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EVALUATION ON ANTIBACTERIAL ACTIVITY OF *TAMARINDUS INDICA* AGAINST BACTERIA

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ABSTRACT: In the present investigation, *Tamarindus indica* plants were collected from Namakkal District, Tamil Nadu, India. The antibacterial studies of Tamarind on cement dust polluted and non-polluted leaf, bark parts with different solvents against bacteria such as *Bacillus cereus, Escherichia coli, Pseudomonas aeruginosa, Pseudomonas aeromonas* and *Staphylococcus aureus* were investigated in well diffusion method. The maximum zone of inhibition *Pseudomonas aeromonas* by tamarind leaf samples and minimum in *Bacillus cereus* were observed. Tamarind bark samples were recorded in *Pseudomonas aeromonas*and minimum in *Bacillus cereus.* The *Escherichia coli* and *Staphylococcus aureus* no zone of inhibition. The comparison of polluted and non-polluted samples, the excellent activities in non-polluted samples of Tamarind were extensively.

KEYWORDS: *Tamarindus indica*, bacteria, Antibacterial activity.

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1.INTRODUCTION

Plants are the most common source of antimicrobial agents. Their usage as traditional health remedies is the most popular for 80% of world population in Asia, Latin America and Africa and is reported to have minimal side effects [7, 16]. Plant derived compounds has an increasing interest throughout the world as they possess potent, less or no toxic pharmacological compound,

economic viable, safer and more dependable process [27]. About 70 – 95% of the world population is relying on traditional medicines or traditional therapies where the whole or parts of plants is used as medicine [29]. Drug resistances in microorganism have become an unsolvable problem and treating an infectious disease with the existing drugs is becoming less used. This situation, truly made researchers with discover drug from various sources, one such source is plant based drugs. Medicinal plants are valuable for getting novel drugs that forms the ingredients in traditional systems of medicine, modern medicines, nutraceuticals, food supplements, folk medicines, pharmaceutical intermediates, bioactive principles and lead compounds in synthetic drugs [22]. World Health Organization pointed out that more than 80% world population depends on plants for primary health care needs. In recent years, multiple drug/ chemical resistance in both human and plant pathogenic microorganisms has been developed due to indiscriminate use of synthetic drugs. Tamarind (*Tamarindus indica*) is a leguminous tree in the family of Fabaceae. The genus *Tamarindus* is a monotypic taxon. Tamarind is a long lived and beautiful fruiting tree, growing up to 30 metres tall with a dense, spreading crown. The tree has fragrant flowers and feathery foliage that is usually evergreen but becomes deciduous in drier regions. Leaves also present good levels of protein, fat, fiber, and some vitamins such as thiamine, riboflavin, niacin, ascorbic acid and β-carotene [13]. Flavonoid and other polyphenols are metabolites that have been also found in tamarind leaves [8], these compounds have a proven record as antimicrobial agents in many other plants. The bowl is usually short, 1 - 2 metres in diameter. The seedpod of the tamarind is widely used for food in the tropics. The tree also yields a number of other edible uses as well as having a wide range of medicinal applications and other uses. The tree is widely cultivated in the tropics and subtropics as an ornamental plant for its edible seedpods and also for its many medicinal uses.

2. MATERIALS AND METHODS

Sample collection

Cement dust polluted and unpolluted bark and leaf samples of *Tamarindus indica* L. were collected from Namakkal District of Tamil Nadu. The Plant leaves and bark were washed with tap water to remove the unwanted dust particles. Then they were shaded, dried, and then powdered by using mechanical blender and stored in air tight bottles.

Extract preparation [6]

The 200gm of bark and leaf of *Tamarindus indica* samples were soaked with methanol, acetone, benzene and hexane solvents for 2 hours. The samples were filtered individually each solvents with help of whatman no. 1 filter paper. The extracts were stored at refrigerated in a sterile bottle.

Antibacterial activity of *Tamarindus indica* against bacteria

Nutrient agar medium for antibacterial activity against bacteria *B.cereus, E.coli, P.aeromonas, P.aeruginosa* and *S.aureus* were performed. Then dispense the media into each of the petridish and

allowed it to solidify. 1ml of 24 hrs bacterial culture was swabbed in nutrient agar plates. Make four well made in nutrient plate with the help of cork borer. Then transferred 100µl of plant leaf and bark extracts separately were poured in respective well. The petriplates were incubated at 37^0C for 24 hrs for antibacterial activity compared with the control and measured zone of inhibition.

3. RESULTS AND DISCUSSION

In the present investigated recognized, the different solvent of polluted tamarind extracts were tested against *Bacillus cereus, Escherichia coli, Pseudomonas aeroginasa, P.aeromonas* and *Staphylococcus aureus*. The highest bacterial zone of inhibition (17mm) was recorded in methanolic extract of *Pseudomonas aeromonas* and lowest in benzene extract (2mm) *Bacillus cereus* respectively (Table 1). According to Mezouar *et al.* [17] methanolic extracts of root barks of *B. vulgaris* have presented a very weak antibacterial activity against all tested strains including *S. aureus*. Comparing results found in this investigation the antimicrobial activity of some medicinal plants from Tunisia, that methanolic extracts of *C.monspeliensis* leaves have shown an interesting activity against *P.aeruginosa, S. aureus, E.faecalis* with inhibition zones diameters of 18.0, 20.0 and 15.0 mm respectively [4]. The cement dust polluted tamarind bark with different solvents were tested against clinical bacteria such as *Bacillus cereus, Escherichia coli, Pseudomonas aeruginosa, P.aeromonas* and *Staphylococcus aureus* were observed. The highest bacterial zone of inhibition of tamarind barks samples were represented in *Pseudomonas aeromonas* and lowest in *Bacillus cereus.* No zone of inhibition was observed in *Escherichia coli* and *Staphylococcus aureus* respectively (Table 2). For *Cassia*, some authors have reported the antibacterial activity of alcoholic leaf extracts against different bacterial strains; the results showed no activity of these extracts in terms of inhibition zones diameters against the tested strains such as *E. faecalis, K. pneumoniae, S aureus* and *P.aeruginosa* [2]. On the other hand, the results found in this study concerning the activity of *R.tripartita* aerial parts extracts are in agreement with other previous works which found significant antibacterial activity of leaves with alcoholic extracts against methicillin-resistant *S. aureus*16mm and no activity against *E. coli* and *P. aeruginosa* [16].

The antibacterial properties of non-polluted tamarind leaf with different solvents extracted against bacteria such as *Bacillus cereus, Escherichia coli, Pseudomonas aeruginasa, Pseudomonas aeromonas* and *Staphylococcus aureus* were tested. The maximum bacterial zone of inhibition of tamarind non-polluted leaf samples were recorded in *Pseudomonas aeromonas* and lowest in *Escherichia coli* recorded respectively (Table 3). Similarly *W. frutescens*, El Bouzidi *et al*. [12] have reported different antibacterial activities of leaves with methanolic extracts against *S. aureus* (11.5 mm), *K. pneumoniae* (18.0 mm), *P.fluorescens* (14.5 mm) and no activity against *E. coli*. The *Staphylococcus aureus* was the most sensitive compared to other strains, while *K. pneumoniae* was the most resistant strain to all tested plant parts extracts. Indeed, the difference in sensitivity

between Gram positive and Gram negative bacteria can be described to morphological differences between these microorganisms, above all to differences in the permeability of the cell wall [23, 5].

The antibactercial activities of Tamarind (*Tamarindus indica* L.) on non-polluted bark with different solvents against bacteria such as *Bacillus cereus, Escherichia coli, Pseudomonas aeruginosa, Pseudomonas aeromonas* and *Staphylococcus aureus* were observed. The highest bacterial zone of inhibition of tamarind unpolluted leaf samples were recorded in *Pseudomonas aeromonas* and lowest in *Staphylococcus aureus* species recorded respectively in (Table4). Mukesh R. Jangra *et al.,* [18] studied that the antimicrobial activity of Methanolic extracts of *Phyllanthus emblica* on different pathogenic organisms using disc diffusion method have showed maximum zone of inhibition against strain (15mm) followed by strain D (11mm), strain A (10mm) and strain F (10mm). The collective analysis of antimicrobial activity of methanolic extract indicated that among the seven medicinal plants the *Phyllanthus emblica* and *Citrus limon* have better impact ranged from 9 to 15mm on all the species of bacterial strains when compared to rest of the plant species such as *A. indica, S. aromaticum, A.leucophora* and *C. longa* (ranged from 3 to 8mm) showed the zone of inhibition against selected soil bacteria in case of agar disc diffusion method. Doughari [11] reported that the plant extracts were effective against both gram positive and gram negative. The highest activity (diameter of zone of inhibition 27mm) was demonstrated by the acetone extracts of stem bark against Proteus mirabilis while the lowest activity (diameter of zone of inhibition 2mm) was demonstrated by the water extract against *Staphylococcus aureus*. The leaf extracts generally showed lower activity against the test organisms compared to the stem bark extracts. The antimicrobial activities of leaves extracts of *T. indica*, obtained with six different organic solvents and aqueous extracts, the ethanol extracts showed the highest activity against the test organisms followed by the methanol extracts and ethyl acetate extracts against the tested bacterial strains [22]. Ethanol extracts showed best activity against *Micrococcus luteus* > *Staphylococcus aureus* > MRSA > *Bacillus subtilis* among the $Gram^{+ve}$ bacteria. The ethanol extracts of leaves of *T. indica* were also tested on three $Gram^{-ve}$ bacteria; *E. coli, K. pneumoniae* and *P. aeruginosa*. The results showed a strong activity against *K. pneumoniae* followed by *E. coli* and *P.aeruginosa*. The aqueous extracts have the least antibacterial activity compared to other solvent extracts. Similar results have been reported in other studies. Daniyan and Muhammad [10] recorded that the ethanol extracts produce strong antibacterial activity against *E. coli, K.pneumoniae, Salmonella paratyphi* and *P. aeruginosa*. The aqueous extracts have the least antibacterial activity compared to ethanol extract against *P. aeruginosa*. However, it has been reported that the acetone extracts showed the highest activity against the test organisms, followed by the ethanol extract and water extracts [11]. The aqueous extract of *T.indica* has been reported to show the presence of alkaloids, which are formed as a metabolic by product, having antibacterial activity against all the tested bacteria in the order of sensitivity *S.aureus, E. coli* and *P.aeruginosa*

except for *Salmonella typhimurium* [30]. Shahla *et al*. [29] studied that the phytochemical screening and antibacterial activity of *Citrullus colocynthis* against *Staphylococcus aureus* were analysed. The antimicrobial properties of medicinal plants against microbes, the significant antimicrobial activity of active extracts was compared with the other extracts against bacteria and fungi [14,19,25,27,31]. According to the previous study, *P. amarus* a plant related with *Phyllanthus urinaria* when extract with ethanol may inhibit the activity of *Salmonella typhi* [24]. Moreover, the *Phyllanthus urinaria* can also inhibit *Pseudomonas aeruginosa, Staphylococcus aureus* and another microorganisms *Escherichia coli, Bacillus cereus, Klebsiella aerogenes, Proteus vulgaris, Shigella boydis* when extract of *Phyllanthus urinaria* with acetone or methanol [9] has found the antimicrobial activities on *S. aureus* and *P. aeruginosa* of the water extract of *P.urinaria*. Plants produce different secondary metabolites as a part of their immune system [3,20].

Table 1: The effect of bactericidal activities of cement dust polluted *Tamarindus indica* leaf with different solvents against clinical bacteria

S.No	Name of the bacteria	Zone of inhibition(mm)			
		Acetone	Benzene	Hexane	Methanol
1	*Bacillus cereus*	3	2	-	14
2	*Escherichia coli*	2	5	-	-
3	*Pseudomonas aeruginosa*	10	2	-	17
4	*Pseudomonas aeromonas*	3	2	-	-
5	*Staphylococcus aureus*	4	9	-	-

(-) no growth

Table 2: The effect of bactericidal properties of cement dust polluted *Tamarindus indica* bark with different solvents against clinical bacteria

S.No	Name of the bacteria	Zone of inhibition (mm)			
		Acetone	Benzene	Hexane	Methanol
1	*Bacillus cereus*	7	4	15	7
2	*Escherichia coli*	-	-	-	-
3	*Pseudomonas aeruginosa*	7	20	11	6
4	*Pseudomonas aeromonas*	10	15	5	7
5	*Staphylococcus aureus*	-	-	-	-

(-) no growth

Table 3: The antibacterial properties of non-polluted leaf of *Tamarindus indica* with different solvents against bacteria

S.No	Name of the bacteria	Zone of inhibition (mm)			
		Acetone	Benzene	Hexane	Methanol
1	*Bacillus cereus*	15	9	-	5
2	*Escherichia coli*	10	10	-	9
3	*Pseudomonas aeruginosa*	-	-	-	-
4	*Pseudomonas aeromonas*	15	20	-	7
5	*Staphylococcus aureus*	-	-	-	-

(-) no growth

Table 4: The antibactericidal studies of *Tamarindus indica* on non-polluted bark with different solvents against bacteria

S.No	Name of the bacteria	Zone of inhibition (mm)			
		Acetone	Benzene	Hexane	Methanol
1	*Bacillus cereus*	-	-	-	-
2	*Escherichia coli*	6	-	10	3
3	*Pseudomanas aeruginosa*	3	15	10	5
4	*Pseudomanasaeromonasa*	5	20	9	-
5	*Staphylococcus aureus*	3	6	3	-

(-) no growth

4. CONCLUSION

In this investigation, it is concluded that many Indian trees/herbs can be used against the multidrug resistant or pathogenic bacteria. It's clear need for exploration of new antimicrobial agents with novel mode of action from plant sources and to study the potentiality for applications in new drugs against microbes.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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