

Available online on 15.06.2020 at ijmspr.com

International Journal of Medical Sciences and Pharma Research

Open Access to Medical and Research

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Review Article

Therapeutic benefits of *Moringa oleifera*: A Mini Review

Sunil Kumar Prajapati^{1*}, Vijay Kumar Tilak², Ram Chand Dhakar³, Rajeshwar Kamal Kant Arya⁴, Jitendra Nagar⁵, Chaman Nagar⁶

¹ Professor, Institute of Pharmacy, Bundelkhand University, Jhansi, India

² Apex Professional University, Pasighat, Arunachal Pradesh-791102, India

³ Hospital Pharmacy, SRG Hospital & Medical College Jhalawar, Rajasthan, India-326001

⁴ Assistant Professor, Department of Pharma sciences, Kumaun University Nainital, India

⁵ Associate Professor, Department of ENT, Jhalawar Medical College, Jhalawar, Rajasthan, India

⁶ B. J. Medical College, Ahmedabad, Gujarat, India

Article Info:

Article History:

Received 04 March 2020

Reviewed 27 April 2020

Accepted 23 May 2020

Published 15 June 2020

Cite this article as:

Prajapati SK, Tilak VK, Dhakar RC, Arya RKK, Nagar J, Nagar C, Therapeutic benefits of *Moringa oleifera*: A Mini Review, International Journal of Medical Sciences & Pharma Research, 2020; 6(2):1-4

DOI: <http://dx.doi.org/10.22270/ijmspr.v6i2.80>

*Address for Correspondence:

Dr. Sunil Kumar Prajapati, Professor, Institute of Pharmacy, Bundelkhand University, Jhansi, India

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 and reported many therapeutics uses in previous years. All part of the *Moringa tree* is useful in some way and people depends 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 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-inflammatory, Oral diseases, anti-diabetic

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, mlonge, 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

Therapeutic benefits 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 antimicrobial 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^{8,9}.

As anti-diabetic agents

Ajit et al., 2003 reported that hypoglycemic activity of *Moringa oleifera*, with significant blood glucose lowering activities has been confirmed.¹⁰ 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 cyclooxygenase enzyme and lipid peroxidation inhibitory activities.¹¹

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.^{12,13}

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.^{12,13}

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%.¹⁴ Similar research was also carried out using preparations in the form of cream of *Moringa* leaves extract with a concentration of 12%, and the results showed that the cream of *Moringa* leaves extract had a fairly good anti-inflammatory effect.¹⁵

Hepatoprotective Activity¹⁶

Alaaeldin A. Hamza et al investigated that the administration of M.O seed extract decreased the CCl₄-induced elevation of serum aminotransferase activities and globulin level¹⁷. The elevations of hepatic hydroxyproline content and myeloperoxidase activity were also reduced by M.O treatment. Liver fibrosis was induced by the oral administration of 20% carbon tetrachloride (CCl₄), twice weekly and for 8 weeks¹⁸. The biochemical and histological results showed that M.O. reduced liver damage as well as symptoms of liver fibrosis. S. Fakurazi et al showed that initiation of acetaminophen toxicities is believed to be promoted by oxidative stress during the event of overdose. MO showed that the hepatoprotective activity gives significant histopathological analysis and reduction of level of alanine aminotransferase (ALT), aspartate aminotransferase (AST), and alkaline phosphatase (ASP) in the group treat with MO compared to those treated with acetaminophen alone. The level of glutathione (GSH) was found to be restored in MO treated animal¹⁹⁻²¹

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*.²²

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.²³

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 extracts. 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 variable sensitivity 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 animals²⁴.

In Enamel Tissue Remineralization

Moringa oleifera extract contains the highest values of calcium and phosphate that are required for the remineralization process. Dental caries is closely related with cariogenic biofilm, an oral biofilm containing a high proportion of *Streptococcus mutans*.¹ Generally, oral biofilm is structurally and functionally organized and contains a balance of normal flora and pathogenic bacteria like *S. mutans*.²⁵ Su-Kyung Jwa has studied the antimicrobial effects of the *M. oleifera* leaf extracts on *S. mutans* and formation of cariogenic biofilm. Extract from *M. oleifera* leaves was derived using distilled water (DW) and ethyl alcohol (EtOH). *S. mutans* susceptibility assays were performed for each extract. Cariogenic biofilm was formed with or without DW and EtOH extract, and cariogenic biofilm was treated with both extracts. Both extracts showed antimicrobial activity against *S. mutans* and inhibited formation of cariogenic biofilm.

26

Table 1: Some reported work of *Moringa oleifera* ⁷

S.N.	Author	Objective of study	Application	Ref
1	Su-Kyung Jwa et 2019	to investigate the antimicrobial effects of the <i>M. oleifera</i> leaf extracts	extracts showed antimicrobial activity against <i>S. mutans</i> and inhibited formation of cariogenic biofilm	26
2	Rao P K, et al 2011	To assess the antibacterial activity of isolated compounds from <i>M. oleifera</i> against selected oral bacteria	All the isolated compounds from <i>M. oleifera</i> were active against <i>Streptococcus mutans</i> (MTCC 497), <i>Streptococcus salivarius</i> , <i>Lactobacillus fermentum</i> , <i>Streptococcus anginosus</i> , <i>Streptococcus gordonii</i> , <i>Lactobacillus acidophilus</i> .	27
3	Carranza J B, 2017	To identify the secondary compounds of three varieties of <i>Moringa oleifera</i> Lam. Extracts namely; Native, Chinese, and Yard Long malunggay using phytochemical analysis	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	28

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 agent¹¹. Further research on *Moringa oleifera* needed to exploit the pharmacological uses for management and prevention of oral disease.

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