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Ethnobotanical study on medicinal wild plants sold at the Brikama market in The Gambia

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Herbal markets, in turn, not only supply herbal treatment for diseases but also conserve biocultural diversity by transferring traditional knowledge to future generations This study aimed to document the vernacular names and therapeutic uses of wild medicinal plants sold and used by Brikama people in The Gambia's West Coast Region. An ethnobotanical survey was conducted to document the wild medicinal plants sold at the Brikama market. The study was carried out between June and July 2023 using semi-structured interviews with 50 market vendors and 20 clients (laypeople) who uses traditional medicines from different age groups in Mandinka local language. The survey identified and recorded 71 plants species from 41 plant families, used for treating diseases in Brikama and its surroundings. The Fabaceae was the most represented plant family and most of the plants were trees and the leaves were the most commonly used plant part 51% followed by shrubs 38% and herbs 11%. The older generation primarily possesses knowledge about plant medicine, but youth should be encouraged to learn and preserve this knowledge through domestication, cultivation, and conservation measures.

Keywords: Traditional, medicine, anti-hypertension, anti-hyperglycaemic, Brikama town

1. Introduction

Biodiversity does not only refer to the diversity of living organisms and ecosystems but also on biocultural diversity (Maffi and Woodley, 2010; Uzun and Koca, 2020). This biocultural diversity is defined by herbalism and ethnobotany, which studies the relationship between humans and plants (Uzun and Koca, 2020). Medicinal plants were first discovered and used by ancient Indians, Chinese and Europeans (Petrovska, 2012). Today, an increased importance on healthy living has encouraged the use of natural plants sold at herbal markets all over the world (Uzun and Koca, 2020). Herbal markets, in turn, not only supply herbal treatment for diseases but also conserve biocultural diversity by transferring traditional knowledge to future generations (Uzun and Koca, 2020). Traditional Medicine (TMs) still remains the key resource for a large majority of people treating health problems (Uzun and Koca, 2020). This is a multi-generational knowledge system that considers socio-cultural norms, religious beliefs, and group experiences in determining substance use, dosages, and practices Uzun and Koca, (2020). The life expectancy of the Gambia was at 62.61 in 2020 and this also shows that the country's health sector is seriously affected by Neonatal conditions, Asthma hypertension, diabetes, cancer, renal failure stroke, heart disease, STI among others (HMIS, 2021). Chemists' attempts to create new molecules often cause side effects, making plant medicines an alternative for low-income individuals, leading to the acceptance of traditional medicine as a substitute healthcare (Diatta et al. 2019). Traditional medical practice is less attractive to young people due to western culture, education, and belief in superstition. This may lead to the loss of valuable knowledge on medicinal plants, which is crucial for future generations (Simbo, 2010). Previous studies on medicinal plant species used by Jolas in The Gambia and Janjanbureh island inhabitants have primarily focused on a specific group of people (Madge, 1998; Choudhary, 2017). This study aims to identify vernacular names and therapeutic uses of wild medicinal plants sold in Brikama, The Gambia, a region with no existing studies.

2. Method

2.1 Study area

The study was conducted at the Brikama market (Figure 1). It is located in Brikama town in Kombo Central District, West Coast Region (WCR) of The Gambia in West Africa. Brikama town is located on Latitude: 13° 15' 60.00" N Longitude: -16° 38' 59.99" W. It is the regional capital of the Western Region, the headquarters of Brikama Area Council (BAC), and it is the most populated Local Government area in the country. The main urban settlement is approximately 35km (22 miles) southwest of the capital city, Banjul, and has a population of 699,704 people (GBoS, 2013 census). Brikama market serves as a major

shopping centre for the people living in Brikama and the entire West Coast Region of The Gambia.

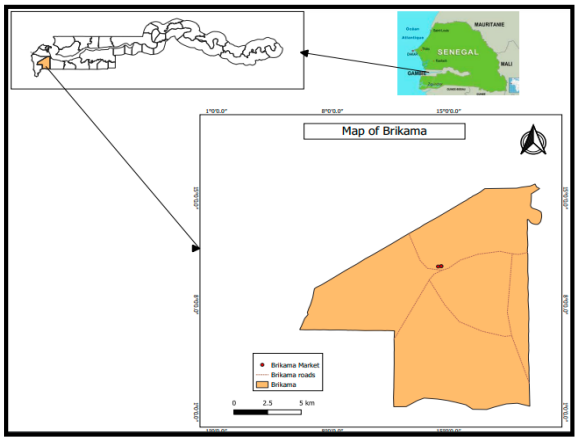

Figure 1: Map of the study area showing Brikama market

Figure 2A: Herbal medicine shop at Brikama market with various Herbs 2B: Sample of *Combretum glutinosum*

2.2 Ethnobotanical data collection and Plant identification

An ethnobotanical survey was conducted in June and July 2023 to study wild medicinal plants sold at the Brikama market, involving interviews with 50 vendors and 20 clients in the Mandinka local language so that informants could accurately express themselves. Participants were selected using snowball techniques among the herb vendors and the "laypeople". The participant's consent was first sorted and only those who voluntarily accepted to participate in the research were interviewed. Ethical guidelines followed the International Society of Ethnobiology Code of Ethics (ISE, 2006) was adopted. The ethnobotanical data aimed to document local plant names, growth forms, frequency of use, and plant parts, while also recording vernacular photographs. The identifications of the plants were based on the unpublished note book obtained from the staff of Furuyar forest part station office in Brikama town of The Gambia.

2.3 Data analysis

Descriptive statistics (frequency, pie charts and percentage) were used to analyse the ethnobotanical data of the reported wild medicinal plants and their associated indigenous knowledge. The most significant medicinal uses of plants were evaluated by calculating the use value (UV) which was used to calculate the citation of plants during interviews (De Albuquerque et al., 2009).

$$UV = \frac{\Sigma Uis}{ns}$$

ΣUis is the sum of the total number of use citations by all informants for a species; ns is the total number of informants.

3. Results

3.1 Demographic information of respondents

The study involved 70 informants, mostly men and women, aged 19-89, with 43% aged 70-89 and 36% having primary education, while 21% had no formal education.

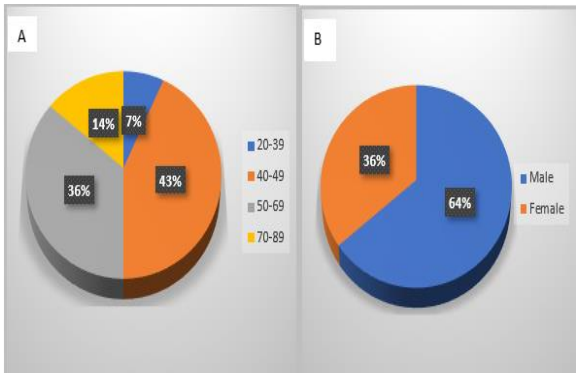

Figure 3: Distribution of frequency of use by (A) Age and (B) Sex

3.2 Ethnomedicinal use of plants and frequency of use value

The communities around Brikama use diverse flora in treatment of various ailments and local people possess rich traditional knowledge on medicinal plants (Table 1). Trees made up 51% of the total number of medicinal plants followed by shrubs 38%) and herbs making up the remaining. A total of 71 plant species distributed in 41 families were identified in this study. Fabaceae contributed 8 species, followed by *Caesalpiniaceae* and combretaceae both contributed 5 species, Apocynaceae, Mimosaceae, Rubiaceae and Solanaceae all represented 3 species each. The leaves were the most commonly used plant part followed by the aerial parts of leaves (47%) and then by the roots (23%) of woody plants and bark was (18%). The species use values (UV) have

confirmed the importance of medicinal uses of by plants sold at Brikama market in The Gambia. UV values ranged from 5 to 96 with *Cassia sieberiana* having the highest citation (UV = 96) whiles Funtumea *elastic* had the least. The majority of plants offer a variety of medical purposes. For instance, boiled leaves of *Saba senegalensis, Cassia sieberiana, Terminalia albida,* and *Dialium guinease* are administered orally to treat hypertension and diabetes. The majority of species use the same component to cure various illnesses. For instance, *Annona senegalensis* leaves are used to treat diabetes and bodily pain. Only a small number of plants were said to have just one application. For example, *Chromolaena odorata* treats children's pneumonia, *Salacia senegalensis* treats skin infections, *Acacia albida* washes the stomach, *Hibiscus surattensis* stimulates appetite, and *Carapa procera* treats knee pain (table 1). All of the plant species listed in this study were available for purchase at nearby herb shops, and several were procured in response to client requests. Our findings also indicated that the top three ailments that the wild plants sold at Brikama are said to treat are stomach aches (19), body, chest, and back discomfort (13), and headaches (12). There were 8 citations for antimalarial, antihyperglycemic (diabetic), and antihypertensive medications, respectively.

4. Discussion

The aim of this work is to document the wild medicinal plants values, local names, forms and their parts sold at the Brikama market. Africans continue usage of TMs has prompted the WHO to develop a set of tools and guidelines to support the scientific development of TMs through the identification of their medicinal components and standardization of procedures for their use (WHO, 2023). More men were involved in this study. However, other researchers have documented finding more women and older participants have demonstrated more know-how in medicinal plant (Chebii et al. 2022). The study's results indicate that young people's lower participation indicates a lack of interest in selling medicinal plants. Few shops sell concoctions of *Cassia sieberiana* and *Salacia senegalensis*. *Salacia senegalensis* leaves are boiled and consumed as tea, with most plants administered by rubbing them on affected body parts after soaking in water for hours or days. *Daniellia oliver* bark is believed to drive evil, while *Anthocleista nobilis* leaves and root are not orally administered but must be inhaled or vaporized. This method of TM administration was also reported in Foni by the Jolas (Madge, 1998), Babungo, Northwest Region, Cameroon (Simbo, 2010) and in Western Kenya (Chebii et al. 2008). TM or their desire to be "modern," which included using biomedicine and they had probably received little instruction from their parents about indigenous medicine and were advised against using it by biomedical professionals (Madge, 1998). Similar research findings have also reported that most TMPs have basic or elementary level of education but display great mastery of TM knowledge (Miara et al. 2019). Folk ethno-taxonomy has characterized the TM markets where the locals use vernacular names of the medicinal plant species were commonly used (Chebii et al. 2022). In traditional markets at Western Kenya were a total of 45 commonly traded plants composed of 87 medicinal wild plants (Chebii et al. 2022), the number of medicinal plant species sold at the market within Brikama town represents an intermediate value.

The Mandinka language, spoken by over 90% of the West Coast Region's Gambia population and it's the lin-gua Franca. All of the medicinal plants sold at the market now have vernacular names in the Mandinka language, following a trend that was also seen in Guinea Bissau. Whereas majority of the plants that were recorded in Guinean Creole or Kriol which is their primary language (Catarino et al. 2016). Fabaceae plants were the more commonly used for medicinal purposes in Brikama due to their diverse biologically active compounds and their large number in the plant kingdom (Chebii et al. 2022). The major medicinal plants traded in Brikama market were derived from trees and this concurs with an earlier report about the predominance of tree species in traded by Bachama tribes of the Adama awa people of Nigeria (Idu et al. 2006). The collected medicinal plants were found to be very common among the people and were used in traditional healthcare for a variety of disease conditions such as spiritual bath, anti-poison, stomach ache, hypertension, diabetes and strong manhood. Most of the TM sold at the market was either in the form of leaves, roots, bark or fruit.

Traditional Medicines, due to their availability, accessibility, and low cost, are widely used in The Gambia, leading to widespread advocacy for their integration into the country's public health system (Randell et al., 2013). TM's use is skepticism due to lack of scientific evidence, but research is shifting towards traditional remedies, focusing on specific preparation techniques and bioactive qualities in Africa for instance, Cola cordifolia (Togola et al., 2008). *Kigelia africana* (Fagbohum et al. 2020) Combretum micranthum (Faye et al. 2023), *Khaya senegalensis* and *Cassia sieberiana* (Drammeh et al. 2023) and *Parkia biglobosa* (Grønhaug et al. 2008), promoting the integration of Traditional Medicine (TM) into global

health systems to maximize its potential and promote health and wellbeing. (WHO, 2023).

5. Conclusion

The study reveals indigenous knowledge of 71 plant species used for treating skin rashes, diarrhoea, eye infections, and wounds in Brikama markets. However, increasing demand has put pressure on wild plant populations, potentially leading to local extinction. To ensure sustainability, domestication and conservation measures are needed for these plants.

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Conflict of interest

The authors declare no conflict of interest.

Ethical approval and consent to participate

All the vendors who decided to collaborate were interviewed according to mutually agreed conditions and under the human rights, especially with regards to the Convention on Biological Diversity.

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Table 1: Ethno-botanical information on plants used for the treatment and management diseases and general well-being in Brikama

	Species	**Family**	**Local name**	**Plant part used and their Therapeutic use or ailment treated**	**UV (%) & PT**
1.	*Annona senegalensis* (Pers)	*Annonaceae*	Sunkungo (m), Dorgut (w)	(L): Fever, body, chest and back pain, Anti-hyperglycaemic and (B) Antidiarrhea, helps women to give birth	89 (S)
2.	*Sclerocarya birrea* (A. Rich)	*Anacardiacea*	Kuntajawo (m), Bjrr (w), Sri (f)	(L): Anti-tetanus, Anti-poison and toothache, anti-diarrheal, anti-diabetic, anti-inflammatory, antimicrobial	87 (T)
3.	*Spondias mombin* (Schumach. & Thonn)	*Anacardiaceae*	Ninkongo (m), Ninkong (w) Chaligoo (f)	(L): Anti-diarrheal, dysentery, haemorrhoids and a treatment for gonorrhoea	63 (T)
4	*Funtumea elastic*	Apocynaceae	Farakono mano	(L): painful menstruation, fungal infections, and wounds	3 (H)
5	*Saba sengalensis*	*Apocynaceae*	Kaba (m,w)	(L): Anti-hypertensive and anti-hyperglycaemic	92 (T)
6.	*Landolphia heudelotii*	*Apocynaceae*	Folay (m), Toll (w)	(F): Appetizer	49 (S)
7.	*Areca cathechu* L.	*Arecaceae*	Corozo	(F) Anthelmintic treatment	11 (T)
8	*Chromolaena odorata*	*Asteraceae*	Kolunkoro	(L) Pneumonia in children	4 (S)
9.	*Kigelia Africana* (Lam.) Benth	*Bignoniaceae*	Sunjubaba	Arthritis and antihyperglycemic (B), Rheumatism and anti-dysentery (F), Piles (B), Waist pain and sexual strength (R)	58 (T)
10.	*Newbouldea leavis*Seem (P. Beav) Seeman	*Bignoniaceae*	Kunjumburungo	coughs, antidiarrhea, anti-dysentery, epilepsy and convulsions in children (L)	14 (T)
11.	*Adansonia digitate L*.	*Bombacaceae*	Sito (m), Bui (w) and Bok (f)	Dysentery (F), Treating wounds (R), Stomach pain (L)	85 (T)
12.	*Cassia sieberiana DC.*	*Caesalpinaceae*	Sinjango (m), Sinjango (w) and Malgagi (f)	Skin infection, eye, constipation and tiredness (L), Stomach pain, worn infection, gastric, erectile dysfunction, antihypertension and antihyperglycemic (R)	96 (S)
13.	*Piliostigma thonningii* (Schumach.)	*Caesalpiniaceae*	Fara jambo messeng (m) Geyges (w) and Barkeyi (f)	Cures stomach ache in newly delivered mother (L)	79 (S)
14.	*Detarium macrocarpa*	*Caesalpinaceae*	Sarawonko	Joint pain, rheumatism and for pregnant women (L)	61(T)
15.	*Tamarindus indica L.*	*Caesalpinaceae*	Timbingo (m), Daharr (w) Jammi (f)	Anemia and Appetite (F)	64 (T)
16.	*Daniellia oliveri* (Rolfe) Hutch. & Dalziel	*Caesalpinaceae*	Santango (m), Santang (w) Chewi (f)	To drive evil away	55 (T)
17.	*Boscia senegalensis* (Pers.)	*Capparaceae*	Tankawo (m)	Erection dysfunction	48 (S)
18.	*Salacia senegalensis (Lam.)*	Celastraceae	Sinjang-koyo	Skin infection	38 (S)
19.	*Guiera senegalensis*	*Combretaceae*	Mamkunkoyo (m), Ngerran (w), Geloki (f)	Marabou use it for spiritual healing, wound healing, chest pain, common cold and fatigue (L) and Urinary problem (R)	46 (S)

20	*Combretum nigricans*	*Combretaceae*	Kunkutu mandingo (m), Tab (w) Buki (f)	Cleanse the blood, used by pregnant women to clean unborn baby	63 (L)
21	*Combretum glutinosum* (Perr. ex DC.)	*Combretaceae*	Jambakatong (m), Ratt (w) and Buki (f)	Antidiarrhea, body pain many unknown illnesses, cleans the blood and impotence (B)	94 (S)
22.	*Combretum micranthum* (G. Don)	*Combreraceae*	Bara jambo (m), Kinkeliba (w) Tali (f)	Washes blood, cough, mouth sore, malaria, detoxification and antihypertension (B)	39 (T)
23	*Terminialia albida*	*Combretaceae*	Wolo koyo (m)	Malaria, stomach ache, chest pain, fever and antihyperglycemic (L)	62 (T)
24	*Neocaryo macrophylla* (Sabine)	*Chryobalanaceae*	Tamba (m), Neeow (w), Naudeh (f)	Antihypertension and prevent constipation (B)	38 (T)
25	*Perinari excelsa* (S)	*Chryobalanaceae*	Mampato (m)	Chest pain and antihyperglycemic (L)	96 (T)
26	*Costus afer* (Ker Gawl)	*Costaceae*	Belicuofo (m)	Antihypertension, stomach ache, arthritis (L)	13 (H)
27	*Diospyros mespiliformis* (Hochst. ex A. DC.)	*Eboraceae*	Kukuwo (m), Alom (w), Nelberi (f)	Fevers, pneumonia, syphilis, leprosy, headache, arthritis and skin infections (L)	15 (T)
28	*Ricinus communis L.*	*Euphorboraceae*	Tumbusuma (m)	Increase milk in lactating mother and it can also be mix with naso for spiritual cleansing	10 (S)
29	*Cassia occidentalis* (L.) Link	*Fabaceae*	Kassala (m)	Bruises, cataracts, washes baby in its mother's womb, fever, antihyperglycemic and cough (L)	92 (S)
30	*Moghania faginea* (G & P)	*Fabaceae*	Sanfito (m)	For pile, stomach pain in pregnant women, washes blood, leprosy (L)	89 (S)
31	*Acacia scopiodes* (L.) W.Wight	*Fabaceae*	Bano (m), Solom solom (w) Mako (f)	Scurvy in children, ulcer, tooth ache and pile (F) and Worms, pile, scurvy and stomach ache (F)	75 (T)
32	*Dialium guinease*	*Fabaceae*	Kosito (m)	Antihyperglycemic and antihypertension	94 (T)
33	*Stylosanthes mucronate* (Retz.) Alston	*Fabaceae*	M'bono (m)	Chest pain	23 (S)
34	*Cassia tora* L.	*Fabaceae*	Jambanduro (m)	Constipation	35 (S)
35	*Acacia albida* (Delile)	*Fabaceae*	Baransango (m), Kada (w)	Malaria and fever	72 (T)
36	*Pterocarpus erinaceus* (Lam)	*Fabaceae*	Keno (m), Wein (w), Bani (f)	Increases blood and antifungal (B)	24 (T)
37	*Icacina senegalensis* (Juss)	*Icacinaceae*	Manankasso (m), Bankanass (w), Sla (f)	Cures chronic malaria (L), Stomach-aches, erectile dysfunction and strong manhood (R)	28 (S)
38.	*Hyptis suaveolens*	Labeateae	Susula ngyamo (m)	Antiinflammation, gastric ulcer (L)	11 (H)
39	*Vitex doniana* (Sweet)	*Lamiaceae*	Kutufingo (m), Khell (w) Galbihi (f)	Anemia (L) and Wound healing (R)	27 (T)
40	*Strychnos spinose* (Lam)	*Longaniaceae*	Pateh kulay (m), Doka (w) Kumbihi (f)	Erectile dysfunction (R and B)	24 (S)
41	*Anthocleista nobilis* (Afzel. ex R.Br.)	*Gentianceae*	Sandibo (m)	Antimalaria, to regulate menstruation and constipation (B), Oedema and scrotal elephantiasis (L)	8 (T)
42	*Hibiscus surattensis* L.	*Malvaceae*	Wulo kono kutcha (m)	Antimalaria (L)	10 (S)
43	*Carapa procera*	*Meliaceae*	Kogunburon (m)	Knee pain (R)	7 (T)
44	*Khaya senegalensis* (Desr.) A. Juss	*Meliaceae*	Jalo (m), Khai (w), Kahi (f)	Skin rash, stomach ache, chest pain (B) and Gastric, pain, syphilis and worm (R)	11 (T)
45	*Entada Africana* (Guill & Perr)	*Mimosaceae*	Sama – netto (m)	Stomach ache (L)	15 (T)
46	*Parkia biglobosa (Jacq)*	*Mimosaceae*	Netto (m), Netteh (w), Nette (f)	Fever and antimalaria (F)	93 (T)

47	*Prosopis Africana*	*Mimosaceae*	Kembo (m), Hirr (w), Rohi (f)	Tooth ache and anemia (B)	17 (T)
48	*Ficus gnapalocarpa* (Sreud. Ex Miq)	*Moraceae*	Sotoba (m)	Increases blood, body pain and tiredness (B)	38 (T)
49	*Ficus glumosa* (Delile)	*Moraceae*	Yerifasoto	Antihypertensive (L) and Body pain (B)	15 (T)
50	*Eucalyptus camaldulensis* (Dehnh)	Myrtaceae	Mentolato- yiro (m), mentelat (w)	Cough and cold (L)	89 (T)
51	*Lophira lanceolate*	*Ochnaceae*	Macharharo (m)	Antihypertension (L)	89 (T)
52	*Pterocarpus erinaceous* (Poir)	Papilionaceae	Keno (m), Wein (w), Bani (f)	Anti-inflammatory, antimalaria, anaemia, ulcer and rheumatism (L)	35 (T)
53	*Bridelia ferruginea* (Willd)	*Phyllantthaceae*	Kunidindolo (m)	Spiritual cleansing (L) and Stomach ache (R)	23 (S)
54	*Scoparia dulcis L*	*Plantaginaceae*	Timin timo	Chest pain, infants stomach ache, for good luck (L)	9 (H)
55	*Cymbopogon citratus* (DC.) Stapf	*Poaceae*	Wafaro (m)	Fever and jaundice (L)	5 (H)
56	*Securidaca longipedunculata* (Fr)	Polgalaceae	Jutto (m), Fuff (w), Lali (f)	Gonorrhea and syphilis (R) and Antimalaria and antivenom (L)	10 (T)
57	*Funtumea elastic ((*Preuss)	Apocynaceae	Farakono mano (m)	painful menstruation, fungal infections, and wounds (L)	5 (S)
58	*Gardenia erubescens* (Stapf & Hutch)	Rubiaceae	Tankango (m)	Anxiety, agitation, bladder infection, bleeding (L) and it prevent stomach aches (R)	5 (S)
59	*Mitragyna inermis*	Rubiaceae	Jungo (m)	fever, headache, antidiarrhea, antidysentery, antimalaria (L)	10 (S)
60	*Nauclia lartifolia*	*Rubiaceae*	Baa-tiyo (m)	Stomach aches, rheumatism (R)	61 (T)
61	*Fagara zanthoxyloides* L	*Rutaceae*	Bafeh (m)	Prevent constipation and chest pain (R)	50 (S)
62	*Allophylus africanus* P. Beauv	Sapindaceae	Nguso (m)	Anti-inflammatory (B) and rashes, bruises, antidiarrhea, fever and stomach ache (L)	13 (S)
63	*Paulinia pinnata L*	*Sapindaceae*	Jambalulu (m)	Antidiarrhea (L)	13 (S)
64	*Vitellaria paradoxa* C.F.Gaertn	*Sapotaceae*	Bamboo tulo (m)	Fever, head ach, jaundice, stomach ache (L) For treating fractures	30 (T)
65	*Hannoa undulata* Planch	*Simaroubaceae*	Kulikuli (m)	Stomach ache and snake bite (B) Rub on disjoint part, detoxicant and antimalaria (L)	35 (T)
66	*Datura stramonium L*	*Solanaceae*	Duwalingo (m)	Cough and chest pain (L)	30 (H)
67	*Solanum indicium L*	*Solanaceae*	Sulajato (m)	Eye pain, and asthma (B)	18 (H)
68	*Datura metel L.*	*Solanaceae*	Kubayjarrow	Body pain and swollen body (L)	63 (H)
69	*Cola cordifolia (*Cav.)	*Sterculiaceae*	Tabo (m), Taba (w)	Stomach ache in new born mother (L)	62 (T)
70	*Lippia multiflora L. chevienii L*	*Verbenaceae*	Sisili ngyamo (m), mbor mobor (w)	For good sight, chest and body pain (L)	69 (H)
71	*Ziziphus mauritiana (Indian jujube) Lam*	Rhamnaceae	Tomborong (m)	Source of vitamin (F) and Reduces blood (L)	50 (S)

Note: Mandika (m), Wollof (w) and Fula (f), Used value (UV), [Plant part used: L (leaves), B (Bark) and (F) Fruit] [Plant Type (PT), S (shrub), H (Herb), T (Tree)]

