Research Article

Preliminary phytochemical study and antibacterial activity of *Tamarindus indica* leaves

Pradeep Vikram¹, Santosh Mishra², Ravikant Vishwakarma², Ajay Kumar Shukla^{2*}

¹Department of Pharmaceutical Science, Guru Ramdas Khalsa Institute of Science & Technology Pharmacy, Jabalpur, India

²Department of Pharmaceutical Science, ITM College of Pharmacy, GIDA Gorakhpur, India

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Abstract

Objective: Preliminary studies on phytochemical and antimicrobial activity of *Tamarindus indica* leaves. **Material and method:** Plant leaves material was collected, washed, dried, coarsely grinded and defatted with petroleum ether and extracted by using ethanol and water. The both extract was taken and performed the preliminary phytochemical tests, powder character and antimicrobial activity on *Staphylococcus aureus*, *Escherichia coli*, *Pseudomonas aeruginosa* and *Salmonella typhi* microorganism, using Amoxicillin as reference standard drug, paralysis and death time was noted. **Results:** Results of the phytochemical studies revealed the presence of alkaloids, glycosides, steroids, flavonoids, tannins and the extracts were active against both gram positive and gram negative bacteria. **Conclusions:** The ethanolic extracts of *Tamarindus indica* Linn leaves were selected and studied for antimicrobial activity. The ethanolic extract of *Tamarindus indica* Linn showed significant results.

Keywords: *Tamarindus indica* Linn, physical constants, microscopy, antimicrobials activity

Introduction

As per World Health Organization (WHO), the medicinal plants are the best source to achieve a wide variety of drugs. Now days it has been observed that in the developed country near about 82% of plants are used traditionally as a medicine. Those plants have been further investigated for superior understanding of their medicinal properties. Natural products are played an vitalrole in both drug discovery and chemical biology. Although various specific plant compounds contain some specific beneficial, some herbs contain lots of active constituents that, together, combine to give the plant its therapeutic effectiveness. The traditional medicine has been established as an alternative system of health care, and the development of microbial resistance to the antibiotics has supported a lot to the researches to find out the potent antimicrobial activity of medicinal plants (Chukwuka et al., 2011; Hammer et al., 1999). By using dissimilar parts of the

plant extract obtained from the roots, barks, stems, leaves and seeds. The practice of herbal medicines can be done in Medical uses. The medicinal plants were used as great antimicrobial agents because it contains a diversity of chemical constituents, that can be resistant to various microbes such as the plant it is possible to synthesize aromatic substances such as phenolic, (e.g. phenolic acids, flavonoids and tannins), the nitrogen compounds (alkaloids, amines), vitamins, terpenoids (including carotenoids) and some other valuable bioactive metabolites and these bioactive metabolites showed plant defense mechanisms against microbes (Ogbulie et al., 2007).

Tamarindus indica it is belongs to family fabaceae. It is a well known tropical evergreen tree of India. All the parts of this plant is very useful such as Its pulp, seed, leaves and bark have been used as herbal medicine and as conventional food. *Tamarindus indica* plant parts have been widely studied in terms of pharmacological activity of its major compounds and result indicate potent antidiarrheal, antioxidant, antiinflammatory, wound healing and antimicrobial activities (Shukla et al., 2018). Tamarind seed gum (TSG) has wide application in the drug delivery (Shukla et al., 2011; Shukla et al., 2019). It has been reported by Shukla et al. (2019) the Tamarind seed

*Address for Corresponding Author:

Ajay Kumar Shukla

Department of Pharmaceutical Science, ITM College of Pharmacy,
GIDA Gorakhpur, India

Email: ashukla1007@gmail.com

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gum (TSG) can be successfully extracted from tamarind seed, using water-solvent extraction method. It can be used in the formulation of sustained release drug dosage form of water soluble and water-insoluble property of drugs. On the basis of the drug release rate profile, Tamarind seed gum (TSG) can be used as release rate retarding membrane of natural origin or as natural excipients for formulation of sustained release drug delivery (Shukla et al., 2018). The objective of study was preliminary studies on phytochemical and antibacterial activity of *Tamarindus indica* leaves against some pathogenic microorganisms.

Materials and methods

Plant materials and sample preparation

Tamarindus indica Linn leaves were collected from local area of Gorakhpur, Uttar Pradesh, India. The plant was identified by the Dr Sandeep Kumar Singh, Department of Pharmacognosy, ITM College Gorakhpur. The leaves were collected from the fresh fruit pulp and were washed carefully and dried for two days at 40°C in an oven. Then the leaves were crushed in an electric grinder to make fine powder. Afterwards the powder was stored immediately in the refrigerator at -20°C and kept in the same temperature up to end of the experiment.

Physio-chemical Parameters

Physio-chemical parameters of the powdered drug such as ash values and extractive values loss on were performed following the method of Anonymous and Indian Pharmacopoeia.

Preparation of extract

The aerial parts of *Tamarindus indica* Linn plant were dried and cursed to make coarse powder. The powder (300gram) was extracted and defatting with 1 liter of petroleum ether (60-80)°C by continuous extraction method for 48hrs, after this marc used for ethanol and water extraction successively (Dubey et al., 2019; Evans et al 2002; Gupta et al., 2002).

Preliminary phytochemical screening

Quantitative preliminary phytochemical tests were performed (Gupta et al., 2013; Harborne et al., 1998; Kokate et al., 1986; Rai et al., 2019).

Chromatographic studies

Thin Layer Chromatography studies were carried by using ethanolic and water extracts to confirm the presence of different phytoconstituents in these extracts. TLC is a mode of liquid chromatography, in which the extract is applied as a small spot at the origin of thin sorbent layer supported on a glass plate. The mobile phase migrates through the stationary phase by capillary action. The separation of solutes takes place due to their differential absorption/ partition coefficient with respect to both

mobile and stationary phases. Each separated component has same migration time but different migration distance. The mobile phase consists of a single solvent or a mixture of solvents. Although, a number of sorbent like silica gel, cellulose, polyamide, alumina, chemically modified silica gel etc. are used, silica gel (type 60) is most commonly used sorbent. Handmade plates are prepared by using techniques like pouring. The retardation factor (R_f) is calculated using following formula:

$$R_f = \frac{\text{Distance traveled by sample from base line}}{\text{Distance traveled by solvent from base line}}$$

Thin layer chromatography

The extracts were subjected to thin layer chromatography for the presence of phytoconstituents. In this technique, the Silica gel-GF254 (for TLC) was used as an adsorbent and plates were prepared by pouring technique, then air dried for an over-night and activated for one hour at 110°C and was using Mobile Phase: Butanol: acetic acid: Water (4:1:5).

Determination of antimicrobial activity

Agar well-diffusion method was followed to determine the antimicrobial activity. Nutrient agar (NA) plates were swabbed (sterile cotton plug) with 8 hour old-broth culture of respective bacteria. Three wells (10mm diameter) were made in each of the plates using sterile cork borer. About 0.3 ml of different concentration of plant solvent extract were added using sterilized dropping pipettes in to the wells and allowed to diffuse at room temperature for two hours. The plates were incubated at 37°C for 18-24 hr for bacterial pathogen. Respective proper controls of solvent plant extracts were also maintained. Diameter of the inhibition zones and the values were recorded (Maneemegalai et al., 2010; Tiwari et al., 2016).

Results and discussion

The loss on drying, ash values likes (Total ash, acid insoluble ash and water soluble ash), ethanol soluble extractive and aqueous soluble extractive of leaf powder are given in table 1.

Table 1. Physical constants for leaves of *Tamarindus indica* Linn

Physical constant	Value
Total ash	4.51%
Acid insoluble ash value	1.52%
Alcoholic soluble extractive value	0.143%
Water soluble extractive value	0.316%

Table 2. Phytochemical investigation of ethanolic and aqueous extracts of *Tamarindus indica* Linn

Name of the test	Ethanolic extract	Water extract
Test for sterols	-	+
Test for glycosides	+	+
Test for alkaloid	+	-
Test for phenol	+	+
Test for saponin	+	+
Test for tannin	+	+
Test for glycosides	+	+

Table 3. Antimicrobial activity of ethanolic extract of *Tamarindus indica* Linn average zone of inhibition (mm)

Micro-organisms	Zone of inhibition (mm)	
	Ethanolic extracts	Amoxicillin
<i>C. albicans</i>	3.29	0.00
<i>E. coli</i>	18.76	19.01
<i>P. aeruginosa</i>	10.19	11.21
<i>S. pyrogenes</i>	14.17	18.11
<i>S. aureus</i>	15.59	30.29

The air dried plant of *Tamarindus indica* were subjected to physical constant determination by using parameters such as total ash, acid insoluble ash value, alcoholic soluble extractive

Figure 1. TLC Profile of ethanolic extract of *Tamarindus indica* Linn

value and water soluble extractive value. The successive extraction of powder of *Tamarindus indica* leaves by using petroleum ether, ethanol and water with soxhlet method. All the three extracts were evaluated and were found to be ethanolic extracts having highest potential chemical constituents. The phytochemical analysis of ethanolic extracts showed the presence of glycosides, alkaloid, phenol, saponin and tannin etc. The different solvent system with different polarity based solvent system for TLC was developed. The Rf value of ethanolic extract of leaves was found to be 0.81 single spot. Further research on the phytochemicals analysis, were conducted the antimicrobial activity by using selected microbial strain such as *C. albicans*, *E. coli*, *P. aeruginosa*, *S. pyrogenes* and *S. aureus*. The both extract of plant does not show antifungal activity against *C. albicans*. However, tests should be conducted on other fungal species. Based on the statistical analysis conducted it was found that the crude extract of the leaves of the *Tamarindus indica* plants exhibit antimicrobial activity and produces a larger mean for the zones of inhibition when compared to standard drug.

Conclusion

Tamarindus indica Linn is widely found in India during all over season. As there is less information available on

pharmacognostical work on leaves hence the phytochemical tests of extract and antimicrobial activity as well as help in scientific authentication of the plant. All these results of experiment also help to build up a suitable utilization of plant profile. The evaluation of results suggests that *Tamarindus indica* exhibited antimicrobial activity similar to Amoxicillin. Conclude that it can be used as antimicrobial agent.

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