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Relative Abundance and ethnomedicinal Uses of some Plant Species found in Federal University Dutsin-ma Permanent Site

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Abstract**—** *This research was aimed to identify and determine the ethnomedicinal potential as well as the relative abundance of some selected plants in Federal University Dutsin-ma permanent site. A total of 40 plants were collected and identified from four different sites (behind senate building, Faculty of Science, Faculty of Agriculture and hostel area). In every study site, 30quadrats of 10 m X 10 m (100 sq m) size were randomly laid to study trees, herbsand shrubs species. The tree species includes all the saplings, poles and trees present in the study area. The shrubs and herbs species were studied by laying 50 quadrats of 1m X 1m (1sq m) size randomly in each study site. A totalof 33 plants were found to possess medicinal history, the plants were identified using morphological features into trees, shrubs and herbs. The total density, frequency and relative abundance of plant species collected behind senate building (Federal University Dutsin-ma) was found to be 340/ha, 260 and 26 respectively. In Faculty of Science, the total density, frequency and relative abundance of plant species collected was found to be 340/ha, 240 and 24 respectively. The total density, frequency and relative abundance of plant species collected around Faculty of Agriculture was 420/ha, 280 and 28 respectively, while at hostel area, the total density, frequency and relative abundance of plant species collected was found to be 420/ha, 280 and 28 respectively. Different plants species were collected, identified and found to possess some medicinal properties, these plants includes Sclerocaryabirrea, Sida alba, Euphorbia hirta, Sennaoccidentalis, Acacia ataxacantha, Sennaobtusifoliaand Cleome monophylla.*

Keywords**— *Ethnomedicinal, Plant Species, Permanent Site and Relative abundance.***

I. INTRODUCTION

The use of traditional medicines and medicinal plants in most developing countries as therapeutic agents for the maintenance of good health has been widely observed (WHO, 2003). Traditional medicine, with medicinal plants as their most important component, are sold in market places or prescribed by traditional healers in their homes (Okigbo *et al*., 2009). The term "herbal drug" determines the part/parts of a plant (leaves, flowers, seeds, roots, barks, stems, etc.) used for preparing medicines WHO (2002) again defines medicinal plant as herbal preparations produced by subjecting plant materials to extraction, fractionation, purification, concentration or other physical or biological processes which may be produced for immediate consumption or as a basis for herbal products.

The most effective method of identifying medicinal plants today is by Ethnopharmacological and through ethnobotanical studies. The clinical success of quinine and quinidine isolated from the *Cinchona* and*azadirachtaindica* tree bark and recently artemisinin from *Artemisia annua* in the treatment of malaria have rekindled interest in medicinal plants as potential sources of novel drugs (Demissew*et al*., 2016; Igoli*et al*., 2005). Today artemisinin based combination therapy is recognized as drug of choice for treatment of malaria.

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Due to unavailability of modern health facilities, most people especially rural people are still forced to practice traditional medicines for their common day ailments, most of these people form the poorest link in the trade of medicinal plants (Dharani, 2012; Ketula, 2007). A vast knowledge of how to use the plants against different illnesses may be expected to have accumulated in areas where the use of plants is still of great importance (Mutheeet *al*., 2011). The continuous search for natural plant products for use as medicines is encouraged by ethnobotanical survey; (Gabrielet *al*., 2019; Igolit *al*., 2005) recognized ethnobotanical survey as one of the major approaches for selecting plants for pharmacological screening. Several workers have conducted ethnobotanical surveys among various tribes of the African continent and some other parts of the world (Ajibesin, 2011; Dharani and Yenesew, 2010) in search of plants with antibacterial, antiviral and antifungal properties. The medicinal values of these plants lie in some chemical substances they contain that produce a definite physiological action on the human body (Ajibesin, 2011).

Obviously the plant kingdom has proven to be the most useful in the treatment of diseases traditionally and otherwise, according to the world health organisation (WHO, 2002), more than 80% of the world population relies on medicinal plant for their primary health care. Use of herbal medicine in Nigeria represents a long history of human interaction with the environment. Medicinal plants are the sources of many important drugs of the modern world. Many of these indigenous medicinal plants are used as spice and food plants; they are also sometimes added to foods meant for pregnant mothers for medicinal purposes (Ajibesin, 2011;Dharani, 2006). They provide an important source of all the world's pharmaceuticals (Ajibesin, 2011). Due to the importance of plant in human life, It necessary to study how common or rare (Relative abundance) these plant of medicinal histories are in other to avoid extinction.

Relative abundance of plant as a component of biodiversity refers to how common or rare species are, in relative to other species in a defined location or community (Hubbeland Lake, 2003). Relative abundance in general refers to the number of percent composition of an organism (plant) of a particular kind relative to the total number of organism (plant) in the area (WHO, 2003). Relative species abundance tends to conform to specific patterns that are among the best-known and most-studied patterns in plant macro-ecology. Relative species abundance and species richness describe key elements of biodiversity. Usually they are described for a single tropic level, because such species occupying the same tropic level will potentially or actually compete for similar resources (Hubbeland Lake, 2003;Gabrielet *al*., 2019).

The idea of relative abundance encompasses two concepts mainly, which are; Number of species and eveness of species relative abundance. Species number was first introduced by Fisher in 1943, and is simply the number of species found in a given community. Due to the implication that the exact number of species could be determined for a boundless community, the concept was later referred to as species richness (Whittaker, 1956). As previously mentioned, species richness is a count. Ideally, a richness value would represent the number of species in a given community; however, most ecologists recognize that a community has no definitive bounds and therefore cannot contain a fixed number of species (Peet, 1974). Hence, species richness must be estimated through sampling and the number of species expressed on an area basis Evenness, on the other hand, refers to the degree to which dominance is distributed among the species in a community. Evenness is highest if all species in the community are equally represented. Evenness is usually represented by species relative abundance (Patil and Taillie, 1982).

The obvious problem encountered when comparing richness values from various communities is the total area sampled must be equivalent. Most botanical studies express species richness as the number of species per square meter (Maugurran, 1988); however, the equality of plot size does not eliminate the possible inequality of sample size, nor does it ensure equality in the numbers of individuals sampled. A number of methods have been proposed for transforming species richness to a value independent of sample size (Taylor *et al*., 2001) however, seldom are the conditions needed to satisfy these transformations met (Peet, 1974). Simpson's index and Shannon's index belong to a family of indices known as heterogeneity indices, which incorporate both richness and evenness (Peet, 1974). These indices stem from information theory, and assign a diversity value based on the sum of each species contribution to an overall measure of abundance.

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This research is therefore undertaken with the view to determining those plant species of medicinal importance (ethnobotanical), such plants that are still available or are in relative abundance for human economic pursuance and those that are vulnerable to extinction so that adequate plan of action can be put in place by botanists or the government to conserve those endangered species if the future generation must benefit from them. This research was aimed to identify the various plant species and their relative abundance, distribution as well as their medicinal uses.

II. MATERIALS AND METHODS

Study area

The research work was carried out at the permanent site of federal university Dutsin-Ma. This study area is located in Dutsin-M, Katsina, Nigeria.Dutsin-ma is located in the Sudan savanna zone of the central part of Katsina State, relatively bounded by Safana and Dan-Musalocal governments to the west, Kurfi and Charanchi local governments to the north, Kankia to the east, Matazu and Dan-Musa local governments in the south. In absolute terms its geographical coordinates are 12° 27' 18" North, 7° 29' 29" East and its original name (with diacritics) is Dutsin-Ma.(.www.google satellite map) it is also found in the basement complex area of Katsina State (Maurran and Hendriks, 2003).

Dutsin-ma became a Local Government in 1976.The chairman is the official Head of Local government. The inhabitants of Dutsin-ma Local Government are predominantly Hausa and Fulani by tribe. Their main occupation is farming and Animalrearing.

The climate of the area is semi arid classified as tropical wet and dry climate (AW), as classified by Kopen (2017). Maximum day temperature reaches about 38 ^{o}C in the month of March, April and May and minimum temperature is about 22 ^{o}C in December and January. (Ugland and White, 2007).

Field work

The study area was divided into three study sections on the basis of disturbance gradient i.e. highly disturbed (HD) area, mildly disturbed (MD) area, and undisturbed (UD) area for studying the status of plant diversity.

The field work was carried out within two months from April to June, 2018. The study of plant diversity, community structure and specimen collection were conducted from the three study sections. In every study sites, 30quadrats of 10 m X 10 m (100 sq m) size were randomly laid to study tree species and shrub species. The tree species includes all the saplings, poles and trees present in the study area. The shrubs species was studied by laying 50 quadrats of 1m X 1m (1sq m) size randomly in each study site.

The obvious problem encountered when comparing richness values from various communities is the total area sampled must be equivalent.

Quantitative analysis

Data obtained were quantitatively analyzed for Relative density, Relative frequency, relative abundance and Importance value index were calculated as follows (Curtis and McIntosh, 1951). Density is calculated by the equation. The relative abundance was analyzed noting in each quadrat how many individual species are present there and expressing this as a percentage of the total number of species in the quadrat. This is given by

$$\text{Relative abundance} = \frac{\text{frequency of a species}}{\text{Sum frequency of all species}} \times \frac{100}{1}$$

(a) Relative abundance: It is the study of the number of individuals of different species in the community per unit area. By quadrats method, samplings are made at random at several places and the number of individuals of each species was summed up for all the quadrates divided by the total number of quadrats in which the species occurred. It is represented by the equation:

(b) Frequency: This term refers to the degree of dispersion of individual species in an area and usually expressed in terms of percentage occurrence. It was studied by sampling the study area at several places at random and recorded the name of the species that occurred in each sampling units. It is calculated by the equation**:**

$$\text{Frequency} = \frac{number\ of\ times\ the\ species\ occur\ in\ the\ quadrants}{total\ number\ of\ quadrats\ examed} \times \frac{100}{1}$$

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(c) Density; Density is an expression of the numerical strength of a species where the total number of individuals of each species in all the quadrats is divided by the total number of quadrats studied. Density is calculated by the equation:

$$\text{Density} \frac{= total\ number\ of\ a\ species\ in\ all\ quadrat/hecta}{total\ number\ hectas\ studied} \times \frac{100}{1}$$

15 quadrats of 10 m X 10 m (100 sq m) size were randomly laid to study tree species and shrub species. The tree species includes all the saplings, poles and trees present in the study area. The herbaceous species was studied by laying 25 quadrats of 1m X 1m (1sq m) size randomly in each study site.

Number of section/hecta sampled = 3

Number of quadrat per/section = 5 (15/1sq m)

Collection of Plant Materials

Fresh leaves and stem of plant samples were collected from three different zones in the study site and taken to ABU Zaria for identification and easy taxonomy. The plant species includes all the parts of trees, shrubs and herbs present in the 3 sections of the study areas. Each plant sample was gently washed under running water from the tap, then air dried under shed.

III. RESULTS AND DISCUSSION

Taxonomy of medicinal plants.

The plant species collected from the three sections of the four study sites were 40. The plants species includestrees, shrubs and herb present in the study locations. Out of the total plants collected,only 33 plants were observed to posses' medicinal value in the study site as presented in Table 1,2,3 and 4 respectively.

Identificationof plants with medicinal values

Crotolaria falcate, *Crotolariamicrocarpum*, *Piliostigmathonningi*, *Acacia nilotica*, *Sennaoccidentalis*, *Senna italic*, *Bauhinia rufescens*, *Acacia sayel*, *Acacia ataxacantha*, *Sennaobtusifolia*, and*Prosopis Africana*from family fabaceae, *Ipomearepens* and *Evolvulusalsinoides* from family Convulvulaceae, *Combretummicranthum*, *Combretumlampocarpum*, *Guirasenegalensis*, and *Anogeissusleiocarpusfamily* Combretaceae, *Leptadenia hastate*, *CalotropisProcera*, *Leptadenia hastate*, from family Asclepidaceae, *Walteriaindica* and *Walteriaindica* from family Sterculiaceae, *Zizyphusabyssinica* from family Rhamanaceae, *Amorphophallusabyssinicus*, *Asparagus filiformis* from family Liliaceae, *Diospyrosmesiliformis* family Ebenaceae, *Borassusaethiopium* family Arecaceae, *Cleome monophylla*, and *Capparistomentosa* from family Cappridaceae, *Lawsoniainermis* family Lauraceae, *Balaniteaegyptiaca* family Zygophyllaceae, *Gardenia rubscens* family Rubiaceae, *Solanuminanum* family Solanaceae, *Euphorbia hirta* family Euphorbiaceae, *Holarrhena floribunda* family Apocynaceae, *Sclerocaryabirrea* family Anacardiaceae, *Cussoniabarteri* family Loganiaceae, *Sida alba* from Malvaceae (Table 1,2,3 and 4).

Table 1: Identification of different plant species collected behind Senate building and their botanical description

S/N	Plant species	Family	Local name	Voucher Number	Medicinal History
1	*Ipomearepens*	Convulvulaceae	Dumankada	12063	Diarrhea
2	*Crotolariafalcate*	Fabaceae	Fararbiyarana	02481	JuJu
3	*Crotolariamicrocarpum*	Fabaceae	Bakarbiyarana	02487	JuJu
4	*Leptadeniahastate*	Asclepidaceae	Yadiya	0578	Headache, Hypertension
5	*Walteriaindica*	Sterculiaceae	Hankufa	0600	Cold in animals
6	*Zizyphusabyssinica*	Rhamanaceae	Magarya	A00/017	Bilhazia

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7	*CalotropisProcera*	Asclepidaceae	Tumfafiya	900219	Protection from evils
8	*Combretummicranthum*	Combretaceae	Geza	900257	Stoppage of bleeding
9	*Amorphophallusabyssinicus*	Liliaceae	Kunnenjaki	10124	Headache
10	*Combretumlampocarpum*	Combretaceae	Taramniya	09231	Cholera

Table 2: Identification of different plant species collected around faculty of science and their botanical description

S/N	Plant species	Family	Local name	Voucher Number	Medicinal History
1	*Guirasenegalensis*	Combretaceae	Barbarta	01823	Pile
2	*Piliostigmathonningi*	Fabaceae	Kalgo	0831	diarrhoea, diabetes, astringent
3	*Acacia nilotica*	Fabaceae	Bagaruwa	900248	Pile
4	*Leptadeniahastate*	Asclepidaceae	Yadiya	0578	Headache, Hypertension
5	*Walteriaindica*	Sterculiaceae	Hankufa	0600	Cold in animals
6	*Sennaoccidentalis*	Fabaceae	Redore	1521	Malaria and typoid
7	*Diospyrosmesiliformis*	Ebenaceae	Kanya	0938	Pile
8	*Sennaitalic*	Fabaceae	Filisko	00923	Stomache
9	*Borassusaethiopium*	Arecaceae	Kaba	00963	Heart burn
10	*Cleome monophylla*	Cappridaceae	Kafdodo	11023	Protection from evils

Table 3: Identification of different plant species collected around faculty of Agriculture and their botanical description

S/N	Plant species	Family	Local name	Voucher Number	Medicinal History
1	*Anogeissusleiocarpus*	Combretaceae	Marke	01738	Catarrh
2	*Lawsoniainermis*	Lauraceae	Lalle	0629	Dead body preservation
3	*Balaniteaegyptiaca*	Zygophyllaceae	Aduwa	0900175	Typhoid fever
4	*Bauhinia rufescens*	Fabaceae	Tsastsagi	01800	Increase milk production
5	*Asparagus filiformis*	Liliaceae	Kayarbera	06821	Cold in animals
6	*Gardenia rubscens*	Rubiaceae	Gaude	1895	Back pain
7	*Solanuminanum*	Solanaceae	Gautanbera	01396	Diarrhea in animals
8	*Acacia sayel*	Fabaceae	Dakwara	0900249	Rashes on tongue
9	*Euphorbia hirta*	Euphorbiaceae	Nononkurciya	01360	Night blindness
10	*Holarrhena floribunda*	Apocynaceae	Sandargamo	900281	Waist pain

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Table 4: Identification of different plant species collected around hostel area and their botanical description

S/N	Plant species	Family	Local name	Voucher Number	Medicinal History
1	*Acacia ataxacantha*	Fabaceae	Sarkakiya	900290	Stomache
2	*Sennaobtusifolia*	Fabaceae	Tafasa	01370	Headache
3	*ProsopisAfricana*	Fabaceae	Gatsari	63012	Pile
4	*Evolvulusalsinoides*	Convulvulaceae	Kafimalam	0559	Juju
5	*Sclerocaryabirrea*	Anacardiaceae	Danya	0681	Dysentery
6	*Cussoniabarteri*	Loganiaceae	Gwaba	12025	Pile
7	*Sida alba*	Malvaceae	Miyartsanya	01450	It boost immune children
8	*Capparistomentosa*	Cappridaceae	Jani	130612	Leg pains
9	*Euphorbia hirta*	Euphorbiaceae	Nononkurciya	01360	Night blindness, chest pain
10	*Cleome monophylla*	Cappridaceae	Gasaya	11023	Joint pains

The total density, frequency and relative abundance of plant species collected behind senate building (Federal University Dutsin-ma) was 340/ha, 260 and 26 respectively. For Faculty of Science, the total density, frequency and relative abundance of plant species collected was found to be 340/ha, 240 and 24 respectively. The total density, frequency and relative abundance of plant species collected around Faculty of Agriculture was 420/ha, 280 and 28 respectively, while at hostel area, the total density, frequency and relative abundance of plant species collected was found to be 420/ha, 280 and 28 respectively as indicated in Table 5, 6, 7 and 8.

Table 5: Relative Abundance Of medicinal plants forms collected behind senate building, identified by their morphological features and their geographical distribution

	Medicinal plants	Density(%)	Frequency (%)	Relative abundance (%)
1	*Ipomearepens*	60.00/ ha	40.00	4
2	*Crotolariafalcate*	40.00/ha	20.00	2
3	*Crotolariamicrocarpum*	60.00/ha	40.00	4
4	*Leptadeniahastate*	20.00/ha	20.00	2
5	*Walteriaindica*	40.00/ha	20.00	2
6	*Zizyphusabyssinica*	20.00/ha	20.00	2
7	*CalotropisProcera*	20.00/ha	20.00	2
8	*Combretummicranthum*	20.00/ha	20.00	2
9	*Amorphophallusabyssinicus*	40.00/ha	40.00	4
10	*Combretumlampocarpum*	20.00/ha	20.00	2
Total		**340/ha**	**260**	**26**

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Table 6: Relative Abundance Of medicinal plants forms collected around Faculty of Science, identified by their morphological features and their geographical distribution

	Medicinal plants	**Density (%)**	**Frequency (%)**	**Relative abundance (%)**
1	*Guirasenegalensis*	20.00/ ha	20.00	2
2	*Piliostigmathonningi*	20.00/ha	20.00	2
3	*Acacia nilotica*	40.00/ha	20.00	2
4	*Leptadenia hastate*	20.00/ha	20.00	2
5	*Walteriaindica*	20.00/ha	20.00	2
6	*Sennaoccidentalis*	120.00/ha	60.00	6
7	*Diospyrosmesiliformis*	20.00/ha	20.00	2
8	*Senna italic*	20.00/ha	20.00	2
9	*Borassusaethiopium*	20.00/ha	20.00	2
10	*Cleome monophylla*	40.00/ha	20.00	2
Total		**340/ha**	**240**	**24**

Table 7: Relative Abundance Of medicinal plants forms collected around Faculty of Agriculture, identified by their morphological features and their geographical distribution

	Medicinal plants	**Density (%)**	**Frequency (%)**	**Relative abundance (%)**
1	*Anogeissusleiocarpus*	40.00/ ha	20.00	2
2	*Lawsoniainermis*	20.00/ha	20.00	2
3	*Balaniteaegyptiaca*	20.00/ha	20.00	2
4	*Bauhinia rufescens*	60.00/ha	40.00	4
5	*Asparagus filiformis*	80.00/ha	40.00	4
6	*Gardenia rubscens*	20.00/ha	20.00	2
7	*Solanuminanum*	40.00/ha	20.00	2
8	*Acacia sayel*	40.00/ha	40.00	4
9	*Euphorbia hirta*	60.00/ha	40.00	4
10	*Holarrhena floribunda*	40.00/ha	20.00	2
Total		**420/ha**	**280**	**28**

Table 8: Relative Abundance Of medicinal plants forms collected around Hostel area, identified by their morphological features and their geographical distribution

	Medicinal plants	**Density (%)**	**Frequency (%)**	**Relative abundance (%)**
1	*Acacia ataxacantha*	60.00/ ha	40.00	4
2	*Sennaobtusifolia*	120.00/ha	80.00	8
3	*Prosopis Africana*	40.00/ha	20.00	2

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4	*Evolvulusalsinoides*	120.00/ha	20.00	2
5	*Sclerocaryabirrea*	40.00/ha	20.00	2
6	*Cussoniabarteri*	20.00/ha	20.00	2
7	*Sida alba*	80.00/ha	40.00	4
8	*Capparistomentosa*	60.00/ha	40.00	4
9	*Euphorbia hirta*	60.00/ha	40.00	4
10	*Cleome monophylla*	40.00/ha	20.00	2
Total		**640/ha**	**340**	**34**

The vegetation in the northern region of Federal University Dutsinma permanent site was observed to be trees, shrubs and herbs and most of these plants present have medicinal properties. The plants with medicinal history present were found to be dominated by *SennaoccidentalisAcacia ataxacantha*, *Sennaobtusifolia*, *Sclerocaryabirrea*, *Sidaalba*, *Euphorbia hirta*, *Cleome monophylla*.The findings of this work is similar to the research work carried out by Bajopas (2011), Akinpelu and Onakoya (2006), in kaduna and which showed same medicinal plants species with their family names, local names, being in abundant in the same sahel savanna (Benz *et al*., 1994; Kvist*et al*., 2001 and Tabuti *et al.*, 2003).

IV. CONCLUSION

Different plants species were collected, identified and found to possess some medicinal properties, these plants includes *Sclerocaryabirrea*, *Sida alba*, *Euphorbia hirta*, *Sennaoccidentalis,Acacia ataxacantha*, *Sennaobtusifolia*and *Cleome monophylla*.Some of the diseases reported to be cured by these plants includes malaria, typhoid, common cold, diarrhea, headache, pile and waist pain. There is need for future researches to focus on phytochemical contents and toxicological aspect of these plants.

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