

Effervescent Denture Cleansing Granules Using Basil Oil and its *In vitro* Antimicrobial Activity Against Oral Pathogens

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ABSTRACT

Introduction and Aim: Basil (*Ocimum basilicum L.*) is a popular culinary herb and its essential oils. It is used in food products, perfumery, and dental and oral products. Basil essential oils and their principal constituents were found to exhibit antimicrobial activity against Gram-negative and Gram-positive bacteria, yeast, and mold. The present study aims to prepare effervescent denture cleansing granules with basil oil and to evaluate its antibacterial activity against oral pathogens.

Materials and Methods: Citric acid, tartaric acid, and sodium bicarbonate composition were taken in a ratio of 1: 2: 3 by weight. Different concentrations of basil oil were mixed with sodium bicarbonate initially. Both the powders were mixed using geometric dilution, further sieved and packed in an airtight glass container. Different concentrations of the prepared basil effervescent denture cleansing solution were tested against *Streptococcus mutans* and *Enterococcus faecalis*. The fresh bacterial suspension was dispersed on the surface of nutrient agar plates. Different concentration of basil effervescent denture cleansing solution (50, 100 and 150 µL) was incorporated into the wells, and the plates were incubated at 37°C for 24 h. Zone of inhibition was recorded on each plate.

Results: Basil mediated effervescent granules showed a dose-dependent antibacterial activity against the tested microorganism with a maximum effect on *Streptococcus mutans* and followed by *Enterococcus faecalis*.

Conclusion: The prepared basil oil mediated effervescent denture cleansing granules were found to be effective against *S. mutans*, *E. faecalis*, and *Candida albicans*. Hence it may be used for routine cleansing of the denture to protect the denture users from infections such as denture stomatitis.

Key Words: Basil oil, effervescent granules, Denture Cleanser, oral pathogens

INTRODUCTION

Ocimum sanctum is found throughout the semitropical and tropical parts of India. The various parts of the plant are traditionally used for treating diverse ailments like infections, skin diseases, hepatic disorders, common cold, and cough, malarial fever and as an antidote for snake

bite and scorpion sting (Satyavathi GV *et al.*) (1). The ether extract and essential oil of the leaves exhibit antibacterial activity against a number of bacterial species (2-5). Crude extracts from the young leaves and plant showed antiviral activity against some common plant viruses like papaya leaf reduction virus (6), top necrosis of pea (7) and bean mosaic virus (8). The acetone extract of the plant showed insecticidal

activity against *Spodoptera litura* (9). The water extract has nematocidal activity (10). A methanol extract and an aqueous suspension of *Ocimum sanctum* leaves were found to have anti-inflammatory and analgesic (11) and immunostimulatory properties (12). The essential oil of *O. sanctum* was observed to have anti-inflammatory (13,14) and anti-ulcer (15) activities in rats. *Ocimum sanctum* also exhibits radioprotective effect, anticarcinogenic and antioxidant properties (16). Some of the basil oils are a rich source of key nutrients like vitamin A, vitamin C, calcium, and phosphorus. Basil also contains antioxidants like beta-carotene that help in preventing cell damage. The leaves of the basil are also effective in reducing mouth ulcers and other infections of the mouth (17). The main constituents in volatile oil from basil are rosmarinic acid (a strong antioxidant, linalool, methylchavicol, methyl cinnamate, 1,7-dimethyl, 6-octadien-3-ol and eugenol). Its medicinal effects are mostly due to thymol, eugenol, and camphor. The seeds contain an oil composed of fatty acids and sitosterol. It has an antifertility effect that may reduce the estrogen hormone levels in females and decrease the sperm count in men (18).

In this present investigation, we have prepared the effervescent cleanser using basil oil, and it was analyzed for its antibacterial activity against oral pathogens such as *S. mutans*, *E. faecalis* and *C. albicans* using agar well diffusion method.

MATERIALS AND METHODS

Preparation of Effervescent Denture cleansing granules with basil oil:

The components such as citric acid, tartaric acid, and sodium bicarbonate are taken in a ratio of 1: 2: 3 by weight. The citric acid crystals are initially powdered and then mixed with tartaric acid. Different concentrations of basil essential oil were mixed with sodium bicarbonate initially. Both the powders are combined using geometric dilution, which is further sieved and triturated and packed in an airtight glass container for use.

The different concentration of basil oil was added with effervescent denture cleanser. After the preparation of basil effervescent it was added with distilled water immediately bubbles were formed shown in figure 1.

Figure 1: Preparation of basil oil effervescent granules



Antibacterial activity of basil effervescent oil:

The agar well diffusion method was used to determine the antibacterial activity of basil effervescent granules (19). Different concentrations of basil effervescent oil were tested against *Streptococcus mutans* and *Enterococcus faecalis*. The fresh bacterial suspension was dispersed on the surface of nutrient agar plates. Different concentrations of basil effervescent oil (50, 100 and 150 μ L) were incorporated into the wells, and the plates were incubated at 37°C for 24 h. Zone of inhibition was recorded on each plate.

Antifungal activity:

Antifungal activity of basil oil mediated effervescent denture cleansing granules was tested against dental fungal pathogen *Candida albicans* using rose Bengal agar well diffusion method. Different concentrations of the prepared basil effervescent denture cleansing granules were used after dissolving it in sterile water. The fresh *Candida albicans* suspension was dispersed on the surface of rose bengal agar plates. Different concentrations of basil effervescent denture cleansing solution were incorporated into the wells, and the plates were incubated at 37°C for 48 h (20). Zone of inhibition in each plate was recorded.

RESULTS

Antibacterial activity of basil oil effervescent against oral pathogens at different concentrations was investigated using agar well diffusion method. The 0.5 mL concentration of basil oil in 5 g of effervescent shows a zone of inhibition at 100 μ L. Other

concentrations are not having a zone of inhibition against the *Streptococcus mutans* and *Enterococcus faecalis*.

Figure 2: Antibacterial activity against E. faecalis

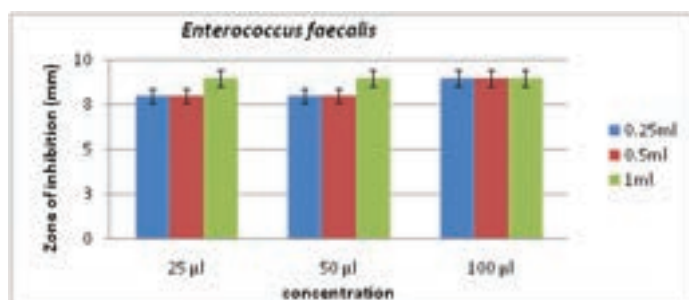
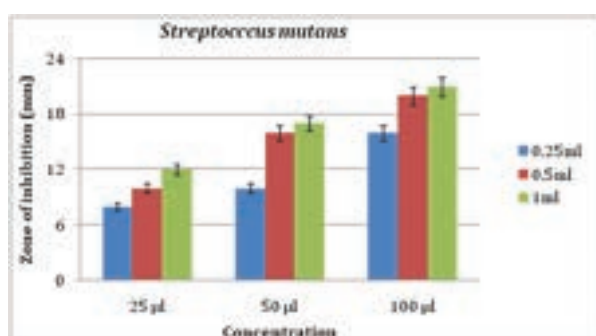


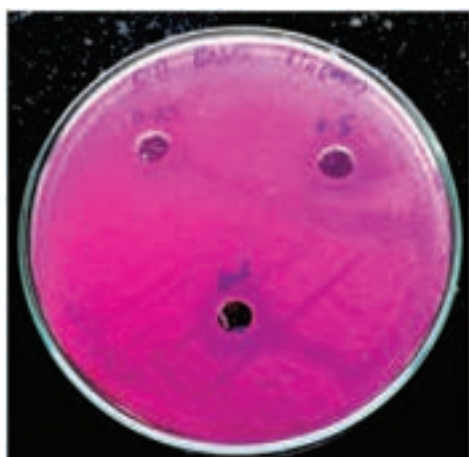
Figure 3: Antibacterial activity against streptococcus mutans



Antifungal activity of basil oil mediated effervescent

The antifungal activity of basil mediated effervescent granules were tested against *Candida albicans* using rose Bengal agar and showed a good zone of inhibition. In figure 4, the 100 µL concentration shows a clear zone indicates inhibition of *Candida albicans* growth due to the anti-fungal efficiency.

Figure 4: Antifungal activity of basil effervescent against C. albicans



DISCUSSION

Basil (*Ocimum basilicum* L.) is a popular culinary herb and its essential oils. It is used in food products, perfumery, and dental and oral products. Basil essential oils and their principal constituents were found to exhibit antimicrobial activity against Gram-negative and Gram-positive bacteria, yeast, and mold. This study is focussed on its usage as a denture cleanser. The denture being exposed to all the microbial content of the oral cavity.

Basil oil proved to be effective at 0.5mL in 5g of effervescence. For dentures, effervescence is also essential as the food particles adhere along with the substances in the saliva. Basil oil can prove to more effective when mixed with other components or when used alone also. With dentures, hard rubbing cannot be done as it will make the surface rough and will harbour more particles. Hence an effervescent substance is used.

The antibacterial and antifungal effect of basil oil is proved with this study and can be further elaborated with numerous other base substances to bring it on regular use.

CONCLUSION

The present investigation demonstrates the oral pathogen control capability of basil oil mediated effervescent granules against *Streptococcus mutans*, *Enterococcus faecalis*, and *Candida albicans*. Based on our research, the different types of essential oils may be used for the preparation of effervescent dental cleanser.

Conflict of Interest: Nil

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