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Comparable Antimicrobial Activity Evaluation of Drumstick (*Moringa oleifera* Lam.) leaves extract against bacterial isolates

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ABSTRACT

Drumstick, also known as *Moringa oleifera* Lam., is a wild and cultivated plant of the genus *Moringa* that belongs to the family Moringaceae. While having no negative side effects, its plant extracts have good therapeutic qualities that are comparable to antibiotics. In order to learn more about the antibacterial activity of *Moringa* extracts prepared in different solvents, including water, methanol, ethyl acetate, ethanol, and chloroform, the current investigation was undertaken utilising air dried fresh *Moringa* leaves. By keeping an eye on the Minimum Inhibitory Concentration (MIC) value, one can determine the antibacterial activity of *Moringa* leaf extracts made in these solvents. Different solvent-based extracts demonstrated antibiotic activity against a variety of pathogens, including *Bacillus subtilis*, *Staphylococcus aureus* and *Escherichia coli*. It was shown that leaf extracts in methanol and ethyl acetate were more efficient than those in ethanol. According to MIC values, *Bacillus subtilis* (23 mg/ml) was the bacterial strain that was most sensitive to moringa extract, followed by *Staphylococcus aureus* (25 mg/ml) and *Escherichia coli* (29 mg/ml). *Staphylococcus aureus* (15 mg/ml) was the strain that was most sensitive to the antibiotic tetracycline, whereas *Escherichia coli* (14 mg/ml) and *Bacillus subtilis* (17 mg/ml) were shown to be sensitive to chloramphenicol. The findings of this study indicate that *Moringa oleifera* leaf extract can be used to uncover antibacterial agents and create new medications for the treatment of common human pathogenic microorganisms that cause specific illnesses. The active substances that are responsible for the antibacterial action should be isolated and characterized in further research. They should also be examined in vivo to assess their toxicity and the ideal dose for application in the future.

Keywords: *Moringa*, MIC value, leaf extracts, antimicrobial activity, bacterial strains.

INTRODUCTION

The monogeneric family Moringaceae includes Moringa oleifera, commonly known as the drumstick because of its long, slender, triangular seed pods (Leone A *et al*., 2015). Moringa leaves are reported to have qualities that treat hallucinations, dry tumours, hiccups, asthma, scurvy, wounds, inflammation and helminthasis. They are also anti-inflammatory, anodyne, and ophthalmic. The most prevalent mesophilic bacteria in soil and water environments are S. aureus, B. subtilis, and E. coli, which are the main causes of human disease. By flocculating Gram-positive and Gram-negative bacterial cells, *M. oleifera* seeds have the ability to filter water (Bukar *et al*., 2010). Folk medicine practitioners have long recognized the usefulness of the moringa species in treating cancerous cells (Abdull Razis AF *et al*., 2014). Since most plants have been subjected to pharmacological or

biological testing due to the global problem of antibiotic resistance, many novel antibiotics that are released onto the market today are derived from natural or semi-synthetic sources. This experiment was called off in light of the rising desire for natural remedies and the bacterial resistance to antibiotics.

MATERIALS AND METHODS

The *M. oleifera* fresh leaves were gathered, allowed to dry naturally, and then utilized for extraction using water, methanol, ethyl acetate, and chloroform as solvents.

Escherichia coli (Gram-negative), *Staphylococcus aureus* (Gram-positive), and *Bacillus subtilis* (Gram-positive) standard cultures purchased from Microbial Type Culture Collection (MTCC), Chandigarh, were among the bacterial strains employed in the study.

To examine the antibiotic potential of various chemical and aqueous solvent based leaf extracts, the three most widely used antibiotics, ampicillin, tetracycline, and chloramphenicol susceptible to these strains, were taken.

The 50 gms of powdered dried leaves were carefully combined with the sample and various solvents before being placed in the refrigerator to incubate overnight. After filtering the supernatant, the filtrate was left to dry overnight. For testing the antibacterial activity, the standard extracts were kept in a refrigerator at 40 degrees Celsius.

The agar well diffusion method was used to assess the antimicrobial activity of leaf extracts and antibiotics against standard strains of various bacteria. For this approach, a solidified agar plate was inoculated with 0.2 ml of each seeded Mueller Hinter containing 10^9 test organisms and dispersed evenly. 20µl of leaf extracts were placed in the wells. Zone of bacterial inhibition was measured after 24 hours of 37°C incubation of bacterial plates.

Serial dilutions of the antibiotic solution were used to determine the MIC value. Mueller-Hinton broth (5 ml) was added to a culture of test bacteria. The suspension was added to 40 ml of Mueller-Hinton broth, diluted by 0.2 ml, and 1 ml of the diluted culture suspension was added to each tube. Each tube was then incubated at 35°C for an overnight period before the bacterial growth was seen. The least inhibitory concentration (MIC) is the maximum dilution at which growth cannot occur.

RESULT AND DISCUSSION

The results of this study clearly showed that *M. oleifera* leaf extract produced in methanol and ethyl acetate was more effective than ethanol which was in accordance with Fadia *et al*. (2021).

When compared to test antibiotics, the lowest inhibitory concentration of *Moringa* leaf extracts ranged from 23 to 29 mg/ml for these microorganisms.

The MIC values for leaf extract for *B. subtilis*, *S. aureus*, and *E. coli* were 23, 25, and 29 mg/ml, respectively. Thus, the results in current study revealed significant inhibitory effect of methanol leaves extract of Moringa oleifera on the E. coli which is in accordance with Fadia *et al*. (2021).

When compared to *B. subtilis* and *E. coli*, *S. aureus* was the test bacteria that responded to *M. oleifera* leaf extract the most, with a maximum inhibition zone of 18 to 19 mm.

The strain of *S. aureus* that was most sensitive to the antibiotic tetracycline (15mg/ml) was also the most sensitive to chloramphenicol (17mg/ml) and *B. subtilis* (14mg/ml).

CONCLUSION

The results showed that *M. oleifera* leaf extract in methanol and ethyl acetate performed better than ethanol. *M. oleifera* leaf extracts have a strong antibacterial activity, thus more study needs to be done to isolate and characterise the active components so they may be evaluated in vivo to assess their toxicity and ideal dose.

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