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Short Communication

Phytochemical analysis and antimicrobial screening of crude extracts from the leaves, stem bark and root bark of *Ekebergia senegalensis* A. Juss

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The leaves, stem bark and root bark of *Ekebergia senegalensis*, which has some traditional medicinal applications were investigated. Phytochemical analysis gave positive results for carbohydrates, glycosides, saponins, tannins and alkaloids. The crude methanol extracts showed growth inhibitory effects on *Salmonella typhi*, *Pseudomonas, Klebsiella, Bacillus subtilis, Escherichia coli* and *Staphylococcus aureus.* The minimum inhibitory concentration (MIC) of these extracts on the bacteria is 0.125 x 10^3 mg/ml for the methanol extracts. The minimum bactericidal concentration (MBC) determination showed that a concentration of 0.03125 x 10^3 mg/ml of the methanol extract of the leaves could completely kill *S. typhi.* The petroleum spirit extract did not show marked antimicrobial activity.

Key words: *Ekebergia senegalensis*, Maliaceae family, Phytochemical analysis, crude extracts, Antibacterial screening.

INTRODUCTION

Ekebergia senegalensis A. Juss belongs to the Maliaceae family. It is a tree that grows up to a height of 30 feet and commonly found in the Savannah forests. It is distributed from Senegal to Angola but can also be found in Southern and Northern parts of Nigeria. The plant and its other related species have been reported to be of immense value in folk medicine. Watt et al. (1962) has it that *E. senegalensis* and some members of its genera are claimed to be useful as an emetic in the treatment of dysentery and chronic cough and as fever remedy and for the treatment of syphilis. While Dalziel (1955) reported the leaves are used by the Senegalese for curing epilepsy but warned that such leaves must be detached from the tree with the aid of only wooden forceps. The various uses of this genera in traditional medicine prompted this study.

MATERIALS AND METHODS

All plant materials were collected from around Zaria, Kaduna State, Nigeria, in the month of July, 2005. They were identified in the Herbarium, Department of Biological Science, Ahmadu Bello University, Zaria, Nigeria and a voucher specimen, Number 766, was deposited in this Herbarium. The plant materials were air-dried, pulverized and stored in paper bags until needed for further work.

Phytochemical analysis of the plant

The pulverized plant material was phytochemically screened using the methods of Brain and Turner (1975) (Table 1).

Table 1. Results of phytochemical analysis.

Constituents	Occurrence
Carbohydrate	+
Glycosides	+
Anthraquinone	+
Flavonoids	-
Flavonoids	+
Tannins	+
Saponins	+
Alkaloids	+

+ = Present
- = Absent

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Table 2. Sensitivity of test organisms to the methanol extracts.

Plant extract	Diameter of zone of inhibition (mm)															
	Ps		ST		Kb		Ec		Bs		SA		As		Ca	
	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
Leaves	23	8	6	18	7	19	5	18	9	13	21	20	-	-	18	5
Stem bark	12	21	19	19	18	22	16	20	20	23	8	21	11	8	10	20
Root bark	20	21	20	21	20	21	18	20	22	22	19	22	10	9	20	19

Ps = *Pseudomonas,* St = *Salmonella typhi,* Kb=*Klebsiella*
Ec = *Escherichia coli,* Bs = *Bacillus Subtilis,* Sa = *Staphylococcus aureus*
As = *Aspergillus niger,* Ca = *Candida albicans.* - = no zone of inhibition
I = 0.5 x 10^3 mg/ml, II = 1.0 x 10^3 mg/ml.

Table 3. Sensitivity of test organisms to petroleum spirit extracts.

Plant extract	Diameter of zone of inhibition (mm)															
	Ps		St		Kb		Ec		Bs		Sa		As		Ca	
	I	II	I	II	I	II	I	II	I	II	I	II	I	II	I	II
Leaves	-	-	-	-	-	-	-	-	-	7	-	-	-	-	-	-
Stem bark	-	-	-	-	-	-	-	-	8	5	-	-	-	-	-	-
Root bark	-	-	-	-	-	-	-	-	3	-	-	-	-	-	-	-

Ps = Pseudomonas, St = Salmonella typhi, Kb=Klebsiella
Ec = Escherichia coli, Bs = Bacillus Subtilis, Sa = Staphylococcus aureus
As = Aspergillus niger, Ca = Candida albicans. - = no zone of inhibition

Table 4. Minimum inhibitory concentration (MIC) of the methanol extracts.

Plant extract	Test Organism	I	II	III	IV	V	VI	VII
Stem bark	Pseudomonas	-	-	-	*	+	++	++
Stem bark	Bacillus Subtilis	-	*	+	+	+	++	++
Root bark	Klebsiella	-	-	-	*	+	++	++
Leaves	Escherichia coli	-	-	-	*	+	++	++
Leaves	Salmonella typhi	-	-	-	*	+	++	++

I = 1.0 x 10^3 mg/ml, II = 0.5 x 10^3 mg/ml, III = 0.25 x 10^3 mg/ml, IV = 0.125 x 10^3 mg/ml, V = 0.0625 x 10^3 mg/ml, VI = 0.0312 x 10^3 mg/ml, VII = 0.0156 x 10^3 mg/ml, * = MIC, - = No growth, + = Little growth, ++ = Dense growth.

Extraction procedure

The air-dried pulverized plant material (200 g) was placed in a soxhlet extractor and was exhaustively and successively extracted using petroleum spirit (60 – 80°C) and methanol. The crude extracts were respectively concentrated *in vacuo* at 40°C using a *rota vapor*. The crude extracts of the leaves, stem bark and root bark were subjected to bioassay studies.

Antibacterial screening

Clinical and pure isolates of *Bacillus subtilis, Escherichia coli, Candida albicans, Aspergillus niger, Klebsiella pneumoniae, Pseudomonas aeruginosa, Salmonella typhi* and *Staphylococcus aureus* were obtained from the Department of Microbiology, Ahmadu Bello University, Zaria, Nigeria. All the cultures were tested for purity. Each inoculum was prepared by inoculating the stock culture into freshly prepared nutrient agar and incubating aerobically at 37°C for 6 h. Two concentrations of the plant extracts were prepared, 1000 and 500 mg/ml and one milliliter aliquot of each of the solutions of the extracts thus prepared was tested for bioactivity on the clinical isolates using the diffusion method of Bauer et al. (1966). All bacteria were incubated for 24 h at 37°C and the fungi for 48 h at 27°C, after which they were examined for zones of inhibition of growth. Observed zones of inhibition of growth were measured and recorded in millimeters (mm) as shown in Tables 2 and 3.

RESULTS AND DISCUSSION

The preliminary phytochemical analysis of the leaves, stem bark and root bark of the *E. senegalensis* showed the presence of carbohydrates, glycosides, saponins, anthraquinones, tannins and alkaloids (Table 1). From the results of the antimicrobial screening in Tables 2, 3, 4

Table 5. Minimum bactericidal concentration (MBC) of the methanol extract.

Plant extract	Test organism	Concentration of extracts (mg/ml)						
		I	II	III	IV	V	VI	VII
Stem bark	Pseudomonas	-	-	*	+	+	++	++
Stem bark	Bacillus Subtilis	-	-	*	+	+	++	++
Root bark	Escherichia coli	-	-	*	+	+	++	++
Leaves	Salmonella typhi	-	-	-	-	-	*	+
Root bark	Klebsiella	-	-	-	*	+	+	++

I = 1.0 x 10^3, II = 0.5 x 10^3, III = 0.25 x 10^3, IV = 0.125 x 10^3, V = 0.0625 x 10^3,
VI = 0.03125 x 10^3, VII = 0.0156 x 10^3, * = MBC, - = no growth, + = little growth, ++ = dense growth.

and 5, the methanol extracts have marked antimicrobial activities compared to the petroleum spirit extracts with respect to *P. aeruginosa, B. subtilis, Klebsiella, E. coli* and *S. typhi*. The minimum inhibitory concentration showed that at a very low concentration of 0.125 x 10^3 mg/ml the methanol extracts of the leaves, stem bark and root bark of this plant can inhibit the growths of *P. aeruginosa, B. Subtilis, K. pneumoniae, E. coli,* and *S. typhi.* The minimum bactericidal concentrations (MBC) of 0.03 /25 x 10^3 mg/ml for the methanol extracts showed that the plant's leaves can kill *S. typhi*. The MBC of 0.0625 x 10^3 mg/ml of the root bark could kill *K. pneumoniae*. Based on these findings, the application of the decoction of the leaves, stem bark and root bark of *E. senegalensis* in ethnomedicine is justified.

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