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Antibacterial activity of *Acmella paniculata* extract on human pathogenic bacteria

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ABSTRACT

The use of plant in treatment of infectious diseases is common in traditional medicine. On the basis of ethno pharmacological and taxonomic information, antibacterial activity of aqueous extract of different parts (leaf, root, shoot and flower) of *Acmella paniculata* were determined by agar diffusion-method against some human pathogenic bacteria. The antibacterial screening of aqueous extract carried out *in vitro* against the following bacteria viz., *Bacillus subtilis*, *Escherichia coli*, *Salmonella typhi*, *Staphylococcus aureus*, *Vibrio cholerae* and *Vibrio parahaemolyticus*. The results of the present study showed that the aqueous extracts of flower and leaf showed relatively high activity against the tested pathogens and the root showed comparatively low antibacterial activity. Root showed moderate activity against the tested pathogens. *Vibrio cholerae* and *Vibrio parahaemolyticus* were the most resistant strains on *Acmella paniculata* extracts. A maximum inhibition zone of 27 mm and 24 mm showed by flower and leaf extract respectively against *Salmonella typhi*. The present screening result demonstrated that the Indian traditional medicinal plant *Acmella paniculata* aqueous extracts has potent antibacterial activity and the studied plant may be new source for novel antibacterial compound discovery for treating drugs resistant human pathogens.

Keywords: Antibacterial activity, *Acmella paniculata*, Pathogens, Bacteria

1. Introduction

In recent times, the World Health Organization reports that at least 75 - 95% of the world populations of developing countries were mainly rely on traditional medicines and major fraction of traditional therapies absorbs the use of plant extract products or their active constituents ^[1]. Traditional medicine treatment is a frequent practice in developed and developing countries at the primary healthcare level ^[2]. Due to amplified and unsystematic use of antibiotics for treatment of humans and animals develops the antibiotic resistance and multidrug resistance microorganisms which has increased a great deal in developing countries ^[3]. The requirement of more and more drugs from plant sources is constantly increasing which necessitates screening medicinal plants with promising biological activity ^[4].

The genus *Acmella* Rich. (Asteraceae) includes 30 species and 9 further infraspecific taxa that are mostly distributed in the tropical and subtropical regions around the world ^[5]. *Acmella paniculata* is an annual hairy herb up to 32-60 cm high, with many stems and marigold eye flowers. Stem is glandular and hairy with pungent taste and the whole plant is acrid in flavour. The flowers are chewed to reduce toothache and the crushed plant is used in rheumatism. The leaves are also eaten raw or as a vegetable by many tribes of India. This species is well-known as a folklore solution for toothache and for throat and gum infections ^[6]. There is need to isolate antimicrobial compounds from *Acmella paniculata*.

The usage of plant parts as traditional medicine is the most common practice in India, particularly as folk-lore medicines. Due to continuous usage of antibiotics against clinical pathogens, development of drug resistance is a major problem now-a-days. With this in view, the wild plant extracts of *Acmella paniculata* was tested for searching a potential source for new types of antibiotics for treating bacterial diseases. The findings from this work may add to the overall value of the medicinal potential of this plant.

2. Materials and Methods

2.1 Plant material collection and Preparation of the plant extracts

Plant selected for this study is based on its traditional medicinal use. Fresh whole plant of *Acmella paniculata* (Figure 1) was collected from Pala of Kottayam District, Kerala, India. The

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taxonomic position of the plants were identified and authenticated. Plants were collected in a large quantity and washed with clear distilled water and separated into leaves,

roots, shoots and flowers and the parts then chopped into small pieces. Then the crude extract of the different parts of the plant was prepared using mortar and pestle.



Fig 1: Experimental Plant



Fig 2: Separated plant parts of *Acmella paniculata*

2.2 Microorganisms used

Test organisms were collected from the Environmental Microbiology section, School of Environmental Sciences, Mahatma Gandhi University, Kottayam, Kerala. These include the standard cultures of *Bacillus subtilis*, *Escherichia coli*, *Salmonella typhi*, *Staphylococcus aureus*, *Vibrio cholerae* and *Vibrio parahaemolyticus*.

2.3 Antimicrobial activity

The young culture of the selected pathogens (*Bacillus subtilis*, *Escherichia coli*, *Salmonella typhi*, *Staphylococcus aureus*, *Vibrio cholerae* and *Vibrio parahaemolyticus*) were prepared in nutrient broth. A lawn culture of different pathogens were prepared by swabbing young culture (16-18 h) in Muller Hinton agar and waited for 15 minutes to absorb the culture to the medium. Agar wells (3 mm diameter) were punched in the plates using a sterile gel puncture. Three hundred micro litres of leaf, root, shoot and flower extract was pipetted in to separate wells and the plates were incubated for 24 h at room temperature. After incubation, zone of inhibition around the wells were recorded in mm.

3. Results and Discussion

The crude extracts of different parts (leaves, roots, shoots and flowers) of *Acmella paniculata* were tested for antimicrobial activity against 6 pathogenic bacteria using well diffusion method. The antibacterial results showed the aqueous extracts of *Acmella paniculata* flower and leaf showed relatively high activity against the tested pathogens and the root exhibited comparatively low antibacterial activity. Root showed moderate activity against the tested pathogens. *Vibrio cholerae* and *Vibrio parahaemolyticus* were the most resistant strains on *Acmella paniculata* extracts and it is suggested that this bacterial strains may possess resistant mechanism and concentration of compound used may be lesser to inactivate the bacterial activity. A maximum inhibition zone of 27 mm and 24 mm showed by flower and leaf extract respectively against *Salmonella typhi*. Zone of inhibition of *Acmella paniculata* plant parts against selected bacterial strains are presented Table 1.

Medicinal plants have been main source for drugs over many centuries in many countries, in both developed and developing world. Traditional medicines products are not officially recognized in many countries, and the European Union

currently developing regulatory laws for superior traditional medicines [1]. The medicinal property of plants is due to the occurrence of diverse complex chemical compounds as secondary metabolites, which are exclusively accumulated in different regions of the plants [7]. These natural secondary metabolites are vital as potential antimicrobial crude medicine and source for natural compounds as new anti-infection agents.[8] The incidence of bacterial diseases is becoming frequent in south Asia mainly in India, because of expansion of antibacterial drug resistant pathogens. For resolve this

trouble and to identify alternative chemotherapeutic agents, the exploration for new antibacterial compounds from newer sources is a global challenge [7].

Apart from *Salmonella typhi* infection, *Salmonella paratyphi* A and B also widely persist in Indian population. The present study reported crude extracts of *Acmella paniculata* showed considerable inhibitory activity against *Salmonella typhi*, and reports of such similar work on enteric *Salmonella* from scientific community is very negligible.

Table 1: Zone of inhibition of *Acmella paniculata* plant parts against selected bacterial strain

Bacterial isolates	Zone of inhibition			
	Flower	Leaf	Shoot	Root
<i>Bacillus subtilis</i>	21	19	15	0
<i>Salmonella typhi</i>	27	24	18	0
<i>Escherichia coli</i>	16	19	0	14
<i>Vibrio parahaemolyticus</i>	0	14	0	0
<i>Vibrio cholerae</i>	13	0	0	12
<i>Staphylococcus aureus</i>	19	20	15	0

4. Conclusion

The results of the present study concluded that the crude extracts of traditional wild plant *Acmella paniculata* have potent antibacterial activity against the clinical human pathogens particularly pathogenic *Salmonella typhi*, *Bacillus subtilis*, and *Staphylococcus aureus*. The present investigation report on antibacterial effectiveness of wild *Acmella paniculata* helps to suggest further study for production of new antibiotics.

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