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Antimicrobial Activity of Aqueous and Methanol Extract of *Tamarindus Indica* Fruit

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Abstract—*This study was done to determine the phytochemical constituents, the antibacterial activity, the Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC) of aqueous and methanol extract of Tamarindus indica fruit pulp. This was done using soxhlet and maceration extraction techniques. Ditch diffusion technique was used for antibacterial screening while tube dilution technique was used to determine the MIC and MBC of the plant extracts. The presence of saponins, tannins, fllavonoids, terpenoids among others was established in this study. The MIC and MBC of methanol extract of the plant against S. aureus was 6.25mg/mL and 12.5mg/mL respectively. .P. aeruginosa has MIC of 3.12mg/mL with aqueous extract and MBC of 6.25mg/mL of aqueous extract. While the MIC and MBC of aqueous extract of T. indica against E. coli was 12.5mg/mL and 25.0mg/mL respectively.*

Keywords*: Antimicrobial, Tamarindus indica, Aqueous, Methanol , Fruit.*

1. INTRODUCTIO

Plants have the capacity to synthesize a diverse array of phytochemicals and understanding how they function in plants may further our understanding of the mechanism by which they benefit humans. Traditionally, the use of plant preparations as sources of drugs are based on the experience and superstition passed from generation to generation, virtually by the word of mouth (Sofowara, 1993). Medicinal uses of *T. indica* are numerous. The fruit extracts are used as refrigerants in fever and as laxative and carminatives alone or in combination with lime juice, milk, dates, spices, honey and camphor. The pulp is used as a remedy for biliousness and bile disorders (Jayaweera, 1981). As an antiscorbutic, it is applied to heal inflammation and sore throat, mixed with salt to treat rheumatism and administered to alleviate sunstroke, dasine poisoning and alcoholic intoxication in Southeast Asia (Morton, 1987).

2. MATERIAL AND METHOD

2.1 STUDY AREA

The area selected for this study is the metropolitan city of Kano State located in the North West of Nigeria.

3. STUDY ISOLATES

Clinical isolates (*Staphylococcus aureus, Escherichia coli and Pseudomonas aeruginosa*) obtained from Murtala Muhammad Hospital, Kano. The isolates as described by Cheesbrough, (2002).

4. PHYTOCHEMICAL ANALYSIS

The methods described by (Cannel, 2000; Hassan *et al*., 2004) were used for the phytochemical screening.

5. PLANT MATERIAL EXTRACTION

Methanol Extraction

The extraction was carried out using soxhlet extraction. 172g of tamarind fruit was extracted with 250 mL of methanol for 3 h. The extract was concentrated over a water bath as earlier reported by Brain and Tuner, (1975).

Aqueous Extract

The extraction was carried out by maceration technique. 200g of tamarind fruit was extracted with 500 mL of distilled water as described by Brain and Tuner, (1975).

6. EXTRACT RECONSTITUTION

Methanol Extract: 2g of the pasty concentrate was dissolved in 10mL of sterile distilled de-ionized water and mixed very well.

ANTIMICROBIAL SUSCEPTIBILITY TEST

The test organism grown on nutrient agar plates incubated at 37^{o}C for 18hr were picked and suspended in normal saline solution (0.85% NaCl) and adjusted the turbidity of 0.5 (10^{8} cells/ml) McFarland standard. Six millimeter diameter wells were punched using cork borer on the agar and filled with the desired concentrations (200mg/mL, 100mg/mL, 50mg/mL, 25mg/mL and 12.5mg/mL) of the aqueous and methanol extracts. Commercial antibiotic (Ciprofloxacin 30µg) was

used as reference standard, to determine the sensitivity of the isolates. Then incubated at 37°C over night, antibacterial activities were measured.

7. RESULTS

The efficacy of the extracts on the test organism showed highest activity of 14.8mm zone of inhibition at 200mg/mL and 6.25 mg/mL aqueous extract on *P. aeruginosa* and *S. aureus*. The least activity was observed on *E. coli* with 10.9mm zone of inhibition using 200mg/ml methanol extract as shown in, table 1 and 2.

Table 1: Phytochemical profile of aqueous and methanol leaf extracts of *Tamarindus indica.*

Phytochemical Constituent	Aqueous Extract	Methanol Extract
Carbohydrate	_	_
Anthraquinones	+	+
Saponins	+	+
Steroids	_	_
Triterpenes	+	_
Flavonoids	+	_
Tannins	+	+
Alkaloids	_	+
Glycosides	+	_

+ = Present, - = absent`

Table 2: Antibacterial Screening Result using 200mg/mL

Zone of Inhibition (mm)	Aqueous Extract (mm)	Methanol Extract (mm)
Staphylococcus aureus	14.7	12.4
Pseudomonas aeruginosa	14.8	11.4
Escherichia coli	11.7	10.9

Table 3: Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC) for *S. aureus*

Extract	MIC (mg/mL)	MBC (mg/mL)
Aqueous	12.50	25.00
Methanol	6.25	12.50

Table 4: Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC) for *P. aeruginosa*

Extract	MIC (mg/mL)	MBC (mg/mL)
Aqueous	3.12	6.25
Methanol	6.25	12.50

Table 5: Minimum Inhibitory Concentration (MIC) and Minimum Bactericidal Concentration (MBC) for *E. coli*

Extract	MIC (mg/ml)	MBC (mg/ml)
Aqueous	12.5	25.0
Methanol	25.0	50.0

8. DISCUSSION

There was no inhibitory effect on *Pseudomonas aeruginosa* by all the extracts; this organism is resistant to plant extracts as reported by Mukhtar and Tukur, (2001) and Aliyu *et. al*.,(2009). *Pseudomonas aeruginosa* has been reported to have possibly developed resistance to most antibiotics even before their discovery (Mukhtar and Tukur, 2001). MIC values of 50 mg/mL and 100 mg/mL were recorded against *E. coli* for aqueous and methanol extracts respectively while 100 mg/mL and 200 mg/mL were recorded against *S. aureus* for aqueous and methanol extracts respectively. The purified components may have even more potency with respect to inhibition of microorganisms. Further work on the phytoconstituents isolation and purification of the bioactive components are recommended.

9. CONCLUSION

The antibacterial activity exhibited by the crude extracts against clinical isolates of *E. coli* (21mm) and *S. aureus* (20mm) that are associated with various infectious diseases, has provided scientific justification in this research for the ethno medicinal uses of the plant in the Northern, Nigeria for medications of various diseases.

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