



Effect of Herbal Extracts in Prevention of Dental Caries - An *In Vitro* Study

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Abstract

Background: Use of herbal extracts for medicinal purpose is used in all civilizations and cultures and hence herbal extracts play a key role in health care systems worldwide. *Thymus vulgaris* is a species of flowering plant of mint family. It has antiseptic, antispasmodic, antibacterial activity for which it is used for various medicinal purposes. *Acacia catechu* is species of fabaceae. Its extracts is used for the purpose of gargling to treat diseases of gingiva. **Aim:** The aim of this study is to estimate the antimicrobial activity of *Acacia catechu* and *Thymus vulgaris* in prevention of dental caries. **Materials and methods:** The antimicrobial activity will be screened by agar well diffusion technique using herbal extracts of *Acacia catechu* and *Thymus vulgaris*. **Results:** The *Acacia catechu* bark extract was more effective against *Streptococcus sanguis* with a zone of inhibition of 24 mm diameter (at conc. 1000 µg/ml) with *Streptococcus mutans* the zone size was found to be 22 mm diameter and *Thymus vulgaris* extract showed a zone of 19 mm and 17 mm diameter (at conc. 1000 µg/ml) against *Streptococcus sanguis* and *Streptococcus mutans* respectively. **Conclusion:** *Acacia catechu* bark and *Thymus vulgaris* extracts have got a very good antibacterial activity against *Streptococcus mutans* and *Streptococcus sanguis* than chlorhexidine.

Keywords: *Thymus vulgaris*; *Acacia catechu*; *Streptococcus mutans*; *Streptococcus sanguis*; Dental caries; Zones

Introduction

Dental caries, one of the globally affecting diseases of the oral cavity is still prevalent in today's era despite knowledge of most advanced sciences and technologies in dental practice. The usage of these herbal extracts in clinical practice can benefit the oral hygiene of the patient [1]. Manifestations of the disease occur when there is an imbalance between the biofilm and the host due to changes in biofilm matrix pH caused by diet, microorganisms, or salivary flow and their components [2]. Conventional preventive methods such as the use of alcohol or antibiotics have proven effective in preventing dental caries. However, excessive use of chemicals has been reported to change the oral and intestinal flora and can cause other problems such as vomiting, oral cancer, etc [3]. Various compounds in plants inhibits bacterial growth and reduces the chance of development of resistant bacterial strain [4]. A considerable part of the general population of dental caries has commonly *Streptococcus mutans* and lactobacilli [5].

Thymus vulgaris L (F. Lamiaceae), is a widely distributed perennial plant for its aromatic use, it was reported for its wide antiseptic and antimicrobial effects [6]. The flowering tops are anthelmintic, strongly anti-septic, antispasmodic, carminative, deodorant, diaphoretic, disinfectant, expectorant, sedative and tonic. The plant is used internally in the treatment of dry coughs, whooping cough, bronchitis, bronchial asthma, laryngitis, indigestion, gastritis and diarrhea and enuresis in children. It should not be prescribed for pregnant women. Externally, it is used in the treatment of tonsillitis, gum diseases, rheumatism, arthritis and fungal infections [7].

Acacia catechu (Family: Fabaceae) is an important medicinal plant and its parts has been widely used in Ayurveda. *Acacia catechu* is highly precious for its powerful astringent and antioxidant activities. The bark, wood, fruits, Gum and flowering tops of *Acacia catechu* are used for medicinal purpose. Used externally as a powder by itself, it arrests the bleeding in gums. The decoction is an effective gargle in sore throat, cough and hoarseness of voice. In stomatitis, halitosis, dental caries and cavities, halitosis, dental caries and cavities [8]. The aim of this study

is to estimate the antimicrobial activity of *Acacia catechu* and *Thymus vulgaris* in prevention of dental caries.

Materials and Methods

Test microorganisms

The bacterial strain used was *Streptococcus mutans* and *Streptococcus sanguis*. The organism was isolated using selective media Mutans-Sanguis agar (Hi media M977) and maintained in nutrient agar slope at 4°C in the department of Microbiology, Saveetha Dental College.

Methodology

The extracts namely *Acacia catechu* bark and *Thymus vulgaris* were dissolved in distilled water in following concentrations 2.5 mg/ml, 5 mg/ml and 10 mg/ml so that 100 µl delivers 250 µg/ml, 500 µg/ml and 1000 µg/ml respectively.

Screening of antibacterial activity (Agar well diffusion technique)

Broth culture of the bacterial strains compared to Mac Farland's standard [9-11] 0.5 was prepared. Lawn culture of the test organisms were made on the Muller Hinton agar (MHA-Hi media M1084) plates using sterile cotton swab and the plates were dried for 15 minutes. Using a sterile well cutter wells measuring 4 mm depth was made on the agar plate. 100 µl of different concentration of the extract is filled in the wells. 0.2% chlorhexidine was used as the positive control. The plates were incubated at 37°C overnight and the zone of inhibition of growth was measured in millimeters. All the tests were done in triplicate to minimize the test error.

Results and Discussion

The antibacterial activity of the extracts at different concentrations was screened by disc diffusion technique and the zone of inhibition was measured in mm diameter. The results are given in Table 1. The *Acacia catechu* bark extract was more effective against *Streptococcus sanguis* with a zone of inhibition of 24 mm diameter (at conc. 1000

Extracts	Zone of Inhibition (in mm diameter)					
	1000 µg/ml		500 µg/ml		250 µg/ml	
	E1	E2	E1	E2	E1	E2
<i>Acacia catechu bark</i>	24	22	19	16	10	08
<i>Thymus vulgaris</i>	19	17	16	13	08	07
Chlorhexidine	35	-	26	-	18	-

E1: *Streptococcus sangius*; E2: *Streptococcus mutans*

Table 1: Antibacterial activity of *Acacia catechu* bark and *Thymus vulgaris* on *Streptococcus sangius* and *Streptococcus mutans*.

µg/ml) with *Streptococcus mutans* the zone size was found to be 22 mm diameter and *Thymus vulgaris* extract showed a zone of 19 mm and 17 mm diameter (at conc. 1000 µg/ml) against *Streptococcus sangius* and *Streptococcus mutans* respectively. Dental caries is one of the major cause for the destruction of mineralized tissue of the teeth. *Streptococcus mutans* is the potent initiator and is considered to be the most cariogenic among all oral Streptococci. The study was done to evaluate the antibacterial activity of *Acacia catechu* bark and *Thymus vulgaris* on caries causing organisms. The results obtained from our study shows that the two extracts have got a very good antibacterial activity against *Streptococcus mutans* and *Streptococcus sangius*. In a similar study *Acacia catechu* ethanolic leaf extract was used against *Streptococcus mutans* and *Streptococcus mitis* at concentration of 62 µg/ml and no growth of organisms was observed. In a study done against streptococcus mutants with Thyme essential oil was diluted in ethanol and the results showed that 0.5% triclosan (positive control) and thyme essential oil, at 1%, 5%, 10% concentrations and were found to be effective against the microorganism [12].

Conclusion

Dental caries is one of the public health concerns for several reasons. If left untreated, this disease gradually leads to teeth loss, which causes chewing difficulties and aesthetic problems. This study demonstrates that *Acacia catechu* bark and *Thymus vulgaris* extracts have got a very good antibacterial activity against *Streptococcus mutans* and *Streptococcus sangius* than Chlorhexidine. They have a greater potential for application in dental caries treatments and several other

oral problems. These plant extracts can be used alone or in combination to provide better effect with less side effects.

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