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, 30 quadrats of 10 m X 10 m (100 sq m) size were randomly laid to study trees, herbands 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 total of 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, Sennaobtusifolia and 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 andazadirachta indica 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.
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 (Muthee et al., 2011). The continuous search for natural plant products for use as medicines is encouraged by ethnobotanical survey; (Gabriel et al., 2019; Igoliet et 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; Gabriel et al., 2019).

The idea of relative abundance encompasses two concepts mainly, which are; Number of species and evenness 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.
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-Musallow 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. 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 Animal rearing.

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 ºC in the month of March, April and May and minimum temperature is about 22 ºC 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, 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 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

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

(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:

Frequency = \( \frac{\text{number of times the species occur in the quadrants}}{\text{total number of quadrats examined}} \times 100 \)

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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:

\[
\text{Density} = \frac{\text{total number of species in all quadrats/hecta}}{\text{total number of quadrats studied}} \times 100
\]

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.

**Identification of plants with medicinal values**

*Crotolaria falcate, Crotolariamicrocarpum, Pilostigma thonningii, Acacia nilotica, Senna occidentalis, Senna italica, Bauhinia rufescens, Acacia sayel, Acacia ataxacantha, Sennaobtusifolia, and Prosopis Africana* from family fabaceae, *Ipomoearepens* and *Evolvulus alsinoides* from family Convulvulaceae, *Combretum micranthum* and *Combretumlampocarpum* from family Combretaceae, *Guira senegalensis* and *Anogeissus leiocarpus* from family Combretaceae, *Leptadenia hastate*, *CalotropisProcera*, *Leptadenia hastate*, from family Asclepidaceae, *Ipomoearepens* and *Evolvulus alsinoides* from family Convulvulaceae, *Ipomoearepens* and *Ipomoearepens* from family Sterculiaceae, *Walteriaindica* and *Walteriaindica* from family Sterculiaceae, *Zizyphus abyssinica* from family Rhamanaceae, *Amorphophallus abyssinicus, Asparagus filiformis* from family Liliaceae, *Diospyros mesiliformis* family Ebenaceae, *Borassusaethiopium* family Arecaceae, *Cleome monophylla*, and *Capparistomentosa* from family Cappridaceae, *Lawsoniainermis* family Lauraceae, *Balanite aegyptiaca* family Zygophyllaceae, *Gardeniarahnsens* family Rubiaceae, *Solanuminanum* family Solanaceae, *Euphorbia hirta* family Euphorbiaceae, *Holarrhena floribunda* family Apocynaceae, *Sclerocarya birrea* 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   | Ipomoearepens       | Convulvulaceae   | Dumankada        | 12063          | Diarrhea                |
| 2   | Crotolaria falcate  | Fabaceae         | Fararbiyarana    | 02481          | JuJu                    |
| 3   | Crotolariamicrocarpum| Fabaceae         | Bakarbiyarana    | 02487          | JuJu                    |
| 4   | Leptadenia hastate  | Asclepideace     | Yadiya           | 0578           | Headache, Hypertension  |
| 5   | Walteria indica     | Sterculiaceae    | Hankufa          | 0600           | Cold in animals         |
| 6   | Zizyphus abyssinica | Rhamanaceae      | Magarya          | A00/017        | Bilhazia                |
| S/N | Plant species                  | Family          | Local name | Voucher Number | Medicinal History            |
|-----|--------------------------------|-----------------|------------|----------------|------------------------------|
| 7   | Calotropis Procera             | Asclepidaceae   | Tumfaiya   | 900219         | Protection from evils        |
| 8   | Combretum micranthum           | Combretaceae    | Geza       | 900257         | Stoppage of bleeding         |
| 9   | Amorphophallus abyssinicus     | Liliaceae       | Kunnenjaki | 10124          | Headache                     |
| 10  | Combretum lampocarpum          | 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   | Piliostigma thonningi          | Fabaceae        | Kalgo      | 0831           | diarrhoea, diabetes, astringent |
| 3   | Acacia nilotica                | Fabaceae        | Bagaruwa   | 900248         | Pile                         |
| 4   | Leptadenia hastate             | Asclepidaceae   | Yadiya     | 0578           | Headache, Hypertension       |
| 5   | Walteria indica                | Sterculiaceae   | Hankufa    | 0600           | Cold in animals              |
| 6   | Senna occidentalis             | Fabaceae        | Redore     | 1521           | Malaria and typhoid          |
| 7   | Diospyros mesiliformis         | Ebenaceae       | Kanya      | 0938           | Pile                         |
| 8   | Senna talliflora               | Fabaceae        | Filisko    | 00923          | Stomache                     |
| 9   | Borassusa ethiopium            | Arecaceae       | Kaba       | 00963          | Heart burn                   |
| 10  | Cleome monophylla              | Capridaceae     | 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   | Anogeissus leioscarpus         | Combretaceae    | Marke      | 01738          | Catarrh                      |
| 2   | Lawsonia inermis               | Lauraceae       | Lalle      | 0629           | Dead body preservation       |
| 3   | Balanitea egypitica            | Zygophyllaceae  | Aduwa      | 0900175        | Typhoid fever                |
| 4   | Bauhinia rufescens             | Fabaceae        | Tsastagi   | 01800          | Increase milk production     |
| 5   | Asparagus filiformis           | Liliaceae       | Kayarbera  | 06821          | Cold in animals              |
| 6   | Gardenia rubescens             | Rubiaceae       | Gaude      | 1895           | Back pain                    |
| 7   | Solanum nanum                  | 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                   |
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   | Senna obtusifolia           | Fabaceae      | Tafasa     | 01370          | Headache            |
| 3   | Prosopis africana           | Fabaceae      | Gatsari    | 63012          | Pile                |
| 4   | Evolvulus alsinoides        | Convolvulaceae| Kafimalam  | 0559           |                     |
| 5   | Sclerocaryabirrea            | Anacardiaceae | Danya      | 0681           | Dysentery           |
| 6   | Cussonia barteri            | Loganiaceae   | Gwaba      | 12025          |                     |
| 7   | Sida alba                   | Malvaceae     | Miyartsanya| 01450          | It boost immune children |
| 8   | Capparistomentosa           | Capridaceae   | Jani       | 130612         | Leg pains           |
| 9   | Euphorbia hirta             | Euphorbiaceae | Nononkurciya| 01360         | Night blindness, chest pain |
| 10  | Cleome monophylla           | Capridaceae   | Gasaya     | 11023          | Joint pains         |

The total density, frequency and relative abundance of plant species collected behind senate building (Federal University Dutse) 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 Leptadenia hastate  | 20.00/ha    | 20.00         | 2                      |
| 5 Walteria indica     | 40.00/ha    | 20.00         | 2                      |
| 6 Zityphus abyssinica | 20.00/ha    | 20.00         | 2                      |
| 7 Calotrops Procura   | 20.00/ha    | 20.00         | 2                      |
| 8 Combretum micranthum| 20.00/ha    | 20.00         | 2                      |
| 9 Amorphophallus abyssinicus| 40.00/ha   | 40.00         | 4                      |
| 10 Combretum lampocarpum| 20.00/ha  | 20.00         | 2                      |
| Total                 | 340/ha      | 260           | 26                     |
### 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. G. senegalensis   | 20.00/ha    | 20.00         | 2                      |
| 2. Piliostigma tonningi | 20.00/ha    | 20.00         | 2                      |
| 3. A. nilotica       | 40.00/ha    | 20.00         | 2                      |
| 4. L. hastate        | 20.00/ha    | 20.00         | 2                      |
| 5. W. indica         | 20.00/ha    | 20.00         | 2                      |
| 6. S. occidentalis   | 120.00/ha   | 60.00         | 6                      |
| 7. D. mesiliformis   | 20.00/ha    | 20.00         | 2                      |
| 8. S. italic         | 20.00/ha    | 20.00         | 2                      |
| 9. B. rufescens      | 60.00/ha    | 20.00         | 2                      |
| 10. C. 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. A. leiocarpus     | 40.00/ha    | 20.00         | 2                      |
| 2. L. aneris         | 20.00/ha    | 20.00         | 2                      |
| 3. B. egypciaca      | 20.00/ha    | 20.00         | 2                      |
| 4. B. rufescens      | 60.00/ha    | 20.00         | 2                      |
| 5. A. filiformis     | 80.00/ha    | 20.00         | 2                      |
| 6. G. rubcsens       | 20.00/ha    | 20.00         | 2                      |
| 7. S. aficanum       | 40.00/ha    | 20.00         | 2                      |
| 8. A. sayel          | 20.00/ha    | 20.00         | 2                      |
| 9. E. hirta          | 60.00/ha    | 20.00         | 2                      |
| 10. H. 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. A. ataaxacantha   | 60.00/ha    | 40.00         | 4                      |
| 2. S. obtusifolia    | 120.00/ha   | 80.00         | 8                      |
| 3. P. africana       | 40.00/ha    | 20.00         | 2                      |
The vegetation in the northern region of Federal University Dutse inma 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 Sennooccidentalis, Acacia ataxacantha, Senna obtusifolia, Sclerocaryabirrea, Sida alba, Euphorbia hirta, 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.

### IV. CONCLUSION

Different plants species were collected, identified and found to possess some medicinal properties, these plants includes Sclerocaryabirrea, Sida alba, Euphorbia hirta, Senna occidentalis, Acacia ataxacantha, Senna obtusifolia 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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