IJPPR
INTERNATIONAL JOURNAL OF PHARMACY & PHARMACEUTICAL RESEARCH
An official Publication of Human Journals
ISSN 2349-7203
HUMAN

Human Journals
Research Article
October 2022 Vol.:25, Issue:3

Antibacterial Activity of *Moringa oleifera*

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Submitted: 23 September 2022
Accepted: 28 September 2022
Published: 30 October 2022

Keywords: *Moringa Oleifera*, Phytochemical analysis, Antibacterial activity.

ABSTRACT

In this work, *Salmonella typhimurium*, *Pseudomonas aeruginosa*, *Escherichia coli*, and *Bacillus cereus* bacteria were utilised to investigate the antibacterial activity of *Moringa oleifera* leaf extracts. The extract contained flavonoids, tannins, steroids, alkaloids, saponins, and other phytochemicals, according to the phytochemical screening. To evaluate the extracts' antibacterial effects on microorganisms, the well diffusion method was performed. All of the isolates were susceptible to the ethanolic extract. According to the study, the enhanced solubility of the antioxidant components in ethanol may be the cause of the ethanolic extract's higher reducing power. These investigations offer proof in favour of the plant's traditional therapeutic properties.

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INTRODUCTION:

Pathogenic bacterial and fungal infections pose a serious threat to human health [1]. Infectious illnesses remain a major cause of morbidity and mortality globally [2] despite the widespread use of antibiotics and vaccination campaigns. According to reports, the main cause of inflammation is microbial infections [3].

According to study done by the WHO in 14 different nations, 8.7% of hospital patients have an infection while receiving medical care [4]. *Escherichia coli, Staphylococcus aureus, Pseudomonas,* and *S. epidermidis* bacteria are those most frequently responsible for the infection. Antibiotics are used to treat people with bacterial infections. The choice of antibiotics employed as an infection therapy plays a significant impact in the healing of the patient. Additionally, it was explained in the National Nosocomial Infection Surveillance (NINS) that therapy with an inappropriate dose, duration, or dose can result in a change in the pattern of bacteria and the development of antibiotic resistance.

One member of the *Staphylococcus* genus that is frequently observed in clinical interest is S. epidermidis. These bacteria, which include the facultative anaerobe staphylococcus with negative coagulation, are gram-positive bacteria in white or yellow colonies. The majority of these bacteria are part of the typical human skin and mucous membrane flora. In the past, these germs hardly ever resulted in serious infection. However, due to the growing use of catheters, implants, and prosthetics [6]. *S. epidermidis* emerges as a key agent in the development of nosocomial infections. Due of the bacterium's increasing resistance to many microbial agents and capacity to form biofilms, treating it becomes highly challenging. Penicillin, cifazolin, ciprofloxacin, oxacillin, and ciprofloxacin resistance has been found in about 70% of isolated *S. epidermidis*. Treatment of infections will be challenging due to the high rate of resistance [7].

The sub-Himalayan tract is home to the medium-sized *Moringa oleifera* tree, which is endemic to Africa, Arabia, South Asia, South America, the Himalaya area, India, Pakistan, the pacific and Caribbean Islands. It is in the family Moringaceae. Moringa oleifera is a plant that has spread naturally throughout many tropical and subtropical regions of the world. It is also known as the miracle tree, horseradish tree, drumstick tree, oil tree, and "Mother's best friend." [9] Zeatin, quercetin, kaempferol, and a variety of other phytochemicals are all found in abundance and in a unique combination in the Moringa oleifera plant. [10] Vitamins C, A and are found in the leaves. Niazirinin, and Niazirin, Niazininins A and B are present in the

ethanol extract of Moringa oleifera leaves number 6. [11] This plant's leaf has a variety of biological effects, including the regulation of thyroid hormone, [16] the central nervous system, digestive system, nutrition, and metabolism, as well as hypocholesterolemic, antidiabetic, and hypertensive agents. These plants are also being investigated for their anti-inflammatory, antimicrobial, diuretic, [17, 18, 19] antibiotic, [20] hypotensive, and antimicrobial effects. They are also known to be hepato protective against anti-tubercular drugs such doxorubicin and rifampicin [21].

MATERIALS AND METHODS:

Collection of Plant: 2019 saw the trial take place in the pharmacy sector. We bought some leaves at the neighbourhood market. The health and infection-free condition of the plant was guaranteed. The leaves were carefully cleaned by being rinsed under running water, removed any dust or other foreign objects, and then dried.

Figure 1: *Moringa oleifera* Leaves

Preparation of leaf extracts: Fresh leaves weighing 20–30 grammes were cooked in 200 mL of solvent for an hour. Using Whatman filter paper No. 1, the extract was filtered before being concentrated in a vacuum at 40°–50°C using a rotary evaporator. The soluble components can be extracted crudely using the rotary evaporator's solvent, and these extracts have undergone qualitative phytochemical examination and antimicrobial tests. [22]

Phytochemical analysis: The leaf extract of *Moringa oleifera* was subjected to phytochemical ingredient analysis to determine the presence of flavonoids, alkaloids, volatile

oil, steroid, glycoside, tannins, reducing sugar, and saponins. Following the instructions provided by Talukdar AD 2010. [23]

Physiochemical Analysis: Physical and chemical attributes According to the procedures advised by the World Health Organization, tests on leaf powder of Moringa oleifera were conducted to determine physicochemical characteristics such as loss and drying, ash values, pH value in 1% and 10% solution, and ethanol and methanol extractive values. [24]

Determination of antibacterial activity: Using an established approach, the antibacterial activity of *Moringa oleifera* leaf extracts was assessed using the agar well diffusion method. Inoculated with the chosen microorganisms, nutrient agar was then punched with 6mm wells and filled with plant extracts. On the same plate as the plant extract-containing wells, control wells without plant extract were also run. The diameter of the zone of inhibition was used to measure the antibacterial activity after the plates had been incubated at 37°C for 24 hours. By contrasting the zones of inhibition between the various extracts and the common antibiotic streptomycin, the antibacterial effects of each extract were assessed. [25]

RESULTS AND DISCUSSION:

Phytochemical Investigation: According to the current study, *Moringa oleifera* plants exhibit the presence of phytochemical components like alkaloids, flavonoids, carbohydrates, glycosides, proteins, saponins, tannins, terpenoids, and anthrax quinones in various solvent extracts. These components are shown in Table 1 of the results.

Table 1: Qualitative phytochemical of *Moringa oleifera* leaf extract

S. No.	Phytochemicals	Ethanol Leaf extract
1	Alkaloids Mayer's Test Wagner's Test	 + +
2	Flavonoids Lead Acetate H2SO4 Test	 + +
3	Steroids Libermann burchard test	 -
4	Terpenoids Salkowaski test	 +
5	Anthraquinone Born trager's test	 -
6	Phenol Ferric chloride test Lead acetate test	 + +
7	Carbohydrate	+
8	Protein amino acid	+
9	Tannin	-
10	Saponin	+
11	Oils and Resins	-

+=Present; -= Absent

Physiochemical Study: According to the physiochemical study, the material has a pH of 6.4, a moisture content of 0.031, is soluble in diethyl ether but insoluble in chloroform, has a total ash content of 96%, a saponification value of 36.1, and an acid value of 3.74.

Table 2: Phytochemical analysis of Moringa oliefera leaf extract

S. No.	Parameters	Leaf Powder of *Moringa oliefera*
1	Moisture content	0.031%
2	Total ash value	96 %
3	pH	6.4
4	Saponification value	36.1
5	Refractive index	16
6	Acid Value	3.74
7	Solubility	Insoluble-chloroform Soluble-Diethyl ether

Antibacterial Activity: The antibacterial activity of *Moringa oleifera* Aqueous Leaf Extract against different Ba*cillus cereus*, *Pseudomonas aeruginosa*, *Escherichia coli*, *Salmonella typhimurium*, and other four pathogenic organisms is shown in Table 3. The highest concentration of the aqueous leaf extract is (100 mg/ml), and the lowest one is (12.5 mg/ml). The highest antibacterial activity was detected against *Escherichia coli* in all different bacteria.

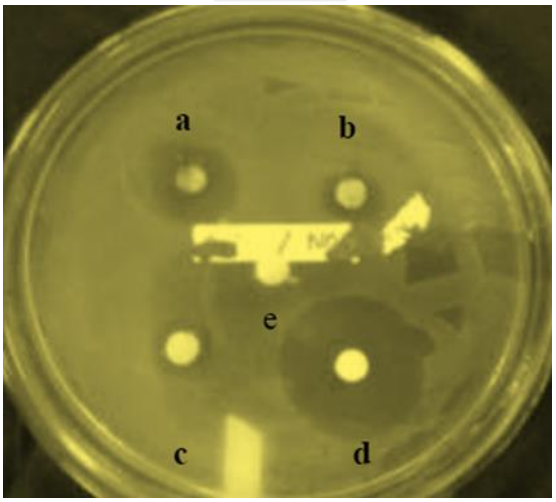

Figure 2: Zone of Inhibition of Bacteria : (a) 100 µg/ml, (b) 50 µg/ml, (c) 25 µg/ml, (d) 12.5 µg/ml (e) Standard

Table 3: Zone of inhibition for different concentrations of *Moringa oleifera* aqueous leaf extract

Microorganism	Concentration of the leaf extract from the Moringa oleifera (µg/ml)				Standard (Streptomycin)
	100	50	25	12.5	
Salmonella typhimurium	15.5	14.2	13.7	12.6	6.6
Pseudomonas aeroginosa	15.4	2.4	2.8	2.6	6.8
Escherichia coli	14.9	12.5	12.5	12.1	6.9
Bacillus cereus	15.2	10.2	11.5	12.3	6.5

CONCLUSION:

Based on the zone of inhibition data, *Salmonella typhimurium*, *Pseudomonas aeruginosa*, *Escherichia coli*, and *Bacillus cereus* were all tested, and none of these microbes showed any signs of observable growth.

The findings of the current study support the traditional use of the *Moringa oleifera* and can be recommended for use as an antimicrobial agent in new medications for the treatment of infectious diseases brought on by pathogens because the Moringa oleifera was found to have significant antibacterial activity against the microorganisms tested.

REFERENCES:

1. Eswarappa SM: Location of pathogenic bacteria during persistent infections: Insight from an analysis using game theory. PLoS ONE, 2009; 4(4): e5383.
2. Bloom BR: Microbial infections and immune defence. Nature, 2000; 406: 759.
3. Du-shieng C, Yi-wen C, Wu-Chang C and Ming-Chung L: Naphthalenedione compounds for treating inflammation related disorders and microbial infection. Free patients Online, 2005.
4. Noer S F 2012 Pola Bakteri Dan Resistensinya Terhadap Antibiotik Yang Ditemukan Pada Air Dan Udara Ruang Instalasi Rawat Khusus RSUP Dr Wahidin Sudirohusodo, Maj. Farm. Dan Farmakol. 16 73–8
5. Radji M and Manurung J 2016 Buku Ajar Mikrobiologi : Panduan Mahasiswa Farmasi [dan] Kedokteran / Maksum Radji ; Editor, July Manurung ed July Manurung (Jakarta: EGC)
6. Levinson W E 2004 Medical Microbiology & Immunology (New York: McGraw-Hill/Appleton & Lange)
7. Cabrera-contreras R, Morelos-ramírez R, Galicia-camacho A N and Meléndez-herrada E 2013 Antibiotic Rsistance and Biofilm Production in Staphylococcus epidermidis Strain, Isolated from a Tertiary Care Hospital in Mexico City 2013.
8. Trapti R, Vijay B, Komal M, et al. Comparative Studies on Anthelmintic Activty of Moringa oleifera and Vitex Negundo. Asian J Research Chem. 2009;2(2):181–182.
9. Julia C. A study of nutritional and medicinal values of Moringa oleifera leaves from susaharan Africa: Ghana, Rwanda Senegal and Zambia. 2008:1–113.

10. Pal SK, Mukherjee PK, Saha BP. Studies on the antiulcer activity of Moringa oleifera leaf extract on gastric ulcer models in rats. Phytotherapy Research. 1995;9(6):463–465.
11. Faizi S, Siddiqui BS, Saleem R. Isolation and structure elucidation of new nitrile and mustard oil glycosides from Moringa oleifera and their effect on blood pressure. J Nat Prod. 1994;57(9):1256–1261.
12. Mehta K, Balaraman R, Amin AH, et al. Effect of fruits of Moringa oleifera on the lipid profile of normal and hypercholesterolemia rabbits. J Ethnopharmacol. 2003;86(2–3):191–195.
13. Kar A, Choudhary BK, Bandyopadhyay NG. Comparative evaluation of hypoglycaemic activity of some Indian medicinal plants in alloxan diabetic rats. J Ethnopharmacol. 2003;84(1):105–108.
14. Faizi S, Siddiqui BS, Saleem R, et al. Fully acetylated carbonate and hypotensive thiocarbamate glycosides from Moringa oleifera. Phytochemistry. 1995;38(4):957–963.
15. Guevara AP, Vargas C, Sakurai H, et al. An antitumor promoter from Moringa oleifera Lam. Mutat Res. 1991;440(2):181–188.
16. Tahiliani P, Kar A. Role of Moringa oleifera leaf extract in the regulation of thyroid hormone status in adult male and female rats. Pharmacol Res. 2004;41(3):319–323.
17. Pari L, Kumar NA. Hepato protective activity of Moringa oleifera on antitubercular drug-induced liver damage in rats. J Med Food. 2002;5(3):171–177.
18. Fakurazi S, Hairuszah I, Nanthini U. Moringa oleifera Lam prevents acetaminophen induced liver injury through restoration of glutathione level. Food Chem Toxicol. 2008;46(8):2611–2615.
19. Caceres A, Cabrera O, Morales O, et al. Pharmacological properties of Moringa Oleifera. 1: Preliminary screening for antimicrobial activity. J Ethnopharmacol. 1991;33(3):213–216.
20. Caceres A, Saravia A, Rizzo S, et al. Pharmacologic properties of Moringa Oleifera. 2:screening for antispasmodic, anti-inflammatory and diuretic activity. J Ethnopharmacol. 1992;36(3):233–237.
21. Udupa SL, Udupa AL, Kulkarni DL. Studies on the anti-inflammatory and wound healing properties of Moringa oleifera and Aeglemarmelos. Fitoterapia. 1994;65:119–121.
22. Korkina LG, Afanas'ev IB. Antioxidant and chelating properties of flavonoids. Adv Pharmacol. 1997;38:151–163.
23. Yamunadevi M, Wesely EG, Johnson M. Phytochemical studies on the terpenoids of medicinally important plant Aerva lanata L. using HPTLC. Asian Pacific Journal of Tropical Biomedicine. 2011;1(2):S22–S225.
24. Winter WP, Mason KT, Ford TD. Mechanism of saponin- induced red cell hemolysis: reexamination. Blood. 1993;82(1):461.
25. Abalaka ME, Daniyan SY, Dyeleke SB, et al. The antibacterial evaluation of moringa oleifera leaf extracts on selected bacterial pathogen. Journal of microbiology research. 2012;2(2):1–4.