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The Wonder Leaf with Magical Properties – Moringa Oleifera

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ABSTRACT:
OBJECTIVES: Phyto-medicine is gaining interest due to the benefits of its antimicrobial compounds from plants, which are renewable, cost-effective, and have a history of safe use. Increased bacterial resistance is driving research on the antimicrobial properties of herbs, with Moringa oleifera recognised for its valuable natural compounds. Its leaves, seeds, roots, flowers, and fruits demonstrate antitumor, anti-inflammatory, and antibacterial effects, thanks to constituents like flavonoids, phytosterols, glycosides, tannins, and amino acids.**MATERIALS AND METHODS:** Dried and cold-milled Moringa oleifera (PKM1) leaves powder, 70% Ethanol, 2% Acetic acid, Propylene glycol, Chitosan powder, Polyethylene glycol, Carbopol 940.In this study, moringa oleifera gel is prepared. Antimicrobial screening of two gels was performed against periodontal pathogens using the disc diffusion method. Microbial investigations are done by calculating the zone of inhibition. **RESULTS:**The results show Moringa oleifera gel does exhibit antimicrobial properties; its effectiveness is comparable or slightly less than that of chlorhexidine gel. These findings highlight the potential use of Moringa oleifera gel as an alternative antimicrobial agent.**CONCLUSION:** Moringa Oleifera, known as the Miracle Tree, significantly enhances health and fights pathogens. Its benefits, from improving oral health to promoting overall wellness, highlight nature's wisdom. By embracing Moringa, we adopt a holistic approach to well-being and utilize nature's gifts for a healthier future.
KEYWORDS: MORINGA OLEIFERA GEL, MIRACLE TREE, MICROBIAL ANALYSIS.

I. INTRODUCTION

Periodontal disease, also known as periodontitis, is a chronic inflammatory condition that affects the periodontium. In its advanced stages, this disease can result in the loss of the periodontal ligament and the destruction of the alveolar bone surrounding the teeth[1]. It is considered one of the two biggest threats to oral health and is the main cause of tooth loss[(1,2)].

It is a prevalent dental disease worldwide, affecting a significant portion of the population. According to the World Health Organization (WHO), 10 to 15% of the global population suffers from severe periodontitis[3]. Clinical attachment loss (CAL) and probing depth (PD) are the standard diagnostic measures for the disease, and it is generally divided into mild, moderate, or severe categories based on their severity and extent[4]. The primary goal of periodontal therapy is to eliminate dental plaque and the factors that contribute to plaque accumulation and retention. Scaling and root planing (SRP) is one of the standard treatments that can help re-establish the periodontal tissues to a healthy state by removing plaque and calculus[5]. However, some studies have shown that SRP alone may not be effective in eliminating most of the causal bacteria, and bacteria may persist in the treated sites. Therefore, systemic and locally delivered pharmacologic substances are used in conjunction with SRP to achieve optimal outcomes.

Local drug delivery (LDD) devices are sophisticated systems that have been designed to deliver medication directly into the periodontal pocket. This targeted approach allows for optimal penetration of the drug into the periodontal tissues, thus maintaining a therapeutic level within the pocket for an extended duration[6]. The combination of this dual effect on pocket microflora and the pathogens invading tissue can significantly improve clinical outcomes without any undesired systemic effects. Several antibiotics have been used in LDD to eliminate periodontal pathogens and provide adjunctive therapy.

Phyto-medicine is regaining interest owing to the advantages of using readily available antimicrobial compounds from plant sources, which are renewable, less expensive, acceptable

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due to a long history of use, have fewer side effects, and are better patients tolerance. It has been estimated that between 60% and 90% of the population of developing countries use traditional medicines almost exclusively and consider them to be a normal part of primary healthcare[7]. Increasing bacterial resistance is prompting a resurgence in research on the antimicrobial role of herbs against resistant strains[8].

The primary objective of this experimental study is to compare the efficacy of three different gels - Moringa oleifera gel, and Chlorhexidine gel - in reducing bacterial load to prevent periodontal infection by measuring the zone of inhibition.

II. MATERIALS AND METHODS

The study was designed as an in vitro experimental study.

The ingredients used in the study were dried and cold-milled moringa oleifera leaves powder, 70% Ethanol, 2% acetic acid, Propylene glycol, Chitosan powder, Polyethene glycol, Carbopol 940, and Nutrient agar. Ten grams of dried and powdered MO leaves were soaked with 400 mL of 70% ethanol at room temperature for 72 h with intermittent stirring. The extract was filtered using Whatman no. 1 filter paper and was re-extracted again until the extraction was depleted. It was then evaporated in a hot air oven at 90°C.

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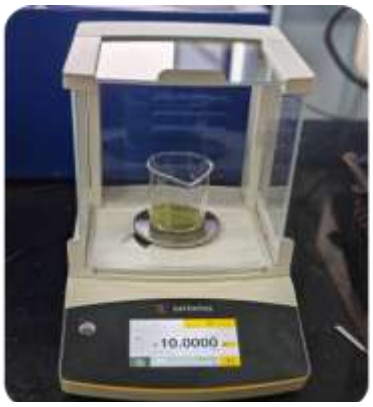

PREPARATION OF MORINGA OLEIFERA GEL

Chitosan gel preparation, 0.5g of chitosan is dissolved in 10 ml of 2% (v/v) acetic acid solution with continuous stirring for 30 mins.

The preparation of Carbopol 940 gel, 0.5g is added to water (10 ml), kept for 30 minutes to swell, and continuously stirred for 30 minutes.

The preparation of peg gel, 0.5g is added

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to 10 ml of water and dissolved with continuous stirring for 20 mins.

M. oleifera leaf extract of 2mg is added to the PEG gel and stirred well. This mixture is added to Carbopol gel and mixed well, then it is added with chitosan gel and dissolved well by stirring for 30 minutes.

2ml of propylene glycol was added and stirred continuously for 1 hr till a clear gel was obtained.

Chitosan gel

Carbopol gel

Polyethylene glycol gel

Moringa gel

SALIVA DILUTION METHOD

1 ml of unstimulated saliva was collected from the participant in a sterile container. The collected saliva was immediately transferred to plastic Eppendorf tubes. Under the aseptic condition, 1 ml of the saliva sample was added to 9 ml of diluents. After thorough mixing, 1 ml of the mixture (10^{-1}) was added to a tube containing 9 ml diluent and mixed again. Using this method, 10^{-9} dilutions were prepared for each sample of saliva. Then 50µl of the sample was dropped onto the surface of the agar plate using a micropipette, followed by placing the plates into a dry incubator at 37°Cfor 24 hours.

MICROBIAL ANALYSIS

The assessment of the microbiological parameters was done using the agar diffusion test. Two types of gels were laid over the incubated agar plates.

Afterwards, the plates were again incubated for 24 hours at 37^0 C, and therefore, the growth of bacteria was determined below each gel (zone of inhibition). The presence of antimicrobial activity is indicated by the absence of bacterial growth directly below the test sample.

III. RESULTS

The result shows that Moringa oleifera has a significant effect against pathogens. Moringa oleifera gel shows equal or fewer effects compared to chlorhexidine gel.

IV. DISCUSSION

In recent times, various medicinal plants and their extracts have been utilized to prevent and treat oral infections. Studies have explored the advantages of using plant-based products on different periodontal clinical parameters[9]. Numerous studies have evaluated the phytochemistry of M. oleifera and its pharmacological applications[10].The investigation of antioxidant polyphenols in the ethanolic extract of M. oleifera leaves, conducted through high-performance liquid chromatography, conclusively identified several phenolic acids—gallic, chlorogenic, ellagic, and ferulic acids—as well as flavonoids, including kaempferol, quercetin, vanillin, and rutin[11]. Polyphenols are promising agents that can help control periodontal diseases due to their antimicrobial and immunomodulatory properties[12].Carbopol, when combined with mucin, creates a secondary bio-adhesive bond, while with other polymers, it forms only a superficial bio-adhesive bond. Carbopol 940 exhibits excellent cross-linking and swelling properties. As the

polymer swells, the gel thickens, reducing the penetration of water. This results in a controlled release of the drug[13].Chitosan is also nontoxic, biocompatible, and biodegradable[14].Chitosan exhibits antimicrobial [15]properties, as well as wound healing, haemostatic, and tissue regenerative effects, making it an agent of interest.[16,17].Our results demonstrated that M. oleifera leaf extract has bactericidal properties against pathogens, even at lower concentrations. Therefore, the combination of chitosan and Moringa oleifera extract provides an additive antimicrobial effect.The findings demonstrate that Moringa oleifera gel exhibits notable antibacterial activity, attributed to phytochemicals such as quercetin, kaempferol, and phenolic acids known to disrupt microbial cell walls and interfere with protein synthesis (Singh et al., 2021; Ahmed et al., 2022)[18,19]. The comparable inhibition to chlorhexidine aligns with emerging reports that herbal gels can achieve clinically relevant plaque reduction without cytotoxic effects (Sharma et al., 2023)[20]. The presence of chitosan enhances bioadhesion and provides sustained release, while Carbopol contributes to viscosity and controlled drug diffusion (Lee et al., 2023; Patel et al., 2024)[21,22]. Polyphenols also exhibit immunomodulatory actions beneficial in chronic periodontal inflammation (Kumar & Raghav, 2022). Although the current study confirms in vitro antimicrobial potential, further clinical trials are necessary to validate safety, substantivity, and therapeutic outcomes in vivo.

V. CONCLUSION

In our exploration of Moringa Oleifera, it is evident why this remarkable plant is known as the Miracle Tree. Its significant impact on health, particularly in fighting pathogens, highlights its potential as a powerful natural remedy. Moringa offers diverse benefits, from improving oral health to enhancing overall wellness, all deeply rooted in nature's wisdom. As we continue to uncover its secrets through scientific research and practical use, Moringa Oleifera stands as a testament to the incredible healing power of the natural world. Embracing Moringa is not only about harnessing its immediate health benefits but also about committing to a holistic approach to well-being that honors and utilizes the gifts of nature. Let this serve as a call to further explore and incorporate Moringa Oleifera into our daily lives, paving the way for a healthier, more balanced future

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