Mpiana et al. (2010a, 2010b) and Famojuro and Moody (2015) who indicated that Euphorbiaceae and Fabaceae were the most prominent families used in the management of SCD by traditional medical practitioners in Congo and Ghoyin Local Government

**Table 2**

List of medicinal plants used in the management of sickle cell disease in southern part of Nigeria.

S/no	Scientific name	Family	Voucher No.	Common name	Local name	Plant parts used	Mode of cultivation	Growth habit	Use Value (UV)	Fidelity level FL (%)	Literature citations
1	<i>Abrus canescens</i> Welw. ex Baker	Fabaceae	UBH dt/SN/003	Jequirity	Omisimmisin	leaf	Wild	Climber	0.001	1.0	Present study
2	<i>Abrus precatorius</i> L.	Fabaceae	UBHdt/SN/156	Crab's eye, rosary, love nut	Oju-ologbo	Leaf	Wild	Climber	0.003	3.0	Nwodo et al., 2008; Kadiri et al., 2014
3	<i>Abutilon mauritianum</i> (Jacq.) Medik.	Malvaceae	UBHdt/SN/157	Bush mallow, country mallow	Furu, kawo	Leaf	Wild	Shrub	0.006	3.0	Present study
4	<i>Acacia ataxacantha</i> DC	Mimosaceae	UBHdt/SN/076	Flame, Benin rope, acacia thorn	Ewon agogo, uke, sarkakiyya	Root, leaf	Wild	Climber	0.004	2.0	Present study
5	<i>Acacia xanthophloea</i> Benth	Mimosaceae	UBHdt/SN/084	Fever tree, sulphur bark, African thorn acacia	Agogo ewon	Stem bark	Wild	Tree	0.001	0.8	Present study
6	<i>Acalypha wilkesiana</i> Mull-Arg.	Euphorbiaceae	UBHdt/SN/098	Copper's leaf, beef steak plant	Jinwinmi, jiwene	leaf	Wild/ cultivated	Shrub	0.057	9.0	Present study
7	<i>Acanthus montanus</i> (Nees) T. Anders.	Acanthaceae	UBHdt/SN/086	false thistle, Bear's Breech	Irumarigbo, Agámòbó, ágáméèbù,	leaf	Wild	Herb	0.068	12.0	Olowokudejo et al., 2008
8	<i>Adansonia digitata</i> Linn.	Bombacaceae	UBHdt/SN/023	Baobao	Ose, kukaa, kaulambali	Leaf, stem bark	Wild	Tree	0.085	23.0	Mpiana et al., 2014; Sahu et al., 2012; Adesanya et al., 1988
9	<i>Adenia cissamopeloides</i> (Planch. ex Hook.) Harms	Passifloraceae	UBHdt/SN/045	Adenia	Godogbo	Leaf	Wild	Liana	0.005	17.8	Present study
10	<i>Adenopus breviflorus</i> Benth	Cucurbitaceae	UBHdt/SN/036	wild colocynth (Ainslie).	Gojinjima, ányúrímñó, tagiiri	Leaf, fruit	Wild	Climber	0.006	12.6	Present study
11	<i>Aerva lanata</i> (L.) Juss. ex. Schult.	Amaranthaceae	UBHdt/SN/067	Bhadrm, cherula	eweowo, furfurata, fatumi	Leaf	Wild	Herb	0.001	4.2	Present study
12	<i>Aframomum melegueta</i> k. Schum.	Zingiberaceae	UBHdt/SN/078	Alligator pepper, grains of paradise	ata-ire, Oseoji, ehin-edo	fruits	Wild	Herb	0.142	24.9	Ameh et al., 2012
13	<i>Afzelia africana</i> Sm. ex Pers.	Fabaceae	UBHdt/SN/099	Pod mahogy	Apa, kawo, akpaalata,	Seed, stem bark	Wild	Tree	0.056	10	Present study
14	<i>Ageratum conyzoides</i> L.	Compositae	UBHdt/SN/011	Goat weed	Imi-esu, urata, ula, ujula	Leaf	Wild	Herb	0.003	0.7	Present study
15	<i>Alchornea cordifolia</i> (Schumach. & Thonn.) Müll. Arg.	Euphorbiaceae	UBHdt/SN/017	Christmas bush	Ipa, esinsin, bambami, ububo	leaf	Wild or cultivated	Shrub	0.002	0.4	Mpiana et al., 2007
16	<i>Alchornea laxiflora</i> (Benth.) Pax & K. Hoffm.	Euphorbiaceae	UBHdt/SN/029	Three- veined bead string	Ijan, pepe, uwenuwen, ububo	Leaf	Wild	Tree	0.043	8.0	Coker et al., 2006
17	<i>Allium ascalonicum</i> L.	Amarylidaceae	UBHdt/SN/026	Spring onion, shallot	Alubosa- elewe, , albasa, maigo	Leaf, Bulb	Wild	Herb	0.051	9.0	Present study
18	<i>Allium cepa</i> L.	Amarylidaceae	UBHdt/SN/044	onion,	Alubosa, yabase, gudaji	Bulb	Cultivated	Herb	0.049	4.0	Nwaoguikpe, 2009
19	<i>Allium sativum</i> L.	Amarylidaceae	UBHdt/SN/171	garlic	Ayu, Ayu-Ishi, Tafarnuwa	bulb	Cultivated	Herb	0.004	0.7	Nwaoguikpe, 2009
19	<i>Alstonia boonei</i> De Wild	Apocynaceae	UBHdt/SN/058	Stoolwood, pattern wood	Ahun, eghu, akpi	Whole plant	Wild	Tree	0.485	28.0	Egunyomi et al., 2009; Kade et al., 2003
20	<i>Amaranthus spinosus</i> Linn.	Amaranthaceae	UBHdt/SN/034	Prickly amaranthus	Tete-elegun, Daguro, inine-ogwu, manjingasaya, nnuno uku	Leaf, fruit	Wild	Herb	0.028	5.0	Grubben and Denton, 2004; Ashok et al., 2012
21	<i>Amaranthus viridis</i> Linn.	Amaranthaceae	UBHdt/SN/089	Green amaranthus, slender amaranthus	Tete-abalaye, malankoshi, akwukwo nri	Leaf	Wild	Herb	0.028	5.0	Present study
22	<i>Angraecum distichum</i> Lindl.	Orchidaeaceae	UBHdt/SN/066	Guava baby	Ela	Leaf	Wild	Orchid	0.001	0.18	Present study
23	<i>Annona senegalensis</i> Pers.	Annonaceae	UBHdt/SN/072	Africa custard apple, wild custard apple	Abo, ibobo, gwandadaji, ocha	Leaf, root	Cultivated & wild	Shrub	0.001	5.0	Mpiana et al., 2012; Mpiana et al., 2014
24	<i>Anogeissus leiocarpus</i> (DC.) Guill. & Perr.	Combretaceae	UBHdt/SN/169	Axlewood, chew-stick	Ayin, markatara, farin gamji, atara	leaf	Wild	Tree	0.028	6.5	Chidozie and Adoga, 2014; Egunyomi et al., 2009

25	<i>Anthocleista djalonensis</i> A. Chev.	Loganiaceae	UBHdt/SN/123	Cabbage tree	Sapo, kwari	Root, stem bark , leaf	Wild	Tree	0.213	32.0	Present study
26	<i>Anthocleista vogelii</i> Planch.	Loganiaceae	UBHdt/SN/136	Cabbage tree	Apaoro, sapo	Leaf, root	Cultivated & wild	Tree	0.199	34.5	Present study
27	<i>Axonopus compressus</i> (Sw.) P. Beauv.	Poaceae	UBHdt/SN/147	Tropical carpet grass, Blanket grass	Idi	Leaf	Cultivated & wild	Grass	0.001	0.18	Present study
28	<i>Bambusa vulgaris</i> Schrad.	Poaceae	UBHdt/SN/167	Bamboo	Oparun	Leaf	Cultivated & wild	Shrub	0.143	25.0	Present study
29	<i>Baphia nitida</i> Lodd.	Papilionaceae	UBHdt/SN/172	Cam wood	Irosun, majigi, aboshi	Leaf	Cultivated & wild	Tree	0.003	0.53	Present study
30	<i>Blighia sapida</i> K.D. Koenig	Sapindaceae	UBHdt/SN/159	akee apple, savory akee tree.	Isin,	Stem bark	Cultivated & wild	Tree	0.001	0.20	Present study
31	<i>Boerhavia diffusa</i> L. (B. coccinea Mill.)	Nyctaginaceae	UBHdt/SN/111	Hog weed	Etiponla, baabaajuyi, Akandom	Leaf, root	Wild	Herb	0.001	0.20	Devi et al., 2012
32	<i>Bombax buonopozense</i> P. Beauv	Bombacaceae	UBHdt/SN/133	Red silk cotton tree	Ponpolo, gurijiya, akpe,	leaf	Cultivated & wild	Tree	0.085	15.0	Present study
33	<i>Caesalpinia bonduc</i> (L.) Roxb	Caesalpiniaceae	UBHdt/SN/138	Yellow nicker, physic nut	Ayoo	Leaf	Cultivated & wild	Shrub	0.085	15.0	Present study
34	<i>Cajanus cajan</i> (L.) Millsp.	Fabaceae	UBHdt/SN/140	Pigeon pea	Otili, orela, viovio,	Leaf	Cultivated	Shrub	0.241	43.0	Akinsulie et al., 2005; Ameh et al., 2012; Imaga, 2013
35	<i>Cannabis sativa</i> Linn.	Cannabaceae	UBHdt/SN/145	Indian hemp	Igbo	Leaf	Cultivated	Herb	0.071	12.0	Ameh et al., 2012
36	<i>Carapa procera</i> DC.	Meliaceae	UBHdt/SN/168	Crabwood, monkey cola, andirob	Irere, nkwo	Leaf	Cultivated	Tree	0.043	8.0	Mpiana et al., 2009; Ngolua et al., 2014
37	<i>Cardiospermum grandiflorum</i> Sw.	Sapindaceae	UBHdt/SN/122	Ballon vine, heartseed vine, love in puff ballon	Koropo	leaf	Cultivated & wild	Climber	0.043	8.0	Present study
38	<i>Carica papaya</i> Linn.	Caricaceae	UBHdt/SN/124	Pawpaw	Ibepe, isirigun, ojo, Gwandi a	Leaf, root, fruits	Cultivated	Tree	0.481	84.0	Iweala et al., 2010; Afolabi et al., 2012; Oduola et al., 2006; Thomas and Ajani, 1987
40	<i>Carpolobia alba</i> G. Don	Polygalaceae	UBHdt/SN/170	poor man's candle	Osunsun	Stem bark, root	Wild	shrub	0.045	8.0	Present study
41	<i>Cassia alata</i> L.	Fabaceae	UBHdt/SN/006	Candle Bush	Asunwon, ogala	leaf	Cultivated	Shrub	0.091	16.0	Present study
42	<i>Cassia obtusifolia</i> L.	Fabaceae	UBHdt/SN/118	Sicklepod	Jeleunbeun	Leaf	wild	Herb	0.068	12.0	Present study
43	<i>Chasmanthera dependens</i> Hochst.	Menispermaceae	UBHdt/SN/120	Chasmanthera	Ato –oloriraun	Leaf, Root	Cultivated & wild	Climber	0.003	0.53	Egunyomi et al., 2009
44	<i>Chassalia kolly</i> (Schumach.) Hepper	Rubiaceae	UBHdt/SN/112		Isepe-agbee	Stem bark	Wild	Shrub	0.043	7.5	Present study
45	<i>Chenopodium ambrosioides</i> L.	Chenopodiaceae	UBHdt/SN/141	wormwood	Arunpale	Root	wild	Herb	0.213	37.0	Adejumo et al., 2011
46	<i>Chromolaena odorata</i> (L.) R. M. King & H. Rob.	Asteraceae	UBHdt/SN/146	Siam weed	Akintola, obirakara,	Leaf	Wild	shrub	0.045	7.90	Present study
47	<i>Chyrophyllum albidium</i> G. Don	Sapotaceae	UBHdt/SN/105	African star apple	Agbalumo, udara,	Leaf	wild	Tree	0.068	12	Akpan et al., 2012
48	<i>Cissampelos owarensis</i> P. Beauv. ex DC.	Menispermaceae	UBHdt/SN/153	Lungwort, velvet leaf	Jokoje, Damaraji	Leaf, root	Wild	Liana	0.007	1.23	Present study
49	<i>Citrus aurantifolia</i> (Christm.) Swingle	Rutaceae	UBHdt/SN/144	Lime, swing	Orombo-wewe, Afontata, Dankabiya, kabuya	Leaf, fruit, root	Cultivated	Tree	0.692	70.2	Chuku et al., 2012; Borokini et al., 2013
50	<i>Clausena anisata</i> (Willd.) Hook.f. ex Benth.	Rutaceae	UBHdt/SN/152	Clausena, Horsewood	agbasa, oboku	Leaf, root	Cultivated & wild	Shrub	0.014	2.5	Present study
51	<i>Cleistopholis patens</i> (Benth.) Engl. & Diels	Annonaceae	UBHdt/SN/038	Salt and oil tree	Apako	Leaf	Wild	Tree	0.014	2.5	Present study
52	<i>Cleome rutidosperma</i> DC.	Capparaceae	UBHdt/SN/075	Fringed spider flower	Ekuya	Leaf	Cultivated & wild	Herb	0.014	2.5	Present study
53	<i>Cnidoscolus aconitifolius</i> I. M. Johnst	Euphorbiaceae	UBHdt/SN/031	Cnidoscolus	Iyanapaja	Leaf	cultivated	Shrub	0.068	12.0	Joseph et al., 2013

**Table 2** (continued)

S/no	Scientific name	Family	Voucher No.	Common name	Local name	Plant parts used	Mode of cultivation	Growth habit	Use Value (UV)	Fidelity level FL (%)	Literature citations
54	<i>Cocos nucifera</i> L.	Arecaceae (palm family).	UBHdt/SN/033	Coconut palm	Agbon, kwakwari, ake babe	Nut, fruit juice	Cultivated	Tree	0.014	2.5	Present study
55	<i>Cola millenii</i> K. Schum	Sterculiaceae	UBHdt/SN/035	Monkey kola	Obi-edun	Leaf, stem bark	wild	Tree	0.014	2.5	Present study
56	<i>Cola nitida</i> Schott & Endl.	Sterculiaceae	UBHdt/SN/032	Kola	Obi-gbanja,	Leaf	Wild	Tree	0.014	2.5	<a href="#">Chikezie, 2011</a> ; <a href="#">Atolaiye et al., 2009</a>
57	<i>Combretum racemosum</i> P. Beauv.	Combretaceae	UBHdt/SN/040	Bush willow, cristmas rose	Okoso, alagame, ogan pupa	Root	Wild	Shrub	0.014	2.5	Present study
58	<i>Crinum jagus</i> Thoms.	Amaryllidaceae	UBHdt/SN/100	Crinum Lily	Ogede-odo	Leaf	Wild	Herb	0.023	4.0	Present study
59	<i>Croton lobatus</i> L.	Euphorbiaceae	UBHdt/SN/149	Fowl feet	Eru, daasaya, okwe	Leaf	Wild	Herb	0.028	5.0	Present study
60	<i>Curcuma longa</i> L.	Zingiberaceae	UBHdt/SN/134	Turmeric	Lali pupa, gangamu	tubers	Cultivated	Herb	0.086	15.1	Present study
61	<i>Cussonia barteri</i> Hochst. ex a.rich.	Araliaceae	UBHdt/SN/173	elephant's sugarcane	Sigo, gwabsa	Leaf	Wild	Tree	0.008	1.40	Present study
62	<i>Cyatula prostrata</i> (L.) Blume	Amaranthaceae	UBHdt/SN/022	Rat's bur grass/guinea fowl bur grass	Sawerepepe, Agbirigba, karangiyar	Leaf	Wild	Herb	0.011	1.93	Present study
63	<i>Cylindiscus gabunensis</i> Harms	Fabaceae	UBHdt/SN/128	African greenheart	Olosan, okan, Uzi	Root	wild	Tree	0.213	37.3	Present study
64	<i>Cymbopogon citratus</i> (DC.) Stafp.	Poaceae	UBHdt/SN/129	Lemmon grass	Kookoba, àchàrà ehi, tsauri	leaf	Cultivated	Herb	0.241	42.18	<a href="#">Mpiana et al., 2007</a>
65	<i>Cyperus esculentus</i> L.	Cyperaceae	UBHdt/SN/130	tiger nut sedge, yellow nutsedge	awere pèpè, àgbí, rì, gbá , Árigiza	leaf	Wild & cultivated	Herb	0.009	1.58	<a href="#">Monago and Uwakwe, 2009</a>
66	<i>Deinbollia pinnata</i> (Poir.) Schumach.ex. Thonn.	Sapindaceae	UBHdt/SN/131	Water willow	Ogiri- egba,	leaf	Wild	Shrub	0.009	1.58	Present study
67	<i>Dennettia tripetala</i> Baker f.	Annonaceae	UBHdt/SN/132	Pepper fruit	Igbere, Nmi-mi, ákò inclv	leaf	wild	Tree	0.009	1.58	Present study
68	<i>Dialium guineense</i> Wild.	Fabaceae	UBHdt/SN/161	Velvet, black tamarid, tumble tree	Awin, Icheku, Tsamiyarkumi	Stem bark	wild	Tree	0.011	1.93	Present study
69	<i>Dioclea reflexa</i> Hook. f.	Fabaceae	UBHdt/SN/163	Bapiana, dauwa, njøwi, njuwi	Arin	Stem bark	Cultivated	Climber	0.009	1.58	Present study
70	<i>Dioscorea alata</i> L.	Discoreaceae	UBHdt/SN/164	Water yam , purple yam	jiabana, ewura	Tuber	Cultivated	Climber	0.028	5.0	Present study
71	<i>Dioscorea rotundata</i> L.	Discoreaceae	UBHdt/SN/101	White yam	Isu	Leaf	cultivated	Climber	0.011	1.93	Present study
72	<i>Dracaena fragrans</i> (L) ker-Gawl.	Asparagaceae	UBHdt/SN/113	Corn plant, happy plant	Peregun	Leaf, root	cultivated	Shrub	0.011	1.93	Present study
73	<i>Eclipta alba</i> L. ex. B. D. Jacks	Asteraceae	UBHdt/SN/126	False Daisy) herb	Arojoko	Leaf	Wild	Herb	0.011	1.93	Present study
74	<i>Ehretia cymosa</i> Thonn.	Boraginaceae	UBHdt/SN/162	Puzzle bush	Jaoke,	Leaf	Wild	Tree	0.142	25.0	Present study
75	<i>Enantia chlorantha</i> Oliv.	Annonaceae	UBHdt/SN/135	Ivory wood, African yellow wood	Osopupa, awopa, kakarim	Leaf, Stem bark	Wild	Tree	0.142	25.0	<a href="#">Ejele et al., 2012</a>
76	<i>Entandrophragma cylindricum</i> (Sprague) Sprague	Meliaceae	UBHdt/SN/064	Sapele wood, Cedar mahogany	Ijébo, owura, aboudikro	Stem bark	Wild	Tree	0.011	1.93	Present study
77	<i>Eudadenia trifoliolata</i> (Schum. & Thonn.) Oliv.	Capparaceae	UBHdt/SN/010	Euadenia	Logbokoya, ólíkà, Oboh yeho	Leaf	Wild	shrub	0.043	7.53	Present study
78	<i>Euphorbia hirta</i> L.	Euphorbiaceae	UBHdt/SN/125	Asthma plant/garden spurge, snake weed	Emi-ile, Asin Uloko	Leaf	Wild	Herb	0.009	1.93	<a href="#">Mpiana et al., 2013</a>
79	<i>Euphorbia kamerunica</i> Pax	Euphorbiaceae	UBHdt/SN/137	Fence cactus	Enuopire	Leaf	Wild	Tree	0.009	1.93	Present study
80	<i>Euphorbia lateriflora</i> (Schum and Thonn)	Euphorbiaceae	UBHdt/SN/148	Scutelann, little cactus	Oro, Keranaa, abananya,	leaf	Wild	Shrub	0.009	1.93	<a href="#">Egunyomi et al., 2009</a>
81	<i>Euphorbia unispina</i> Pax.	Euphorbiaceae	UBHdt/SN/	cactus	óró adéte, bidaserti,		Wild	Shrub	0.009	1.93	Present study

82	<i>Ficus capensis</i> var. <i>Pubescens</i> Warb. ex De Wild. & T. Durand	Moraceae	139 UBHdt/SN/ 005	Figtree, African mustard tree	gururu Farin, Opoto	Whole plant	Wild	Tree	0.009	1.93	Mpiana et al., 2008; Umeokoli et al., 2013
83	<i>Ficus exasperata</i> Vahl.	Moraceae	UBHdt/SN/ 127	Sand paper tree, white fig tree	Eepin, ewe-ipin	Whole plant	Cultivated	Tree	0.227	39.73	Present study
84	<i>Glyphaea brevis</i> (Spreng.) Monachino	Tiliaceae	UBHdt/SN/ 121	Masquare stick	Atori	Stem bark	Cultivated	Climber	0.043	7.53	Present study
85	<i>Gongronema latifolium</i> Benth.	Asclepiadaceae	UBHdt/SN/ 154	Amaranth globe	Itaji, utazi, Madunmaro, arókéké	Leaf	Wild & cultivated	Climber	0.253	44.28	Egunyomi et al., 2009
86	<i>Gossypium barbadense</i> L.	Malvaceae	UBHdt/SN/ 155	West indian cotton	Owu, akese, gwandi, olulu, ogho, owula	Leaf	Cultivated	Shrub	0.028	5.0	Present study
87	<i>Gossypium hirsutum</i> L.	Malvaceae	UBHdt/SN/ 160	upland cotton or Mexican cotton, Dragon's blood	Owuelepa, elaowu, ebeoru (Edo)	Leaf	Cultivated & wild	Shrub	0.284	49.70	Ilondou and Enwa, 2013
88	<i>Harungana madagascariensis</i> Lam. ex Poir.	Hypericaceae	UBHdt/SN/ 069		Amuje, uturu, adandan	Leaf, stem bark	Cultivated & wild	Tree	0.341	59.68	Mpiana et al., 2008; Gbadamosi et al., 2012
89	<i>Heliotropium indicum</i> L.	Boraginaceae	UBHdt/SN/ 091	Cock's comb, Heliotrope	Ogberi-akuko	leaf	wild	Herb	0.142	24.85	Present study
90	<i>Hymenocardia acida</i> Tul.	Hymenocardiaceae	UBHdt/N/ 087	<i>Hymenocardia</i>	Orupa, aboopa	Leaf	Wild	Tree	0.142	24.85	Ibrahim et al., 2007; Mpiana et al., 2007
91	<i>Hibiscus sabdariffa</i> L.	Malvaceae	UBHdt/SN/ 054	Bush roselle, thorny water hemp	Isapa, iregu, dangira	Leaf	Cultivated & wild	Herb	0.228	39.90	Present study
92	<i>Icacina trichantha</i> Oliv.	Icacinaceae	UBHdt/SN/ 093	Icacina	Gbegbe	Leaf	Wild	Shrub	0.009	1.58	Present study
93	<i>Ipomoea batatas</i> (L.) Lam.	Convolvulaceae	UBHdt/SN/ 020	Sweet potato	Anamo, odunku	Leaf	cultivated	Climber	0.142	24.88	Mpiana et al., 2014
94	<i>Irvingia gabonensis</i> (Aubry-Lecomte) Baill	Irvingiaceae	UBHdt/SN/ 119	African/Native/Bush mango	Oro mopa, Ogb-ono, Mamujigoro	Leaf, fruit	cultivated	Tree	0.142	24.88	Present study
95	<i>Jatropha curcas</i> L.	Euphorbiaceae	UBHdt/SN/ 081	Physic nut	Botuje, Olulu-idu, lapalapa, Zugu, Ol	Leaf, root	Cultivated	Shrub	0.159	27.83	Ilondou and Enwa, 2013; Mpiana et al., 2012
96	<i>Khaya grandifoliola</i> C. DC.	Meliaceae	UBHdt/SN/ 049	African mahogany	Oganwo, ono, madachi	Root, stem bark	Cultivated & wild	Tree	0.398	69.65	Fall et al., 1999; Olowokudejo et al., 2008
97	<i>K. senegalensis</i> (Desr.) A. Juss.	Meliaceae	UBHdt/SN/ 013	African mahogany	Oganwo, ono, madachi	Root, stem bark	Cultivated & wild	Tree	0.341	59.68	Olowokudejo et al., 2008
98	<i>K. ivorensis</i> A. Chev.	Meliaceae	UBHdt/SN/ 024	African mahogany	Oganwo, ono, madachi	Root, stem bark	Cultivated & wild	Tree	0.228	39.90	Olowokudejo et al., 2008; Egunyomi et al., 2009
99	<i>Kigelia africana</i> (Lam.) Benth	Bignoniaceae	UBHdt/SN/ 116	Sausage tree	Pandoro, iyan, rawuya, uturubein	Fruit, leaf	Cultivated	Tree	0.185	32.38	Present study
100	<i>Launaea taraxacifolia</i> (Willd) Amin Ex. C Jeffrey.	Compositae	UBHdt/SN/ 096	Wild lettuce	Yanrin, Yamurin, Nonanbarya	Leaf	Wild & cultivated	Herb	0.128	22.40	Present study
101	<i>Lactuca capensis</i> Thunb.	Compositae	UBHdt/SN/ 019	lettuce	Yanrin-oko	Leaf	Wild	Tree	0.142	24.88	Present study
102	<i>Lawsonia inermis</i> Linn.	Lythraceae	UBHdt/SN/ 025	Hennaplant	Lali, Laali, Lallee	Leaf	cultivated	Shrub		24.88	Chang and Suzuka, 1982; Yogisha et al., 2002
103	<i>Lonchocarpus cyanescens</i> (Schum. & Thonn.) Benth.	Fabaceae	UBHdt/SN/ 060	indigo vine;	Elu, anunu, talaki	Leaf	cultivated	Shrub	0.011	1.93	Avaligbe et al., 2012
104	<i>Lonchocarpus sericeus</i> (Poir.) Humb., Bonpl. & Kunth	Fabaceae	UBHdt/SN/ 061	Dotted lencepod, liliac tree	Ipapo, alakiriti, njaso, faki	Root	Wild	Tree	0.011	1.93	Present study
105	<i>Loranthus micranthus</i> Linn.	Loranthaceae	UBHdt/SN/ 150	African mistletoe	Owube, afomoonisana, kauchin	Leaf	Wild	Shrub	0.011	1.93	Present study
106	<i>Luffa acutangula</i> (L.) Roxb.	Cucurbitaceae	UBHdt//SN/ 053	Angularloofah; snake gourd.	Oriro, sosonwanka, kààn-kan-aïya	Stem bark	Cultivated	climber	0.043	7.53	Present study
107	<i>Macaranga barteri</i> Mull-Arg	Euphorbiaceae	UBHdt/SN/ 052		Agbosa /aarasa, owariwa,	Leaf	Wild	Shrub	0.011	1.93	Present study
108	<i>Mangifera indica</i> L.	Anacardiaceae	UBHdt/SN/ 108	Mango	Mongora, mamgoloo, mangwaro	Stem bark, leaf	Wild & cultivated	Tree	0.224	39.20	Egunyomi et al., 2009
109	<i>Mezoneuron benthamianum</i> Baill	Fabaceae	UBHdt/SN/ 115	tiger's claw	Jenifiran	Root	Wild & cultivated	Climber	0.068	11.90	Present study
110	<i>Milicia excelsa</i> (Welw)C. C. Berg	Moraceae	UBHdt/SN/ 114	Iroko tree	Iroko	Leaf, stem bark	Wild & Cultivated	Tree	0.511	89.42	Present study

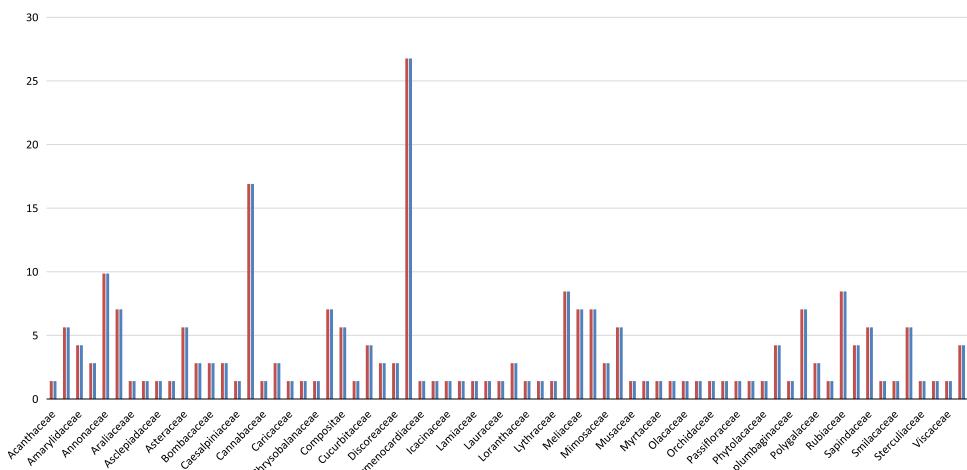
**Table 2** (continued)

S/no	Scientific name	Family	Voucher No.	Common name	Local name	Plant parts used	Mode of cultivation	Growth habit	Use Value (UV)	Fidelity level FL (%)	Literature citations
111	<i>Mondia whitei</i> (Hook. f.)	Apocynaceae	UBHdt/SN/151	White's ginger, tonic root	Isirigun, gbolo-gbo, aghuma	Leaf	Wild	Climber	0.085	14.88	Egunyomi et al., 2009
112	<i>Monodora tenuifolia</i> Benth.	Anacardiaceae	UBHdt/SN/083	African nutmeg (Unwin),	Ehinawo sinin, érùlù, úyèngħen	Leaf	Wild & cultivated	Tree	0.011	1.93	Uwakwe and Nwaoguikpe, 2008; Ojiako et al., 2012
113	<i>Morinda lucida</i> Benth.	Rubiaceae	UBHdt/SN/097	Brimstone tree	Oruwo, Eze-ogu, nyisi	Leaf, root	Wild & Cultivated	Tree	0.397	69.48	Joppa et al., 2008; Avaligbe et al., 2012; Mpiana et al., 2010
114	<i>Momordica charantia</i> L.	Cucurbitaceae	UBHdt/SN/057	African cucumber, bitter gourd, balsam pear	Ejinrinwewe, Alo-ose, Kakayi agbadoje, bódékádún	Leaf	Wild & Cultivated	Climber	0.142	24.88	Present study
115	<i>Motandra guineensis</i> Linn.	Apocynaceae	UBHdt/SN/175			Stem bark	Wild	Climber	0.009	1.58	Present study
116	<i>Mucuna pruriens</i> (L)DC.	Leguminosae	UBHdt/SN/051	Cow-hage, cow-itch plant, velvet bean	Werepe, Abbala, Kakara, Esisi,	Leaf, stem bark	Wild	herb	0.233	40.78	Ilondou and Enwa, 2013; Obioma et al., 2014
117	<i>Mucuna sloanei</i> Fawc. & Rendle	Leguminosae	UBHdt/SN/050	horse-eye bean	Ewe ina	Leaf	Wild & cultivated	Climber	0.142	24.88	Ojiako et al., 2012
118	<i>Musa sapientum</i> L.	Musaceae	UBHdt/SN/165	Banana	Ogede wewe, agade	Leaf, fruit	Cultivated	Herb	0.142	24.88	Present study
119	<i>Mussaenda elegans</i> Schumach. & Thonn.	Rubiaceae	UBHdt/SN/090	Mussaenda	Odoomode, paniebi, ezebwø	Leaf, stem bark	Cultivated	Shrub	0.009	1.58	Present study
120	<i>Newbouldia laevis</i> (P. Beauv.) Seem. ex Bureau	Bignoniaceae	UBHdt/SN/102	tree of life, Fertility tree	Akoko	Whole plant	Wild & cultivated	Tree	0.639	89.76	Egunyomi et al., 2009; Ejele et al., 2012
121	<i>Nicotiana tabacum</i> L.	Solanaceae	UBHdt/SN/117	Tobacco	Taba, otaba	Leaf	Cultivated	Herb	0.142	24.88	Chikezie et al., 2013
122	<i>Nauclea latifolia</i> Sm.	Rubiaceae	UBHdt/SN/110	Nauclea African peach	tafeshiyana, ubuluinu	Leaf	Wild	Tree	0.009	1.58	Present study
123	<i>Ocimum gratissimum</i> Linn.	Lamiaceae	UBHdt/SN/077	Scent leaf, mint, tae bush, balsam basil	Efinrin, Nchanwu, Daidoya, oromoba	Leaf	Cultivated	Shrub	0.241	42.18	Ngbolua et al., 2013
124	<i>Olax subscorpioidea</i> Oliv.	Olacaceae	UBHdt/SN/016	Olax, stink ant forest	Ifon, igbula, gwanorafi, gwanonraafi	Whole plant	Wild	Tree	0.241	42.18	Egunyomi et al., 2009
125	<i>Oncoba spinosa</i> Forssk.	Flacouritiaceae	UBHdt/SN/056	Snuff-box tree	Panisa, kookocikoo	Leaf	Wild & cultivated	Tree	0.009	1.58	Present study
126	<i>Parinari excelsa</i> Sabine	Chrysobalanaceae	UBHdt/SN/063	grey plum; Guinea plum;	Ésàghò, yínrínyíńriń	Leaf	wild	Tree	0.009	1.58	Present study
127	<i>Parkia biglobosa</i> (Jack) Benth.	Leguminosae	UBHdt/SN/062	West African locust bean tree	Irugba,	Leaf, stem bark	Wild	Tree	0.026	4.55	Present study
128	<i>Parquetina nigrescens</i> (Afzel.) Bullock	Periplocaceae	UBHdt/SN/065	African parquetina	Ogbo	Leaf	cultivated	Herb	0.250	43.75	Kade et al., 2003; Imaga et al., 2010
129	<i>Paullinia pinnata</i> L.	Sapindaceae	UBHdt/SN/030	Hippo cola, five finger, water cola	Obi- omode, yababiyar	Leaf, root	Wild & cultivated	Climber	0.009	1.58	Present study
130	<i>Pausinystalia talbotii</i> Wernham	Rubiaceae	UBHdt/SN/068		idágbon, nwérewéré	Root	Wild	Tree	0.009	1.58	Present study
131	<i>Pennisetum purpureum</i> Schumach	Poaceae	UBHdt/SN/027	Elephant grass, Napier grass	Esuse, eësún, àchàlà, daá-wàr kádàà	Leaf	Wild & cultivated	Herb	0.009	1.58	Present study
132	<i>Peperomia pellucida</i> Kunth	Piperaceae	UBHdt/SN/070	Silver bush, pepper elder	Rinrin	Leaf	Wild	Herb	0.239	41.83	Present study
133	<i>Persea americana</i> Mill.	Lauraceae	UBHdt/SN/104	Avocado (pear)	Pia, Ube oyibo, eben mbakara	Leaf	Cultivated	Tree	0.009	1.58	Iweala et al., 2010
134	<i>Petiveria alliacea</i> L.	Phytolaccaceae	UBHdt/SN/143	guinea-hen weed	Awogba, anamu	Leaf, root	Cultivated and wild	Herb	0.142	24.88	Adejumo et al., 2011
135	<i>Phaseolus lunatus</i> L.	Fabaceae	UBHdt/SN/142	Butter bean or lima bean	Awuje	Leaf	Cultivated and wild	Climber	0.159	27.83	Present study
136	<i>Physalis angulata</i> Linn.	Solanaceae	UBHdt/SN/107	Ground angular, angular winter cherry	Koropo, papo, putu, matsaramana	Leaf	Cultivated and wild	Herb	0.142	24.88	Present study
137	<i>Picralima nitida</i> Stapf Th. & H. Dur	Apocynaceae	UBHdt/SN/103	Picralima	Esoabere, erin, osu-igwe	Whole plant	Wild	Tree	0.224	39.20	Present study

138	<i>Piptadeniastrum africanum</i> (Hook.f.) Brenan	Fabaceae	UBHdt/SN/018	African greenheart, dahoma	Agbonyin, ufikiriyia, kurmi	Stem bark	Wild	Tree	0.156	27.30	Present study
139	<i>Piper guineense</i> Schumach. & Thonn.	Piperaceae	UBHdt/SN/095	Climbing black pepper	Iyere, ozeza, masooroo	Fruit, leaf	Cultivated and wild	Climber	0.244	42.70	Kunle and Egherevba, 2013; Ameh et al., 2012; Ekanem et al., 2010
140	<i>Piper umbellatum</i> Linn.	Piperaceae	UBHdt/SN/014	cow-foot leaf, Wild pepper	Ewe-efon, iwere	Leaf	Wild	Shrub	0.228	38.85	Present study
141	<i>Plumbago zeylanica</i> L.	Plumbaginaceae	UBHdt/SN/048	Ceylon Leadwort or Doctorbush	Inabiri,	Root	Cultivated and wild	Shrub	0.216	37.80	Adejumo et al., 2010
142	<i>Psidium guajava</i> L.	Myrtaceae	UBHdt/SN/037	Guava	Goroba	Leaf	Cultivated	Tree	0.196	34.30	Chikezie, 2011; Chikezie and Uwakwe, 2011
143	<i>Pycnanthus angolensis</i> (Welw.) Warb	Myristicaceae	UBHdt/SN/073	African nutmeg, false nutmeg	Akomu, oje, akwa-milAkujaadi (Hausa) and Eg-wunoma (Igbo)	Stem bark	Cultivate and wild	Tree	0.227	39.73	Present study
144	<i>Rauvolfia vomitoria</i> Afzel.	Apocynaceae	UBHdt/SN/106	swizzle-stick.	ákáta, wada, alkantaasoféyejè eraogi, cíkà-cídàà, ògirì-aró, (IFE) lárà	Leaf	Cultivated and wild	Tree	0.222	38.85	Abere et al., 2014; Egunyomi et al., 2009
145	<i>Ricinus communis</i> L.	Euphorbiaceae	UBHdt/SN/015	castor oil plant	Atapara, kpólokóto,	Leaf	Cultivated	Shrub	0.009	1.58	Present study
146	<i>Rhaphiostylis beninensis</i> (Hook. f. ex Planch.)	Icacinaceae	UBHdt/SN/028			Root	Cultivate and wild	Shrub	0.009	1.58	Avaligbe et al., 2012
147	<i>Sacrocephalus latifolius</i> (Sm.) Bruce.	Rubiaceae	UBHdt/SN/047	African Peach	Egbesi, uwon biri, Ubuluinu	Leaf, root	Wild	Tree	0.043	7.53	Yesufu et al., 2011
148	<i>Schrebera arborea</i> A. Chev.	Oleaceae	UBHdt/SN/082		Opele	Fruit	Cultivated	Tree	0.009	1.58	Present study
149	<i>Securidaca longipedunculata</i> Fresen	Polygalaceae	UBHdt/SN/042	Violet tree	Uwar magnigunar, ezeogwu, mpesu	Leaf	Wild	Tree	0.006	1.05	Egunyomi et al., 2009
150	<i>Senna alata</i> (L.) Roxb	Fabaceae	UBHdt/SN/109	ringworm bush, or ringworm shrub;	Asunwon,	Leaf	Wild	Shrub	0.207	36.26	Okpuzor and Adebésin, 2006
151	<i>Senna occidentalis</i> (L.) Link	Fabaceae	UBHdt/SN/079	negro coffee; coffee senna; Nigerian senna;	Rere	Leaf	Wild and cultivated	Herb	0.142	24.88	Present study
152	<i>Sida carpinifolia</i> L. f.	Malvaceae	UBHdt/SN/021	hornbeam-leaved Sida;	Osokotu	Whole plant	Wild	Shrub	0.146	25.55	Present study
153	<i>Smilax anceps</i> Willd.	Smilacaceae	UBHdt/SN/080	West African sarsparilla	Kasan, Igbaø	Root	Wild	Climber	0.006	1.05	Present study
154	<i>Solanum anomalam</i> Thonn. ex Schumach	Solanaceae	UBHdt/SN/043		Igba-yinrin, cimcim	Leaf	Wild and cultivated	Shrub	0.006	1.05	Present study
155	<i>Solanum torvum</i> Sw.	Solanaceae	UBHdt/SN/007	Devil's Fig, Wild Egg-plant, turkey berry	Igba-yinrin elegun, ikanwewe	Leaf	Wild and cultivated	Shrub	0.006	1.05	Present study
156	<i>Sorghum bicolor</i> L.	Poaceae	UBHdt/SN/166	sorghum	Oka-baba, abantako, durra, jowari,	Leaf, seed	Cultivated	Grass	0.239	41.83	Mpiana et al., 2013; Abugri et al., 2013; Gbadamosi et al., 2012
157	<i>Sphenocentrum jollyanum</i> Pierre.	Menispermaceae	UBHdt/SN/009	Sphenocentrum	Akerejupon	Leaf, stem bark, root	Wild	Shrub	0.228	39.90	Present study
158	<i>Synedrella nodiflora</i> (L.) Gaertn.	Asteraceae	UBHdt/SN/071	Cinderella Weed, Nodeweedy, Pig grass	zannapo	Leaf	Wild	Herb	0.006	1.05	Present study
159	<i>Talinum triangulare</i> (Jacq.) Willd	Portulacaceae	UBHdt/SN/012	waterleaf,	Gbure, nle-oka/nene, aleñyruwa	Leaf	Wild	Herb	0.006	1.05	Present study
160	<i>Theobroma cacao</i> L.	Malvaceae	UBHdt/SN/074	Cocoa tree	Koko,	Leaf, seed, stem bark, pod	Cultivated	Tree	0.179	31.33	Gbadamosi et al., 2012
161	<i>Telfairia occidentalis</i> Hook.f.	Curcurbitaceae	UBHdt/SN/008	Fluted pumpkin,	Ugwu, Ugu.	Leaf	Cultivated	Climber	0.236	41.30	Nwaoguikpe et al., 2013
162	<i>Terminalia avicennioides</i> Guill. & Perr.	Combretaceae	UBHdt/SN/085		Idi, Baushe	Root, leaf	Wild	tree	0.222	38.85	Present study
163	<i>Terminalia ivorensis</i> A. Chev.	Combretaceae	UBHdt/SN/004	black afara, black barked terminalia	Afara-dudu, idigbo, awunshin, eghoèn-nébi	stem bark	Wild and cultivated	Tree	0.142	24.88	Present study
164	<i>Terminalia catappa</i> L.	Combretaceae	UBHdt/SN/039	almond tree, Umbrella tree	Ebelebo, mbákárá	Leaf	Wild and cultivated	Tree	0.172	30.10	Moody et al., 2003; Samuel et al., 2009; Mgbeñene and Ohiiri, 1999
165	<i>Tetrapleura tetraptera</i>	Fabaceae	UBHdt/SN/	Aidan tree	Aridan, Igbo Oshoshö;	Fruits	Wild	Tree	0.228	39.90	Egunyomi et al., 2009;

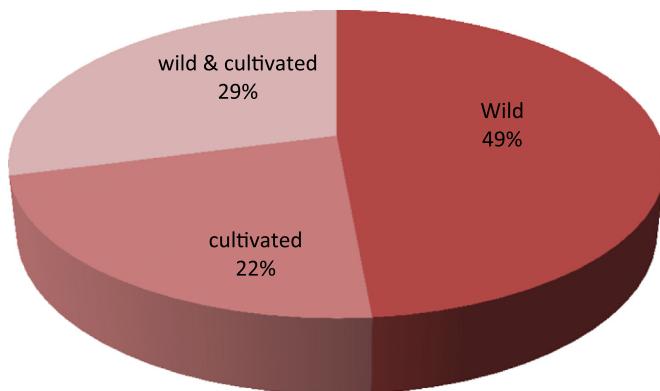
**Table 2** (continued)

S/no	Scientific name	Family	Voucher No.	Common name	Local name	Plant parts used	Mode of cultivation	Growth habit	Use Value (UV)	Fidelity level FL (%)	Literature citations
	(Schum and Thonn)		046		apapa; ighimiakia ighir-ehimi; Ighimiakia Afon Ukwa, barafuta	Leaf, stem bark	Wild and cultivated	Tree	0.142	24.88	Imaga et al., 2010
166	<i>Treculia africana</i> Decne.	Moraceae	UBHdt/SN/055	African bread fruit,	<i>Gbogbonse</i> , Umimi ofia, Osu-Umimi, Ákóṣá	Root	Wild	Shrub	0.009	1.58	Mpiana et al., 2012
167	<i>Uvaria afzelii</i> Scott-Elliot	Annonaceae	UBHdt/SN/088		Eruju, Kaskaifi,	Root	Wild	Shrub	0.142	24.88	Egunyomi et al., 2009
168	<i>Uvaria chamae</i> P. Beauv.	Annonaceae	UBHdt/SN/002	finger-root, bush banana	Ewuro, Onu-gbu, olug-bu, Shiwaka ewa, akedi, akoti	Leaf, root	Cultivated	Shrub	0.219	38.33	Adejumo et al., 2010; Gbadamosi et al., 2012; Avalligbe et al., 2012
169	<i>Vernonia amygdalina</i> Delile	Asteraceae	UBHdt/SN/092	Bitter leaf	afomo , onishana	Leaf	Wild	Shrub	0.223	39.03	Ilondu and Enwa, 2013; Egunyomi et al., 2009
170	<i>Vigna unguiculata</i> (L.) Walp	Fabaceae	UBHdt/SN/158	crowder-pea, southern pea, black-eyed peav	Oriri	Stem bark	Cultivated	Shrub	0.179	31.32	Egba et al., 2012
171	<i>Viscum album</i> L.	Viscaceae	UBHdt/SN/041	Mistletoe					0.009	1.58	Present study
172	<i>Vitex grandifolia</i> Gürke	Labiatae	UBHdt/SN/001	Black plum, chase tree					0.228	39.90	Uwakwe and Nwaoguikie, 2008; Egunyomi et al., 2009
173	<i>Xylopia aethiopica</i> (Dunal) A. Rich	Annonaceae	UBHdt/SN/059	African pepper, Guinea pepper	èèrù, ódà, ùdà, kimbáá	fruit	Wild and cultivated	Tree	0.239	41.83	Egunyomi et al., 2009; Ejele et al., 2012; Ameh et al., 2012
174	<i>Zanthoxylum zanthoxyloides</i> (Lam.) Zepern. & Timler. Engl.: <i>Zingiber officinale</i> Rosc.	Rutaceae	UBHdt/SN/094	Fagara, candlewood.	Orin ata	Root	Wild and cultivated	Herb	0.228	39.90	Kshatriya et al., 2008
175		Zingiberaceae	UBHdt/SN/174	Ginger	Atale,	rhizome	Cultivated				

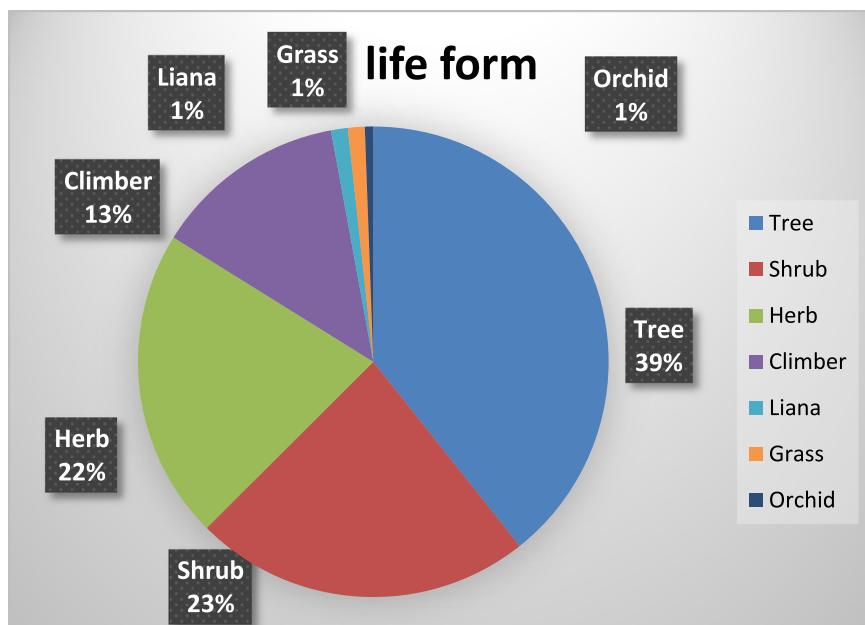


**Fig. 2.** Percentage distribution of families of medicinal plants used in management of Sickle cell disease in Southern Nigeria.

### sources of plant species



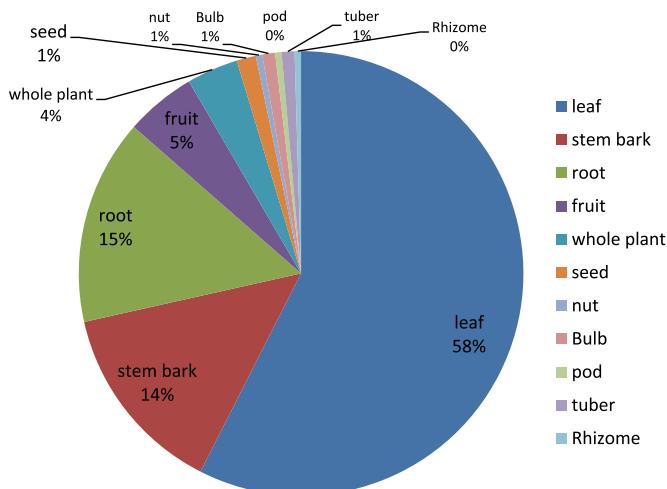
**Fig. 3.** Status of medicinal plants used in the management of sickle cell disease in Southern Nigeria.



**Fig. 4.** Percentage of growth of medicinal plants used in the management of sickle cell disease in Southern Nigeria.

Area of Ekiti State, Nigeria respectively. Most of the plant species collected was obtained from the wild (49%) as depicted in Fig. 2. This indicates that these plants may be greatly endangered. The

plants growth form were trees (38.96%) followed by shrubs (23.00%), herbs (21.14%), climber (13.14%), grass and liana (1.14%) and orchid (0.57%) (Fig. 3). Trees and shrubs were the most



**Fig. 5.** Percentage of plant parts used in the management of sickle cell disease in Southern Nigeria.

frequent growth form for preparing SCD formulation in Southern Nigeria. This might be due to the plant availability throughout seasons as they are drought resistant and not affected by seasonal variations (Albuquerque, 2006). Leaves (69.10%) and root (17.98%) are the main parts of plant used for preparation of recipes to manage SCD (Fig. 4). The whole plant was used in some species such as *Alstonia boonei*, *Sida carpinifolia*, *Picralima nitida*, *Olax subscorpioides*, *Newbouldia laevis*, *Ficus capensis*, *Ficus exasperate*. The harvesting of leaves does not damage the plant as compared to the collection of stem and root barks (De Wet et al., 2013). Majority of the herbal preparation involved boiling the plant parts and drinking the decoction while few involved soaking in alcohol for few days before taken (tincture) Fig. 5.

### 3.3. Use Value and Fidelity level (FL (%))

The relative importance of the plants with use value (UV) and fidelity level (FL) is displayed in Table 2. The highest UV was noted in *Citrus aurantifolia* (0.692) while *Acacia xanthophloea*, *Baphia nitida* and *Blighia sapida* had the lowest UV of 0.001. Researcher claimed that knowing the use value of a plant might be useful in determining the use reliability and pharmacological features of the related medicinal plant (Cakilcioglu and Turkoglu, 2010). Polat et al. (2013) reported that conducting an activity study with these plants been used by study participants with high use value might be beneficial. The fidelity level values showed that *Citrus aurantifolia* recorded the highest value 70.2% while *Angraecum distichum* had the lowest value of 0.081%.

### 3.4. Verification of claims of activity of plants used in Southern Nigeria

The result obtained, verify claims of antisickling activity of plants used in Southern Nigeria (Table 2). This study recorded one hundred and two (102) plant species being used to manage sickle cell disease for the first time with no literature records. The remaining seventy-three plant species out of 175 recorded plants in the present study have earlier been evaluated for their antisickling activity. Scientists proposed that if a plant is used to treat the same disease in different places across the world then its pharmacologic effect could be accepted (Cakilcioglu et al., 2011). The 102 plants which have not been evaluated may show some promising potential antisickling activity.

## 4. Conclusion

The study showed that people in the studied areas are knowledgeable in the medicinal plants used to manage sickle cell disease. It was observed that majority of the information were obtained from traditional healers and acquired by inheritance. Moreover, these traditional healers are of old age and there is no proper documentation about their knowledge. There is thus a possibility of losing this valuable ethnomedicinal knowledge in the nearest future and therefore, this present study provides opportunity to sustain the knowledge by documentation. This study reported for the first time 102-plant species having antisickling potentials with Fabaceae and Euphorbiaceae as the most dominant plant families. They serve as the largest flowering plant families with great medicinal importance. Many of the claimed plants were harvested from the wild. The accessibility and availability of the medicinal plants is very important so that people can easily harvest it for medicinal utilization. This could also provide awareness for government to formulate policy to conserve these medicinal plants for future generation to avoid extinction of the plants. Some plants with high use value and fidelity level provide quantitative and qualitative ethnomedicinal evaluation within and across the plant families. This gives room for further scientific investigations in pharmacological profiles and better economic exploitations.

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