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Ethnobotanical Survey of Medicinal Plants in Malumfashi Local Government Area, Northwestern Nigeria

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Abstract

People in Malumfashi Local Government Area Katsina State, Nigeria have been using medicinal plants to cure various ailments since time immemorial. However, the medicinal uses of such plants were never documented. Herein, we conducted an ethnobotanical survey to document medicinal plants as well as the ethnobotanical knowledge of Malumfashi Local Government, Katsina State, Nigeria. We employed a semi-structured questionnaire to interview 50 respondents comprising of herbalists, traditional midwives, housewives and farmers. Medicinal plants belonging to 37 genera distributed among 29 families were documented. The majority of the mentioned medicinal plants belong to the family Fabaceae (9), Asteraceae Combretaceae and Moraceae (4), Malvaceae (3), Myrtaceae and Anacardiaceae (2) families. *Securidaca longipedunculata*, *Azadirachta indica,* and *Mangifera indica* were the medicinal plants with the highest relative frequency of citation with 0.44. 0.38, and 0.34, respectively. For fidelity level (FL), *Spinacia oleracea* and *Diospyros mespiliformis* were the species with the highest, 100% each. Among the 10 categories of ailments, Urogenital, Fever, and Antinode had the highest Informant Consensus Factor (ICF) of 0.78,0.76 and 0.75, respectively. Most of the reported plants (84%) were trees and shrubs and about 70% of the surveyed plants were wild. The most frequent plant parts used were leaves and bark. The majority of the medications (70%) were prepared as decoctions and were mostly administered orally (86%). We recommend screening of bioactive compounds present in the reported plant species as well as their biological activities on the pathogens that cause the diseases. Additionally, the cultivation of medicinal plants to minimize the pressure on wild species is also recommended.

Keywords: Ailments, Ethnobotanical survey, Malumfashi Local Government, Medicinal plants

Introduction

Ethnobotany is a division in botany that is mainly concerned with the role of plants in ecosystems in relation to their commercial, societal and cultural importance (*Gaoue et al*., 2017). It focuses on plant-human interaction at various levels with much emphasis on how different individuals, cultural groups, and societies utilized floras for their uses in their systems (Awang *et al*., 2018; Dogara *et al.,* 2021)., Inhabitants of various communities, particularly in the village settlements utilize plants in their areas in their traditional health care system

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(Dogara *et al*., 2021). This is because modern hospitals and infrastructures are not adequately available in the villages, even if available the cost is very expensive and not affordable to low-income households. Several communities across the globe utilize flora and its resources in their daily activities (Barbosa *et al*., 2019). Several factors, including anthropogenic activities and recent climate change, were to have severe negative consequences on the abundance and distribution of plant species with medicinal importance. Additionally, over-exploitation of the indigenous plant's resources was also reported to have a serious negative impact on the biodiversity of medicinal plants (Barbosa *et al*., 2019). Documenting the different kinds of medicinal plants and folk medicine knowledge and practice for a particular region in a given time will play a major role in biological study and conservation. Folks medicine is utilized by the majority of communities for the treatment of their endemic diseases particularly in Africa and Asian continents (Abdulrahman *et al*., 2018; Dogara *et al*., 2022). Traditional popular medicine is the most traditional practice used in curing diseases in Sub-Saharan Africa's rural and urban areas, where people's purchasing capacity is often limited (Barbosa *et al*., 2019).

In Africa, Nigeria is one of the countries with the highest floristic biodiversity and the majority of the plant species have medicinal values and are widely distributed in almost all the six geopolitical and vegetation zones of the country (Wasongo*,* 2011). Because of its complicated topography and diverse climatic circumstances, the country is endowed with genetic diversity of flora and animals. The majority of plant species of medicinal value are found in the wild, where they grow naturally. Medicinal plants, however, are seriously in danger of going extinct due to several detrimental human and environmental factors, including overharvesting, deforestation, desertification, and global warming, to name a few. Approximately 15,000 species of medicinal plants are thought to be in danger of going extinct globally as a result of habitat degradation, overharvesting, and large-scale commercial operations (Naguib, 2011). The pressure on the diversity of medicinal plants is tremendous because many of them are also valuable as raw materials for other sectors, including food, confectionaries, textiles, cosmetics, and biomass. In developing nations, where most people rely on medicinal herbs for their primary healthcare needs, the overuse of these plants is comparatively more prevalent. Due to a lack of documentation, it is difficult to obtain information about therapeutic plants. People are dying with their ethnobotanical knowledge of medicinal plants used for treatments and healing of various diseases and ailments. As the newer generation becomes more mobile and the potential trust moves on this is a danger that knowledge will disappear. There is a need for documentation of the medicinal plants of indigenous communities. Malumfashi's local government area has been well known in the utilization of folk medicine for the past decades, this practice is no longer utilized efficiently and it is as a result of a lack of documentation of the knowledge. In the other hand, modern healthcare facilities are lacking in most of the communities, thereby making folk medicine the only alternative for the inhabitants of the area. Therefore, there is a need to gather, document and validate the ethnomedicinal information of the local area.

Materials and Method

Study Area

Malumfashi local government area is situated in Katsina state, North-west Nigeria and has its headquarters in the town of Malumfashi (Figure 1). The LGA is made up of several towns and villages such as Marmawa, Sabon Gari, Yaro, Agagiwa, Fanisau, Karfi, Gora, and Makaurachi. The LGA is located between latitude 11.7929^0 N And longitude 7.6168^0 E. Malumfashi Local Government Area (LGA) has an estimated population of 202,619 people, the great majority of whom belong to the Fulani ethnic group. In Malumfashi LGA, the languages Fufulde and Hausa are frequently spoken, and Islam is a regularly practiced religion there. The LGA's traditional administrator is the Galadiman Malumfashi. The Malumfashi local government has an average temperature of 33 degrees Celsius and a total area of 674 square kilometres. The two main seasons in the LGA are the dry and the rainy, with

the dry seasons bringing hot, muggy weather to the region

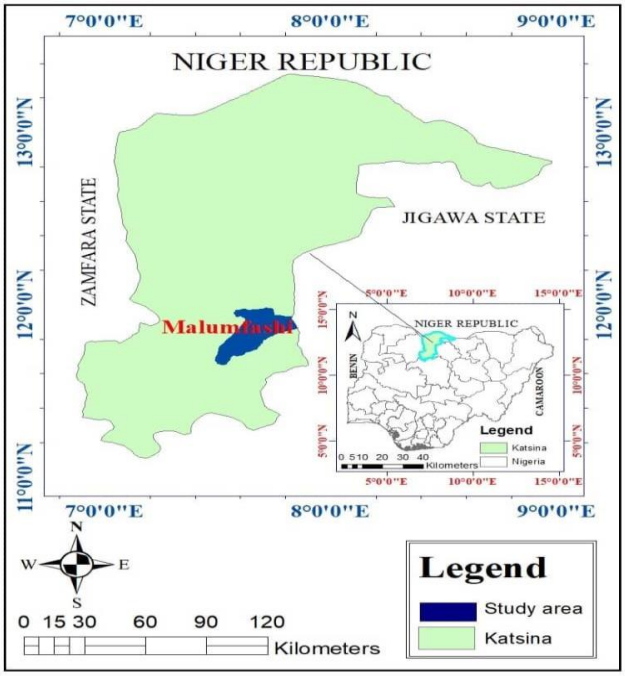

Figure 1: Map of Katsina state showing the study area

Sampling Design and Informant Selection

Four wards of Malumfashi Local Government Area were selected purposively. A Series of field trips were made in the selected areas in the first quarter of 2023, the informants were interviewed in Hausa at their farmlands, workplaces, homes and markets. We explained the content and purpose of the research to the volunteers and we also sought their consent before administering the questionnaire. The criteria for being a respondent are to be an adult, above 18 years and be able to respond to questions independently. In each ward, the village head was first interviewed and asked to recommend people who fall within the stated criteria and are familiar with the topic in question (snowball sampling). The ethnobotanical data of the wild edible plant was collected using the semi-structured questionnaire (Cotton, 1996; Cunningham, 2001; Martin, 1995), with slight modification. After the data collection, field observations, general interviews and discussions were made on the overall checklist of questions with some selected respondents to validate the responses obtained. The information in the questionnaire is divided into two parts: Part A is concerned with the socio-demographic information of the respondent which includes name, sex, occupation, and level of education. Part B is concerned with the information on the use of wild edible plants (diseases treated, part used and conservation status etc.)

Collection and Identification of Plant Specimen

A guided field walk was conducted with some volunteered informants to collect wild edible plants cited by the respondents during the data collection. Typical specimens bearing good vegetating and floral parts (leaves, fruits and flowers) were collected for the preparation of voucher specimens. During the collection, the habitat, GPS location, and habitat of each plant were recorded and the specimen was assigned a unique collection number. The collected specimens were pressed immediately following the standard procedure and taken to the herbarium of Umaru Musa Yaradua University, Katsina (HUMYU). The plant species were identified using various floras, and herbarium specimens and with the help of the herbarium curator. The names were further verified and standardized with the aid of the Database of the Plants of the World (POWO) and the African Plant Database.

Data analysis

The socio-demographic information of the respondents and ethnobotanical data collected were organized in a Microsoft Excel spreadsheet. The socio-demographic information of the respondents was evaluated using simple percentages. Relative Frequency of Citation (RFC) was used to analyse the ethnobotanical data collected during the survey. The formula for calculating the RFC is:

$$RFC = \frac{\text{frequency of citation}}{\text{total number of informants}}$$

where Fc= number of informants who cited a particular plant species and N= total number of informants that participated in the study. To identify the most common and cited wild edible plant species we used Informant Consensus Factor (FIC), using the formula:

$$FIC = \frac{\text{Nur} - \text{Nt}}{\text{Nur} - 1}$$

where Nur = frequency of use citation in each disease group and Nt = the number of wild edible plants cited for each disease. To do this, we first categorize the diseases into various categories based on the nature of the disease and the site of infection. The values of the computed ICF range from 0 to 1. A higher value of 1.0 or > 0.8 shows that the majority of the informants utilize few numbers of wild edible plant species in the treatment of various ailments while a lower value of 0 – 0.8 indicates that the respondent did not agree with the usage of the wild edible plant in the treatment of a particular ailment group.

The Cultural Importance Index (CII), measures the importance of a species in the study area. It is calculated by dividing the number of separate uses reported by the informant by the total number of informants.

$$CII = \frac{\text{number of use report}}{\text{total number of informants}}$$

The Fidelity Level was calculated using the below formula

$$FL = \frac{\text{Np}}{\text{Na}} X100$$

where Np is the number of informants that report the use of a plant species in the treatment of a particular ailment and Na is the number of informants that report the use of the plant in the treatment of any disease.

Results

Socio-Demographic Information

The socio-demographic information of the respondents is presented in Table 1, most of the respondents (56%) were male, and this may not be unconnected to the fact that males are more concerned with traditional medicine and were easily accessed during the study. In terms of age, the majority of the respondents (53%) are 42 to 60 years of age, which shows that people of old age are the main custodians of traditional knowledge. This, however, poses a serious threat to indigenous knowledge because it may eventually be lost following the demise of the older generation. Most of the respondents (70%) had no formal education, and this finding is attributed to the fact that men, who were the majority of the respondents, were not enrolled in Western schools. Most of the respondents (30%) were Traditional herbalists because these individuals were the most cooperative during the survey and had more experience in the use of medicinal plants.

Diversity of Medicinal Plants Used in Traditional Medicine in Malumfashi

The survey recorded and reported a total number of fifty 50 plant species plants species, distributed in 37 genera and 29 families of different growing habits amongst which 28 are trees, 14 shrubs and 8 herbs (Table 2, Figure 2). This is consistent with previous studies where trees were reported as the most prevalent life form of the medicinal plants used in different communities (Yaradua and El-Ghani, 2016). The abundance of the tree's life forms as herbal medicine around the world has been related to wide distribution and the ease of collection Shrubs were also said to be common because of their availability all year around and the fact that it has several parts that may be considered for use as medicine. In this study, Fabaceae is the family with the highest number of plant species (9), followed by the family Asteraceae, Combretaceae and Moraceae (4), followed by the family Malvaceae,(3) followed by family Myrtaceae and Anacardiaceae (2), followed by the family Amaranthaceae, Amaryllidaceae, Apocynaceae, Boraginaceae, Burseraceae, Cleomaceae, Cochlospermaceae, Cucurbitaceae, Cyperaceae, Ebenaceae, Euphorbiaceae, Lamiaceae, Leguminoceae, Lyhtraceae, Meliaceae, Olacaceae, Polygalaceae, Rhamnaceae, Rubiaceae, Salicaceae, Sapotaceae, Moringaceae (Table 3, Figure 3).

Plant part and mode of preparation

The plants, parts of plants and remedies or purposes for which they are used are presented in(Tables 4, and Figure 5). Leaves (48 %) and bark (26 %) were the most commonly used part in the disease treatment as reported by the volunteered respondents while whole plants, roots and fruits

Table 1: Demographic of the informants

Variable	Categories	Percentage
Gender	Male	56%
	Female	44 %
Age group	< 20	8%
	20 -40	12%
	41 – 60	52%
	61 >	28 %
Education	No formal education	70%
	Primary	16%
	Secondary	10%
	Tertiary	4%
Profession	Farmer	22%
	Herbalist	30%
	Housewife	24%
	Civil servant	8%
	Other	16%

were the least with 12 %, 8 % and 6 %, respectively. In the majority of medications, the modes of taking the medicine are usually orally as concoctions, topically (applied on localized parts of the body), decoctions(boiling), bathing, and ointment. For the traditional cures, there were no prescribed dosages; nevertheless, patients were advised to take healthy amounts or to stick with the treatment until they experienced complete symptom relief. For the preparation of the medicine, some are prepared in powder forms and some are boiled while some of the medicines are prepared in a mixture with red potash (Table 4, Figure 4).

Informant Consensus Factor (FIC). Informant Consensus

Informant Consensus Factor (FIC) is a form of analysis used to measure the degree of agreement among informants and collaborators regarding the ability of a certain plant species or group of plant species to treat a given disease category. Here, the FIC appears to be high for all listed illnesses (FIC values are between 0.4 and 1) (Table 5), This could indicate that the ethnomedicinal knowledge of the respondents was from a single source, resulting in uniformity in their knowledge of the medicinal plants, or it could signify that there is a strong likelihood that the plants mentioned can treat the corresponding ailments. Large sample sizes also have an impact on the FIC; for instance, when the sample size exceeds fifty, there is a greater likelihood of receiving repeated information, which makes the FIC values near 1. FIC values can be relatively unreliable in certain cases. In a recent ethnobotanical survey by Nortje and Van Wyk (2015) where only 16 respondents were interviewed, their findings indicated negative values in some of the calculated FIC. However, in a scenario where only one informant provided a remedy for a given disease, the value of 0 could quickly change to 1. In reality, FIC values have a weaker correlation than other quantitative analyses employed in the ranking of diseases based on various quantitative analyses, according to Nortje and Van Wyk (2015).

Table 2: List of medicinal plants in Malumfashi Local Government Area

Hausa name	Scientific name	Family name	Habit
Sabara	*Guiera senegalensis* J.F.Gmel.	Combretaceae	Shrub
Taura	*Detarium microcarpum* Guill. And Perr	Fabaceae	Tree
Tafasa	*Senna obtusifolia* (L.) H.S. Irwin and Barneby	Fabaceae	Herb
Runhu	*Senna singueana* Delile) Lock	Fabaceae	Shrub
Mangoro	*Mongifera indica* L.	Anacardiaceae	Tree
Gasaya	*Cleomo gynandra* L.	Cleomaceae	Herb
Rawaya	*Cochlospermum tinctorium* Perr.ex A.Rich.	Cochlospermaceae	Shrub
Tsamiya	*Tamarindus indica* L.	Fabaceae	Tree
Kirya	*Prosopi safricana* (Guill and Perr.)taub.	Fabaceae	Tree
Cindazugu	*Jatropha curcas* L.	Euphorbiaceae	Shrub
Bagaruwa	*Acacia nilotica* (L) Willd.	Fabaceae	Tree
Tazargade	*Artemisia annua* L.	Asteraceae	Shrub
Gamji	*Ficus platyphylla* Del	Moraceae	Tree
Kuka	*Adansonia digitata* L.	Malvaceae	Tree
Garahuni	*Momordica balsamina* L.	Cucurbitaceae	Shrub
Tsada	*Ximenia americana* L.	Olacaceae	Tree
Lalle	*Lawsonia intermis* L.	Lyhtraceae	Shrub
Geza	*Combretum micranthum* G.Don	Combretaceae	Shrub
Sanya	*Securidaca longipedunculata* Fresen	Polygalaceae	Tree
Bedi	*Azadirachta indica* A Juss	Malvaceae	Tree
Minjirya	*Erythrina senegalesis* DC.	Fabaceae	Herb
Marke	*Anogeissus leiocarpa* (DC.) (Guill. And Perr.)	Combretaceae	Tree
Dorowa	*Parkia biglobosa* (Jacq) G.Don	Fabaceae	Tree
Tawatsa	*Entada africana* Guill and Perr.	Fabaceae	Tree
Alayyahu	*Spinacia oleraceae* L.	Amaranthaceae	Herb
Tafarnuwa	*Allium sativum* L.	Amaryllidaceae	Herb
Shuwaka	*Vernonia amygdalina* Delile	Asteraceae	Shrub
Kalgo	*Piliostigma thonningii* DC.	Leguminoceae	Tree
Madaci	*Khaya senegalensis* (Desr.) A.Juss.	Meliaceae	Tree
Baure	*Ficus capensis* Engl	Moraceae	Tree
Gwaba	*Psidium guajava* L.	Myrtaceae	Tree
Goga masu	*Mitracarpus acunae* L.	Rubiaceae	Herb
Malmo	*Syzigium abbreviatum* Wall.	Moraceae	Tree
Kanya	*Diospyros mespiliformis* Hochst.ex A.DC	Ebenaceae	Tree
Tattaba	*Vernonia strumambiguum* (Kotschy and Peyr.) H.Rob.	Asteraceae	Herb
Sobo	*Hibiscus sabdariffa* L.	Malvaceae	Shrub

Chediya	*Ficus thonningii* Bl.	Moraceae	Tree
Magarya	*Ziziphus mauritiana* Lam.	Rhamnaceae	Shrub
Zogala	*Moringa oleifera* Lam.	Moringaceae	Shrub
Doddoya	*Ocium basilicum* L.	Lamiaceae	Herb
Turare	*Eucalyptu camaldulensis* Dehnh	Myrtaceae	Tree
Hano	*Boswellia dalzielii* Hutchinson	Burseraceae	Tree
Kajiji	*Cyperus articulates* L.	Cyperaceae	Shrub
Rimi	*Salix ledermannii* (L.) Gaertn.	Salicaceae	Tree
Kukkuki	*Combretum collinum* L.	Combretaceae	Tree
Tumfafiya	*Calotropis procera* L.	Apocynaceae	Shrub
Alulluba	*Cordia africana* L.	Boraginaceae	Tree
Kadanya	*Vitellaria paradoxa* C.F Gaertn	Sapotaceae	Tree
Danya	*Sclerocarya birrea* (A.Rich.) Hochst	Anarcardiaceae	Tree
Faru	*Lanea acida* A.Rich.	Anarcardiaceae	Tree

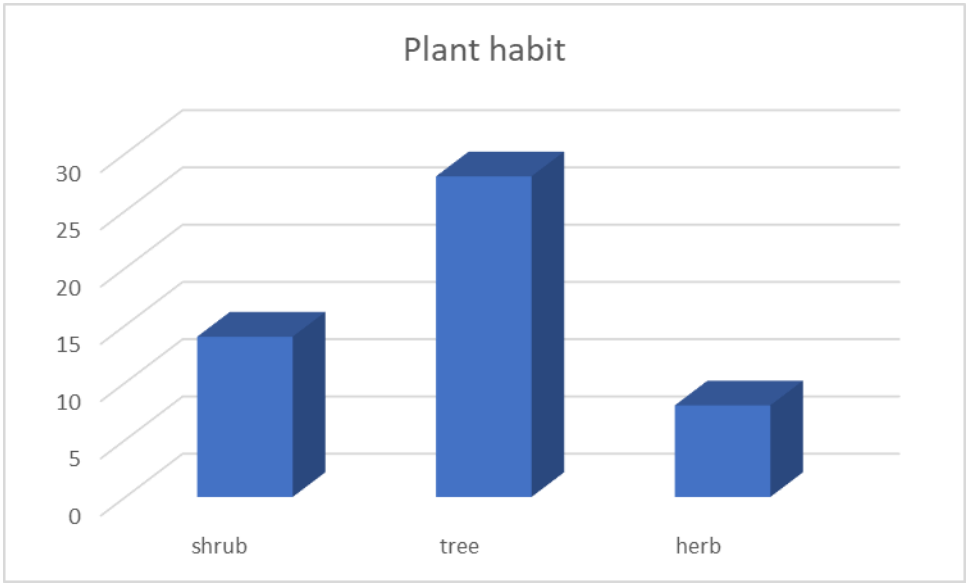

Figure 2: Habits of the medicinal plant species.

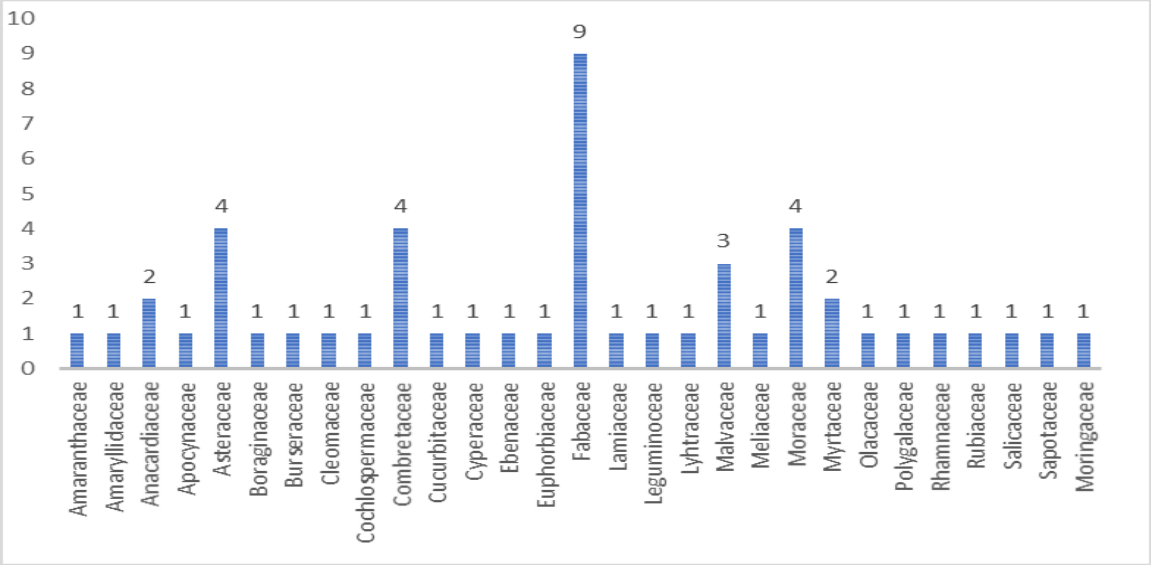

Figure 3: Species distribution according to family

Relative Frequency of Citation (RFC): Herein, the calculated RFC values range from 0.44 in *Securidaca longipedunculata* and 0.01 in *Ficus sur* (Table 6). This value was a result of the significance and uses of the plant species in the area, most plant species are more popular than others because of their utilization in some other cultural uses other than medicinal uses. For instance, *Securidaca longipedunculata* is the plant species with the highest RFC value and the plant is reported to treat only one kind of disease with several substitutions. Having the highest RFC values is an indication that the species is well known by the respondents and also the majority of the community inhabitants are using the plant for many purposes.

Cultural Importance Index (CII): *Artemisia annua* is the medicinal plant with the highest CII of 0.28 followed by *Guiera senegalensis* (0.16), *Ficus platyphylla* (0.14), and *Ficus capensis* (0.12) while *Cordia African, Vernonia amygdalina* and *Combretum collinum* (0.02) were the plants with least CII (Table 6). If a plant species is reported to have a high CII value, it indicates that the species overexploited; As a result, these plants should be put under conservation.

Moreover, this suggests that plant species are more likely to have biological activities, which means that they should be subjected to pharmacological and phytochemical screening.

Fidelity level: The fidelity level of the reported medicinal plants used in the treatment of various ailments in this study ranges from 20% to 100 %. Two species *Diospyros mespiliformis* and *Spinacia oleraceae* were the species with the fidelity level of 100% (Table 6). *Cyperus articulates*, *Lanea acida* and *Cordia Africana* were the medicinal plants with the lowest fidelity levels having 20%, 25 % and 33 %, respectively.

Discussion

Herein, we undertake an intensive ethnobotanical study of medicinal plants in the Malumfashi Local Government Area, to have an insight into the different kinds of plant species with medicinal importance in the area and the ailments they cure. The socio-demographic data of the volunteered respondents showed that most of them were males, indicating that males possessed more ethnobotanical knowledge than females, a similar finding was reported by Bello *et al*. (2019) in Sahelian region of Katsina state This can be as a result of males being more mobile and engaged more in cultural activities such as farming and hunting than females. In terms of level of education, the majority of the respondents don't

Table 4: Medicinal Plants of Malumfashi and their uses

Plant name	Medicinal uses	Part use	Mode of preparation	Mode of admistration
Guiera senegalensis J.F.Gmel.	Milk production in lactating women, rashes	Leaves,Root	Maceration	Oral
Detarium microcarpumGuill. And Perr	Yellow fever,haemorrhoid	Bark,Fruit	Decoction	Oral
Senna obtusifolia (L.) H.S. Irwin and Barneby	Cancer,abdominal pain,diarrhea	Leave,root	Decoction	Oral
Senna singueana (Delile) Lock	skin infection,high blood Pressure,diabetes	Leave	Decoction	Oral
Mongifera indica L.	Rashes,yellow fever,fever	Bark	Decoction	Oral
Cleomo gynandra L.	Fever,indigestion	Whole plant	Decoction	Oral
Cochlospermum tinctorium Perr.ex A.Rich.	Jaundice,high fever	Root	Decoction	Oral
Tamarindus indica L.	Typhoid,paralysis,burns	Bark	Decoction	Oral
Prosopi safricana(Guill And Perr.)Taub.	Fever,pile,yellow fever,malaria	Bark	Maceration	Oral
Jatropha curcas L.	Skin infection ,pimples,cuts	Leave	Ointment	Dermal
Acacia nilotica (L) Willd.	Wound healing,ulcer	Bark,Pod,Leave	Powder	Dermal/oral
Artemisia annua L.	Malaria,fever,nausea	Leave	Maceration	Oral
Ficus platyphylla Del	Yellow fever,pile,dysentery	Leave	Maceration	Oral
Adansonia digitata L.	Cardiovascular diseases,ulcer,diarrhea	Leave	Powder	Oral
Momordica balsamina L.	Internal fever,postpartum bleeding	Leave	Decoction	Oral
Ximenia americana L.	Snake bite,ulcer,skin rashes	Bark	Maceration	Oral
Lawsonia intermis L.	Chicken pox,gonorrhea,abortion	Leave	Decoction	Bath/seat bath
Combretum micranthum G.Don	Inflammation of legs,joint swelling	Leave	Ointment	Dermal
Securidaca longipedunculata Fresen	General well being,blood purification	Bark,Leave	Decoction	Oral
Azadirachta indica A Juss	Fever,typhoid,stomach ache	Bark,Leave	Decoction	Oral
Erythrina senegalesis DC.	Amenia,pile,rheumatism	Whole plant	Decoction	Oral
Anogeissus leiocarpa (DC.) (Guill. And Perr.)	Yellow fever,pile	Bark	Decoction	Oral
Parkia biglobosa (Jacq) G.Don	Stomach ache,yellow fever.pile	Bark	Decoction	Oral

Entada africana Guill and Perr.	Fever,stomach ache	Leave,Bark	Decoction	Oral
Spinacia oleraceae L.	Malaria,anemia	Leave	Decoction	Oral
Allium sativum L.	Cough,gonorrhea	Bulb	Decoction	Oral
Vernonia amygdalina Delile	Deworming,anemia	Leave	Decoction	Oral
Piliostigma thonningii DC.	Diabetes,bladder swelling	Root,Leave,	Decoction	Oral
Khaya senegalensis (Desr.) A.Juss.	Skin diseases,malaria	Bark	Maceration	Oral
Ficus capensis Engl	Gonorrhea,pile.diarrhea	Bark,Leave	Maceration	Oral
Psidium guajava L.	Fever,yellow fever	Leave	Decoction	Oral
Mitracarpus acunae L.	Skin infection,rashes,cold	Whole plant	Ointment	Dermal
Syzigium abbreviatum Wall.	Inflammation,pile,bone fracture	Bark	Ointment,decoction	Dermal,oral
Diospyros mespiliformisHochst.ex A.DC	Ulcer,haemorrhoid	Bark,Fruit	Decoction	Oral
Vernonia strumambiguum (Kotschy and Peyr.) H.Rob.	Fever,malaria	Whole plant	Decoction	Oral
Hibiscus sabdariffa L.	Anemia	Leave	Decoction	Oral
Ficus thonningii Bl.	Fever,haemorrhoid	Bark,Leave	Maceration	Oral
Ziziphus mauritiana Lam.	Jaundice,high fever	Leave	Decoction	Oral
Moringa oleifera Lam.	Anemia,gonorrhea	Leave,Root	Decoction	Oral
Ocium basilicum L.	Ease labour	Whole plant	Decoction	Oral
Eucalyptu camaldulensis Dehnh	Fever	Leave	Decoction	Oral
Boswellia dalzielii Hutchinson	Pile,measle,yellow fever	Bark	Maceration	Oral
Cyperus articulates L.	Common cold,throat irritation	Root	Decoction	Oral
Salix ledermannii (L.) Gaertn.	Diabetes,haemorrhoid	Bark	Maceration	Oral
Combretum collinum L.	Cancer,diabetes,cough	Leave	Decoction	Oral
Calotropis procera L.	Skin infection,cough,cooling disease	Leave,Root	Decoction,Ointment	Oral,Dermal
Cordia africana L.	Typhoid,yellow fever	Bark,Leave	Decoction	Oral
Vitellaria paradoxa C.F Gaertn	Headache,ulcer	Bark	Decoction	Oral
Sclerocarya birrea (A.Rich.) Hochst	Cancer,pile,fever	Bark	Maceration	Oral
Lanea acida A.Rich.	Yellow fever,pile	Bark	Decoction	Oral

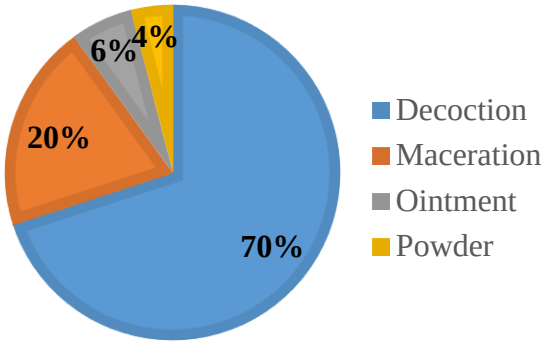

Figure 4: Method of preparation of the medicinal plants

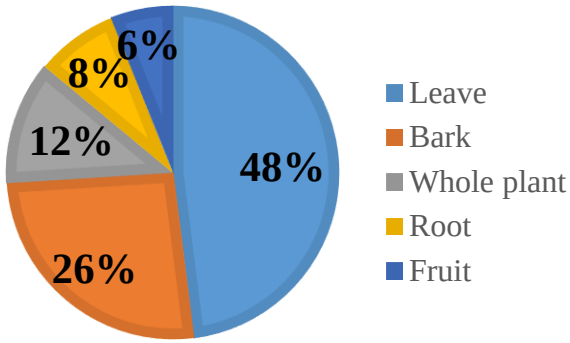

Figure 5: Plant part used

Table 5: Categories of ailments and Informant Consensus factors (FIC)

Use Category	Number of taxa (Nt)	Number of use report (Nur)	Informant consensus factors (ICF)
Fever	6	22	0.76
Gastrointestinal	7	15	0.57
Dermatological	7	12	0.45
Respiratory	6	15	0.64
Cardiovascular	4	10	0.67
Maternal ailments	4	11	0.7
Urogenital	4	14	0.78
Muscular skeletal	6	17	0.69
Antinode	3	9	0.75
Metabolic	4	6	0.4

Table 6: Relative frequency of citation and cultural importance index and fidelity level of the medicinal plants

Plant name	RFC	CII	FL
Guiera senegalensis J.F.Gmel.	0.18	0.16	50%
Detarium microcarpum Guill. And Perr	0.1	0.08	67%
Senna obtusifolia (L.) H.S. Irwin and Barneby	0.16	0.06	80%
Senna singueana (Delile) Lock	0.06	0.04	75%
Mongifera indica L.	0.34	0.12	67%
Cleomo gynandra L.	0.1	0.04	50%
Cochlospermum tinctorium Perr.ex A.Rich.	0.12	0.02	33%
Tamarindus indica L.	0.2	0.04	71%
Prosopi safricana (Guill and Perr) Taub.	0.04	0.1	40%
Jatropha curcas L.	0.12	0.08	75%
Acacia nilotica (L) Willd.	0.22	0.12	67%
Artemisia annua L.	0.28	0.24	63%
Ficus platyphylla Del	0.12	0.14	78%
Adansonia digitata L.	0.22	0.16	60%
Momordica balsamina L.	0.04	0.04	67%
Ximenia americana L.	0.14	0.04	80%
Lawsonia intermis L.	0.08	0.04	40%
Combretum micranthum G.Don	0.08	0.06	40%
Securidaca longipedunculata Fresen	0.44	0.3	73%
Azadirachta indica A Juss	0.38	0.2	69%
Erythrina senegalesis DC.	0.06	0.04	60%
Anogeissus leiocarpa (DC.) (Guill. And Perr.)	0.18	0.14	71%
Parkia biglobosa (Jacq) G.Don	0.1	0.08	67%
Entada africana Guill and Perr.	0.04	0.02	50%
Spinacia oleraceae L.	0.04	0.02	100%
Allium sativum L.	0.14	0.08	57%
Vernonia amygdalina Delile	0.06	0.02	67%
Piliostigma thonningii DC.	0.2	0.1	60%
Khaya senegalensis (Desr.) A. Juss.	0.16	0.08	71%
Ficus capensis Engl	0.12	0.12	57%
Psidium guajava L.	0.08	0.06	67%
Mitracarpus acunae L.	0.04	0.04	67%
Syzigium abbreviatum Wall.	0.06	0.04	60%
Diospyros mespiliformis Hochst.ex ADC	0.22	0.14	100%
Vernonia strumambiguum (Kotschy and Peyr.) H.Rob.	0.1	0.06	80%
Hibiscus sabdariffa L.	0.12	0.04	67%
Ficus thonningii Bl.	0.26	0.14	75%
Ziziphus mauritiana Lam.	0.32	0.14	78%
Moringa oleifera Lam.	0.24	0.16	67%

Ocium basilicum L.	0.02	0.04	63%
Eucalyptu camaldulensis Dehnh	0.24	0.04	67%
Boswellia dalzielii Hutchinson	0.08	0.08	50%
Cyperus articulates L.	0.06	0.02	20%
Salix ledermannii (L.) Gaertn.	0.18	0.1	78%
Combretum collinum L.	0.02	0.02	38%
Calotropis procera L.	0.14	0.04	50%
Cordia africana L.	0.12	0.02	33%
Vitellaria paradoxa C.F Gaertn	0.18	0.1	86%
Sclerocarya birrea (A.Rich.) Hochst	0.14	0.04	73%
Lanea acida A.Rich.	0.16	0.06	25%

have any form of formal education, this was also reported by Kankara *et al*. (2015), and Mudansiru *et al.* (2016). Not having formal education is connected to the nonexistence of basic and social amenities in the native communities which is the major factor that forced them to go into folk medicine. In relation to the informants' ages, the vast majority of them are older than 40, meaning that the older people are the category with an understanding of therapeutic plants. All these findings are similar to the findings of ethnobotanical studies in Northern Nigeria (Bello *et al*., 2019, Kankara *et al*., 2015, Mudansiru *et al*., 2016). Most of the informant interviewed, were not willing to reveal their traditional knowledge of the medicinal plants in the local government area, because of the belief that the knowledge should be a secret of their immediate families. Therefore, this necessitates for development of strategies on how to efficiently get the traditional knowledge so as to prevent it from being lost (Garba *et al*., 2014; 2013; Etkin, 2002). Our study reported 50 different plant species with medicinal values in Malumfashi, most of which were reported in earlier ethnobotanical studies in Northern Nigeria, however with different medicinal uses. The survey revealed that Fabaceae is the family with the highest number of species (9). This agrees with the findings of Bello *et al*. (2019), Yaradua and El-Ghani, (2016) and Kankara *et al*. (2018) who reported that Fabaceae has the highest number of medicinal plant species in Katsina. Several other studies have also reported Fabaceae as the dominant family providing medicinal plants in Nigeria (Dambatta & Aliyu 2011; El-Ghani, 2016; Ene & Atawodi, 2012). The plant parts used for medicinal purposes in this study are the leaves, followed by the bark. This contradicts the findings of Shrivastava, (2003) and Steenkamp, (2003) but agrees with the findings of Yaradua and El-Ghani (2016), the former reported that root is the most frequently part used for medicinal purposes while the latter reported that leave is the most frequent plant part used in the folk medicine. High utilization of leaves in folk medicine may be due to the fact that the plant part is easy to collect and process compared to the other plant parts (Tugume *et al*., 2016 & Rehmana *et al*., 2017) In the other hand, photosynthesis takes place in the leaf and therefore have a high concentration of bioactive compounds which gives the activities of the parts (Ghorbani, 2005). Some ethnobotanical studies reported that plants within the herb habit were more utilized in the folk medicine than the trees and shrubs (Tumoro & Maryo, 2016), this is not the case in Malumfashi local government area and other related study areas.

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