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Antimicrobial Activity Of Turmeric On Oral Pathogens Depending On Duration Of Exposure

Preethi Shankar [1] , Muralidharan [2*]

[1] Department of Microbiology, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences(SIMATS), Saveetha University, Chennai, Tamilnadu, India.

[2*]Associate Professor, Department of Microbiology, Saveetha Dental College and Hospitals, Saveetha Institute of Medical and Technical Sciences(SIMATS), Saveetha University, Chennai, Tamilnadu, India.

E-mail: [1] 151901014.sdc@saveetha.com , [2*]muralidharan@saveetha.com

Abstract

INTRODUCTION: Turmeric is a spice of turmeric plants. Turmeric attains its colour due to the presence of curcumin. Turmeric is used to treat various disorders and diseases due to its antibacterial, antifungal, anti inflammatory properties. Oral pathogens develop in the oral cavity due to lack of oral hygiene. Streptococcus mutans, Actinomyces,, Eubacterium, Fusobacterium, Lactobacillus, are some of the common bacteria seen in oral cavities.

MATERIALS AND METHODS: Crude extract of turmeric was prepared and centrifuged. Supernatant was taken and 50%, 20%, 10% and 5% concentration were made and pipette 1 ml to the cuvettes. 10ml of streptococcus mutans were added and subculture was carried on nutrient agar and total colony forming units were calculated on different durations like 5min, 10min, 1hr, 2hr and 3hr.

RESULTS: The amount of streptococcus mutans were observed to be decreased with increase in concentration and duration. Turmeric exhibits potent antimicrobial activity.

CONCLUSION: Turmeric exhibits potent antimicrobial property. Incorporation of turmeric in toothpaste, oral gels can be considered to eliminate the bacterial load and its associated diseases.

Keywords: Oral cavity, oral diseases, streptococcus mutans, turmeric, innovative technology.

Introduction

Turmeric is a flowering plant,*Curcuma longa* of the ginger family, Zingiberaceae. Turmeric is a spice that comes from turmeric plants. Its roots are used for cooking, it is a major ingredient in curry powder. The plant is a perennial, rhizomatous, herbaceous plant native to the Indian subcontinent and Southeast Asia. Turmeric was used as an dye initially and was slowly introduced in folk medicines. Turmeric is majorly used in Ayurveda, Siddha medicine, traditional Chinese medicine (1). Phytochemical components of turmeric include curcuminoids, such as curcumin, demethoxycurcumin and bisdemethoxycurcumin. The golden yellow color of turmeric is due to the presence of curcumin. Turmeric is used in conditions involving inflammation and pain like osteoarthritis. It is used in treating hay fever, depression, high cholesterol, liver disease, itching, disorders of the skin, upper respiratory tract, joints and digestive system. Turmeric is utilised as a dietary supplement for a variety of conditions, including arthritis, digestive disorders, respiratory infections, allergies, liver disease, depression (2). Consumption of turmeric for a long duration might lead to abnormal heart rhythm. Since turmeric contains oxalates it increases the risk of kidney stones. Rhizomes of turmeric possess anti cancer property as a result it has thepotential to reduce the tumours. Turmeric exhibits a wide range of biological cpactivity like hypolipidemic, lipoxygenase, cyclooxygenase, protease inhibitory effects. Roots of turmeric are rich in antiseptic activity and aroma. Paste

of turmeric is used in cleansing and disinfecting the skin and skin ulcers (3). Turmeric is widely used in dentistry for treating gingivitis, and helps in removing plaque, bacteria and inflammation.

Oral pathogens develop in the oral cavity which accumulates due to poor oral hygiene. Oral bacteria exhibit a high specific adherence mechanism and results in colonising and causing disease in the oral cavity. Dental caries, periodontal diseases and streptococcal pharyngitis are the common oral infections caused by oral pathogens. Streptococcus, Actinomyces, Herpes simplex virus type-1 are some of the examples of disease causing oral pathogens (4). Bacteria accumulate in the oral cavity both on the hard and soft oral tissues in biofilms. Bacteria occupy the ecological niche provided by both the tooth surface and gingival epithelium. Oral pathogens invade the body to affect cardiac health and cognitive function. IgA antibody in B plasma cells provides a barrier against oral pathogens. Brushing and flossing regularly can prevent the build up of oral pathogens (5). Foods rich in phosphates and calcium help to neutralise theacid in the oral cavity and kill oral pathogens. Chewing celery can also help in destroying the oral pathogens. Oral cancer, pro dental trauma, cleft lip and palate, oral HIV lesion, nome are caused by oral pathogens. Nearly 530 million of childrens suffer from dental caries of primary teeth caused by oral pathogens. Streptococcus mutans is a facultative anaerobe, gram positive cocci responsible for tooth decay (6).

Microbial means relating to or caused by microbes. Antimicrobial activity refers to the process of killing or inhibiting the disease causing microbes. Antimicrobials can be anti-bacterial, antifungal or antiviral. Physical methods in killing microbes are heat and radiation (7). Antimicrobial property is considered as the important characteristic of medical textiles, to provide adequate protection against microorganisms, biological fluid and aerosols and disease transmission. Natural antimicrobials are used to preserve the food from spoilage and pathogenic microorganisms. Plant derivatives like flavonoids, alkaloids, tannins, and terpenoids are known to possess high antimicrobial properties. Crude extract of gargled, cinnamon, ginger, sage and mustard possesses high antimicrobial properties against gram positive and gram negativebacteria (8). The aim of the study is to analyse the microbial activity of turmeric on oral pathogens depending on duration of exposure.

MATERIALS AND METHODS

Make a crude extract of turmeric by soaking for 2 days in water after sterilisation. 50g of turmeric was measured and taken in a conical flask, to this 500ml of distilled water was added. The turmeric solution was boiled to acquire 200ml. Then mix thoroughly and centrifuge. Take the supernatant and have it as master dilution. Make 50%, 20%, 10% and 5% concentration and pipette (1 ml) them to cuvettes. Add 10mL of the bacterial suspension (Streptococcus mutans) in all cuvettes including the control. Do subculture on Nutrient agar and incubate for 5 minutes, 10 minutes, 1 hour, 2 hour, 3 hour and 12 hours and count the total colony forming unit on them and tabulate the results.

FIGURE 1: Preparation of extract of turmeric and its activity against Streptococcus mutans.

RESULTS AND DISCUSSION

Concentrationin%.	5 minutes	10 minutes	1 hour	2 hour	3 hour	12 hours
5	80	76	40	40	35	0
10	79	70	35	32	25	0
20	64	63	25	22	21	0
50	58	43	23	17	18	0
Control - 82						

Table 1: The table illustrates the amount of streptococcus mutans at 5%, 10%, 20% and 50% concentration at an interval of 5 minutes, 10 minutes, 1 hour, 2 hour, 3 hour and 12 hours.

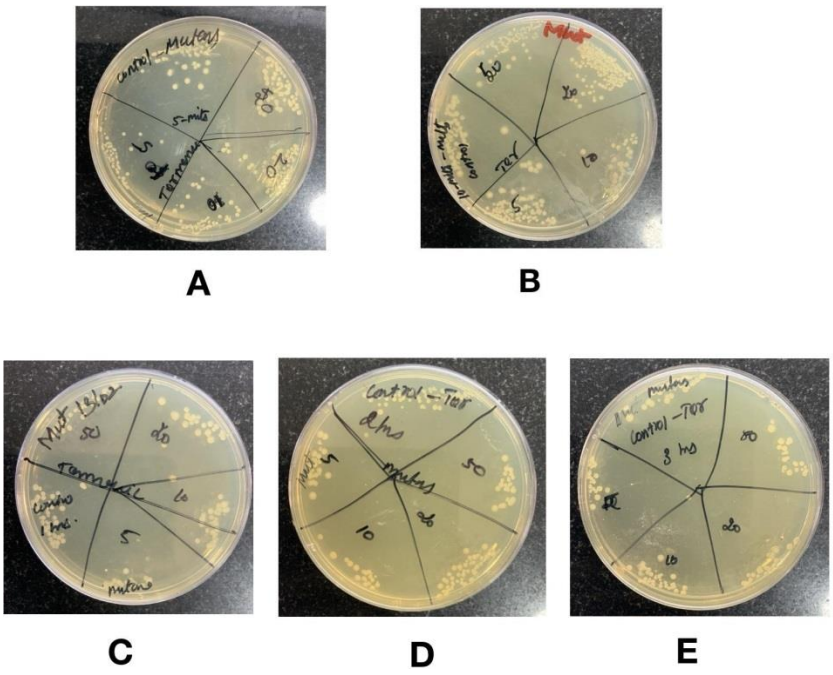
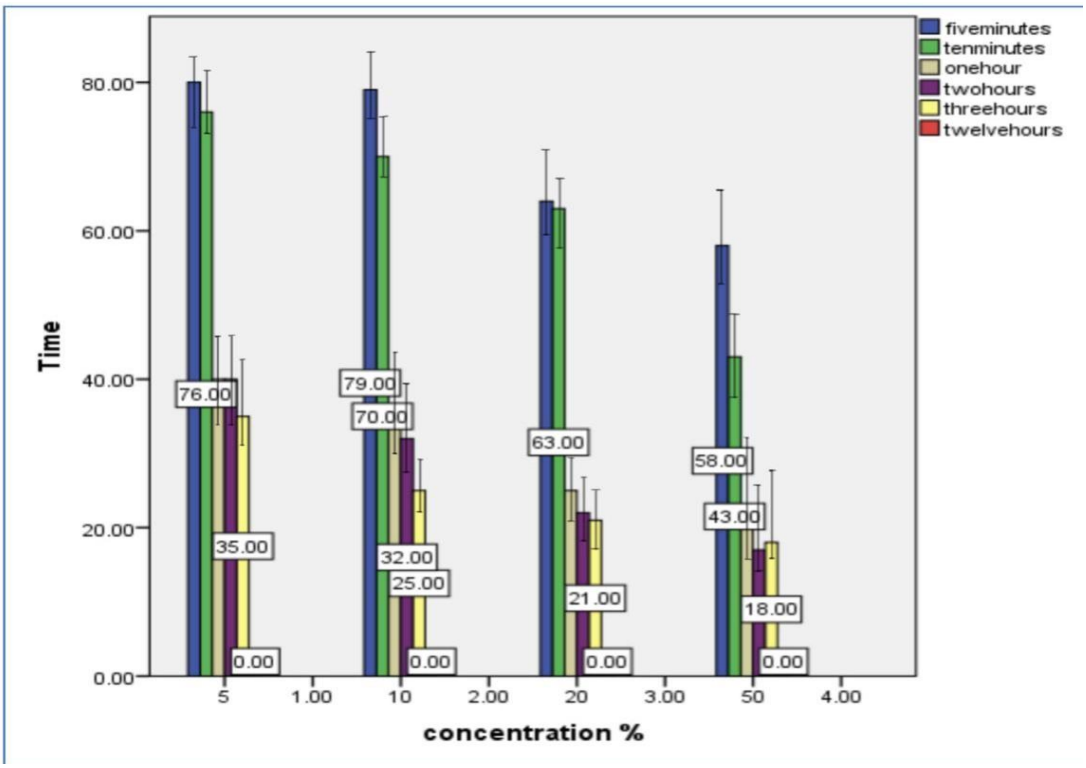


Figure 2: The picture shows the colonies after incubation of streptococcus mutans A- 5 minutes, B- 10 minutes, C- 1 hour, D- 2 hour and E- 3 hour.



Errot Bars : 95 % Cl

FIGURE 3:

The graph depicts the colony forming units of Streptococcus mutans at different concentration and duration. Blue colour represents 5 minutes, green colour represents 10 minutes, brown colour represents 1 hour, purple colour represents 2 hours, yellow colour represents 3 hours and redcolour represents 12 hours. p value is found to be 3.52, hence statistically not significant.

The amount of Streptococcus mutans present decreased with increase in the concentration and duration. At 12th hour Streptococcus mutans were not alive.On comparing the study Saldanha et al.. of Turmeric belongs to the Curcuma Curcuma longa belonging to the Ginger family of Zingiberaceae. Curminoids seen in turmeric consist of curcumin demethoxycurcumin 5 methoxycurcumin and dihydrocurcumin, which are natural antioxidants. It consists of anti-inflammatory, Chloe relic, antimicrobial and carminative actions. Further turmeric is used in treating asthma, bronchial hyperreactivity and allergy. Turmeric is believed to possess medicinal properties due to its volatile oils (9). A study of Chandra states that turmeric is incorporated into a mouthwash to treat inflammation, pain and ulcerative area in the oral cavity. The concludes that the tropical application of turmeric is effective in controlling the symptoms of oral mucositis. Turmeric is also known as 'Indian Saffron' and is used widely in dentistry as colorant in pit and fissure sealant and in dental plaque detection. The chemopreventive activity is beneficial in treating premalignant lesions (10).

On comparing the article of Gold et al., Streptococcus belongs to a genus of gram positive cocci belonging to the family of Streptococcaceae. The bacteria causes many disorders including strep throat, pneumonia, wound and bloodstream infections. It is found high in the oral cavity and is responsible for causing tooth decay. They colonise the oral cavity and can withstand the oral cleansing forces of saliva and tongue. A study demonstrates that turmeric extract is effective in controlling streptococcus mutans and thereby controlling dental biofilms and dental caries formation (11).

Based on the study, Sharma demonstrates that turmeric decreases the congestion and inflammation of stagnant mucous membranes in the oral cavity. Turmeric possesses anti-inflammatory to the mucous membranes, coating the throat, lungs, stomach and intestines. Regular application of turmeric helps in preventing Colitis, Crohn's disease, diarrhea, and post-giardia or post salmonella conditions (12). The itching and inflammation that are caused by hemorrhoids and anal fissures can be reduced by use of turmeric. Study of Naveed concludes that turmeric is beneficial in many conditions of skin like eczema, psoriasis and acne, and acts as a potent detoxifier. Turmeric possesses a wide range of pharmacological activity. Prolonged use of turmeric can cause staining in the oral cavity and cell death due to the presence of tannins (13). Our team has extensive knowledge and research experience that has translate into high quality publications (14–25),(26–30). (31) (32) (33)

The limitation of the study is that only Streptococcus mutans was used as an oral pathogens; many more oral pathogens could have been tested with turmeric extract. In future studies, further characteristics of S.mutans could be assessed to understand its effects on oral cavity. Incorporation of turmeric in various toothpastes, oral gels, mouthwash can be done to decrease the bacterial load on oral cavities.

CONCLUSION

The turmeric extract shows a potent antibacterial activity. Its activity is highest with increase in duration and concentration. It can be formulated in mouthwash, oral gel to decrease the amount of bacteria present in the oral cavity to prevent gingivitis and dental caries. The antimicrobial property in turmeric helps in identifying new sources of therapeutically and industrially valuable compounds.

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CONFLICT OF INTEREST

Authors have no conflict of interest to declare.

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