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EVALUATION OF ANTIBACTERIAL ACTIVITY OF CARDAMOM SEED POWDER EXTRACT

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ABSTRACT

The aim of this research work is to evaluate the antibacterial activity of cardamom seed powder extract on Streptococcus Mutants. An in-vitro study was conducted to assess effectiveness of 15%, 20%, and 50% cardamom seed powder extract on Streptococcus mutants. The cup plate method was used to test the antibacterial activity. Cavities were prepared on Nutrient agar plates with the help of borer having 6-mm diameter. The plates were left for 1 hr at room temperature and then incubated at 37°C for 48 hours and examined for zone of inhibition. There was significant difference in mean diameter of zone of inhibition of 15% and 20% cardamom seed extract. Results showed that cardamom seed powder extracts had antibacterial activity against streptococcus mutants, while antibacterial activity was significantly higher in 50% cardamom seed powder extract.

KEYWORDS: Streptococcus mutants, Cardamom seed extract zone of inhibition, antibacterial activity.

INTRODUCTION

Dental diseases are recognized as major public health problems throughout the world. Numerous epidemiological studies showed that tooth decay is the most common affliction of mankind.[1] Dental caries is one of the most common human diseases that affect the vast majority of individuals. Hence, there is an urgent need to promote traditional preventive measures that are acceptable, easily available, and cost effective.[2]

Herbs and spices have been found to reduce inflammation, protect against infection, helps to detoxify the liver and cleanse the lungs and other organs and also protect from cell damage that can lead to rheumatoid arthritis, osteoporosis, heart disease and other degenerative diseases.[3]

The use of herbs is the most ancient approach to healing known. The herbal medicines may be in form of powders, liquids, or mixtures, which may be raw, or boiled, ointments, liniments, and incisions. Roots, barks, and leaves of various plants are employed in ethnomedicine.[4]

Elettaria cardamomum (L.) Maton is an important member of family Zingiberaceae. Small cardamoms are popularly known as 'chhoti elaichi' or the 'true cardamom' or '*Ela*'. Chhoti elaichi has been the second most important 'National Spice" of India and is also rightly known as the 'Queen of Spices'. This leafy perennial herb is originated from India and Sri Lanka and is commonly cultivated in southern India. Fruits and seeds are economically important parts of the plant. The seeds contain essential oil in concentration of about 4% of dry weight. The main compound is 1, 8-cineole (representing 50% or more), with smaller amounts of α-terpineol, borneol, camphor, limonene, α-terpenyl acetate, and α-pinene. Indian cardamom is low in fat and high in protein, iron, and vitamins B and C. Cardamom seeds, with their sweet and spicy aroma, are used in aromatherapy to stimulate energy. It also acts as Ayurvedic aphrodisiac and remedy in case of digestive problems, asthma, bronchitis, and urinary complaints and several other human ailments.[5]

As cardamom seeds are used in Indian context in cities, as well as in villages. It is easily available and consumed on daily basis by Indian people. Although many studies have been conducted to explore medicinal uses of the cardamom seed, still there is grey area in relation to research pertaining to streptococcus mutants species. So we undertook this study to check the effect of cardamom seed extract on streptococcus mutants.

MATERIAL AND METHODS

The cardamom fruits were purchased from the market of Karimnagar city of Telangana state.

Extract Preparation[6,7]

150 gm of cardamom fruits were used in the experiment. After drying properly, the pods of fruits are separated from seeds, and then the seeds were grounded to powder. The weighted

powder i.e. 15 gm, 20 gm and 50 gm was kept separately in sterile, dry screw-capped bottles, which were stored in a dry cool place for one week before aqueous extraction. 10 ml of sterile water was added to each bottle of powder. The extract was allowed to soak for 48 hours before the mixture was centrifuged at 2,000 rpm for 10 minutes. The supernatant was passed through a 0.45 mm membrane filter; the extract was prepared at 15, 20 and 50% concentrations (v/v) and stored in 5 ml portions at 20°C.

Micro-organism

The test microorganism Streptococcus mutants were obtained from Department of Microbiology, Kakatiya University, Warangal, Telangana.

Preparation of Culture Media[8,9]

Streptococcus mutants was added to nutrient broth and then sub-cultured onto nutrient agar plate and incubated anaerobically at 37^0 for 24 hours. The inoculum for antibacterial activity was prepared by adjusting the density of organism to approximately 10^8 colony forming units/ml with the help of 0.5 Mcfurland opacity standards. Lastly it was inoculated on nutrient agar plate by micropipettes.

Antibacterial susceptibility testing[10,11]

The cup plate method was used to test the antibacterial activity. Cavities were prepared on Nutrient agar plates with the help of sterile borer having 6-mm diameter. On each petri dish, four cavities were made and labeled for various concentrations of cardamom seed extract. 50 micro-litres each of 15%, 20% and 50% cardamom seed extract was introduced into equal sized cavities made on petri dishes. Sterile distilled water was used as control. The plates were left for 1 hr in refrigerator for diffusion of extract in to solid agar media, and then incubated at 37°C for 48 hours and examined for zone of inhibition. The average of those zones was recorded in millimeters.

Statistical analysis[12]

The antibacterial activity was recorded by an inhibition zone surrounding the cavities containing the cardamom seed extract. The experiments were performed 4 times and the mean values of the diameter of inhibition zones with ± standard deviations were calculated. Statistical Package for Social Sciences (SPSS version 17, SPSS Inc., Chicago) was used for analysis. $P < 0.05$ was taken as statistically significant.

RESULTS

The inhibition zone of Streptococcus mutants for the extract was observed at various concentrations (15%, 20% and 50%) for 24 h incubation period. There was significant difference in mean diameter of zone of inhibition of 15% and 20% cardamom seed extract. Results showed that cardamom seed powder extracts had antibacterial activity against streptococcus mutants, while antibacterial activity was significantly higher in 50% cardamom seed powder extract. There was a statistical significant result ($P < 0.05$) when the mean diameter of inhibition zones for cardamom seed extract were compared at concentration of 20% and 50%.

Table 1: Effect of various concentrations of Cardamom seed extract on Streptococcus mutants.

Concentration	Zone of inhibition (mm)				Mean ±SD
	C1	C2	C3	C4	
15%	2.2	1.8	1.9	2.2	2.02±.20
20%	2.5	2.8	2.1	2.6	2.5±.20
50%	4.2	4	4	4.3	4.12 ± 0.19
Streptomycin	4.0	3.8	4.1	4.5	4.1±0.2

DISCUSSION

In the present study maximum antibacterial activity of cardamom seed extract with mean zone of inhibition of 4.12 mm ± 0.19 mm was found at 50% concentration. Our results are in line with the findings of the study conducted by Rahim et al.[10]

The antibacterial activities of cardamom seed have been proved against several bacteria strains. Sofia et al. tested the antibacterial activity of different Indian spice plants as mint, cardamom, cinnamon, mustard, ginger, garlic and clove. The only sampled that showed complete bactericidal effect against all the food-borne pathogens tested Escherichia coli (E. coli), Staphylococcus aureus and Bacillus cereus was the cardamom seed powder extract at 5%. At the concentration of 2% cardamom seed powder extract also showed good inhibitory action.[11]

Our findings support the traditional medicinal use of this plant and its future aspects in developing novel antimicrobials. *Elettaria cardamomum* can potentially be used in the treatment of various infectious diseases caused by microorganisms that are showing resistance to currently available antibiotics. Furthermore, active plant extracts can be subjected to various chemical evaluations by several methods such as GC-MS, NMR (nuclear

magnetic resonance), Mass Spectrometry, etc. for the isolation of the therapeutic antimicrobials.

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