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A REVIEW: ANTI BACTERIAL EFFECT OF MINT MOUTHWASH

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ABSTRACT

These days, we have access to a wide range of mouthwash formulations, including both chemical and herbal ones. The danger, effectiveness, and state of the mouth may all be taken into consideration while choosing a mouthwash. Mother Nature has given us a wealth of therapeutic plants with antibacterial and antimicrobial qualities, as noted in the literature. These herbal plants are still used to treat a variety of periodontal disorders and other oral ailments, despite the paucity of information on their therapeutic qualities. For the beneficiaries, understanding the scientific explanation of the herbal medicine's actual effects is crucial. During the process of revising the bibliography, articles were gathered to support the traditional uses of herbs and come to the conclusion that using plants to treat oral diseases should be dependent on experimental research that confirm the plants' appropriateness for dental therapies. When handling various oral health concerns, oral healthcare providers may find this review useful in making an informed mouthwash selection.

Keywords *Herbal mouthwash, Herbal natural extract, Mentha*

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INTRODUCTION

Mint leaves, commonly known for their refreshing flavor and aroma, also possess noteworthy antibacterial properties. This characteristic is primarily attributed to the presence of various bioactive compounds in mint, including menthol, menthone, and rosmarinic acid. These compounds contribute to the antimicrobial effects of mint leaves, making them effective against a range of bacteria.

Here are some key points regarding the antibacterial effects of mint leaves:

Menthol: Mint leaves contain menthol, a compound known for its cooling sensation and antibacterial properties. Menthol has been found to exhibit antimicrobial activity against several bacteria, including those responsible for causing foodborne illnesses and oral infections.

Menthone: Another essential oil component in mint leaves, menthone, contributes to the antibacterial properties. It has been studied for its effectiveness against various bacterial strains, showing potential in inhibiting the growth and proliferation of harmful bacteria.

Rosmarinic Acid: Mint leaves also contain rosmarinic acid, a polyphenolic compound with antioxidant and antimicrobial properties. Rosmarinic acid has been investigated for its ability to combat bacteria and has shown effectiveness against both Gram-positive and Gram-negative bacteria.

Essential Oils: Mint essential oils extracted from mint leaves are rich in antimicrobial compounds. These essential oils are commonly used in traditional medicine and natural remedies to address bacterial infections. They can be applied topically or used in the form of essential oil diffusers.

Mint oil extraction is the process of obtaining essential oil from mint plants, especially those of the Mentha species. Mint oil's well-known, distinctive, and stimulating aroma makes it valuable in many industries, including food, medicine, and cosmetics. A summary of the steps involved in obtaining mint oil from mint is provided in this introduction on plants. During the extraction process, many techniques are employed to extract the essential oil from the components of the mint plant. The primary goal is to remove the volatile aromatic compounds from other plant parts, such as mint leaves. These components aid in the oil's desired benefits and give it its characteristic minty fragrance. Out of all the extraction procedures, steam distillation is the one that is most commonly utilized.[1]

Mentha Piperita Leaves:

The scientific classification of Peppermint, whose leaves are known as Piperita leaves, is as follows:

Kingdom: Plantae

Division (or Phylum): Magnoliophyta

Class: Magnoliopsida

Order: Lamiales

Family: Lamiaceae

Genus: Mentha

Species: Mentha × piperita

Peppermint is a hybrid mint, a cross between watermint (Mentha aquatica) and spearmint (Mentha spicata). This hybridization gives peppermint its distinctive flavor and aroma. The "Piperita" in its name refers to the peppermint's characteristic pungent or "peppery" taste.[2]

Botanical Characteristics:

Leaves: Peppermint has serrated, lance-shaped leaves with a characteristic minty aroma.

Stems: Square-shaped stems, which is a common feature in the Lamiaceae family.

Flowers: Small, purple to pink flowers clustered in terminal spikes.

Chemical Composition:

Main Constituents: The essential oil of peppermint contains menthol as a major component, along with menthone, menthyl acetate, and various other terpenoids.

Flavonoids: Peppermint leaves also contain flavonoids, which contribute to their antioxidant properties.

Uses:

Culinary Uses:

Flavoring: Peppermint is commonly used as a flavoring agent in various culinary dishes, including desserts, candies, teas, and beverages.[3]

Herbal Teas: Peppermint tea, made by steeping peppermint leaves in hot water, is popular for its refreshing taste and digestive benefits.

Medicinal Uses:

Digestive Aid: Peppermint has been traditionally used to alleviate digestive issues such as indigestion, bloating, and gas. It can help relax the muscles of the gastrointestinal tract.

Headache Relief: The menthol in peppermint may provide relief from headaches when applied topically or inhaled. It has a cooling effect that can help soothe tension headaches.

Respiratory Health: Peppermint's menthol content makes it beneficial for respiratory health. It may help relieve congestion and soothe respiratory discomfort.

Anti-nausea: Peppermint may help reduce nausea and motion sickness. It is often used in the form of teas or essential oils for this purpose.[4]

Pain Relief: Peppermint oil applied topically may have analgesic (pain-relieving) properties and is sometimes used for soothing muscle pain.

Fig. No.1: Mentha Piperita

Morphology of Mint:

The morphology of mint plants, specifically the peppermint variety (Mentha × piperita), involves various characteristics related to their structure and appearance. Here's an overview of the typical morphology of a mint plant:

Plant Height and Growth Habit: Mint plants are herbaceous perennials that typically grow low to the ground. They have a spreading and creeping growth habit, with stems that can trail along the ground.[5]

Stems: The stems of mint plants are square-shaped, a characteristic common to many members of the mint family (Lamiaceae). The square stems are often covered with fine hairs.

Leaves: The leaves are opposite, meaning they are arranged in pairs along the stem, with one pair at each node. Peppermint leaves are lance-shaped and have serrated (toothed) edges. The leaves are typically dark green, and they have a strong, distinct aroma when crushed.The presence of glandular trichomes (tiny hair-like structures) on the leaves contributes to the release of aromatic oils.[6][7]

Flowers: Mint plants produce small, tubular flowers that are typically arranged in whorls or clusters in the axils of the upper. The flowers can be various colors, including white, pink, or purple, depending on the specific mint variety.

Roots: Mint plants develop a fibrous root system, and they can also spread through underground runners (stolons), contributing to their ability to form dense colonies.

Aroma: One of the distinguishing features of mint plants is their strong and refreshing aroma, which is released when any part of the plant is bruised or crushed.[8]

Essential Oil Glands: Peppermint plants contain essential oil glands, primarily in the leaves. These glands produce essential oils rich in compounds like menthol and menthone, contributing to the characteristic flavor and aroma.

Adaptations: Mint plants have adaptations that help them thrive in various environments. Their ability to spread horizontally through stolons allows them to cover large areas, and their aromatic compounds may act as natural repellents against certain pests. Understanding the morphology of mint plants is crucial for proper identification and cultivation.[9]

Taxonomy:

This tribe consists of about 65 genera; relationships between them are not yet known. Regarding Mentha's circumscription, different authors have different opinions. For example, M. cunninghamii is categorized under Micromeria, whereas M. cervina is categorized under Pulegium and Preslia.Classification is difficult since many species in the genus are easily hybridized or are derived from perhaps ancient hybridization occurrences. Variable offspring that may multiply vegetatively are produced by hybrid seeds."Paroxysms of species and subspecifictaxa" have been described as the outcome of the transition; for example, a taxonomist published 434 new mint taxa for central Europe between 1911 and 1916. The references used now differentiate between and species.[10],[11]

Cultivation:

Cultivating peppermint (Mentha × piperita) successfully involves considerations related to soil, sunlight, water, and propagation methods. Here are guidelines for cultivating peppermint:

Sunlight: Peppermint prefers partial to full sunlight. Ensure that the plant receives at least 4-6 hours of sunlight per day.

Soil: Peppermint thrives in well-drained, moist, and fertile soil. It can adapt to a range of soil types but prefers slightly acidic to neutral pH levels (6.0-7.0). Amending the soil with organic matter, such as compost, helps improve fertility and water retention.[12]

Watering: Peppermint has a high-water requirement and prefers consistently moist soil. Water the plant regularly, especially during dry periods. Avoid waterlogging, as excessive moisture can lead to root rot.

Temperature: Peppermint is hardy and can tolerate a range of temperatures. It typically thrives in cooler climates, but it can also grow well in warmer regions if provided with adequate moisture.[13]

Properties of mint oil:

Sr. No	Properties	Values
1	Molecular Formula	C62H108O7
2	Molecular weight	965.51672 g/mol
3	Density	0.896-0.908 g/cm3 at 25^0C
4	Boiling point	82-93°C.
5	Solubility	Slightly soluble in water and alcohol
6	Specific Gravity	0.90 g/mL at 20ºC
7	Refractive Index	1.421

Table No.1: Properties of Mint Oil

Materials and methods of mint plant:

The current in-vitro investigation was designed as a pilot project to investigate the antibacterial efficacy of various doses of extract of mint plant leaves (Mentha L.) enhanced with polyphenols against S. Aureus. After giving the leaves a thorough water wash, they are rinsed in 0.5% KMnO4 for five minutes, and then they are given another distilled water twice to get rid of any possible microorganisms.[27] In addition, the leaves were sieved, powdered, and shade dried before being kept in a dry glass jar for later use. Powdered mint leaves (25 g) were combined with 250 mL of methanol and extracted for 72 hours using a Soxhlet machine. The extra methanol solvent was eventually evaporated. Similar to this, additional solvents such as hexane, butanol, ethyl acetate, and chloroform were also used in the extraction process to produce the residual methanol fractions, hexane, ethyl acetate, and chloroform-butanol, respectively.[14]

Test for antibacterial activity of mint:

It involves conducting experiments to determine whether mint exhibits inhibitory effects against bacteria. Here's a simple procedure you can follow:

Materials:

Mint Extract, Bacterial Cultures, Agar Plates, Sterile Discs or Wells, Incubator.

Procedure:

Inoculation: Inoculate the agar plates with the chosen bacterial strains using a sterile swab.

Application of Mint Extract: Apply the mint extract to the designated sections on the agar plates using sterile paper discs or agar wells. Apply a control substance (e.g., water) in a separate section for comparison.

Incubation: Place the agar plates in the incubator for a specific period (e.g., 24 hours) at the appropriate temperature.[15]

Observation: After incubation, observe the plates for zones of inhibition around the areas where mint extract was applied. Measure and record the diameter of the inhibition zones.

Comparison: Compare the inhibition zones between the mint extract and control sections. A larger or clear zone around the mint extract indicates antibacterial activity.

Data Analysis: Analyse the results statistically if applicable. Conduct replicate experiments to ensure reliability.[16]

MOUTHWASH:

Fig. No.2.: Herbal Mouthwash

Techniques of mint oil in mouthwash:

Basic Recipe:

Start with a base of distilled water (around 1 cup). Add a few drops of peppermint or spearmint essential oil (start with 1-2 drops and adjust according to your preference for strength). Optionally, add a teaspoon of xylitol for sweetness and dental benefits. Mix these ingredients thoroughly.[17]

Alcohol Addition (Optional):

If using alcohol, you can add it to the mixture. Vodka or witch hazel can be used, but be cautious about the amount as it can be drying to the mouth.

Enhancements: For extra cleansing, consider adding a pinch of baking soda.

Vegetable glycerine can be added for its soothing properties if desired.

Mixing and Storage: Ensure all ingredients are well mixed. Shake the mixture thoroughly before each use as some ingredients might settle at the bottom. Store the mouthwash in a tightly sealed container, preferably in a cool, dark place. [18]

Formulation Table:

Ingredients	Quantity		Function
	Formula I	Formula II	
Glycerin	5 g	5 g	Humectant
Sodium saccharin	450 mg	450 mg	Sweetener
Lutrol 4% *w/v*	50 mL	50 mL	Surfactant
Polymer	0.2 mg	0.2 mg	Anti-biofilm
Acetic acid (0.5 M)	1 mL	1 mL	Acidity modifier/co-solvent
Food blue	-	0.2 mL	Coloring agent
Peppermint oil	-	0.25 mL	Flavoring agent
Ethanol	-	20 mL	Co-solvent
Water	to 100 mL	to 100 mL	Vehicle

Table No.2.: Formulation of Mouthwash

The formulation of mouthwash involves combining various ingredients in specific proportions. Here's a basic method for preparing a simple alcohol-based mouthwash:

Ingredients:

Water
Alcohol (e.g., ethanol or isopropyl alcohol)
Flavoring agents (peppermint, eucalyptus, etc.)
Antimicrobial agent (e.g., chlorhexidine)
Sweeteners (optional)
Coloring agents (optional)

Procedure:

Measure Water: Start by measuring the required amount of water. This serves as the base for your mouthwash.

Add Alcohol: Gradually add the alcohol to the water. The alcohol content is often around 20-30% in commercial mouthwashes.[19]

Incorporate Flavouring Agents: Add flavouring agents such as mint or eucalyptus oils for a pleasant taste. Adjust the quantity based on personal preference.

Integrate Antimicrobial Agent: Include the antimicrobial agent, like chlorhexidine, to help combat bacteria and promote oral hygiene. Ensure proper concentration according to recommended guidelines.

Optional Additions: If desired, incorporate sweeteners for taste and colouring agents for aesthetic appeal. Be mindful of not compromising the overall effectiveness of the mouthwash.[20]

Mix Thoroughly: Stir or mix the ingredients thoroughly to ensure an even distribution.

Check pH: Measure and adjust the pH if necessary. The pH level is crucial for oral health and comfort.

Filter (Optional): Filter the mixture to remove any particulate matter or impurities.

Bottle the Mouthwash: Transfer the prepared mouthwash into suitable bottles or containers. Ensure they are clean and sterile.

Labelling: Label the bottles with the ingredients and usage instructions.

It's crucial to note that formulating a mouthwash requires careful consideration of ingredient concentrations, pH levels, and potential interactions. Following specific guidelines and, if applicable, consulting with professionals in dentistry or pharmacology is advisable.[21][22]

Mechanisms of Action:

The mechanism of action of mouthwash depends on its specific formulation, but common components contribute to several key functions:

Antimicrobial Action: Antiseptic agents like chlorhexidine or cetylpyridinium chloride target and kill bacteria in the mouth. This helps reduce plaque, gingivitis, and bad breath.

Reduction of Plaque: Mouthwashes with antimicrobial agents disrupt the formation of dental plaque, which is a biofilm of bacteria on teeth. This can contribute to better oral hygiene.

Fluoride Protection: Mouthwashes containing fluoride contribute to the prevention of tooth decay. Fluoride strengthens enamel, making teeth more resistant to acid attacks.

Freshening Breath: Flavoring agents such as mint or eucalyptus provide a pleasant taste and help mask bad breath. Additionally, the antimicrobial action helps eliminate odor-causing bacteria.[23]

Reduction of Gingivitis: Regular use of antimicrobial mouthwashes can help reduce gingivitis, which is inflammation of the gums.

Removal of Particles: The action of rinsing with mouthwash can help remove loose particles and debris from the mouth, contributing to a cleaner feeling.[24]

pH Regulation: Some mouthwashes contain pH-adjusting agents to maintain an optimal pH in the oral environment. This can influence the effectiveness of certain active ingredients and contribute to overall oral health.

Desensitizing Effects: Mouthwashes with desensitizing agents may help reduce tooth sensitivity by blocking pain signals.[25]

CONCLUSION

Mouthwashes can be applied in a variety of situations, depending on the kind of oral sores. Mouthwash is used to help while improving your dental hygiene and protection your gums due to disease. Herbal mouthwash has been shown to be quite inexpensive and to have very few, if any, adverse effects. Herbs have a long history of usage in medicine; as an antioxidant, antibacterial, and painkiller, they can strengthen immunity and speed the recovery from oral infections of these herbs have antibacterial properties that make them helpful in treating a range of oral health issues.

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