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College of Dentistry**



**Antimicrobial Activity Effect of Mastic and Hibiscus  
Extracts on Salivary Mutans Streptococci and *Candida  
albicans* with Synergism of Fluoride  
(*In vitro* study)**

A Thesis

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## Abstract

**Background:** Mastic gum which is resinous exudate from *Pistacia lentiscus* tree and the flowers and calyces of *Hibiscus sabdariffa* subshrub had demonstrated antimicrobial, anti-inflammatory and antioxidant properties.

**Aims of the study:** This *in vitro* study was conducted to evaluate the effect of mastic gum and hibiscus extracts on growth, adherence and acidogenicity of Mutans Streptococci and on growth of *Candida albicans* in comparison to chlorhexidine gluconate (0.2%). The extracts' substantivity and the synergism of their antibacterial activity with fluoride against Mutans Streptococci were also intended to be evaluated.

**Materials and methods:** Ten Mutans Streptococci and *Candida albicans* isolates were isolated from saliva samples that had been collected from volunteers (18-22 years old healthy dental students) and identified according to their morphology and biochemical properties. Agar well diffusion technique was used to test the antimicrobial effect of mastic gum extracts (aqueous, alcoholic and essential oil) and hibiscus extracts (aqueous and alcoholic) alone on Mutans Streptococci and *Candida albicans* and with synergism of fluoride on Mutans Streptococci and used also for the extracts' substantivity evaluation. The extracts' effect on Mutants Streptococci acidogenicity and adherence on extracted teeth had been examined and also laboratory analysis for the extracts' chemical composition had been performed.

**Results:** Mutans Streptococci was sensitive to mastic and hibiscus extracts at concentrations from 50 to 250 mg/ml. And in comparison to chlorhexidine, mastic extracts had revealed higher antibacterial activity at 200 and 250 mg/ml for the aqueous extract with highly significant difference ( $P < 0.01$ ), at 250 mg/ml for the essential oil with highly significant difference ( $P < 0.01$ ) and at 250 mg/ml for the alcoholic extract with non- significant difference ( $P > 0.05$ ). Hibiscus alcoholic extract revealed higher activity than chlorhexidine at all tested concentrations with non-significant ( $P > 0.05$ ) at 50 and 100 mg/ml, significant ( $P < 0.05$ ) at 150 mg/ml and

highly significant differences ( $P < 0.01$ ) at 200 and 250 mg/ml. Also, hibiscus aqueous extract revealed higher activity at 150mg/ml with non- significant difference ( $P > 0.05$ ) and at 200 and 250 mg/ml with highly significant difference ( $P < 0.01$ ). The minimum bactericidal concentration was 150 mg/ml for mastic essential oil and aqueous extract, 100mg/ml for mastic alcoholic and hibiscus aqueous extracts and 50 mg/ml for hibiscus alcoholic extract. *Candida albicans* was resistance to different concentrations of mastic extracts and were sensitive to hibiscus extracts at concentrations from 50 to 250 mg/ml. Only hibiscus alcoholic extract was more effective as anti-fungal agent than chlorhexdine at 200 mg/ml with non- significant difference ( $P > 0.05$ ) and at 250 mg/ml with highly significant difference ( $P < 0.01$ ). The minimum fungicidal concentration for hibiscus aqueous extract was 100 mg/ml and for hibiscus alcoholic extract was 50 mg/ml. In synergism with fluoride, Mastic and hibiscus extracts revealed antibacterial activity against Mutans Streptococci higher than their activity when tested alone with non-significant difference ( $P > 0.05$ ) for mastic extracts and highly significant difference ( $P < 0.01$ ) for hibiscus extracts. Hibiscus extracts were more synergistic with fluoride than mastic extracts with highly significant difference ( $P < 0.01$ ). Additionally, mastic and hibiscus extracts prevented Mutans Streptococci adherence (on teeth surfaces *in vitro*) and acidogency in concentration- dependent manner in which their activity increased as the concentration of the extracts increased and in this regard, hibiscus alcoholic extract was the most effective among the studied extracts. Furthermore, only mastic aqueous extract and hibiscus aqueous and alcoholic extracts revealed substantivity capacity. The laboratory analysis of mastic gum and hibiscus had revealed many chemical compounds with antimicrobial potential.

**Conclusion:** Mastic extracts had revealed antibacterial activity against Mutans Streptococci and hibiscus extracts had revealed antimicrobial activity against Mutans Streptococci and *Candida albicans*; hence, they could be used as effective oral health care preparations for the prevention and treatment of dental caries and oral candidiasis.