

Antibacterial activity of *Caralluma fimbriata* against *Lactobacillus acidophilus* - An *in vitro* study

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ABSTRACT

Aim and Objective: The aim of this study was to evaluate the antibacterial activity of *Caralluma fimbriata* (CFE) against *Lactobacillus acidophilus*. **Background:** *C. fimbriata* is an appetite suppressant. It possesses good antioxidant, hepatoprotective, and anticancer activity. It is an indigenous herb with lots of medicinal value. It exhibits anti-inflammatory, antiviral, and antiobesity activity. **Materials and Methods:** Antibacterial activity is determined by disc diffusion method by adopting *in vitro* standard protocol. **Results:** According to the obtained results, the inhibitory activity (maximum zone of inhibition) CFE against *L. acidophilus* is observed in 25 mg/ml in disc diffusion method. **Conclusion:** The results indicated that CFE showed antibacterial effect in disc diffusion method.

KEY WORDS: Antibacterial, *Caralluma fimbriata*, Disc diffusion, *Lactobacilli acidophilus*

INTRODUCTION

Streptococcus mutans and *Lactobacilli acidophilus* are considered to be the major oral pathogens causing common dental problems such as dental caries/dental plaque. The process of cariogenesis is by the bacterial biofilm initially adhering to tooth structure, leading to the formation of plaques and calculus which finally leads to caries formation.

The formation of multispecies biofilms is influenced by three major factors, the substrate, host and the environment the nature of the surface to which the biofilm adheres^[1] the microorganisms due to the overuse of the antibiotics have developed resistance to the commonly used antibiotics. Hence, newer antibiotics are being employed in the treatment practice in the current practice.

Usage of herbal extracts to treat various disease conditions caused by the microorganisms is increasingly rapidly. Herbal extracts being natural,

cost-efficient, with a fewer side effect, higher bioavailability, and ease of absorption into the system increases its preference over the synthetic chemical antibiotics that are used. Herbal extracts such as the aqueous and ethanol extracts of *Hibiscus rosa-sinensis*,^[2] and aqueous extracts of *Aloe vera*^[3,4] *Acacia nilotica*, and Eucalyptus hybrid^[5] have proven to inhibit the growth of the cariogenic pathogens of the oral cavity.

Caralluma fimbriata (CFE) is an edible cactus succulent belonging to the family Asclepiadaceae, is a roadside shrub well known in Ayurvedic medicine and used by tribal Indians to suppress hunger and enhance endurance for centuries. Although bitter to taste, CFE powder is easy to drink, and its safety and toxicity profile have been studied. CFE is commercially available in many countries including India, Australia, and New Zealand.^[6] CFE contains various phytochemicals such as flavonoids and polyphenols which exhibit antimicrobial activity.^[7] Other herbal medicines include the extract of *Mitracarpus scaber* leaves formulated as syrup reported the *in vitro* antimicrobial activity^[8] to cure the gastrointestinal disorders;^[9,10] hence, the aim of the study is to evaluate the effect of CFE extract against *L. acidophilus*.

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MATERIALS AND METHODS

Plant Material

Ethanollic leaf extract of CFE was collected from Hosur, Tamil Nadu, and was authenticated by Green Chem lab, Bengaluru, India.

Preparation of Extract

Leaves were shade dried for a week. Dried leaves were milled to fine powder. Powder was passed through 100 mesh sieve and stored in a sealed polythene bag. 2.5 kg of powdered plant material were extracted with 10 L of acetone at 65°C temperature, for 1 h, in a 20 L round bottom flask with Graham condenser attached. Condenser was cooled circulating with chilled water. After 1 h of extraction, round bottom flask was cooled to room temperature and the extract was filtered and collected. The Marc was extracted repeatedly with 10 L of ethanol twice. The extracts were filtered and collected. The extracts were evaporated to dryness under reduced pressure in a Buchi Rotary Evaporator (Switzerland) at 65°C, to obtain 150 g of powder extract. The w/w yield of the prepared extract was 6%. The extract was stored at 4°C until used.

Test Microorganisms

Bacterial strain used was *L. acidophilus* (ATCC 4356). The organisms were obtained from the Department of Microbiology, Saveetha Dental College and Hospitals, Chennai.

Methodology

The plant extract 200 mg was weighed aseptically into a sterile tube and dissolved in 2 ml of sterile Tryptic soy broth. From the stock solution, various concentrations were prepared, namely 10 mg/100 µl, 15 mg, 20 mg, and 25 mg/ml, respectively, into wells of microplates. 100 µl of these concentrations were taken and the plates were incubated at 37°C for 24 h.

Screening of Antibacterial Activity

Disc diffusion method

The pooled extracts were concentrated and extracts were loaded into sterile readymade discs (Hi-Media, Mumbai) in different volumes of 15 mg/ml, 20 mg/ml, and 25 mg/ml/disc, respectively, and allowed to dry for 24 h at room temperature. Mueller-Hinton agar plates were spread with 100 µl of actively growing broth cultures of the respective bacteria and are allowed to dry for 10 min. The sterile readymade discs loaded with each extract individually (15 mg/ml and 25 mg/ml/disc, respectively) were imposed on the inoculated plates. The plates were then incubated at 37°C for 24 h. The development of the zone of inhibition around the extract loaded disc was recorded.^[11-13]

Table 1: Zone of inhibition in (mm) anticariogenic evaluation of herbal extracts against *L. acidophilus* - disc diffusion assay

15 mg/ml	20 mg/ml	25 mg/ml
10	12	14

L. acidophilus: *Lactobacillus acidophilus*



Figure 1: Disc diffusion method (zone of inhibition)

RESULTS AND DISCUSSION

L. acidophilus is a commensal of the oral cavity which becomes a major causative organism of various oral diseases such as dental caries and dental plaque under suitable condition.^[12] It helps in fermentation of the carbohydrates and sugars by which the bacteria colonize and adhere on the tooth structure.^[13] It is a Gram-positive bacteria whose growth is restricted by the extracts of *Malus domestica*,^[14] *Psidium guajava*,^[15] *Punica granatum*, and *Acacia catechu*^[16] among the others.

It also has the potential to reduce the risk of coronary heart diseases by 6–10% by reducing serum cholesterol concentration.^[17] They may also produce Vitamin K and lactase.^[18] *L. acidophilus* has a positive effect on the immune system, and in pediatric diarrhea, they decrease the toxic levels of amines significantly.^[19]

From the study, it is observed that CFE extract shows maximum zone of inhibition at 25 mg/ml, whereas minimum zone of inhibition was recorded at 15 mg/ml, respectively, against *L. acidophilus* [Table 1 and Figure 1].

CONCLUSION

Natural compounds have been extensively used in dental practice for the eradication of dental caries/dental plaque. With this regard, the study has proven that CFE extract possesses significant antibacterial efficacy against *L. acidophilus*. Further, *in vivo* studies could be carried out to check its efficacy for a commercial purpose.

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