ABSTRACT

Context and objectives: West Africa has a very rich ethnozoological heritage due to its rich biodiversity, history and culture. Due to its location in a biodiversity hotspot, its agro-pastoralist traditions and its role during the maritime discoveries of the Renaissance, West Africa has a long list of animals and animal parts that have been used in its folk medicine. These uses can still be found in many historical documents and pharmacopeias. *Bridelia ferruginea, Combretum glutinosum* and *Mitragyna inermis* are tropical and subtropical medicinal plants widely used in general traditional African medicine and in West Africa in particularly, including Benin, Nigeria, Burkina Faso and Ivory Coast to treat many diseases such as bladder troubles, diabetes, dysentery, arterial hypertension, rheumatism pain. This study aims to do a literature review of these three tropical plants on their biological and pharmacological properties on veterinary medicine.

Methodology and Results: A thorough literature search was done and plants little studied *Bridelia ferruginea, Mitragyna inermis* and *Combretum glutinosum* were chosen in the search for their anthelmintic activity against gastrointestinal parasitic nematodes of small ruminants in Djallonké. Also to confirm their use in traditional veterinary medicine in West Africa.

Conclusion and application of results: This literature review of their extracts properties showed that the plants possessed wide-reaching pharmacological actions, including anti-diabetic, cardiovascular disease antibacterial, anti-inflammatory, antispasmodic and antiplasmodial and justifies their use in traditional medicine for treating various diseases. This manuscript intends to be a starting point to these future investigations.

Key words: *Bridelia ferruginea, Combretum glutinosum, Mitragyna inermis*, anthelmintic, Traditional folk medicine, Pharmacological action.
INTRODUCTION
Medicinal plants are used in the whole world and have a growing economic importance (Agra et al., 2007). The use of plant parts to treat human or animal disease is as old as the disease itself and herbal medicine was the major form of medicine in West Africa especially in Benin. Besides, 80% of developing countries population depends on traditional medicines for their primary health care and 25% of the drugs are based on plants and their derivatives (Azu & Onyeagba, 2007). In Benin, medicinal plant knowledge and exploitation remain a permanent priority. Benin medicinal flora is rich and medicinal plant knowledge nowadays has a great development. Bridelia ferruginea, Combretum glutinosum and Mitragyna inermis belong to this flora (Akoègninou et al., 2006) and are well known in many African countries. They appear to be the most studied species regarding their traditional uses and for their pharmacological properties (Ngueyem et al., 2009; Gong et al., 2012). According to ethno-veterinary surveys in Benin as in other African countries, these three plants are used as anthelmintics in traditional human and veterinary medicine (Kabore et al., 2007, Kone et al., 2008; Djoueche et al., 2011). Validation of plants’ uses in traditional medicine is not only involved in ethnobotanical studies (Adjanohoun et al., 1999), but also by evaluation of biological and chemical properties (Hounzangbé - Adoté, 2000; Lagnika, 2005). The fact that few plants from the Beninese pharmacopoeia were subject of clinical investigation; it was decided to study anthelmintic properties of these three plants against gastro-intestinal parasites on small ruminants. Because in the whole world, the strongyles are recognized as one of the first causes of production losses (Gbangboché et al, 2005). The treatment of these parasites and other diseases is done using synthetic molecules. While the exclusive use of synthetic drugs in health many obstacles currently limit prophylaxis. First, some parasites have developed resistance to anthelmintics such as benzimidazoles, Levamisole, and even now to ivermectin because of too frequent use (Brunet, 2008). Moreover, routine deworming regress youngs’ immunity development (Brunet, 2008). In additional, manufactured drugs are unavailable and more expensive to rural population and when they are effective, these drugs are harmful to environment because of their remanence. This manuscript comprises the first study entirely devoted to a review of all uses of zootherapeutic remedies in West Africa, using historical documents, already published sources and original data from field surveys. We will also highlight some possible conservation problems that those uses might cause for some species of Bridelia ferruginea, Combretum glutinosum and Mitragyna inermis plants.

OBJECTIVES
This study examined native anthelmintic activity against gastro-intestinal parasitic nematode of small ruminants Djallonké (West African Dwarf Sheep) plants of Bridelia ferruginea, Combretum glutinosum and Mitragyna inermis and confirms their uses in traditional veterinary medicine.

METHODOLOGY AND RESULTS
Botany description
Botany of Bridelia ferruginea (figure 1): The genus Bridelia Willd consists of about approximately 60–70 species including B. atroviolida, B. cathartica, B. ferruginea, B. micrantha, B. ovate, B. siamensis, B. tomentosa, B. tulasneama. All are native to Africa, Asia and Australia (Rashid, 2000). B. ferruginea and B. micrantha appear to have been the most studied. B. ferruginea is a small non-laticiferous scaly tree or shrub that grows to about 4 meters high. The plant often bears spines and may be slash crimson coloured. The leaves may be small to medium sized, simple, alternate, spiral or distichous, broadly elliptic and pubescent. They are also pinnately veined with entire margin and an acuminate or acute apex (GHP, 1992).
Botany of Bridelia ferruginea (figure 1): Leaves and fruits of Bridelia ferruginea (Alissou, 2013)

Botany of Combretaceae glutinosum (figure 2): The family Combretaceae is distributed in approximately 20 genus with 600 species. The largest genus is Combretum and Terminalia (Pietrovski et al., 2006). Combretum is a very large genus, comprising about 250 species and distributed worldwide in the tropics and subtropics. About 140 species occur in tropical Africa including Combretum glutinosum. It is a bushy shrub or small tree growing up to 12 m and a deciduous species sprouting in the middle of the dry season. The trunk is usually twisted and low branched, with a rounded, open crown. The lower branches characteristically point downwards. The bark is grey-black and may be smooth or rough with fissures on the upper surface and red to orange slash. The leaves are opposite, verticillate in threes or sometimes subopposite; they are very variable in shape and size, even on the same tree.

Botany of Mitragyna inermis (figure 3): The genus Mitragyna belongs to Rubiaceae family and is found in swampland territory in the tropical and subtropical regions of Asia and Africa. There is six species: M. speciosa (Korth.), M. tubulosa (Arn.), M. parvifolia (Roxb, Korth), M. hirsuta (Havi1), M. diversifolia (Wall. ex G. Don) and M. rotundifolia (Roxb., O.Kuntze.), widely grow in India and Asia (Puff et al., 2005). Other four species, M. ciliate, M. inermis, M. stipulosa and M. africanus, widely grow in west African. Mitragyna inermis falls under the Rubiaceae family, and is a medium-to-tall deciduous shrub, growing to around 10 m in height with a trunk of wide diameter and light-colored bark. The leaves are light green and opposite and oval-shaped with a short blunt point, around 6 to 9 cm in length. The young leaves and twigs are red in colour. The tree blooms from May to September into small, fragrant white flowers, in round heads of up to 2 cm in diameter on short stalks. The tree bears fruits year-round that are hard, woody and spherical clusters of capsules. Mitragyna inermis is most traditional (ethnomedicinal) uses (Gong et al., 2012).

Figure 2: Leaves of Combretum glutinosum (Alissou, 2013)

Figure 3: Leaves and fruits of Mitragyna inermis (Alissou, 2013)
Phytochemical studies carried out in Bridelia ferruginea, Combretum glutinosum and Mitragyna inermis have showed the presence of many classes of secondary metabolites, including quinones, catechic and gallic tannins, alkaloids, sterols, polyterpenes, polyphenols, reducing compounds, flavonoids, saponins, phenols and tannins (Akuodor et al., 2011; Sore et al., 2012;). Several unusual compounds have also been isolated from the three plants like lignans (deoxypodophyllotoxin, 5’-demethoxy-[beta]-peltatin-5O-[beta]-D-glucopyranoside, [beta]-peltatin, [beta]-peltatin-5-O[beta]-D-glucopyranoside) isolated from Bridelia ferruginea roots (Rashid, 2000;); flavonoids (quercetin, quercetrin, rutin, myricitrin, myricetin-3-O-[beta]-glucoside, ferrugin) and a biflavanol (galloclatechin-[4-O-7]-epigallocatechin) (Cimanga, 2001), galloclatecin- (4’-O-7)-epigallocatechin has been found in Bridelia ferruginea bark (De Bruyne et al., 1997), while rutin and quercetin, are present in Bridelia ferruginea leaves (Addah-Mensah & Munenge, 1989). Gallic acid, ellagic acid, flavonoid, glycosides and four tannins have been isolated from the leaves of Combretum glutinosum. The tannins are 2,3-(S)-hexahydroxydiphenoyl-D-glucose, punicalin, punicalagin and combreglutinin (Traore, 1999). The presence of indole and oxindole alkaloids from the leaves of Mitragyna inermis have been described by Shellard & Sarpong, (1967). From the bark of M. inermis, two 27-nor-triterpenoid glycosides, named inermiside I and II were isolated and their structures determined based on extensive 2D-NMR and MS spectral analysis as 6-deoxy-β-D-glucopyranosyl-[3-O-β-D-glucopyranosyl-(16)-β-D-glucopyranosyl]-pyrocincholate and 6-deoxy-β-D-glucopyranosyl-pyrocincholate, respectively (Cheng et al., 2002).

PHARMACOLOGICAL ACTIVITY

Bridelia ferruginea, Combretum glutinosum and Mitragyna inermis are tropical and subtropical medicinal plants widely used in traditional African to treat a range of diseases. Studies carried out by various workers have shown that the plants have several properties, which justify the plants’ medicinal use. Many classes of constituents, including quinones, tannins, alkaloids, sterols, polyphenols, reducing compounds, flavonoids and saponins are usually responsible for the plants’ activity such as antibacterial and antifungal effects, antispasmodic effect, anti-inflammatory effect and antidiabetic activity (Table 1).
Table 1: Bioactivities of drugs obtained of *Bridelia ferruginea*, *Combretum glutinosum* and *Mitragyna inermis*

<table>
<thead>
<tr>
<th>Botanical Name</th>
<th>Biological Activity</th>
<th>Part Tested</th>
<th>Bioassay Models</th>
<th>Results</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Bridelia ferruginea</em></td>
<td>Antimicrobial screening</td>
<td>Crude extracts from the root, stem bark and leaves</td>
<td>Agar diffusion method</td>
<td>Crude root extract inhibited the growth of <em>Escherichia coli</em>, <em>Staphylococcus aureus</em>, <em>Salmonella typhi</em>, <em>Proteus mirabilis</em> and <em>Candida albicans</em> at concentrations of 40, 100, 60, 60, and 80 mg/ml respectively. Stem bark had minimum inhibitory concentration (MIC) of 60 mg/ml on <em>Salmonella typhi</em> and 10 mg/ml on <em>Candida albicans</em>.</td>
<td>Adebayo et al., 2009</td>
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<td></td>
<td></td>
<td>Methanol, ethanol and acetone extracts of bark</td>
<td></td>
<td>Methanol extract was the most effective on <em>Bacillus subtilis</em> and <em>Escherichia coli</em>, while ethanol extract was most effective on <em>Staphylococcus aureus</em>.</td>
<td>Kayode et al., 2009</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Crude ethanolic, methanolic and water extracts of leaves and bark</td>
<td></td>
<td>Half strength (10 g/ml) concentration of the bark ethanol and methanol extracts was the minimum inhibitory concentration against <em>Citrobacter</em> sp. and <em>Bacillus subtilis</em>. While quarter strength (5 g/ml) concentrations of the bark methanol and ethanol extracts were the minimum inhibitory concentration against <em>Staphylococcus aureus</em> and <em>Micrococcus luteus</em>.</td>
<td>Owoseni et al., 2010</td>
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<tr>
<td>Laxative effect</td>
<td>Aqueous extracts from the stem bark</td>
<td></td>
<td></td>
<td>Extract for concentrations ranging from 10^{-5} mg/ml to 10^{-1} mg/ml, caused an increase of the rhythmical contraction of guinea pig <em>Taenia coli</em> smooth muscle. It suggested the presence of cholinomimetic substances in the crude extract of <em>Bridelia ferruginea</em></td>
<td>Nene - Bi et al., 2009</td>
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<tr>
<td>Anti diabetic effects</td>
<td>Aqueous extracts from the leaves</td>
<td></td>
<td>Oral glucose tolerance test</td>
<td>Oral glucose tolerance test showed that pregnancy induced glucose intolerance in the rats. However, <em>B. ferruginea</em> caused a reduction in glycemic response to glucose challenge and an increased glucose tolerance in rats that had pregnancy-induced glucose intolerance. Thus, diabetogenic effect of pregnancy was ameliorated by oral administration of aqueous extracts of <em>B. ferruginea</em> to pregnant albino rats.</td>
<td>Taiwo et al., 2012</td>
</tr>
<tr>
<td>Antioxidant activity</td>
<td>Ethanol extract of stem bark</td>
<td>2,2-diphenyl-1-picrylhydrazyl (DPPH) radical scavenging, Ferric reducing</td>
<td></td>
<td>Ethanolic extract of <em>Bridelia ferruginea</em> bark in this study showed inhibition against the formation of thiobarbituric acid reactive species (TBARS) induced by iron (II) sulphate (60µM FeSO4) in the brain and liver homogenates of the albino rat used. The extract was found to have different</td>
<td>Omotade et al., 2012</td>
</tr>
<tr>
<td>Activity</td>
<td>Extract/Compound</td>
<td>Method/Assay</td>
<td>Results</td>
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<tr>
<td><strong>Antioxidant Activity</strong></td>
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<td>Semi-ethanolic extracts of barks</td>
<td></td>
<td>the Oxygen Radical Absorbance Capacity (ORAC)</td>
<td>Extracts have antioxidant property and α-Glucosidase inhibitory activity (IC50 = 1.4 ± 0.04 µg / ml) for <em>B. ferruginea</em> higher than the reference compound acarbose (IC50 = 726 ± 15 mg / ml).</td>
<td>Bothon et al., 2012</td>
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<td>Hexane and ethyl acetate extract from leaves</td>
<td></td>
<td>Antioxidant assay and Artemia salina test</td>
<td>The test showed an IC50 value of 158.2µg/ml, which is quite significant, compared with that of the gallic acid, 201 µg/ml. Artemia salina test showed an acute toxicity with LC50 value of 319 µg/ml and lethal dose with LC50 value of 5.86 µg/ml indicating that that <em>B. ferruginea</em> could be a source of cytotoxic and antioxidant agents.</td>
<td>Atolani et al., 2012</td>
<td></td>
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<tr>
<td>Anti-inflammatory activity</td>
<td></td>
<td>Tail immersion mice test and Yeast-induced hyperpyrexia test</td>
<td>Extract significantly attenuated the spinal pain sensation against conduction heat in mice. The maximum nociceptive effect was observed at higher dose (100 mg/kg) which was comparable to that of morphine (10 mg/kg). The extract at the dose of 25, 50 and 100 mg/kg caused a more significant reduction in rectal temperature.</td>
<td>Akuodor et al., 2011;</td>
<td></td>
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<td>Antischistosomal Activity</td>
<td><em>Combretum glutinosum</em> Perrot. Ex DC</td>
<td>Aqueous extract of dried leaf</td>
<td><em>In vitro</em> assay</td>
<td>Aqueous extract of dried leaf has miracidicidal and cercaricidal activity on <em>Schistosoma mansoni</em> at concentration for drug: 1,000 ppm</td>
<td>Elsheikh et al., 1990</td>
</tr>
<tr>
<td>Antimicrobial Activity</td>
<td><em>Combretum glutinosum</em></td>
<td>Methanolic and water extract from leaves and stem bark</td>
<td><em>Agar diffusion method</em></td>
<td>Methanolic extract of the stem bark showed the highest level of inhibition on <em>Salmonella typhi</em> and <em>Escherichia coli</em> while the aqueous extract showed less response.</td>
<td>Yahaya et al., 2012.</td>
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<tr>
<td></td>
<td></td>
<td>Aqueous extracts from stem bark and root</td>
<td>Antibacterial activity showed a minimum inhibitory concentration (MIC) value of 0.86 mg/ml for 1.41 mg/ml for <em>Combretum glutinosum</em> against <em>Staphylococcus aureus</em>.</td>
<td>Sore et al., 2012</td>
<td></td>
</tr>
<tr>
<td>Molluscicidal</td>
<td></td>
<td>Methanol extract of dried fruit, dried root or dried stem</td>
<td><em>In vitro toxicity bioassay</em></td>
<td>No molluscicidal effect of aqueous extract against <em>Bulinus globosus</em> (snail) at concentration for all drugs: 100.0 ppm.</td>
<td>Sofowora et al., 1980</td>
</tr>
<tr>
<td>Antimalarial Activity</td>
<td></td>
<td>Methanol and hydromethanol extracts from the leaves</td>
<td><em>In vitro antimalarial assay</em></td>
<td>Extracts was screened against Vietnamese <em>Plasmodium falciparum</em> chloroquine-resistant strain W2 <em>in vitro</em>. Hydromethanol extracts of <em>Combretum glutinosum</em> was the</td>
<td>Ouattara et al., 2006</td>
</tr>
</tbody>
</table>
A review of *Bridelia ferruginea*, *Combretum glutinosum* and *Mitragyna inermis* plants used in zootherapeutic remedies in West Africa.

<table>
<thead>
<tr>
<th>Plant Species</th>
<th>Effect</th>
<th>Extract Type</th>
<th>Methodology</th>
<th>Results</th>
</tr>
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<tbody>
<tr>
<td><em>Mitragyna inermis</em> (Willd.) Kuntze</td>
<td>Cardiovascular effects</td>
<td>Bark aqueous extract</td>
<td><em>Plasmodium</em> Lactate Dehydrogenase (PLDH) method</td>
<td>Extract produced relaxation in isolated porcine coronary artery at concentration up to 3 mg/ml. This relaxation involved partial depolarization (KCl 20, 40 mM) and NO synthase inhibitor-sensitive mechanisms.</td>
</tr>
<tr>
<td></td>
<td>Antiplasmodial activity</td>
<td>Hydroethanolic extract, hydroacelonic extract and aqueous extract</td>
<td><em>Plasmodium</em> Lactate Dehydrogenase (PLDH) method</td>
<td>Extracts have been tested <em>in vitro</em> against Chloroquine-resistant strain (K1) and chloroquine-sensitive strain (3D7) of <em>Plasmodium falciparum</em>. Aqueous extracts exhibited the best results against K1 with the 50% inhibitory concentration (IC50) values of 0.54±0.18, 1.72±0.99, 1.54±0.04 g/mL for <em>M. inermis</em> leaves. Hydroethanolic extract from the leaves of <em>M. inermis</em> gave also IC50 value of 0.87±0.10 g/mL with 3D7.</td>
</tr>
<tr>
<td></td>
<td>Ethanol and pentane extracts from Stem and root</td>
<td>Radioactive micro-method</td>
<td></td>
<td>Extracts of these plants were tested on three strains of <em>Plasmodium falciparum</em>, FcB1-Colombia and FcM29-Cameroon (chloroquine-resistant strains) and a Nigerian chloroquine-sensitive strain. But extract has effects on the symptoms of malaria (fever, headaches, and so on) rather than on the parasite itself at least in regards with our results on the parasite inhibition.</td>
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<td></td>
<td>Anti-diabetic effect</td>
<td>Stem bark ethanol extract</td>
<td></td>
<td>Hypoglycaemic effects of the ethanol extract of <em>M. inermis</em> on blood glucose levels of alloxan induced diabetic albino rats have been investigated. The results revealed that the plant possessed hypoglycaemic activity. Doses of 250, 350 and 450 mgkg^-1^ body weight intraperitoneally (i.p.) were administered to the rats but the 350 mg/kg^-1^ dose exhibited the highest hypoglycaemic potentials.</td>
</tr>
</tbody>
</table>
| Antibacterial activity | Methanol leaf extract | Disc diffusion method | Extract showed antibacterial activity on *Staphylococcus aureus*, *Escherichia coli* and *Klebsiella pneumonia* with minimum inhibitory concentration of 50 mg/ml, 50 mg/ml and 25 mg/ml respectively. The activity was concentration dependent having no effect on tested concentration of 35.5 mg/ml and 75 mg/ml on *Staphylococcus aureus* and *Escherichia coli* while at 18.75 mg/ml on *Klebsiella pneumoniae*. The extract was bactericidal at concentration of 100 mg/ml on *Staphylococcus aureus* and *Klebsiella pneumoniae* while 200 mg/ml on *Escherichia coli*.

Wakirwa et al., 2013 |
| Water insoluble residue and fractions and crude ethanol extract of stem bark | Ethanol crude extract, water insoluble residue and ethyl acetate fraction did not inhibit growth of *Escherichia coli*, but inhibited growth of *Staphylococcus aureus*, *Proteus mirabilis*, *Streptococci pyogenes* and *Salmonella typhi*. n-Butanol fraction failed to inhibit growth of *Staphylococcus aureus* but inhibited growth of other bacteria tested. Except *Streptococci pyogenes*, all tested bacteria were inhibited by residue of water-soluble crude ethanol extract. | Tor-Anyiin et al., 2012 |
DISCUSSION

In this review, Bridelia ferruginea, Combretum glutinosum and Mitragyna inermis possessed wide-reaching pharmacological actions, including anti-diabetic, cardiovascular disease antibacterial, anti-inflammatory, antispasmodic and antiparasitic activity. In studies evaluating three plants antibacterial activity, agar diffusion assays method was used and the extracts used were obtained with different solvents (ethanol, chloroform, methanol, petroleum ether, water). Activities were observed against the following bacterial species: Pseudomonas aeruginosa, Staphylococcus aureus, Salmonella species, Streptococcus species, Proteus vulgaris, Klebsiella species, Sarcina lutea, Micrococcus luteus and Bacillus subtilis (Owoseni et al., 2010), except extract of Bridelia ferruginea’s leaf which had no antimicrobial activity against any of the clinical isolates (Adedayo et al., 2009). In general, this study showed that leaves and stem bark of Bridelia ferruginea, Combretum glutinosum and Mitragyna inermis was the organ mostly used and different extracts from leaves and stem bark at different concentrations significantly inhibited the growth of Staphylococcus aureus, Candida albicans, Staphylococcus epidermidis, Escherichia coli, Streptococcus lactis, Proteus vulgaris, Proteus mirabilis, Streptococcus pyogenes and Klebsiella sp. Besides activity showed against Staphylococcus aureus and Candida albicans may justifiably the use of the Bridelia ferruginea bark as mouthwash in Nigerian and Ivorian traditional medicine (Ozerov et al., 1994). Mitragyna inermis and Combretum. Glutinosum were selected by ethnobotanical survey as plants commonly used by traditional healers for the treatment of malaria (Mustofa et al., 2000 ). Extracts of these plants were tested in vitro on three strains of Plasmodium falciparum, FcB1-Colombia and FcM29-Cameroon (chloroquine-resistant strains) or Vietnamese Plasmodium falciparum chloroquine-resistant strain W2 and a Nigerian chloroquine-sensitive strain for an evaluation of antiparasitic activity in vitro (Zongo et al., 2011). These plants could be effectively more active on Plasmodium falciparum on human, as it is the case for plants containing prodrugs non active by themselves but which can be metabolised to active drugs (Mustofa et al., 2000). The antioxidant and anti-inflammatory properties were only evaluated in this review for leaves and barks of Bridelia ferruginea by DPPH and carrageenan-induced paw edema tests in mice assays respectively. Extracts of the barks had the highest DPPH and ABTS free radical scavenging activity (Bothon et al., 2012) and for anti-inflammatory activity aqueous extract of the stem bark was the most active (Akuodor et al., 2011). These findings provide some evidence for the traditional use of Bridelia ferruginea for the rheumatic pain, diarrhoea, dysentery, intestinal disorders, female sterility, as anthelmintic for roundworm and in the treatment of cystitis in Nigeria and Congo Kinshasa (Cimanga et al., 2001). Adoum et al. (2012) and Taiwo et al. (2012) demonstrated an anti-diabetic effect of leaves and bark’s extracts of Bridelia Ferruginea and Mitragyna inermis. In their studies, the dose of 250 mg/kg and 350 mg/kg of the extract was respectively the most effective, among the doses tested. It produced a significant hypoglycemic and antidiabetic activity. This study demonstrated the potential antidiabetic properties of extract of Bridelia. Ferruginea and Mitragyna inermis for both type 1 and type 2 diabetes, justifying its traditional use in the treatment of this disease. All of the above results contribute to justify the use of the plant in traditional medicine for treating various conditions, particularly infections and diabetes. This study has showed that the three plants treat several diseases because of their different properties and. Through this review, we have the certitude that leaves of plants have never been studied for their anthelmintic properties and will enable us to continue our PhD thesis.

CONCLUSION

Results of this review contribute to the validation of the popular use of Bridelia ferruginea, Combretum glutinosum and Mitragyna inermis in the treatment of bacterial, fungal, malaria and viral infections and cardiovascular problems, among others. Anthelmintic properties of these plants were not found in this study thus we can screen anthelmintic activities of Bridelia ferruginea, Combretum glutinosum and Mitragyna inermis leaves against gastrointestinal parasites of small ruminants to confirm their use in traditional veterinary medicine plants.

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