

Crude herbal formulation against *Streptococcus mutans*

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ABSTRACT

Dental caries is generally caused by *Streptococcus mutans* that present in the human mouth. Therefore, an attempt has been made to collect the reported information about the plant which are used against teeth problems. The present work aims to develop a formulation that can prevent dental caries. A combination of *Azadirachta indica* (neem), *Tinospora cordifolia*, *Glycosmis pentaphylla* and *Moringa oleifera* (drumstick) powder is made and phytochemical analysis of formulation is carried out. Antimicrobial activity of aqueous extract of formulation against *S. mutans* is done. Results revealed that the aqueous extract of formulated powder showed good zone of inhibition against *S. mutans*. Therefore, formulated powder can be good source of future drug formulation against teeth decay.

Keywords: Medicinal plants, *Streptococcus mutans*, Dental caries, Minimum Inhibitory Concentration

INTRODUCTION

Dental problems are among the most common health problems worldwide and are caused by several microorganisms. Specific type of

acid producing bacteria, especially *S. mutans* colonizes the dental surface and cause damage to the tooth structure in the presence of fermented carbohydrates (Daboor et al. 2015). The tooth surface is covered with a biofilm- a slime layer consisting of millions of bacterial cells, salivary polymers, and food debris (Chandki et al. 2011). If uncontrolled, this biofilm can easily reach a thickness of hundreds of cells on the surface of the teeth. The formation of biofilm is known as plaque provides an excellent adhesion site for the colonization of many bacterial species (Forssten et al. 2010). Over 700 bacterial taxa have been found in the oral cavity (Sakamoto et al. 2005). *S. mutans* is a facultative anaerobic, gram-positive cocci bacterium (Sherbiny et al. 2014). By utilizing the enzyme glucosyl transferase, *S. mutans* produces an extracellular polysaccharide from sucrose, which causes dental caries. Persistent dental diseases are painful. The pain can be worsened by heat, cold or sweet food or drinks (Wright et al. 2002; Taylor et al. 2004). Antibiotics, such a penicillin and erythromycin have been reported to prevent dental caries in humans but they are never used clinically because of their many adverse effects (Kubo et al. 1992). Recent natural remedies with the use of medicinal plants, which are good reservoirs of bioactive compounds can be contributed as an alternative for antibiotic effects. In present study, authors have focused on the formulation of crude powder of four plants, *Azadirachta indica*, *Tinospora cordifolia*, *Glycosmis pentaphylla* and *Moringa oleifera*. They have ethnomedicinal uses against teeth problems.

METHODOLOGY

The experimental plants, *Tinospora cordifolia*, *Glycosmis pentaphylla*, *Azadirachta indica* and *Moringa oleifera* were identified by Dr. Sanjeet

Kumar and collected from Bhubaneswar, India. Soxhlet method was adopted to obtain the extract of formulated powder and phytochemical analysis carried out (Kumar et al. 2013). To prepare powder for formulation, 10 % powder of *Tinospora cordifolia* (stem), 10 % powder of *Glycosmis pentaphylla* (stem), 30 % powder of *Azadirachta indica* (stem) and 50 % powder of *Moringa oleifera* (fruits) are mixed and made a formulation for experimental works. The aqueous extract of formulation was screened for antibacterial activity against the gram-positive bacteria *Streptococcus mutans* (MTCC 497). Antimicrobial activity *Streptococcus mutans* was done using Broth dilution, Agar well diffusion and Disc Diffusion assay (Kumar and Jena 2014; Kumar et al. 2017).

RESULTS AND DISCUSSION

The phytochemical analysis of formulated powder showed that aqueous extract posses' diverse secondary metabolites (Table 1). The antibacterial activity of aqueous extract of formulated powder showed sound zone of inhibition against *S. mutans* through Agar Well Diffusion assay and Disc diffusion assay (Table 2-3).

Table 1: Phytochemical Tests of formulated powder

Solvent	Metabolites present
Aqueous	Saponin, steroid, Flavonoid, tannin, reducing sugar, phenolic compound

Table 2: Agar well diffusion assay of Aqueous extract of formulated powder

Pants parts	Bacteria	Extract	Concentration	Zone of inhibition
<i>Formulated powder</i>	<i>S. mutans</i>	Aqueous	400 mg/ml	20 mm
			250 mg/ml	15 mm
			200 mg/ml	10 mm

			50 mg/ml	NIL
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Table 3: Disc diffusion assay of Aqueous extract of formulated powder

Plant parts	Bacteria	Extract	Concentration	Zone of inhibition
<i>Formulated powder</i>	<i>S. mutans</i>	Aqueous	400 mg/ml	13 mm
			250 mg/ml	11 mm
			200 mg/ml	10 mm
			50 mg/ml	NIL

The Minimum Inhibitory Concentration of formulated powder (aqueous extract) was observed at 400 mg/ml (Table 4). The above results showed that formulated powder can inhibit the growth of *S. mutans*.

Table 4: MIC of Aqueous extract of formulated powder

Plant name	Bacteria	Extract	Different concentrations of drugs	
<i>Formulated powder</i>	<i>S. mutans</i>	Aqueous	400 mg/ml	No growth (MIC)
			250 mg/ml	Growth
			200 mg/ml	Growth
			50 mg/ml	Growth

CONCLUSION

The present study conclude that locally available plants are useful in teeth decay and ethnomedicinal uses of plants are good source of formulation for herbal drugs. The selected plants of the study could be useful to formulate an herbal drug against teeth problems.

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