IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

ANTIMICROBIAL EFFECTS OF STEM BARK EXTRACTS FROM FICUS SYCOMORUS ON SHIGELLA DYSENTERIAE AND STAPHYLOCOCCUS AUREUS

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ABSTRACT

A study was conducted to determine the antibacterial effects of *Ficus sycomorus* on *Shigella dysenteria*, and *Staphylococcus aureus*, after determining the phytochemical composition. Disc diffusion plate method was employed in the antibacterial property determination. The phytochemical screening revealed the presence of alkanoids, flavonoids, tannins, reducing sugar, saponins and steroids. Both Aqueous and ethanolic extracts had the best activities at 15 mg/ml with 6.1, 6.0, 3.7 mm and 8.1, 7.0, 4.7±0.42mm against S. *aureus* and S *dyenteria* respectively. The least effect was by 5 mg/ml treatments of both aqueous and ethnolic extracts with 2.5 and 3.3 mm, respectively. The 10 mg/ml treatments had values close to those of the positive control. The results therefore indicate a positive antibacterial activity of *F. sycomorus* which lend a support to the usage in traditional herbal medicines, and can be included in further investigation with a view to treat diseases caused by these pathogenic bacteria.

Key words: *Ficus sycomorus*; S. *aureus*; *S. dysenteria*; Antibacterial

I. INTRODUCTION

Investigation into the efficacy of plant-based drugs has been paid great attention because of the few or no side effects, cheap cost and easy availability (1). According to WHO, 25 % of pharmaceutical drugs are made from plants that were first used as traditional medicine (2). The *in vitro* antibacterial or antifungal assay is the first aim to evaluate the importance of these plants since the antibiotic resistance has become a global concern (3). The extensive use of plants due to their pharmacological properties is quite common. Natural products are preferred for biological screening based on ethno-medical use of plants because many infectious diseases are known to have been treated with herbal remedies throughout the history of mankind (4).

Ficus sycomorus L. belongs to Moraceae, a family that is reputable for medicinal values, and consists of about 40 genera and over 1,400 species of trees, shrubs, vines and herbs, often with milky latex (5). F. *sycomorus* , also called Baure or Bore in Hausa language is found near streams in savanna area. It is a tree that attains a height of 20 m with widely spreading branches and a massive crown, whose foliage is eaten by cattle and sheep (6). The Hausa and Fulani tribes of Northern Nigeria use the stem bark to treat diabetes mellitus. Traditionally, a single plant may be used for the treatment of various disease conditions, depending on the community. Several ailments including fever, asthma constipation oesophagal cancer and hypertension have been treated with traditional medicinal plants (7).

The plants are applied in different forms such as poultices, concoctions of different plant mixtures, infusions as teas or tinctures or as mixtures in porridges and soups.. they are administered in different ways including oral, nasal (smoking, snuffing or steaming), topical, as lotions or creams; bathing or rectal (enemas). Different plant parts and components such as roots, leaves, stem

barks, flowers, or their combinations and essential oils have been employed in the treatment of infectious pathologies in the respiratory system, urinary tract, gastrointestinal and biliary systems as well as on the skin (8).

Shigella dysenteriae is a gram negative non spore forming *Baccilus* rod. It has no flagella or any locomotive means. It does not produce gas when breaking down carbohydrates. Humans are the only hosts of *Shigella* and the dysentery it causes usually strikes pre-school age children and populations in nursing homes, and areas of overcrowding and poor sanitation (developing countries). Its transmission is fecal-oral. Symptoms of dysentery due to this organism include mild to severe diarrhea, which is sometimes bloody or watery and accompanied also by fever and nausea. Symptoms of the disease generally show between 12 – 19hrs after infection. It produces the shiga toxin which can be partly responsible for the bloody diarrhea. The organism can be treated successfully with antibiotics such as ampicillin and ciprofloxacin in severe cases.

The bacterium *S. aureus* is a Gram-positive, true facultatively anaerobic, non-spore forming spherical bacterium belonging to the *Staphylococcus* genus. It causes staphylococcal food poisoning, a form of gastroenteritis with rapid onset of symptoms (8). It causes disease by infecting tissues typically creating abscesses and/or by producing toxins A. Commonly found in the environment (soil, water and air) S. aureus is also present in nose and on skin of humans (9).

II. MATERIALS AND METHODS

Extract preparation was according to the procedure described by (10). Fresh bark was air dried at room temperature in the absence of sunlight and later grounded to powderus8ng mortar and pestle, to a constant weight and stored in plastic container. Fifty grams of the powder was used to obtain diluted aqueous and ethanolic concentrations of 50 mg/ml, 100 mg/ml and 150 mg/ml and then stored in sealed conical flasks for 72hrs.

Test organisms were collected from Sir Yahaya Memorial hospital Birnin Kebbi and sub cultured using *Staphylococcus* and *Shigella* agars. Puncher was used to bore 6.5mmdiscs from cardboard papers, sterilized in hot air oven at 100^{o} C for 1hr, then soaked with the different concentrations of extracts after cooling. Test organisms were inoculated aseptically into 4 different agar plates by streaking method, labeled appropriately before the discs were placed in the plates. The plates were incubated at 37^{o} C for 24 hrs before observations commenced. Phytochemical analysis was according to the method of (11).

III. RESULTS AND DISCUSSION

Table 1 shows the presence of flavonoids in higher quantities than other phytochemicals, especially from the alkaline reagent test. The phytochemicals were all observed to be moderately present in the plant extracts. This is in conformity with the findings of (12).the phytochemical screening showed that the extract contained alkaloids in mild concentrations in both the aqueous and ethanoloic extracts. Flavonoids were found to be present in high concentrations from the aquous extract, but in mild concentrations in the ethanolic extract using the shinoda test. The reverse was, however observed using the alkaline reagent. The presence of reducing sugars, saponins, steroids and tannins was also recorded. They were however not observed in high concentrations.

Table 1: Phytochemical constituent of F. *sycomorus*

Phytoconstituents	Aqueous extract	Ethanolic extract
Alkaloids		
a. **Wagner test**	+ +	+ +
b. **Hager's test**	+ +	+ +
Flavonoids		
a. Shinoda test	+ ++	+ +
b. Akaline reagent	+ +	+ ++
Reducing sugar	+ +	+ +
Saponins test	+ +	+ +
Steroid test	+ +	+ +
Tannins test	+ +	+ +

Key: + + present in mild condition + + + present in high concentration

In Table 2, the antimicrobial activity revealed the efficacy of the extracts to be more pronounced at the highest concentrations of 150 mg/ml, showing more efficacy than the positive control on S. *aureus*, with a very close effect on S. *dysenteriae*. Significant differences were shown between all the categories of treatment, with the 50mg/ml being the least effective. The potential antibacterial activity of the plant *Ficus* species has been extensively reported in many investigations (13; 14; 15; 16;17; 18; 19).

Table 2; Antimicrobial activity of aqueous extract of *F. sycomorus* bark

Concentration	*Shigella dysenteriae*	*Staphylococcus aureus*
50mg/ml	2.5 ±0.71[a]	4.5 ±0.98[b]
100mg/ml	3.1 ±0.53[a]	5.3 ±0.82[c]
150mg/ml	3.5 ±0.33[b]	6.0 ±0.42[d]
Pc	3.7 ±0.44[b]	5.5 ±0.47[c]

Key; Pc positive control Nc negative control

Table 3: Antimicrobial activity of ethanolic extract of *F. sycomorus* bark

Concentration	*Shigella dysenteriae*	*Staphylococcus aureus*
5mg/ml	3.3 ±0.60[a]	5.4 ±0.80[a]
10mg/ml	4.1 ±0.53[b]	6.5±0.53[b]
15mg/ml	4.7±0.42[c]	7.0±0.51[c]
Pc	5.0±0.53[d]	5.5 ±0.42[d]
Nc	0.00	0.00

KEY; Pc positive control; Nc negative control

Very impressive inhibition of growth by the ethanolic extracts by all concentrations is shown in Table 3. However, the effects were more pronounced on S *aureus* where the 100 mg/ml and 150 mg/ml performed better than the positive control. The inhibition of growth by the extracts on S *dyesnteriae* was not as pronounced as the S. *aureus*, but the 150 mg/ml performed at a rate very close to that of the positive control. This finding is corroborated by (20), who reported that acetone extracts of *F. sycomoras* bark exhibited higher antimicrobial activity than that of methanol, and that the control drugs had lower inhibition than those of the both plant extracts.

IV. CONCLUSION AND RECOMMENDATIONS

The research concludes that both aqueous and ethanolic extracts had inhibitory effects on the two test organisms but the ethanolic extract was observed to be more effective. The plant was also reported to possess the active phytochemicals that are reported to be responsible for efficacy in control of different bacteria. The traditional use of the plant in various diseases control should be more exploited with a view to finding the most effective phytochemical constituents that are active against specific ailments for the benefit of drug development.

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