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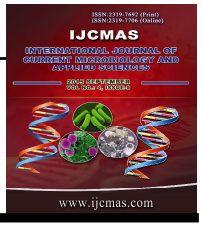

Original Research Article

Antimicrobial Activity of *Albizia lebbeck* Leaf Extract on some Medically Important Bacteria

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Keywords

Abezia lebbeck, Antimicrobial activity, Bacteria, Extract, Solvents

A B S T R A C T

The present study was conducted to investigate the antibacterial effect of *Albizia lebbeck* against selective human pathogens. Ethyl acetate, Absolute Ethanol and Aqueous solvents were used to extract the active components from the plant leaf. The antibacterial activity was studied against selective human pathogens viz., *Escherichia coli, Salmonella typhi, Pseudomonas aeruginosa, Klebsiella pneumoniae Proteus mirabilis and Shigella spp.* Among the different solvents, ethyl acetate extract showed greater antibacterial activity against *Pseudomonas aeruginosa* (20mm), *Proteus mirabilis* (10mm), *Klebsiella pneumoniae (*15mm), *Escherichia coli* (12mm), *Shigella spp.* (17mm) and *Salmonella typhi* (10mm). The control antibiotics augmentin and Ofloxacin had diameter of inhibition ranging between 3mm to 7mm. The minimum inhibitory concentrations (MIC) obtained for ethyl acetate extract ranged from 50 to 400mg/ml for all bacterial isolates. The results from this study indicated that *Shigella spp.* was the most sensitive bacteria to the *Albizia lebbeck* leaf extract with the lowest MIC concentration of 50mg/ml. This study indicates that *Albizia lebbeck* has an important antimicrobial effect, which justifies its potential use in infectious diseases.

Introduction

The ability of Plants to grow on different types of soils rich in microorganisms are as a result of their potential to produce wide range of selective anti-bacterial compounds that are capable of wading off potential microbial invaders (Cammune *et al.*, 1992). Medicinal plants have been used for centuries as remedies for human and animal diseases because of their therapeutic values. Hence, plant derived drugs remain an important resources especially in many countries of the world to combat diseases. Approximately 60-80% of the world's population still relies on traditional medicines for the treatment of common illness (WHO, 2002). It is estimated that there are 250,000 to 500,000 species of plants on earth (Borris, 1996). There is a growing interest in correlating phytochemical constituents of plant with its pharmacological activity.

Albizia lebbeck is a fast growing tree with a spreading umbrella-shaped leaf and smooth grayish brown bark (Mohammed *et al.*, 2012). The flowers, fruits, bark, leaves and

root are all have medicinal value (Mohammed *et al.,* 2012). The *Albizia lebbeck* plant belong to the family fabaceae (formerly leguminosae), and sub-family Mimosae (Mishra *et al.,* 2010). The plant has many common names such as 'women tongue' and rattle tree these names are derived from the noise made by the dry pods of the tree when they are being shaken by the wind (Ibraheem, 2007).

They are the plants of choice because of their traditional uses for the treatment of typhoid, gastrointestinal disorders and genitourinary tract infection in Jos Plateau State, Nigeria.

Materials and Methods

Plant source and identification

Fresh leave of *Albizia lebbeck* plant were collected from Jos North Local Government Area in Plateau State. The leaves were identified and authenticated in the herbarium, Department of Plant science University of Jos, Nigeria. The collected leaves were shade dried and then ground to coarse powder.

Preparation of crude extracts

Plant extracts were prepared using maceration extraction method according to Mamman *et al.,* (2012). Powered dried leaves (50g) were transferred into a conical flask and the content was soaked in 300ml of absolute ethanol and allow to stand overnight at room temperature. The content was agitated using a mechanical shaker. The resulting suspension was filtered using sterile Whatman filter paper No 1. The filtrate obtained was evaporated at controlled temperature of 60^{o}C to dryness in a water bath (Falodun *et al.,* 2006) and weighed on chemical balance. The same procedure was adopted for the extraction of ethyl acetate and aqueous solvents.

Source of test organisms

The pure culture of clinical isolates of *Escherichia coli, Proteus mirabilis, Salmonella typhi, Pseudomonas aeruginosa, Klebsiella pneumoniae, and Shigella spp.* were obtained from National Veterinary research institute Vom (NVIR).

Culture media

Nutrient agar was used for the antimicrobial sensitivity test. They were prepared according to the manufacturers' instruction.

Standardization of inoculums

The test organisms were inoculated by transferring a loopful of each organism into peptone water, and then it was incubated at 37^{o}C for 18hrs. Suspensions of the organisms were made from peptone water, and were shaken to achieve homogenous suspensions. The homogenous suspension of inoculum was adjusted to McFarland's standard 0.5 (McFarland, 1907).

Antibacterial activity of leaf extracts

The antibacterial efficacy of ethanol, aqueous and ethyl acetate leaf extract of *Albizia lebbeck* was tested by agar well diffusion method (Olurinola, 1996). The cultures from the standardized broth were aseptically swabbed on sterile Nutrient agar plates using sterile cotton swabs. The wells of 6 mm were punched in the inoculated plates using a sterile borer; the base of each ditch was filled with molten agar to seal the bottom of the plate. Aliquots of 100 µl of each extract prepared at concentration of 400 mg/ml was transferred into labeled wells. The wells were also filled with 100 µl positive controls (augmentin 30µg and Ofloxacin 10 µg). The plates were incubated

at 37^0C for 24 hrs and the zones of inhibition were recorded.

Determination of minimum inhibitory concentration (MIC)

Minimum inhibitory concentration of the ethyl acetate leaf extract of *Albizia lebbeck* was determined using the following concentrations 400mg/ml, 200mg/ml, 100mg/ml, 50mg/ml, and 25mg/ml. The cultures from the standardized broth were aseptically swabbed on sterile Nutrient agar plates using sterile cotton swabs. The wells of 6 mm were punched in the inoculated plates using a sterile borer. Aliquots of 100 µl of different concentrations of leaf extract were transferred into labeled wells. The plates were incubated at 37^0C for 24hrs after wish it was examined for presence or absence of growth. The MIC was taken as the lowest concentration that prevented bacteria growth (Oluduro, 2012).

Results and Discussion

Table 1 shows the antimicrobial activity of absolute ethanol, ethyl acetate and aqueous extract of *Albizia lebbeck* on selected pathogens. The result indicates that absolute ethanol and aqueous extract stock concentrations of 400mg/ml had no inhibitory effect on the bacterial isolates rather the ethyl acetate stock concentration showed inhibitory effect on all the test organisms.

The order of activity against selected bacteria by ethyl acetate extract was *Pseudomonas aeruginosa* (20mm), *Proteus mirabilis* (10mm), *Klebsiella pneumoniae* (15mm), *Escherichia coli* (12mm), *Shigella spp.* (17mm) and *Salmonella typhi* (10mm). The control antibiotics had diameter of inhibition ranging between 3mm to 7mm.

The minimum inhibitory concentrations MIC obtained for ethyl acetate extract ranged from 50 to 400mg/ml for all bacterial isolates. The results from MIC indicated that *Shigella spp.* and *Proteus mirabilis* was the most sensitive bacteria to the *Albizia lebbeck* leaf extract, being negatively affected at lowest concentration tested 50mg/ml and 100mg/ml respectively. *Escherichia coli* was the least sensitive isolate as it was only inhibited at a stock concentration of 400mg/ml (Table 2).

This study revealed that the leaf extracts of *Albizia lebbeck* possess appreciable antibacterial activity against the tested organisms and ethyl acetate extract showed the highest activity to test organisms when compared to absolute ethanol and aqueous extract. Test organisms were more susceptible to ethyl acetate extract than control antibiotics used in this study. The apparent low susceptibility of bacterial isolates to antibiotics could be attributed to indiscriminate use of these drugs. A higher activity of *Albizia lebbeck* leaf extract to test organisms as revealed in this study implies that the extract could be used in the treatment of wide range of bacterial infections.

As observed in this study absolute ethanol and aqueous extracts of *Albizia lebbeck* leaf had no inhibitory effect on test organisms, this is contrary to the report of Maji *et al.*, (2010) who documented an antimicrobial activity of aqueous extract of *Albizia lebbeck* to *Escherichia coli* and *Klebsiella pneumoniae.*

Although, the mechanism of action of these plant constituents is not yet fully known it is clear that the effectiveness of the extracts largely depends on the type of solvent used for the extraction. This may be due to the insolubility of the active ingredients of the leaf in some solvents.

Table.1 Antimicrobial Activity of Absolute ethanol, Ethyl acetate and Aqueous extract of *Albizia lebbeck* on Bacteria isolates

Test organisms	Diameter of zone of inhibition (mm)				
	Extract (400mg/ml)			Control drugs (µg)	
	AE	EA	AQ	Aug (30)	Ofl (10)
Escherichia coli	0	12	0	0	0
Klebsiella pneumoniae	0	15	0	0	5
Proteus mirabilis	0	10	0	0	0
Salmonella typhi	0	10	0	7	3
Pseudomonas aeruginosa	0	20	0	0	0
Shigella spp.	0	17	0	0	0

Key: AE= Absolute ethanol; EA= Ethyl acetate; AQ= Aqueous; Aug= Augmentin; Ofl= Ofloxacin

Table.2 Minimum inhibitory concentration of ethyl acetate extracts on bacteria isolates

Test organisms	Concentration of extract			
	400mg/ml	200mg/ml	100mg/ml	50mg/ml
25mg/ml				
Escherichia coli	+	-	-	-
Klebsiella pneumoniae	+	-	-	-
Proteus mirabilis	+	+	+	-
Salmonella typhi	+	+	-	-
Pseudomonas aeruginosa	+	+	-	-
Shigella spp.	+	+	+	+

Key: + inhibition, - Not inhibition

The minimum inhibitory concentration of ethyl acetate extract of *Albizia Lebbeck* leaf range from 50 to 400mg/ml this observed MIC disagrees with the work of Acharya *et al.*, (2009) who had a much lower MIC value 16-24mg/ml against test bacterial isolates.

The results from the current study indicate that *Albizia lebbeck* leaves show appreciable activity against organisms used. Further research work involving more detailed in vitro and in vivo investigations is required to establish the biologically active components of the plant extract in terms of antibacterial activity of bacterial infections.

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