

# Formulation and Evaluation of Antibacterial Mouthwash

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**Abstract:** The importance of mouth and teeth cleanliness has been recognized from the earliest days of civilization to the 21<sup>st</sup> century. Patients and oral health practitioners are faced with a multitude of mouthwash products containing many different active and inactive ingredients. Making informed decisions as to the suitability of a particular product for a particular patient can be complex task. Although many popular herbal products have helped to control dental plaque and gingivitis, they have been used for a short time and only as an adjunct to other oral hygiene measures such as brushing and flossing. Natural mouthwashes may offer significant advantages over the chemical ones. If such mouthwashes can be formulated which can be easily prepared and used safely by people at home using natural products, it may lead to improvement in the general dental health of the population. In this study the various natural ingredients and materials are used.

**Keywords:** Herbal mouthwash, natural extracts, plaque maintenance.

## I. INTRODUCTION

Mouthwash, an aqueous solution usually used to remove plaque, is held in the mouth and swished about by the perioral muscle to get rid of oral infections. An active approach is taken by herbal medicine. Since there haven't been any side effects related with their use documented to date, this natural herb's main benefit is that. Other than this, there is no sugar or alcohol in any herbal mouthwash. These items pose a problem because the bacteria that cause halitosis and bad breath like to feed on them and create the byproducts that lead to halitosis. Using herbal mouthwash to avoid hazardous elements is therefore a positive start[1] Plaque-induced gingivitis, a highly widespread periodontal disease, is commonly seen in dental practise.

By using a number of techniques that raise oral hygiene standards, plaque accumulation can be prevented and controlled. The mechanical removal of dental plaque using tooth brushing, dental floss, tooth cleaning sticks, oral irrigators, and/or professional scaling and polishing are some examples of this. To control plaque formation, mechanical means alone might not be sufficient in all cases. Use of antimicrobial mouthwashes in conjunction with mechanical oral hygiene techniques is strongly advised in such circumstances. Several well-known herbal products have assisted in controlling. Mouthwashes are often prescribed in dentistry for prevention and treatment of several oral conditions. In the recent times the use of naturally occurring products what is otherwise known as grandmothers remedy are used on a large scale. This has now called for a newer age of mouth washes but is the new age mouth washes at par with the gold standard or even better than them this study investigates.

Herbal medicines, derived from botanical sources, have been applied in dentistry for a long history to inhibit microorganisms, reduce inflammation, soothe irritation, and relieve pain It has been recently reported that a considerable number of herbal mouthwashes have achieved encouraging results in plaque and gingivitis control Herbal mouthwashes are designed and prepared with extracts and essential oils from phytotherapeutic plants, containing a mixture of active agents such as catechins, tannins, and sterols. The mixture of natural compounds inside the herb- or plant-derived substances usually performs gentle remedial effects. Compared with the antimicrobial mechanisms by synthetic chemicals, herbal mouthwashes can have additional anti-inflammatory and antioxidant properties, which could further benefit gingival health. [2,3]



## **Oral diseases :-**

### **1. Dental Caries :**

Caries is the most typical oral infection and illness. A persistent, contagious illness called caries is brought on by bacteria that consume sugar to generate an acidic environment that erodes teeth. This process causes holes (cavities) in the tooth's structure over time. Streptococcus mutans is the main bacterium implicated, but the disease may be caused by the breakdown of a complex biofilm on the teeth rather than an abundance of one particular species. [4,5]

### **2. Candidiasis :**

A candida species infection of the oral mucosa is known as candidiasis. Candida albicans is the type of candida that affects people most frequently. Risk elements Species of Candida are typical dweller of the digestive system. Oral candidal infections are more common among immunocompromised people, such as the elderly, young children, HIV-positive people, cancer patients, diabetics, and people with glucose intolerance. People who take certain treatments, such as chemotherapy, inhaled steroids, broad-spectrum antibiotics (which alter the body's usual defensive flora), and antibacterial therapy are more susceptible. Additionally, dentures may develop a Candida infection, leaving the surrounding skin erythematous rather than white.[6]

### **3. Gingivitis :**

An reversible form of gingival inflammation is gingivitis. A gentle form of periodontal disease, that. There are three classifications: plaque-induced, non-plaque-induced, and systemic diseases and medication-induced gingivitis. Poor dental hygiene/plaque formation, primary or secondary tooth emergence, and dental equipment (braces, dentures) are risk factors for gingivitis. [7]

### **4. Mouth Ulcer :**

Mouth ulcers are small sores that form on gums, lips, inner cheeks or palate (roof of mouth). They can be triggered by several different factors, including minor injuries, hormonal changes and emotional stress. Mouth ulcers aren't contagious and they go away on their own but there are treatments to help ease pain and discomfort .[8]

### **5. When Was Mouthwash Invented :**

In the late 1800s, mouthwash was created. When toothpaste was created in the 1800s, oral care products as we know them now first entered the market. In the late 1800s, mouthwash was first mass-produced for commercial purposes. Most early mouthwash brands contained alcohol to stabilise the formulation, but nowadays, alternatives, such as cetylpyridinium chloride (CPC), offer germ-killing qualities without the requirement for alcohol stabilisation.

### **6. Who made mouthwash popular :**

Dr. Lawrence invented Listerine, a mouthwash intended to sanitise surgical incisions and clean lips, in 1879. By 1895, Lambert Pharmaceutical Co. purchased Listerine, and dentists started using it.[9]

Types of Mouthwash :

There are several types of mouthwash which all perform a particular function. There are fluoride mouthwashes which help to strengthen your teeth, antiseptic mouthwashes which deal with tooth decay and hide bad breath and herbal mouthwashes which do not contain alcohol.

To re-iterate: the types of mouthwash available include: [10,11]

- 1) Fluoride
- 2) Cosmetic
- 3) Antiseptic
- 4) Natural (herbal)
- 5) Total care

### **Herbal Mouthwash :**

Herbal mouthwashes can be used in addition to different oral hygiene techniques like flossing and teeth brushing. They can be utilised in supportive periodontal therapy due to their effective anti-inflammatory and anti-plaque characteristics, which have been demonstrated. Alcohol, artificial flavours, colours, or preservatives are not present. Hence Because of the additional benefits offered by herbal preparations, herbal mouthwashes might be thought of as a substitute for chemical mouthwashes in maintaining oral hygiene. A precise diagnosis of the oral condition and in-depth product knowledge are prerequisites for using mouthwashes. The choice must take into account elements like the patient's oral



health, disease risk, the effectiveness and safety of the mouthwash, and the patient's capacity for practising excellent oral hygiene.[12,13]

- Mucositis
- Periodontal Diseases
- Gum disease
- Xerostomia
- To clean septic sockets
- Vincent's angina
- To control plaque
- To relieve pain
- To effectively deliver fluoride in order to prevent dental caries
- Reduce inflammation etc.
- Herbal ingredients used in Mouthwash.
- Fennel (Foeniculum vulgare) :
- Fennel (Foeniculum vulgare) is a versatile plant with a wide range of uses, both culinary and medicinal. Here's a breakdown of its applications:

#### **Culinary Uses:**

##### **Seeds:**

**Spice:** Fennel seeds have a distinct fennel-like flavour and are widely used as a spice in various cuisines. They are a key ingredient in spice blends like the Indian panch phoron and Chinese five-spice powder.

**Flavouring:** They add flavour to both sweet and including curries, stews, soups, breads, pastries, and sweet pickles.

**Breath Freshener:** In many parts of India and the Middle East, fennel seeds are chewed after meals to freshen breath and aid digestion. Sugar-coated fennel seeds (mukhwas) are a popular after-meal treat.

**Garnish:** Toasted fennel seeds can be sprinkled over salads and other dishes for added flavour and texture.

**Bulb:** The crisp bulb can be eaten raw in salads or cooked in various ways: sautéed, stewed, braised, or grilled.

**Leaves (Fronds):** The tender young leaves are used as a garnish, added to salads for flavour, and used in sauces, soups, and with fish.

**Pollen:** Fennel pollen is a highly prized spice with an intense flavour, used to season seafood, meats, and vegetables.

**Fennel Butter:** Blended with butter, it makes an excellent topping for fish, grilled chicken, pasta, and rice.

##### **Medicinal and Health Uses:**

**Digestive Aid:** Fennel seeds have been traditionally used to aid digestion, relieve gas, bloating, indigestion, and constipation. They may help relax the smooth muscles of the gastrointestinal system.

**Anti-inflammatory Properties:** Compounds in fennel may help reduce inflammation in the body, potentially benefiting conditions like inflammatory bowel disease.

**Antioxidant Properties:** Fennel contains various antioxidants that can help protect against cell damage from free radicals and may reduce the risk of chronic diseases.

**May Lower Blood Pressure:** The high potassium and low sodium content in fennel may help regulate blood pressure.

**May Benefit Heart Health:** The fibre content in fennel can help lower cholesterol levels, reducing the risk of heart disease.

**May Have Cancer-Fighting Properties:** Some studies suggest that compounds in fennel may have anticancer effects.

**May Support Breast Milk Production:** Anethole, a compound in fennel, may stimulate prolactin, a hormone that promotes milk production in breastfeeding women.

**May Ease Menopausal Symptoms:** As a phytoestrogen, fennel may help improve symptoms associated with menopause.

**May Relieve Menstrual Cramps:** Fennel may help reduce uterine spasms and pain associated with menstruation.

**May Support Eye Health:** Antioxidants in fennel may help protect against age-related vision loss.

**Antimicrobial and Antifungal Properties:** Fennel and its essential oil have shown antimicrobial and antifungal activity.



**Respiratory Health:** Fennel may have expectorant properties, helping to relieve coughs and other respiratory issues.

**May Help Manage Blood Sugar:** Some research suggests that compounds in fennel may help regulate blood sugar levels.

**Freshens Breath:** Chewing fennel seeds or using fennel seed mouthwash can help combat bad breath due to its antimicrobial properties.

**Skin Health:** Antioxidants and vitamin C in fennel may promote healthy skin and help combat damage from free radicals.

**Bone Health:** The calcium content in fennel contributes to maintaining bone strength and health.

**Other Uses:**

**Insect Repellent:** Fennel has been used as an insect repellent.

**Scent:** Fennel oil is used in perfumes and other scented products.

**Traditional Medicine:** Fennel has a long history of use in traditional medicine systems for various ailments.

**Forms of Use:**

**Whole or crushed seeds:** Used in cooking, teas, and for chewing.

**Fennel tea:** Made by steeping fennel seeds in hot water, used for digestive and other health benefits.

**Fennel oil:** A concentrated extract used for aromatherapy and in some medicinal applications.

**Fresh bulb and fronds:** Used as a vegetable in salads and cooked dishes.



Fig No.1 Fennel Leave

**Tulsi :**

Tulsi is rich in Vitamin C and zinc. It thus acts as a natural immunity booster and keeps infections at bay. It has immense anti-bacterial, anti-viral and anti-fungal properties which protect us from a variety of infections.[15]



Fig. No. 3 Tulsi

In recent years, researchers from all around the world have come to the conclusion that any antimicrobial agent has a limited shelf life since microbes are increasingly developing resistance to it. In order to discover new alternative



sources of antimicrobial agents, particularly from plants, several investigations have been carried out. The objectives of this project were to quantify the volatile components found in flower spikes, leaves, and the essential oil, to examine the compounds responsible for any activity, and to examine the antimicrobial properties of essential oils distilled from Australian-grown *Ocimum tenuiflorum* (Tulsi). An effective topical antibacterial medication for the treatment of skin infections brought on by these organisms could be tulsi essential oil.

It is an odoriferous plant. Since its earliest days, plants have provided the human race with sources of therapeutic substances.

In fact natural product once served as the source of all drugs. The main chemical constituents of Tulsi are: Oleanolic acid, Ursolic acid, Rosmarinic acid, Eugenol, Carvacrol, Linalool, and  $\beta$ -caryophyllene, have been used extensively for many years in food products, perfumery, and dental and oral products and plant extract continues the numerous searches for more effective drugs of plant origin which are less toxic and available for low socioeconomic population in the treatment of diseases caused by pathogenic bacteria. Recent studies suggest that Tulsi may be a COX-2 inhibitor, like many modern painkillers, due to its high concentration of eugenol. The present study was to evaluate the phytochemical screening of aqueous extracts of leaves of *Ocimum*. Study has been shown that this medicinal herbs can be used as pharmaceutical adjuvants in the formulation of various dosage form.[16,17]

#### **Clove Oil :**

Clove oil is an essential oil extracted from the clove plant (*Syzygium aromaticum*), primarily from the flower buds, though other parts like leaves and stems can also be used. It's widely known for its strong aroma and medicinal properties.

#### **Key Uses:**

**Dental Care:** Acts as a natural pain reliever for toothaches due to its eugenol content (a natural anesthetic and antiseptic).

**Antimicrobial:** Effective against bacteria and fungi; used in mouthwashes and skin treatments.

**Digestive Aid:** Sometimes used to relieve bloating and gas.

**Aromatherapy:** Helps with stress relief and boosting circulation.

**Topical Pain Relief:** Used for sore muscles and joint pain (must be diluted with a carrier oil).



Fig No.4 Clove

Formulation ingredients Table No 1

Ingredients	Uses	F1	F2
Tulsi Extract	Antibacterial, Antiseptic	10ml	10ml
Fennel powder	Sweetening agent , Expectorant.	1.80 gm	2gm





Clove oil	Antibacterial , Flavouring	0.1 ml	1ml
Mentha peprita oil	Antibacterial	5ml	2ml
Glycerol	Co-surfactant	6.5ml	6.5ml
SLS	Surfactant	3gm	1gm
Alcohol	Preservative	2ml	1ml
Water	Up to 100 ml	-	-

### AIM AND OBJECTIVES

Aim : To prepare herbal mouthwash by using selected herbs to diminish the side effect of oral disorders.

Objectives :

The main objective of formulation of herbal mouthwash is to maintain the oral hygiene.

Prevention, control and reduction of oral infection.

To reduce side effects by promoting herbal use.

### MATERIALS AND METHODS

Material used :-

1) Preparation of ocimum santum Extract

Tulsi extract for the study was obtained by washing the leaves clean and sundry them after that grinding that specific solution into mixer to get finely powdering the dried leaves. Then the powder was macerated with 100% ethanol for 48 Hr in the breaker, then filtered that solution with the whatsmann Filter paper. The obtained extract used for procedure.



Fig No. 5 Ocimum Santum Extract

1) Clove oil

Clove oil, Clove extracts, and pure compounds show significant antimicrobial activities against oral pathogens and could be beneficial in caries and periodontal disease prevention, endodontics, and candidiasis treatment.

2) Peppermint oil

Peppermint oil appears to be safe when taken orally (by mouth) or applied topically in the doses commonly used. Peppermint oil has been safely used in many clinical trials. Possible side effects of peppermint oil taken are Journal orally include heartburn, nausea, abdominal pain, and dry mouth.

3) Fennel powder

Fennel powder is useful in managing sore throat, cough and excessive production of mucus in the respiratory tract. It also helps loosen mucus and coughing it out. Fennel is good properties.



4) Glycerol

Helps prevent products from drying out, acts as a thickener and provides sweetness

5) Sodium lauryl sulphate

SLS (sodium lauryl sulphate) is an emulsifying and surface-cleaning ingredient found in toothpaste and mouthwash. One of the most often used synthetic detergents in toothpaste is sodium lauryl sulphate. The material that the dentifrice removes from the tooth is typically emulsified or suspended by surface active agents, which also penetrate and release surface deposits.

6) Equipment used

Conical flask, beaker, Test tube, pipette, Measuring cylinder, Autoclave, Incubators.

2) Preparation of ocimum sanctum Extract

Addition of the Herbal ingredients like Fennel powder, Tulsi Extract, Clove oil, Mentha peprita oil, and Glycerol and SLS with alcohol with the constant string with the help of Mortar and pestal.

Until we get the clear solution of that of preparation.

Then Filtration of that specific solution with the whatmans Filter paper to get clear appearance of that specific Mouthwash solution.

Storage condition at room temperature in Airtight container.

## EVALUATION

1) Preparation of Agar plate

The most common solid foundation for growing bacteria is agar plates. Agar keeps the microbial growth medium in a semi-solid, gel-like form. Microbial growth media also contains nutrients and an energy source to power the microorganisms as they proliferate. Having used the autoclave Before pouring the agar into petri dishes, allow it to cool to 110-120 °F (when the breaker feels warm but not very hot to the touch). Just enough space should be left to slide open the petri dish's cover so that agar can be added. Pour enough agar (about 10-13ml) to completely cover the bottom of the plate. Keep the bottle's mouth away from the plate. To prevent contamination, cover the dish right away, then gently rock it back and forth until the agar covers the entire surface.

2) Growing microbial growth in plate

Prepare the soil solution sample in the test tube, and then, using nichrome wire, pour that particular solution onto the plate. Replace the dish's lid after gently rubbing the over the agar in a few zigzag motions. Before bacteria begin to proliferate, let the dish to stay in the incubator for 3 to 7 days. Each day, draw a picture and write a description to document the growth. Without a powerful microscope, it is impossible to view a single bacterium, but you can see bacterial colonies. By observing the colour and shape of the colonies, you may distinguish between several species of bacteria. After that, create a hole in the battery plate so that the formulation's solution can go there.

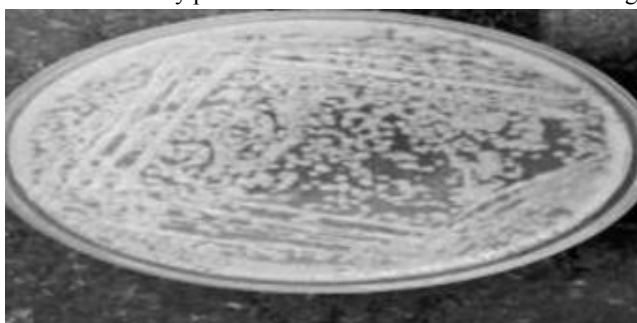


Fig No.6 Streak Plate Method

3) Staining procedure

Gramme staining separates bacteria based on the physical and chemical characteristics of their cell walls. The Gramm stain method can't be used to screen every type of bacterium, and it's not always enough to make a diagnosis. Instead,



they aid in generically identifying the bacterial species. The staining technique was completed by extracting the bacteria mentioned above from the patri plate. As a result, we may see the following.



Fig No. 7.Gram positive.

Staphylococcus aureus



Fig No.8 Gram Negative

E.coli

## RESULTS AND DISCUSSION:

Antimicrobial Growth



Fig No 7 Formulation F1







Formulation F2

Ingredients	Organisms	Zone of Inhibition (mm)	
		F1	F2
1.Prepared Formulation	S. aureus	16	25
	E.coli	18	27

## 2) pH of Formulation:

Since the scheme has an acidic pH of about 5.5, the pH of the formulation was discovered to be 6.1. Oral problems are appropriate for this pH range of formulation. The greatest way to maintain a healthy pH level in the mouth is through the foods you eat. The pH level in the mouth has a direct impact on the health of our teeth and gums. Your chance of developing cavities, gum disease, and tooth decay will be reduced by controlling the pH in your mouth.



Fig No.8 pH meter

## Foam Height:

Mix 1 mL of oral solution with 50 mL of distilled water. Pour the mixture into the 500 mL graduated cylinder. Add enough water to make the volume 100 mL. Pour the mixture 25 times and set aside. Note the height of the foam above the water container.



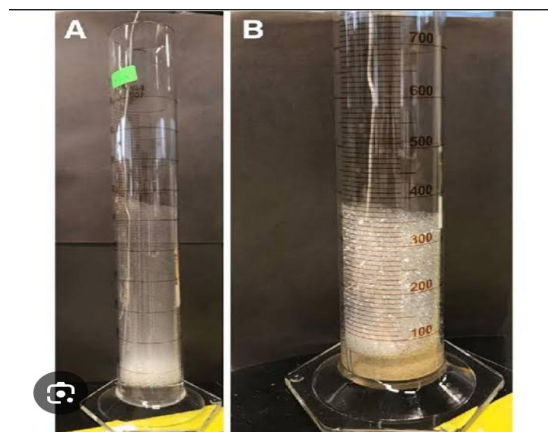


Fig.7 Foam height of mouthwash

## II. CONCLUSION

According to the information presented in this study, the created herbal mouthwash has significant therapeutic potential and is an appropriate vehicle for medication delivery at a reasonable cost. When compared to commercial mouthwash, herbal mouthwash formulations work effectively and have few side effects; as a result, their use should be increased to prevent negative consequences. The current liquid herbal mouthwash may be really effective in assisting people to get rid of foul breath and other oral health issues.

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