

Phytochemical and Antimicrobial Screening of *Ficus platyphylla* against Human/Animal Pathogens.

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ABSTRACT

Ethanol and water extracts of *Ficus platyphylla* were screened for their phytochemical and antimicrobial activity against *Bacillus subtilis*, *Escherichia coli*, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, *Streptococcus spp.* and *Salmonella spp.* The results indicated that saponins, tannins, and volatile oils were present while flavanoids, glycosides, alkaloids, and resin were absent. The roots and stem-bark of the ethanol extract was active on most of the pathogens. But for *Staphylococcus aureus*, all the other microbes developed resistance against the water extract. This attests to the fact that *Ficus platyphylla* contains bioactive compounds of potentially therapeutic and prophylactic significance and thus could be a promissory candidate for drug development and validates folkloric claim, as a cure for tuberculosis and other bacterial and fungal infections.

(Keywords: *Ficus platyphylla*, phytochemical, antimicrobial activity, *Staphylococcus aureus*, *Pseudomonas aeruginosa*, flavonoids)

INTRODUCTION

In Yola, Northeastern Nigeria, tuberculosis is a health challenge (FHI, 2001; Nwankwo *et al.*, 2005; Emokpae *et al.*, 2006). *Ficus platyphylla* possesses medicinal properties that are effective in the management of tuberculosis, cough and other ailments (kubmarawa *et al.*, 2007).

Plants are used medicinally in different countries and are a source of many potent and powerful drugs (Srivastava *et al.*, 1996).

Most of the developing countries have adopted traditional medical practice as an integral part of their culture. The United Nation Commissions of Trade and Development (UNCTAD) indicated that

with the addition of microbes, sixty percent (60%) of medicinal products are of plant origin (Sofowara, 1981). Eighty percent (80%) of present day medicines are directly or indirectly derived from plants known to have been investigated pharmacologically out of an essential (250-500) thousand species of higher plants growing on earth (Farnsworth, *et al.*, 1977 and Borris, 1996). Plants remain the primary source of many important drugs in orthodox medicine today. For instance, there are over 50 commercially available anticancer drugs (excluding endocrines) approved by USFDA which are significantly based on natural products. Taxol, approved in 1992 and semi synthesized in 1995, is a natural product from the Pacific Yew tree *Taxu brevifolia*, for the treatment of ovarian arid breast cancer (Clark, 1996).

Super Cissus RX™ from *Cissus quadrangularis* relieves pain, rebuilds tendons, and ligaments, without damaging effects like *ibuprofen* (Udupa, *et al.*, 2003 and Chopra. *et al.*, 2004). The active principles of many drugs found in plants are secondary metabolites (Ghani, 1990; Dobelis, 1993). Therefore, basic phytochemical investigation of these extracts for their major phytoconstituents is vital.

Ficus platyphylla (Meliaceae), *gamji*, in Hausa, and *ogbagba* in Yoruba, is a Savanna tree of about 18m high, 6m in girth, with large widely spreading branches and broad crown. The bark is rusty red, flaking off in scattered patches and grey beneath; slash pink. Branchlets very stout; twigs, stipules and young foliage finely velvety. Leaves are 7-40 cm long by 10-28 cm broad, mostly broadly elliptic, round or blunt at the apex and narrowly cordate; thick finely velvety or glabrous (Irvine, 1961; Keay *et al.*, 1989).

It is highly reputed for its numerous medicinal uses and has been reported to be used

indigenously in the treatment of tuberculosis, and trypanosomiasis (Atawodi *et al.*, 2001). The plant has also been reported to possess an *in vitro* anti-trypanosomal activity (Wurochekke and Nok, 2004; Atawodi, 2005).

In the present study, ethanol and water extracts from *Ficus platyphylla* were screened for phytochemical constituents and antimicrobial activity against Gram-positive and gram-negative human / animal bacteria, with the view to making sure that its claimed curative property on tuberculosis be ascertained. This paper is also aimed at sourcing natural therapeutics whose chemotherapeutic index equals or surpasses that of the present-day odotox medicine and also bringing the drug closer to the patient.

MATERIALS AND METHODS

Sampling

Fresh samples of the roots, stem- bark, and leaves of *F. platyphylla* were collected in June, 2006 from the Northeastern States (Adamawa and Gombe) Nigeria. Identification was done by the Forestry Department of Federal University of Technology Yola. The samples were air dried in the laboratory before pounding to a fine powder using pestle and mortar to a mesh size of about 60 and then stored in a dry container.

Extraction

180g each of the powdered roots, stem-bark and leaves of the plant were percolated with 2L of distilled ethanol for two-weeks. After which there was decantation, filtration, and concentration on rotary evaporator (R110) at 40°C to obtain ethanol soluble fractions, (F_{E01}), labeled, F_{E0R} (09g), F_{E0S} (10g) and F_{E0L}. (07g) respectively. A portion of each was used for the phytochemical screening while the other kept in the refrigerator for the sensitivity test.

The above procedure was repeated on 250g each with the use of 2L of water, giving the following fractions, F_{W01}, labeled, F_{W0R} (10g), F_{W0S} (11g), F_{W0L} (09g) respectively.

Phytochemical Screening

Phytochemical screening for major constituents was undertaken using standard qualitative methods as described by Fadeyi *et al.* (1989), Odebiyi and Sofowora (1990), and Harborne, (1992), Abulude *et al.* (2001, 2004) and Abulude (2007). Saponins, tannins, flavanoids, volatile oils, glycoside, alkaloids, phenols and resin tests were conducted in all the fractions. Results are shown in Table 1.

Preparation of Culture Medium and Inoculation

Six bacteria species: *Staphylococcus aureus*, *Streptococcus spp*, *Escherichia coli*, *Pseudomonas aeruginosa*, *Salmonella spp*, and *Bacillus subtilis*, stock cultures were collected from the Specialist Hospital, Yola. These organisms were identified in the Microbiology Department, Federal University of Technology, Yola.

The stock were maintained on nutrient agar slant and sub –culture in nutrient broth for incubation at 37°C prior to each antimicrobial testing. Inoculation of the test organisms on nutrient agar-prepared plates was achieved by flaming a wire loop on a spirit lamp, cooling the wire loop (air cooling) and fetching the test organisms. The discs were prepared using a what-man filter paper. 100 discs were obtained by punching and putting in vials-bottles and sterilizing in an oven at 150°C for 15 minutes.

Prepared disks containing the various fractions were carefully placed on the inoculated plates using a sterilized forceps in each case. (Fatope, 1993) The plates were then turned upside-down and incubated at 37°C for 24hours in an incubator.

Scoring and Reading

The result was taken by considering the zone of growth and inhibition of the organisms by the test fractions (Mackie and McCartney: 1989). Activity and inactivity were observed in accordance with the standard and acceptable method. Results are shown in Table 2.

RESULTS AND DISCUSSION

Table 1: Results of Phytochemical Analysis of Extracts from Roots, Stem-Bark, and Leaves of *F. platyphylla*

Chemical Compounds	Water Extract			Ethanol Extract		
	Root	Stem-bark	Leaves	Root	Stem-bark	Leaves
Saponnins	+	+	+	+	+	+
Tannins	+	+	-	+	+	+
Flavanoids	-	-	-	-	-	-
Volatile oils	+	+	-	-	+	+
Glycoside	-	-	-	-	-	-
Alkaloids	-	-	-	-	-	-
Phenols	-	-	-	+	+	+
Resin	-	-	-	-	-	-

Key: Absent (-); Present (+)

Table 2: Antimicrobial Efficacy of Different Extracts of Roots, Stem-Bark and Leaves of *F. platyphylla* Against Human/Animal Pathogens, (Zones of inhibition in millimeters).

Plant	Fraction		Microorganism					
			<i>S. aureus</i>	<i>S. spp</i>	<i>E. coli</i>	<i>P. aeruginosa</i>	<i>S. spp</i>	<i>B. subtilis</i>
<i>Ficus platyphylla</i>	Water Fraction	Roots	8.4±0.1	R	R	R	R	R
		Stem	R	R	R	R	R	R
		Leaves	12.1±0.2	R	R	R	R	R
	Ethanol Fraction	Roots	08.6±0.4	R	14.2±0.4	14.2±0.0	16.4±0.2	R
		Stem	14.4±0.3	12.3±0.0	14.3±0.7	4.4±0.3	16.2±0.2	12.6±0.1
		Leaves	R	R	10.6±0.8	14.6±0.2	10. ±0.1	R
<i>Control</i>	Gentamicin	21.6±0.1	13.8±0.3	14.6±0.1	9.5±0.10	17.0±0,2	11.5±0.2	

Results: Mean of three trials ± Standard error, R→ Resistance.

From the phytochemical screening, some of the natural products tested for were absent: Flavanoids, glycosides, alkaloids and resin. Phenols were present only in the ethanol extracts. Saponins and tannins were present in both water and ethanol fractions. This shows the generality of the components in medicinal plants. Biological actions are primarily due to these components in a very complicated concert of synergistic or antagonistic activities. Mixtures of such chemicals show a broad spectrum of biological effects and pharmacological properties. To a large extent, the phonological age of the plant, percentage humidity of the harvested material, situation and time of harvest, and the method of extraction are

possible sources of variation for the chemical composition, toxicity and bioactivity of the extracts (Felix, 1982).

Table 2 shows the zones of inhibition (mm) of the various plant parts against the microorganisms. From the table, ethanol extracts are more efficacious, covering nearly the entire spectrum of organisms. The organisms seemed to have developed resistance against the water extracts. However, studies have indicated that certain bioflavonoid have inhibitory activity against human pathogen bacteria (Lin *et al.*, 2001) and other components that acts in similar way as gentamicin, the control. This is the reason for

some of the fractions having more inhibitory effects than the control.

CONCLUSION

This analysis suggests that, the water and the ethanol extracts of the roots, stem- bark and leaves of *F. platyphylla* contain active agent(s) and could be a promissory candidate for drug development and validate the tribal / folkloric claim, as a cure for some human ailments. This assertion is also confirmed, as their extracts indicate a relatively moderate number of phytochemicals. It is suggested that more research be conducted that will further elucidate and characterized the active components and possible mechanism(s) involved in the use of this plants in the ethno medical practices.

RECOMMENDATION

It is desirable that more effort, more research, more support, and more funding be encouraged specially in valorizing our natural patrimony as well as conducting more scientific researches on our local herbs. This will ensure that the entire ethno- flora of the sanctuary be documented in a way that information about sustainable uses of plants is conserved. Our base will thus be strengthened and it will foster greater compatibility between orthodox and ethno medical claims paving the way to the discovery of "lead" compound(s) to our present day ailments. Time and research are the utopia to our African diseases for the cure is at our "back yard".

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