

## Antibacterial activity of *Caralluma fimbriata* against enteric pathogens – An *in vitro* study

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### ABSTRACT

**Aim and Objective:** *Caralluma fimbriata* is a certain species of the *Caralluma* genus that appears to have historical usage as a famine food, appetite suppressant, and thirst quencher when the vegetables are boiled and salted. *C. fimbriata* appears to require up to a month or so to work for appetite suppression. Enteric pathogens refer to any microorganism or substances that are capable of producing disease in the small intestine. Enteric bacterial pathogens mainly cause diarrhea and gastroenteritis. **Materials and Methods:** Antibacterial activity is determined by the disk diffusion method by adopting *in vitro* standard protocols. Plant material: *C. fimbriata* ethanolic extract is obtained from Green Chem Herbal Extracts and Formulations, Bengaluru. **Conclusion:** The study reveals that *C. fimbriata* is a potential candidate for the treatment of diarrhea caused by enteric pathogens food spoilage and is often caused by the growth of many pathogenic bacterial strains. Prevention of food spoilage in the food industry and food stuff is mainly based on the application of chemical preservatives. The plant extracts which proved to be potentially effective and can be used as natural alternative preventives to control food poisoning diseases and preserve foodstuff avoiding health hazards of chemically antimicrobial agent applications.

**KEY WORDS:** Antibacterial, *Caralluma fimbriata*, Disk diffusion

### INTRODUCTION

*Caralluma adscendens* has been eaten in rural India for centuries, raw, as a vegetable with spices, or preserved in chutneys and pickles, and is often found as a roadside shrub or boundary marker. It has been used as a portable food and thirst quencher for hunting.<sup>[1]</sup> Tribesmen on a day's hunt will often only pack some *Caralluma fimbriata* to sustain themselves, and it is commonly known as "famine food" in India. Various diet pills claiming to contain *C. fimbriata* extracts (CFE) are marketed for weight loss. The FTC cautions against the use of "miracle diet" products. The weight loss effects of *C. fimbriata* are powerful enough, but *C. fimbriata* has other effects that turn it from an average supplement into a "superfood." *C. fimbriata* intercepts signals going to and from the hypothalamus, which disrupts your natural hunger/fullness cycle and makes you feel less hungry even

when you don't eat a lot. *C. fimbriata* is ideal for those who are obese and trying to lose weight. One of the problems with being obese is that you naturally have a higher appetite than skinnier people. This puts you at a huge disadvantage when trying to lose weight.<sup>[1,2]</sup>

*Caralluma* helps you turn that disadvantage into an advantage: You can eat less, enjoy better weight loss results, and turn your existing fat storage into lean muscle mass. *C. fimbriata* contains high levels of omega-9 fatty acids, which can reduce inflammation and lower your risk of heart disease, arthritis, and other inflammatory conditions.<sup>[3]</sup>

*C. 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 has been studied. CFE is commercially available in many countries including India, Australia, and New Zealand. CFE contains various phytochemicals such as flavonoids and polyphenols which exhibit

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antimicrobial activity. Other herbal medicines include the extract of *Mitracarpus scaber* leaves formulated as syrup reported the *in vitro* antimicrobial activity to cure the gastrointestinal disorders.<sup>[4,5]</sup>

### Uses of *C. fimbriata*

*C. fimbriata* is an edible perennial herb grown in dry parts of Tamil Nadu, India.<sup>[2]</sup> It belongs to family Asclepiadaceae. It is well-known as famine food, appetite suppressant, and thirst quencher.<sup>[4]</sup> The stem of the plant is widely used to treat several ailments including diabetes, rheumatism, leprosy, peptic ulcer, inflammation, jaundice, dysentery, constipation, stomach pain, and hepatitis B and C.<sup>[5]</sup> It is listed in the Wealth of India (1992) as a medicinal plant used for diabetes, rheumatism, leprosy, peptic ulcer, inflammation, jaundice, dysentery, constipation, stomach pain, and hepatitis B and C.<sup>[6,7]</sup>

Phytochemical's in fruits, vegetables, spices, and traditional herbal medicinal plants play a protective role against many human chronic diseases including cancer and cardiovascular disease. On investigation, the phytochemical discovered are flavone glycosides, pregnane glycosides, lupeol, megastigmane glycosides, bitter principles, saponins, and various flavonoids. The plant possesses beneficial effects as antihyperglycemia, antibacterial, antifungal, antinociceptive, and antiproliferative activities. *C. fimbriata* has potent resistance against fungal attack and hence can be used for the management of skin infections.<sup>[8,9]</sup>

## MATERIALS AND METHODS

Plant material: *C. fimbriata*.

Ethanol extract is obtained from Green Chem Herbal Extracts and Formulations, Bengaluru.

### Antibacterial Activity

MTCC strains used in the study.

*Escherichia coli* – MTCC 739.

*Klebsiella* – MTCC432.

*Pseudomonas* – MTCC424.

### Preparation of Extract

Leaves were shade dried for a week. Dried leaves were milled to a fine powder. The 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. The condenser was cooled circulating with chilled water. After 1 h of extraction, the 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 *E. coli*, *Pseudomonas*. The organisms were obtained from the Department of Microbiology, Saveetha Dental College and Hospitals, Chennai.

### Experimental Section

All the chemicals and reagents used were from Sigma. Glasswares used were from Borosil. The media and broth used for microbial culture were from HiMedia Pvt. Limited, Bombay, India.

### Disk Diffusion Assay

The assay is carried out by the disk diffusion method. The pooled extracts were concentrated and extracts were loaded into sterile readymade discs (HiMedia, 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 36 h. The development of the zone of inhibition around the extract loaded disc was recorded.<sup>[2,4]</sup>



Extract zone	Zone of inhibition (mm)		
	<i>Escherichia coli</i>	<i>Klebsiella pneumoniae</i>	<i>Pseudomonas auroginosa</i>
Caralluma fimbriata			
15 mg/ml	-	7	12
20 mg/ml	8	10	12
25 mg/ml	-	12	16



## RESULTS AND DISCUSSION

The assay is carried out by the disk diffusion method. The pooled extracts were concentrated and extracts were loaded into sterile readymade discs (HiMedia, 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  $\mu$ l 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 36 h. The development of the zone of inhibition around the extract loaded disc was recorded.<sup>[6]</sup>

*C. fimbriata* when tested at 15 mg/ml against *E. coli* no zone of inhibition is seen, when tested against *Klebsiella pneumoniae* and *Pseudomonas aeruginosa* it showed 7 mm and 12 mm, respectively.

*C. fimbriata* when tested at 20 mg/ml against *E. coli* it showed 8 mm and when tested against *K. pneumoniae* and *P. aeruginosa* it showed 10 mm and 12 mm, respectively.

*C. fimbriata* when tested at 25 mg/ml against *E. coli* no zone of inhibition is seen and when tested against *K. pneumoniae* and *P. aeruginosa* it showed 12 mm and 16 mm, respectively. Antimicrobial properties of medicinal plants are being increasingly reported from different parts of the world. The World Health Organization estimates that plant extract or their active constituents are used as folk medicine in traditional therapies of 80% of the world's population. In the present work, the extracts obtained from *C. fimbriata* show strong activity against most of the tested bacterial and fungal strains. The results were compared with standard antibiotic drugs. In this screening work, extracts of *C. fimbriata* were found to be not inactive against any organism, such as Gram-positive, Gram-negative, and fungal strains were resistant to all the extracts of *Cassia fistula*.<sup>[7]</sup>

The above results show that the activity of hydroalcoholic extracts of *C. fimbriata* show significant antibacterial and antifungal activities. This study also shows the presence of different phytochemicals with biological activity that can be of valuable therapeutic index. The result of phytochemicals in the present investigation showed that the plant contains more or less the same components such as saponin, triterpenoids, steroids, glycosides, anthraquinone, flavonoids, proteins, and amino acids. Results show that plant rich in tannin and phenolic compounds have been shown to possess antibacterial activities against a number of microorganisms.<sup>[8]</sup>

Plants and plant products have been used extensively throughout history to treat medical problems. The traditional medicinal methods, especially the use of medicinal plants, still play a key role to cover the basic health needs in the developing countries and moreover the use of herbal remedies has risen in the developed countries in the past decades. In this connection, plants continue to be a rich source of therapeutic agents. The active principles of many drugs are found in plants or are produced as secondary metabolites. The remarkable contribution of plants to the drug industry was possible, due to the large number of phytochemical and biological studies all over the world. Herbal remedies used in folk medicine provide an interesting and still largely unexplored source for the creation and development of potentially new drugs for chemotherapy which might help overcome the growing problem of resistance and also the toxicity of the currently available commercial antibiotics. Therefore, it is of great interest to carry out a screening of these plants to validate their use in folk medicine and to reveal the active principle by isolation and characterization of their constituents.<sup>[9]</sup>

## CONCLUSION

The study reveals that *C. fimbriata* is a potential candidate for treatment of diarrhea caused by enteric pathogens. Food spoilage is often caused by the growth of many pathogenic bacterial strains. Prevention of food spoilage in food industry and food stuff is mainly based on the application of chemical preservatives. The adverse effects of these chemical preservatives on human health increase the demand to search for potentially effective, healthy safer, and natural food preservative. The plant extracts which proved to be potentially effective and can be used as natural alternative preventives to control food poisoning diseases and preserve foodstuff avoiding health hazards of chemically antimicrobial agent applications.

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