Antimicrobial And Phytochemical Screening Activities Of Ficus Sur (Forssk)

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ABSTRACT: The antimicrobial activity and chemical constituents of the leaves and stem bark extract of *Ficus sur* were investigated. The extracts at crude level were shown *in vitro* to inhibit *Staphylococus aureus, Escherichia coli, Bacillus subtilis* and *Candida pseudotropicalis* of the six test organisms at 2mg/ml. *Pseudomonas aeruginosa* and *Salmonella typhimorium* were not inhibited at the same concentration. The stem bark extract had a wide spectrum of activity against some micro-organisms at minimum inhibitory concentration of 0.5mg/ml. The leaf extract also had activity on the micro organisms but at 1.0mg/ml. Saponins, saponin glycosides, tannins, phenols and volatile oils were the important phytochemical components found in the plant parts which may be responsible for the biological properties of this plant. The biological screening result is indicative of the potential of *Ficus sur* as antimicrobial substance.

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Key words: *Ficus sur,* antimicrobial activity, chemical constituents.

INTRODUCTION

A great number of Nigeria higher plants are traditionally noted for their medicinal and pesticidal properties (Ayensu 1978, Okwute 1992, 1998), but regrettably only very few have so far been studied for their active constituents (Takeda and Fatope, 1988, Okwute, 1989). Traditional medicine has existed for ages and has relied largely on experience handled down from one generation to another. Many of plant materials used in traditional medicine are readily available in rural areas and have made tradomedicine relatively cheaper than modern medicine.

Ficus sur (Forssk) formerly *Ficus capensis* moraceae family is a medium size tree up to 6-9 metres high grow cylindrical extending to the ground, barkbrown with small scales, sap white turning darker, foliage leaves 2.5 – 15 cm long (Keay, 1989).

Ficus sur(Forssk)), is used to treat diarrhoea and anaemia as well as sexually transmitted diseases (Irvine, 1961) previous phytochemical screening of some species belonging to the genus *Ficus* have led to the isolation of tannins and saponins (Story, 1998). It is interesting to note that most plant extracts have been reported to possess inhibitory growth and lethal activities on some pathogenic microorganism in vitro (Agumetal 2003 and Oluma and Elaigwu 2006). However search for new antibiotic drugs is continuous as long as resistant strains exist.

The present study was undertaken to examine the antimicrobial activity of *Ficus sur* with a view to providing a rational basis for their medicinal application.

MATERIALS AND METHODS

Plant materials

The bark and leaves of *F. sur* were collected from Gwagwalada, Abuja in February, 2000 and were air dried and reduced to a fine powder.

Extraction of plant materials

The powdered bark (100 g) was extracted with 95% methanol (3.0L) using a sexhlet extractor. The extractor was filtered and evaporated to dryness using a rotavapor to give a dark brown gumming residue (20g). The leaves (100g) on extraction with 95% methanol (3.0L) and evaporation gave a dark syrupy residue (18g).

Antimicrobial Screening of Extracts

The crude methanol extracts of the bark and leaves were each screened *in vitro* for antimicrobial activity against six pathogenic micro-organisms (Table 1) using Agar-Dilution Streak Technique (Mitscher *et al.*, 1972) as follows: The test organism were prepared by incubating them in freshly prepared nutrient broth of 37^{o}C for 8 hours. The cultures were serially diluted with sterile normal saline. 48 mg of the test extract was dissolved in 1ml of 95% methanol and made into 3 ml with sterile distilled water to give a concentration of 16mg/ml of extract. 1ml of the prepared extract was then introduced into 15ml of molten nutrient Agar placed in water at 54^{o}C. These were mixed well and poured into sterile Petri dish plates to give a final concentration of 1000mg/ml of Agar. The plates were then hardened in a refrigerator for 15 minutes. There after the standardized test organism (100 ml each) were inoculated into the nutrient Agar plate and incubated

at 37°C for 24-45 hours. The positive controls used were griseofulvin (1%) for the fungus and phenol (19%) for the bacteria. Inhibition was determined by measurement of zone inhibition. The results of the tests done in triplicate are shown in Table 2.

Phytochemical Screening of Extracts

The materials under investigation were also screened for their phytochemical properties such as alkaloids saponins, saponins glycosides, tannins, authroquinones, glycosides, flavonoids, volatile oils, phenols, steroids using standard procedures (Trease and Evans, 1989 and Harbone, 1993).

RESULTS

Four of the test organisms were inhibited by the methanol extracts of both the leaf and the stem bark as indicated in Table 1 at 2mg/ml while the one that the extract had no inhibition on were *Pseudomonas aeruginosa* and *Salmonella typhimorium.* However, the spectrum of activity of the leaf extract was relatively lower than that of the stem bark extract, which was confirmed in minimum inhibitory concentration result in Tables 3, 4.

Both the leaf and stem bark extract had inhibitory effect of same micro organisms which went down to 0.5 mg/ml in stem bark as against 1.0mg/ml of leaf extract. This makes this plant of important interest, since generally leaf extract are not as active as their stem bark at crude level. It means the leaves of *Ficus sur* contain bioactive substances that are probably responsible for the test organism susceptibility to it.

The active components of the extract are distributed through the plant i.e in the leaves as well as stem bark. This was reflected in the phytochemical screening in Table 5.The stem bark contained saponins, saponin glycosides, steroids and tannins, while the leaf extract contained as above but differs in its phenol and volatile oil component which were absent in the stem extract.

Comparative test revealed that Gentamicin at 0.01 mg/ml inhibited test organisms in table 6. The minimum inhibitory concentration of the stem bark is 0.5mg/ml which indicates that the crude extract has 50% strength of Gentamicin. However, no effect was shown on *C. pseudotropicalis* because the control Gentamicin was an antibacterial.

Table 1: Antimicrobial activity of methanol leaf and bark extract of *Ficus sur* in mg /ml

Organisms	Leaf extract 2mg/ml	Bark extract 2mg/ml
Pseudomonas aeruginosa	_	_
Candida pseudotropicalis	+	+
Esherichia coli	+	+
Staphylococcus aureus	+	+
Bacillus subtilis	+	+
Salmonella typhimorium	_	_

Key: + Presence of activity (No growth)
_ Absence of activity (presence of growth)

Table 2: Minimum inhibitory concentration methanol leaf extract of *Ficus sur* in mg/ml

Organisms	**Concentration of extract (mg/ml**				
	0.5	1.0	1.5	2.0	2.5
P. aeruginosa	_	_	_	_	_
C. pseudotropicalis	_	+	+	+	+
E. coli	_	+	+	+	+
S. aureus	_	+	+	+	+
B. subtilis	_	+	+	+	+
S. typhimorium	_	_	_	_	_

Table 3: Minimum inhibitory concentration of methanol extract (stem bark) in mg/ml

Organisms	**Concentration of extract (mg/ml**				
	0.5	1.0	1.5	2.0	2.5
P. aeruginosa	_	_	_	_	_
C. pseudotropicalis	+	+	+	+	+
E. coli	+	+	+	+	+
S. aureus	+	+	+	+	+
B. subtilis	+	+	+	+	+
S. typhimorium	_	_	_	_	_

Table 4: minimum inhibitory concentration values of the leaves and stem bark extract in mg/ml

Plant Parts Used	Organisms					
	Pa	Cp	Ec	Sa	Bs	St
Methanol extract (stem bark)	_	0.5	0.5	0.5	0.5	_
Methanol extract (Leaves)	_	1.0	1.0	1.0	1.0	_

Key: Pa - *Pseudomonas aeruginosa*
Cp - *Candida Pseudotropicalis*
Ec - *Escherichia Coli*
Sa - *Staphylococcus aureus*
Bs - *Bacillus substilis*
St - *Salmonella typhimorium*

Table 5: Phytochemical Screening of *Ficus sur* leaf and bark extract.

Secondary Metabolites	Stem Bark	Leaves
Saponins	+	+
Saponin glycosides	+	_
Alkaloids	_	_
Steroids	+	+
Triterpenoids	_	_
Flavonoids	_	_
Glycosides	_	_
Tannins	+	+
Volatile oils	_	+
Hydrolysable tannins	_	_
phenols	_	+

Key: + = Presence of secondary metabolites
_ = Absence of secondary metabolites

Table 6: Comparative Minimum Inhibitory Concentration

Extract	Concentration	Organisms					
		Pa	**Cp**	**Ec**	**Sa**	**Bs**	**St**
Stem bark	0.5mg/ml	+	_	_	_	_	+
Leaf extract	0.1mg/ml	+	_	_	_	_	+
Control Drug (Gentamicin)	0.01mg/ml	_	_	_	_	_	_

DISCUSSION

The whole study was at crude level and the plant parts were still found active especially the leaf extract. Thus, this indicates that extracts could be used in the treatment of diseases caused by organisms, for example supportive infections like boils, superficial infection such as skin pustules, conjunctivitis, septicaemia, intestinal diseases, food poisoning, surgical wounds and burns, acute bacterial endocardities and bacteremia (Akpulu *et al.,* 1994). If this plant extract could be purified it could be quite close or even compete with the universal antibiotic streptomycin.

In conclusion, it is recommended that further studies should be undertaken on this plant to help discover the hidden therapeutic properties of this plant if we sincerely believe nature heals and cures, and our natural medicines are so rich and wonderful in their storage of active constituent. Further work should also attempt to isolate and screen pure components and also enquire to know the various bio-active components and those actually responsible for the inhibition of specific microbes. This is expected to be highly enhanced when tested as pure sample and may compare favourably with existing anti-infective agents.

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