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Application of Moringa oleifera in Dentistry

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Abstract

All part of the *Moringa tree is* useful in some way and people depends on it for their livelihood. Oral diseases persist to be a major health problem all over the world. Various microorganisms are found to be the possible pathogens responsible for the oral diseases. 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 application of *Moringa oleifera* in the field of dentistry.

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

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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.

Figure 1: Various parts of Moringa Oleifera [7-14]

Moringa oleifera in Dentistry

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 [15, 16].

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.[17] 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.[17]

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.[18]

Based on the results of the study by Risnayanti Anas et al, it can be concluded that there is an increase in the amount of calcium in the teeth after the application of *Moringa oleifera* based paste and Casein phosphopeptide-amorphous calcium phosphate (CPP-ACP) application. *Moringa oleifera* based paste and CPP-APP are effective to increasing calcium levels in teeth compared to the pre-test group.[19]

Dental caries is closely related with cariogenic biofilm, an oral biofilm containing a high proportion of *Streptococcus mutans* [20]. Generally, oral biofilm is structurally and functionally organized and contains a balance of normal flora and pathogenic bacteria like *S. mutans* [21]. Su-Kyung Jwa has investigated 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. [22]

Table 1: Application of *Moringa oleifera* in Dentistry

S.N.	Author	Objective of study	Application	Ref
1	Rao P K, et al 2011	To assess the antibacterial activity of isolated compounds from *M. oleifera* against selected oral bacteria	All the isolated compounds from *M. oleifera* were active against Streptococcus mutans (MTCC 497), Streptococcus salivarius, Lactobacillus fermentum, Streptococcus anginosus, Streptococcus gordonii, Lactobacillus acidophilus.	23
2	Hanaa Elgamily et al 2016	To assess the antibacterial and antifungal potentials of different parts of *Moringa oleifera*	For dental remedies, experimental toothpaste exhibited higher mean inhibition than the mouthwash against *Staphylococcus aureus, Streptococcus mutans* and only the toothpaste revealed antifungal effect against *Candida albicans*	18
4	Carranza J B, 2017	To identify the secondary compounds of three varieties of *Moringa oleifera* 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	24
5	Su-Kyung Jwa et 2019	to investigate the antimicrobial effects of the *M. oleifera* leaf extracts	extracts showed antimicrobial activity against *S. mutans* and inhibited formation of cariogenic biofilm	22
6	Piasti Sopandani et al 2020	to assess the antibacterial effect of *M. oleifera* extract as an irrigation solution against *E. faecalis*	*M. oleifera* extract solution at concentrations of 75% and 100% is as effective as 5.25% NaOCl against *E. faecalis*	25
7	Mahassen M Farghaly et al 2020	to formulate a nontoxic mouthwash from *Moringa oleifera*	Moringa extract showing antibacterial and antiplaque effect will be used	26
8	Younis SH 2020	To assess the effect of Leaves extract of *Moringa oleifera* loaded-varnish groups IV & V on enamel	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	17
9	Anas R et al 2021	To study the Effectiveness of Paste Based *Moringa oleifera* To Increase Calcium Levels Human Tooth	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	19
10	Nawal Aidaros et al 2021	To investigate and compare the effect of green tea, black tea and *Moringa oleifera* on artificially demineralized enamel and dentin	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 effective natural remineralizing agents	27
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	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 agent[27]. Further research on *Moringa oleifera* needed to exploit the pharmacological uses for management and prevention of oral disease.

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