Antimicrobial properties of crude extracts of *Moringa oleifera* against some pathogenic bacteria and fungi isolated from different sites on human body

Khamael Ali Kareem*¹, Ammar Adnan Tuama¹, Intesar Kareem AbdulHassan¹

1. College of Basic Education, University of Diyala, Iraq

*Corresponding author: Ammar Adnan Tuama (ammartuama02@gmail.com)

Abstract

*Moringa oleifera*, or the horseradish tree, a is a pan-tropical plant, is one of approximately thirteen species belonging to the monogeneric Moringaceae family. Many reports have appeared in mainstream scientific journals describing its nutritional and medicinal properties. *M. oleifera* was its use for the treatment of infectious skin and mucosal diseases. As it is common practice for researchers to scientifically validate the efficacy of traditional medicine, it is less common for researchers to scientifically validate simple, reproducible means of conferring therapeutic benefits of plant parts. This study was conducted to investigate pragmatic extraction techniques for seed and leaf extracts of *M. oleifera*, a plant species for which numerous studies have demonstrated its antimicrobial efficacy. *M. oleifera* seeds and leaves were extracted. Sensitivity disks impregnated with the various extracts were used for antibiotic susceptibility testing of four bacterial species and two fungal species.

The zone of inhibition was used to compare antibacterial efficacy between extraction methods, trials, and controls.

Conclusion, significance and impact of study: The study showed that *Moringa oleifera* leaves possess inhibitory properties thus can serve as an alternative therapy for wounds, certain fungal infections, bacterial, and a good source of nutrient supplements.

Keywords: *Moringa oleifera*, Crude extraction, pathogenic bacteria


INTRODUCTION

A pan tropical plant of the Moringaceae family, *Moringa oleifera*, is one of approximately thirteen species in the monogeneric family (1) (2) (3) (4). The leaves of *Moringa oleifera* Lam are eaten in African countries, such as Ghana, Ethiopia, Nigeria, East Africa and Malawi. *Moringa* tree is cultivated for foods and medicinal purposes (5). *Moringa* leaf is a natural antihelmintic, antibiotic, detoxifier, outstanding immune builder used in some countries for the treatment of malnutrition and malaria (6). All parts of the *Moringa* tree are edible and have long been consumed by humans. According to (7), the many uses of *Moringa* include: alley cropping (biomass production), animal forage (leaves and treated seedcake), biogas (leaves), fertilizer (seed-cake), foliar nutrient (juice expressed from leave), green manure (from leaves), gum (from tree trunks), honey and sugar cane juice-clarifier (powdered seed), honey (flower nectar) and
Moringa leaves are known to have a high content of protein, minerals and vitamin, hence an ideal nutritional supplement, (Fletcher, 1998). Traditionally, the leaves of the plant are used for the treatment of a variety of disorders. The plant is reported to possess a wide range of pharmacological effects that includes antifertility (8), antitumor (9), antipyretic (10), antiepileptic (11), antispasmodic, anti-inflammatory, diuretic (12), antidiabetes (13), hypotensive (14), hypolipidemic (15), hypoglycemic (16), hepatoprotective (17), antifungal (18) and antibacterial activities (19).

Materials and Methods
Collect and determine the plant sample
New leaves of Moringa oleifera L. Collected from the city of Diwaniya in central Iraq. Plant samples were identified and approved by the Ministry of Science and Technology and were classified in Laboratory of Science and Technology in Baghdad.

Prepare snippets
Ethanol extracts (95%) of fresh and dried leaves Twenty-five grams (25 g) of fresh leaves of M. oleifera L. It was weighed and crushed directly by the mill. It was suspended in 100 ml of ethanol (95%) in a conical flask and was covered with rubber flakes. Left for 7 days with occasional shaking. Recommended on the seventh day using sterile filter paper (Whatman no. 1) in another clean conical flask; it was subjected to evaporation of water bath where the alcohol solvent was evaporated at a boiling temperature of 70°C. The standard extracts obtained in the refrigerator were then stored in 4°C to test antibacterial activity (20).

The method of posting agar well:
Antimicrobial and fungal activities extracted from leaves of M. oleifera L. extracts were tested using agar method for good reproduction. Three different concentrations (10-20 _30 μg / ml) were prepared. Nutrient agar plates were immunized with 100 ml of a 24-hour broth culture of tested bacteria or 100 mL of Sabouraud Dextrose soup. 5 days of fungi were tested. Four wells (6 mm) were manufactured and filled with 100 ml extract. The dishes were incubated for 24 hours at 37 °C for bacteria or for 3 days at 30 °C for fungus. The diameter of the region was measured to discourage recorded results (Attai et al., 1987). In addition, antimicrobial activity was compared with the standard.

Analysis by Gas Chromatography –Mass Spectrometry (GC-MS)
For GC-MS analysis, a high-temperature column (Inert cap 1MS; 30 m × 0.25 mm id × 0.25 μm film thickness) was purchased from Agilent Technologies (SHIMADZU—Japan), by employing a high-temperature column. Derivatization of each sample was eliminated. The injector and detector temperatures were set at 280 °C while the initial column temperature was set at 100 °C. A 5 μL sample volume was injected into the column and ran using split (1:10) mode. After 1 min, and the oven temperature was raised to 225 °C at a ramp rate of 12.5 °C/min (hold time 4 min). The oven temperature was then raised to 300 °C at a ramp rate of 7.5 °C/min (hold time 5 min). The helium carrier gas was programmed to maintain a constant flow rate of 17.5 mL/min and the mass spectra were acquired and processed using both Agilent GC-Mass. Solution (SHIMADZU—Japan) and postrun software. The compounds were identified by comparison of their mass with NIST library search and authentic standards.
Result

The present study included bioactivity of crude extracts of *Moringa oleifera* on some pathogenic organisms isolated from different site. The result showed the different sensitivity to the series of extraction on inhibition zone to a microorganism under study, table (1) and figure (1). The zone of inhibition of *Moringa oleifera* extracts against bacteria was ranged between (9-17 mm at 10 mg/l and 7mm - 13mm and 10mm-12mm at 20mg/l, and 30mmg/l respectively. The zone of inhibition of *Moringa oleifera* extracts against fungi was ranged between (9-13 mm at 10 mg/l and 12mm - 14mm and 11mm-14mm at 20mg/l and 30mmg/l respectively.

Table (1). Antimicrobial Activity of crude extracts of *Moringa oleifera*

<table>
<thead>
<tr>
<th>Microbes</th>
<th>Control</th>
<th>10 mg/l</th>
<th>20mg/l</th>
<th>30mg/l</th>
<th>LSD value</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>E. coli</em></td>
<td>0</td>
<td>9</td>
<td>7</td>
<td>10</td>
<td>2.51 *</td>
</tr>
<tr>
<td><em>Klebsiella</em></td>
<td>0</td>
<td>10</td>
<td>8</td>
<td>10</td>
<td>2.95 *</td>
</tr>
<tr>
<td><em>St. epidermis</em></td>
<td>0</td>
<td>12</td>
<td>11</td>
<td>12</td>
<td>3.04 *</td>
</tr>
<tr>
<td><em>St aureus</em></td>
<td>0</td>
<td>17</td>
<td>13</td>
<td>12</td>
<td>3.74 *</td>
</tr>
<tr>
<td><em>c. albicans</em></td>
<td>0</td>
<td>13</td>
<td>14</td>
<td>14</td>
<td>3.17 *</td>
</tr>
<tr>
<td><em>Asperniger</em></td>
<td>0</td>
<td>9</td>
<td>12</td>
<td>11</td>
<td>3.68 *</td>
</tr>
<tr>
<td>LSD value</td>
<td>--</td>
<td>4.38 *</td>
<td>2.62 *</td>
<td>2.33 *</td>
<td>---</td>
</tr>
</tbody>
</table>

* (P<0.05).

The *S aureus* bacteria show more sensitivity and inhibition zone which reach a significant level (P<0.05) in all dilution were compare with other microorganisms , while *E. coli* was less sensitive in compare with other organisms as shown figure (1) as well as the result show a significant differences in any dilution between all pathogenic organisms inhibition zones , furthermore there are found a significant difference between serial dilution against the same pathogen under probability levels (P<0.05).

![Antimicrobial Activity of crude extracts of *Moringa oleifera* as presented by inhibition zone diameter (mm).](http://doi.org/10.36295/ASRO.2020.23922)
Dissuasion
Administered at clinical doses, antibiotics that inhibit the proliferation of bacteria are classified as either: bactericidal or bacteriostatic. The former prevent bacterial proliferation by killing the organism, whereas the latter prevents bacterial proliferation by preventing the organism from dividing, which in turn assists the individual’s immune system to destroy the pathogen. The mechanism by which *M. oleifera* derived isothiocyanates lead to bacterial inhibition cannot be understood. However, intensive research documenting the efficacy of highly active synthetic antibacterial peptides derived from *M. oleifera* seed proteins has helped to clarify the mechanism by which the cationic peptide inhibits microbes (21).

The secondary structure of the antimicrobial polypeptide contains positively charged α-helices that are thought to bind to negatively charged phospholipid heads of the bacterial cell membrane; the charge attraction and stabilization allows for subsequent interaction between a loop region in the antibacterial peptide structure and aliphatic fatty acids of the bacterial membrane (22). In turn, the bacterial membrane is destabilized by changes in permeability and lipid distribution, as well as disruption of its membrane potential. In sum, these effects result in breaks in the bacterial cell membrane, disaggregation of its components, and eventually cell death (21).

*M. oleifera* leaf showed significant antifungal activity part on *c. albicans*, and *Aspergillus*. These findings corroborate with previous reports (23) (24) (25). Extract produced antifungal growth inhibition zone of 22 mm with *T. mentagrophytes*, thus agrees with (26) who reported in vitro antifungal activity from the extracts of the leaves of *M. oleifera* against dermatophytes such as *T. rubrum*, *T. mentagrophytes*, *E. Xoccosum*, and *M. canis*. Similarly, (27) reported antifungal activity of *M. oleifera* against seven pathogenic fungi of which the extracts were effective against *T. rubrum* and *T. mentagrophytes*.

Reference


