Research Article

Antimicrobial activity of turmeric, cumin, and ginger oil on oral pathogens

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ABSTRACT

Aim: The aim of the present study was to find the antimicrobial activity of turmeric, cumin, and ginger oil on oral pathogens. **Background:** Turmeric is useful in relieving pain and bleeding in gingivitis and periodontitis. People consume cumin for digestion problems such as diarrhea, colic and spasm. Ginger gives relief from rheumatoid arthritis, osteoarthritis, and menstrual pain. **Materials and Methods:** Different concentrations of turmeric oil, cumin oil and ginger oil were used for screening the antimicrobial activity. Agar well diffusion method was used to evaluate the effect of different essential oils against *Staphylococcus aureus*, *Streptococcus mutans* (Gram +), *Enterococcus faecalis*, and *Pseudomonas*. **Results:** Among the tested oils, cumin oil showed the highest activity against *S. aureus*, *S. mutans*, and *Enterococcus*. **Conclusion:** This study conclude that cumin oil may be a better choice to control in bacterial infection caused by *S. aureus*, *S. mutans*, and *Enterococcus*.

KEY WORDS: Cumin oil, Ginger oil, Oral pathogens, Turmeric oil, Zone of inhibition

INTRODUCTION

Curcuma longa or turmeric is a commonly used spice in India, China and South Asia. It is used for its colouring and preservative properties. Various sesquiterpenes and curcuminoids have been isolated from the rhizome of *C. longa*, attributing a wide array of biological activities,[1,2] anti-inflammatory,[3,4] wound healing,[5] anticancer,[6] and antibacterial activity.[7,8] Curcumin described as prebiotic, which has beneficial effects on human health.[9] Prebiotics and probiotics have diverse effects on human health.[10,11] It has been used topically on the skin for wounds, blistering diseases such as pemphigus and herpes zoster, for parasitic skin infections, and for acne. It has been used through oral administration for the common cold, liver diseases, urinary tract diseases, and as a blood purifier.[12] For chronic rhinitis and coryza, it has been used through inhalation.[13] Throughout the most important effects, curcumin had shown a wide spectrum of biological actions such as anti-inflammatory agents, thereby a wide range of pharmacological uses.[14] The meta-analysis data showed that the curcuminoids may be effective in controlling dental biofilms and dental cavity formations, suggested that turmeric extracts can be extensively used in the treatment premalignant lesions in oral cavity.[15] Turmeric can be used in relief from pain and bleeding of gingival in gingivitis and periodontitis, as colorant in pit and fissure sealant or in dental-plaque detection system.

Ginger (Zingiber) is a perennial herb belongs to Zingiberaceae family; the rhizome is used for extraction of ginger oil and gingerol is the major component in the oil.[16-18] The volatile oil gingerol and other pungent principles not only give ginger its pungent aroma but also its medicinal properties. They inhibit prostaglandin and luecotriene formation.[19] Ginger compounds are active against diarrhea which is leading to cause death in infant in developing countries. Moreover, it has been found that ginger is effective in treating nausea caused by seasickness, morning sickness, and chemotherapy, though it was found superior over a place for post-operative nausea[20]. In addition, it has been reported that the main ingredients of ginger such as volatile oil, gingerol, shogaol, and diarylheptanoids work as antioxidant, anti-inflammatory, antilipid, antidiabetic, analgesic, antipyretic, and antitumor agent.[21]

Access this article online	
Website: jprsolutions.info	ISSN: 0975-7619

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Received on: 10-10-2018; Revised on: 12-12-2018; Accepted on: 14-01-2019

Cumin is a small flowering herbaceous plant belonging to Apiaceae. The cumin plant grows to 30–50 cm. It is an annual plant, with a slender, branched stem 20–30 cm tall. Nutrient contents of cumin (in 2 g of seeds) are included: Water 0.16 g; some calories: Protein 0.36 g, carbohydrates 0.88 g, dietary fiber 0.22 g, total fat 0.44 g, saturated fat 0.04 g, monounsaturated fat 0.28 g, polyunsaturated fat 0.06 g, and ash (g) 0.16, and some vitamins such as Vitamin A 25.40 IU, thiamin (B) 0.02 mg, niacin (B) 0.10 mg, niacin equiv. 0.10, Vitamin C 0.16 mg, Vitamin E 0.02 mg, folate 0.20 µg, and Vitamin K 0.11µg; in addition, it contained some minerals: For example, calcium 18.62 mg, copper 0.02 mg, iron 1.32 mg, magnesium 7.32 mg, manganese 0.06 mg, phosphorus 9.98 mg, potassium 35.76 mg, selenium 0.10 µg, sodium 3.36 mg, and zinc 0.10 mg.[22] Cumin also contains very good amounts of B-complex vitamins such as thiamine, Vitamin B6, niacin, and riboflavin, and other vital antioxidant vitamins such as Vitamin E, Vitamin A, and Vitamin C. The seeds are rich source of many flavonoid phenolic antioxidants such as carotenes, zeaxanthin, and lutein.[23] Cumin had some reputation as a drug, but its chief medicinal use nowadays in veterinary medicine. It is used as a homeopathic treatment for a variety of conditions. Due to its numerous medicinal properties, cumin is used as an ingredient in many home remedies and Ayurveda preparations.[24] In traditional herbal medicine, cumin was used to treat hoarseness, jaundice, dyspepsia, and mixed with other ingredients to treat diarrhea and colic. In the present study, cumin, turmeric, and ginger oil were tested against various oral pathogens to find its effectiveness.

MATERIALS AND METHODS

Antimicrobial Assay

Oil of turmeric cumin and ginger were obtained from Synthite Industries Ltd., Kerala. Agar well diffusion method was used to determine the antibacterial activity of cumin, turmeric, and ginger oil against *Staphylococcus aureus*, *Streptococcus mutans* (Gram +), *Enterococcus sp*., and *Pseudomonas sp*. The fresh bacterial suspension was dispersed on the surface of Muller-Hinton agar plates. Different concentrations of cumin, turmeric, and ginger oil (20, 40, and 60 µL) were incorporated into the wells and the plates were incubated at 37°C for 24 h. Amoxycillin was used as positive control. Zone of inhibition was recorded in each plate.

RESULTS AND DISCUSSION

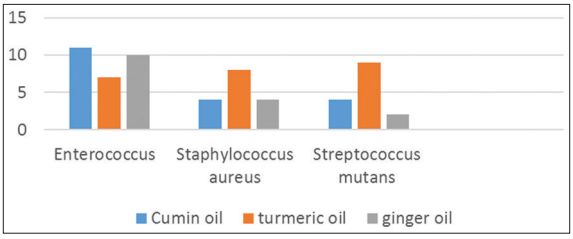
Oil extracts serve as a source of medicinal compounds since ancient times. Oil extracts are used in different systems of medicine for the treatment of various human ailments and for the treatment of viral and fungal infections.[25] The effects of oil extracts on bacterial growth have been investigated in different parts of the world. It has been suggested that aqueous and ethanolic extracts from plants are a potential source of antiviral, anticancer, and antibacterial agents. In the present study, the results showed that the antimicrobial activity of turmeric, cumin, and ginger oil exhibited antimicrobial activity against *S. mutans*, *enterococcus* and *S. aureus* [Table 1 and Graphs 1-3].

The turmeric oil was effective in inhibiting the three pathogenic bacteria with zone of inhibition of 7 mm, 8 mm, and 9 mm against *S. mutans, Enterococcus*, and *S. aureus,* respectively, in the concentration of 25 µg/ml. In 50 µg/ml, the zone of inhibition was found to be 8 mm, 5 mm, and 7 mm against the oral pathogens, respectively. For 100 µg/ml, it was 8 mm, 5 mm, and 12 mm against *S. mutans, Enterococcus*, and *S. aureus*, respectively. Therefore, it can be said that turmeric oil has a good antibacterial activity against *S. mutans* [Table 1 and Figure 2]. This study was done with oil as all the current studies have done on the natural extract and wanted to find out if they had the same effect; therefore, this finding is in agreement with Chattopadhyay *et al*. who reported that turmeric extract produces antibacterial activity against a broad range of microbes and especially Gram +ve strains and multiple antibiotic-resistant bacteria.[13] These results also correlate with Shahi *et al*. who reported that turmeric extract exhibited potent growth inhibitory effect against Gram-positive bacteria (*S. aureus* and *S. mutans*).[26]

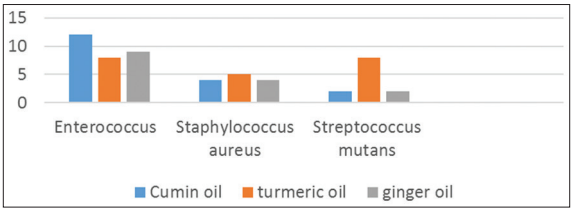
Ginger oil also inhibited the oral pathogens in this study with 10 mm, 4 mm, and 2 mm against *S. mutans, Enterococcus*, and *S. aureus*, respectively, in the concentration of 25 µg/ml. In 50 µg/ml, the zone of inhibition was found to be 9 mm, 4 mm, and 2 mm against the oral pathogens, respectively. For 100 µg/ml, it was 10 mm, 3 mm, and 3 mm against *S. mutans, Enterococcus*, and *S. aureus*, respectively. Therefore, it can be said that ginger oil shows antibacterial property against the oral pathogens [Graph 3]. This study was done with oil as all the current studies have done on the natural extract and wanted to find out if they had

Table 1: Antibacterial activity with zone of Inhibition at different concentration

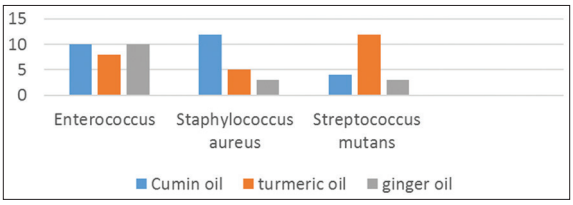
Test microorganism	Cumin oil			Turmeric oil			Ginger oil		
Concentrations	25 µg/ml	50 µg/ml	100 µg/ml	25 µg/ml	50 µg/ml	100 µg/ml	25 µg/ml	50 µg/ml	100 µg/ml
Enterococcus	11 mm	12 mm	10 mm	7 mm	8 mm	8 mm	10 mm	9 mm	10 mm
Staphylococcus aureus	4 mm	4 mm	12 mm	8 mm	5 mm	5 mm	4 mm	4 mm	3 mm
Streptococcus mutans	11 mm	2 mm	11 mm	9 mm	7 mm	12 mm	2 mm	2 mm	3 mm



Graph 1: Zone of inhibition at 25 µg/ml



Graph 2: Zone of inhibition at 50 µg/ml



Graph 3: Zone of inhibition at 100 µg/ml

the same effect; therefore, this finding is in agreement with Malu *et al*.,[26] studied the antibacterial activity and medicinal properties of ginger extracts which obtained using solvents, n-hexane, ethyl acetate, ethanoic Soxhlet, and water. They found that all extracts except the aqueous extract have antibacterial activity and that the inhibition of bacterial growth was dose dependent.[25]

Cumin oil was effective in inhibiting the three pathogenic bacteria with zone of inhibition of 10 mm, 12 mm, and 11 mm against *S. mutans, Enterococcus*, and *S. aureus*, respectively [Table 1 and Figure 1], in the concentration of 25 µg/ml. In 50 µg/ml, the zone of inhibition was found to be 12 mm, 4 mm, and 2 mm against the oral pathogens, respectively. For 100 µg/ml, it was 11 mm, 4 mm, and 4 mm against *S. mutans, Enterococcus*, and *S. aureus*, respectively [Graphs 1-3]. Therefore, it can be said that cumin oil has a good antibacterial activity. A similar study shows that different concentrations of cumin oil showed antibacterial activity against Gram-positive and Gram-negative bacteria. In addition, the concentration 100% inflicted the highest antibacterial activities, and in this study, this finding is confirmed [Table 1].[27]

To conclude, cumin oil was found to be more effective against *S. mutans, Enterococcus*, and *S. aureus*; thus, cumin oil has a good antibacterial activity potential. Cumin extract is known for its antiseptic, analgesic anti-inflammatory and anti-bacterial effect. It can be

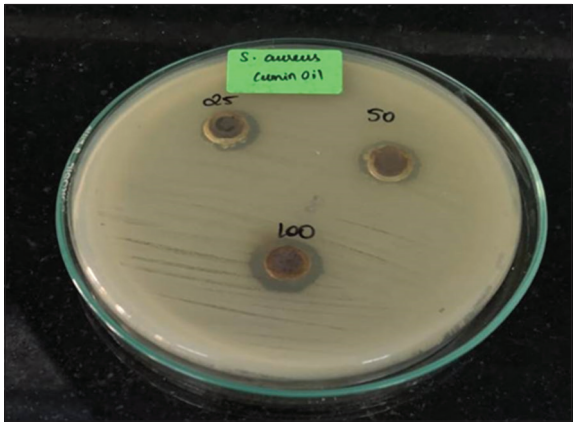


Figure 1: Zone of inhibition of cumin oil against *Staphylococcus aureus*

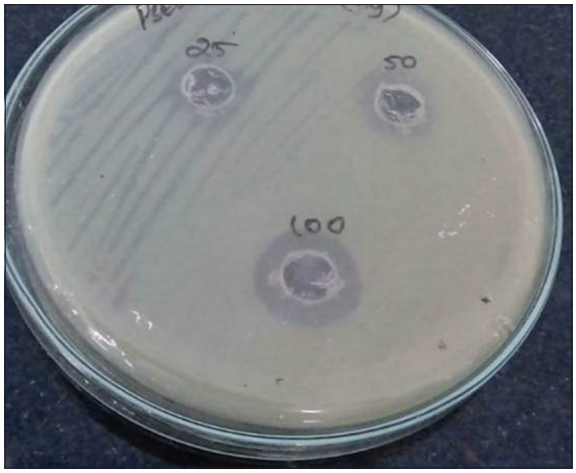


Figure 2: Zones of inhibition of turmeric oil against *Enterococcus*

further suggested that cumin oil can used as part of medicine to help cure any microbial infections.

CONCLUSION

It is suggested that cumin oil can be used for bacterial infection against *S. aureus*, *S. mutans,* and *Enterococcus.*

ACKNOWLEDGMENTS

Authors express their deep gratitude to Synthite Industries Limited, Kerala, for providing cumin oil, turmeric oil, and ginger oil as a gift sample to carry out this project.

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Source of support: Nil; Conflict of interest: None Declared