Anti-Inflammatory Activity of Mouthwash Using Ethanolic Extract of Cinnamon and Clove

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**Abstract: Aim:** To investigate the anti-inflammatory properties of mouthwash utilising cinnamon and clove ethanolic extract. **Materials And methods:** Ten milliliters of distilled water were mixed with one gram of clove and one gram of cinnamon to create the provided plant sample. 0.3g of sucrose, 0.001g of sodium benzoate, 0.01g of sodium lauryl sulfate, and 9 ml of distilled water were combined with 1 ml of extract to make the mouthwash, which was then put in a Wartax spinner machine. **Result:** Positive outcomes have been shown in the anti-inflammatory properties of mouthwash that contains ethanolic extracts of clove and cinnamon**. Discussion:** herbal mouthwashes containing medicinal ingredients like antimicrobials might work well for some long-term odor control. Since there are no negative consequences from their systemic availability in traces, they can also be used as a gargle**. Conclusion:** The current liquid herbal mouthwash can be very effective in helping individuals get rid of foul breath and a variety of oral conditions.

**Keywords:** Anti inflammatory,ethanolic mouthwash, sodium lauryl sulfate

# INTRODUCTION

Oral microbial communities grow and immune system defenses are compromised as a result of human dietary diversification and increased sugar intake [(Hwang et al., 2004)](https://paperpile.com/c/Q7KAlQ/RIA5M). The most prevalent oral ailment, dental caries, is brought on by a number of things, including diet, bacterial interactions in dental plaque, and saliva. It frequently results in tooth loss [(Chokkattu et al., 2022)](https://paperpile.com/c/Q7KAlQ/elDZJ).

Oral mouthwashes have been developed to remove dental plaque, strengthen dental structures, and prevent or treat periodontal disease and inflammation of the oral mucosa.[(Banu et al., 2016; Yadav et al., 2020)](https://paperpile.com/c/Q7KAlQ/bxAVQ+2fUkD). Cinnamon bark has long been used in both conventional and spicy treatments. Cinnamon bark and leaves include flavonoids, saponins, and essential oils that have long been used to cure a range of ailments . [(Merchant et al., 2022; Pandiyan et al., 2022; Yadav et al., 2020)](https://paperpile.com/c/Q7KAlQ/bxAVQ+VOqYP+jczTj)

There are many strategies to prevent plaque buildup in the mouth, including regular tooth brushing, antiseptic solution rinsing, flossing between teeth, tongue cleaning, chewing gum, and avoiding fermented carbohydrates [(American Academy of Periodontology. Research et al., 2001; Ganapathy & Professor and Head of Department of Prosthodontics, 2021)](https://paperpile.com/c/Q7KAlQ/yKMb+idKm). Plaque can be removed most easily by rinsing. Herbal mouthwashes can temporarily cover up unpleasant odors and offer a palatable flavor. However, herbal mouthwashes containing anti[(American Academy of Periodontology. Research et al., 2001; Ganapathy & Professor and Head of Department of Prosthodontics,2021)](https://paperpile.com/c/Q7KAlQ/yKMb+idKm)microbials or other medicinal compounds may be useful for some long-term odor control[(De Oliveira, 2016)](https://paperpile.com/c/Q7KAlQ/vAyen). Numerous studies have shown how effective and practical an antiseptic mouthwash with active ingredients like chlorhexidine and essential oils is in preventing the development of plaque and gingivitis [(Chokkattu et al., 2022; Dhanvanth & Maheswari, 2022; Ramamurthy et al., 2022)](https://paperpile.com/c/Q7KAlQ/nBoR5+elDZJ+9UKMG).

Since the beginning of human civilization, plants have been employed as medicines [(Merchant et al., 2025)](https://paperpile.com/c/Q7KAlQ/PRqs). Ayurveda, Siddha, European, Tibetan, and Unani are just a few of the traditional medical systems that have used medicinal plants to treat sickness [(Maya et al., 2022)](https://paperpile.com/c/Q7KAlQ/5vZ3C). Because herbal medicine is well accepted in many developing countries, is compatible with the human body, and has no negative side effects, 75–80% of people still utilize it as their main method of therapy [(Chauhan et al., 2020; Jain & Verma, 2022; Marya et al., 2022)](https://paperpile.com/c/Q7KAlQ/hVV4L+nb7xp+X9gKT). Therefore, a viable complementary anti-inflammatory option that has few side effects would be highly valued to treat oral infections. (Cytotoxic and Antimicrobial Properties of Herbal Mouthwash Formulation Based on Menthapiperita, Azadirachta Indica, and Ficus Benghalenis, n.d.) This study researches the anti-inflammatory effects of mouthwash utilizing cinnamon and clove ethanolic extract.

# MATERIALS AND METHODS

One gram of cloves and one gram of cinnamon were combined with ten milliliters of distilled water and one milliliter of ethanol in a beaker to create the plant extract. The mixture was then filtered and left in a shaker for three days. About 5 ml of the extract was kept in the centrifuge tube after it was placed in the heating mantle for about 20 minutes to allow for condensation.

A Wartax spinner machine was used to prepare the mouth, which contained 0.3g of sugar, 0.001g of sodium benzoate, 0.01g of sodium lauryl sulfate, 9 ml of distilled water, and 1 ml of extract.

Using the produced extract, an anti-inflammatory test was conducted.

# ALBUMIN DENATURATION ASSAY

The following technique, which was proposed by Muzushima and Kabayashi with minor changes, was used to assess the anti-inflammatory qualities of Solanum tarvum gel (Pratik Das et al., 2019). 0.05 mL of Solanum tarvum gel of different fixation (10, 20, 30, 40, and 50 µL) was mixed with 1% aqueous solution of bovine serum albumin. A small amount of 1N hydrochloric acid was added to bring the pH of the mixture down to 6.3. Following a 20-minute incubation period at room temperature, these samples were heated to 55 °C in a water bath for 30 minutes. The absorbance at 660 nm was determined spectrophotometrically after the samples had cooled. Diclofenac sodium was used as the standard. DMSO is utilized as the control.

The proportion of protein denaturation was determined using the following formula:

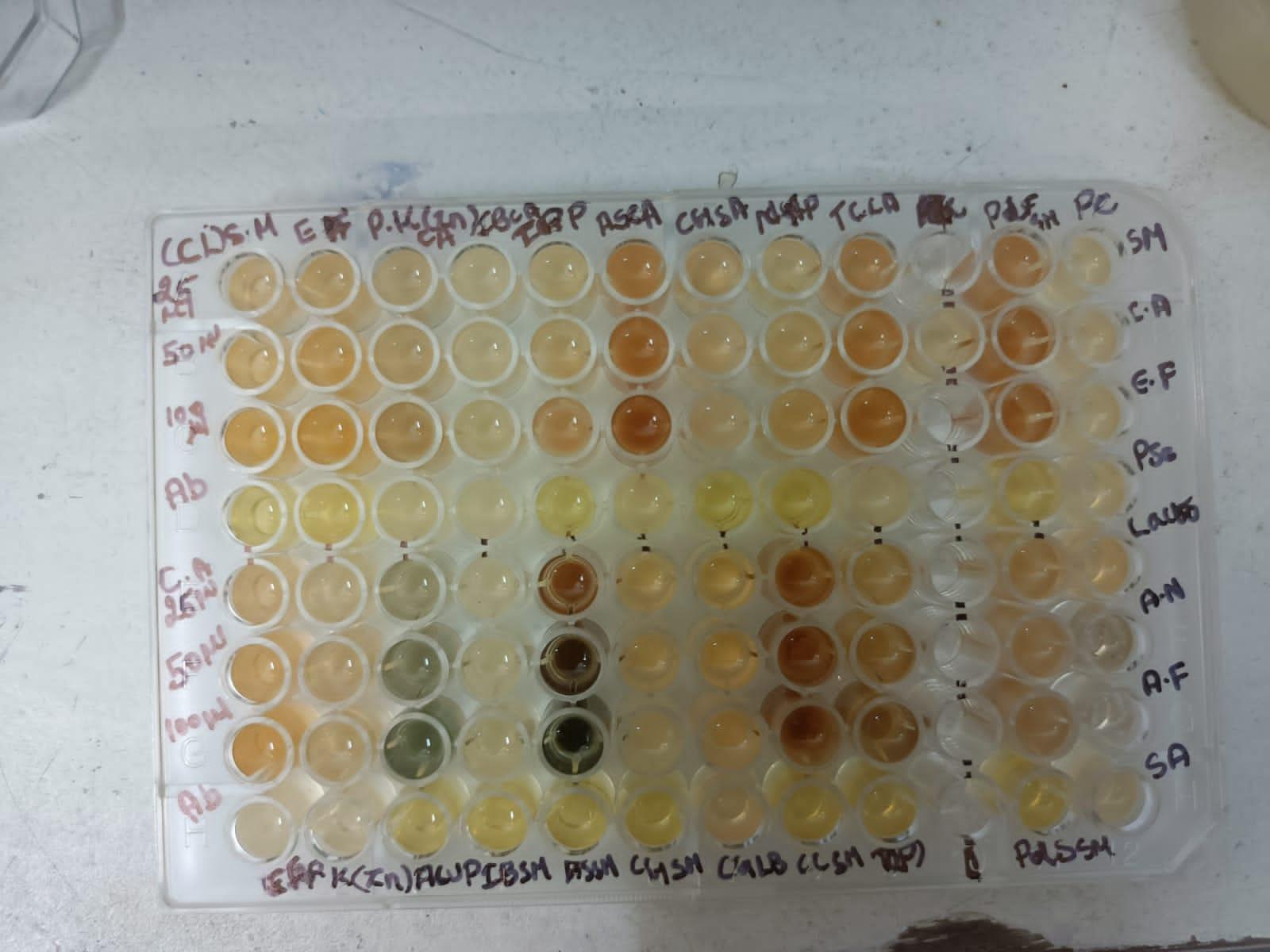
% inhibition= Absorbance of control- Absorbance of sample×100

# EGG ALBUMIN DENATURATION ASSAY

2.8 ml of freshly made, pH-6.3 phosphate buffered saline and 0.2 ml of hen's egg albumin extraction were combined to make a 5 ml solution. Different preparations with different concentrations (10µL, 20µL, 30µL, 40µL, and 50µL) were prepared for Syzygium caryophyllatum. The experimental medication used was diclofenac sodium. After that, the mixtures were cooked for fifteen minutes at 37oC in a water bath. The samples were then allowed to cool to ambient temperature, and absorbance at 660 nm was measured.

|  |  |  |
| --- | --- | --- |
|  |  |  |
| (a) | (b) | (c) |

**Figure 1: (a) (b) (c)** Preparation of cinnamon and clove extract



**Figure 2:** representation of BSA assay tray along with the addition of cinnamon and clove ethanolic mouthwash extract

# RESULT

The current study looks at the clinical results and in vitro effects of herbal mouthwash as a supplement for oral hygiene in individuals with any inflammatory condition.

The anti-inflammatory activity of mouthwash using ethanolic extract of cinnamon and clove has shown positive results.

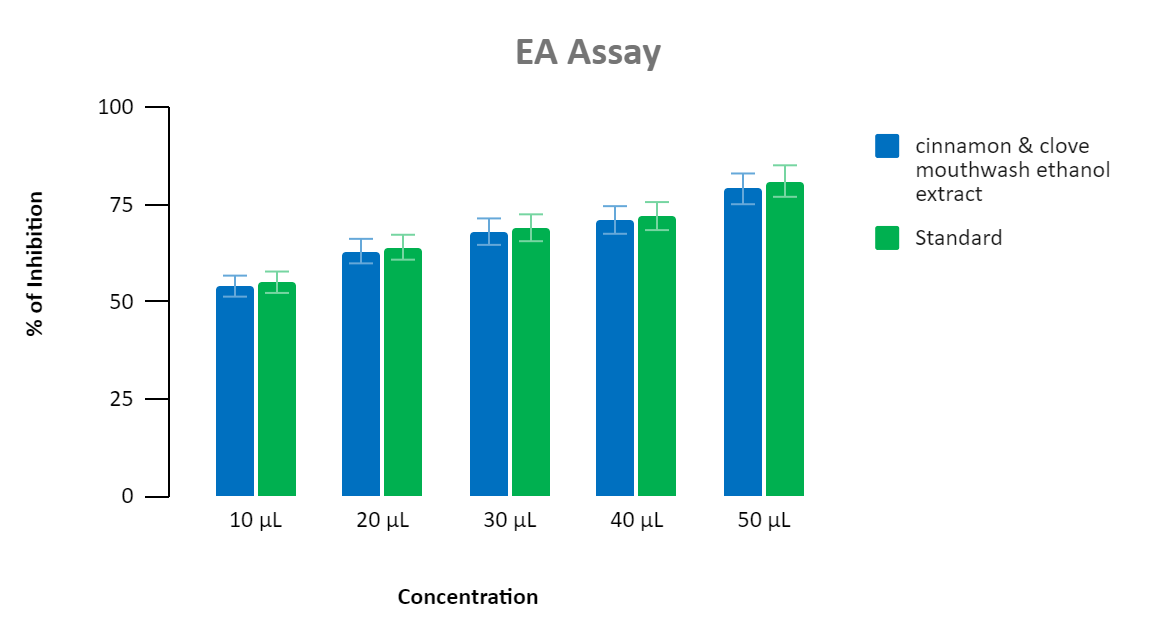


Figure 3: Represents the effect of ethanolic extract of cinnamon and clove mouthwash’s % of inhibition against concentration compared to the standard. The X axis represents concentration and Y axis represents % of inhibition of an EA Assay.

Table 1: The below table shows the % of inhibition of cinnamon and clove ethanolic extract mouthwash compared to standard an EA assay

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| EA Assay |  |  |  |  |  |
|  | 10 μL | 20 μL | 30 μL | 40 μL | 50 μL |
| cinnamon & clove mouthwash ethanol extract | 54 | 63 | 68 | 71 | 79 |
| Standard | 55 | 64 | 69 | 72 | 81 |

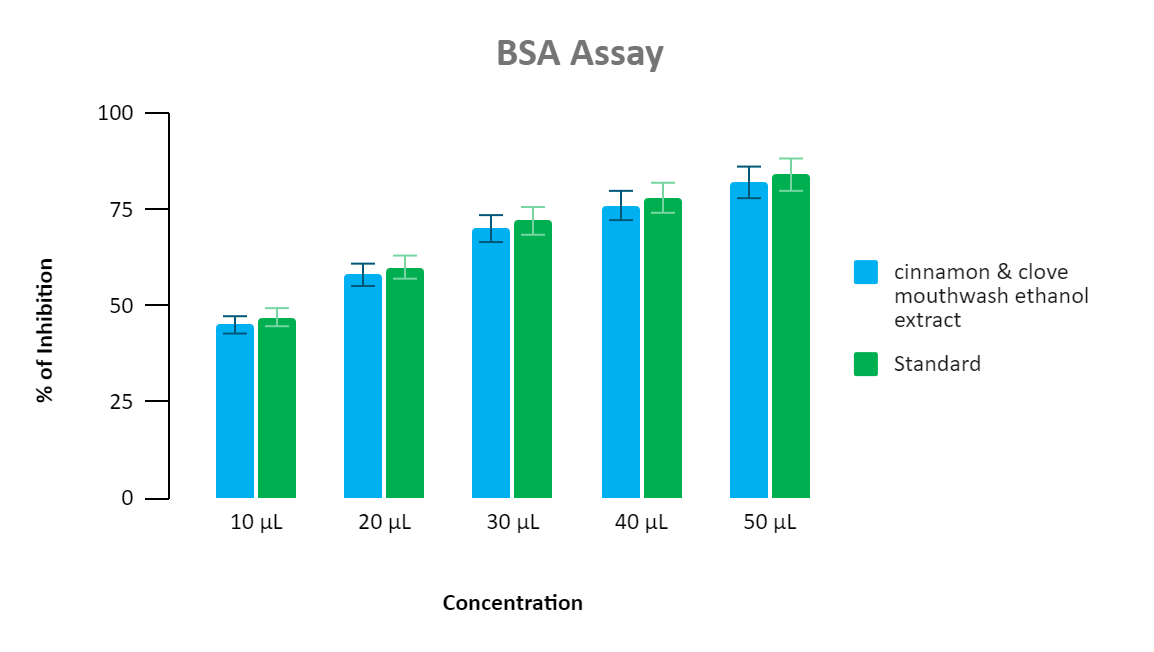


Figure 4: Represents the effect of ethanolic extract of cinnamon and clove mouthwash’s % of inhibition against concentration compared to the standard. The X axis represents concentration and Y axis represents % of inhibition of a BSA Assay.

Table 2: The below table shows the % of inhibition of cinnamon and clove ethanolic extract mouthwash with standard a BSA assay

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| BSA Assay |  |  |  |  |  |
|  | 10 μL | 20 μL | 30 μL | 40 μL | 50 μL |
| cinnamon & clove mouthwash ethanol extract | 45 | 58 | 70 | 76 | 82 |
| Standard | 47 | 60 | 72 | 78 | 84 |

# DISCUSSION

The therapeutic effects of herbal mouthwash as a supplement to gingivitis patients' self-performed oral hygiene were examined and assessed in this in vitro investigation. Herbal mouthwashes have been shown to be successful in lowering gingivitis and plaque [(Shenoy et al., 2025; Singh et al., 2024)](https://paperpile.com/c/Q7KAlQ/J0ga+WajA).

According to Hakeem KR et al. (Hakeem et al., 2018), mouthwash manufactured with a herbal formulation has a significant impact on longer usage times than one made with a chemical formulation. According to this study, using mouthwash containing cloves and cinnamon has an anti-inflammatory effect on the oral cavity. On the sultrier plate, the pathogens develop far less. [(Poornima et al., 2021; Verma & Muthuswamy Pandian, 2021)](https://paperpile.com/c/Q7KAlQ/CONnb+re0Yl)

Mouthwash made from natural extracts is known as a herbal mouthwash. Because herbal mouthwashes don't irritate the mouth or cause stains, and because they don't include alcohol, they have an advantage over chemical mouthwashes[(Sinduja et al., 2021; Sreevarun et al., 2023; Wadhwani et al., 2022)](https://paperpile.com/c/Q7KAlQ/1B2Ur+bv4mX+XXi1k).

Mouthwashes provide several advantages, including lowering the danger of plaque accumulation, preventing gum disease, decreasing tooth decay, removing debris while eliminating bacteria, and assisting with canker sores (Aparna et al., 2021; Hirunrat et al., 2004). According to earlier research by the scientists, the natural inflammatory properties of cloves and cinnamon have shown more effective in eliminating oral infections. Compared to the current chemical formulation, this cure has been around for decades and is less dangerous (Adel et al., 2023; Havale et al., 2022; Subramanian & Harikrishnan, 2023)

The visible adverse effects of using chemically designed mouthwash are increasing and include tooth discoloration, gingivitis, mouth odor, periodontal disease, and irritation of the oral mucosa (Chehelgerdi et al., 2023). According to Adam et al. (2022), Chokkattu et al. (2023), and Solanki et al. (2023), prolonged use of chemically formulated mouthwashes can result in health risks like increased sodium concentration in patients on a sodium diet, oral cancer, harm to children if consumed, and the destruction of beneficial bacteria.

When the head is tilted backwards, mouthwash can sit in the back of the mouth and bubble as air is exhaled, a condition or procedure known as gargling [(Matsuoka et al., 2004; Muthuswamy Pandian et al., 2022)](https://paperpile.com/c/Q7KAlQ/QY4d8+wP2xn). Gargling with herbal formulations is safe because they have no negative side effects when ingested in trace amounts through the system. The patients preferred this herbal mouthwash due to its taste, ease of use, and test duration in the mouth after washing, and the zone of inhibition data further showed how effective it was as a plaque inhibitor (Anti-Inflammatory Potential of a Mouthwash Formulated Using Clove and Ginger Mediated by Zinc Oxide Nanoparticles: An In Vitro Study, n.d.; Gancho et al., 2022). They can be used in addition to mechanical therapy to treat plaque-induced gingivitis. The current study has a major influence on attempts to create an effective and reasonably priced herbal oral health intervention for poor socioeconomic groups.

Long-term studies with bigger sample sizes are needed because this study was short-term in nature. Medical research has shown that the natural herbs utilised in the current formulation can prevent oral hygiene issues and foul breath. Numerous studies have shown that these plants have a long history of being used successfully (Saadh et al., 2024). This herbal mouthwash makes it simple for a person to rinse his mouth and avoid a variety of oral health problems.[(Laghari et al., 2023)](https://paperpile.com/c/Q7KAlQ/C0B96)

Even if the results were encouraging, more uptake for the development of mouthwash and flavoring agents cannot be prepared because of the limited time allotted for this research and the lack of funding to support it.

# CONCLUSION

People can effectively eliminate bad breath and a number of dental ailments with the help of the modern liquid herbal mouthwash. Furthermore, we may rest easy knowing that this preparation contains no harmful ingredients. The findings of the zone of inhibition test provided additional evidence of this herbal mouthwash's potency as a plaque inhibitor. Because of its flavor, simplicity of use, and length of time in the mouth after washing, patients will prefer it.

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