






## ETHNOPHARMACOLOGICAL SURVEY OF SOME SELECTED MEDICINAL PLANTS USED FOR THE TREATMENT OF TYPHOID IN KAFIN HAUSA, NORTH WEST, NIGERIA

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**ABSTRACT.** Employing raw materials from medicinal plants in managing diseases traditionally is a well-recognized practice in developing countries. However, one of the major limitations of this practice is the inadequate documentation of knowledge on these medicinal plants. This study was carried out to collect data on plants employed traditionally in treating typhoid by the people of Kafin Hausa. It also assessed the traditional medicine practice in Kafin Hausa. Data was collected using an open ended semi structured questionnaire by oral interview. Respondents were sampled purposively. Relative Frequency of Citation (RFC), informant consensus factor ( $F_{ic}$ ) and Fidelity Level (FL) were used to analyze the data. A total of 43 respondents were interviewed, where farmers (32.6%) had the highest number of respondents while nomads (2.3%) had the least number of respondents. A total of 12 plant species from 11 families were recorded, where Myrtaceae had the highest number of species. *Anona senegalensis* had the highest number of citation (20), RFC of 57.1%, while *Commiphora africana* and *Artemisia absinthium* had the least number of citations (1) each with RFC of 2.9%. Leaves (66.7%) were the major plant part mentioned. Informant consensus factor of 0.86 was recorded. *Anona senegalensis* have been reportedly used in the treatment of gastritis and fever. *Citrus aurantifolia* and *Olea europaea* have been used for malaria and pain treatments respectively. The result of this study documented plants traditionally employed in treating typhoid by the people of Kafin Hausa. This could serve as a source new molecules with antibacterial activity.

**Keywords:** Kafin Hausa, medicinal plants, Typhoid, traditional medicine, Nigeria.

### INTRODUCTION

Health care systems have evolved in many parts of the world that are based on human interactions with the natural environment [1]. Health systems that are based on the use of plants have developed over the years through advertisement and trials [2, 3, 4]. This knowledge acquired is the concept based on which ethnobotany is founded, Such knowledge is the subject of ethnobotany, which strive to comprehend the sapience, convalesce approach, and the use of resources from natural origin to combat ailments or

maintain well being in the traditional health systems [1]. The application of plants in the management or cure of diseases either as primary or alternative medicine has continuously gained recognition all over the world [5, 6, 7, 8, 9]. The knowledge on the application of plants is huge so much so that if it is not studied and documented, the possibility of it being lost with succeeding generations is great [10].

Traditional medicine practice is recognized in virtually all part of Nigeria although with differences in the raw materials used and mode of practice depending on the region or location. In Kafin Hausa, Jigawa state, this system of medicine is very well recognized and practiced, using different plants of medical importance in the management of different ailments. However, this rich indigenous knowledge on application of medicinal plants in their traditional medicine system has unfortunately not been sufficiently documented. The importance of knowledge on applications of plants having therapeutic properties can not be over emphasized, however, transmitting these knowledge has continuously diminished. Hence, developing means by which these plants can be documented requires attention, such that the knowledge is preserved and plants conserved as well as its sustainable management and utilization by majority of the local people [11].

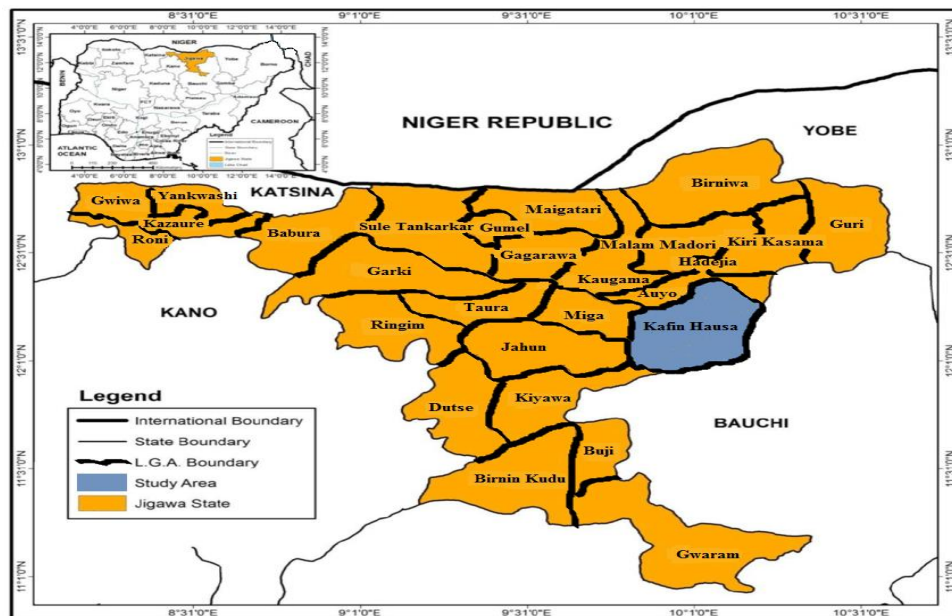
Fever resulting from *Salmonella* sp infection is regarded a worldwide infection otherwise known as typhoid [9] transmitted via consumption of food or drink contaminated with an infected person's feces containing the bacteria (*Salmonella enterica*, *Serovar typhi*) often referred to as *Salmonella typhi* [12, 13]. Aside from it being a cause for concern, the disease has been an important issue in the public health system of developing nations (like Asia and Africa), with primary focus on Nigeria due to poor sanitary conditions lack of portable water supply [14, 15]. On an annual bases, 600, 000 deaths are recorded as result of typhoid fever according to the world health organisation [12, 16, 17]. The world health organisation estimated 21.6 million infection rate, annually [16] with Africa and Asia having the highest rates [18]. Furthermore, the increasing resistance of microbial pathogens to existing antibiotics has prompted the search for new drug candidates with antimicrobial activity from various sources including plants [13].

Claims on the treatment of various diseases including microbial infections such as typhoid by the indigenous people of Kafin Hausa using plants and/herbal preparations has never been documented. Therefore, this study was carried out to collect and document data on plants traditionally employed in treating typhoid and assess traditional medicine practice among the indigenous people of Kafin Hausa.

## **MATERIALS AND METHODS**

### ***Study Area***

The study was carried out at Kafin Hausa LGA, Latitude 12° 14' N and Longitude 9° 54' E, Jigawa State, Nigeria. It has an area of 1380 km<sup>2</sup>. The inhabitants of the study area are predominant farmers, hunters and traders. The area is characterised by wet season that last from late June to mid-September while the dry season is from late September to mid-June. For the purpose of this study, three towns, Agura, Toyawa and Kafin Hausa were selected for the study (Fig.1).



**Fig. 1.** Map of Nigeria Showing the Study Area (Adapted and Modified from Google Maps)

### **Sample Population**

Purposive sampling technique was employed in sampling the population [19]. The sampled population were categorised into five different groups comprising of Traditional Medicine Practitioners (TMP's), Herbalists, farmers, nomads and traditional birth attendants. Respondents were categorised into different age groups without gender discrimination.

### **Data Collection**

Collection of data was carried out in the month of March and April, 2018. Data was collected with the aid of semi-structured questionnaires and oral interview. The interview was conducted using the local language (Hausa) for ease of communication. Questions were asked by the interviewer who filled the questionnaires and direct questions were avoided. The questionnaires were first designed in English, translated to Hausa and used for data collection. It was then back translated to English after data collection with the help of Dr. Mu'azu Kudan, Department of languages, Hausa unit, Sule Lamido University Kafin Hausa. Information provided by respondents were confirmed by making a second visit. Consent was sort from relevant authorities and individual respondents before carrying out the study.

### **Plant Collection and Identification**

All of the plant species mentioned by the respondents were collected from the wild in the dry season of the year 2018. Respondents were made to collect the plant species mentioned so as to avoid collection of the wrong species due to variation in local names. Identification of the plant species were made by a botanist, Prof. A. S. Kutama, Department of Biological Sciences, Federal University Dutse, in comparison with

reference materials such as standard identification texts, monographs and herbarium specimens. All the plant materials collected were deposited in the herbarium unit.

### ***Data Analysis***

Demographic data of respondents were analyzed using descriptive statistics while the results of the medicinal plant knowledge were analyzed using the Relative frequency of citation (RFC); Fidelity level (FL) and Informant consensus factor (ICF) measures. Statistical Package for Social Sciences (SPSS) v16.0 was used to carryout regression analysis on the data.

### ***Relative Frequency of Citation (RFC)***

The RFC was calculated to determine Local importance of each plant species [20]. The RFC was calculated as follows:

$$RFC = F_c / N$$

Where;

$F_c$  = Number of respondents, who mentioned the use of the species.

$N$  = Total number of respondents.

### ***Fidelity Level (FL)***

This index used to determine the relative healing potential of a medicinal plant against a particular ailment [21]. It was calculated using the equation:

$$FL = N_s / N \times 100$$

Where;

$N_s$  = Frequency of citation of a particular species for a particular ailment.

$N$  = Total number of citations of that species.

### ***Informant Consensus Factor (ICF)***

The method of Fisseha et al [22] was adopted. The ICF was calculated using equation:

$$ICF = (N_{ur} - N_t) / N_{ur} - 1$$

Where;

$N_{ur}$  = Number of citations for each particular ailment

$N_t$  = Number of species reported to cure that ailment.

## **RESULTS AND DISCUSSION**

### ***Socio-Demographic Information***

In this study, a total of 43 respondents were interviewed. Majority of the respondents, 13 (30.2%) were between the age of 41-50 and was immediately followed by age 51-60 with 10 (23.3%) respondents. Respondents within the age of 31-40 had the least 6 (13.9%) representation (Table 1). These data indicates a wide gap in the knowledge of traditional medicine practice between the older and the younger generations. This is in agreement with previous reports [23, 24, 25, 26]. A high number of male respondents 33 (76.7%) were encountered in this study as compared to the female respondents 10 (23.3%) as

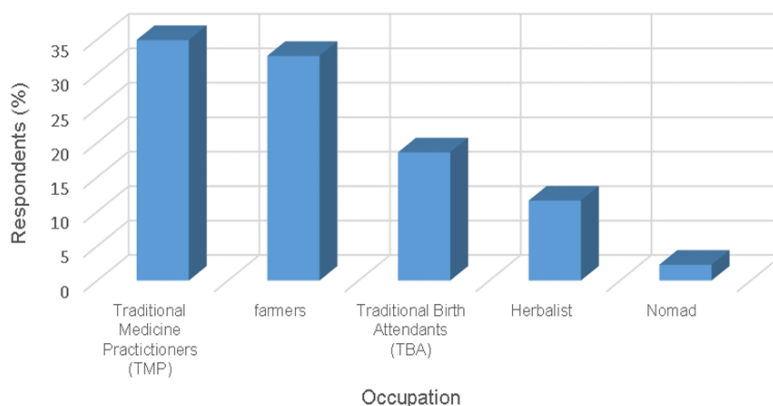
shown in table 1. Generally, it is believed that in the traditional medicine system, medicinal plant knowledge is transferred from male parents to their first born sons. This is in agreement with reports from previous studies [16, 27, 28].

**Table 1.** Age and sex characteristics of respondents

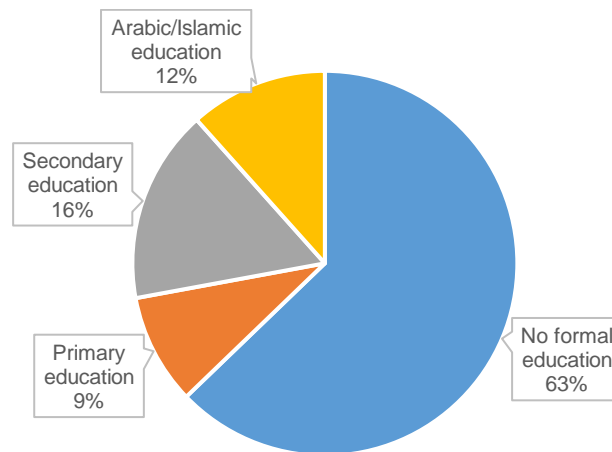
Variables	Frequency	Percentage (%)
<b>Age (Years)</b>		
<20	0	0.0
21-30	7	16.3
31-40	6	13.9
41-50	13	30.2
51-60	10	23.3
>60	7	16.3
<b>TOTAL</b>	<b>43</b>	<b>100</b>
<b>Sex</b>		
Male	33	76.7
Female	10	23.3
<b>TOTAL</b>	<b>43</b>	<b>100</b>

Traditional medicine practitioners 15 (34.9%) had the highest number of respondents. This was closely followed by farmers having 14 (32.6%) respondents. The high number of respondents encountered in this regard could be attributed to their inclination to share the knowledge. It is common practice among some traditional medicine practitioners to shroud their recipes in secret for fear of knowledge theft or losing their means of livelihood. Nomads 1 (2.3%) had the least number of respondents (Fig 2). This could be attributed to their lifestyle of constant migration.

Respondents had little primary or secondary education with majority of the respondents 27(62.8%) having no formal education (Fig. 3). The rural nature of the study area may have contributed to the large proportion of respondents having no formal education since education is not really a priority, rather, they engage in skills that will make ends meet.



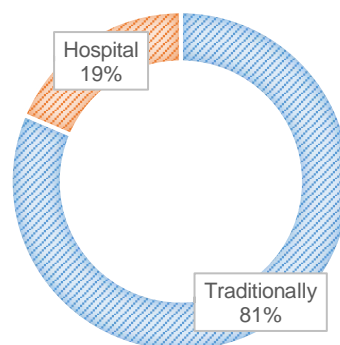
**Fig. 2.** Occupational Representation of Respondents in Kafin Hausa



**Fig. 3.** Educational Status of Respondents in Kafin Hausa

### ***Disease Treatment Mode***

Typhoid fever was treated traditionally using medicinal plants by 35 (81.6%) of the respondents, while 8 (18.6%) of the respondents claim to treat the disease at the hospital (Fig. 4). This result further justifies the increased reliance on traditional medicine system by most Nigerians. However, this increased reliance on traditional medicine system is on one hand due to economic circumstances and on the other hand due to the common perception on how effective these traditional therapies are. Even in communities where conventional healthcare systems are present, most people rather treat diseases using traditional means [27, 28, 29, 30].



**Fig. 4.** Disease Treatment by Respondents

### ***Medicinal Plant Resources***

A total of 12 plant species classified into 11 families were encountered in this study. Family Myrtaceae had the highest number of species (2) while all the other families had a single species representation (Table 2). Heinrich [31] reported that families of plant

used in traditional medicine are considered significant based on cultural perspective and their relationship with the effectiveness of the chemical constituents of species from these families; a combination of these factors influences and determines plant species selection by the locals for therapy [32]. *Annona senegalensis* had (20) number of citations (Fig. 4) and RFC of 57.1% (Table 2), this was followed *Olea europaea* with (18) number of citations and 51.4% RFC, and *Citrus limon* having (11) number of citations and 31.4% RFC. A critical analysis of the medicinal plant flora encountered and considering citation number per plant species, the respondents were observed to have used two species with only one citation (Fig. 5). A clear indication that some plant species are exclusively applied in the treatment of certain diseases, some are not popular among the locals while others can be perceived as been threatened or endangered in the community [1]. Linear regression analysis did not show significant correlation between the medicinal plants mentioned per family and the citations per family after an  $R^2$  value of 0.1% was recorded on analysis.

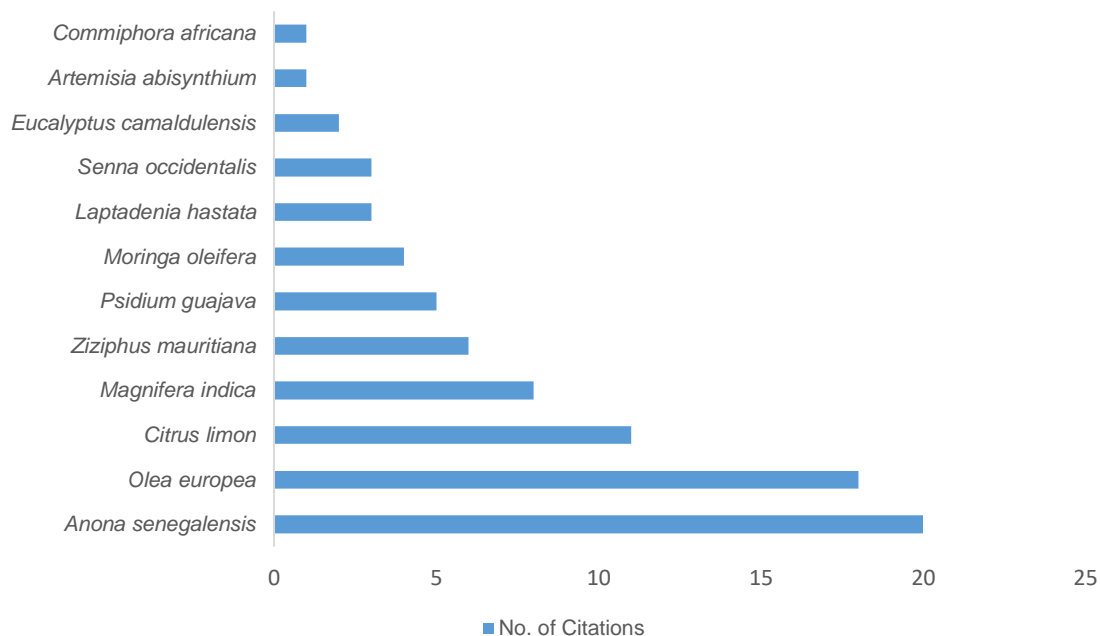
**Table 2.** Ethnobotanical Information of Medicinal Plants Used to Treat Typhoid

Plant species	Accession number	Local name	Plant Family	Plant form	Plant part	RFC (%)	FL (%)
<i>Annona senegalensis</i> Pers.	SLU2018JKH0005	Gwandar daji	Annonaceae	Shrub	Leaves	57.1	100
<i>Olea europaea</i> L.	SLU2018JKH0008	Zaitun	Oleaceae	Tree	Leaves	51.4	94.7
<i>Citrus aurantifolia</i> Burmn. F.	SLU2018JKH0006	Lemun tsami	Rutaceae	Tree	Leaves, Fruits	31.4	100
<i>Mangifera indica</i> L.	SLU2018JKH0001	Mangwaro	Anacardiaceae	Tree	Leaves	22.9	72.7
<i>Ziziphus mauritiana</i> Lam.	SLU2018JKH0007	Magarya	Rhamnaceae	Tree	Roots	17.1	85.7
<i>Psidium guajava</i> L.	SLU2018JKH0004	Goiba	Myrtaceae	Shrub	Leaves	14.3	62.5
<i>Moringa oleifera</i> Lam.	SLU2018JKH0003	Zogale	Moringaceae	Shrub	Leaves, Seeds	11.4	44.4
<i>Laptadenia hastata</i> Vatke	SLU2018JKH0010	Yadiya	Apocynaceae	Herb	Stem	8.6	42.8
<i>Senna occidentalis</i> L.	SLU2018JKH0002	Mazamfari	Fabaceae	Herb	Whole plant	8.6	9.6
<i>Eucalyptus camaldulensis</i> Dehnh.	SLU2018JKH0009	Bishiyar turare	Myrtaceae	Tree	Leaves, Seed	5.7	22.2
<i>Artemisia abyssinthium</i> Pers.	SLU2018JKH0012	Tazargade	Asteraceae	Herb	Leaves	2.9	100
<i>Commiphora africana</i> A. Rich	SLU2018JKH0011	Dashi	Burseraceae	Tree	Stem	2.9	8.3

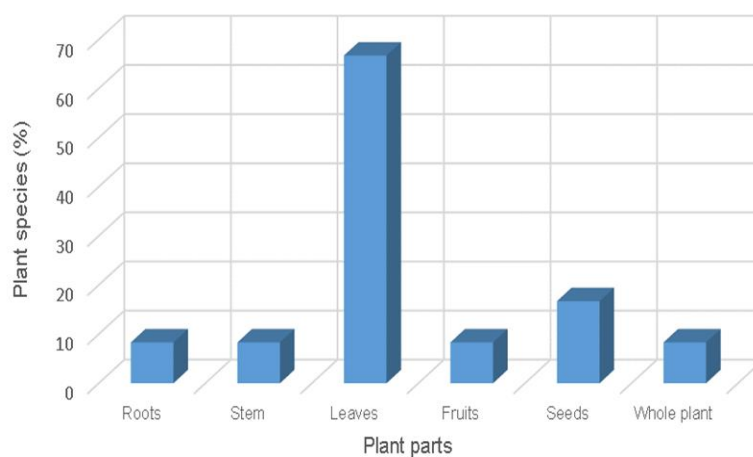
### Medicinal Plant Parts Used

Part of the plant most used was the leaves (66.7%) followed by the seeds and stem (16.7%) each (Fig. 6). This finding is similar to those of [32, 33]. Ayyanar and Ignacimuthu [34] reported that leaves are occasionally combined with different plant parts during herbal preparations. Various communities have been reported to show preference towards employing leaves in herbal preparations [34], this is attributed to convenience in the collection of leaves as compared to other plant parts [35]. Leaves are scientifically associated with photosynthesis and biosynthesis of secondary metabolites [36], thus, the array of bioactive constituents present in leaves may have accounted for their effectiveness in the management diseases either in animals or man [32]. From the perspective of conservation, collecting leaves for herbal preparations is considered sustainable on the condition that some leaves are left on the plant [37]. The most abundant

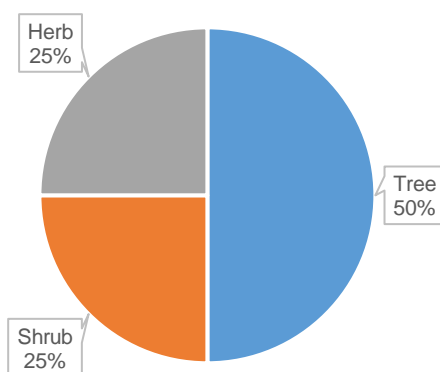
plant form (50%) was the tree followed by shrub and herb with 25% abundance each (Fig. 7). This can be attributed to this growth form's resistance to drought and seasonal variations making them available almost throughout the seasons [38].



**Fig. 5.** Number of Citations per Species of Medicinal Plants Used to Treat Typhoid



**Fig. 6.** Percentage of Plant Parts Used to Treat Typhoid in Kafin Hausa



**Fig. 7.** Plant Form Representation of Medicinal Plants Used to Treat Typhoid in Kafin Hausa

### **Relative Importance of Plants in Traditional Medicine**

Popular plant species with broad applications in traditional medicine have higher fidelity level unlike the unpopular ones. On another note, plant species used for the management of one disease possess 100% fidelity level compared to those used for the management of several diseases [30]. This could be said to be the case for *Annona senegalensis*, *Citrus limon* and *Artemisia abisynthium* (Table 2). Thus, these plants have the potential to serve as source of new compounds acting singly or in synergy for the treatment of typhoid. Observation and experimentation based on traditional knowledge has to be reliable in order for it to be credible [39]. The measure of reliability of any given claim in ethnobotanical study that is evidence based is determined by consensus analysis and its between 0 and 1. An agreement on the selection of plant species for the management of diseases between respondents is represented with a high ICF value, while disagreement among respondents is represented with a low ICF value [39]. In this study, an ICF of 0.86 was obtained, indicating agreement between the respondents on the utilization of plant species encountered for the treatment of typhoid. This result has shown that the use of plants for treating typhoid is in practice among the populace.

### **Medicinal Plant Uses: Supporting Literature Evidence and Additional Anecdotes**

#### ***Annona senegalensis***

Various parts of this plant were reportedly employed in treating yellow fever, tuberculosis, chicken pox, small pox [40, 41, 42], hernia, venomous bites, gastritis, infectious diseases [43, 44, 45, 46], malaria and diabetes [47, 48]. Mahwasane et al [25] reported the use of the leaves, bark and roots for treating stomach problems, infertility, improve sexual performance, fever, pain during pregnancy. Samie et al [49] reported cases where essential oils from the leaves of *A. senegalensis* are used for treating venereal diseases, diarrhea and dysentery. The roots are reportedly used for the treatment of herpes, zoster and cryptococcal meningitis [50].

#### ***Olea europaea***

Fruits and seeds of the plant have been reported to be used for the treatment of hypertension, tumor and as an appetizer [51]. Yemane et al [52] reports the use of the

stem for the treatment of dandruff and ringworm. The oil is reported to be used as an analgesic, wounds, burns and antihemorrhagic [53]. Hassan-Abdullahi et al [54] reports the use of the leaves for gonorrhoea treatment.

### ***Citrus aurentifolia***

Latifou et al [55] reports the application of the leaves from this plant in treating malaria.

### ***Magnifera indica***

The leaves are used in the treatment of bronchitis, diabetes and fever [52]. A decoction of the stem bark combined with *Psidium guajava* is used to treat diarrhoea while a decoction of the bark only is used to relieve toothache [56].

### ***Moringa oleifera***

Maroyi [11] reported the use of its leaves in the treatment of diarrhoea and tooth wash. The leaves, stem bark and seeds are reportedly used in the management of animal diarrhoea. Yemane et al [52] and Latifou et al [55] reported the application of its leaves in the treatment of anaemia, rheumatism and malaria.

### ***Psidium guajava***

Yemane et al [52] reported the use of the fruits in treating dysentery and digestion problem. Offiah et al [32] documented the use of its leaves in treating animal diarrhoea. The leaves are mixed with fruits of *Citrus limon* and leaves of *Eucalyptus sp* for the treatment of cough, flu and fever [11]. The fruits and leaves are reportedly employed for treating heart disease, malaria, diabetes, jaundice, colic and as an appetizer [51]. Poultice or decoction of the leaves is used as antibiotics for wounds, ulcers and toothache [57]. Poultice or decoction of the bark is used as astringent in the treatment of ulcer, wounds, diarrhoea, dysentery, skin ailments, also, it is used to expel the placenta after childbirth, vaginal haemorrhage and dehydration [58].

### ***Ziziphus mauritiana***

Leaf paste is reportedly used in the treatment of Ringworm and angina. Fresh or crushed leaves is used as an eye wash in cases of spitting snake, allergies and haemorrhage. The leaves and stem combined are used as laxatives, against sun burn, snake bites and eye infection. The bark is used to treat wounds [54]. Leaf of the plant is used for the treatment of diarrhoea, wounds, abscesses, swelling and gonorrhoea [59]. Young leaves are used to treat chicken pox, measles and rhinitis [60]. The leaf and bark are used for the treatment of AIDS, tuberculosis, high blood pressure [61, 62]. Shoot, leaf and bark are used to treat helminth parasite infection and leishmaniasis [63], while the fresh leaves are used to treat nervousness [64]. The fruits *Ziziphus jujuba* to which *Ziziphus mauritiana* is synonymous, is reportedly eaten raw and used to make jam. Decoction of the fruit is used for the treatment of tonsillitis [65].

### ***Artemisia absinthium***

Decoction of its capitulum is used in the treatment of diabetes and shortness of breath [65]. The herb is used to relieve pain in pregnant women during labour, for treating

leukaemia and sclerosis [66]. The leaf powder has application in gastric disorder and complications from intestinal worms, while the powdered seed is applied orally in treating rheumatism and its paste is applied as a pain reliever in toothache [67].

### ***Commiphora africana***

The root is reportedly used for convulsion, venereal diseases, spiritual ailments and jaundice [68, 69].

### ***Eucalyptus camaldulensis***

The leaves are reportedly used for the treatment of cough, as an antibiotic, insecticide [52], flu and fever [11].

### ***Senna occidentalis***

Root decoction of the plant is reportedly taken for constipation. Its leaves are used for treating eczema, other skin defects, small pox, measles [70], as snake repellent and for treating anthrax [71].

### ***Laptadenia hastata***

The leaves have been reportedly used against stomach upset in children [72], sexual potency, trypanosomiasis [73]. A decoction of the leaves combined with the bark of *Erythrina senegalensis* is taken orally or as medicinal bath to treat ochocercosis [74]. The root is used to treat scabies [75]. The latex has been reported to be used for skin disease and wound healing [73].

## **CONCLUSION**

This study documented plant species employed traditionally for treating typhoid disease, providing a perception on the traditional medicine knowledge and its practice by the people of Kafin Hausa. This study encountered medicinal plants that could be promising, with lots of prospects in the pharmaceutical industry.

Though all the medicinal plants encountered in this study have been indicated in the treatment of various diseases, only few were reportedly used as antibiotics and for the treatment of fever. Hence, the need to carry out pharmacological activities with emphasis on *Salmonella* sp, the causative agent of typhoid to establish these traditional claims. Furthermore, extensive phytochemical studies can be carried out with the aim of identifying active biomolecules that may be responsible for the treatment of typhoid. Also, this data can be used as a basis for the discovery of new drug(s) from plants with activity against other pathogenic microbes.

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