

**ANTICARIOGENIC ACREAGE OF MYROBALAN AND GINGER ON CARIES
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ABSTRACT

Background: Herbal medicine is the oldest form of healthcare known to mankind. Herbs had been used by all cultures throughout history. In this study we used two such herbs Ginger (*zingiber officinalia*) and Myrobalan (*terminalia chebula*) ("King of medicines") to evaluate their anticariogenic activity. **Aim:** The aim of the present study was to evaluate and compare the antimicrobial efficacy of ginger and myrobalan against caries microflora. **Methodology:** Caries samples were collected from 20 patients and sited in brain heart infusion (BHI) broth under aseptic conditions and incubated for 24 hours at 37°C. This was followed by inoculation of samples in Muller Hinton agar and was incubated for 24 hours at 37°C. Crude extract of ginger and myrobalan were tested for their antimicrobial activity as compared to standard antibiotic streptomycin discs (25mcg) by using Muller Hinton agar by disc diffusion method. **Results:** A wide clear zone of inhibition was identified surrounding the crude extract pellets thus proving their antimicrobial activity. Zone of inhibition was measured using a ruler, zone diameter was measured upto edge of the growth as zone of inhibition was clear. **Conclusion:** Ginger and myrobalan showed antimicrobial activity equivalent to standard antibiotics, so these natural products can be used in diverse pharmacological applications.

KEYWORDS: Ginger, Myrobalan, Antibacterial activity.**INTRODUCTION**

Dental caries is one of the globally affecting diseases of the oral cavity still prevalent in today's era despite of the most advanced treatments available. There has been constant effort to focus on prevention of this disease process. Medicinal plants have been documented for prevention and cure of many systemic diseases since ancient times. These plants have potential curative action for oral diseases such as dental caries. The usage of these herbal extracts in dental practice can credibly benefit the overall health of the patient.^[1] In the present study we aimed to evaluate and compare antimicrobial efficacy of Ginger and myrobalan.

METHODOLOGY

Caries sample from 20 patients was collected using spoon excavator under sterile conditions and incubated in brain heart infusion broth for 24 hours at 37°C. Flocculation was observed on the surface of broth. Muller hinton agar medium of pH 7.3 at 25°C was prepared by suspending 38 g of the medium in one liter of distilled water in a conical flask. Heated with frequent agitation and boiled for one minute to completely dissolve the medium. Then, autoclaved at 121°C for 15 minutes and allowed to cool to room temperature. Cooled Mueller Hinton Agar was then poured into sterile

petri dishes on a level, horizontal surface to give uniform depth. After solidification, samples were inoculated in muller hinton agar media.

Ginger and myrobalan tablets of two concentrations (8mg, 16mg) were prepared, to test the activity at increased concentrations by mixing respective powders in menthol. Prepared tablets of ginger and myrobalan along with commercially available streptomycin discs were inoculated in the media and incubated for 24 hours at 37°C. A wide clear zone of inhibition was observed surrounding the pellets of crude extract along with streptomycin disc. Thus authenticating the antimicrobial activity of ginger and myrobalan.

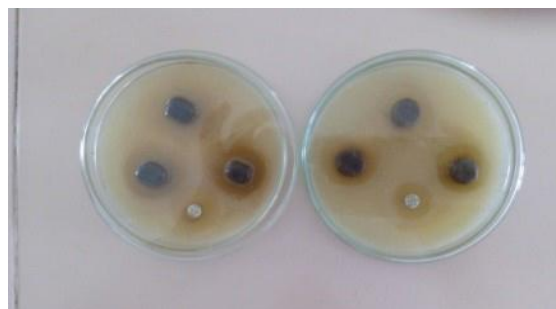


Fig 1: The muller hinton agar dishes with ginger, myrobalan tablets of 8mg, 16mg, 32mg concentrations and streptomycin tablets.

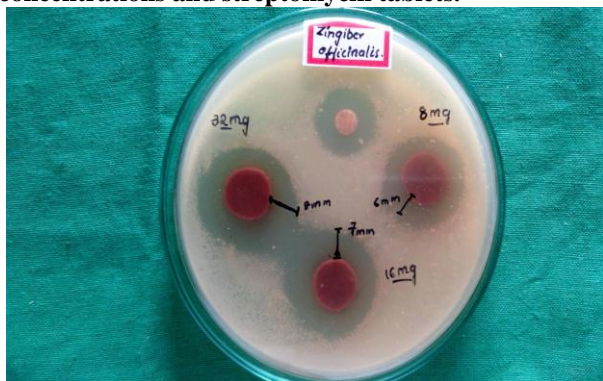


Fig 2: The muller hinton agar petri dishes with 8mg, 16mg, 32mg concentrations of myrobalan tablets and streptomycin disc showing zone of inhibition.

Statistical Analysis

Mean values of antimicrobial activity of ginger and myrobalan were analysed through unpaired t test.

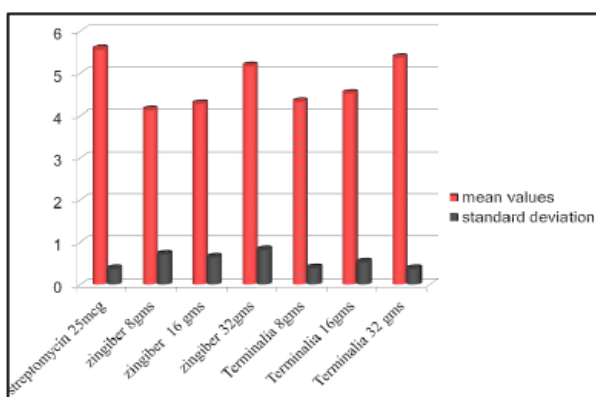


Fig 3: Graph showing mean values and standard deviations of ginger and myrobalan at 8,16,32 mg concentrations.

RESULTS

Ginger 8mg, 16 mg and myrobalan 8mg, 16 mg showed anti microbial activity but were less efficient when compared with streptomycin ($p < 0.05$) against caries microflora. Ginger 32mg and myrobalan 32mg are as effective as streptomycin ($p > 0.05$) against caries microflora. Thus proving its anti microbial activity. The mean value of antimicrobial activity of ginger 8mg, 16mg was less than the mean value of streptomycin and their mean difference was statistically significant ($p < 0.05$). The mean difference of ginger 32 mg was statistically insignificant when compared to streptomycin disc. The mean value of myrobalan 8mg, 16mg was less than the mean value of streptomycin and their mean difference was statistically significant. The mean difference of myrobalan 32mg was statistically insignificant when compared to streptomycin disc. Ginger 32mg, myrobalan 32mg are as effective as streptomycin ($p > 0.05$) against caries microflora and myrobalan showed greater anti

microbial activity compared to ginger at same concentrations. Thus proving its anti microbial activity.

DISCUSSION

Dental caries is one of the most common preventable diseases which is recognized as the primary cause of oral pain and tooth loss. It is a major public health oral disease which hinders the maintenance of oral health in all age groups. It is due to the irreversible solubilization of tooth mineral by acid produced by certain bacteria that adhere to the tooth surface in bacterial communities known as dental plaque. The most common bacteria associated with dental caries are mutans streptococci, most prominently *Streptococcus mutans* and *Streptococcus sobrinus*, and lactobacilli. Other few specific species of bacteria that are believed to cause dental caries are *Lactobacillus acidophilus*, *Actinomyces* spp., *Nocardia* spp., and *Streptococcus mutans*.^[2] The prevention of this disease has been the main moto of many researchers since ages. Use of easily available medicinal herbs for prevention of this disease can be a beneficial approach. So we tried to use two such easily available medicinal herbs and studied their anticariogenic activity.

Ginger (*Zingiber officinale* Rosc.) belongs to the family Zingiberaceae. It originated in South-East Asia and then used in many countries as a spice and condiment to add flavor to food.^[4] The rhizome of ginger has also been used in traditional herbal medicine. The health-promoting perspective of ginger is attributed to its rich phytochemistry.^[5] Jolad *et al.* grouped fresh ginger into two wide range categories, i.e. volatiles and non-volatiles. Volatiles include sesquiterpene and monoterpenoid hydrocarbons providing the distinct aroma and taste of ginger. On the contrary, non-volatile pungent compounds include gingerols, shogaols, paradols, and zingerone.^[6]

Ginger has the potential for treating a number of ailments including arthritis and rheumatism, digestive health indigestion, ulcers, atherosclerosis and hypertension, vomiting, diabetes mellitus, and cancer. It also has anti-inflammatory and anti-oxidative properties for controlling the process of aging. Furthermore, it has antimicrobial potential as well which can help in treating infectious diseases. Generation of free radicals or reactive oxygen species (ROS) during metabolism beyond the antioxidant capacity of a biological system results in oxidative stress, which plays an essential role in heart diseases, neurodegenerative diseases, cancer, and in the aging process. The bioactive molecules of ginger like gingerols have shown antioxidant activity in various modules. It is also effective against the inflammatory disorders such as gastritis, esophagitis, and hepatitis.^[3]

Terminalia chebula is an important medicinal plant in Indian traditional medicine that is commonly used herb in Ayurveda.^[7] *Terminalia chebula* is a medium- to

large-sized tree distributed throughout tropical and subtropical Asia. The fruit of *Terminalia chebula* is considered as the "king of medicines" by Tibetans.^[8] It was used in India to cure several ailments such as fever, cough, diarrhea, gastroenteritis, skin diseases, candidiasis, urinary tract infection and wound infections.^[10] Antibacterial activity of *Terminalia chebula* extracts against several bacterial strains have been reported. Extracts from different parts of diverse species of plants like root, flower, leaves, seeds, etc. exhibit antibacterial properties were applied on cotton material for wound, healthcare application.^[7]

In *Terminalia chebula*, 33% of the total phytoconstituents are hydrolysable tannins which are responsible for pharmacological activity. These tannins contain phenolic carboxylic acid like gallic acid, ellagic acid, chebulic acid and gallotannins. Ellagitannin such as punacalagin, casuarinin, corilagin and terchebulin and others such as chebulanin, neochebulinic acid, chebulagic acid and chebulinic acid reported in literature.^[7] Ethanolic extract were used for treating wounds as they showed significant response in wound healing. Aqueous extract showed anti-microbial activity of *Terminalia chebula* against microorganisms like *Bacillus subtilis*, *Staphylococcus aureus*, *Staphylococcus epidermidis*, *Escherichia coli*, *Staphylococcus flexinaria* and *Pseudomonas aeruginosa* which were studied by disc diffusion method. Acetone, ethanol, methanol, cold and hot aqueous extracts have anticariogenic property. The extracts showed anti microbial activity against common human pathogenic bacterial stains like *Staphylococcus aureus*, *Escherichia coli*, *Klebsiella pneumoniae*, *Proteus vulgaris*, and *Salmonella typhi*. Water extract of *Terminalia chebula* improves glucose tolerance and brings down Fasting blood glucose in diabetic rats. Comparisons of antioxidant activities between unfermented extracts and fermented products are demonstrated for the first time. *Terminalia* also has antioxidant properties.^[7]

In present study, both ginger and myrobalan showed antimicrobial activity, as efficient as standard antibiotics. Comparitively, Myrobalan showed more efficacy than ginger due to the following reasons - strong inhibition of growth of bacteria, inhibition of sucrose induced adherences, inhibition of glucan induced adherence of *S. Mutans*.

CONCLUSION

Ginger and myrobalan have antibiotic property and we have found in our study that they also have anticariogenic property. So they can be used in pharmacology to develop mouth washes, floss and topical creams for application in oral cavity as they reduce the bacterial load. Thus these two herbal products can be further developed and used in oral cavity to control dental Caries.

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