



ANTIMICROBIAL ACTIVITY OF MORINGA OLEIFERA LAM. EXTRACT AGAINST SOME FOOD-BORNE MICROORGANISMS AND SOME HUMAN PATHOGENS.

Microbiology

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ABSTRACT

Moringa oleifera is a tropical tree whose many economic applications and facility of propagation are arousing growing international interest. Various parts of the plant such as the leaves, roots, seed, bark, fruit, possess antitumor, cholesterol-lowering, antibacterial and antifungal activities. Its parts are being used in water purification processes by flocculating Gram-positive and Gram-negative bacterial cells. The significance of this investigation suggests that the extracts and juice of *M. oleifera* Lam. contain antibacterial agent for developing new pharmaceuticals to control studied human pathogenic bacteria responsible for severe illness. The various parts of the plant were dried and grounded into coarse powder and extracted in suitable solvent. The antimicrobial activity of the compounds from *Moringa oleifera*, were measured by disk diffusion method. The extracts were found to inhibit the growth of Gram-positive bacteria as well as Gram-negative bacteria. All the extracts showed varying degrees of antimicrobial activity on the microorganism tested. These findings suggest a new pathway in elucidating a potent antimicrobial agent from *Moringa oleifera*. This study indicates that the plant contains antimicrobial compound that can be further developed as phyto-medicine for the therapy of infection and drug development. The study was designed to investigate antibacterial activity of Methanol extract from the leaf of *Moringa oleifera*. The extract were screened for antibacterial activity by disk diffusion method. The leaf extract of *Moringa oleifera* showed a broad-spectrum antibacterial activity against different pathogens. The maximum zone of inhibition was seen in *Pseudomonas aeruginosa* at 100µg concentration, while the lowest was seen in *Proteus* species at 30µg concentration.

KEYWORDS

Moringa oleifera, antibacterial, methanol, bacteria.

INTRODUCTION.

The frequency of life-threatening infections caused by pathogenic microorganisms has increased worldwide and is becoming an important cause of morbidity and mortality in immunocompromised patients in developing countries (Al-Bari et al., 2006). The increasing prevalence of multi-drug resistant strains of bacteria and the recent appearance of strains with reduced susceptibility to antibiotics raised the spectre of "untreatable" bacterial infections and adds urgency to the search for new infection-fighting strategies (Zy et al., 2005; Rojas et al., 2006).

For a long time, plants have been an important source of natural products for human health.

The antimicrobial properties of plants have been investigated by a number of studies worldwide and many of them have been used as therapeutic alternatives because of their antimicrobial properties (Adriana et al., 2007). Plants have many antimicrobial properties as secondary metabolites such as alkaloids, phenolic compounds, etc. The practice of complementary and alternative medicine is now on the increase in developing countries in response to World Health Organization (WHO) directives culminating in several pre-clinical and clinical studies that have provided the scientific basis for the efficacy of many plants used in folk medicine to treat infections. (Vijaya and Ananthan, 1997; Dilhuydy and Patients, 2003).

Despite the existence of potent antibiotic and antifungal agents, resistant or multi-resistant strains are continuously appearing, imposing the need for a permanent search and development of new drugs (Silver, 1993). It is therefore very necessary that the search for newer antibiotic sources be a continuous process. Plants are the cheapest and safer alternative sources of antimicrobials (Pretorius and Watt, 2001; Sharif and Banik, 2006; Doughari et al., 2007). *Moringa oleifera* Lam. is the most widely cultivated species of a monogeneric family, the Moringaceae, that is native to the sub-Himalayan tracts of India, Pakistan, Bangladesh and Afghanistan (Fahey, 2005) which is widely used for treating bacterial infection, fungal infection, anti-inflammation, sexually-transmitted diseases, malnutrition and diarrhoea (Bhupendra et al. 2015).

M. oleifera is a tropical tree whose numerous economic applications and facility of propagation are arousing growing international interest. Various parts of the plant such as the leaves, roots, seed, bark, fruit, flowers and immature

parts act as cardiac and circulatory stimulants, possess anti-tumour, antipyretic, anti-epileptic, anti-inflammatory, antiulcer activity (Bhupendra et al., 2015). Other important medicinal properties of the plant include antispasmodic, di-uretic, antihypertensive, cholesterol lowering, antioxidant, antidiabetic, hepatoprotective (Bhupendra et al., 2015), antibacterial and antifungal activities (Nickon et al., 2003). *M. oleifera* parts are being employed for the treatment of different ailments in the indigenous system of medicine, particularly in South Asia (Farooq et al., 2007). In addition, *M. oleifera* seeds possess water purifying powers (Muyibi and Evison, 1995; Kawo, 2007, SanthoshKumar et al. 2016) by flocculating Gram – positive and Gram bacteria.

Hence, this present study was undertaken specifically to investigate the antimicrobial activity of the extracts of *Moringa oleifera* (Lam.) leaves.

2. MATERIALS AND METHODS.

2.1 Plant materials.

Various parts of the plants were identified and collected from the botanical garden/herbarium of Osmania University, Hyderabad.

2.2 Extraction.

The leaves were air-dried, grinded into coarse-fine particles with the help of a mechanical blender. It was then extracted with methanol for 7 days by shaking in an orbital shaker. The extract was filtered while the filtrate was concentrated with the use of rotary evaporator and was dried at 50 to 60 °C and the yielded percentage was calculated.

2.3 Bacterial Media.

Nutrient Agar Media was prepared according to the manufacturer's instruction and then sterilized in autoclave at 15 lb pressure for 15 minutes. The sterilized media were poured into sterile Petri dishes.

2.4 Antimicrobial screening

The intended microorganisms (collected from the departmental laboratory) were inoculated on the media-containing-plates, via the spread plate technique.

The impregnated discs were aseptically placed inside the inoculated plates, the plates were incubated at 37±2 °C for 24 hours.

The Incubated plates were then observed for the zone of inhibition, the methanol extract was dissolved in sterile distilled water to form dilution at concentration of 30 µg, 50 µg and 100 µg. Each concentration of the plant extract was tested against different bacterial pathogens. The zone of inhibition was calculated by measuring the diameter of the inhibition zone around the disc (in mm) including the disc diameter.

3. RESULTS.

The results of the antimicrobial assay of the *Moringa oleifera* (Methanol extract) showed

that this plant exhibited antimicrobial activity against the tested microorganisms of interest at

various concentrations of 30, 50 and 100 µg/disc. The potential sensitivity of the extract was obtained against all the microorganisms of interest tested and the various zone of inhibition was recorded and presented in the table below.

Minimum Inhibitory Concentration (MIC)

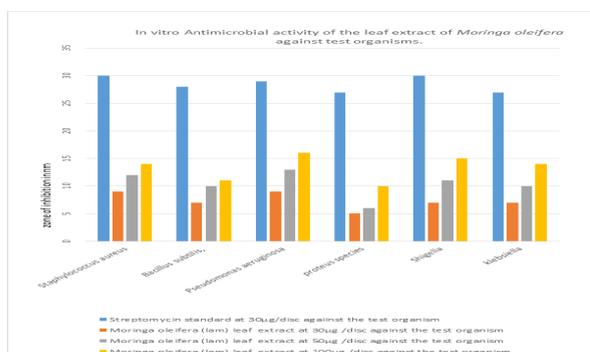
Table 1.

Test organism	Concentration of extracts (µg/disc)										MIC (µg/disc)
	66.6	22.2	7.4	2.4	0.8	0.2	0.0	0.0	0.0	0.0	
Staphylococcus aureus	-	-	+	+	+	+	+	+	+	+	22.4
Bacillus subtilis,	-	-	-	+	+	+	+	+	+	+	7.4
Pseudomonas aeruginosa	-	-	-	+	+	+	+	+	+	+	7.4
proteus species	-	-	-	+	+	+	+	+	+	+	7.4
Shigella spp	-	+	+	+	+	+	+	+	+	+	22.2
Klebsiella spp	-	-	-	-	+	+	+	+	+	+	2.4

KEY: - NO growth + Growth

Table 2: In vitro Antimicrobial Activity of the Leaf Extract of Moringa oleifera.

Bacterial Species	Zone of Inhibition in mm			
	Streptomycin Standard.	Moringa oleifera (Lam) Leaf (Methanol) Extract		
	30µg/disc	30µg/disc	50µg/disc	100µg/disc
Staphylococcus aureus	30mm	9mm	12mm	14 mm
Bacillus subtilis,	28mm	7 mm	10 mm	11 mm
Pseudomonas aeruginosa	29mm	9 mm	13 mm	16 mm
proteus species	27mm	5 mm	6 mm	10 mm
Shigella	30mm	7 mm	11 mm	15 mm
Klebsiella	27mm	7 mm	10 mm	14 mm



4. DISCUSSION.

The extracts were found to inhibit the growth of Gram-positive bacteria as well as the Gram-negative bacteria. All the extracts showed varying degrees of antimicrobial activity on the microorganism tested. The maximum zone of inhibition was seen in Pseudomonas aeruginosa at 100µg concentration, while the lowest was seen in Proteus species a 30µg concentration. It is thus established that M. Oleifera contains compound that has antimicrobial property.

The lowest MIC was observed in Klebsiella at 2.4µg/disc, (i.e. at a concentration of 2.4µg of the test agent, the microorganism became highly susceptible when compared with others) this showed that Klebsiella is quite sensitive to the test agent when compared with the other microorganism. Shigella was observed to have the highest MIC (i.e. at 22.2µg/disc). This showed that there was high resistance to the test agent by Shigella when compared to other test organisms used for this research. Hence its effectiveness in drug development (phyto-medicine) should be encouraged and developed.

5. CONCLUSION

These findings suggest a new pathway in elucidating a potent antimicrobial agent from

Moringa oleifera. Present study indicates that the plant contains antimicrobial compound that can be further developed as phytomedicine for the therapy of infection. Thus further research is needed to identify the actual compound in M. Oleifera that has the antimicrobial activity which will be a leap in the development of a phytomedicine.

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