



## ETHNOBOTANICAL ASSESSMENT OF PLANTS USED FOR THE TREATMENT OF ENDOCRINE DISORDER IN DAURA EMIRATE, KATSINA, NIGERIA

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### ABSTRACT

*Medicinal plants are integral components of traditional medical system in Nigeria as in other cultures and societies in Africa. This study examines local knowledge of woody vegetation use for the treatment of endocrine disorders in Daura Emirate with a view to providing information that can assist in management of medicinal plants in the area. This study employed open ended questionnaire and unstructured interview to collect information from local people and traditional healers in the study area respectively. Simple Random Sampling Techniques was used for the selection of 66 respondents and 24 interview participants. Data was collected using questionnaires which were administered in 5 communities of Daura Emirate while 18 traditional healers and 6 herbalists were engaged in an unstructured interview with a view to collecting their opinions on the treatment of endocrine disorders in the area. Result from this study found that endocrine disorders (diabetes, goitre and sexual dysfunction) were treated with 14 plants in combination with other products such as oil obtained from animals and red potash. This study further revealed that leaf (52.17%) was utilised most for the preparation of herbal remedies for endocrine disorders in the study area, while root and pod (04.35%) are the less utilised. It has been found that the remedies were administered orally and nasally. Respondents mentioned two methods employed for management of medicinal plants in the study area. These are: Assisted Natural regeneration (ANR) and seed bank. However, ANR was used by 79% of the respondents. This study recommended that pharmacopoeia of the area should be development in order to avoid knowledge losses. This can be done through collaboration among stakeholders in ethnobotany, medicine, pharmaceutical sciences.*

**Keywords:** Ethnobotanical assessment, plants, endocrine disorders,

### 1.0 INTRODUCTION

Local people interact with the natural environment and have ways of categorizing, managing and utilizing part of the environment such as plants existing around them. They use plants for food, medicines, building materials and other purposes. The science that studies these relationships between plants and people is ethnobotany (Farnsworth, 1994). Ethnobotany refers to all studies that are related to the reciprocal relationship between plants and traditional peoples (Martin, 1995). According to

Cotton (1996) ethnobotanical work seems to have started with Christopher Columbus in 1492, at a time when he brought tobacco, maize, spices and other useful plants to Europe from Cuba. The discipline is fast growing, interdisciplinary and multidisciplinary science, which focuses on documenting, analyzing of indigenous knowledge on plants and the interaction between humans and plants as well (Alexiades, 1996). It has crucial role in traditional medicine (Pei, 2005).

Since the beginning of civilization, people have used plants as medicine. Historically, it is estimated

that between 35,000 and 70,000 species of plants have been used at one time or another for medicinal purposes (Farnsworth *et al.*, 1991). Medicinal plants play a vital role in the maintenance of human health throughout the world and notably in the tropics. Today, well over 30,000 plants and wild species used by local people in India for the treatment of various ailments are discovered (Modhvadia, 2009). Mantry *et al.*, (2014) reported that recent estimates show that over 9,000 plants have known medicinal applications in various cultures and countries, and this is without having conducted comprehensive research amongst several indigenous and other communities. The documentation of the medicinal plants used by the people of northern Nigeria is done though on limited scale by many authors including von Maydell (1990), Mohammed (1994) and Aliyu (2006).

Ethnobotanical practices have been involved in the treatment of disease conditions such as mental illnesses (Abbo, 2011), HIV/AIDS/STI/TB (Tabuti *et al.*, 2010), cancer (O'Brien *et al.*, 2012), Alzheimer's disease (Santos-Neto *et al.*, 2006), chronic hepatitis B and C (Modi *et al.*, 2006), hypertension (Kretchy *et al.*, 2014). Others are cough, diarrhoea, dysentery and fever (Rahman, 2013), malaria (Orwa *et al.*, 2007), liver diseases (Stickel and Schuppan, 2007) and kidney, urinary disorders (Ballabh *et al.*, 2008), dysentery, yellow fever, and pile (Mohammed, Danjuma, and Abdulkarim, 2015). Ethnobotany has a particular role in the treatment of diabetes mellitus (Kumar *et al.*, 2006; Abo, Fred-Jaiyesimi and Jaiyesimi, 2008).

Studies revealed that endocrine disorders have been treated with natural products of plant sources including seeds, berries, roots, leaves, fruits, bark, flowers, or even the whole plants. Talaviya *et al.*, (2014) reported that more than 600 medicinal plants have been reported to have anti diabetic potential globally. Ajibesin *et al.*, (2008) identified a total of 114 medicinal plant species representing 102 genera and 54 families employed in the traditional medical practice of the people of Akwa Ibom State, Nigeria. Although not the only endocrine disease, the World Health Organisation (2012) reports that one in ten

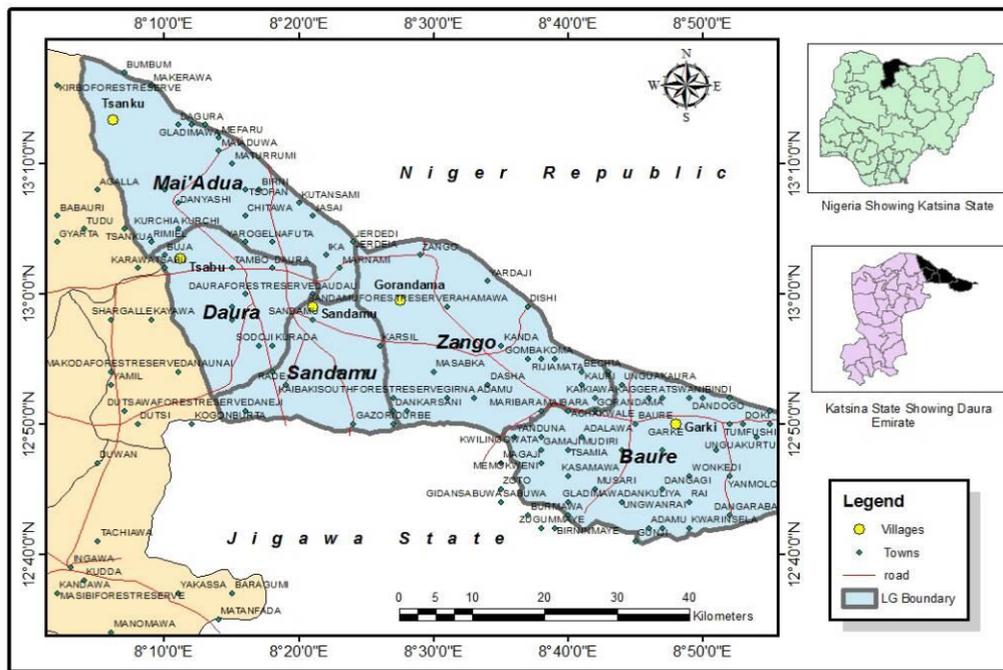
adults worldwide has diabetes mellitus and 12% of the world's population are considered obese, a risk factor for diabetes mellitus. About 80% of people living with diabetes mellitus in the world live in low and middle income countries and 72.8% of all deaths in Africa attributable to diabetes mellitus occur in people under the age of 60 years (WHO, 2013). These alarming figures therefore triggered this study with a view to contribute to the fight to this dreadful disease and others. Awah *et al.* (2009) reported that the impact of indigenous knowledge in the management of diabetes mellitus has been realised in Africa.

Culturally, the people of Daura Emirate were reported to have high reliance on traditional medicine for health owing to the fact that the area is on the borderline of the country Niger Republic to the northeast. The Emirate attracts people from within and outside the country; thus promoting herbal trade activities in the area. The fear of loss of this vital tradition through death of herbal specialists is high now than ever because with modernisation such knowledge systems are eroding and corroding fast and at times totally disappearing. This have been reported in recent publications such as Naranjo (1995) who lamented that due to modernisation such precious is fast disappearing. Therefore, this study examines local knowledge in Daura Emirate on the use of medicinal plants for the treatment of endocrine disorders with a view to documenting information that will help in development of the region's pharmacopeia.

## MATERIALS AND METHOD

### Study Area

Daura Emirate is adjoining conurbation which comprised five Local Governments Areas (LGAs) in Katsina State. The LGAs include Baure, Zango, Sandamu, Daura and Mai'adua (Figure 1). The Emirate is located between longitude 8° 50' E and 9° 50' E and 12°45' N and 13°18' N and covers a total of 3570 km<sup>2</sup>. According to the census results of 2006 in Nigeria, the population of the LGAs which make up Daura Emirate is 751,784 people. The area has an average growth rate of 2.8% (National Population Commission of Nigeria, 2006).



**Figure 1: Daura Emirate, Katsina, Nigeria**

The climate of Daura Emirate is generally hot and termed tropical continental type. The area has a mean annual temperature of about 25°C and a rainfall of over 400mm/annum. The gross characteristics of the area is determined by the movement of Inter Tropical Discontinuity Zone (ITDZ) which brings about the dry season, which starts from November to March and wet season which starts from May to October. The ITDZ advances north at the rate of 160 km/month, with gradual onset of rains and retreats at about 320km/month which causes an end to rainfall season (Olofin, 1987).

The vegetation of Daura Emirate consists of mixed formation of grasses and fire resistant trees. With exclusion of *Azadirachta indica* (Bedi) and *Eucalyptus camaldulensis* (Turare) which are exotic species, the dominant indigenous tree species found in the area include *Faidherbia albida* (Gawo), *Parkia biglobosa* (Dorawa), *Tamarindus indica* (Tsamiya), *Diosphyros mespiliformis* (Kanya), *Acacia nilotica* (Bagaruwa). The common grasses and shrub species in the area include: *Cenchrus biflorus* (Karangiya), *Andropogon gayanus* (Gamba), *Moringa oleifera* (Zogale), *Cassia tori* (Tafasa), *Ziziphus mauritiana* (Magarya), *Calotropis procera* (Tumfafiya) and *Annona*

*senegalensis* (Gwandar daji). Most of the trees are short and hardly reach 20m with the exception of *Adansonia digitata* (Dorawa) which is taller. Most of the trees have adapted to the long dry season condition through shedding their leaves (deciduous character), developing long tap root system and succulent character (Mohammed, 1994).

### Sampling of Study Villages

The sampled study villages are located on latitude 12°45' N and 13°5' N and longitude 8°700' E and longitude 9°00' E (Figure 1). The locations extended from Tsanku village in the West to Garki village in the East and cut across five locations namely: Garki (Baure), Gorandama (Zango), Sandamu (Sandamu), Tsabu (Daura) and Tsanku (Mai'adua). These study locations were sampled purposively based on the information obtained from the Local Traditional Healers Association of each LGAs that the villages are most frequented by health seekers from within and outside the region especially because it borders Niger Republic to the north.

### The Study Population

This study targets people of the sampled study villages, all traditional healers and herbalists of the 5 communities. Traditional healers here refer to those specialists that prepare remedies with plants

and non-plant materials such as oils, bones, skins of animals and products such as potash. Herbalists specialises on plants applications for the treatment of diseases in the study area.

**Table 1: Population of the Study Area**

SN	LGAs	Population according to 2006 census	Study Villages	Persons Living with Endocrine Disorders*	Gender		Total Number of Traditional Healers	Total Population of Herbalists
					Male	Female		
1	Daura	224,884	Tsabu	25	16	9	6	1
2	Baure	197,425	Garki	51	37	14	12	3
3	Zango	154,743	Gorandama	36	32	4	6	0
4	Mai'adua	2,011,78	Tsanku	22	18	4	10	1
5	Sandamu	137,287	Sandamu	67	61	6	24	6
	<b>Total</b>	<b>9,15517</b>		<b>201</b>	<b>164</b>	<b>37</b>	<b>58</b>	<b>11</b>

\*This list was compiled in 2017 with the help of some key informants particularly Malama Usama (Village Head of Garki)

The target population was composed of all those that used traditional medicine for the remedy of endocrine disorders in the study area. This was never obtained; therefore this study relied on information provided by the herbal practitioners as well as Village Heads concerning people with endocrine disorders. The 201 individuals consist of 164 male and 37 female who were between the age 45-67 and suffering endocrine disorders in the study villages (Table 1).

The population of specialists (traditional healers and herbalists) comprised of 67 males and 2 females (Table 1). This is because of the socio-cultural reasons that prevent female from having contact with strangers. All the members were above 50 years with the exception of 2 who were under 40 years found in Sandamu village. No herbalist was

encountered in Gorandama village as of the time of this research. This was attributed to the death of the eldest person in the profession and migration of two of his sons to Kano Nigeria for greener pasture.

### Sampling Procedure for Respondents

#### Questionnaire Respondents

A total of 66 respondents were sampled for questionnaire administration using simple random sampling technique. This comprised of 55 male and 11 female. This comes from 201 individuals suffering from either of the endocrine disorders in the study villages. A total of 33% was sampled in line with Brewer (2014) with little adjustments were the population and the ratio of male to female cannot support that.

**Table 2: Sample for Respondents for Questionnaire Administration**

SN	Study Villages	Sample of Respondents	Gender		Endocrine Disorder Type		
			Male	Female	Diabetes	Goitre	Sexual Dysfunction
1	Tsabu	8	6	2	5	1	2
2	Garki	17	14	3	10	3	4
3	Gorandama	12	9	3	5	1	6
4	Tsanku	7	5	2	4	2	1
5	Sandamu	22	19	3	10	4	7
	<b>Total</b>	<b>66</b>	<b>55</b>	<b>11</b>	<b>35</b>	<b>11</b>	<b>20</b>

### Interview Participants

A total of 24 participants were selected using random sampling techniques so as to represent both

gender in the sample. These fall into 19 traditional healers and 5 herbalists (Table 3). In line with, a total of 33% was sampled from the population of both traditional healers and herbalists that were encountered in the study area. Only two herbalists

were encountered in Tsabu and Tsanku respectively and therefore were included in the sample for representation. No herbalist was encountered in Gorandama at the time of this survey (Table 3).

**Table 3: Interview Participants for the Study**

SN	Study Villages	Sample of Traditional healers	Sample of Herbalists
1	Tsabu	2	1
2	Garki	4	1
3	Gorandama	2	0
4	Tsanku	3	1
5	Sandamu	8	2
	<b>Total</b>	<b>19</b>	<b>5</b>

### Data Collection Procedures

#### Questionnaire

A total of 66 questionnaires were administered in the study area with a view to collecting quantitative information on parts of plants in the preparation of remedy for their particular ailment and the methods used in the management of such species. The questionnaires were retrieved after two weeks and none was lost or mutilated.

#### Unstructured Interview

Unstructured interviews were conducted with herbalists and traditional healers in 5 LGAs of Daura Emirate. The interview focused on the preparation of remedies for endocrine disorders as well as mode of administration. Information provided by the participants were carefully recorded and logged. Other questions asked were on medicinal plants for endocrine disorder and whether they were still in use or abandoned.

### Data Analysis

Quantitative data was analysed using percentage and presented in tables. Qualitative data was sorted, coded into thematic and presented in relevant sections of this work.

## RESULTS

### Medicinal plants used for the Treatment of Endocrine Disorders in Daura Emirate

According to the local healers, a total of 14 medicinal plants all indigenous except *Azadirchata indica* and *Acacia senegalensis* were used for the treatment of endocrine disorders in Daura Emirate (Table 4). With the exception of *Moringa oleifera* and *Annona senegalensis*, all other plants encountered were trees. A total of 9 plants are used to treat diabetes while 2 and 4 plants were used to treat sexual dysfunction and goitre. *Gueira senegalensis* a dominant shrub in the study area was the commonly used plants to remedy sexual dysfunction in the study area (Table 4).

**Table 4: Types of Endocrine Disorders and Plants used for their Treatment**

S/No.	Types of Endocrine Disorders	Plants Used for their Treatment	Local Names of Plant (Hausa)
1	Diabetes	<i>Combretum micranthum</i>	Geza
		<i>Hyphaene thebaica</i> (big)	Goriba
		<i>Sclerocarya birrea</i>	Danya
		<i>Parkia biglobosa</i>	Dorawa
		<i>Cassia singueana</i>	Runhu
		<i>Ziziphus mauritania</i>	Magarya
		<i>Acacia senegalensis</i>	Madaci
		<i>Moringa oleifera</i>	Zogale
		<i>Azadirachta indica</i>	Darbejiya
2	Sexual Dysfunction	<i>Bauhinia rufesceus</i>	<i>Tsatstsagi</i>
		<i>Gueira senegalensis</i>	Sabara
3	Goitre	<i>Annona senegalensis</i>	Gwandar daji
		<i>Disophyros mespiliformis</i>	Kanya
		<i>Tamarindus indica</i>	Tsamiya
		<i>Adansonia digitata</i>	Kuka

#### **Preparation and Administration of Remedies for Endocrine Disorders in Daura Emirate**

This study found that a total of 8 plant and several recipes were utilized by traditional practitioners to

produce remedies for patients who consult them with diabetes, sexual dysfunction and giotre in Daura Emirate (Table 5).

**Table 5: Preparation and Administration of Remedies for Endocrine Disorders in Daura Emirate**

S/No.	Botanical Name of Plant	Other Recipes	Part Used	Mode of Preparation	Ailments	Mode of Administration
1	<i>Moringa oleifera</i>	red potash, animal products (dried bone of an animal)*	Leaf	Leaf boiled with red potash. The boiled product is allowed to cool and add the animal product.	Diabetes	Taken orally as an infusion in the morning and evening
2	<i>Azadirachta indica</i>	Unripe mango fruit	Bark	Boil bark of the plant, collect extract before cooling, soak unripe mango fruit slices and allow for some hours.	Diabetes	Taken orally as a drink
3	<i>Acacia segenegalensis</i>	Leaf of <i>Cassia singuena</i>	Bark	Boil bark of the plant, collect the extract, soak unripe leaf of <i>Cassia singuena</i> and allow to settle for an hour	Diabetes	Taken orally as a drink
4	<i>Guiera senegalensis</i>	goat milk	Leaf	Dry leaf of <i>Bauhinia rufescens</i> in the sun, grind it, collect 2 spoonful of the powder and soak in water, sieve the content, add goat milk.	Sexual dysfunction	Oral
5	<i>Annona senegalensis</i>	Millet	Leaf	Dry the leaf of <i>Annona senegalensis</i> , soak some substantial amount in water, collect the extract, add handful raw millet, allow to stay for sometime	Goitre	Taken orally as infusion
6	<i>Tamarindus indica</i>	products from the herbalists	Bark/stem	a. Collect some slices from bark of <i>Tamarindus indica</i> that is not exposed, dry it, burn with other products from herbalists, stay close for the smoke	Goitre	Nasal
				b. Decoction of bark and fruit of <i>Tamarindus indica</i> **	Goitre	Oral
				c. Decoction of roots***		Oral
7	<i>Diosphyros mespiliformis</i>	Ginger and garlic	bark	Boil the bark of <i>Diosphyros mespiliformis</i> and collect the extract, add ginger and garlic, allow for few minutes. Only ginger is used in Tsabu village	Goitre Goitre	Oral as infusion
8	<i>Adansonia digitata</i>	Lemon/ other products obtained from the herbalists	Pod	Collect the pod of <i>Adansonia digitata</i> , extract the powder and the seed, soak it for an hour, add lemon and other products (normally obtained from the herbalists).	Goitre	Oral as infusion

\*name not mentioned for secrecy

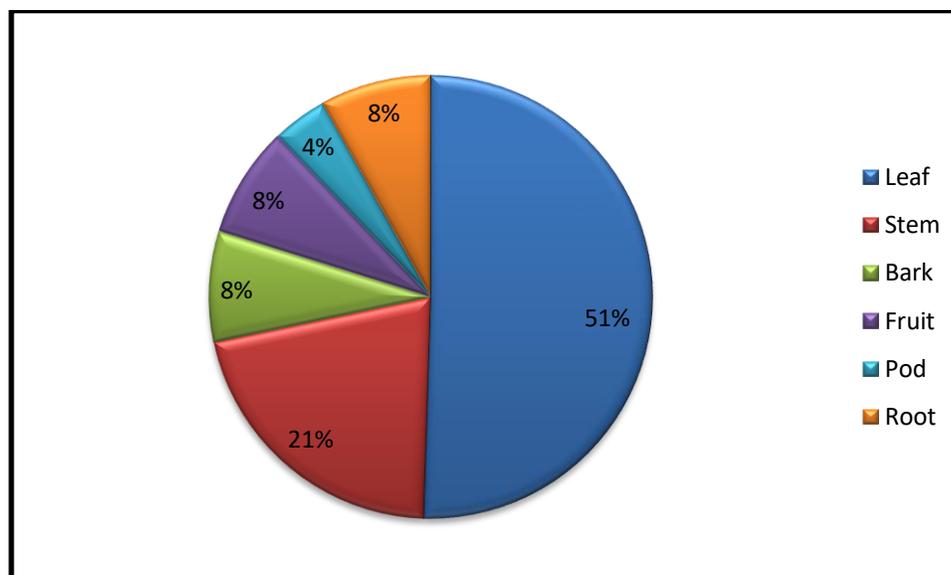
\*\*this is done in Sandamu village

\*\*\*this is done in Garki village

### Plant Parts used for Preparation of Remedies for Endocrine Disorders in Daura Emirate

A total of 6 plant parts: leaf, bark, stem, fruit, pod, and root were used in this study area for preparation of remedies for endocrine disorders (Figure 2). Of the

6 parts, leaf was the most widely used in the study area while root, fruit and pod were the least. A total of 51% of the respondents used leaf and another 21% used bark for preparation of remedies while only 4% used pod (Figure 2).



**Figure 2: Parts Used by the Respondents in the Preparation of Remedies in Daura Emirate**

### Local Methods for the Management of Medicinal Plants in Daura Emirate

According to the respondents medicinal plants of the study area were managed using two indigenous techniques namely: Assisted Natural Regeneration (ANR) and seed bank (Table 6). Assisted natural regeneration was widely practiced (79%) in the

study area (Table 6). Seed bank was utilised by 21% of the respondents who mentioned that they travel as far as Zinder in Niger Republic to collect seeds of rare medicinal species such as *Acacia camphylacanta* and *Anogeissus leiocarpus* to propagate on their farmlands for future use.

**Table 6: Local Methods of Plants Management in Daura Emirate**

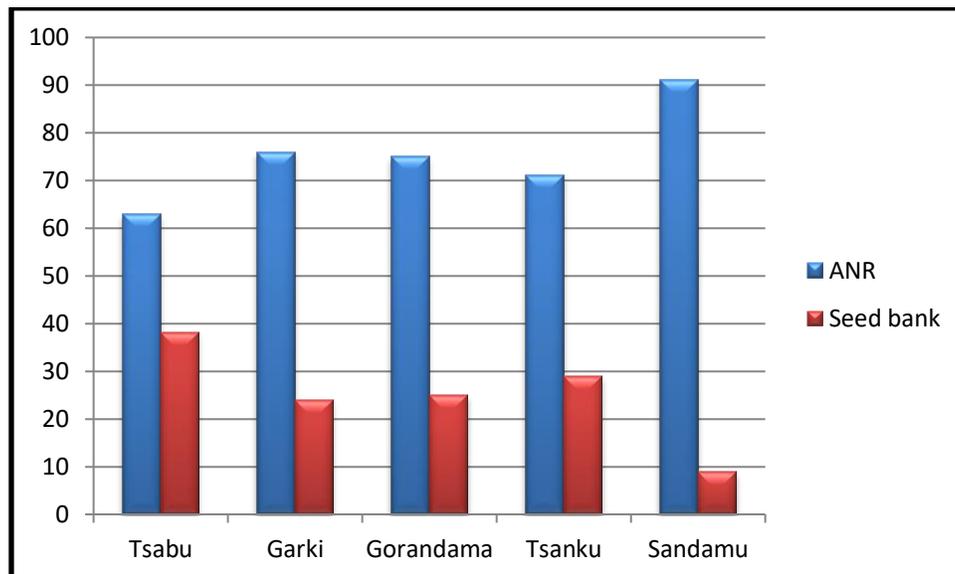
S/No.	Type of Method	Frequency	%
1	ANR*	52	79
2	Seed bank	14	21
	Total	66	100

\*assisted natural regeneration

### Level of Utilisation of Methods among Study Villages in Daura Emirate

There are variations in terms level of utilisation of among the study villages. About 90% of the respondents in Sandamu while 76% and 75% in

Garki and Gorandama villages respectively used Assisted Natural Regeneration technique to manage vegetation. However, 38% and 29% used seed bank technique in Tsabu and Tsanku villages respectively (Figure 3).



**Figure 3: Utilisation of Methods among Study Villages**

## DISCUSSION

### Medicinal plants used for the Treatment of Endocrine Disorders in Daura Emirate

This study found 14 species used for the treatment of endocrine disorders in the study area. This finding corroborates so many studies including Ibrahim (2013) who reported that more than 400 plants are being used in different forms for their hypoglycaemic effects in treating diabetes. Particularly, *Bridellia ferruginea* (Iwu, 1980) and *Dioscorea dumentorum* (Iwu et al., 1990) were reported to be used in the preparation of remedies for diabetes in various parts of Nigeria. Others plants with anti diabetic effects include *Ficus sycomorus* (Mousa, 1994), *Carica papaya* (Oke, 1998), *Psidium guajava* (Sabjan and Vinoji, 2012), *Khaya senegalensis* (Ibrahim and Islam, 2014) and *Acacia nilotica* (Mwangi et al., 2015). Perez-Gutierrez and Domain-Guzman (2012) also reported that *Azadirachta indica* has compound that can treat diabetes while Ibrahim (2013) reported that *Cassia singuena* (which is not used in this area for treating diabetes) have anti-diabetic compounds with no toxic effects *in vivo*. *Azadirachta indica* was also reported by Shinkafi, Bello, Hassan and Ali (2015) to cure diabetes in northwestern Sokoto State, northern Nigeria.

Several plants were used for sexual enhancement in various parts of the world. However, none of the

plant mentioned in Table 4 here were reported in southern Nigeria by Akah, Okoli and Nwafor (2002). In South East Asia, *Epimedium* (*Epimedium sagittatum*), also called “Horny Goat Weed” has traditionally been used for sexual dysfunction, fatigue and libido enhancement. *Epimedium* has been shown to improve sexual function and quality of life even in patients with chronic disease (Liao, Chen, Li, 1995). *Mucuna* (*Mucuna pruriens*) is recognized as an aphrodisiac in Ayurvedic Medicine, used for both men and women with low libido, and for women undergoing menopause. Significant increase of sexual behaviour through enhanced libido has been attributed to L-dopa, a constituent of *Mucuna* (Berger, Mehrhoff, Beier, Meinck, 2003).

### Preparation and Administration of Remedies for Endocrine Disorders in Daura Emirate

This study revealed that modes of preparation of remedies are similar although slight differences are among the study villages. For example, decoction of the bark and fruit of *Tamarindus indica* is made in Sandamu while decoction of roots is done in Garki village for the treatment of goitre (table 5). The combination of different plants and parts for the preparation of herbal remedy is common among the respondents because of the understanding that that some plants enhance the action of other species. For instance, in Gorandama village the bark of

*Diosphyros mespiliformis* is decocted with garlic and taken as remedy for goitre while in Tsabu only ginger is used. This study found that oral ingestion is the main means of administration of remedies. Interestingly, a mixture of different plants is often used to prepare certain remedies (Table 5).

This result is in line with Glover, Yadav, and Vats (2002), and Shinkafi, et al. (2015) who reported that traditional remedies for diabetes were mostly prepared with leaf and bark of plants in India and Sokoto State, Nigeria respectively.

### Plant Parts used for Preparation of Remedies for Endocrine Disorders in Daura Emirate

Result in Figure 2 is line with several authors that various plant parts are used for the preparation of remedies by traditional healers. For example, Pan *et al.* (2014) reported the use plant parts including seeds, berries, roots, leaves, fruits, bark, flowers, or even the whole plants. Root is one of the most extensively used plant part in preparation of traditional herbal medicine in this study as in a study conducted in Ethiopia and China respectively (Abebe and Ayehu, 1993; Hong *et al.*, 2014). Ngbolua *et al.*, (2014) reported that leaves are the most commonly used plant parts by traditional healers. Similarly, in Dek Island in Ethiopia, Teklehaymanot (2009) reported that the dominant plant part used by local informants in the preparations of herbal remedies in both single and multiple treatments is root: 58% and 48%, respectively. The use of leaves could be attributed to easy availability and also due to the presence of high amount of chemicals compounds, which could be easily extracted and used in different forms (Imran *et al.*, 2014). Use of leaves is safer in terms of species management.

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### Local Methods for the Management of Medicinal Plants in Daura Emirate

According to the participants more species are managed with assisted natural regeneration technique in the study area. Species with medicinal value that are managed using this technique in Daura Emirate include *Diosphyros mespiliformis* and *Vitex doniana*. This result is in line with Rinaudo (2010) who reported that ANR otherwise called (Farmer Managed Natural Regeneration) is the most widely used method in the Sahel for the management of trees and some resilient shrubs.

### CONCLUSION

People of the study area showed sound knowledge of the use of tree species and the utility of most of them for treatment of endocrine disorders. Many species including *Azadirachta indica*, *Cassia singuena*, *Combretum micranthum*, *Faidherbia albida* and *Tamarindus indica* were used to prepare remedy for diabetes, goitre and sexual dysfunction in Daura Emirate.

Because of the promising medicinal properties of plants found in the study area and their various utilities, this study found that the traditional practitioners and herbalists contribute immensely to health care in Daura Emirate.

### Recommendations

1. This study recommended the development of pharmacopoeia of the area through collaboration among stakeholders in ethnobotany, medicine, pharmaceutical sciences and herbal.
2. Herbal practitioners with long years of experience should be encouraged on the need to train the youths on the practice in order to avoid knowledge losses. This can be achieved through expos and fair and training of traditional medical practitioners using a clearly defined manual which all traditional healers should operate with afterwards.

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