ANTIBACTERIAL PROPERTIES OF TAMARINDUS

*Kusuma Dorcas, Praneetha Palakodeti, Harshitha Yadav, Vidyarani Yerra, Varshini Majjiga

Department of Microbiology, Kasturba Gandhi Degree and P.G College for Women, West Marredpally, Secunderabad, Telangana, India. 500026

DO: http://dx.doi.org/10.24327/ijrsr.2020.1105.5347

ARTICLE INFO

Article History:
Received 15th February, 2020
Received in revised form 7th March, 2020
Accepted 13th April, 2020
Published online 28th May, 2020

Key Words:
Antibacterial activity, Leaf extracts, Fruit extracts, Phytochemical screening, Bacteria.

ABSTRACT

Plants are common source of antimicrobial agents. *Tamarindus* is a cheap and an easily available plant in India. The antibacterial activity of leaf and fruit extracts of *Tamarindus* using methanol, ethanol, isopropanol and aqueous extracts were studied against five different bacteria; *Escherichia coli*, *Staphylococcus sp.*, *Pseudomonas sp.*, *Bacillus sp.* and *Klebsiella sp.* by agar well diffusion method. In leaf extract, *Klebsiella sp.*, *E.coli*, *Staphylococcus sp.* and *Pseudomonas sp.*, the ethanol extract showed best antibacterial activity, while in *Bacillus sp.* methanolic extracts showed better activity. In fruit extract, isopropanol extracts showed best antibacterial activity. The phytochemical screening of fruit extract has revealed the presence of carbohydrates, flavonoids, alkaloids and vitamin C whereas the studies in leaf extract has revealed the presence of alkaline reagents, flavonoids, lead acetate, alkaloids and vitamin C. This study reveals the possible use of this plant in drug development, for human consumption in treatment of various infections.

INTRODUCTION

Plants have not only provided mankind with food, clothing, flavors, cosmetics, fumigants, etc., but also have served humanity in the treatment of ailments (Mbatchou et al., 2011). Traditional medicine is the sum total of knowledge, skills and practices based on the theories, beliefs and experiences indigenous to different cultures that are used to maintain health as well as, diagnose, improve, or treat physical and mental illness (WHO fact sheet, 2008). The World Health Organization (WHO) reported that 80% of the emerging world’s population relies on traditional medicine for therapy, particularly herbal remedies (Chintamumnee, 2012). Herbal medicines include herbs, herbal materials, herbal preparations and finished herbal products that contain various parts of plants or other plant materials as active ingredients. *Tamarindus indica* (tamarind) is a leguminous tree belong to the family Fabaceae that is native to tropical Africa. *Tamarindus indica* is derived from the Arabic Romanized name ‘Tamhrind’ (Indian date) which is a tree belonging to the family Fabaceae. The genus *Tamarindus* is having only a single species. Tamarind tree produces a ‘pod like fruit’ which contains safe to eat pulp that is used in cuisines around the world. Because of its several uses, its nurturing has spread around the world in tropical and subtropical zones. Antimicrobial property of various areal parts, leaf, stem bark and fruit of *Tamarindus* have been reported (Waghmare Shital et al., 2010; Islam Ara N Monirul 2009; Daniyan and Muhammad 2008). The phytochemicals work in the human system and due to their therapeutic properties cure many ailments which cannot be cured by the modern drugs (Rahman et al., 2001).

Today India is the largest producer of Tamarind. The fruit is an ‘indehiscent legume’. Sometimes called a pod, 12-15 cm in length, with a hard, brown shell (Doughari, 2006; Christman, 2010). The fruit has a fleshy, juicy, acidic pulp. It is a mature fruit when the flesh is coloured brown or reddish brown. The fruit is best described as sweet and sour in taste and is high in ‘Tartaric acid, sugar, vitamin B and unusually for a fruit, calcium’. *Tamarindus* has been used traditionally, to treat many diseases in different parts of the world (Doughari, 2006). Tamarind is also used as a raw material for the microbial production of citric acid (Singh, 2007). Sometimes pulp is fermented into an alcoholic beverage (FAO (1988) cited in El-Siddig et al., 2006). Every part of *Tamarindus* plant (root, body, fruit and leaves) not only has rich traditional value and has broad treatment area in medicine, but also has industrial and cost-effective importance. Tamarind leaves possess a strong in vitro antibacterial activity against more than 13(81%) common Gram positive and Gram negative bacteria that were

*Corresponding author: Kusuma Dorcas
Department of Microbiology, Kasturba Gandhi Degree and P.G College for Women, West Marredpally, Secunderabad, Telangana, 500026
tested (Melendez and Capriles, 2006). The latter also reports that the Tamarind leaf extract was very effective against *E. coli*, not much is known, however, about the antibacterial components present in the tamarind leaves (Melendez and Capriles, 2006) or the specific component responsible for such activity. Studies of biological/pharmacological activities of some other parts of the plants (leaves, fruit, and stem bark) have also been reported (Adeola, 2010; De Caluwé, 2010; Abubakar, 2010; Nwodo, 2011; Bhutkar, 2011; Gungumjee, 2012; Ramchander, 2012; Bhadoriya, 2012; Gupta, 2013; Koyagura, 2013; Meher, 2014). The plant parts have been extensively studied in terms of pharmacological activity of its major compounds and result indicate potent antiadipheal, antioxidant, anti-inflammatory, wound healing and antimicrobial activities (Nikkon et al., 2003).

**MATERIALS AND METHODS**

**Materials Required**

Conical flask, sterile petriplates, pipettes, spreaders, beaters, inoculation loops, measuring cylinders, droppers, test tubes, distilled water, vials, biochemical reagents, forceps, incubator, zonal scale for measuring the zone of inhibition.

**Media**

Nutrient Broth: Peptone 0.5g, Beef extract 0.3g, Sodium chloride 0.5g, Distilled water 100ml, pH 7.

Nutrient Agar: Peptone 0.5g, Beef extract 0.3g, Sodium chloride 0.5g, Agar 2.0g Distilled water 100ml, pH 7.

**Plant Materials**

Fresh Tamarind fruit, Fresh Tamarind leaves are collected from the regions of Hyderabad, Telangana, India.

**Preparation of Extracts**

The fresh leaves and fruits of the plant were shade dried at room temperature till they are dried properly. The dried samples were crushed (from the fruit, the seeds were removed) to smaller granules using mortar and pestle. The granules were further reduced to powder with the use of a laboratory blender. This was done to allow for maximum penetration of extracting solvents (ethanol, methanol, isopropanol, water) into the micronized samples, allowing for the release of active components in the plant materials.

Approximately, 50g of the powdered leaves and fruit was weighed using a balance and dissolved in 500ml of water, ethanol, methanol, isopropanol and water separately (i.e., in the ratio 1:10). The mixtures were agitated for 3 hours and then soaked for 3 days. The soaked materials were filtered into clean containers using Whatman’s No.1 filter paper. The resulting filtrates were evaporated to dryness using a boiling water bath. The yields were separately weighed and kept in a refrigerator for further use.

100mg/ml concentration of the leaf and fruit extracts were prepared using the respective solvents i.e. Aqueous leaf (AL), Aqueous fruit (AF), Ethanol leaf (EL), Ethanol fruit (EF), Methanol leaf (ML), Methanol fruit (MF) Isopropanol leaf (IL) Isopropanol fruit (IF) were prepared in sterile sample bottles by dissolving them.

**Microorganisms**

In vitro antimicrobial activities were examined for aqueous and solvent extracts of leaf and fruit extracts of *Tamarindus*. Microorganisms on which it was investigated are *Escherichia coli*, *Staphylococcus sp.*, *Pseudomonas sp.*, *Bacillus sp.* and *Klebsiella sp.*

**Antimicrobial assay**

The antimicrobial assay was performed by an agar well diffusion method for both aqueous and solvent extracts of leaf and fruit extracts of *Tamarindus*. For agar well diffusion method, a well was prepared in the plates with the help of a cork-borer (0.6 cm) 50µl of the test compound was introduced into the well. The plates were incubated overnight at 37°C. Microbial growth was determined by measuring the diameter of the zone of inhibition. For each bacterial strain controls were maintained where pure solutions (aqueous and solvents) were used instead of the extracts. The result was obtained by measuring the zone diameter. The experiments were done in triplicates and the mean values are presented.

**Phytochemical Screening**

Phytochemical screening was performed to determine the presence of natural products in the extracts obtained from the leaf and fruit of Tamarind using the following standard procedures (Raman, 2006; Harborne, 2005; Satheesh et al., 2012)

**RESULTS AND DISCUSSION**

In the present study, the fruit and leaf extracts of tamarind were tested against the active pure cultures of *E. coli*, *Bacillus sp.*, *Staphylococcus sp.*, *Klebsiella sp.* and *Pseudomonas sp.* Agar well diffusion method was used to determine the extent of antibacterial property. This helps us in knowing the efficiency of that leaf or fruit extract on that particular bacteria. The zone of inhibition as determined by agar well diffusion method varied with the fruit and leaf extract, the solvent used for extraction and the organism tested. Here three different solvent extracts (ethanol, isopropanol and methanol) were tested along with aqueous extracts for both leaf and fruit as shown in Figure 1 and 2. A control was also maintained while carrying out the test.

Figure 1 Antimicrobial activity of leaf extract
Based on the observations, in leaf extract both aqueous and alcoholic extracts are found to be highly susceptible on all the five bacteria. Ethanol extract showed the best antibacterial activity in *Pseudomonas* sp., while with respect to the *Bacillus* sp., methanolic extracts showed the best as shown in Graph 1.

**CONCLUSION**

*Tamarindus* is a rich source of essential phytochemicals. *Tamarindus* leaves and pulp are reported worldwide as antibacterial agents and has numerous health benefits. With aid of modern techniques, it could be used in substantiation based medicine with many health conditions. Further research like antimicrobial assay with extracts of various natural products and with other organic solvents can be performed. The demonstration of broad spectrum of antibacterial activity by *Tamarindus* may help to discover new chemical classes of antibiotic substances that could serve as selective agents for infectious disease chemotherapy and control. This study has opened up the possibility of the use of this plant in drug development, in human consumption for the treatment of different bacterial infections. The affect of this plant on various pathogenic organisms, toxicological investigations and further purification studies however needs to be carried out.

**Acknowledgement**

We thank the Management, Principal and Vice Principal of Kasturba Gandhi Degree and P.G College for Women, W. Marredpally, for permitting us to carry out this work and for allowing us to use the facilities in the Microbiology laboratory.

**References**


Kusuma Dorcas et al., Antibacterial Properties of Tamarindus.


How to cite this article: Kusuma Dorcas et al., Antibacterial Properties of Tamarindus. Int J Recent Sci Res. 11(05), pp. 38618-38621. DOI: http://dx.doi.org/10.24327/ijrsrc.2020.1105.5347

******