

Original Article

Relative Abundance and Medicinal Values of Some Plant Species Found in Federal University Dutsin-ma Take-off Site

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ABSTRACT

Background: A medicinal plant is any plant, in which one or more of its organ contains substances that can be used for the therapeutic purposes or which, are precursors for the synthesis of useful drugs. This research was designed to assess the relative abundance of medicinal plants in Federal University Dutsin-ma (FUDMA) take off site.

Methodology: About 20 plants have been identified to possess medicinal value in the area; these plants were identified based on their morphological features into trees, shrubs and herbs. The relative abundance of the plant species has been calculated using Curtis and McIntosh method (1951).

Results: The most abundant trees of medicinal value found within the University take off site have been identified as *Azadirachta indica* (22.43%), and *Albizia lebbek* (16.82%), the least abundant was *Mangifera indica* (0.02%). The most abundant of shrubs was *Indigofera pulchra* and the most abundant of herbs was *Cyperus rotunda*.

Conclusion: These plant species were being used by the local people of the area to cure some diseases for many years.

Keywords: Medicinal values, plant species, relative abundance, take off site

INTRODUCTION

The study of plants relative abundance and their phyto-constituent is very important, as the earth's life existence and survival revolves around plants.¹ Plants are obviously very important in our everyday existence, they form the base of food chain, produce the oxygen we breathe as a byproduct of

photosynthesis. Plants also serve as raw materials for building and construction and for many industrial products such as; clothes, foot wears and in the manufacture of bio fuels, dyes, perfumes, pesticides, adsorbents and drugs.² McGill *et al*³ reported that Relative species abundance follow very similar

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patterns over a wide range of ecological communities. Observations show that some plant species are rare while others are abundant, when studies are conducted and plotted out.³ Such patterns have been long-recognized and can be broadly summarized with the statement that most species are rare. For example, Charles Darwin noted in 1859 in the origin of species that “rarity is the attribute of vast numbers of species in all classes”. Plants are now occupying important position in allopathic medicine, herbal medicine, homoeopathy and aromatherapy. These medicinal plants are of great importance to the health of individuals and communities. It was the advent of antibiotics in the 1950s that led to the decline of the use of plant derivatives as antimicrobials.⁴ Medicinal plants contain physiologically active components which over the years have been exploited in the traditional medical practices for the treatment of various ailments.¹ A relatively small percentage of less than 20% of all the plants on earth is believed to serve as sources of medicine⁴ This therefore is the reason why continuous study of plants, its chemical properties, trace element, relative abundance etc. at different location on earth will remain very important.

Ecologists investigating terrestrial systems often focus on relative species abundance or diversity of plant communities since green plants usually account for an overwhelming proportion of the biomass in a given system. However, as pointed out, complexity of a community's plant species composition does not reflect the diversity of other taxonomic levels.⁵ For example, a community could exist which is limited to a few genera, but many species are represented within each genera. Measures of abundance that is commonly used include number of individuals per species, percent cover, and biomass. The selection of which measure to apply is entirely subjective and can promote bias in the index value.⁵ Given that species vary greatly in size, the number of individuals is an inappropriate representation of dominance.⁶ suggests that species relative net primary productivity is a direct result of resource partitioning, and therefore represents a species true dominance in a community. Instead of numbers of individuals, he suggests a direct measure of biomass. Since determining the biomass of all the species in a community can be time consuming and costly, dominance can also be represented by the crown cover of each species.⁶ Medicinal plants produce bioactive compounds used mainly for medicinal purposes. These compounds either act on different systems of animals including man, and/or act through

interfering in the metabolism of microbes infecting them.^{7,8} The microbes may be pathogenic or symbiotic. In either way the bioactive compounds from medicinal plants play a determining role in regulating host-microbe interaction in favor of the host, the identification of bioactive compound in plants, their isolation, purification and characterization of active ingredients in crude extracts by various analytical methods is important. The medicinal properties of plants could be based on the antioxidant, antimicrobial, antipyretic effects of the phytochemicals in them.^{9,10} The instant rising demand of plant-based drugs is unfortunately creating heavy pressure on some selected high-value medicinal plant populations in the wild due to over-harvesting. Several of these medicinal plant species have slow growth rates, low population densities, and narrow geographic ranges,¹¹ therefore they are more prone to extinction.¹² Conversely, because information on the use of plant species for therapeutic purpose has been passed from one generation to the next through oral tradition, this knowledge of therapeutic plants has started to decline and become obsolete through the lack of recognition by younger generations as a result of a shift in attitude and ongoing socio economic changes. Furthermore, the indigenous knowledge on the use of lesser-known medicinal plants is also rapidly declining. Continuous erosion in the traditional knowledge of many valuable plants for medicine in the past and the renewal interest currently, the need existed to review the valuable knowledge with the expectation of developing the medicinal plants sector.¹³ Medicinal plant materials have been successfully used for the treatment of fungal and bacterial infections in humans.¹⁴ Gabriel *et al*¹⁵ Suggests that some plant materials also possess antifungal and antibacterial constituents that are useful in controlling plant diseases. Ugland *et al*¹⁶ indicated that spices, herbs and other plant materials possess antifungal activity. *Jatropha curcas* belongs to the family Euphorbiaceae and grows in tropical and subtropical regions like Central and South America, Africa, India and South East Asia.¹² It is a multipurpose plant with several industrial, ecological and medicinal applications. *Jatropha curcas* L, has been considered a potential source of antimicrobial and seed oil for the production of biofuel.¹² The plant ethnopharmacological applications are well known, but much of the information is empirical and lacking in scientific validations.¹⁷ According to

Bem *et al*¹⁸ the study of medicinal plant history is never complete without a survey on ethnobotany. Therefore, ethnobotany is the study of useful plants prior to commercial exploitation and eventual domestication. It is based on the knowledge of plants by the local people and their usefulness as understood by the people of a particular ethnic group, since information concerning a particular plant varies from one ethnic group to another. The use of medicinal plants as remedies is common and widespread in Nigeria.¹⁹ Okigbo *et al*²⁰ reported that Nigerian vegetation is naturally endowed with arrays of floristic composition of different plant forms including trees, shrubs, herbs and other non-wood forest resources. Within the natural forest abound several valuable non-timber resources of edible and highly nutritious plants whose fruits, twigs, barks, roots, gum, latex or dyes are of medicinal value. Other researchers^{19,21} opined that with the unique diversity of plant and animal life, tropical rainforest represents biologically renewable resources of food, medicine and fuel if well managed. The people of the area are suffering from many different types of diseases ranging from typhoid, malaria, common cold, stomach pain, joint pains and many more. The area is rich with abundant plant species (Shrubs, trees and herbs) that are of great benefit to health if investigated using scientific approach. Therefore, this research was carried out to determine different plant species that are found in the Federal University Dutsin-ma take off site, Katsina State, Nigeria and their medicinal importance, 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.

MATERIALS AND METHODS

This research work was carried out at the take-off site of Federal University Dutsin-Ma, Nigeria. This study area was situated 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-Musa Local 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 as presented in Figure 1. In absolute terms its geographical coordinates are 12° 27' 18" North, 7° 29' 29" East and its original name (with

diacritics) is Dutsin-Ma. It is also found in the basement complex area of Katsina State. The inhabitants of the Local Government are predominantly Hausa and Fulani by tribe. Their main occupation is farming and animal rearing.¹⁸ The climate of the area is semi-arid classified as tropical wet and dry climate (AW), as classified by Bem *et al*¹⁸ maximum day time temperature reaches about 38 °C in the month of March, April and May and minimum temperature is about 22 °C in December and January.¹⁸

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 diversity of the plants. The field work was carried out within two months from April to June, 2016. The study of plant diversity, community structure and specimen collection were conducted from the three study sections. In every study sites, 30 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 shrubs species was studied by laying 50 quadrates 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.

The data obtained were quantitatively analyzed for Relative density, Relative frequency, relative abundance and Importance value index were calculated as follows.²² 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

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

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:

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:

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

(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:

$$\text{Density} = \text{total number of a specie in all quadrants/hecter} / \text{total number of hectas studied} \times 100 / 1$$

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)

Table 1: Identification of plant species found in Federal University Dutsin-ma take off site.

S/N	Plant species	Family	Local name	Voucher No.	Medicinal history
1	<i>Delonix regia</i>	Fabaceae	Ayin	1971	Seed oil for blood cleansing.
2	<i>Albizia lebbek</i>	Fabaceae	Bagaruwa	900247	Pile
3	<i>Pilostigma thonningii</i>	Fabaceae	Kalgo		Diarrhoea,diabetes, astringent
4	<i>Tamarindus indica</i>	Fabaceae	Tsamiya	602	Condiments in juice
5	<i>Eucalyptus camelduensis</i>	Myrtaceae	Turare	2510	Treats tooth ache
6	<i>Khaya senegalensis</i>	Meliaceae	Madacci	900181	Used to stop vomiting
7	<i>Terminalia cutappa</i>	Combretaceae	Baushe	90032	Treat joint pain
8	<i>Mangifera indica</i>	Anacardiaceae	Mangwaro	1944	Pile
9	<i>Ipomea repens</i>	Convolvulaceae	Duman kada	1060	Diarrhoea
10	<i>Azadirachta indica</i>	Meliaceae	Dogonyaro	900151	Yellow fever, malaria
11	<i>Cymbopogon schoenanthus</i>	Poaceae	Nobe	1882	Treat joint pain
12	<i>Laptadenia hastate</i>	Asclepiadaceae	Yadiya	578	Hypertension, onchorcercosis, catarrh.
13	<i>Indigofera pulchra</i>	Papilionaceae	Bákin búnúú	900113	Anti-inflammatory, insect stings.
14	<i>Parkia biglobosa</i>	Mimosaceaea	Doruwa	2848	Sore throat, high fever, convulsions, common cold
15	<i>Adansonia digitate</i>	Bombacaceae	Kuka	2512	Obesity malaria, diabetes
16	<i>Anacardium occidentale</i>	Anarcadiaceae	Kashiu/fisa	991	Treats scabies, fungi skin infection.
17	<i>Vernonia amygdalina</i>	Asteraceae	Shuaka		Treats hepatitis, dysentery, fever.
18	<i>Portulaca oleracea</i>	Portulacaceae	Gure		Treats bacteria in human digestive tract
19	<i>Portulaca quadrifida</i>	Portulacaceae	Gure		Treat bacterial infections
20	<i>Calotropis procera</i>	Asclepiadaceae	Tumfafiya	900219	Protection from charm

RESULTS

The plant species that were collected from the three sections of the study sites were 47. This includes all the trees (poles, saplings), shrubs and herb present in the study areas, and only 20 of the plants were observed to possess medicinal value in the study site as presented in Table 1.

Based on the relative abundance of different plant species (trees) found in FUDMA take off site, *Azadirachta indica* was having the highest with 22.43%. This was followed by *Albizia lebbbeck*, *Eucalyptus camelduensis*, *Adansonia digitata*, *Phoenix dictyfera*, *Tamarindus indica*, *Khaya senegalensis*, *Terminalia catappa*, *Parkia biglobosa* with 16.82%, 13.46%, 11.74%, 11.66%, 7.47%, 5.98%, 5.98%, and 4.49%, respectively. *Mangifera indica* was reported to have the least with 0.02% (Table 2).

Based on the relative abundance of different plant species (shrubs) found in FUDMA take off site, *Indigefera pulchra* was having the highest with 37.24%. This was followed by *Calotropis procera*, and *Ipomea repens*, with 27.59%, and 18.62%, respectively. *Pilustigma thonningii* and *Anacardium occidentale* were reported to have the least with 8.28% each (Table 3).

Table 3

Based on the relative abundance of different plant species (herbs) found in FUDMA take off site, *Cyperus rotunda* was having the highest with 34.17%. This was followed by *Laptadenia hastata*, *Portulaca quadrifida*, and *Portulaca oleracea*, with 31.54%,

Table 2: Relative abundance of medicinal plants forms identified by their morphological features into trees.

	Medicinal plants (tree)	Density	Frequency (%)	Relative abundance (%)
1	<i>Azadirachta indica</i>	70.00/ ha	100.00	22.43%
2	<i>Albizia lebbbeck</i>	.54.67/ha	75.00	16.82%
3	<i>Eucalyptus camelduensis</i>	45.00/ha	60.00	13.46%
4	<i>Tamarindus indica</i>	5.00/ha	33.33	7.47%
5	<i>Khaya senegalensis</i>	18.33/ha	26.67	5.98%
6	<i>Terminalia catappa</i>	1.00/ha	26.67	5.98%
7	<i>Mangifera indica</i>	0.33/ha	0.13	0.02%
8	<i>Parkia biglobosa</i>	40.00/ha	20.00	4.49%
9	<i>Phoenix dictyfera</i>	23.00/ha	52.00	11.66%
10	<i>Adansoniadigitate</i>	13.33/ha	52.33	11.74%
Total		270/ha	445.80	

Table 3: Relative abundance of medicinal plants forms identified by their morphological features into shrubs

S/N	Medicinal plant (shrubs)	Density	Frequency (%)	Relative abundance (%)
1	<i>Indigefera pulchra</i>	18.33/ha	90.00	37.24%
2	<i>Pilustigma thonningii</i>	38.33/ha	20.00	8.28%
3	<i>Calotropis procera</i>	40.00/ha	66.67	27.59%
4	<i>Ipomea repens</i>	23.33/ha	45.00	18.62%
5	<i>Anacardium occidentale</i>	16.67/ha	20.00	8.28%
Total			241.67	

Table 4: Relative abundance of medicinal plants forms identified by their morphological features into herbs.

S/N	Medicinal plant (herbs)	Density	Frequency (%)	Relative abundance (%)
1	<i>Laptadenia hastate</i>	65.00/ha	80.00%	31.54%
2	<i>Portulaca oleracea</i>	5.00/ha	13.33%	5.25%
3	<i>Portulaca quadrifida</i>	40/ha	67.00%	26.41%
4	<i>Cyperus rotunda</i>	61.67/ha	86.67%	34.17%
5	<i>Vernonia amygdalina</i>	1.00/ha	6.67%	2.63%
Total			253.67%	

26.41% and 5.25%, respectively. *Vernonia amygdalina* was reported to have the least with 2.63% each (Table 4).

DISCUSSION

The vegetation of Federal University Dutsin-ma take off site was observed and categorized into trees, shrubs and herbs. Some of these plants present possess medicinal properties. The plants with medicinal history present were found to be dominated by *Azadirachta indica*, *Indigefera pulchra* and *Cyperus rotunda* which is similar to the research work carried out by a number of researchers^{22,23,24} which showed same medicinal plants species with their family and local names, being in abundance in different climatic conditions. Another work carried out by Bem et al¹⁸ at Federal University Dutsin-ma permanent site had also showed similar findings.

CONCLUSION

Several plants species were collected, identified and found to possess some medicinal properties, these plants include *Azadirachta indica*, *Indigefera pulchra* and *Cyperus rotunda*. Some of the major diseases reported to be cured by these plants includes typhoid, malaria, diarrhea, pile and joint pain. Future researches should focus on studying the toxicological aspect as well as the phytochemical contents of these medicinal plants.

Conflicts of Interest:

The authors declare no conflict of interest.

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