



## Antimicrobial Activity of Ethanolic and Distilled Water Bark Extract of *Tamarindus indica* L. against some Pathogens with reference to Air Pollution at Indore

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### Abstract

In the present investigation the antimicrobial activity of *Tamarindus indica* in ethanolic and distilled water bark extract against gram-positive bacteria (*Staphylococcus aureus* and *Bacillus subtilis*) and gram-negative bacteria (*Escherichia coli* and *Klebsiella pneumoniae*) was evaluated for different polluted areas and was compared by reference area of Indore city. Investigation showed significant activity in ethanolic bark extracts against *Escherichia coli*, followed by *Staphylococcus aureus* and *Klebsiella pneumoniae* in comparison to distilled water. The highest zone of inhibition (mm) was found to be at LPA against *E. coli* (18mm) while comparing with polluted areas it was found to be highest at IPA i.e. 15mm against *Klebsiella pneumoniae*. No zone of inhibition was seen in *Bacillus subtilis* at all polluted areas.

**Key-words:** *Tamarindus indica* L., Antimicrobial Activity, Zone of inhibition

### Introduction

*Tamarindus indica* belongs to the family fabaceae. It is a tropical evergreen tree of India. Its pulp, seed, leaves and bark have been used as traditional food and also consumed as herbal medicine. Bark of *Tamarindus indica* is brownish or dark grey, longitudinally and horizontally fissured. The bark is an effective astringent tonic & febrifuge. A decoction is used in cases of eye inflammations, gingivitis & asthma. Lotions & poultices made from the bark are applied on open sores & caterpillar rashes. Bark is also used in curing gonorrhea, paralysis and urinary discharges. (Basu and Kirtikar, 1984).

The plant parts have been extensively studied in terms of pharmacological activity of its major compounds and results indicate anti-inflammatory, potent antidiarrheal, antioxidant, wound healing and antimicrobial activities (Nikkon et al., 2003). The present study is aimed to evaluate the antimicrobial activity of bark extract of

*Tamarindus indica* against some pathogenic microorganisms with reference to air pollution at Indore City.

### Botanical description

***Tamarindus indica* L.**

**Family**– Caesalpiniceae (Leguminosae)

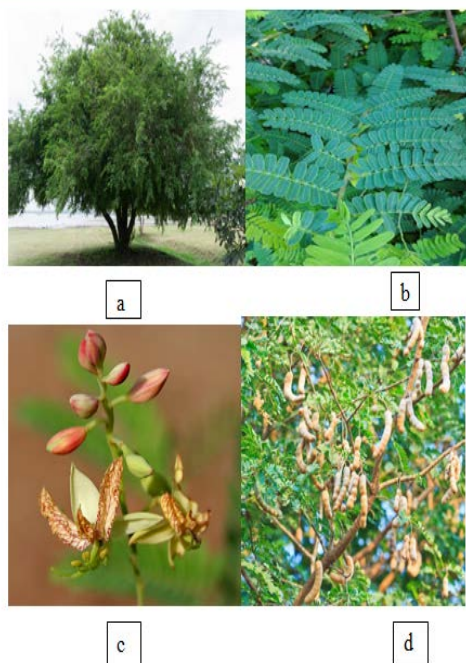
**Vernacular name** – Imli or Amla

Large evergreen shade tree with spreading crown and 15 – 25 m tall. **Leaves** - 4 -12 cm long, rachis is minutely pubescent. leaflet 10-20 pairs, oblong. petiolules, very short. **Inflorescence** - Axillary raceme. **Flower** – Bracteate, bracteolate, pedicellate, bisexual, zygomorphic, complete, perigynous, white or yellow. **Calyx**- Sepals 4, polypetalous, boat shaped, posterior sepal large, greenish – yellow. **Corolla** – Petals 5, polypetalous, yellow coloured, striped with red. **Androecium** – Stamens 3, well developed monadelphous, anther dithecal, introrse.

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**Gynoecium** -Monocarpellary, ovary semi – inferior or superior, unilocular, style short and curved, stigma flat. **Fruit** - Legume, Pods linear 5-20 cm long, with crustaceous pericarp and pulpy mesocarp.**Seeds** – Seed 3 – 10 dark brown. **Flower &Fruit** - November to April. It is common around villages and fields.



**Fig.1 (a) Showing *Tamarindusindica* (Imli) (b) Arrangement of leaf in *Tamarindusindica*(c) *Tamarindusindica*flower and (d) Showing *Tamarindusindica*fruit.**

## Material and Methods

### Collection and Authentication

The bark of *Tamarindusindica* was collected from four different areas on the basis of sources and nature of pollutants in Winter season by sharp knife at the height of 4-5 meter above ground level from all directions viz. Vijay nagar, a mixed pollution area (MPA), Eastern ring road between Khajarana to Bengali square, a vehicular pollution area (VPA), Sanwer Road, Industrial cluster situated on Ujjain road industrial pollution area (IPA). Bark samples of same tree species were also collected from Ralamandal village, low polluted area (LPA) which is situated 10 km away from Indore in north east direction and was serves as control or reference for comparison. The samples were brought in the laboratory for the

further analysis and identified with the help of flora and available literature.

### Antimicrobial Activity

#### Extract Preparation

The freshly collected bark was cut into small pieces and coarsely powdered in a mixer. The material was packed in soxhlet apparatus and successively extracted with Ethanol and Distilled water for extracts.

#### Method for Antimicrobial Activity

Antimicrobial activity for bark extract was done by Disc diffusion method mentioned by Bauer and Kirby (1966).

#### Source of the microorganisms

Isolates of *Staphylococcus aureus* (MTCC 1430) and *Bacillus subtilis* (MTCC 121) (Gram positive) *Escherichia coli* (MTCC 40) and *Klebsiellapneumoniae* (MTCC 39) (Gram negative) were obtained from the Microbial Type Culture Collection & Gene Bank (MTCC) Chandigarh. Institute of Microbial Technology.

#### Sterilization of the equipment's and disinfection

All the equipment was disinfected with cotton wool soaked in methylated spirit so as to maintain sterility throughout the process. Wire loop, disc, test tube, conical flasks and beaker were sterilized by hot air oven at 160°C for 45 minutes, whereas media and disc were sterilized by autoclaving at 121°C for 15 minutes.

#### Procedure

- Twenty-eight grams of nutrient agar media (Hi-MEDIA M001) was dissolved in 1000 ml of distilled water and adjusted to pH of  $7.4 \pm 0.2$  at 37°C.
- This was sterilized by autoclaving at 121°C for 15 minutes at 15 psi pressure and was used for sensitivity tests.
- Agar plates were prepared and the test microorganisms were inoculated by the spread plate method.
- 6mm filter paper disc were placed in the previously prepared agar plates.
- And then 10µl of the bark extract was pipette on to each disc.
- The agar plates were incubated at 37°C for 24 hours. Thereafter, the diameters of the zones of complete inhibition were observed and measured by scale, including the diameter of the disc.

➤ To find the effective concentration of the extract showing maximum zone of inhibition different dilutions were prepared which are as 12.5%, 25%, 50% & 100%.

### Results and Discussion

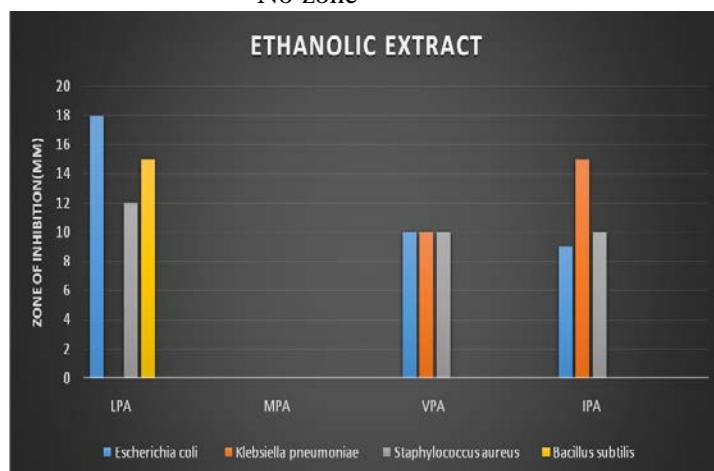
Determination of the inhibition zone in table 1 and graph 1 shows that bark extract of *Tamarindusindica* showed significant activity in ethanolic bark extracts against *Escherichia coli*, followed by *Staphylococcus aureus* and *Klebsiellapneumoniae* in comparison to distilled water. The highest zone of inhibition (mm) was found to be at LPA in *E.coli* (18mm) while comparing with polluted areas it was found to be highest at IPA i.e. 15mm in *Klebsiella pneumonia*. No zone of inhibition was seen in *Bacillus subtilis* at all polluted areas. Reduced zone of inhibition was observed at MPA followed by IPA and VPA. This might be due to cumulative effect of gaseous pollutants SO<sub>2</sub>, NO<sub>x</sub> and other particulates released from various industries. Gaseous pollutants released from motor vehicles, industries, anthropogenic activities such as SO<sub>2</sub>, NO<sub>x</sub> and other particulates present at all the polluted areas when adsorbed by bark reduces the concentration of phytoconstituents and may be the reason to cause reduction in antimicrobial activity. With this reference, few more studies for *Tamarindusindica* were done in Nigeria, by Doughari (2006) with disc diffusion Method in relation with the effect of temperature and pH. He concluded that *Tamarindusindica* has broad spectrum antibacterial property. In vitro antibacterial activity was evaluated for the stem, bark, leaves and fruit pulp of *Tamarindusindica* against 13 gram negative and 5 gram positive bacterial strains by Nwodo et al. (2011) in Nigeria. The antibacterial activity exhibited by the ethanolic extract was significant and this justified the use of this plant in traditional practices for the treatment of ailments. Nagarajan et al. (2014) of Thanjavur, (Tamil Nadu) suggested that bark of *Tamarindusindica*, contains several phytoconstituents like procyanidin, sesquiterpenes, alkaloids, lupeol, saponins, and phlobatannins. Antimicrobial activity of ethanolic bark extract of *Tamarindusindica* against some gram positive bacteria and gram negative bacteria was studied by Kapur and John (2014). The result supported the use of *Tamarindusindica*

in drug development for human consumption for various infectious diseases.

**Table 1: Antimicrobial activity of *Tamarindusindica* bark (Zone of Inhibition (mm)) against gram negative and gram positive bacteria in different extracts**

S. No.	Area	<i>Escherichia coli</i>		<i>Klebsiellapneumoniae</i>		<i>Staphylococcus aureus</i>		<i>Bacillus subtilis</i>	
		EE	D.W.E.	EE	D.W.E.	EE	D.W.E.	EE	D.W.E.
1	LPA	18	N.Z.	N.Z.	N.Z.	12	N.Z.	15	N.Z.
2	MPA	N.Z.	N.Z.	N.Z.	N.Z.	N.Z.	N.Z.	N.Z.	N.Z.
3	VPA	10	N.Z.	10	N.Z.	10	N.Z.	N.Z.	N.Z.
4	IPA	9	N.Z.	15	N.Z.	10	N.Z.	N.Z.	N.Z.
	CORRELATION	No relation		No relation		No relation		No relation	

LPA = Low polluted area, MPA = Mixed polluted area, VPA = Vehicular polluted area, IPA = Industrial polluted area, EE= Ethanolic extract. D.W.E. = Distilled water extract, N.Z. = No zone



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inspiration, elaborative discussions and encouraging advice.

### Conclusion

From the study, it can be concluded that ethanol extract of *Solanum lycopersicum* fruits had good potential as anti-inflammatory and analgesic agent and so this plant can be used to discover bioactive natural products that may serve as leads for the development of new pharmaceuticals.

It can be evident that lycopne can be used as synergistic anti-inflammatory drug along with NSAID or can be used as alternative treatment for chronic conditions like rheumatoid arthritis therapy

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