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Research Article

ANTIMICROBIAL EFFICACY OF LIQUORICE EXTRACT ON COMMON ORAL PATHOGENIC ORGANISMS-AN IN VITRO STUDY

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ABSTRACT

Aim: To evaluate the antimicrobial efficacy of liquorice extract on common oral pathogenic microorganisms like Streptococcus mutans, Staphylococcus aureus, Lactobacillus and Enterococcus faecalis.

Materials & Methods: Liquorice root was dried, pulverised and refluxed with ethanol using reflux condenser. The crude extract was filtered using a whatmann filter paper. The antimicrobial efficacy was evaluated by agar well diffusion method and the minimal inhibitory concentration was determined using serial dilution test.

Results: Zones of inhibition were measured as 17 mm in S.mutans, 30mm in S.aureus, 35 mm in Lactobacillus & 25 mm in E.faecalis. The lowest concentration of liquorice test solution that inhibited microbial growth on culture plates was considered as minimum inhibitory concentration - 75%.

Conclusion: Within limitations of this study, it can be concluded that liquorice extract showed antibacterial activity against S.mutans, S.aureus, Lactobacillus & E.faecalis.

INTRODUCTION

Medicinal plants offer a natural and new source of antimicrobial agents for use. Due to the increasing side effects caused by antibiotics, much attention has been paid to extracts and biologically active compounds isolated from plant species used in herbal medicine.

Liquorice (Glycyrrhiza glabra; family - fabacaeae) is a perennial leguminous plant, widely spread in Spain, Italy, Turkey, Israel, Syria, Iran, China, Russia and India (1). Liquorice is also known as licorice, kanzoh, gancao, sweet root and yasti-madhu (1). Liquorice is a hardy erect shrub that grows to about 2m height. The roots are long, cylindrical, having a diameter of 0.5±2.5 cm and length of 15±20 cm thick and multi-branched (2).

The principal component of liquorice is Triterpene saponins, which contains high percentage of Glycyrrhizin. Several flavonoids are also present, both as glycosides and aglycones. Glycyrrhizin is a water-soluble pentacyclic triterpenoid glycoside occurring as a mixture of calcium, sodium and potassium salts of glycyrrhizinic or glycyrrhizic acid. It is responsible for the sweetness of liquorice and its aglycone is responsible for various medicinal attributes and clinical applications. The flavonoid content in liquorice is usually based on flavanones and chalcones such as liquiritin, isoliquiritin and their corresponding aglycones (1). Other flavonoid subclasses of liquorice, namely flavones and flavonols have been shown to exhibit strong antioxidant effects (1).

Liquorice is said to possess anti-inflammatory, antimicrobial, antiviral, antioxidative, and immunomodulatory effects (1). It is used in treating various illnesses like throat infections, hypertension, jaundice, peptic ulcer, and chronic viral illnesses and also has cholesterol lowering effect. In upper respiratory infections it effectively cures infections caused by streptococcus and staphylococcus species (1). Based on this reference, this study was undertaken to check its efficacy against common oral pathogens causing caries and reinfection.

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Hence the aim of this study was to evaluate the antimicrobial efficacy of liquorice extract on oral pathogenic microorganisms such as Streptococcus mutans, Staphylococcous aureus, Lactobacillus and Enterococcus faecalis.

MATERIALS & METHODS

Preparation of Extract

Liquorice roots were dried, pulverised and refluxed with ethanol using reflux condenser. The crude extract was filtered using a what man filter paper (no.40). The filtrate was reddish brown in colour with a pH of 7(measured using pH meter). Gas chromatography analysis showed the presence of glycyrrhizin or glycyrrhizic acid, flavonoids, isoflavonones, chalcones and phenolic compounds in the extract.

The antimicrobial efficacy was evaluated by agar well diffusion method and the minimal inhibitory concentration was determined using serial dilution test.

Agar Well Diffusion Method

Four plates were prepared, one with blood agar for S.mutans and three with Muller-Hinton agar for S.aureus, Lactobacillus and E.faecalis. One well of dimension 4x4mm was punched in each of the agar plates. Microbial suspensions were streaked using sterile swabs. Each well was filled with 100 microliters of the liquorice extract, maintained at room temperature for 2 hrs and then incubated at 37° C for 48 hours. Zones of microbial inhibition around the wells were measured. The inhibitory zone was considered to be the shortest distance (mm) from the outer margin of the well to the initial point of microbial growth.

Minimum Inhibitory Concentration – Serial Dilution Method

Specific inoculum density of broth media was taken in sterile test tubes. Bacteria was added and incubated for 5 hours at 37 °C. Five fold serial dilutions of the test materials were added and then the test tubes were incubated for 24 hours at 37 °C. Visual turbidity was observed. Then they were subcultured onto nutrient agar plates. MIC was calculated by the minimal concentration that showed absence of bacterial growth.

RESULTS

The measured zones of inhibition of S.mutans, S.aureus, Lactobacillus and E. faecalis was 17 mm, 30mm, 35 mm & 25 mm respectively (figure1). The lowest concentration of liquorice test solution that inhibited microbial growth on culture plates was 75% for all microorganisms

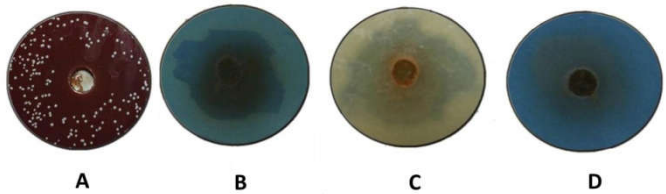

Figure 1 Zone of Inhibition

A – S.mutans
B – S.aureus
C – Lactobacillus
D – E.faecalis

DISCUSSION

Liquorice has a long history of medicinal uses. Several studies have suggested the possible uses of glycyrrhizin and its derivatives in dentistry. The results showed microbial growth inhibition in all species tested while the minimum inhibitory concentration was 75%. The exact mechanism of action behind this remains unrecognized. It could be attributed to the action of glycyrrhizin and flavonoids.

Glycyrrhizin exerts its antimicrobial effect by changing the cell membrane permeability and membranolytic action (3). Flavanoids exerts its antimicrobial effect by strong inhibition of oxygen consumption in bacterial cells, thus interfering with bacterial respiratory electron transport chain (4, 5). It has also been shown that glycyrrhizin inhibits the synthesis of insoluble glycans by glucosyltransferases from S.mutans, which is a valid strategy for restricting adherence and persistent colonization by the caries inducing organism (6 - 10). Also it was shown to inhibit acid production from plaque in vivo (8).

CONCLUSION

Within the limitations of this study, liquorice extract showed antibacterial activity against S.mutans, S.aureus, Lactobacillus and E.faecalis. It holds a promising future in caries management. Further studies are required to evaluate its clinical efficacy and toxicity.

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