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Review

Medicinal plants for the treatment of malaria and typhoid diseases

Olusola, L. F.*, Baba, J. and Muhammad, I. L

Department of Microbiology, Ibrahim Badamasi Babangida University, Lapai, Nigeria.

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The review concentrated on current literature on medicinal plants for the treatment of malaria and typhoid related diseases, highlighting information about their ethnobotany. The entire plants reviewed showed strong activities, establishing their different traditional applications and capability to control or eliminate malaria and typhoid diseases. Malaria and typhoid diseases are the most problematic public health challenge in Nigeria. Records have showed that annually, about 50% of the population suffers from at least one episode of malaria and typhoid diseases. The expenditure for malaria treatment creates high economic burden to households and health care system. The present review confirms application of forty-two (42) medicinal plants for the treatment of Malaria and typhoid related diseases. The zone of inhibition of the plants extract ranges from 5.4 to 35.0 mm and *Anacardium occidentale L.* (Cashew) was found to have the highest zone of inhibition. Among the plant parts in use, leaves had the highest percentage of utilization, followed by Shoot, Rhizome, Bulb and Tuber. The rate of utilization of medicinal plants around the world for the treatment of malaria and typhoid diseases is growing daily. Therefore, the need for further scientific research to analyze and extract the bioactive compounds in these plants in order to develop effective, reliable and affordable drugs that will help in the treatment of malaria and typhoid related diseases are strongly recommended.

Key words: Ethnobotany, documentation, malaria, medicinal, plant treatment, typhoid.

INTRODUCTION

Gastrointestinal tract is a reservoir for several antibiotic-resistant pathogens capable of causing diseases through different mechanisms. Some pathogens and parasites present in the environment and intestinal tracts of animals and humans are causal agent of infection (Ivarsen et al., 2014; Wei et al., 2017).

Malaria and typhoid are among the most common infectious parasitic and pathogenic diseases respectively. They are leading cause of death that frequently affects people, especially in developing countries (Fischer and Bialek, 2002).

Studies have shown that children and pregnant women in developing countries, including Nigeria die majorly from Malaria and Typhoid diseases (Mesike and Majekwu, 2012; Fatoba et al, 2018). This occurrence, prevalence and incidence have been on the increase in recent times. Malaria and Typhoid are endemic in more than 100 developing countries, with about 1.2 million estimated

*Corresponding author. E-mail: Lucyemma366@gmail.com. Tel: +2348131593008.

deaths record each year in Africa (WHO, 2015). Pregnant women and children below 5 years old have been recorded as the major victim (Tabuti, 2008).

The prevalence of pathogenic bacterial cases has been increasing annually in both healthcare and community settings **(**Buonomo and Petri, 2016). Frequent incidence and harshness of these bacterial infections has caused severe economic burden in healthcare systems owing to the associated cost of treatment, and prolonged admission of patients in hospital (Elliott et al., 2016). This challenge necessitated the search for alternative sustainable, reliable and potent medicine.

History has revealed that the utilization of herbs as medicine is the oldest form of healthcare to humanity, and it is utilized in all culture (Barnes et al., 2007). The connection between plants and human health has existed for over thousand years (Faleyimu and Oluwalana, 2008). Medicinal plants remain an important resource of effective means of treatment for a greater number of people suffering from Malaria and Typhoid diseases (Roger et al., 2013). Plants are very essential source of conventional medicines utilized against various diseases (Mintah et al., 2019). Traditional medicine involves the effective utilization of therapeutic plants substances and their active substances based on socio-cultural practices which are handed down from generation to generation in order to correctly diagnose, prevent and eliminate health challenges (Gupter and Paulsen, 2000).

The development of multidrug resistance micro-organisms to conventional antimicrobial agents are challenging clinical microbiologists worldwide (Agholor et al., 2018). Consequently, efforts of the present work to review documentation of medicinal plants for the treatment of malaria and typhoid diseases for necessary analytical evaluation to further establish their applications are justified.

CAUSES OF MALARIA DISEASES

Malaria is an infectious disease caused by the parasite, Plasmodium species, among which, *Plasmodium falciparum* is the leading cause among the other species (vivax, malariae, ovale and knowlesi) especially in Nigeria and other sub- Saharan Africa, where the infection is endemic. It is the most virulent, dominant, prevalent malaria strain. Malaria is spread from one person to another through the bites of an infected female Anopheles mosquito. The disease is spreads when the infected mosquito bites an uninfected individual when taking a blood meal (Agholor et al., 2019). About 220 million people worldwide are infected with malaria annually and these cases occur majorly in Africa and South Asia (Fatoba et al., 2018). Although malaria can infect anyone, but people in Africa have higher risk of infection. The mortality rate of the infection is higher in young children, aged people and pregnant women (Agholor et al., 2019). Around 450,000 of individuals die from the disease every year as a result of the proliferation and development of the matured form of the parasite (trophozoite and schizont) in the erythrocytes of human blood (Mesike and Majekwu, 2012; Fatoba et al., 2018).

Malaria presents symptoms such as chills, fever, sweating, headache, muscle aches and fatigue. Others include chest pain, breathing problems and cough, diarrhoea, nausea and vomiting (Fischer and Bialek, 2002; WHO, 2015). The control of malaria is becoming challenging due to development of resistance to the commercially available antimalarial drugs (Okosodo and Sarada, 2021).

CAUSES OF TYPHOID DISEASES

Typhoid is an infectious disease caused by *Salmonella* species*,* a typhoid bacillus. The bacterium can be spread through faecally contaminated food and water. An individual can become infected when water or food contaminated with faecal matter is consumed or used for washing fruit and vegetables. The bacterium is usually found in the intestines and bloodstream of humans. The disease spreads from an infected individual to a healthy person through direct or indirect contact with faeces of the infected person. Globally, about 21.5 million people contract typhoid annually. If typhoid is caught early, it can successfully be treated with antibiotics but if it is not treated, typhoid can be fatal (Bokoe et al., 2017). Typhoid disease is a systemic infection; the bacterium can spread and colonizes the liver, spleen, and bone marrow in addition to the small intestine and mesenteric lymph nodes. It causes intestinal inflammation with predominantly mononuclear infiltrates. The causal bacterium can stay persist in human tissue for long period of time.

Symptoms of typhoid infection include abdominal pain, weakness of the body, constipation, fever and headaches. Other symptoms might include diarrhoea and un-severe vomiting. In serious, untreated cases, the bowel can become perforated (Roger et al., 2013; WHO, 2015).

SOCIO-ECONOMIC EFFECT OF MALARIA AND TYPHOID DISEASES ON NIGERIA POPULACE

Malaria and typhoid have high socio-economic impact in Africa. About $12 billion cost is incurred yearly. This cost includes health care services and facilities, days lost and absenteeism in education and work place, decreased productivity due to brain damage from people infected with cerebral malaria and loss of investment and tourism. Nearly half the world's population are at risk of transmission and in 2020, malaria caused an estimated 241 million clinical episodes, and 627,000 deaths (WHO, 2020).

Malaria and typhoid diseases are the most problematic

Figure 1. *Carica papaya* (pawpaw).
Source: (Peter et al., 2014).

public health challenge in Nigeria. They are responsible for about 30% of deaths in under-fives and 25% of deaths in infants and 11% maternal mortality (Federal Ministry of Health Nigeria, 2006; Onwujekwe et al., 2013). Available records show that annually, about 50% of the population suffers from at least one episode of malaria and typhoid diseases while children under 5 have an average of 2 to 4 attacks of malaria (Adedotun et al., 2010). Indeed, malaria and typhoid diseases constitute a heavy burden on Nigeria's families, communities, health system, and workforce (WHO, 2009).

Treatment of malaria cases alone contributes about 2.91% of the total monthly curative healthcare costs incurred by households (Onwujekwe et al., 2000). The house-hold expenditures on malaria can be on preventive and treatment cost. The household direct cost of treatment includes payment for consultation, drugs, laboratory tests and transportation. While the indirect cost is the productive time lost due to malaria. Expenditure on treatment of malaria constitutes a high economic burden to households and to the health system (Asenso-Okyere and Dzatorb, 1997; Onwujekwe et al., 2013).

REVIEW OF SOME DOCUMENTED MEDICINAL PLANTS FOR THE TREATMENT OF MALARIA AND TYPHOID RELATED DISEASES

A wide spectrum of medicinal plants has been considered as reliable sources for natural antimicrobial compounds (Arora et al., 2013; Ghazali, 2016). Effective phytochemicals in plants, particularly fruits, roots and leaves have been connected with wide spectrum of health benefits, usually utilized as ingredients in several pharmaceutical preparations today (Lachance and Das, 2007).

Working on medicinal plants for the treatment of malaria and typhoid diseases in Minna, Niger State, Halimat et al. (2017) reported that *Mangifera indica, Alstonia boonel, Ananas comosus, Carica papaya* (Figure 1)*, Ocimum gratissimum, azadirachta indica* (Figure 2)*, Psidium guajava, Sarcocephalus latifolius, Citrus aurantifolia, Citrus paradise, and Zingiber officinale* showed appreciable result. The ethnobotanicals survey of forty-five (45) plants consisting of thirty-three (33) families of different plants used for the control of diseases in infant in south Western Nigeria also supported the potential of these plants in the treatment of infant diseases (Fatoba et al., 2018). The medicinal values of the plants lie in their phytochemicals, which produce definite physiological actions on the human body (Agholor et al., 2018). It was also observed that various plants parts such as stem, bark, fruits, leaves, bulb, seeds and flower were collected as recipes (Fatoba et al., 2018). Some recipes for the treatment of Malaria and typhoid in Infant are shown in Table 1.

Odugbemi et al. (2007) reported that many plants parts are used as malaria therapy in southwest Nigeria. These parts includes barks, roots, leaves or whole plants which could be used singly or in combination with different parts or plant species. The study highlights the possibility of development of new antimalarial drugs from indigenous

Figure 2. *Azadirachta indica* (Neem Tree).
Source: (Maragathavalli et al., 2012).

Table 1. Some recipes for the treatment of malaria in Infant.

S/No.	Recipes	Mode of administration and dosage
1.	Decoction of *Alstonia* and *Carica papaya* leave	5 ml taken orally thrice daily
2.	Extract of *Morinda lucida* leaves	5 ml taken orally thrice daily
3.	Lemon grass, lime, grape, unripe, pawpaw, unripe pineapple and garlic are boiled in water for 15 minutes	10 ml taken orally thrice daily

Source: (Fatoba et al., 2018).

plants in Nigeria. The plants utilized in the treatment of malaria disease from their study, also agreed with the reported ethnobotanicals employed for infant disease treatment. Likewise, Ebigwai et al. (2012) in their study reported that *Citrus paradisi* indicated positive effect when screened against microfilarial larva of *Simulium yahense In-vitro* anti-microbial screening of *Kalanchoe crenat*. extract was equally carried out by (Aibinu et al., 2007) and the result showed that the plant could be effective for the treatment of typhoid.

Zachariah et al. (2012) also made e*ffort to investigate the* In-vitro antibacterial activity of the extract of *Mirabilis Jalapa* and phyto-constituents such as flavonoids and triterpenes were reported to be present in the aerial parts of the plant while carbohydrates, resin and alkaloids were reported to be present in the roots. Mintah et al. (2019) reported that the fraction F-1 of the root of *A. nilotica* that was rich in alkaloids and phenolics has significant antimalarial activity.

The anti-anaemic activity of *Mangifera indica, Terminalia catappa, Sorghum bicolor, Perquatina nigrescens,* and *Theobroma cacao* was also successfully investigated by Gbadamosi et al. (2012), showing that leaves contains significantly high phytochemicals with valuable antioxidant property. The antimicrobial activity of neem leaf (*Azadirachta indica*) extract against human pathogenic bacteria was also investigated and the result show that these plant could be used as an alternative for typhoid and malaria therapy (Maragathavalli et al. 2012).

Gbadamosi and Obogo (2013) reported the phytochemical composition, nutritional composition and screening of *Alstonia boonei, Gossypium barbadense* and *Vernonia amygdalina* (Figure 4) for the treatment of aliment. The phytochemical components of the plants and the antimicrobial properties, justified their therapeutic values in the management of disease.

The studying of the medicinal plants used against typhoid fever in Bamboutos Division, Western Cameroon

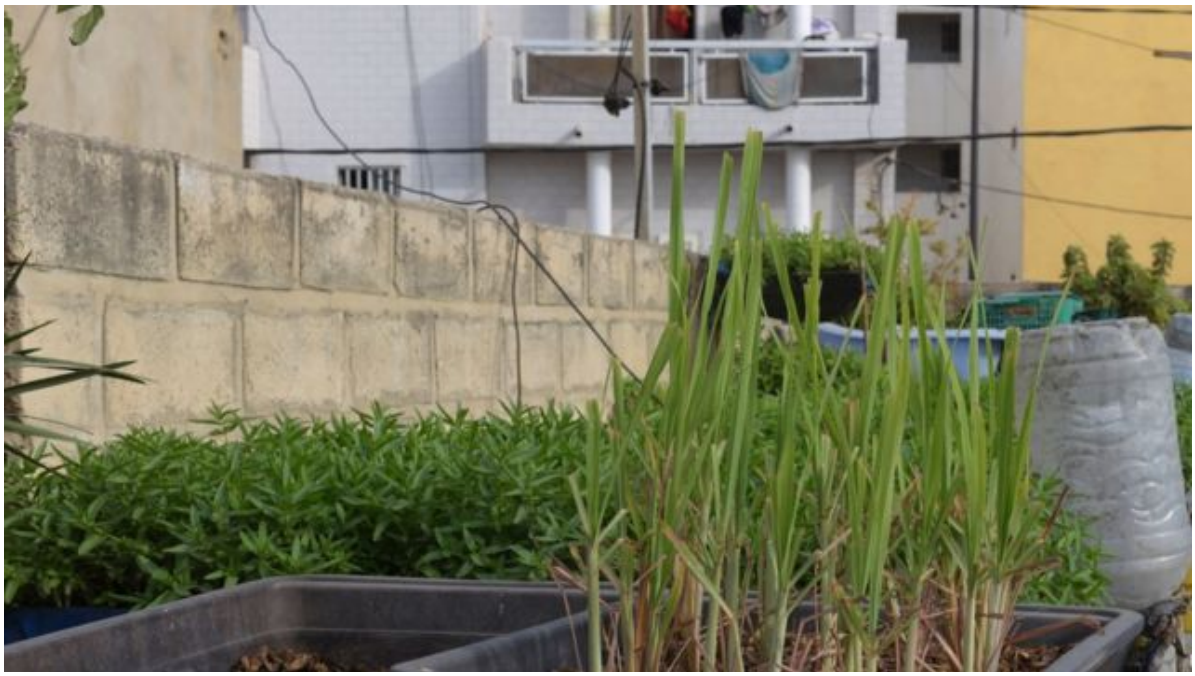

Figure 3. *Cymbopogon citrate* (Lemon Grass).
Source: (Akash *et al*., 2015)

Figure 4. *Vernonia amygdalina* (Bitter leaf).
Source: (Aliyu *et al*., 2020)

by Roger et al. (2013), who carried out ethnobotanical survey to document the various medicinal plants used traditionally by traditional healers and elders to treat typhoid fever, revealed that 59 different medicinal plant species belonging 33 families were being used. The most frequently utilized families documented were

Figure 5. *Annona sanegalensis* Leaf and seed.
Source: (Fatoba et al., 2018)

Bignoniaceae, *Fabaceae* (7%) and *Asteraceae* (17%); *Moraceae and Malvaceae* (5.0% each). The commonly used plant parts for medicine were the leaves (48.6%), and then bark of the stem (28.9%), whole stem (7.8%), roots (5.2%), and fruits (2.6%). The study also revealed that shrubs (35.5%) were the major source of medicine in use compared to herbs (32.2%) and trees (30.5%). However, decoction was the widely used method of the medicine preparation. Oral administration was the only mode of administration of herbal medicine and most of the plants were utilized in combination with other plants to enhance their efficacy.

Akash et al. (2015) worked on the documentation of ethnomedicinal and ethnographic profile of plants used against gastrointestinal complaints in five selected remote regions of Pakistan and selection of potential medicinal plants for further *in-vitro* and *in-vivo* investigation using semi-structured questionnaire. Thestudy showed the application of fifty-two (52) medicinal plants used for the treatment of gastrointestinal infections in the region. *Apiaceae* was found to be the major dominant plant family that is effective for typhoid and malarial fever. Among the plant parts used, fruit (24%) and leaves (23%) were the utmost utilized parts for treatment of infection.

Fatoba et al. (2018) also documented forty-five (45) different plants belonging to thirty-three (33) families and their medicinal use in the treatment of infant and communal diseases such as malaria, cholera, pneumonia, tuberculosis and asthma. The information about the various recipes was documented including their method of preparation, used parts, administration and the dosage. Mintah et al. (2019) found that all the plants reviewed revealed potent activity, confirming their different traditional applications and their capability to treat malaria and other prevalent diseases.

An ethnobotanical survey carried out by Aliyu et al. (2020), to ascertain some medicinal plants utilized for the treatment of typhoid fever in Kaduna metropolis, Nigeria. A check-list of pharmacognostic activity of most commonly used plant was created. The results of the survey revealed that forty (40) plants of different species comprising twenty-nine (29) different families were utilized for treatment of typhoid fever. From the study, the regularly applied species of plants include *Balanites aegyptiaca, Alchornea cordifolia, Blighias apida, Cymbopogon citrate* (Figure 3) *Gardenia aqualla, Annona sagegalensis* (Figure 5), *Datarium microcarpum, Madagaceriensi* (Figure 6), *Grewia mollis, Morinda lucida, Lawsonia inermis, Khaya senegalensis* (Figure 7), *Nanclei latifolia, Plumeria rubra, Cinnamomum zeyianiam* (Figure 8), *Ocimum gratissimum* and *Mangifera indica*.

The leaves and stem of these plants were established as the most important parts utilized for herbal preparation and the decoction were orally administered (Aliyu et al., 2020).

MEDICINAL PLANTS WHICH DEMONSTRATED ANTI-MALARIA AND ANTI-TYPHOID RELATED DISEASES

Some of the notable medicinal plants for treatment of

Figure 6. *Madagascariensi* tree.
Source: Halimat et al., 2017

Figure 7. *Khaya senegalensis* Tree.
Source: Aliyu et al., 2020

malaria and typhoid diseases are summarized in Tables 2 and Table 3 respectively as shown. Table 3 is the documentation of the profile of medicinal plants and zone of inhibition of the extracts of the parts frequently utilized in the treatment of typhoid diseases. The table showed that the zone of inhibition of the plants extract ranges from 5.4 mm to 35 mm. *Anacardium* 20.59%, fruits 11.77%, and roots 8.82%, while flower and seeds were

Figure 8. *Cinnamomum zeyianiam* Tree.
Source: Akash et al., 2015

Table 2. Review of medicinal plants utilized for treatment Malaria diseases, the local names and the plant part.

S/N	Botanical names	Common name	Local names	Family	Plant parts used	References/Sources
1.	*Mangifera indica L.*	Mango tree	Mangoro(Y) (N	Anacardiaceae	Leaves, Barks	Okwu and Ezenagu, 2008; Kamble et al.,2016; Parvez, 2016
2.	*Sorghum bicolor (L.)*	Guinea corn	Oka baba (Y) Dawa (H)	Poaceae	Shoot, Leaves	Faleyimu and Oluwalana, 2008; Okosodo et al., 2021
3.	*Azadirachta indica*	Neem	Dogo yaro (Y)	Meliaceae	Leave, Barks	Maragathavalli et al., 2012; Mathew et al., 2017; Fatoba et al., 2018
4.	*Annona sanegalensis*	Wild custard apple	Gwandaaji (H)	Annonaceae	Leaves, bark, fruits	Oluduro and Omoboye, 2010; Fatoba et al.,2018
5.	*Citrus medica*	Lime	Leme magaajiyaa (H)	Rutaceae	Leaves, fruits, roots	Fatoba et al., 2018; Aliyu et al., 2020
6.	*Musa paradisiaca*	Plantain	Ogede agbagba(Y) Ayaba (H)	Musaceae	Fruits, Flowers	Faleyimu and Oluwalana, 2008; Aliyu et al., 2020

Table 2. Contd.

7.	*Alstonia boonei*	Alstonia, pattern wood	Egbu (I), Awun (Y)	Apocynaceae	leaves and bark	Wang et al., 2016;Halimat et al., 2017; Aliyu et al., 2020
8.	*Bridelia ferruginea*	Benth	Ola (I), Iralodan (Y)	Euphorbiaceae	Leaves, bark, roots	Okwu and Ezenagu, 2008; Kamble et al., 2016;
9.	*Anacardium occidentale*	Cashew	Kaju (Y), kanju (H), Okpokpo (I)	Anacardiaceae	leaves and bark	Oluduro and Omoboye, 2010; Fatoba et al., 2018
10.	*Cymbopogon citrata (DC.) Strapt.*	Lemon grass	Kooko oba (Y)	Poaceae	Leaves	Akash et al., 2015; Okosodo and Sarada, 2021
11.	*Carica papaya L.*	Pawpaw	Ibepe (Y), Konkeni (N)	Caricaceae	Leaves	Peter et al., 2014; Mintah et al.,2019
12.	*Citrus paradisi macfad*	Grape fruit	Osan gerepu (Y)	Rutaceae	Fruits	Oluduro and Omoboye, 2010; Fatoba et al., 2018

H= Hausa; Y= Yoruba; N=Nupe; I=Igbo*.

Table 3. Review of medicinal plants utilized for treatment typhoid diseases, plant part and their average zone of inhibition.

S/N	Botanical names	Common name	Local names	Family	Plant parts used	Zone of Inhibition	References/Sources
1	*Anacardium ccidentale L.*	Cashew	Kaju (Y) Kashiwu (N)	Anacardiaceae	Leaves	20-35mm	Roger et al., *2013;* Okosodo and Sarada , 2021;
2	*Ananas comosus (L.) Merr*	Pineapple	Ope Oyinbo (Y), Abaruba (N)	Bromeliaceae	Fruits	22.67±0.88mm	Oluduro and Omoboye, 2010
3	*Carica papaya L.*	Pawpaw	Ibepe (Y), Konkeni (N)	Caricaceae	Leaves	8.8mm	Peter et al., 2014; Mintah et al., 2019
4	*Citrus paradisi macfad*	Grape fruit	Osan gerepu (Y)	Rutaceae	Fruits	22mm	Oluduro and Omoboye, 2010; Fatoba et al., *2018*
5	*Cymbopogon citrata (DC.) Strapt.*	Lemon grass	Kooko oba (Y)	Poaceae	Leaves	20±0.5mm	Akash et al., 2015; Okosodo and Sarada, 2021
6	*Daniella oliverii (Rolfe)*	Balsam tree	Iya (Y)	Caesalpinaceae	Leaves	25mm	Rani and Khular, 2004; Bekoe et al., 2017
7	*Gossypium barbandense L.*	Cotton	Owu (Y)	Malvaceae	Leaves	18mm	Koffuor et al., 2016
8	*Morinda lucida Benth*	Brime stone tree	Oruwo (Y) Shuwaka (H)	Rubiaceae	Leaves	8mm	Husnan and Alkahtani, 2016, Fatoba et al., 2018
9	*Psidium guajava L.*	Guava	Guofa (Y)	Myrtaceae	Leaves	25mm	Bisi-Johnson et al., 2017; Diaz-de-Cerio et al., 2017
10	*Vernonia amygdalina*	Bitter leaf	Ewuro (Y)	Asteraceae	Leaves stem	NM	Aliyu et al., 2020
11	*Zingiber officinalis Roscoe*	Ginger	Atale (Y), Jinga, (I), Chita (H)	Zingiberaceae	Rhizomes	5.4mm	Olufunke, 2011
12	*Azadirachta indica*	Neem	Dogo yaro (Y)	Meliaceae	Leave, Barks	20-25mm	Maragathavalli et al., 2012; Mathew et al., 2017; Fatoba et al., 2018
13	*Ananas comosus*	pineapple	Abarba (H)	Bromeliaceae	Unripe fruit	18-28mm	Aliyu et al., 2020
14	*Pseudocedrella kotschyi*	Dry-zone cedar	Tuunas (H)	Rubiacea	Leaves, barks	12-15mm	Aliyu et al., 2020
15	*Trema orientalis*	Charcoal tree	Ajerana(H)	Ulmaceae	Leaves, barks	≥ 20mm	Koffuor et al., 2016; Aliyu et al., 2020
15	*Citrus aurantifolia*	Lime	Lemu (H) (Y)	Rutaceae	Leaves, Fruits, roots	21mm	Aibinu et al., 2007; Bisi-Johnson et al., 2017; Aliyu et al., 2020

Table 3. Contd.

17	*Citrus medica*	Lime	Leme magaajiyaa (H)	Rutaceae	Leaves, fruits, roots	18mm	Fatoba et al., 2018; Aliyu et al., 2020
18	*Musa paradisiaca*	Plantain	Ogede agbagba(Y) Ayaba (H)	Musaceae	Fruits, Flowers	≥14mm	Faleyimu and Oluwalana, 2008; Aliyu et al., 2020
19	*Musa sapientum*	Banana	Ogede wewe (Y) Ayaba (H)	Asteraceae	Leaves, Flowers	14.5mm	Aliyu et al., 2020
20	*Allium sativum*	Garlic onion	Tafarnuwa	Liliaceae	Bulb	15-20mm	Durairaj et al., 2009; Maragathavalli et al., 2012; Mathew et al., 2017;Aliyu et al., 2020,
21	*Alchornea cordifolia*	Christmas bush	Bambami (H), Ipa, esinsin (Y)	Euphorbiaceae	Leaves	15mm	Okosodo and Sarada, 2021;Aliyu et al., 2020
22	*Acanthospermus hispidum*	Stuaburr, goathead	Dangunro-gogoro (Y) kashinyaawo (H)	Asteraceae	Leaves	12mm	Roger et al.,2013; Aliyu et al., 2020
23	*Albizia ferruginea*	Albizia	Ayinre-ogo(Y), Ngu (I)	Leguminosae	leaves and bark	16mm	Oluduro and Omoboye, 2010; Dike-Ndudim et al., 2016
24	*Ceasalpinia bonduc*	Physic nut, Bonduc nut	Ayoo (Y)	Leguminosae	Leaves, seed, root	17mm	Peter et al., 2014; Mintah et al.,2019
25	*Anacardium occidentale*	Cashew	Kaju (Y), kanju (H), Okpokpo (I)	Anacardiaceae	leaves and bark	13-16mm	Oluduro and Omoboye, 2010; Fatoba et al.,2018
26	*Anthocleista djalonensis*	Cabbage	Sapo (Y), Akpakoro (I), Putaa (H)	Gentiaceae	Barks	10mm	Roger et al.,2013; Aliyu et al., 2020
27	*Aspilia Africana*	Wild sunflower	Yunyun (Y), Orangila (I), Tozalin (H)	Asteraceae	Leaves	11mm	Wang et al., 2016;Halimat et al., 2017; Aliyu et al., 2020
28	*Bauhinia simplicifolia*	Mountain ebony	Eku (Y)	Fabaceae	Leaves, fruits	14mm	Oluduro and Omoboye, 2010; Dike-Ndudim et al., 2016
29	*Bridelia ferruginea*	Benth	Ola (I), Iralodan (Y)	Euphorbiaceae	Leaves, bark, roots	16mm	Okwu and Ezenagu, 2008; Kambe et al.,2016;
30	*Curcuma longa*	Turmeric	Atale pupa (Y), Gangamau (H), Turi (N), Boboch (I)	Zingiberaceae	Tubers, roots	13mm	Oluduro and Omoboye, 2010; Dike-Ndudim et al., 2016
31	*Diospyros mespiliformis*	Ebony	Kanya (H), Igi dudu (Y), Akawayi (I)	Ebeneceae	Leaves	16mm	Oluduro and Omoboye, 2010; Fatoba et al.,2018
32	*Gongronema latifolia*	Gongronema	Arokeke(Y), Utazi (I)	Asclepiadaceae	Leaves, barks	17mm	Roger et al.,2013; Aliyu et al., 2020
33	*Haematostaphis barteri Harungana*	Blood plum	Jan danya (H)	Anacardiaceae	Leaves, barks	20mm	Halimat et al., 2017; Aliyu et al., 2020
34	*Moringa oleifera*	Moringa or Horseradish Tree	Zogale(H)	Moringaceae	Leaves	8mm	Dzotam et al.,2015; Dike-Ndudim et al., 2016; Wang et al., 2016; Aliyu et al., 2020
35	*Heliotropicum indicum*	Cock's comb	Agogo Igun (Y)	Boraginaceae	Leaves, barks	21mm	Roger et al.,2013; Aliyu et al., 2020
36	*Leucas martinicensis*	Whitewort	Kan barawo (H)	Lamiaceae	Leaves, barks	10mm	Halimat et al., 2017; Aliyu et al., 2020
37	*Lophira alata*	Red iron wood or Naim Tree	Ekki (Y), Okopia (I)	Ochnaceae	Roots	19.2mm	Nandagopal and Kumari, 2007; Roger et al.,2013; Aliyu et al., 2020
38	*Monadora myristica*	Calabash Nutmeg	Ariwo (Y), Ehuru ofia (I), Gujiya dan miya (H)	Annonaceae	Leaves, Seeds	14mm	Olufunke, 2011; Roger et al.,2013; Aliyu et al., 2020

H= Hausa; Y= Yoruba; N=Nupe; I=Igbo*.

2.94% each and shoot, rhizome, bulb and tuber percentage of utilization were found to be 1.47% each.

CONCLUSION

The study established that all the Medicinal plants documented exhibited potent activity confirming their various traditional uses and their ability to treat various diseases. Hence, the rate of utilization of medicinal plants around the world for the treatment of malaria and typhoid diseases is growing daily.

Therefore, there is need to carry out further studies on these plants by extracting the bioactive compounds in these plants that could be processed into potent or new medicines in order to develop effective and affordable drugs that will help in the treatment of malaria and typhoid related diseases.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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