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ANTIBACTERIAL AND PHYTOCHEMICAL STUDIES OF *Pteriocarpus erinaceus* CRUDE EXTRACTS AGAINST DIARRHOEAGENIC *Esherichia coli*

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ABSTACT

The study was carried out to determine the antibacterial and phytochemical studies of *Ptericarpus erinaceus* extracts. The antibacterial assay was conducted using agar well diffusion method. The phytochemical screening was conducted using standard qualitative methods. The phytochemical screening of *Ptericarpuserinaceus* leaf extracts commonly contained alkaloids, flavonoids and steroids, while stem-bark extracts commonly indicated the presence of anthraquinones, glycosides, saponins and steroids. The bacteriaused were ten isolates (*Escherichia coli*) isolated from diarrhoeic stool of children 0-5 years. The result of *Ptericarpus erinaceus* crude leaf extracts showed appreciable inhibitory effect on all test isolates at 0.5-2.0 mg/ml concentration with zones of inhibition ranging from 8.00mm-22.00mm, while the entire isolates were resistance to hexane leaf extract. The stem-bark extracts inhibited the entire isolates at 0.5-2.0mg/ml concentration with zones of inhibition ranged between 8.00-30.00mm.The results has justified their utilization by the traditional medicine practioners for the treatment of ailments associated with the test isolates.

Keywords: Diarrhoea, Antibacterial, Extract, Phytochemical, *Ptericarpus erinaceus*

INTRODUCTION

Escherichia coli isolated from diarrhoeic stool are called diarrhoeagenic *Escherichia coli*. *Escherichia coli*is one of the bacteria agents capable of causing inflammation of gut resulting in diarrhoea among other symptoms of gastro-intestinal illness (Muhammad *et al*., 2020). The development of drug resistance in human pathogens against commonly used antibiotics has necessitated a search for new antimicrobial substances. Higher plants produce diverse secondary metabolites with different biological activities (Adefuye *et al*., 2007; Lagnika*et al*., 2012).Medicinal plants naturally synthesize and accumulate some secondary metabolites like alkaloids, steroids, tannins, terpenes, flavonoids, saponins, glycosides, cyanogenics, resins, lactones and carotenoids (Melkamu *et al*., 2018). Medicinal plants are used by traditional medicinal healers' inform of decoction, concoction, infusion and tisane (Muhammad *et al*., 2020).

Medicinal plants are the back bone of traditional medicine which more than 3.3 billion people in developing countries utilize on a regular basis (Davidson-Hunt, 2000). More so, World Health Organization (WHO), estimated that more than 80% of the world population still relies on traditional medicine for their primary health

care needs (Sasidharan*et al*., 2011).The discovery of modern drugs such as quinine, vincristine, digoxin, digitoxin and artemisinin from medicinal plants signifies the huge potential that still exists for the production of more novel pharmaceuticals (Geyid*et al*., 2005). The *Ptericarpus erinaceous* plant is commonly known as Africa Rose wood tree belonging to *Fabaceae* Family. The plant is called Treek (English), Modibiya (Hausa), Zanchi (Nupe), Apepe or Osunchidu (Yoruba), Senyo or Doli (Ghanian) (Mann *et al*., 2003). It is a perennial deciduous legume tree and widely distributed throughout the west and central Africa savannah and dry forest.

The deciduous tree is about 8-10m high with a tall, narrow, open crown. The stem-bark of the trunk is dark grey and roughly with scales that curl up at the ends. The leaves are composite, impair pinnate with 4-5 pairs of alternated or sub opposite that are elliptic, shortly pubescent at the lower side. Inflorescences consist of golden yellow flora in lax panicle which is formed when leaves have fallen (Mann *et al.,* 2003). Flowering period is between November and February. Fruits have a special pod and when the fruit mature, papery wing all around it, which looks like a leave at a distance but with centre swelling which contain single seed (Mann *et al.,* 2003). The fruiting period is between January and March. The red heart wood is used for the preparation of the cotton dye. Ethno-botanical uses include treatment of dysentery, diarrhea, fever, and as well as an arbotificent (Figure 1).

Figure 1: *Ptericarpus erinaceus* plant

MATERIALS AND METHODS

Collection and Identification of Plant

The fresh leaves and the stem-bark of *Ptericarpus erinaceus* were collected within the premises of Ibrahim Badamasi Babangida University, Lapai Niger state. The plant was identified and authenticated by a botanist Dr. M.O Adebola from the Department of Biological Sciences, Ibrahim Badamasi Babangida University Lapai, where a voucher document has been deposited in the school herbarium.

Preparation of Plant Sample

The fresh leaves and stem-bark of *Ptericarpus erinaceous* (African Rose tree) were rinsed with distilled water, cut into pieces and air-dried in the laboratory for three weeks at room temperature ($22^{O}C$) in a shaded area. The dried plant materials were ground into powder by the aid of a clean mortar and pestle. The ground particles or powder form were sieved with mesh sieve size (0.26mm) to obtain a fine powder.

Extraction of Pulverized Plant Sample

Extraction of plant samples was carried out using Soxhlet extractor. Acetone, water, hexane and methanol were used as extractants (solvents). Methanol being polar solvent has capacity of extracting hydrophilic compound, while hexane (non-polar) has capacity of extracting lipophilic compounds.

Hundred gram (100g) of the powdered leaves of each plant *Ptericarpus erinaceous* was weighed and wrapped in a plain paper and placed in a Soxhlet extractor and extracted with water, acetone, hexane and methanol. The extraction was done until solvent in the Soxhlet turned colourless. The solution (filtrate) was transferred into Porcelain dish then allowed to dry. The extract obtained was labeled, weighed and kept for further analysis. The same procedure was followed for stem-bark extraction.

Sources of Test Organisms

Pure clinical isolates used in this study were *Escherichia coli* isolated from diarrhoeic stool of children 0-5 five years attending selected Hospitals in Niger State, Nigeria. vizEtsu Umaru Sanda General Hospital, Bida; General Hospital, Minna and General Hospital, Kontagora.

Preparation and Standardization of Inoculums

All test organisms were separately prepared by sub culturing the pure isolates in to nutrient agar and incubated at 37^{o}C for 24 hours. One gram (1g) of Barium chloride was weighed and dissolved in 99ml of sterile distilled water. This was followed by the measurement of 1ml of concentrated sulphuric acid in 99ml of sterile distilled water. To prepare 10ml of McFarland Nephelo meter, 0.2ml of 1% Barium chloride was added to 9.8ml of concentrated sulphuric acid. Turbidity corresponds to 6.10^{8}ml bacteria cells referred to McFarland standard (McFarland, 1970).

Reconstitution of the Plant Extracts

The dried residue (extracts) was weighed into McCartney bottles. Two hundred milligrams (200mg) of the dried residue of *Ptericarpus erinaceus* leaf and stem-bark extracts were dissolved or dispensed into 10ml of glycerol to make a stock solution of 2.0mg/ml respectively. The serial dilution of 1.0mg/ml was performed to yield 0.5mg/ml and0.25mg/ml respectively.

Determination of Antibacterial Activity

The susceptibility of the test organisms to the plant extract were assayed as described by Aliyu *et al.* (2009). The standardized suspension was used to inoculate the surface of the nutrient agar plates using sterile cotton swab stick. Agar well diffusion method was used, and the agar plates were allowed to set. A standard cork borer of 6mm diameter was used to punch five wells aseptically on the surface of agar and filled with the desired concentration (2.0mg/ml, 1.0mg/ml, and 0.5mg/ml) of *Pteriocarpus erinaceus* acetone, aqueous, hexane and methanol leaf extracts respectively. The same procedure was followed for *Pteriocarpus erinaceus* stem-bark extracts. All plates were allowed to stand for 1hour at room temperature for extracts to diffuse into the agar and then incubated at 37^{o}C overnight. Antibacterial activities were evaluated by measuring zone of inhibition. Zone of inhibition means the zone of clearance around each well and the diameter was measured using transparent metric ruler.

Preliminary Phytochemical Screening of *Ptericarpus erinaceus* Extracts

The method of Hassan *et al.* (2005) and El-Mahmood and Doughari (2009) were used to detect the presence of phytochemical constituents. The crude aqueous, acetone, hexane and methanolic extracts were subjected to phytochemical constituent's test for alkaloids, anthraquinones, flavonoids, glycosides, resin, saponins, steroids and tannins.

Test for Alkaloids

To 3ml of extract, 1ml of 1% of HCl was added. The mixture was treated with two drops of Meyer's reagent. A creamy white precipitate indicated the presence of alkaloids. Absence of white precipitate indicated negative result (Ogukwe*et al*., 2004)

Test for Anthraquinones

To 4ml of extract, 4ml of 100% ammonia solution was added. Pink violet or red colour in the ammonical layer (lower layer) indicated the presence of anthroquinones (Danlami, 2009).

Test for Flavonoids

To 1ml of extract, 3 drops of ammonia solution was added. Half (0.5) ml of conc. HCl was further added to the mixture. A pale brown coloration indicated the presence of flavonoids (Odebiyi and Sofowora, 1978).

Test for Glycosides

To 1ml of the extract, 2ml of acetic acid was and added and then cool in an ice bath at (4^0c). To the mixture, 1ml of conc. H_2SO_4 was added drop wise. Oil layer formed on top of the solution indicated the presence of glycosides (Odebiyi and Sofowora, 1978; Ogukwe*et al*., 2004; El-Mahmood and Amey, 2007).

Test for Resins

To 5ml of extract, 5ml of copper acetate solution was added. The mixture was shaken vigorously and the allowed to separate. A reddish brown precipitate indicated the presence of resin (El-Mahmood and Doughari, 2008).

Test for Saponins

To 2ml of the extract, 5 drops of olive oil was added. The mixture was vigorously shaken, a stable emulsion forms in the extract indicated the presence of saponin (Hassan *et al*., 2005)

Test for Steroids

To 1ml of extract, 1ml of conc.H_2SO_4 was added. A red coloration indicated the presence of steroid (Hassan *et al*., 2005).

Test for Tannins

Two drops of 5% $FeCl_3$ was added to 1ml to 1ml of extract and a dirty green precipitate indicates of tannins (Ogukwe*et al*., 2004).

RESULTS

The phytochemical screening of *Ptericarpus erinaceus* leaf extracts indicated the presence of alkaloids; flavonoids and steroids in the acetone leaf extract, alkaloids, flavonoids and saponins were found to be in aqueous leaf extract. Hexane leaf extract contained alkaloids, flavonoids and steroids, while methanol leaf extract contained all the phytochemical constituents tested for except saponins. As for the stem-bark, acetone stem-bark contained anthraquinones, flavonoids, saponins, glycosides and steroids, the aqueous stem-bark extract contained anthraquinones, glycosides, saponins and steroids. The hexane stem-bark extract contained alkaloids, anthraquinones, glycosides, saponins and steroids. Finally, methanol stem-bark extract contained anthraquinones, glycosides, saponins, tannins and steroids (Table 1).

Table 1: Phytochemical constituents of Leaf and Stem-Bark Crude Extracts of *Ptericarpus erinaceu*

	Phytochemical constituents							
Extracts	Alkaloids	Anthraquinones	Flavonoids	Glycosides	Resins	Saponins	Steroids	Tannins
PEALE	+	-	+	-	-	-	+	-
PEQLE	+	-	+	-	-	+	+	-
PEHLE	+	-	+	-	-	-	+	-
PEMLE	+	+	+	+	+	-	+	-
PEASBE	-	+	+	-	-	+	+	-
PEQSBE	-	+	-	+	-	+	+	-
PEHSBE	-	+	-	+	-	+	+	-
PEMSBE	+	+	-	+	-	+	+	+

Key: + = Present; - = absent; PEALE = *Ptericarpus erinaceus* acetone leaf extract; PEASBE = *Ptericarpus erinaceus* acetone stem-bark extract; PEHLE = *Ptericarpus erinaceus* hexane leaf extract; PEHSBE = *Ptericarpus erinaceus* hexane stem-bark extract; PEMLE = *Ptericarpus erinaceus* methanol leaf extract; PEMSBE = *Ptericarpu serinaceus* methanol stem-bark extract; PEQLE = *Ptericarpus erinaceus* aqueous leaf extract; PEQSBE = *Ptericarpus erinaceus* aqueous stem-bark extract

Table 2 shows the results of Preliminary antibacterial activity of *Ptericarpus erinaceus*crude leaf extracts against selected *Escherichia coli* isolates. All *Escherichia coli* isolates were resistant to hexane leaf extract at various concentrations chosen. Acetone leaf extract inhibited all tested isolates at concentration of 2.0mg/mL with zones of inhibition which ranged between 14.00mm-20.00mm. At concentration of 1.0mg/mL, all tested *Escherichia coli* isolates were susceptible with zones of inhibition ranging from 9.00mm-13.00mm and at 0.5mg/mL concentration, the two isolates coded 010 and 349 were not susceptible to acetone leaf extract. For methanol leaf extract, all tested *Escherichia coli* isolates were susceptible at 0.5mg/mL concentration with zones of inhibition which ranged between 8.0mm-11.00mm and at concentration of 1.0mg/mL, zones of inhibition recorded ranged between 11.0mm-15.00mm, while at concentration of 2.0mg/mL, all *Escherichia coli* isolates were inhibited with zones of inhibition which ranged from 16.00mm-22.00mm.

Table 3 shows the results of preliminary antibacterial activity *Ptericarpuse rinaceus*crude stem-bark extract. Acetone stem-bark fairly inhibited the growth of *Escherichia coli* isolates except *Escherichia coli* coded 349 with zones of inhibition which ranged from 8.00mm-9.00mm at 0.5mg/mL concentration. At concentration of 1.0mg/mL, all tested *Escherichia coli* isolates were susceptible with zones of inhibition ranges from 8.00mm-15.00mm and at 2.0mg/mL concentration, all *Escherichia coli* isolates were susceptible with zones of inhibition ranging from 12.00mm-22.00mm. In the same vain, all isolates tested were susceptible to aqueous stem-bark with zones of inhibition ranging from 8.00mm-11.00mm, 10.00mm-15.00mm and 14.00mm-22.00mm at 0.5, 1.0 and 2.0mg/mL concentrations respectively. For hexane stem-bark extract, five out of ten *Escherichia coli* isolates tested, were fairly susceptible with zones of inhibition ranging from 8.00mm-10.00mm and 10.00mm-12.00mm at 1.0 and 2.0mg/mL concentration respectively. Methanol stem-bark indicated high activity against the

Escherichia coli isolates with zones of inhibition ranging from 20.00mm-26.00mm at 2.0 mg/mL and low activity at 0.5mg/mL with zones of inhibition ranging from 9.00mm-12.00mm, while *Escherichia coli* isolates showed moderate activity at 1.0mg/mL concentration with zones of inhibition ranging from 13.00mm-17.00mm.

Table 2: Preliminary Antibacterial Activity of *Ptericarpus erinaceus* Crude Leaf Extracts against *Escherichia coli*

	Zone of inhibition (mm) and Concentration of extract (mg/ml)											
PEALE		PEQLE			PEHLE			PEMLE				
Code	0.5	1.0	2.0	0.5	1.0	2.0	0.5	1.0	2.0	0.5	1.0	2.0
EUS003	10.00	13.00	20.00	8.00	14.00	18.00	0.00	0.00	0.00	11.00	15.00	22.00
EUS010	0.00	9.00	13.00	0.00	9.00	12.00	0.00	0.00	0.00	9.00	12.00	16.00
EUS149	8.00	11.00	16.00	8.00	10.00	14.00	0.00	0.00	0.00	19.00	13.00	20.00
GHM166	9.00	11.00	15.00	8.00	10.00	14.00	0.00	0.00	0.00	9.00	12.00	18.00
GHM220	8.00	10.00	14.00	0.00	10.00	13.00	0.00	0.00	0.00	8.00	11.00	18.00
GHM268	8.00	10.00	15.00	8.00	10.00	14.00	0.00	0.00	0.00	9.00	12.00	18.00
KGH349	0.00	9.00	13.00	0.00	9.00	12.00	0.00	0.00	0.00	9.00	11.00	16.00
KGH360	9.00	11.00	15.00	8.00	10.00	14.00	0.00	0.00	0.00	10.00	14.00	20.00
KGH399	8.00	11.00	16.00	8.00	11.00	14.00	0.00	0.00	0.00	10.00	13.00	20.00
KGH445	8.00	10.00	14.00	8.00	9.00	12.00	0.00	0.00	0.00	8.00	12.00	16.00

Key: EUS = Etsu UmaruSanda General Hospital, Bida; GHM = General Hospital, Minna; KGH = General Hospital, Kontagora; PEALE = *Ptericarpus erinaceus* acetone leaf extract; *E. coli* = *Escherichia coli*; PEQLE = *Ptericarpus erinaceus* aqueous leaf extract; EPHLE = *Ptericarpus erinaceus* hexane leaf extract; PEMLE = *Ptericarpus erinaceus* methanol leaf extract; 0.0=No zone of inhibition.

Table 3: Preliminary Antibacterial Activity of *Ptericarpus erinaceus* Crude Stem-Bark Extracts against *Escherichia coli* isolates

	Zone of Inhibition(mm) and Concentration of crude extracts (mg/ml)											
Code		PEASBE			PEQSBE			PEHSBE			PEMSBE	
	0.5	1.0	2.0	0.5	1.0	2.0	0.5	1.0	2.0	0.5	1.0	2.0
EUS003	9.00	14.00	22.00	11.00	15.00	22.00	0.00	9.00	12.00	12.00	17.00	26.00
EUS010	8.00	11.00	15.00	8.00	11.00	16.00	0.00	0.00	0.00	9.00	14.00	20.00
EUS149	9.00	12.00	18.00	9.00	13.00	20.0	0.00	8.00	10.00	10.00	14.00	22.00
GHM166	8.00	10.00	15.00	8.00	10.00	18.00	0.00	0.00	0.00	10.00	15.00	23.00
GHM220	9.00	12.00	17.00	9.00	15.00	19.00	0.00	0.00	0.00	9.00	13.00	20.00
GHM268	8.00	11.00	16.00	9.00	11.00	16.00	0.00	8.00	11.00	10.00	14.00	22.00
KGH349	0.00	8.00	12.00	8.00	10.00	14.00	0.00	0.00	0.00	11.00	15.00	20.00
KGH360	8.00	10.00	16.00	8.00	12.00	16.00	8.00	10.00	12.00	10.00	15.00	24.00
KGH399	9.00	15.00	16.0	9.00	12.00	18.00	0.00	8.00	10.0	11.00	16.00	26.00
KGH445	8.00	11.00	16.00	11.00	14.00	20.0	0.00	0.00	0.0	13.00	19.00	30.00

Key: EUS = Etsu UmaruSanda General Hospital, Bida; GHM = General Hospital, Minna; KGH = General Hospital, Kontagora; PEALE = *Ptericarpus erinaceus*acetone stem-bark extract; *E. coli* = *Escherichia coli*; PEQLE = *Ptericarpus erinaceus* aqueous stem-bark extract; PEHLE = *Ptericarpus erinaceus* hexane stem-bark extract; PEMLE = *Ptericarpus erinaceus* methanol stem-bark extract

DISCUSSION

Escherichia coli isolated from diarrhoeic stool are called diarrhoeagenic *Escherichia coli*. *Escherichia coli*is one of the bacteria agents capable of causing inflammation of gut resulting in diarrhoea among other symptoms of gastro-intestinal illness (Muhammad *et al*., 2020).

In the phytochemical screening of *Ptericarpus erinaceus* leaf extracts, the methanol leaf extract contained all the phytochemical constituents tested for except saponins. The reason may be as a result of solvent used. Methanol being a polar solvent has ability to extract both hydrophilic and some lipophilic compounds. Also flavonoids and alkaloids detected in all the leaf extracts are reported to be organ specific under normal environmental condition. This result is contrary to the findings of Onwuliri *et al*. (2006) who reported the presence of only tannins, saponins, flavonoids, glycosides and balsam in the leaf extracts in their studies on phytochemical, toxicological and histopathological analysis of some medicinal plants in Nigeria. This could be attributed to the season of plant collection and geographical area. The report is also contrary to the findings Haizhom *et al*., (2008) who documented the presence of only cyanogenic glycosides and maltol glycosides in their phytochemical analysis of glycosides in leaf extracts of *Ptericarpus erinaceus.* The report is also contrary to the fingings of Owuliri *et al*. (2007) who reported the presence of tannins, saponins, terpenes and steroids, balsam and phenol in their studies on phytochemical, toxicological and histopathological studies of some medicinal plants in Nigeria.

From the study, it was observed that *Ptericarpus erinaceus* stem-bark extracts contained anthraquinones, saponins, steroids and glycosides. The reason may be as a result of season of plant collection. The findings is however contrary to findings of Musa (2006) who reported the presence of steroids, glycosides, saponins, tannins, carbohydrates, proteins, protein and amino acids in his study on some pharmacological studies of the ethanol stem-bark of *Ptericarpus erinaceus.* The report is also contrary to the findings of Patrick *et al*. (2016) who found saponins, phenols, alkaloids, flavonoids, steroids and tannins in their studies on *in-vitro* anti-oxidant activity and phytochemical evaluation of aqueous and methanol extracts of *Ptericarpus erinaceus.* The reason may be the water and methanol used as extractants. The two solvents are polar and can extract hydrophilic compounds whereas methanol on the other hand can extract both hydrophilic and some lipophilc compounds, thus they are called broad spectrum solvents. The result is in conformity with the findings of Ajayi *et al*. (2017) who also reported that *Ptericarpus erinaceus* extracts contained cardiac glycosides, flavonoids, alkaloids, saponins, tannins and carbohydrates in their studies on the anti-diabetic effect of methanolic leaf extract of *Ptericarpus erinaceus* in Streptozotocin induced diabetic rats.

Abdullahi *et al*., (2012) investigated the phytochemical constituents of leaf extract of *Ptericarpus erinaceus*and reported the presence of alkaloids, tannins, glycosides, saponins, terpenes, steroids, balsam and carbohydrates which is contrary to findings in this study. The result of *Ptericarpus erinaceus* leaf extracts revealed that all tested *Escherichia coli* isolates were susceptible to acetone leaf extract with zones of inhibition ranging from 9.00mm-13.00mm, 13.00mm-20.00mm at 1.0 and 2.0mg/mL concentration. The result is

contrary to the findings of Abdullah *et al*. (2012) who reported a zone of inhibitions ranging from 7.00mm-16.00mm, 12.00mm-22.00mm at 50 and 100mg/mL concentration and also to what was reported by Prtrick *et al*., (2016) with zones of inhibition ranging from 6.00mm-15.00mm and 10.00mm-22.00mm at 20 and 40mg/mL concentration. The reason may be attributed to less concentration of extract used in our study.

Aqueous leaf extract of *Ptericarpus erinaceus* inhibited the growth of *Echerichia coli* isolates with zones of inhibition ranging from 9.00mm-13.00mm and 13.00mm-20.00mm at 1.0 and 2.0mg/mL concentration respectively. The reason could be attributed to geographical location and season of harvesting. This finding is similar to the report of Musa *et al*. (2006) who reported zones of inhibition ranging from 13.00mm-16.00mm and 16.00mm-19.00mm at 1.0 and 2.0mg/mL concentration respectively and similar to the report of Onwuliri *et al*. (2007) who documented zones of inhibition ranging from 10.00mm-12.00mm and 16.00mm-18.00mm at 1.0 and 2.0 mg/mL concentration respectively.

The methanol leaf extract of *Ptericarpus erinaceus* indicated that at 0.5, 1.0 and 2.0mg/mL concentrations, all tested *Escherichia coli* isolates were highly susceptible with inhibition zones ranging from 8.00mm-19.00mm, 11.00mm-15.00mm and 16.00-22.00mm respectively. This finding also contradict the report of Ajayi*et al.*(2017) who documented zones of inhibition ranging from 5.00mm-8.00mm, 10.00mm-12.00mm and 11.00mm-18.00mm at 25ug/mL, 50ug/mL and 75ug/mL respectively. The reason may be attributed to variation of concentration of used.

The antibacterial activity of stem-bark extracts of *Ptericarpus erinaceus* indicated that, all tested *Echerichia coli* isolates were moderately susceptible to acetone stem-bark with zones of inhibition ranging from 8.00mm-9.00mm and 8.00mm-15.00mm at 0.5mg/mL and 1.0mg/mL concentration and highly susceptible with zones of inhibition ranging from 12.00mm-22.00mm at 2.0mg/mL concentration. The finding is contrary to the report of Abdullahi *et al*. (2012) who documented the zones of inhibition ranging from 5.00mm-9.00mm and 8.00mm-10.00mm at 50mg/mL and 100mg/mL concentrations respectively. This could be attributed to concentration of extract adopted for the study. Aqueous stem-bark extract of *Ptericarpus erinaceus* inhibited all tested *Echerichia coli* isolates with zones of inhibition ranging from 9.00mm-14.00mm and 12.00mm-18.00mm at 1.0 and 2.0mg/mL concentrations respectively. The result is contrary to the findings of Musa *et al.* (2016) who reported zones of inhibition ranging from 3.00mm-5.00mm, 5.00mm-10.00mm and 10.00mm-17.00mm at 0.5, 1.0 and 2.0mg/mL concentration respectively. The reason may be as result of geographical location and season of plant collection.

The methanol stem-bark extract of *Ptericarpus erinaceus* revealed that, at 0.5 and 1.0mg/mL concentration respectively with zones of inhibition ranging from 9.00mm-13.00mm, 13.00mm-19.00mm and 20.00mm-30.00mm respectively. The study is contrary to the report of Ajayi *et al*. (2017) who also documented zones of inhibition ranging from 8.00mm-11.00mm, 10.00mm-14mm and 12.00mm-18.00mm at 25mg/mL, 50mg/mL and 75mg/mL concentrations respectively.

CONCLUSION

The *Ptericarpus erinaceus* leaf extracts were found to have alkaloids, flavonoids and steroids, while methanol leaf contained all test phytochemical constituents except saponins and tannins that were not detected. The stem-bark extracts commonly contained anthraquinones, saponins and steroids, while resins and saponins were found to be absent. *Ptericarpus erinaceus* stem-bark extracts were more active against *Escherichia coli* isolates than leaf extracts. The stem-bark extracts inhibited the entire isolates at 0.5-2.0mg/ml concentration with zones of inhibition ranged between 8.00-30.00mm, while the leaf extracts showed appreciable inhibitory effect on all test isolates at 0.5-2.0 mg/ml concentration with zones of inhibition ranging from 8.00mm-22.00mm. However, the entire isolates were resistance to hexane leaf extract. The result has justified their utilization by the traditional medicine practioners for the treatment of ailments associated with the test organism.

Collaboration between academic institutes and pharmaceutical industries should be encouraged to ensure that the research carried out on medicinal plants would not be swept under carpet. 2. The toxicological studies should be conducted to determine the safety of the plant for consumption. 3. Structural elucidation of the plant extracts should be carried out by Nuclear Magnetic Resonance machine so that more compounds can be isolated from the plants for further analysis.

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