A Review on Medicinal uses of *Moringa oleifera*

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**Abstract**

There are about thirteen species of Moringa trees in the family Moringaceae. *Moringa oleifera* Lam. (synonym: *Moringa pterygosperma* Gaertn.) is the most widely known species. All part of the *Moringa tree* is useful in some way and people depend on it for their livelihood. The leaves of the Moringa tree are an excellent source of Nutrients like Minerals, Protein and Vitamins (A and C). Moringa tree has approximately 46 antioxidants and it is one of the cheapest sources of natural anti-oxidants. Anti-oxidants supply the free atoms needed by the human body and mitigate the effect of free radicals. *M. oleifera* contains active compounds such as flavonoids, tannins, saponins, alkaloids, phenolics, and triterpenoids which possess antibacterial effects. Moringa leaves contain flavonoids and tannins that are thought to have anti-inflammatory effects. *Moringa oleifera* has high mineral and protein content and has been previously investigated for its potential in treating different oral soft tissue diseases. Present review summarises the various medicinal uses of *Moringa oleifera*.

Keywords: Moringa oleifera, Anti-oxidants, Oral diseases, dentistry

**Introduction**

*Moringa oleifera* is the most widely cultivated pan-tropical species of a monogeneric family, the Moringaceae, which is native to the sub-Himalayan tracts of India, Pakistan, Bangladesh and Afghanistan. *Moringa oleifera* is known by such regional names as benzolive, drumstick tree, kelor, marango, mlange, mulangay, nébéday, saijhan, and sajna.1. Virtually every part of the tree is beneficial in some way and both rural and urban people depend on it for their livelihood. In developing tropical countries, Moringa trees have been used to combat malnutrition, especially among infants and nursing mothers.2,3. The leaves of the Moringa tree are an excellent source of Nutrients like Minerals, Protein and Vitamins (A and C).4, 5, 6, Moringa has approximately 46 antioxidants and is one of the most powerful sources of natural anti-oxidants. Anti-oxidants supply the free atoms needed by the human body and mitigate the effect of free radicals. *M. oleifera* contains active compounds such as flavonoids, tannins, saponins, alkaloids, phenolics, and triterpenoids which possess antibacterial effects.7

**Medicinal uses of Moringa oleifera**

Moringa has approximately 46 antioxidants and is one of the most powerful sources of natural anti-oxidants. Anti-oxidants supply the free atoms needed by the human body and mitigate the effect of free radicals. *M. oleifera* contains active compounds such as flavonoids, tannins, saponins, alkaloids, phenolics, and triterpenoids which possess antibacterial effects hence it can be used as safe and cheap plant antimalarial agent. The extract from leaves of *Moringa oleifera* has high mineral and protein content and its historic reputation as a traditional medicine for different diseases has been previously investigated for its potential in treating different oral soft tissue diseases.16, 17.

**Enamel Tissue Remineralization**

*Moringa oleifera* extract contains the highest values of calcium and phosphate that are required for the remineralization process. Therefore, *Moringa oleifera* extract is investigated by Younis et al for its ability to treat induced enamel lesion.18 Scanning electron microscopy revealed that Leaves extract of *Moringa oleifera* loaded-varnish groups IV & V showed the most re-establishment of normal enamel architecture. Elemental analysis of the treated surfaces of Groups IV and V showed the surfaces treated by *Moringa oleifera* leaf extract loaded-varnish groups had significantly higher Ca, P, and O deposition than the fluoride varnish group. Leaves extract of *Moringa oleifera* might be considered as a biomimetic material which having capacity to guiding enamel tissue remineralization.19

Study by Risnayanti Anas et al, concluded that there is an increase in the amount of calcium in the teeth after the application of *Moringa oleifera* based paste and Ccasein phosphopeptide-amorphous calcium phosphate (CPP-ACP) application. *Moringa oleifera* based paste and CPP-ACP are effective to increasing calcium levels in teeth compared to the pre-test group.20
Dental caries is closely related with cariogenic biofilm, an oral biofilm containing a high proportion of Streptococcus mutans. Generally, oral biofilm is structurally and functionally organized and contains a balance of normal flora and pathogenic bacteria like S. mutans. Su-Kyung Jwa has studied the antimicrobial effects of the Moringa oleifera leaf extracts on S. mutans and formation of cariogenic biofilm. Extracts had the maximum antibacterial activity among the different extracts of different parts of Moringa oleifera plant using different extraction methods in which 50% methanol and ethyl acetate had maximum antibacterial activity against S. aureus. Ethyl acetate had maximum antibacterial activity against E. coli, Staphylococcus aureus, Streptococcus gillinarum and P. aeruginosa. The ethyl acetate, acetone and methanol extracts showed maximum and equal antibacterial activity against P. aeruginosa. The disc diffusion study revealed that both the Gram positive and Gram-negative organisms showed variablesensitivity to different extracts of M. oleifera. In general, ethyl acetate and acetone extracts showed maximum antibacterial activity against S. aureus, S. gallinarum and P. aeruginosa. The antibacterial potential of different extracts of M. oleifera specially of those of ethyl acetate and acetone extracts, demand further in vitro and in vivo studies to exploit their antibacterial action in the treatment of bacterial diseases of man and animals.

As Antimicrobial Agent

The leaf extracts of M. oleifera showed varying antimicrobial activity on wide range of microorganisms. In a study by Singh et al. (2012), the antimicrobial activity of Moringa oleifera was examined using the main model Kirby-bauer disc diffusion method in which 50% of Moringa oleifera leaf extract was used. The results showed that 50% ethanolic extract successfully displayed anti-bacterial activity however only little. Even at higher concentration, the extract displayed mild inhibitory activity and no activity at all against pseudomonas.

Hanaa Elgamily et al carried out a study to assess the antibacterial and antifungal potentials of different parts of Moringa oleifera plant using different extraction methods in attempts to formulate natural dental remedies from this plant. The different extracts of different parts of Moringa oleifera showed an antibacterial effect against Staphylococcus aureus and Streptococcus mutans growth. The novel toothpaste of ethanolic leaves extract has antimicrobial and antifungal potential effects all selected strains.

Another study indicated that E. coli was found to be equally sensitive to ethyl acetate, acetone and chloroform extracts and had the maximum antibacterial activity among the extracts. S. aureus was sensitive to all the extracts studied. The ethyl acetate had maximum antibacterial activity against S. aureus in comparison to the other extracts. The study revealed that S. gallinarum was also sensitive to all the extracts showing maximum antibacterial activity with ethyl acetate extracts and moderate and equal sensitivity to methanol and chloroform. The ethyl acetate, acetone and methanol extracts showed maximum and equal antibacterial activity against Paeruginosa. The disc diffusion study revealed that both the Gram positive and Gram-negative organisms showed variablesensitivity to different extracts of M. oleifera. In general, ethyl acetate and acetone extracts showed maximum antibacterial activity against E. coli, S. aureus, S. gallinarum and P. aeruginosa. The antibacterial potential of different extracts of M. oleifera specially of those of ethyl acetate and acetone extracts, demand further in vitro and in vivo studies to exploit their antibacterial action in the treatment of bacterial diseases of man and animals.

As anti-diabetic agents

Ajit et al., 2003 reported that hypoglycemic activity of Moringa oleifera, with significant blood glucose lowering activities has been confirmed. From work of Francis et al., 2004 et al., Methanolic extract of its dried fruits powder has produced N-Benzyl thiocarbamates, N-benzyl carbamates, benzyl nitriles and a benzyl; which prove to trigger insulin release significantly from the rodent pancreatic beta cells and have cydooxygenase enzyme and lipid peroxidation inhibitory activities.

As anti-inflammatory agents

Now a days, herbal medicine is being widely used as alternative medicine in developed countries. Leaves of Moringa plant have been shown to have anti-inflammatory activities. Moringa leaves contains flavonoids and tannins that are thought to have anti-inflammatory effects.
Tannins are polyphenolic compounds that are abundant in Moringa leaves. The amount of tannin in M. oleifera ranged between 13.2 gTAE/kg and 20.6 gTAE/kg in dry leaves. Tannins have anti-inflammatory activity and antioxidant activity. In the inflammatory process, tannins can inhibit the production of oxidants by neutrophils, monocytes, and macrophages and directly inhibit reactive oxidants such as OH and NO.

Utilization of the efficacy of moringa leaves developed in various dosage forms has also begun to be widely studied. The results showed that moringa leaves extract could be applied topically in the form of gels, ointments, and creams. The advantage of giving topical anti-inflammatory drug preparations is that it is easy to use because it can be directly applied to the inflamed area and has fast absorption, therefore, it can directly provide a therapeutic effect. Previous research has conducted an anti-inflammatory test of 5% moringa extract in gel preparations and found that inflammation was reduced by 47.09%.

Some similar research was also carried out using the extract of Moringa leaves with a concentration of 12%, and the results showed that the cream of Moringa leaves extract had a fairly good anti-inflammatory effect.

### Table 1: Some reported work of Moringa oleifera

<table>
<thead>
<tr>
<th>S.N.</th>
<th>Author</th>
<th>Objective of study</th>
<th>Application</th>
<th>Ref</th>
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<tr>
<td>1</td>
<td>Rao P K, et al (2011)</td>
<td>To assess the antibacterial activity of isolated compounds from M. oleifera against selected oral bacteria</td>
<td>All the isolated compounds from M. oleifera were active against Streptococcus and mutans (MTCC 497), Streptococcus salivarius, Lactobacillus fermentum, Streptococcus anginosus, Streptococcus gordonii, Lactobacillus acidophilus.</td>
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<td>2</td>
<td>Hanaa Elgamily et al (2016)</td>
<td>To assess the antibacterial and antifungal potentials of different parts of Moringa oleifera</td>
<td>For dental remedies, experimental toothpaste exhibited a high mean inhibition compared to those treated with M.O.</td>
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<td>3</td>
<td>Carranza J B, (2017)</td>
<td>To identify the secondary compounds of three varieties of Moringa oleifera Lam. Extracts namely; Native, Chinese, and Yard Long malunggay using phytochemical analysis</td>
<td>The extracts of moringa varieties contain flavonoids, alkaloids and tannins that are known to have antimicrobial and anti-inflammatory properties; thus, these have potential natural components in the manufacture of toothpastes</td>
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<td>4</td>
<td>Su-Kyung Jwa et al (2019)</td>
<td>to investigate the antimicrobial effects of the M. oleifera leaf extracts</td>
<td>Extracts showed antimicrobial activity against S. mutans and inhibited formation of cariogenic biofilm</td>
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<td>5</td>
<td>Plasti Sopandani et al (2020)</td>
<td>to assess the antibacterial effect of M. oleifera extract as an irrigation solution against E. faecalis</td>
<td>M. oleifera extract solution at concentrations of 75% and 100% is as effective as 5.25% NaOCl against E. faecalis</td>
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<td>6</td>
<td>Mahassen M Farghaly et al (2020)</td>
<td>to formulate a nontoxic mouthwash from Moringa oleifera</td>
<td>Moringa extract showing antibacterial and antiplaque effect will be used</td>
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<td>7</td>
<td>Younis SH (2020)</td>
<td>To assess the effect of Leaves extract of Moringa oleifera loaded-varnish groups IV &amp; V on enamel</td>
<td>Moringa leaf extract loaded-varnish groups had significantly higher Ca, P, and O deposition than the fluoride varnish group. Leaves extract of Moringa oleifera might be considered as a biomimetic material which having capacity to guiding enamel tissue remineralization</td>
<td>18</td>
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<td>8</td>
<td>Anas R et al (2021)</td>
<td>To study the Effectiveness of Paste Based Moringa oleifera To Increase Calcium Levels Human Tooth</td>
<td>Results of this research showed that Moringa oleifera paste has higher calcium level compared to Pre-test groups and Moringa oleifera paste can be effective in increasing calcium levels of human teeth</td>
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<td>9</td>
<td>Nawal Aidaros et al (2021)</td>
<td>To investigate and compare the effect of green tea, black tea and Moringa oleifera on artificially</td>
<td>In dentin, the highest mean value was found in Moringa oleifera. Study concluded that Moringa tree enhanced the remineralization process and thus, might be considered as an alternative to fluoride varnish</td>
<td>43</td>
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</table>
Conclusion

*M. oleifera* contains active compounds such as flavonoids, tannins, saponins, alkaloids, phenolics, and triterpenoids which possess antibacterial effects hence it can be used as safe and cheap plant antimicrobial agent. The extract from leaves of *Moringa oleifera* has high mineral and protein content. As traditional medicine it has potential in treating different oral soft tissue diseases. Study by Nawal Aidaros et al concluded that *Moringa oleifera* enhanced the remineralization process of demineralized enamel and dentin, and thus, might be considered as an effective natural remineralizing agent. Further research on *Moringa oleifera* needed to exploit the pharmacological uses for management and prevention of oral disease.

References


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| 11 | Buakaew et al 2021 | *Moringa oleifera* and *Azadirachta indica* were assessed for oral healthcare and gingivitis adjunctive treatment | Author state that accumulative reduction percentages of both Staphylococcus spp. and Candida spp. were found and indicated that the herbal mouthwashes reduced Gingival index and plaque index and showed potential as oral healthcare products | 44 | 13 | 100 | 2023; 13(11):197-201 | Journal of Drug Delivery & Therapeutics |
Wistar rat (Rattus norvegicus) induced by carrageenan 1%. Bali Medical Journal 2022; 11(1):122-126. https://doi.org/10.15562/bmj.v11i1.3384


42. Mahassen M Farghaly, Shahinaz G Elashiry, Anticariogenic Effect of Moringa Oleifera Mouthwash Compared to Chlorhexidine MouthwashClinicalTrials.gov Identifier: NCT04575948.
