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To cite this article: Kola' K. Ajibesin, Danladi N. Bala & Uwemedimo F. Umoh (2012) Ethno medicinal survey of plants used by the indigenes of Rivers State of Nigeria, *Pharmaceutical Biology*, 50:9, 1123-1143, DOI: [10.3109/13880209.2012.661740](https://doi.org/10.3109/13880209.2012.661740)

To link to this article: <https://doi.org/10.3109/13880209.2012.661740>



Published online: 13 Aug 2012.



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RESEARCH ARTICLE

Ethno medicinal survey of plants used by the indigenes of Rivers State of Nigeria

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Abstract

Context: The medicinal plants used in the traditional medicine of Rivers State of Nigeria were surveyed.

Objective: The survey aims to identify and document the plants used amongst the indigenes of Rivers State.

Materials and methods: Semi-structured interviews were conducted during a field trip to gather information from traditional medical practitioners (TMPs) and community elders.

Results: Medicinal plant species (188) representing 169 genera and 82 families used in the ethno medicine of the people of Rivers State were recorded from 460 households. The most represented genera were *Ipomoea* and *Citrus* providing four species each. The most important species showed the highest Fidelity level (FL) value and these included *Ageratum conyzoides* L. (Asteraceae) (100%) and *Tridax procumbens* L. (Asteraceae) (100%). The most important categories of diseases were those that showed the highest Informant consensus factor (ICF) value of 0.99, such as dermal or digestive problems and fever/malaria. The most used plant part was leaves (42%), while decoction was the main method of drug preparation (36%).

Discussion and conclusion: The survey shows that more than half of the medicinal plants gathered in Rivers State are also used in other countries of the world for various ailments. The high values of ICF recorded indicate high degree of agreement among the informants, while the high FL values suggest the popular use of the plants. The survey provides a useful source of information for TMPs and medicinal plant researchers. These medicinal plants gathered may bring about drug discovery and may also be incorporated into the healthcare delivery system of the country.

Keywords: Ethno medicine, medicinal plants, traditional medical practitioners, dermal problems, digestive problem

Introduction

Throughout the ages people have turned to herbal medicine for healing. All cultures have folk medicines that include the use of plants and plant products. Traditional medicine is becoming more the mainstream as improvement in analysis and quality control alongside advances in clinical research show the value of traditional medicine in the treatment and prevention of diseases (Kraft, 2009). Alternative medicine emphasizes therapies that improve quality of life, prevent disease, and address conditions that modern medicine has limited success in curing (Blackman, 2008). Traditional systems of medicine – both organized (e.g., Ayurveda and Chinese traditional medicine) and unorganized (herbalism) – using medicinal

plants as the raw material is crucial to indigenous people in the developing countries of the world (Bannerman, 1979; Rastogi & Dhawan, 1982).

The World Health Organization (2002) estimated that about 80% of people worldwide rely on herbal medicine for some part of their primary health care. A similar percentage of the Nigerian population was reported to employ traditional medicine for their primary health care (Sofowora, 1991; Ajibesin et al., 2008). Traditional medicine is gaining prominence in view of new or resistant and challenging ailment which modern medicine has not been able to address, and the total care approach of traditional medicine. In wealthy nations, a growing number of patients rely on alternative medicine for preventive or

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(Received 02 September 2011; revised 17 January 2012; accepted 25 January 2012)

palliative care. In France, 75% of the population has used complementary medicine at least once, in Germany, 77% of pain clinics provide acupuncture and in the UK, expenditure on complementary and alternative medicine stands at USD 2.3 million per year (WHO, 2002). In the US, public dissatisfaction with the cost of prescription medications, combined with an interest in returning to natural or organic remedy results in an increase in the use of herbal medicine (Moquin et al., 2009). Global estimate of herbal medicine business has been put down to about USD 60 million (NNMDA, 2006).

Traditional medicine is generally transmitted orally through a community, family, or individuals. However, such knowledge is scarcely documented in developing countries and this may result in distortion or loss of the entire knowledge. Hence, this study aims to identify and document medicinal plants used in traditional medicine of Rivers State of Nigeria.

Materials

Study area

Rivers State is situated in the oil rich Niger Delta Region of Nigeria (Figure 1). It is bounded on the South by the Atlantic Ocean, to the North by Imo, Anambra and Abia States, to the East by Akwa Ibom State and to the West by Bayelsa and Delta States (Anonymous, 2003). The State covers a total land area of 11,077 km² and lies between latitudes 4° 45' N and longitudes 6° 50' E. The inland part of the State consists of tropical rainforest, while mangrove forest, a characteristic of the Niger Delta environment dominates the coast (Anonymous, 2003).

Rivers State consists of twenty-three Local Government Areas with a population of about 6,689,087. The State is made of four major ethnic groups: Ikwerre, Ekpeye, Kalabari and Ogoni, from which other minor ethnic groups emerged such as Abua, Andoni, Engenni, Etche, Ibani, Igbani, Ndoni, Ogba and Okrika. Thus, the languages of the four major ethnic groups are spoken throughout the State.

The people of Rivers State are of diverse tribes and languages, whose chief occupations are fishing for those living in the riverside areas, and farming for those in the upland areas. However, the urban dwellers embark on commerce and industry. The people also produce fired clays and bronze. Majority of the people live in the rural areas (about 72%) and are bonded culturally by music, dances, plays and masquerades (Anonymous, 2003).

Rivers State has one of the largest economies in Nigeria, mainly because of its crude oil. The State has two major refineries, two major seaports, airports and various industrial spread across the State.

Mode of information collection

The ethno medicinal survey was undertaken between January and December 2010. Information on data such as local names, plant part used, therapeutic effect, diseases treated, method of preparation and method of

administration, doses and duration of treatment was gathered through semi-structured questionnaires amidst informal conversation (Huntington, 2000). Interviews were administered individually on traditional medical practitioners (TMPs) and community elders in all the Local Government Areas of Rivers States (Figure 1). All the TMPs interviewed were those available in all the Local Government Areas, while the selection of community elders was based on the recommendation of the respective community head. The basic method followed was a guided field interview (Martin, 1995; Maundu, 1995). The informants were conducted during the day on field trips to areas where they often collected plants, while survey interviews which included questions such as what ailments were treated by what plant species were simultaneously asked and information taken. The information obtained was noted while in the field and later cross checked with the informants at evening meetings, which usually

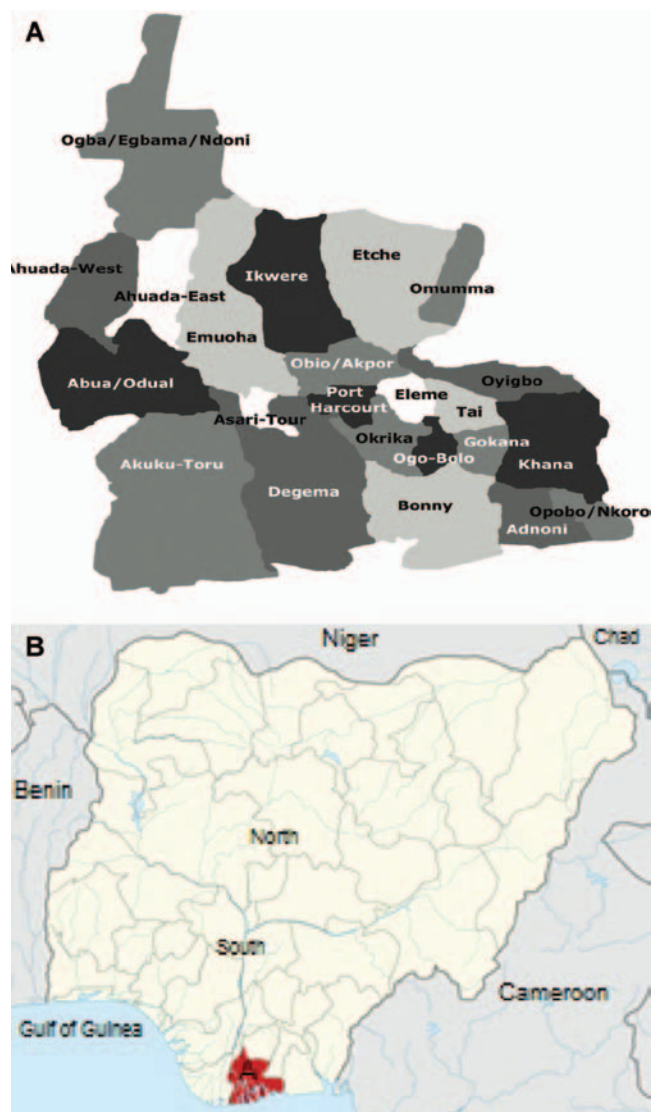


Figure 1. (A) Map of Rivers State showing the Local Government Areas surveyed. Map of Nigeria. (B) (shaded portion): Rivers State.

comprised the TMP, community elders and any other interested persons. Informed consent was obtained from every informant prior to the interview. Interviews were conducted with the aid of an interpreter throughout the survey. The survey covered all the local government areas of the State (Figure 1).

Medicinal plants mentioned were collected, identified and subsequently preserved and stored in the herbarium of the Department of Pharmacognosy and Natural Medicine, Faculty of Pharmacy, University of Uyo.

The plants were identified by the use of flora of Nigeria and West Africa, and their taxonomy was further established by the use of International Plant Names Index Database and African Plants Database (Hutchinson & Dalziel, 1954, 1958, 1968; Keay et al., 1964; Stanfield & Lowe, 1987; Anonymous, 2008, 2009), as well as by the use of other publications on medicinal plants (Iwu, 1986, 1993; Ajibesin et al., 2008).

Biodiversity rights of the indigenes were protected. Aerial parts of the plants were collected on a sustainable basis so as to preserve the lives of the plants. Where collection of roots was involved, new plants were cultivated for sustenance of biodiversity.

Data analysis

Informant consensus factor

The reported diseases were grouped into twelve categories based on the information gathered from the respondents. The categories were: parasitic, viral and bacterial diseases; dermal system; digestive system; musculoskeletal and articular system; nervous system; reproductive system; respiratory system; stings/bites; fever/malaria; urinary system; cardiovascular system and others such as anemia, diabetes, ear infection and eye infection. Informant consensus factor (ICF) was calculated for each category of ailments to identify the agreements of the informants on the reported cures for the group of ailments. ICF was calculated as follows:

$$ICF = \frac{(N_{ur} - N_t)}{(N_{ur} - 1)}$$

where N_{ur} is the number of use citations in each category and N_t is the number of species used (Heinrich et al., 1998).

Fidelity level (FL)

Fidelity level was also used to analyze the data. It was calculated for the most frequently reported diseases as:

$$FL(\%) = \frac{N_p}{N} \times 100$$

Where N_p is the number of informants that claim a use of a plant species to treat a particular disease and, N is the number of informants that use the plant as a medicine

to treat any given disease (Alexiades, 1996). This method helps in selecting medicinal plants for further study.

Results

Knowledge of informants and medicinal plants

Four hundred and sixty informants provided information on remedies used to treat 61 ailments (Table 1) in Rivers State, of which 70% were male and 30% female. Their mean age was 65 years. All the healers available for survey (222 TMPs) were male and reported both single and multiple medicinal plants treatment of diseases; whereas the non-healers (238) who were a mix of male and female reported only single medicinal plant remedies (Table 1).

The number of ethno medicinally important plant species documented in Rivers State was 188, belonging to 169 genera and 82 families. The number of medicinal use reports recorded was 54,479 (Table 2). The plants were arranged in the alphabetical order of their families. Local names were provided in four major ethnic languages: Ikwerre, Kalabari, Ogoni, and Ekpeye.

The ten most important plant families in terms of their number of taxa were recorded as Lamiaceae (11), Asteraceae (10), Euphorbiaceae (8), Cucurbitaceae (7), Papilionaceae (7), Rubiaceae (7), Liliaceae (6), Malvaceae (5), Solanaceae (5) and Rutaceae (5) (Figure 2). The most represented genera were *Ipomoea* and *Citrus* providing four species each.

Plant parts used, methods of preparation and administration

The most frequently used plant part was the leaves (42.24%), followed by root (7.36%), bark (7.36%), whole plant (7.36%), seed (6.58%), fruit (6.20%) and stem (4.65%). The other plant parts were rarely mentioned (Figure 3).

Plant remedies were prepared mainly by decoction (36.22%) followed by infusion (24.85%), juice (20.05%) and poultice (11.37%) (Figure 4). The internal method of administration which was largely oral was more common (70.83%) than the external method which was usually topical or bathing (23.56%). Other routes of administration (5.61%) such as eye drop, ear drop, chewing and gargle were also applied.

Importance of ailments treated

Diseases relating to the dermal system, digestive system, fever/malaria, parasitic, viral and bacterial diseases, and musculoskeletal and articular diseases were among the most frequently treated diseases with medicinal plants, representing 67.92% of all the medicinal applications (Table 2). Of this, the largest number of remedies was employed to treat diseases relating to the dermal system (22.07%), followed by digestive problem (15.88%) and fever/malaria (11.73%).

About 32 combinations of medicinal plants were utilized to treat various external and internal ailments (Table 1). Of the multiple plant treatments, 47% contained

Table 1. Medicinal plants of Rivers State.

Family	Botanical name	Specimen number	Local name	Plant part used ^b (sources)	Method of preparation	Allment treated, therapeutic effect	Administration, dosage, duration of treatment	Fidelity Level	Reported ethno botanical uses ^c
Acanthaceae	<i>Justicia shimperi</i> (Hochst) Danby	PNM 1	Ekpegwo (Kalabari)	Leaves (12,13,16,18,19,21)	Decoction	Chest pain, heart failure	Internal use: 3 x 1 till relief	61	
	<i>Acanthus montanus</i> (Nees) T. Anders	PNM 2	Oga (Ikwerre)	Leaves (1-5,7,11,12)	Poultice	Boils, abscess, rheumatism, Malaria	External use: 2 x 1 till relief; Internal use: 2 x 1 for 7 days; External use: bathe till recovery	35	
	<i>Dracaena arborea</i> (Willd.) Link. Enum. Hort.	PNM 3	Odo (Ikwerre)	Bark, leaves (2-4,7,8,11)	Infusion Juice	Stomachache Stomachulcer	Internal use: 3 x 1 till recovery	58	
Anacardiaceae	<i>Anacardium occidentale</i> L.	PNM 4	Kasiu (Kalabari)	Bark, Twigs Leaves (1-23)	Decoction Chewing sticks Poultice	Malaria Toothache Ringworm	Internal use: 3 x 1 for 3 days; chewed (twigs) External use 3 x 1 till relief	68	Toothache (Haiti), diarrhea (Mexico)
	<i>Spondias mombin</i> L.	PNM 5	Aginiran (Ogoni)	Leaves, Bark (1-23)	Decoction Juice Decoction	Gonorrhea, dysentery Toothache, Cough, aphrodisiac, fibroid	Internal use: 3 x 1 for 14 days; gangle 3 x 1 for 5 days; Internal use: 3 x 1 for 3 days	31	Cough (Haiti), gonorrhoea (Ghana)
Annonaceae	<i>Mangifera indica</i> L.	PNM 6	Manko (Ikwerre)	Leaves and bark (1-23), leaves	Infusion Juice	Malaria, headache, jaundice Skin disease	Internal use: 3 x 1 for 2 days; External use: 2 x 1 till relief	44	Malaria (Panama), jaundice (India)
	<i>Pistacia vera</i> L.	PNM 7	Kasiu (Ikwerre)	Nut (1-3,7)	Scrabbled	Debility, premature ejaculation	Internal use: chewed as required till relief	52	
Annonaceae	<i>Annona muricata</i> L.	PNM 8	Nangi (Kalabari)	Leaves (12,14-19,22)	Decoction	Malaria, diarrhoea, dysentery, debility, hypertension, heart failure	Internal use: 3 x 1 till relief	21	
	<i>Xylopiya aethiopica</i> (Dunal) A. Rich.	PNM 9	Enyi (Kalabari)	Seeds, Seeds and fruit Fruits (1-23)	Chew, Poultice Decoction	Cough, rheumatism Diarrhoea, dysentery	Internal use: Chewed till relief; External use: 2 x 1 till relief	37	Dysentery (Africa), rheumatism (Ghana),
Apiaceae	<i>Unaria chamae</i> P. Beauv.	PNM 10	Mfee (Ikwerre)	Root Leaves (5,9)	Decoction Juice	Malaria, hemorrhoid Boil, wound,	Internal use: 3 x 1 till recovery External use: 2 x 1 till relief	35	Pile (Africa), wound (Ghana), purgative (Sierra Leone)
	<i>Anethum graveolens</i> L.	PNM 11	Udumie (Kalabari)	Seed (2,3,9)	Infusion with honey Decoction	Laxative Lactation	Internal use: 2 x 1 for 2 days Internal use: as desired	52	Laxative (Bahamas), carminative (China)
Araceae	<i>Foeniculum vulgare</i> Mill.	PNM 12	Icheje (Ikwerre)	Seed (5,6,7,8,9)	Infusion	Eye infection Cough	Eye wash: 2 x 1 till recovery Internal use: 2 x 1 for 3 days	71	
	<i>Pastinaca sativa</i> L.	PNM 13	Udeghe (Kalabari)	Leaves (9,13,15,17,19)	Decoction	Cough, hypertension	Internal use: 3 x 1 till relief	62	
Apocynaceae	<i>Daucus carota</i> L.	PNM 14	Nsoro (Ikwerre)	Root (1-13,15,18,21)	Decoction	Eye infection	Internal use: 3 x 1 till relief	100	Cancer (US)
	<i>Alstonia boonei</i> De Wild	PNM 15	Ulodiri (Ekpeye)	Bark, Bark and leaves (1-23)	Decoction, Poultice	Malaria, asthma, cough Rheumatism	Internal use: 3 x 1 for 3 days; External use: 2 x 1 till relief	54	
Araceae	<i>Funtumia elastica</i> (Preuss) Staff	PNM 16	Mini-eme (Ikwerre)	Bark (1-5)	Poultice Infusion	Hemorrhoid Jaundice	External use: 2 x 1 till recovery; Internal use: 2 x 1 for 10 days	58	Pile (Ivory Coast), jaundice (Africa)
	<i>Rauwolfia vomitoria</i> Afzel	PNM 17	Donuinya (Kalabari)	Root Leaves (1-23)	Infusion Juice	Mental illness, aphrodisiac Skin disease	Internal use: 2 x 1 till recovery; External use: 2 x 1 for 7 days	47	
Araceae	<i>Xanthosoma sagittifolium</i> (L.) Schott	PNM 18	Edebra (Ogoni)	Leaves Tuber (1-23)	Crushed in water	Skin disease, small pox Hemorrhoid	External use: 2 x 1 for 10 days; Enema: 1 x 1 for 14 days	76	
	<i>Caladium bicolor</i> (Ait) Vent	PNM 19	Honya (Ekpeye)	Corm (3-21)	Poultice	Skin disease, wound	External use: 2 x 1 for 7 days	63	
	<i>Colocasia esculenta</i> (L.) Schott	PNM 20	Inodin (Ekpeye)	Whole plant (13-17, 19,21,23)	Juice	Insect bite, sore	External use: 2 x 1 for 5 days	61	

(Continued)

Table 1. (Continued).

Family	Botanical name	Specimen number	Local name	Plant part used ^b (sources)	Method of preparation	Ailment treated, therapeutic effect	Administration, dosage, duration of treatment	Fidelity Level	Reported ethno botanical uses ^c
Asclepiadaceae	<i>Gongronema latifolium</i> Benth.	PNM 21	Utazi (Ikwerre)	Leaves (6-14,17-20)	Decoction with lime juice and Pine juice,	Diabetes, hypertension, worm infestation, anemia	Internal use: 3 x 1 till recovery;	39	
Asclepiadaceae	<i>Pergularia dermatia</i> (Forsk) Chiov.	PNM 22	Utazi (Ikwerre)	Leaves (1-23)	Poultice Decoction of leaves with those of <i>Carica papaya</i> , <i>Vernonia amygdalina</i> , <i>Ananas comosus</i> and <i>Chromolaena odorata</i> Juice	Boil Typhoid, malaria Cough	External use: 2 x 1 till recovery; internal use: 2 x 1 for 4 days Internal use: 2 x 1 for 4 days	45	
Asteraceae	<i>Aspilia africana</i> Oliv. & Hiern	PNM 23	Oranjila (Ikwerre)	Leaves (1-8,9,11)	Juice	Wound, bleeding	External use: 3 x 1 for 3 days	71	Hemorrhage (Africa)
	<i>Chromolaena odorata</i> (L.) King & Robinson	PNM 24 PNM 25	Nshegbu awom (Ekpeye)Ukuro (Ogoni)	Leaves (1-23) Leaves (8,9,11)	Decoction of leaves with those of <i>Carica papaya</i> , <i>Vernonia amygdalina</i> , <i>Ananas comosus</i> and <i>Pergularia dermatia</i> Infusion Juice Infusion Decoction	Malaria, typhoid Diabetes Skin disease, cut, arthritis Laxative Worm	Internal use: 2 x 1 for 3 days Internal use: 2 x 1 for 7 days External use: 2 x 1 for 3 days Internal use: 2 x 1 for 2 days Internal use: 2 x 1 for 2 days	3268	Carminative (Turkey),
	<i>Emilia coccinea</i> (Sims) G. Don.	PNM 26	Ntiene (Ekpeye)	Leaves (2-5,8)	Juice	Ear and eye infection Measles, skin diseases, sore	Internal use: eye or ear drop 2 x 1 for 3 days External use: 2 x 1 for 4 days External use: 2 x 1 for 5 days	24	
	<i>Ageratum conyzoides</i> L.	PNM 27	Ogba Okukpo (Kalabari)	Leaves (1-3,4, 9,11-23)	Poultice, juice	Skin disease		100	Craw craw (Sierra Leone), wound (India)
	<i>Calendula officinalis</i> L.	PNM 28	Ukpuda (Ikwerre)	Leaves (12-21)	Decoction Poultice	Urinary tract infection, Inflammation	Internal use: 2 x 1 till recovery External use	86	Ulcer (Chile), fever (Trinidad)
	<i>Tridax procumbens</i> L.	PNM 29	Mbuli (Ikwerre)	Leaves (1-23)	Decoction	Skin disease	Internal use: 3 x 1 for 5 days	100	Hemostat, bruise, wound, parasiticide (Africa)
Asteraceae	<i>Adenostemma mauritanium</i> DC.	PNM 30	Oforu (Ikwerre)	Leaves (12-23)	Infusion	Measles	Internal use: 2 x 1 for 14 days	100	
	<i>Vernonia amygdalina</i> Del.	PNM 31	Olugbu (Ekpeye)	Leaves Bark (1-23)	Decoction with <i>Carica papaya</i> , <i>Chromolaena odorata</i> , <i>Ananas comosus</i> and <i>Pergularia dermatia</i> Infusion Decoction	Malaria, typhoid Diabetes; laxative Rheumatism	Internal use: 2 x 1 for 3 days Internal use: 3 x 1 for 14 days; 2 x 1 for 1 day Internal use: 2 x 1 for 7 days	46	Laxative (West Africa), fever (Angola), yaws (South Africa)
Bassellaceae	<i>Tussilago farfara</i> L.	PNM 32	Odoupo (Ekpeye)	Leaves (4,9)	Decoction	Miscarriage	Internal use: 2 x 1 for 14 days	100	
	<i>Bassella alba</i> L.	PNM 33	Gbologi (Ikwerre)	Whole plant (1-3,6,8)	Infusion	Laxative	Internal use: 3 x 1 for 5 days	100	
Betulaceae	<i>Corylus avellana</i> L.	PNM 34	'Hazel' (Ikwerre)	Leaves and flowers (1,4,5,7,9)	Decoction Decoction	Hemorrhoid Menstrual disorder, bleeding	Internal use: 3 x 1 for 14 days; Internal use: 2 x 1 for 5 days	47	

(Continued)

Table 1. (Continued).

Family	Botanical name	Specimen number	Local name	Plant part used ^b (sources)	Method of preparation	ailment treated, therapeutic effect	Administration, dosage, duration of treatment	Fidelity Level	Reported ethno botanical uses ^c
Bignoniaceae	<i>Neuboulidia laevis</i> (P. Beauv.) Seeman ex Beauv.	PNM 35	Ogilisi (Ogomi)	Leaves and root; leaves Bark (1-8,11)	Decoction Poultice	Convulsion, epilepsy, bleeding; eye infection Skin disease	Internal use: 2 x 1 for 5 days; External use: eye wash 2 x 1 for 5 days External use: 1 x 1 for 5 days	28	Epilepsy (Upper Volta), hemorrhage (Ghana)
	<i>Spathodea campanulata</i> P. Beauv.	PNM 36	Arochukwu (Ikwerre)	Leaves Bark (5,6,9,11)	Juice Infusion	Convulsion; burn, skin disease, wound Diarrhea, dysentery	External use; Internal use: 2 x 1 for 5 days Internal use: 3 x 1 for 3 days	33	Dysentery (Ghana), sore (Central Africa)
	<i>Heliotropium indicum</i> L.	PNM 37	Azu (Ekpeye)	Whole plant (1,3,4,7)	Decoction Infusion Infusion	Malaria, convulsion Worm Toothache Scorpion sting, insect bite, boil	Internal use: 3 x 1 for 3 days and bathing; External use: bathing; Internal use: 2 x 1 for 2 days; Gargle: 2 x 1 for 5 days Internal use: 3 x 1 for 2 days	22	Boil, eczema (Haiti), thrush (Java), scabies (India)
Brassicaceae	<i>Brassica nigra</i> (L.) W.D.J. Koch	PNM 38	Ogwu nje (Kalabari)	Leaves Seeds (2,6,8,10,11)	Juice mixed with onion juice Poultice Infusion	Hypertension Rheumatism Headache	Internal use: 2 x 1 for 14 days External use: 2 x 1 for 5 days External use: bath	36	Arthritis, rheumatism lumbago (China),
	<i>Brassica oleracea</i> L.	PNM 39	Ogbeagu (kalabari)	Leaves (2,3,5,9)	Juice Poultice	Stomachulcer, diabetes Wound	Internal use: 2 x 1 for till recovery External use: 2 x 1 for till recovery	43	Wart (France), cancer (Spain)
Bromeliaceae	<i>Nasturtium officinale</i> R. Br	PNM 40	Aguba (Ikwerre)	Leaves (3,9,11)	Decoction	Impotence	Internal use: 2 x 1 for 14 days	100	Aphrodisiac (Africa)
	<i>Ananas comosus</i> (L.) Merrill	PNM 41	Ediebo (Ekpeye)	Fruit (1-23)	Decoction with <i>Carica papaya</i> , <i>Chromolaena odorata</i> , <i>Vernonia amygdalina</i> and <i>Pergularia dermatis</i> Fruit decoction	Typhoid, malaria Menstrual disorder Waist pain	Internal use: 2 x 1 for 3 days Internal use: 2 x 1 for 7 days; Internal use: 2 x 1 for 5 days	45	Diuretic (Germany), digestive (Iran)
		PNM 42	Eben (Ikwerre)	Leaves (1-23)	Decoction with <i>Carica papaya</i> , <i>Citrus limon</i> and <i>C. sinensis</i> Decoction	Skin disease, hypertension, cough	Internal use: 2 x 1 for 5 - 10 days	55	
Caesalpinaceae	<i>Dialium guineense</i> Willd	PNM 43	Ugbe-him (Ikwerre)	Leaves (4-8)	Infusion	Malaria, diarrhoea, stomachache Toothache	Internal use: 2 x 1 for 3 days Gargle: 2 x 1	27	
Cannabaceae	<i>Senna alata</i> L.	PNM 44	Nduruchi (Ikwerre)	Leaves	Poultice	Abscess, inflammation, skin disease Bleeding	External use: 2 x 1 for 5 days Internal use: 3 x 1 for 5 days	57100	Skin (Philippians), itch (Venezuela), ringworm (Ghana)
	<i>Senna occidentalis</i> (L.) Link	PNM 45	Agbara (Ogomi)	Root (1-23)	Infusion				
	<i>Distemonanthus benthamianus</i> Baill.	PNM 46	Osashi (Ikwerre)	Bark (4,5,7,11)	Poultice Decoction with <i>Pterocarpus erinaceus</i>	Skin disease, boil Malaria	External use: 2 x 1 for 7 days; Internal use: 3 x 1 till relief	72	
	<i>Humulus lupulus</i> L.	PNM 47	Oshikapa (Ogomi)	Leaves Bark (9,10)	Poultice Infusion Decoction	Rheumatism Malaria Infertility	External use: 3 x 1 for 3 days; Internal use: 3 x 1 for 3 days and bathing Internal use: 2 x 1 for 3 days	43	Rheumatism, fever (US), tuberculosis (China)

(Continued)

Table 1. (Continued).

Family	Botanical name	Specimen number	Local name	Plant part used ^b (sources)	Method of preparation	Aliment treated, therapeutic effect	Administration, dosage, duration of treatment	Fidelity Level	Reported ethno botanical uses ^c
Capparaceae	<i>Cratogeomada adansonii</i> DC	PNM 48	Amakarode (Kalabari)	Leaves Bark (1-9, 19, 21, 22)	Poultice Decoction Decoction	Rheumatism Malaria Infertility Stomachache	External use: 3 x 1 for 7 days; Internal use: 2 x 1 for 3 days; Internal use: 3 x 1 for 1 month; Internal use: 2 x 1 for 3 days	32	
Caricaceae	<i>Carica papaya</i> L.	PNM 49	"Pawpaw" (Ogoni)	Leaves (1-23) Fruit Root	Decoction with <i>Ananas comosus</i> , <i>Chromolaena odorata</i> , <i>Vernonia amygdalina</i> and <i>Pergularia dermatia</i> Decoction Decoction with <i>Ananas comosus</i> , <i>Citrus limon</i> and <i>C. sinensis</i> Infusion	Diabetes Waist pain Syphilis	Internal use: 2 x 1 for 3 days Internal use: 2 x 1 for 14 days Internal use: 2 x 1 for 5 days Internal use: 3 x 1 for 14 days	25	Veneral diseases (Trinidad), tumor (Indochina), asthma (Mexico)
Caryophyllaceae	<i>Stellaria media</i> (L) Vill.	PNM 50	Ahilia okuko (Ikwerre)	Leaves (3,8,9,11)	Decoction	Cough, debility	Internal use: 2 x 1 for 3 days	60	Debility (Turkey)
Clusiaceae	<i>Garcinia kola</i> Heckel	PNM 51	Aklu, akama (Ikwerre)	Seed (1-23)	Chew with <i>Aframomum melegueta</i> seed	Cough, liver problem	Internal use: eaten as desired	96	Masticatory (Africa)
Combretaceae	<i>Terminalia superba</i> Engl and Diels	PNM 52	Egae (Ogoni)	Leaves	Decoction	Skin disease	External use: bath 2 x 1 for 7 days	29	
	<i>Combretum racemosum</i> P. Beauv.	PNM 53	Adallabanya (Kalabari)	Stem, root (1,3,4,6,8) Leaves (12,15,16,18,19,21-23-W)	Juice Infusion Juice	Eye infection Diarrhea, dysentery Skin disease	Eye drop: 2 x 1 for 5 days Internal use: 2 x 1 for 2 days External use: 2 x 1 for 5 days	100	Vermifuge (Ghana)
Commelinaceae	<i>Palisota hirsuta</i> (Thunb.) K. Schum.	PNM 54	Asatie (Ekpeye)	Leaves (8,10)	Poultice	Boil Gonorrhea	External use: 2 x 1 for 7 days Internal use: 3 x 1 for 14 days	50	Craw craw, (Africa), gonorrhea (Sierra Leone)
Convolvulaceae	<i>Ipomoea involucrata</i> P. Beauv.	PNM 55	Fiflori (Kalabari)	Leaves Leaves and stem (1-8,9)	Infusion Decoction	Malaria, rheumatism Asthma	Internal use: 3 x 1 for 3 days Internal use: 2 x 1 for 3 days	70	
	<i>I. mauritania</i> Jacq.	PNM 56	Mgba-ala	Root (1,2,6,8,11)	Decoction	Asthma	Internal use: 2 x 1 for 3 days	100	
	<i>I. quamoclit</i> L.	PNM 57	Kpulibo (Ogoni)	Leaves (12-23)	Poultice	Boil, wound	External use: 2 x 1 for 5 days	74	Snakebite (Australia)
Connaraceae	<i>Cnestis ferruginea</i> DC.	PNM 58	Okpe-nketa (Ikwerre)	Leaves (12,13,14,17)	Infusion	Eye infection	Eye drop: 2 x 1 for 3 days	100	Ophthalmia (Upper Volta)
Crassulaceae	<i>Bryophyllum pinnatum</i> (Lam) Oken	PNM 59	Nkwaaka (Ekpeye)	Leaves (4,6,7,8,9)	Juice	Ear infection Cough, boil, convulsion	Ear drop: frequently Internal use: 2 x 1 for 3 days	29	Earache (Trinidad), epilepsy, spasm (Haiti)
Cucurbitaceae	<i>Adenopus breviflorus</i> Benth	PNM 60	Ukuro (Ekpeye)	Fruit Leaves (1-11)	Infusion Decoction	Convulsion Laxative	External use: bath Internal use: 2 x 1 for 2 days	78	
	<i>Citrullus colocynthis</i> (L.) Schrad	PNM 61	Egusi (Kalabari)	Fruit Leaves and fruit Seed shell (1-8, 11)	Decoction Decoction Powder mixed with palm oil	Syphilis, stomachache Laxative Skin disease	Internal use: 2 x 1 for 7 days Internal use: 2 x 1 for 2 days External use: 3 x 1 for 5 days	49	Cathartic (Egypt), urogenital (Kurdistan)
	<i>Momordica charantia</i> L.	PNM 62	Alo ose (Ogoni)	Leaves and fruit Fruit (1,4,5,7,10,11)	Decoction Decoction	Diabetes Worm Infertility	Internal use: 2 x 1 for 14 days Internal use: 2 x 1 for 3 days Internal use: 2 x 1 for 30 days	42	Diabetes (Cuba), emmenagogue (Panama), snakebite (India)
	<i>Momordica balsamina</i> L.	PNM 63	Sibifuka (Kalabari)	Whole plant (12,13)	Decoction	Hemorrhoid	Internal use: 2 x 1 for 5 days	100	Fever (Ghana), wound (Syria)

(Continued)

Table 1. (Continued).

Family	Botanical name	Specimen number	Local name	Plant part used ^b (sources)	Method of preparation	Alliment treated, therapeutic effect	Administration, dosage, duration of treatment	Fidelity Level	Reported ethno botanical uses ^c
	<i>Cucurbita maxima</i> Duchesne	PNM 64	Akumocha (Ikwerre)	Leaves (14-20,22)	Juice	Skin disease	External use: 3 x 1 for 3 days	100	Rash (Hawaii), boil (Iraq)
	<i>Luffa cylindrica</i> (L.) M.J. Roem	PNM 65	Ania mme	Leaves Root (2-8,11)	Infusion Decoction	Cough Laxative	Internal use: 3 x 1 for 3 days Internal use: 2 x 1 for 2 days	77	Cough (Japan), carminative (China)
Cucurbitaceae	<i>Telfaria occidentalis</i> Hook. f.	PNM 66	Mkpuru ugu	Flowers, leaves (1-23)	Decoction \Poultice	Headache, anemia Acne	Internal use: 2 x 1 for 7 days External use: 2 x 1 till relief	72	
Dioscoreaceae	<i>Dioscorea villosa</i> L.	PNM 67	Ododo (Kalabari)	Tuber (12,13,16,19,20,21)	Juice	Stomachache Infertility	Internal use: 2 x 1 for 2 days Internal use: 3 x 1 for 30 days	56	Uterotonic, asthma (US)
	<i>Dioscorea rotundata</i> Poir	PNM 68	Fingi (Kalabari)	Leaves (13-17,20,22,23)	Infusion	Burn, skin disease	External use: 3 x 1 for 5 days	95	
Equisetaceae	<i>Equisetum arvense</i> L.	PNM 69	Oru etemi (Kalabari)	Leaves (4-21)	Infusion Decoction	Asthma, cough Urinary tract infection	Internal use: 2 x 1 for 3 days Internal use: 3 x 1 for 5 days	39	Sore (United Kingdom, Canada)
Ericaceae	<i>Vaccinium myrtillus</i> L.	PNM 70	Anyaoka (Ikwerre)	Leaves (15-20,21,23)	Decoction	Eye infection	Internal use: 2 x 1 till recovery	100	
Euphorbiaceae	<i>Croton lobatus</i> L.	PNM 71	Okwe (Ikwerre)	Leaves (1,5,7,8,11)	Poultice Decoction	Skin disease, rheumatism, scorpion sting Stomachache	External use: 3 x 1 for 7 days Internal use: 2 x 1 for 3 days	34	
	<i>Ricinus communis</i> L.	PNM 72	Ogiri aro (Ogomi)	Seed Leaves (2-8,9-14)	Decoction Juice	Stomachache Worm infestation Skin disease	Internal use: 2 x 1 for 3 days Internal use: 2 x 1 for 2 days External use: 2 x 1 for 5 days	82	Stomachache (South Africa), burn (India)
Euphorbiaceae	<i>Alchornea cordifolia</i> (Schum & Thonn.) Muell. Arg.	PNM73	Epai (Ikwerre)	Leaves Leaves and root (3,6,7,9,11)	Juice Decoction Poultice Decoction	Wound Toothache Hemorrhoid, ringworm, rheumatism Gonorrhea	External use: 2 x 1 for 7 days Gargle: 2 x 1 for 3 days External use: 3 x 1 for 5 days Internal use: 2 x 1 for 14 days	20	
	<i>Acalypha fimbriata</i> (Schum & Thonn) Forsk	PNM 74	Abalebaji (Kalabari)	Leaves Leaves and twigs (1-7,9,11)	Juice Decoction	Heart failure, cough skin disease, boil	Internal use: 2 x 1 for 7 days External use: bath 2 x 1 for 5 days	28	
	<i>Jatropha curcas</i> L.	PNM 75	Olulu idu (Ogomi)	Leaves Twigs Root ((1-23)	Juice, poultice Chewing stick Decoction	Skin disease Toothache Syphilis Hemorrhoid	External use: 2 x 1 for 2 days Chewed Internal use: 2 x 1 for 14 days	82	Caries, skin (Africa), rash (Trinidad), gonorrhoea (Haiti)
	<i>Tetracarpidium conophorum</i> (Muell. Arg.) Hutch & dalz.	PNM 76	Ukpa (Ikwerre)	Leaves and seeds (5,8,9)	Infusion	Hemorrhoid	Internal use: 3 x 1 for 7 days	100	
	<i>Euphorbia hirta</i> L.	PNM 77	Okwu ngwo (Ikwerre)	Whole plant (12,15,16,18,19,20)	Decoction	Asthma	Internal use: frequently till recovery	100	Cough (Africa, India)
	<i>Croton zambesicus</i> L.	PNM 78	Alete (Ogomi)	Leaves (12-15,17,22,23)	Decoction	Dysentery, diarrhea	Internal use: 3 x 1 till recovery	71	
Fabaceae	<i>Glycyne max</i> L.	PNM 79	Mmanu agwa (Ikpeye)	Seed (2,3,4,6,11,7,9,10,13,16,17,21,22)	Extraction of oil, Decoction Oil	Eye infection, anemia Measles	Internal use: 2 x 1 for 7 days, External use: 2x1 for 2 days	54	Ophthalmia, eczema, smallpox (China)
Flacourtiaceae	<i>Caloncoba echinata</i> (Oliv.) Glig	PNM 80	Uhie (Kalabari)	Leaves Seed (6,8,9,13,14,19)	Decoction Decoction	Measles Hepatitis Diabetes	Internal use: 2 x 1 till recovery Internal use: 3 x 1 for 14 days Internal use: 2 x 1 till recovery	42	

(Continued)

Table 1. (Continued).

Family	Botanical name	Specimen number	Local name	Plant part used ^b (sources)	Method of preparation	Ailment treated, therapeutic effect	Administration, dosage, duration of treatment	Fidelity Level	Reported ethno botanical uses ^c
Geraniaceae	<i>Pelargonium graveolens</i> L.	PNM 81	Apara (Ikwerre)	Seed and fruit (3,5,8,10)	Juice, decoction Poultice	Hypertension, stomachulcer Skin disease, wound	Internal use: 2 x 1 till recovery External use: 2 x 1 for 5 days	32	
Grossulariaceae	<i>Embllica officinalis</i> L.	PNM 82	Igbero (Kalabari)	Leaves (16,17,19,20,21,23)	Decoction	Eye infection	Internal use: 2 x 1 till recovery	100	
Hamamelidaceae	<i>Hamamelis virginiana</i> L.	PNM 83	Ogwu ogwu (Ikwerre)	Leaves and stem (1-23)	Decoction	Convulsion, epilepsy	Internal use: 2 x 1 for 7 days	56	Hemorrhage, pile (China)
Icacinaeae	<i>Lastanthera africana</i> P. Beauv	PNM 84	Turumma (Ekpeye)	LeavesFruit (1-23)	Infusion Juice Infusion	Measles, gonorrhoea Skin disease, measles Asthma	Internal use: 2 x 1 till recovery External use: 3 x 1 for 3 days Internal use: 3 x 1 for 3 days	30	
	<i>Icacina trichantha</i> Oliv.	PNM 85	Mbia (Ikwerre)	Leaves (12-15,18,22)	Juice	Asthma	Internal use: 2 x 1 for 4 days	100	
Irvingiaceae	<i>Irvingia gabonensis</i> (Ambry-lecomte ex O' Rorke) Baill.	PNM 86	Uglli (Ikwerre)	Leaves Bark Seed (1-23)	Decoction Infusion Poultice Decoction	Stomachache Worm Skin disease Infertility	Internal use: 2 x 1 for 3 days Internal use: 2 x 1 for 3 days External use: 2 x 1 for 5 days External use: 2 x 1 for 30 days	40	
Lamiaceae	<i>Origanum majorana</i> L.	PNM 87	Atagbasi (Kalabari)	Flower (2-9,11)	Infusion Decoction	Hypertension Laxative Rheumatism	Internal use: 2 x 1 for 7 days Internal use: 3 x 1 for 2 days External use: bath 2 x 1 for 2 days	45	Carminative (Turkey), cancer (Europe)
	<i>Rosmarinus officinalis</i> L.	PNM 88	Imerewo (Ogomi)	Leaves (9,11)	Decoction	Malaria	Internal use: 2 x 1 for 3 days	100	Stress (China)
Lamiaceae	<i>Marrubium vulgare</i> L.	PNM 89	Oguru (Ogomi)	Leaves Leaves and seeds (1-23)	Poultice Decoction	Inflammation, rheumatism Stomachache, stomachulcer, typhoid, malaria, cough, skin disease	External use: 2 x 1 till recovery Internal use: 2 x 1 for 10 days	34	Fever (Mexico), stomachic (Turkey)
	<i>Thymus vulgaris</i> L.	PNM 90	Akuko (Ikwerre)	Leaves (1-8,10,11)	Infusion	Laxative	Internal use: 2 x 1 for 7 days	100	
	<i>Ocimum basilicum</i> L.	PNM 91	Ihiri (Kalabari)	Leaves (1,4,7,9,11)	Juice Infusion mixed with a pinch of salt	Skin disease Stomachache, dysentery, laxative	External use: 2 x 1 for 3 days Internal use: 3 x 1 for 3 days Internal use: 3 x 1 for 14 days	34	Stomach (China), dysentery (Kurdistan)
	<i>Ocimum gratissimum</i> L.	PNM 92	Odukwu (Ekpeye)	Leaves (1-23)	Infusion	Hemorrhoid	Internal use: enema 1 x 1 for 5 days Internal use: 2 x 1 for 7 days	42	Stomachache (Ghana, Sierra Leone), cough (Upper Volta)
	<i>Solenostemon monostachyus</i> (P. Beauv.) Briq.	PNM 93	Egba (Ikwerre)	Leaves (5-11)	Decoction	Stomachache, cough Measles, malaria	Internal use: 2 x 1 for 7 days	77	
	<i>Hypis pectinata</i> (L.) Poir	PNM 94	Tululie (Ekpeye)	Whole plant (4-8)	Infusion	Malaria Stomachache Convulsion	Internal use: 2 x 1 for 5 days Internal use: 2 x 1 for 3 days External use: bath 2 x 1 for 2 days	36	Spasm, vermifuge, tonic (Malagasy)
	<i>Salvia officinalis</i> L.	PNM 95	Uzi (Ikwerre)	Leaves, stem (12-19,21)	Juice Juice mixed with <i>Zingiber officinale</i>	Diabetes, cough, ear infection Stomachache	Internal use: 2 x 1 till recovery	49	
	<i>Hyssopus officinalis</i> L.	PNM 96	Ofete (Ikwerre)	Root, stem (13,15,16,18,20,22)	Decoction	Diabetes, jaundice, laxative, heart failure, ear infection, Skin disease, rheumatism, stomachache, laxative, diarrhea	Internal use: 2 x 1 till recovery	35	Tumor (Europe), carminative (Turkey)
	<i>Satureja hortensis</i> L.	PNM 97	Aghara (Ikwerre)	Leaves, stem (12-14,16,17,19,21)	Infusion		Internal use: 3 x 1 till recovery	39	Diarrhea, laxative (Turkey)

(Continued)

Table 1. (Continued).

Family	Botanical name	Specimen number	Local name	Plant part used ^b (sources)	Method of preparation	Ailment treated, therapeutic effect	Administration, dosage, duration of treatment	Fidelity Level	Reported ethno botanical uses ^c	
Lauraceae	<i>Cassipoupa filiformis</i> L.	PNM 98	Ngbu akpu (Ikwerre)	Whole plant (2-10)	Infusion Juice	Infertility Worm infestation Skin disease	Internal use: 3 x 1 for 30 days Internal use: 2 x 1 for 3 days External use: 2 x 1 for 5 days	57	Cold (Solomon), dropsy (India)	
		PNM 99	Ube (Ikwerre)	Fruits and leaves Fruit (1-23)	Decoction Infusion	Hypertension Menstrual disorder	Internal use: 2 x 1 for 7 days Internal use: 2 x 1 for 5 days	82	Hypertension, malaria (Panama)	
	Liliaceae	<i>Allium cepa</i> L.	PNM 100	Ayo (Ikwerre)	Bulb (1-23)	Infusion Infusion mixed with sugar	Diabetes Hemorrhoid Infertility	Internal use: 3 x 1 for 7 days Internal use: 2 x 1 for 14 days Internal use: 2 x 1 for 30 days	26	Cataract (Egypt), ear (Hawaii), scorpion (Malaya)
			PNM 101	Ayo odi (Ikwerre)	Clove (1-23)	Juice mixed with milk and honey Juice Poultice Juice mixed with <i>Brassica nigra</i> juice	Ear infection Scorpion sting Hypertension	Ear drop use: 2 x 1 for 4 days External use: 2 x 1 for 3 days Internal use: 2 x 1 for 14 days		
Liliaceae	<i>Allium sativum</i> L.	PNM 102	Mbele (Ikwerre)	Leaves (12-18,20,22)	Chew	Hypertension, diabetes	Internal use: eaten 2-3 cloves x 1 till relief	21	Asthma, cough (Egypt), hypertension (China)	
					Macerated in vinegar and honey Juice mixed with <i>Aloe vera</i> gel and honey	Asthma, cough Hemorrhoid, Burns, skin disease	Internal use: 2 x 1 for 10 days Internal use: 2 x 1 for 7 days External use: 2 x 1 till relief			
	<i>Allium ascalonicum</i> L.	PNM 103	Ayo ohia (Ikwerre)	Leaves (13,15,16,18,19,23)	Infusion	Gonorrhea, infertility	Internal use: 2 x 1 till recovery	83		
	<i>Aloe vera</i> L.	PNM 104	"Aloe vera"	Leaves (1-23)	Gel mixed with juice of <i>Allium sativum</i> and honey Gel Gel mixed with water and honey	Skin disease, burns Hemorrhoid Diabetes Menstrual disorder	External use: 2 x 1 for 3 days Internal use: 2 x 1 for 5 days Internal use: 2 x 1 till recovery Internal use: 2 x 1 for 5 days	41	Skin, eczema (China), burn (Malaya)	
Liliaceae	<i>Gloriosa superba</i> L.	PNM 105	Ugu-ele	Tuber and leaves Tuber (2,6,10,11)	Poultice Decoction	Rheumatism Stomachache	External use: 3 x 1 for 5 days Internal use: 2 x 1 for 2 days	54	Skin, gonorrhoea, stomachic (India)	
Loganiaceae	<i>Anthocleista djalonensis</i> L.	PNM 106	Aga okpolo (Kalabari)	Bark Whole plant (2-8)	Decoction Decoction	Skin disease, wound Stomachulcer, stomachache Asthma Diabetes Gonorrhea	External use: 2 x 1 for 5 days Internal use: 2 x 1 for 3 days Internal use: 1 x 1 for 3 days Internal use: 2 x 1 for 14 days Internal use: 3 x 1 for 7 days	26		
Malvaceae	<i>Hibiscus rosa-sinensis</i> L.	PNM 107	Ireagu (Ekpeye)	Leaves Flowers (5,6,7,9,10,11)	Juice Juice	Infertility, Menstrual disorder Stomachache Urinary tract infection	Internal use: 2 x 1 for 30 days Internal use: 2 x 1 for 3 days Internal use: 3 x 1 for 7 days Internal use: 2 x 1 for 5 days	43		
		PNM 108	Nkwoda (Ikwerre)	Leaves Root (1-7,9)	Decoction Infusion	Malaria Stomachache, dysentery, convulsion	Internal use: 2 x 1 for 3 days Internal use: 2 x 1 for 5 days	31	Malaria dysentery, stomachic (India)	
Malvaceae	<i>Gossypium hirsutum</i> L.	PNM 109	Ngobe (Ikwerre)	Leaves (1-23)	Infusion	Gonorrhoea, hemorrhoid	Internal use: 3 x 1 for 14 days	81	Lactagogue (Dominican Republic)	
		PNM 110	Ubabara (Ikwerre)	Leaves, flower (12,14,17,18,19,21)	Juice	Stomachulcer, urinary tract infection, hemorrhoid	Internal use: 2 x 1 till recovery	68	Gonorrhoea, venereal disease (India)	

(Continued)

Table 1. (Continued).

Family	Botanical name	Specimen number	Local name	Plant part used ^b (sources)	Method of preparation	Ailment treated, therapeutic effect	Administration, dosage, duration of treatment	Fidelity Level	Reported ethno botanical uses ^c
Meliaceae	<i>Althaea rosea</i> Cav.	PNM 111	Nshi atu (Ikwerre)	Leaves (14,16,17,19,22)	Infusion	Liver problem	Internal use: 2 x 1 till recovery	100	Leucorrhoea (China)
Meliaceae	<i>Carapa procera</i> DC	PNM 112	Mbete (Ekpeye)	Leaves (2-7,9,11)	Juice Infusion	Sore, burn, ringworm Rheumatism	External use: 2 x 1 for 5 days Internal use: 2 x 1 for 5 days	43	
Meliaceae	<i>Azadirachta indica</i> A. Juss	PNM 113	Dongoyaro (Ikwerre)	Leaves and bark (1-23)	Infusion Decoction Decoction with <i>Cymbopogon citratus</i>	Skin disease, boil Malaria Cough	External use: bath 3 x 1 till relief Internal use: 2 x 1 for 3 days Internal use: 3 x 1 for 2 days	48	Skin (India), malaria (Turkey)
Mimosaceae	<i>Mimosa pudica</i> L.	PNM 114	Onwueke (Kalabari)	Whole plant (3-7,9,10,11)	Poultice	Rheumatism, arthritis	External use: 3 x 1 till recovery	57	Swelling (Java)
Moraceae	<i>Albizia zygia</i> (DC.) J.F. Macbr.	PNM 115	Mgbeobi (Ekpeye)	Leaves (12,14,15,17,18,20,21)	Decoction	Malaria, rheumatism	Internal use: 3 x 1 for 5-7 days	66	
Moraceae	<i>Millettia excelsa</i> (Welw.) C.C. Berg	PNM 116	Oji (Ikwerre)	Stem and bark (4-7)	Decoction Poultice Infusion	Hemorrhoid Wound Rheumatism	Internal use: enema 1 x 1 for 10 days External use: 2 x 1 for 5 days Internal use: 2 x 1 for 7 days	24	
Moraceae	<i>Ficus exasperata</i> Vahl	PNM117	Aseba (Ikwerre)	Leaves Bark Root (1-23)	Juice or decoction Juice mixed with <i>Citrus aurantium</i> juice Decoction Juice	Bleeding, wound Stomachache Eye infection Cough Fibroid, urinary tract infection Skin disease, boil Infertility	External use: 2 x 1 for 5 days Internal use: 2 x 1 for 3 days drop: 2 x 1 for 3 days Internal use: 2 x 1 for 3 days Internal use: 2 x 1 for 21 days Internal use: 2 x 1 for 5 days Internal use: 3 x 1 for 30 days	26	Corn (Senegal)
Moraceae	<i>Ficus carica</i> L.	PNM 118	Oshishitu (Ikwerre)	Leaves or stem (12-23)	Decoction	Infertility	Internal use: 3 x 1 for 30 days	100	
Musaceae	<i>Musa paradisiaca</i> L.	PNM 119	Okirima (Kalabari)	Root Stem Leaves (1-11)	Infusion Juice Infusion Juice	Impotence, aphrodisiac Menstrual disorder, urinary tract infection Hypertension Snake bite, measles	Internal use: 2 x 1 for 30 days Internal use: 2 x 1 for 7 days Internal use: 2 x 1 for 14 days External use: 4 x 1 for 2 days	19	
Myristicaceae	<i>Myristica fragrans</i> Houtt	PNM 120	Nto (Ikwerre)	Leaves (12-15,17,18,21)	Decoction	Diabetes, hemorrhoid	Internal use: 2 x 1 till relief	76	Impotence (Malaya), malaria (Trinidad)
Myrtaceae	<i>Psidium guajava</i> L.	PNM 121	"Guava" (Ogoni)	Leaves (1-23)	Decoction with <i>Cymbopogon citratus</i> Infusion Decoction	Malaria, typhoid Stomachache, laxative Infertility Convulsion Cough, diarrhea Diabetes	Internal use: 4 x 1 for 5 days Internal use: 2 x 1 for 3 days Internal use: 2 x 1 for 30 days Internal use: 2 x 1 for 10 days Internal use: 3 x 1 for 4 days Internal use: 3 x 1 till recovery	27	Stomachache (Mexico), laxative (Ghana), diarrhea (Bahamas)
Nyctaginaceae	<i>Pimenta dactyloides</i> (L.) Merr.	PNM122	Utashidiri (Ikwerre)	Leaves, stem (12-23)	Infusion	Asthma	Internal use: 3 x 1 for 3 days	100	
Nyctaginaceae	<i>Boerhavia diffusa</i> L.	PNM 123	Azu-igwe (Ikwerre)	Whole plant (12-23)	Infusion	Asthma	Internal use: 3 x 1 for 3 days	100	
Oleaceae	<i>Olea subscorpioides</i> Oliv.	PNM 124	Uburubu (Ogoni)	Leaves, stem and root Root (2,3,4,8,9,11)	Decoction Infusion Chewing stick	Jaundice, yellow fever Convulsion Toothache	Internal use: 2 x 1 for 7 days Internal use: 2 x 1 for 3 days Chewed: 3 x 1 for 3 days	58	Jaundice (Ghana), fever (Ivory Coast)
Oleaceae	<i>Olea europaea</i> L.	PNM 125	Mkpuru ada (Ekpeye)	Fruit and seed (13-19)	Decoction	Eye infection	Internal use: 3 x 1 for 3 days	100	Laxative (Europe)
Onagraceae	<i>Oenothera biennis</i> L.	PNM 126	Obimara (Ikwerre)	Leaves and flower (1-3,9)	Infusion	Stomachulcer	Internal use: 2 x 1 for 4 days	100	Sedative, astringent (Turkey)
Palmae	<i>Elaeis guineensis</i> Jacq	PNM 127	Nkwo (Ikwerre)	Fruit pericarp (1-23)	Peeled and applied	Boil	External use: 2 x 1 for 3 days	100	

(Continued)

Table 1. (Continued).

Family	Botanical name	Specimen number	Local name	Plant part used ^b (sources)	Method of preparation	Ailment treated, therapeutic effect	Administration, dosage, duration of treatment	Fidelity Level	Reported ethno botanical uses ^c
Papilionaceae	<i>Abrus precatorius</i> L.	PNM 128	Anya nnumu (Kalabari)	Leaves (1-23)	Juice Decoction	Eye infection; skin diseases Cough, malaria	Eye drop: 2 x 1 for 3 days; External use: 3 x 1 for 3 days Internal use: 3 x 1 for 3 days	44	Ophthalmia (Venezuela), malaria (China), skin (Mexico)
	<i>Baphia nitida</i> Lodd.	PNM 129	Abode (Ekpeye)	Leaves (1-23)	Juice Decoction	Wound, boil; eye infection Hemorrhoid, gonorrhea	External use: 3 x 1 for 5 day; Eye drop: 3 x 1 for 5 days Enema: 2 x 1 for 7 days	60	Dysentery (West Africa), enteritis (Upper Volta)
	<i>Erythrina senegalensis</i> DC.	PNM 130	Echichi (Ekpeye)	Whole plant (2,5,6,8,11)	Decoction Poultice	Jaundice, menstrual disorder Rheumatism	Internal use: 2 x 1 for 7 days External use: 2 x 1 till recovery	52	Blennorrhagia (Africa)
	<i>Lonchocarpus cyanescens</i> (Schum. & Thonn.) Benth.	PNM 131	Nji (Kalabari)	Root Root and stem Leaves (1-23)	Decoction Poultice	Arthritis Syphilis Skin disease	External use: 3 x 1 for 7 days Internal use: 2 x 1 for 14 days External use: 2 x 1 for 5 days	70	Cataract, leprosy (Sierra Leone)
Papilionaceae	<i>Trigonella foenumgraecum</i> L.	PNM 132	Akidoucha (Ekpeye)	Leaves and seed Seed (1-23)	Decoction	Anemia Laxative	Internal use: 2 x 1 for 7 days Internal use: 2 x 1 for 2 days	59	
	<i>Glycyrrhiza glabra</i> L.	PNM 133	Uziza (Ikwerre)	Leaves or seed (12-20,23)	Infusion	Skin disease, urinary tract infection, typhoid, stomachache, inflammation	Internal use: 3 x 1 till recovery	30	Antidote, antitussive (Japan), tonic (China)
	<i>Pterocarpus erinaceus</i> Poir.	PNM 134	Aja (Ikwerre)	Leaves and bark (12,13,15,16,18,19)	Infusion with <i>Distemnonanthus benthamianus</i> leaves	Malaria, dysentery	Internal use: 3 x 1 till recovery	80	Dysentery (Ghana), fever (Ivory Coast)
Pedaliaceae	<i>Sesamum indicum</i> L.	PNM 135	Ulogbo (Ogoni)	Seed (1-8,11)	Decoction Poultice Powder mixed with milk	Hemorrhoid Skin disease Anemia	Internal use: 2 x 1 for 14 days External use: 3 x 1 for 7 days Internal use: 2 x 1 for 7 days	64	Pile (China), skin (Mexico), deafness (Ethiopia)
	<i>Phyllanthus amarus</i> Schum. & Thonn.	PNM 136	Ngwu (Ikwerre)	Whole plant (1-23)	Infusion	Hemorrhoid. Menstrual disorder Hypertension, diabetes, malaria Laxative	Internal use: 2 x 1 for 14 days Internal use: 3 x 1 till recovery Internal use: 3 x 1 for 2 days	43	Diabetes, malaria, diuretic (Haiti)
Pinaceae	<i>Bridelia ferruginea</i> Benth.	PNM 137	Mmahu (Ekpeye)	Leaves and bark Leaves (1,3,5,8,9,10)	Poultice Infusion	Arthritis Skin disease	External use: 2 x 1 for 2 days External use: bath 2 x 1 for 3 days	47	Diabetes (Africa), skin (Togo)
	<i>Pinus caribaea</i> Morelet	PNM 138	Afoma (Ikwerre)	Seed Leaves (12-23)	Decoction Juice mixed with leaf decoction and <i>Gongronema latifolium</i> juice <i>Citrus aurantium</i> juice	Diabetes Eye infection Diabetes, hypertension	Internal use: 2 x 1 till recovery Internal use: 2 x 1 for 7 days Internal use: 3 x 1 till recovery	39	Liniment (Haiti)
Piperaceae	<i>Piper guineense</i> Schum. & Thonn.	PNM 139	Uziza (Ikwerre)	Seed (12-23)	Infusion	Gonorrhea	Internal use: 3 x 1 for 7 days	100	
Poaceae	<i>Cymbopogon citratus</i> (DC) Stapf	PNM 140	Achara (Ikwerre)	Leaves (1,4,10,11)	Decoction with <i>P. guajava</i> ; decoction with <i>A. indica</i>	Malaria, typhoid, cough	Internal use: 2 x 1 for 5 days	75	Cough, malaria (Trinidad)
Polygalaceae	<i>Triticum sativum</i> Lam.	PNM 141	Mmahuta (Ogoni)	Leaves Bran (1-23)	Infusion Decoction	Skin disease, laxative, Menstrual disorder	Internal use: 3 x 1 till recovery Internal use: 3 x 1 for 3 days Internal use: 2 x 1 for 2 days	63	
	<i>Carpolobia lutea</i> G. Don	PNM 142	Anagalagala (Kalabari)	Root (1-4,9,10,11)	Infusion	Rheumatism Aphrodisiac	Internal use: 2 x 1 for 7 days Internal use: 2 x 1 for 14 days	63	

(Continued)

Table 1. (Continued).

Family	Botanical name	Specimen number	Local name	Plant part used ^b (sources)	Method of preparation	Ailment treated, therapeutic effect	Administration, dosage, duration of treatment	Fidelity Level	Reported ethno botanical uses ^c
Polygonaceae	<i>Rheum palmatum</i> L.	PNM 143	Oshishili (Kalabari)	Leaf and stem (9,11)	Infusion	Cough	Internal use: 2 x 1 for 5 days	100	Tonic (China)
Portulacaceae	<i>Talinum triangulare</i> (Jacq.) Willd	PNM 144	Anyiri (Ogoni)	Whole plant (1-11)	Poultice Decoction	Inflammation Laxative	External use: 2 x 1 for 7 days Internal use: 3 x 1 for 2 days	54	Conjunctivitis (Venezuela)
	<i>Portulaca oleracea</i> L.	PNM 145	Nti-odu (Ikwerre)	Whole plant (12-17,19,20)	Infusion	Gonorrhea, syphilis	Internal use: 2 x 1 for 14 days	80	Urinogenital (Spain)
Punicaceae	<i>Punica granatum</i> L.	PNM 146	Nsoba (Ekpeye)	Leaves, flower bud and bark	Decoction or infusion Powder	Malaria, diarrhoea, dysentery, worm infestation Skin disease	Internal use: 3 x 1 for 5 days External use: 2 x 1 for 3 days	33	Diarrhoea, dysentery, paralysis (China)
	<i>Pyrus cydonia</i> L.	PNM 147	Bunyga (Kalabari)	Fruit pericarp (1-23)	Infusion	Typhoid, stomachache Headache	Internal use: 3 x 1 for 5 days Internal use: 3 x 1 for 2 days	36	
Rosaceae	<i>Rosa camina</i> L.	PNM 148	Ughele (Ikwerre)	Leaves, stem (12-23)	Decoction	Hypertension, measles	Internal use: 2 x 1 for 5 days	64	Diuretic (Europe), diarrhoea (Haiti)
Rubiaceae	<i>Rubus idaeus</i> L.	PNM 149	Oracha (Ikwerre)	Leaves (12-19)	Decoction	Cough	Internal use: 2 x 1 for 5 days	100	
	<i>Galium aparine</i> L.	PNM 150	Akara (Ogoni)	Leaves (2,3,9,10)	Decoction	Convulsion, epilepsy	Internal use: 2 x 1 for 7 days	50	
Rubiaceae	<i>Mitracarpus hirtus</i> (L.) DC.	PNM 151	Obwa (Ikwerre)	Leaves and stem (2,4,6,7,8)	Juice	Skin disease	Internal use: 2 x 1 for 5 days	100	
	<i>Diodia sarmentosa</i> L.	PNM 152	Abayin (Ogoni)	Leaves (12,14,15,17,20,21)	Juice	Skin disease	Internal use: 3 x 1 for 5 days	100	
Rubiaceae	<i>Heinsia crinita</i> G. T ayl.	PNM 153	Amateme (Ogoni)	Leaves (12-23)	Juice	Measles, abscess, skin disease	Internal use: 3 x 1 for 5 days	56	
	<i>Ixora coccinea</i> L.	PNM 154	Orsu (Ogoni)	Whole plant (12-23)	Decoction	Dysentery, gonorrhoea	Internal use: 3 x 1 for 5 days	82	Dysentery (India)
Rubiaceae	<i>Sarcocephalus latifolius</i> (Sm) E.A. Bruce	PNM 155	Kulata (Ogoni)	Root (12-17,20,23)	Decoction	Skin disease, gonorrhoea	Internal use: 3 x 1 for 5 days	65	Gonorrhoea (Upper Volta), pile (Ghana)
	<i>Pausinystalia johimbe</i> Pierre ex Beille	PNM 156	Mmatu (Ikwerre)	Flower (13-20,22)	Decoction	Hypertension, infertility	Internal use: 2 x 1 for 10 days	63	
Rutaceae	<i>Citrus sinensis</i> (L.) Osbeck.	PNM 157	Appe (Ogoni)	Fruit (1-23)	Juice Decoction with <i>Citrus limon</i> , <i>Ananas comosus</i> and <i>Carica papaya</i>	Laxative Waist pain Malaria	Internal use: as desired Internal use: 2 x 1 for 5 days Internal use: 2 x 1 for 5 days	57	Stomachache (Trinidad), fever (Angola), expectorant (China)
	<i>Citrus limon</i> L.	PNM 158	Puloumbiya (Ekpeye)	Fruit (1-23)	Decoction with <i>Citrus limon</i> Juice Juice mixed with a pinch of salt Decoction with <i>Citrus sinensis</i> juice Decoction with <i>Citrus sinensis</i> , <i>Ananas comosus</i> and <i>Carica papaya</i>	Rheumatism, laxative Kidney disease Malaria Cough Waist pain	Internal use: 2 x 1 for 3 days Internal use: 2 x 1 for 7 days Internal use: 2 x 1 for 5 days Internal use: 3 x 1 for 4 days Internal use: 2 x 1 for 5 days	43	Fever (Turkey), stomach (Ecuador), epilepsy (Gabon)

(Continued)

Table 1. (Continued).

Family	Botanical name	Specimen number	Local name	Plant part used ^b (sources)	Method of preparation	ailment treated, therapeutic effect	Administration, dosage, duration of treatment	Fidelity Level	Reported ethno botanical uses ^c
	<i>Citrus aurantium</i> L.	PNM 159	Oroma (Ikwerre)	Fruit (1-23)	Juice, Juice mixed with <i>Ficus exasperata</i> leaf juice Juice mixed with <i>Gongronema latifolium</i> leaf decoction and <i>Pinus caribaea</i> juice	Eye infection, cough Diabetes, hypertension, anemia	Internal use: 2 x 1 for 3 days Internal use: 2 x 1 for 3 days	36	Hypertension (Curacao), thrush (Trinidad)
	<i>Citrus paradisi</i> MacIad.	PNM 160	Ogbe (Ikwerre)	Fruit (1-23)	Juice	Skin disease	Internal use: 2 x 1 for 3 days	100	Cancer (US)
	<i>Fagara mycrophylla</i> Engl.	PNM 161	Duku (Ekpeye)	Root Bark (11-23)	Chewing stick Decoction Poultice	Toothache Gonorrhea, hemorrhoid Boil	Chewed Internal use: 2 x 1 for 7 days External use: 2 x 1 for 5 days	36	
Sapindaceae	<i>Blighia sapida</i> Konig	PNM 162	Orugbo (Ekpeye)	Leaves (10,13,14,17,19)	Juice mixed with salt	Skin disease, wound	External use: 3 x 1 for 7 days	51	Poison (Guatemala), migraine (Upper Volta)
Sapotaceae	<i>Chrysophyllum albidum</i> G.Don	PNM 163	Udara (Ogomi)	Stem Seed Whole plant (13,15,16,19,20,22)	Decoction Powder Decoction	Malaria Urinary tract infection Impotence	Internal use: 2 x 1 for 3 days Internal use: 2 x 1 for 14 days Internal use: 3 x 1 for 30 days	45	
Scrophulariaceae	<i>Sapora dulcis</i> L.	PNM 164	Dweinakum (Ekpeye)	Whole plant (14, 16, 17, 18, 20, 21-23)	Infusion	Hemorrhoid	Internal use: 2 x 1 for 14 days	100	
Smilacaceae	<i>Smilax anceps</i> Willd	PNM 165	Iiabana (Ekpeye)	Root (1-23)	Juice Decoction	Skin disease Gonorrhea, syphilis	External use: 2 x 1 for 3 days Internal use: 2 x 1 for 14 days	64	
Solanaceae	<i>Nicotiana rustica</i> L.	PNM 166	Utaba (Ikwerre)	Leaves (1-7,9,11)	Infusion Poultice Juice	Toothache Wound Convulsion	Gargle: 2 x 1 for 4 days External use: 2 x 1 for 7 days External use: 2 x 1 for 3 days	38	Tumor (Amerindian), cancer (Mexico)
	<i>Solanum nigrum</i> L.	PNM 167	Anara (Ogomi)	Leaves (1-5,8)	Juice	Eye infection Jaundice, convulsion	Eye drop: 2 x 1 for 2 days Internal use: 2 x 1 for 7 days	39	Eye (India), dropsy, hepatitis (Sudan)
	<i>Solanum tuberosum</i> L.	PNM 168	Mkwutu (Ikwerre)	Tuber (4,8,9,10)	Infusion Juice	Rheumatism Stomachache, stomachulcer, inflammation	Internal use: 2 x 1 for 10 days Internal use: 2 x 1 till recovery	32	Wart (US, Canada)
	<i>Solanum torvum</i> Sw	PNM 169	Kilali (Kalabari)	Fruit (16, 17, 20, 22, 23)	Infusion	Stomachulcer	Internal use: 2 x 1 till recovery	100	Rheumatism (Mexico)
	<i>Physalis angulata</i> L.	PNM 170	Numu (Kalabari)	Leaves and stem (14, 17, 20, 21, 23)	Decoction	Asthma	Internal use: 3 x 1 till recovery	100	Asthma (Upper Volta), boil (Thailand)
Sterculiaceae	<i>Sterculia tragacantha</i> Lindl.	PNM 171	Obiribo (Kalabari)	Leaves (12-23)	Infusion	Diarrhea, dysentery	Internal use: 3 x 1 till recovery	64	
	<i>Cola nitida</i> (Vent) Schott and Endl.	PNM 172	Eji (Ikwerre)	Bark (12,14,16,17,21,22)	Infusion Powder	Stomachache Wound, inflammation	Internal use: 2 x 1 for 2 days External use: 2 x 1 for 7 days	46	Astringent, stimulant, malaria (Africa)
Tiliaceae	<i>Corchorus olitorius</i> L.	PNM 173	Ahihara (Kalabari)	Leaves (5-11)	Infusion	Stomachache, worm infestation, diarrhea	Internal use: 2 x 1 for 3 days	34	Fever, dysentery (India)
Tiliaceae	<i>Glyphsea brevis</i> Spreng	PNM 174	Itono (Ikwerre)	Leaves and bark Leaves and fruit Leaves, stem and root (1,2,4,7,9)	Infusion Juice Decoction	Gonorrhea, diarrhea Wound Impotence	Internal use: 2 x 1 for 14 days External use: 2 x 1 for 3 days Internal use: 2 x 1 for 30 days	32	

(Continued)

Table 1. (Continued).

Family	Botanical name	Specimen number	Local name	Plant part used ^b (sources)	Method of preparation	Ailment treated, therapeutic effect	Administration, dosage, duration of treatment	Fidelity Level	Reported ethno botanical uses ^c
Ulmaceae	<i>Triumfetta rhomboides</i> Jacq.	PNM 175	Udoho (Ogoni)	Leaves Bark (4-7,9,11)	Decoction	Impotence, diarrhea	Internal use: 2 x 1 for 5 days Internal use: 2 x 1 for 14 days	36	
	<i>Trema orientalis</i> (L.) Blume	PNM 176	Elemukien (Ogoni)	Leaves Bark (1,3,4,5,7,9)	Juice Poultice Infusion	Gonorrhoea Debility Skin disease Malaria, cough, dysentery	Internal use: 2 x 1 for 3 days External use: 2 x 1 for 5 days Internal use: 2 x 1 for 3 days	49	
Urticaceae	<i>Laportea aestuans</i> (L.) Chew.	PNM 177	Ile (Ikwerre)	Leaves (1-23)	Decoction Infusion Poultice	Toothache Menstrual disorder Skin disease, inflammation	Mouth wash: as desired Internal use: 3 x 1 for 5 days External use: 3 x 1 till relief	32	Burn (Africa), dysentery, enema (Upper Volta)
Valerianaceae	<i>Valeriana officinalis</i> L.	PNM 178	Odukwu (Ikwerre)	Leaves (10-13)	Infusion	Stomachulcer, typhoid	Internal use: 2 x 1 for 7 days	68	
Verbenaceae	<i>Verbena officinalis</i> L.	PNM 179	Agwa (Ikwerre)	Stem, leaves (14,15,18,19,21,23)	Infusion	Kidney disease, catarrh	Internal use: 3 x 1 till recovery	52	
	<i>Stachytarpheta cayennensis</i> (Rich.) Vahl	PNM 180	Mbeku (Kalabari)	Leaves (12-15,22)	Juice	Eye infection	Eye drop: 1 -2 drops till recovery	100	
Violaceae	<i>Viola tricolor</i> L.	PNM 181	Ekpeobi (Kalabari)	Leaves (13-20,22)	Infusion	Stomachulcer, skin disease	Internal use: 3 x 1 for 7 days	86	
Vitaceae	<i>Hybanthus enneaspermus</i> (L.) F. Muell.	PNM 182	Ocha (Ikwerre)	Whole plant (1,2,4,7,9,11)	Juice Infusion	Snake bite Debility	Internal use: 2 x 1 for 3 days Internal use: as desired	53	Gonorrhoea, diuretic, tonic (India)
	<i>Cissus quadrangularis</i> L.	PNM 183	Ogbagi (Ekpeye)	Whole plant (1-23)	Infusion	Gonorrhoea Stomachache Syphills, gonorrhoea Skin disease, whitlow	Internal use: 2 x 1 for 5 days Internal use: 3 x 1 for 5 days Internal use: 3 x 1 for 7 days External use: 2 x 1 for 5 days	26	Stomachic (Sudan)
Zingiberaceae	<i>Vitex doniana</i> Sweet	PNM 184	Nalele (Ogoni)	Fruit (12-17,19)	Chew	Diarrhoea, dysentery	Internal use: eaten as desired	56	Diarrhoea, dysentery (Africa), stomach (Guinea)
	<i>Zingiber officinale</i> Roscoe	PNM 185	Oseojiala (Ikwerre)	Rhizome (1-23)	Chew Juice mixed with <i>Salvia officinalis</i> Chew with <i>Garcinia cola</i> fruit Decoction	Hypertension, laxative, cough, catarrh Stomachache Cough, liver problem Worm infestation	Internal use: eaten as desired Internal use: 2 x 1 till recovery	29	Stomachache (China, Ethiopia), cough (China)
Zingiberaceae	<i>Aframomum melegueta</i> K. Schum	PNM 186	Ojili (Ikwerre)	Seed Root (1-23)	Chew with <i>Garcinia cola</i> fruit Decoction	Worm infestation	Internal use: eaten as desired Internal use: 2 x 1 for 3 days	81	Aphrodisiac (Liberia), dysentery (Egypt)
	<i>Curcuma longa</i> L.	PNM 187	Ukafo (Ogoni)	Rhizome (4,5,7,9,10)	Decoction	Worm infestation Jaundice Skin disease Eye infection	Internal use: 2 x 1 for 3 days Internal use: 2 x 1 for 14 days External use: bath 2 x 1 for 7 days Eye wash: 2 x 1 till relief	31	Conjunctivitis, jaundice, scabies (Java)
	<i>Costus afer</i> Ker. Gawl	PNM 188	Biringbe (Kalabari)	Stem (15-23)	Juice	Wound	External use: 2 x 1 for 10 days	100	

1x1, once a day; 2x1, two times a day; 3x1, three times a day; 4x1, four times a day (it means one glass of decoction or infusion, unless otherwise indicated).

^a Sources (local government areas of the State where the information was gathered): 1: Abua/Oduval, 2: Ahoada East, 3: Ahoada West, 4: Akuku-Toru, 5: Andoni, 6: Asari-Toru, 7: Bonny, 8: Degema, 9: Elema, 10: Emohua, 11: Etche, 12: Gokana, 13: Ikwerre, 14: Khana, 15: Obio-Akpor, 16: Ogbai/Egbema/Ndoni, 17: Ogu/Bolo, 18: Okrika, 19: Omuma, 20: Opobo/Nkoro, 21: Oyiabo, 22: Port Harcourt, 23: Tai.

^b Sourced from UK CROPNET (2003)

Table 2. ICF value of category of ailments.

Category	Number of species	% All species	Number of use citation	% All use citation	ICF value
Parasitic, viral, bacterial diseases	64	34.04	5049	9.26	0.98
Dermal system	93	49.46	12027	22.07	0.99
Digestive system	114	60.63	8652	15.88	0.98
Musculoskeletal and articular system	60	31.91	4893	8.98	0.98
Nervous system	22	11.70	1774	3.25	0.98
Reproductive system	36	19.14	2930	5.37	0.98
Respiratory system	42	22.34	4008	7.35	0.99
Stings/bites	7	3.72	336	0.61	0.98
Fever/malaria	48	25.53	6394	11.73	0.99
Urinary system	10	5.31	951	1.74	0.99
Cardiovascular system	21	11.17	2800	5.13	0.99
Others	51	27.12	4665	8.56	0.99

ICF, informant consensus factor.

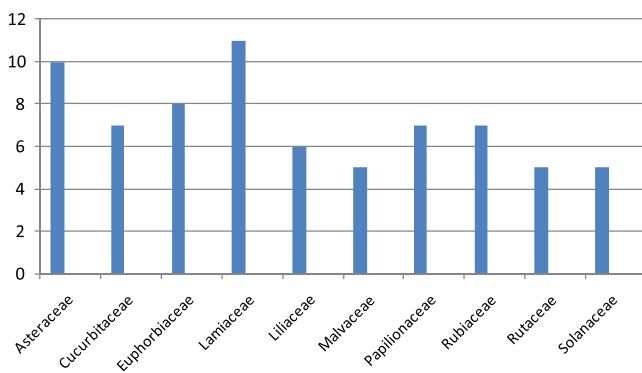


Figure 2. Frequency of plant families.

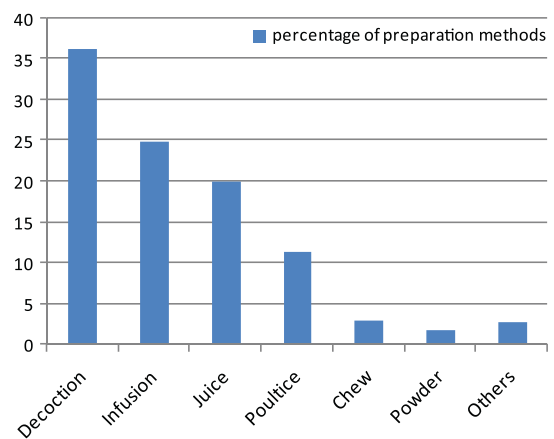


Figure 4. Percentage occurrence of methods of preparation.

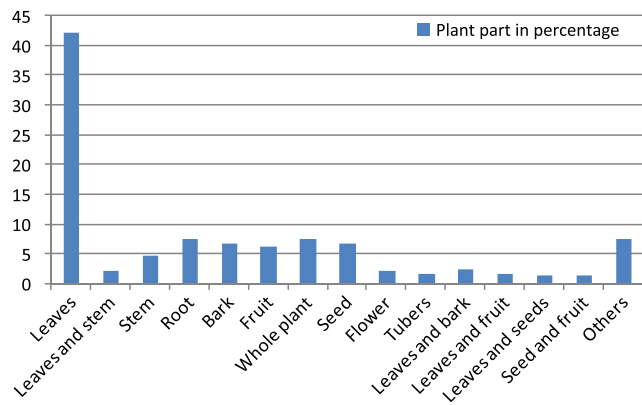


Figure 3. Percentage occurrence of plant parts used.

leaves and were prepared by mixing the ingredients in different proportions.

Informant consensus factor

The medicinal plants presumed to be efficacious in treating a certain disease showed higher ICF values. Table 2 indicates disease categories with ICF values. Disease categories such as dermal, respiratory, fever/malaria,

urinary and cardiovascular systems have relatively higher values (0.99).

Fidelity level (FL)

Fidelity level is the percentage of informants claiming the use of a certain plant for the same purpose. Table 1 indicates the FL for all the medicinal plant species collected to treat various specific ailments. Plant species such as *Daucus carota* L. (Apiaceae) and *Ageratum conyzoides* L. (Asteraceae) gave the highest FL value of 100%, while *Musa paradisiaca* L. (Musaceae) provided the lowest FL value of 19%.

The highest number of plant species employed to treat diseases belong to the family Lamiaceae, suggesting that it is the most important family in the traditional medicine of the State. The other important families in terms of number of taxa with medicinal uses in the State were Asteraceae, Euphorbiaceae, Cucurbitaceae, Papilionaceae, Rubiaceae, Liliaceae, Malvaceae, Solanaceae, and Rutaceae. These families feature saliently in the traditional medicines of other parts of Nigeria, and are reported in the flora and pharmacopoeia

of the country (Nyananyo, 2006; NNMDA, 2006, 2008; FMH, 2008). These families are usually considered during ethno botanical approaches to drug discovery due to their rich content of secondary metabolites such as steroids, terpenes and alkaloids (Desmarchelier & Witting-Schaus, 2000). The previous ethno botanical survey on one of the States in the same Niger Delta Region also revealed that Euphorbiaceae was among the most important families (Ajibesin et al., 2008). A recent study among the people of Zegie in Ethiopia reported Euphorbiaceae and Asteraceae to be among the most important families used by the community (Teklehaymanot & Giday, 2007).

Lamiaceae is of particular importance to the State. Eleven species were cited for medicinal use by the informants. The plant species of the family were indicated in the treatment of virtually all the diseases of the most important categories recorded. This may be due to their volatile oil content which is known to treat a vast number of diseases. Lamiaceae was also reported as the most prevalent family in the flora of Ethiopia and Eritrea (Ryding, 2006).

In this study, leaves were the most common plant part used followed by root, bark and seed. The reason for the widespread use of leaves may be due to the ease of obtaining them. The leaves remain lush and abundant for most part of the year since the State receives rainfall for about eight months of the year. Leaves have been observed as the most widely used plant part in many ethno botanical studies (Tabuti et al., 2003; Kala, 2005; Muthu et al., 2006; Giday et al., 2009; Hossan et al., 2010). Harvesting leaves for medicinal use ensures plant survival unlike the roots that may threaten its continuity (Lulekal et al., 2008; Yin, 2009), unless a sustainable harvesting strategy has been developed (Cunningham, 2001). The most common method of preparation was decoction followed by infusion and juice. Decoction was also reported as the most prevalent method of preparation in Babungo, Cameroon (Simbo, 2010). Medicines were administered mainly orally through internal use. This may be related to the prevalent use of decoction since decoction is usually administered orally. Generally, this result follows the pattern of medicinal plant use in Africa (Anonymous, 2008, 2009). However, in some other parts of the world, decoction was also indicated as a common method of herbal preparation (Taylor, 2005; Rahmatullah et al., 2010; Sankaranarayanan et al., 2010). The use of single plant in preparing herbal remedies predominates over the multiple plant preparation in this study. This offers the advantage of a relatively safer potion over mixture of plants that may be ill-matched and dangerous for human body system. In the traditional medicine of other countries such as Bangladesh and Peru, single medicinal plants were also observed to treat single or multiple ailments (Hossan et al., 2010; Rahmatullah et al., 2010; Luziatelli et al., 2010). All the remedies in this study were prepared in crude form, thus lacking standardized dosage and quality control (Anonymous, 2008; Nanyingi et al., 2008).

The most frequent categories of diseases treated with medicinal plants in Rivers State based on medicinal use report were dermatological problems, digestive problems and fever/malaria. These categories were also prevalent in the ethno botanical studies undertaken among indigenous people of Fiji, Australia, India, Mexico, Kenya, Haiti, Nicaragua, Peru, Saudi Arabia, Thailand, North America, Tonga and West Africa (Cox, 1994). This implies that these categories of diseases treated in Rivers State with medicinal plants are similar to those encountered by the majority of the rural people in developing countries.

Ailments affecting the dermal system are, among others, skin diseases, wounds, bleeding and burns. These diseases were diagnosed by visual examination. The skin diseases were the most frequently mentioned ailment and were usually cited as skin rashes, skin spots, and eczema. This category is also reported as the most important in Bajo Quimiriki and Yanasha in Peru (Luziatelli et al., 2010; Valadeau et al., 2010). Problems relating to digestive system include stomachache, diarrhea, dysentery, and worm infestation. These may be caused by the absence of sewage system and infestation of drinking water by eggs of intestinal parasites. Malaria is a major disease treated by the people of Rivers State. The people were aware that malaria was caused by the bite of infected mosquitoes, and diagnosis was by febrile condition. However, diagnosis of malaria by TMPs can be nebulous in certain cases. For instance, an herbalist claimed that he diagnosed malaria by going in a trance where he found the patient swimming in a pool of blood. Malaria is a widespread disease in Brazil treated with various medicinal plants (Botsaris, 2007). Some of these diseases mentioned are the same as those frequently treated in the neighboring Akwa Ibom State (Ajibesin et al., 2008). This is probably due to intercultural diffusion of medicinal plant knowledge between the two States.

Categories of ailments such as dermal system, respiratory system, fever/malaria, urinary system, cardiovascular system and others including specific diseases such as diabetes, anemia, eye infection and ear infection showed the highest ICF. This implies that the diseases of these categories have the highest level of agreement for being treated by medicinal plants. Other categories of diseases also showed relatively high ICF. The medicinal plants that are considered to be efficacious in treating certain diseases have higher ICF. This may suggest high prevalence rate of such diseases in the region, possibly due to poor socio-economic and hygienic conditions of the people. It also suggests that the knowledge of the treatment of the categories of diseases with higher ICF is accessible to both the healers and the elders in this study.

The medicinal plants that are commonly used by the local people have higher FL value than those that are less popular. On the other hand, medicinal plants that treat a single ailment have 100% FL, while those that are used as remedies of more than a single ailment give lower FL value. For instance, *Irvingia gabonensis* is used to treat stomachache, worm infestation, skin disease and

infertility, and its FL value is 40%. A high FL value may also indicate good healing potential of the plants (Giday et al., 2009).

The use of ICF aids in detecting major categories of health conditions for which medicinal plants are used, while through FL, the most important plant species are selected from these categories.

Scientific literature was surveyed to compare the uses of medicinal plants in Rivers State with those of the other parts of the world, so as to validate the uses of medicinal plants reported by informants in this study (Table 1). This indicates their significance in the traditional medicine of other countries. The widespread use of these plants provides a confirmatory evidence of their uses in Nigeria, and this underpins a greater chance of drug discovery, especially when the cultures are totally unrelated.

One hundred and eleven plant species (59%) used by the indigenes of Rivers States are also used in other parts of the world for similar and other ailments. The literature search on ethno pharmacological use showed that many of the medicinal plants with high FL are used to treat ailments in other parts of the world (Table 1). However, those that have low FL because they are used to treat more than one disease are also employed in the traditional medicine of other countries to treat one or more diseases. Although plants with high FL are the most preferred species in study sites (Table 1), plants with low FL should not be neglected as failing to mention them to the future generation could increase the risk of gradual disappearance of the knowledge (Chaudhary et al., 2006).

Ageratum conyzoides L. (Asteraceae) is used specifically to treat skin diseases in Rivers State, thus showing a very high FL of 100%. However, amongst the Mopa ethnic group of India, the plant gave FL of 60% because it is used for more than one ailment. It is used in veterinary medicine, as fish poison and to treat wound (Namsa et al., 2011).

In some African countries, *Ageratum conyzoides* is used as a local remedy to treat diseases such as skin diseases, wound, headache and mental and infectious diseases (Durodola, 1977). In other parts of the world such as Brazil and Vietnam, it is used to treat inflammation and gynaecological diseases (Yamamoto et al., 1991; Sharma & Sharma, 1995).

The plant has been reported to contain flavonoids identified as ageconyflavone A, ageconyflavone B, ageconyflavone C and isoflavones (Adesogan & Okunade, 1979; Vyas & Mulchandani, 1986; Yadava & Kumar, 1999), chromenes (Sharma et al., 1980) and pyrrolizidine alkaloids (Wiedenfeld & Röder, 1991). These compounds may be responsible for the bioactivity of the plant.

Tridax procumbens L. (Asteraceae) is used to treat skin diseases in Rivers State with FL of 100%. The plant also showed FL of 100% in treating swellings by the Kani tribes in India (Ayyanar & Ignacimuthu, 2011). The plant was also reported to cure skin diseases in Akwa

Ibom State, Nigeria (Ajibesin et al., 2008). In Togo, the leaf juice of the plant is used to treat injury, cuts and wounds (Adjanohoun et al., 1986), while the whole plant was reported to stop bleeding in Madagascar (Boiteau, 1986). The plant is also used for other diseases that are not related to the skin such as amenorrhea (Adjanohoun et al., 1986), hypertension (Adjanohoun et al., 1989) and malaria (Kokwaro, 1993).

Flavonoids such as luteolin, glucoluteolin, quercetin and isoquercetin (Ali et al., 2001), and sitosterol (Verma & Gupta, 1988) were identified in the flower of the plant.

Zingiber officinale Roscoe (Zingiberaceae) is used to treat diseases such as hypertension, constipation, cough and stomachache in other parts of the world as it is in Rivers State. The plant gave a low FL of 29% which suggests that the plant is less preferred for the treatment of a specific ailment. However, this FL value was the highest recorded for ginger to treat stomachache, indicating the disease as the most commonly treated by ginger. In Northwest Ethiopia, ginger is used to treat stomachache alone (Teklehaymanot & Giday, 2007). Also, in Egypt, it is used solely to treat common cold, thereby showing 100% FL (AbouZid & Mohamed, 2011). However, in India, the plant was reported to treat cough and throat clearance with FL value of 67% (Namsa et al., 2011). Ginger is in the pharmacopoeias of countries such as China, India, Egypt and Japan. Traditionally, ginger is used in these countries as an acrid bitter to strengthen and stimulate digestion, and to treat stomachache (Langner et al., 1998). It is also used for hypertension and constipation (Ali et al., 2008).

In China, ginger root may be prepared as tea or prepared with scrambled eggs to treat cough (Bensky et al., 2004). Ginger may also be made as candy in fermented plum juice and sugared to suppress cough. In Ethiopia, ginger rhizome is chewed for stomachache (Gedif & Hahn, 2003). In North Africa, olive oil in which powdered rhizome has been soaked for several days is used for rubbing the body, after a birth, for rheumatism (Boulos, 1983). The decoction of the rhizome mixed with equal amount of black pepper, then added into boiling honey, is taken in the form of pellets twice a day, in the morning and at night, against pectoral diseases (Boulos, 1983).

The majority of the medicinal properties of ginger, including hypertensive and cardiotoxic properties, have been attributed to pungent vallinoids such as [6]-gingerol and [6]-paradiol and other constituents such as shogaols and zingerone (Nigam et al., 2011).

The leaves of *Abrus precatorius* L. (Papilionaceae) are used for eye infection, skin disease, cough and malaria in Rivers State with FL of 44%. Although its FL value was not reported, the root of the plant mixed with cow milk was indicated as a local remedy to treat scorpion sting and snakebite in Tamil Nadu, India (Muthu et al., 2006). The seed is very poisonous when swallowed (Verma et al., 1989). It is so poisonous that external application is done

with great care (Panda, 2004). The toxic principle of the seed has been reported as abrin which may cause blindness or even death (Dickers et al., 2003).

In Trinidad, a tea made from the leaves is used to treat fever, cough and cold (Mendes, 1986). Decoction of the leaf is used in India to wash the eyes early morning for a month to cure poor eye sight (Turkey, 2006). Leaves are also made into paste in Chattisgarh, India, and applied to the affected parts twice a day for a week to cure any type of skin diseases (Turkey, 2006). In treating conjunctivitis in Tanzania, the seeds are boiled and the decoction used to bathe the eyes (Chhabra, 1990). In Chinese medicine, the leaf decoction is used to treat fever (Chevallier, 1996; Navarra, 2004), while in Cambodia, it is the seeds that are utilized to treat malaria (Ross, 2003). In Ogun State, Nigeria, the leaf decoction is also used to treat malaria (Idowu et al., 2010).

World Health Organization (1990) reported constituents such as abrin, abralin, *N*-methyl tryptophan and urease from the plant, while Limmatvapirat et al. (2004) identified isoflavanquinone, abruquinone B from the aerial part of the plant.

Vitex doniana Sweet (Vitaceae) is used to treat diarrhea and dysentery in Rivers State with FL of 56%. In an ethno botanical study of Kainiji Lake National Park, Nigeria, the leaves and bark of *Vitex doniana* were reported to cure stomachache (Amusa et al., 2010). The FL of the plant was not provided, but it was reported to occur frequently and its mean density was given as 0.028 ± 0.520 . The plant is used extensively to cure dysentery and diarrhea in the traditional medicines of many countries of Africa. In Southwestern Nigeria, a decoction of the stem bark is taken orally to treat diarrhea (Kilani, 2006). In the same region of the country, the stem bark and branches of *Vitex doniana* are macerated with those of *Lannea welwitschii* (Hiern) Engl. (Anacardiaceae), *Terminalia glaucescens* Planch. ex Benth. (Combretaceae) and *Diodia scandens* Sw. (Rubiaceae), and the potion taken orally to treat diarrhea and dysentery (Adjanohoun et al., 1991). However, in Northern region of Nigeria, the leaves of the plant, mixed with those of *Psidium guajava* L. (Mrytaceae), are macerated to treat diarrhea (Igoli et al., 2005). In Republic of Benin, the plant is mixed with the pulp of *Vernonia doniana* DC. (Asteraceae) to cure diarrhea (Adjanohoun et al., 1989). The root decoction is used in Democratic Republic of Congo for diarrhea and dysentery (Hirt & Bindanda, 1993). The trunk barks, stem with leaves or roots of the plant are prepared separately in Mali to treat infantile diarrhea and leprosy (Malgras, 1992). *Vitex doniana* has also been reported to treat other ailments. The bark of the underground part of the plant is boiled in water to treat constipation in Burundi (Baerts & Lehmann, 1989), while the mixture of its bark and the fruits of *Parkia biglobosa* (Jacq.) R. Br. ex G. Don. (Fabaceae) has long been used in Senegal as a palm wine infusion to cure fever (Thomas, 1972).

Conclusions

The majority of the people in developing countries rely on TMPs and community elders for the treatment of various diseases. Collectively, they possess a vast knowledge of medicinal plant uses. Thus, it is important to collate information on medicinal plants that are used as treatments for diseases. This survey therefore provides a useful source of information for practitioners of traditional medicine and medicinal plant researchers.

A substantial number of medicinal plants used in Rivers State to treat ailments are also used in other regions of the world for similar purposes. These plants provide a basis for investigation by modern scientific methods for possible discovery of novel drugs, which may be incorporated into the healthcare system of the country. A comparison of the survey results with the published scientific reports indicates that some of the plants have had their uses in traditional medicine scientifically validated.

Acknowledgements

The authors acknowledge the contributions of the TMPs and the community elders of Rivers State. We are also grateful to Mr. Okon Abia-Williams, an herbalist in the Department of Pharmacognosy & Natural Medicine, University of Uyo, Uyo, for facilitating contact with the TMPs of Rivers State.

Declaration of interest

The authors declare no conflict of interest.

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