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Research Article

PHARMACOLOGICAL JUSTIFICATION FOR THE ETHNOMEDICAL USE OF ROOTS, STEM-BARK AND LEAVES OF *TAMARINDUS INDICA* PLANT

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Abstract

The ethanol and water extracts of *Tamarindus indica* were screened for their phytochemical and antimicrobial activity against *Staphylococcus aureus, Escherichia coli* and *proteus.* The results indicated that saponnins, tannins, volatile oils, and phenols were present in the roots, stem-bark, and leaves ofethanol extracts. While alkaloids was present in only the stem-bark, and leaves of ethanol extract. Similarly, saponnins, volatile oils, and phenols were present in all the fractions of water extract. Tannins and alkaloids were present in the stem-bark and leaves fractions of the water extract. Flavoniods was completely absent in all the fractions of ethanol and water extracts. The roots, stem-bark, and leaves of ethanol extracts were active against almost all the pathogens, excluding *Staphylococcus aureus* that developed resistance against stem-bark of the ethanol extract. *Staphylococcus aureus, Escherichia coli* and *proteus* developed resistance on the stem-bark and roots of the water extract. Only the leave of the water extract was active against *Staphylococcus aureus, Escherichia coli* and *proteus* this attests to the fact that *Tamarindus indica* contains therapeutic and prophylactic significance and thus could be a promissory candidate for drug development.

Keywords: *Staphylococcus aureus,* Therapeutic, *Tamarindus Indica,* Alkaloids and Extracts.

INTRODUCTION

Plants do not only provide food for human and animals, but other diverse products such as medicines, building materials, textile, gums, resins, waxes, rubbers, perfumes, dyes and tanning materials. Investigation into the chemical and biological activities of plants during the past two centuries have yielded compounds for the development of modern synthetic organic chemistry and the emergence of medicinal chemistry as a major route for the discovery of novel and more effective therapeutic agents. The African continent is one which is endowed with one of the richest biodiversity in the world as abundance of many plants used as herbs, foods and for therapeutic purpose. Great need arises for the evaluation of the constituent pharmacological properties and detailed screening of bioactive substance for chemotherapeutic purpose. Furthermore, investigation into the antimicrobial activities of these plants will show that plants are potential sources of synthesis of drugs (Clark, 1996; Kubmarawa *et al.,* 2009). Tamarind, common name for a tropical evergreen tree, of the legume family, native to fertile areas throughout tropical Africa and southern Asia. The tamarind is a large tree, attaining a height of 24 m (80 ft). The extremely hard wood is used in cabinetwork. The tamarind is cultivated widely in tropical areas of the eastern and western hemispheres as an ornamental tree and for its acidic fruits. The pale yellow flowers, arranged in loose, terminal racemes, have a four-parted calyx, five petals, three fertile stamens, and a solitary pistil. The fruit is a tapering, indehiscent (remaining closed at maturity), many-seeded pod. Tamarind juice mixed with sugar and water is a popular drink in Latin America. The tamarind belongs to the subfamily *Caesalpinioideae*, family *Fabaceae* (formerly *Leguminosae*).

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It is classified as *Tamarindus Indica.* other species of the plant include; *Tamarindus officindis, Tamarindus occidentolis*. (Redmond, 2009).In Nigeria, it is known by various local names such as Awim (Yoruba), Tsamiya (Hausa) and Icheku (Igbo) (Arogba, 1994). Phytochemical studies of the plant has revealed the presence of tannins, saponins, sesquiterpens, alkaloids, and phlobatannins and other extracts active against both gram-negative and gram-positive bacteria (Doughari, 2006). In the native practice, *Tamarindus Indica* is used as a gargle for sore throat and is applied as a liniment for rheumatism. The *Tamarind* leaves are occasionally usedin sub-acid infusions, while a decoction prepared with the leaves is believed to eliminate worms in children. In addition, the decoction is also effective in treating jaundice, and useful as an external treatment for tender ages and ulcers. In the West Indies, people prepare a punch with the fruit blend with a decoction prepare with porage to alleviate the burning sensation during urination. The liquid derived from slewing of the plant can be used a laxative drink and the fruit is been found to be useful in healing some types of sore throat conditions. Throughout Asia and Africa, the *Tamarind* plant is common for health remedies, in northern Nigeria, fresh stem-bark and leaves are used as decoction mixed with potash for the treatment of stomach disorders, general body pain, yellow fever and as a blood tonic and skin cleanser. Studies have revealed that the plant parts could be in future if properly investigated upon be useful in drugs development and in the field of medicine for some human ailment. It is an important ingredient in cardiac and blood sugar reducing medicine, their medical actions and uses are observed in cathartic, astringent, febrifuge, and antiseptic. The seed coat extract is a polyphenolic flavonoid that has been shown to have anti-oxidant properties; the seed extract also possesses anti-snake venom properties. The bark extract also is used for diarrhoea, bathing with an infusion of the boiled leaves help against disorders such as scabies. Afresh leaves is applied to swellings

and boils and for relieving pains. The flower is used in inflammatory infections of the conjunctiva, the bark is astringent and is given in diarrhoea cases (Morton, 1987; Doughari, 2006; Haslam, 1996; Klink, 1997). In Nigeria, particularly in the north western part, *Tamarindus Indica* is used in traditional medicine practices. The plant extract are said to posses antiviral, and antiseptic properties and is used to treat certain infections such as Bacterial skin infections, boils, diarrhoea, dysentery and urinary tract infections that are caused by bacteria. The plant extract is also used to treat gingivitis, keratitis, jaundice, leprosy and is used as a disinfectant.

The *tamarind* is used as medicine for gastric and/or digestion problems and also in cardio-protective activity. And also, in animal studies, *tamarind* has been found to lower serum cholesterol and blood sugar levels due to a lack of available clinical trials, there is insufficient evidence to recommend *tamarind* for the treatment of hypercholesterolemia (high cholesterol or diabetes) (Mason, 1987; Morton, 1987). In the present study, ethanol and water extracts from the roots, stem-bark and leaves of *Tamarind Indica* were screened for phytochemicals constituents and antimicrobial activity, with the view to making sure its claimed curative property on ailments is ascertained. This paper also aimed at sourcing natural therapeutics whose chemotherapeutic index equals or surpasses that of the present-day orthodox medicine and also bringing the drugs closer to the patient.

MATERIALS AND METHODS

Sampling

Fresh samples of the roots, stem-bark and leaves of *Tamarindus indica* were collected from Gombi Local Government Area in Adamawa State and were identified by Dr D. A. Jauro of the Department of Forestry, Modibbo Adama University of Technology, Yola. The leaves, stem- bark and roots were air-dried in the chemistry laboratory of Modibbo Adama University of Technology, Yola. The dried plant materials were ground into fine powder using pestle and mortar. Each ground sample was weighed and then stored in a dry container at ambient temperature.

Extraction

120 g each of the powdered roots, stem-bark and leaves of the plant were percolated with 1.5 L of ethanol for five days. After which there was decantation, filtration and concentration on rotary evaporator model R110 at 40^{O}C to obtained ethanol soluble fractions. A portion of each was used for the phytochemical screening while the other kept in the refrigerator for the antimicrobial test. The above procedure was repeated on 120 g each of the powdered roots, stem-bark and leaves of the plant with the use of 1.5 L of distilled water.

Phytochemical screening

Phytochemical screening for major constituents was undertaken using standard qualitative methods as described by (Fadeyi *et al.,* 1989), (Odebiyi and Sofowora, 1990), (Harborne, 1992) and (Abulude, 2007). Saponnins, tannins, flavonoids, alkaloids, volatile oils, glycosides, phenols and resins test were conducted in all the fractions.

Test for Saponins

5ml of extract was vigorously shaken with 10ml of water in a test tube. Frothing which persisted was taken as an evidence for the presence of saponins.

Test for Tannins

Extract plus 4ml of water and drops of ferric chloride. Immediate green precipitate was taken as evidence for the presence of tannins.

Test for Flavonoids

Extracts plus small quantity of Magnesium chips plus drops of concentrated hydrochloric acid down the side of test tube. Reddish colouration was taken as evidence for the presence of flavanoids.

Test for Alkaloids

2 ml of the extract plus picric acid. An orange colouration was taken as evidence for the presence of alkaloids.

Test for Volatile oils

Extract was dissolved into 90% ethanol and two drops of ferric chloride were added. Green colourations were taken as an indication for the presence of volatile oils.

Test for Phenols

Equal volume of the extract was added to equal volume of ferric chloride, a deep bluish green solution was taken as a positive test for the presence phenols.

Test for Glycosides

5ml of extract plus 25ml of dilute sulphuric acid were poured into a test tube. The mixture is boiled for 15 minutes, cooled and neutralized with 10% sodium hydroxide and 5 ml of Fehling A and Bwas added. Brick red precipitate is a positive test for the presence of glycosides

Test for Resins

2 ml of extract plus equal volume of acetic anhydride solution plus two drop of concentrated sulphuric acid. A violet colouration was taken as an indication for the presence of resins. The results of the phytochemical screening for the ethanol and water extracts are shown in table 1 and 2 respectively.

Antimicrobial Investigation

Three microorganisms; *Escharichia coli, Staphylococcus aureus, and Proteus.*, the stock cultures were collected from specialist hospital, Yola, Adamawa State. These organisms were identified in the Microbiology Department, Modibbo Adama University of Technology, Yola. The stocks were maintained on nutrient agar slant and sub-culture in nutrient both for incubation at 37^{o}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 Whitman filter paper and putting in vials-bottles and sterilizing in an oven at 150^{o}C for 15 minutes. Prepared discs containing the various extracts were carefully placed on the inoculated plates using a sterilized forceps in each case (Fatope, 1993). The plates were then turned upside-down and inoculate at 37^{o}C for 24 hours in an incubator. After incubation, the inoculated plates were observed for zones of inhibition (in mm diameter). The result was taken by considering the zone of growth and inhibition of the organisms by the test fractions (Mackie and McCartney, 1989). Results are shown in table 3 and 4. Gentamicin was used as a reference standard (control).

RESULTS AND DISCUSSION

Table 1. Phytochemical analysis of ethanol extracts from the roots, stem-barks and leaves of the *Tamarindus indica*

Bioactive Compounds	Roots	Stem-Barks	Leaves
Saponnins	+	+	+
Tannins	+	+	+
Flavanoids	_	_	_
Volatile Oils	+	+	+
Phenols	+	+	+
Alkaloids	_	+	+

Key: Absent (-), Present (+)

Table 2. Phytochemical analysis of water extracts from the roots, stem-barks and leaves of the *Tamarindus Indica*

Bioactive Compounds	Roots	Barks	Leaves
Saponnins	+	+	+
Tannins	_	+	+
Flavanoids	_	_	_
Volatile Oils	_	+	+
Phenols	+	+	+
Alkaloids	_	+	+

Key:(+) Present: (-) Absent

Table 3. Microbial efficacies of ethanol extract of roots, stem-bark and leaves of *Tamarindus Indica* against pathogens (zones of inhibition in millimetres)

Plant Parts	Microorganisms		
	Staphylococcus aureus	*Escherichia coli*	*Proteus*
Stem-Barks	R	16.2±0.1	10.1±0.1
Leaves	15.2±0.1	17.3±0.3	18.4±0.3
Roots	16.4±0.1	18.1±0.3	16.2±0.3
Control/(Gentamicin)	15.2±0.3	18.1±0.3	17.1±0.1

R= Resistance

Table 4. Antimicrobial efficacy of water extract of roots, stem-barks and leaves of *Tamarindus Indica* against some pathogens (zones of inhibition inmillimetres)

Plant Parts	Microorganisms		
	Staphylococcus aureus	*Escherichia coli*	*Proteus*
Roots	R	R	R
Stem-Barks	R	R	R
Leaves	20.1±0.3	18.2±0.3	17.2±0.1
Control/(Gentamycine)	15.2±0.3	18.1±0.3	17.1±0.1

R= Resistance

The phytochemical analysis of the ethanol and water extracts from the root, bark and leaves of *Tamarindus Indica* plant is shown in the Table 1and 2. Table 3 and 4 shows the antimicrobial activities of ethanol and water fractions from the plant against some human/animal pathogens. From the phytochemical screening (Table 1and 2)shows that most of the natural products tested for were present in both ethanol and water fractions: tannins, saponnins, volatile oils, phenols and alkaloid. Flavanoids were completely absent in both the ethanol and water extract. This shows the generality of component in medicinal plant. Mixture of such chemical shows a broad spectrum of biological effect and pharmacological properties. Table 3 and 4 shows the zone of inhibition (mm) of the various plant parts against the microorganisms. The ethanol extracts were more efficacious, covering nearly the entire spectrum of organisms while the water extract shows that most of the organisms seen to have developed resistance.

Conclusion

The analysis indicated that, the ethanol and water extract of the roots, stem-barks, and the leaves of the T*amarindus indica* plant contains active agents and could be a promissory source of drug development. This assertion is also confirmed as extract indicate a relatively moderate number of phytochemical and antimicrobial strength.

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