

# Screening the Antibacterial Activity of *Moringa oleifera* Leaves and Seeds Extract against Selected Members of Bacteria

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## Abstract

**background:** Natural antibacterial agents derived from different parts of medicinal plants (leaves, seeds, roots, flowers....etc) might represent an alternative treatment of infectious diseases, Plants with their wide variety of chemical constituents offer a promising source of new antimicrobial agents, with general as well as specific antibacterial activity. The aim of this study is to screen antibacterial activity of *Moringa oleifera* leaves and seeds extract against selected members of bacteria. **Method:** Five bacterial ATCC strains and seven clinically isolated strains were used in this study. 100 g of *Moringa olifara* leaves and 150 g of the coarsely powdered Seeds were extracted with 80 % methanol using soxhlet extractor apparatus for about eight hours. The antibacterial activity was determined by the agar well diffusion method .Muller Hinton agar medium was used for bacterial cultures. **Results:** The study reveals that the *Moringa oleifera*leaves and seeds extract show prominent *Invitro* antibacterial activity against all used bacterial species and the antibacterial activity of leaves extract is stronger than antibacterial activity of seeds extract and these results showing the possibility of using this tree in treatment of diseases caused by these pathogens. **Conclusion:** The study concluded that the activity of this plant in the treatment of diseases associated with bacterial pathogens is validated and scientifically supported by the results obtained in this study.

**Key words:** *Moringa oleifera*, antibacterial activity, Screening, bacteria.

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## INTRODUCTION

*Moringa oleifera* (*M.oleifera*) is belong to family Moringaceae, The tree is considered one of the world's most useful trees, as almost every part of the *Moringa* tree can be used for food .and is one among such plants cultivated for different purposes such as medicine, vegetable, as spice for cooking and as a cosmetic [1].

The tree has been reported to possess anti-inflammatory, antioxidant, anti-ulcer, anti-cancer, anti-hyperlipidaemic, anti-diabetic, anti-asthmatic, hepatoprotective and anti-hypertensive properties [2].

Previous studies reveal that the extracts of different parts of *M. oleifera* have antibacterial activity against species of bacteria that cause water-borne diseases, food-borne diseases, *Staphylococcus aureus*, *Streptococcus pyogens*, *Pseudomonas aeruginosa*,

*Bacillus Subtilis*, *Salmonella typhi*, *Vibrio cholera* and *Escherichia coli* [3].

Studies also reveals that leaves extract showed the highest anti-bacterial index than seeds and roots extract [3]. In Sudan, powdered seeds of *M. oleifera* have been used in water purification. Reports have been elucidated on the findings of the antibiotic principle of *M. oleifera* seeds through their purification, elucidation, and antimicrobial properties, and also on the antibiotic substance of the roots of *M. oleifera* [4].

Many antibacterial agents are available in the market for treating bacterial diseases, but indiscriminate use of antibacterial agents resulted in development of drug resistance among many virulently pathogenic bacteria species [5].

Natural antibacterial agents derived from different parts of medicinal plants (leaves, seeds, roots ,flowers....etc) might represent an alternative treatment

of infectious diarrheal diseases, Plants with their wide variety of chemical constituents offer a promising source of new antimicrobial agents, with general as well as specific antimicrobial activity [6]. There are several reports on the presence of anti-microbial compounds in various plant parts like leaves, bark, fruit, root and flowers [7].

## METHOD

### Plant material

*M. oleifera* leaves and seeds were collected from Omdurman city, identified and authenticated by the Medicinal and Aromatic Plants Research Institute, The plant materials were air-dried and then ground into powdered form, using a mortar and pestle.

### Preparation of leaves extracts

Extraction was carried out according to method described by [8]. In accordance with this method, 100 g of *Moringa olifera* leaves was coarsely powdered using mortar and pestle and extracted with 80 % methanol using soxhlet extractor apparatus for about eight hours. Extract was then filtered through filter paper and the solvent was evaporated under reduced pressure using rotary evaporator apparatus. Extracts were left to air till complete drying then dissolved in methanol [8].

### Preparation of the seeds extracts

Extraction was carried out according to method described by [8], In accordance with this method, 150 g of the coarsely powdered Seeds were successively extracted with Petroleum ether (40 – 60) C and methanol using soxhelt extractor apparatus. Extraction carried out for about four hours for petroleum ether and eight hours for methanol. Solvents were evaporated under reduced pressure using rotary evaporator apparatus. Finally extracts allowed to air in Petri dishes till complete dryness [8].

### Test organisms

The test organism's *Escherichia coli* ATCC25922, *salmonella typhi* ATCC19430, *salmonella paratyphi A* ATCC9150, *salmonella paratyphi-B* ATCC0650 and *shigella dysenteriae* ATCC13313 were the standard bacterial strains obtained from Sudan reference laboratory- Khartoum.

Seven additional bacterial strains were isolated from clinical specimens including: *staphylococcus aureus* Isolated from eye swab, *streptococcus feacalis* and *pseudomonas aeruginosa* from wound swab, *Escherichia coli* and *Proteus mirabilis* from urine specimen, *klebsiella Pneumoniae* from sputum specimen and *salmonella typhi* isolated from stool specimen.

### Determination of antibacterial activity

The antibacterial activity was determined by the agar well diffusion method. Muller Hinton agar medium was used for bacterial cultures.

The culture medium was inoculated with the microorganism separately suspended in clear broth. And the density of suspension inoculated onto the media for susceptibility test was determined by comparison with 0.5 McFarland standard of Barium Sulphate solution.

A total of 5 mm diameter wells were punched into the agar and filled with plant extracts, the inoculated plates were then incubated at 37 °C for 18 hours. The antibacterial activity was evaluated by measuring the diameter of zone of inhibition observed.

## RESULTS

In this study five bacterial ATCC strains and seven clinically isolated strains were used to study the antibacterial activity of the *Moringa oleifera* leaves and seeds extract, each experiment was repeated four times and the average of zone inhibition diameter was calculated from the four readings.

Both of leaves and seeds extracts showed activity against tested bacterial strains whether ATCC strains or clinically isolated strains were. In this study *M. oleifera* leaves extract showed antibacterial activity against all bacterial ATCC strains: *Escherichia coli* ATCC25922, *Shigella dysenteriae* ATCC13313, *Salmonella typhi* ATCC19430, *Salmonella paratyphi A* ATCC9150, and *Salmonella paratyphi B* ATCC0650, the highest activity was observed against *Salmonella typhi* ATCC19430.

*M. oleifera* seeds extract showed antibacterial activity against all bacterial ATCC strains: *Escherichia coli* ATCC25922, *Shigella dysenteriae* ATCC13313, *Salmonella typhi* ATCC19430, *Salmonella paratyphi A* ATCC9150, and *Salmonella paratyphi B* ATCC0650, the highest activity was observed against *Escherichia coli* ATCC25922.

In this study *M. oleifera* leaves extract showed antibacterial activity against all clinically isolated bacterial strains: *Staphylococcus aureus*, *Streptococcus feacalis*, *Escherichia coli*, *Klebsiella pneumonia*, *Pseudomonas aeruginosa*, *Proteus mirabilis*, and *Salmonella typhi*, the highest activity was observed against *Staphylococcus aureus*.

*M.oleifera* seeds extract showed antibacterial activity against all clinically isolated bacterial strains: *Staphylococcus aureus*, *Streptococcus feacalis*, *Escherichia coli*, *Klebsiella pneumonia*, *Pseudomonas aeruginosa*, *Proteus mirabilis*, and *Salmonella typhi*, the highest activity was detected against *Klebsiella pneumonia*, *Proteus mirabilis* and *Salmonella typhi*.



Fig-1: Shows antibacterial Activity of *M.oleifera* leaves extract against *K.pneumoniae*



Fig-2: Shows antibacterial Activity of *M. oleifera* leaves extract against *E.coli*



Fig-3: Shows antibacterial Activity of *M. oleifera* leaves extract against *P. aeruginosa*



Fig-4: Shows antibacterial Activity of *M. oleifera* seeds extract against *S. aureus*

## DISCUSSION

In these both of *M. oleifera* leaves and seeds extract has antibacterial activity against all tested bacterial ATCC strains and clinically isolated strains and these findings are in close agreement with findings obtained by [10].

The maximum inhibition zone for *M.oleifera* leaves extract was observed against *staphylococcus aureus* (22mm in diameter),meanwhile the minimum inhibition zone for *M.oleifera* leaves extract was observed against *salmonella paratyphi B* ATCC0650 strain(12mm in diameter). This finding was in difference with that obtained by [9] who denoted that maximum inhibition zone of *M.oleifera* leaves extract was observed against salmonella species, this difference may be attributed to variations of solvents applied.

The maximum inhibition zone for *M.oleifera* seeds extract was observed against *Escherichia coli* ATCC25922(15mm in diameter),meanwhile the minimum inhibition zone for seeds extract was observed against *salmonella paratyphi A* ATCC9150 strain and *Salmonella paratyphi B* ATCC0650 (10mm in diameter).

The seeds extract was more effective against gram negative bacteria in comparison to their activity against gram positive bacteria. This finding was in different with that obtained by [10] who indicated that the extract was more more effective against gram positive bacteria than gram negative bacteria, this difference may be due to variations of extract concentrations applied by each study.

Both extracts showed prominent activity against *pseudomonas aeruginosa* (16mm for leaves and 11mm for seeds) and *klebsiella pneumonia* (13mm for both extracts) which are normally resistant to most used antibacterial agents. This finding was indifference with that obtained by [3] who reported that *pseudomonas aeruginosa* was sensitive only against the leaf extract but not the seed extract.

Leaves extract was more effective than seeds extract against gram positive bacteria and these results are in close agreement with findings obtained by [11].

## CONCLUSION

The extracts of the plant used in the present study showed a promising antibacterial activity against all used bacterial strains, including *pseudomonas aeruginosa* and *klebsiella pneumoniae* which are normally highly resistant to most used antibacterial agents. The results of this study suggest that the extracts from *Moringa oleifera* leaves and seeds can be a source of natural antimicrobials with potential applications in pharmaceutical industry to control diseases associated with the infection of these pathogens, and this is validated and scientifically supported by the results obtained in this work.

## REFERENCES

- Mangale, S. M., Chonde, S. G., Jadhav, A. S., & Raut, P. D. (2012). Study of *Moringa oleifera* (drumstick) seed as natural absorbent and antimicrobial agent for river water treatment. *J Nat Prod Plant Resour*, 2(1), 89-100.
- Yousuf, R.K., Archanajoshi., & Mehraj. (2011). In vitro antibacterial screening of different extracts of *Moringaoleifera* on pathogenic microorganisms. *International Journal of Pharmacy and Pharmaceutical Sciences*, 3: 75-99.
- Bukar, A., Uba, A., & Oyeyi, T. (2010). Antimicrobial profile of *Moringa oleifera* Lam. extracts against some food-borne microorganisms. *Bayero Journal of Pure and Applied Sciences*, 3(1).
- Jamil, A., Shahid, M., Khan, M. M., & Ashraf, M. (2007). Screening of some medicinal plants for isolation of antifungal proteins and peptides. *Pakistan Journal of Botany (Pakistan)*.
- Makkar, H. P. S., Francis, G., & Becker, K. (2007). Bioactivity of phytochemicals in some lesser-known plants and their effects and potential applications in livestock and aquaculture production systems. *animal*, 1(9), 1371-1391.
- Lakshminarayana, M., Shivkumar, H., Rimaben, P., & Bhargava, V. K. (2011). Antidiarrhoeal activity of leaf extract of *Moringa Oleifera* in experimentally induced diarrhoea in rats. *International journal of Phytomedicine*, 3(1), 68.
- Devendra, B. N., Srinivas, N., Prasad, V. S. S. L., & Latha, P. S. (2011). Antimicrobial activity of *Moringa oleifera* Lam., leaf extract, against selected bacterial and fungal strains. *International Journal of Pharma and Bio Sciences*, 2(3), 13-18.
- Harborne, J. B. (1984). *Phytochemical methods*. 2<sup>nd</sup> edition. Chapman and Hall.
- Rahman, M. M., Rahman, M. M., Akhter, S., Jamal, M. A., Pandeya, D. R., Haque, M. A., & Rahman, A. (2010). Control of coliform bacteria detected from diarrhea associated patients by extracts of *Moringa oleifera*. *Nepal Med Coll J*, 12(1), 12-19.
- Saadabi, A. M., & Abu, Z. A. I. (2011). An in vitro antimicrobial activity of *Moringa oleifera* L. seed extracts against different groups of microorganisms. *Asian J. Basic Appl. Sci*, 5, 129-134.
- Abdalla, A. M., Alwasilah, H. Y., Mahjoub, R. A. H., Mohammed, H. I., & Yagoub, M. (2016). Evaluation of antimicrobial activity of *Moringa oleifera* leaf extracts against pathogenic bacteria isolated from urinary tract infected patients. *Journal of Advanced Laboratory Research in Biology*, 7(2), 47-51.