Inhibitory activity of *Alpinia galanga* (Kulanjan) against pathogenic bacteria

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Abstract-Infectious disease are the world's leading cause of premature deaths, killing almost 50 000 people every day. With the continuous use of antibiotics microbes have become resistant. This has created immense clinical problems in the treatment of infectious diseases.

Therefore, there is a need to develop alternative antimicrobial drugs for the treatment of infectious diseases. Plant materials remain an important recourse to combat serious diseases in the world. They are used directly as therapeutic agents, as well as starting materials for the synthesis of drugs or as models for pharmacologically active compounds. The search for potent antibacterial agents has now been shifted to plants. One approach is to screen local medicinal plants for possible antimicrobial properties.

According to WHO (1993), 80% of the world's population is dependent on the traditional medicine and a major part of the traditional therapies involves the use of plant extracts or their active constituents. Yet a scientific study of plants to determine their antimicrobial active compounds is a comparatively new field. There are many published reports on the effectiveness of traditional herbs against pathogenic bacteria, viruses and fungi and as a result plants are still recognized as the bedrock for modern medicine to treat infectious diseases. Keeping in view of the importance of herbs traditionally used for the treatment of infectious diseases, this study is designed to evaluate the antimicrobial activity of *Alpinia galanga* used in the Indian system of medicine for the treatment various diseases. Results showed broad spectrum antimicrobial activity of Methanolic extract of *Alpinia galanga* roots.

Key words: *Alpinia galanga*, Antimicrobial activity, Infectious diseases

Introduction

Natural plant products known as herbal medicines have long been used in control of microorganisms causing plant and human diseases[1]. Medicinal plants are excellent antimicrobial agents because they possess a variety of chemical constituents that are antimicrobial in nature. Recently, much attention has been directed towards extracts and biologically active compounds isolated from popular plant species[2] because of the need for alternative sources of the antibiotics as the pathogenic microbes

are gaining resistance against standard antibiotics[3].

There is thus continuous effort for synthesis of new chemicals having antimicrobial activity. But most of these chemicals are potentially toxic and are not free of side effects on the Host[4].This has urged microbiologist for formulation of new antimicrobial agents and[5-6] evaluation of the efficacy of natural plant products as the substitute for chemical antimicrobial agents[7].

The aim therefore this work to evaluate the antibacterial efficacy of *Alpinia galanga* roots extracts on pathogenic bacterial cultures. *Alpinia galanga* is also known as Greater galangal in English and Kulanjan in Hindi. Most of the South Indian physicians of traditional Ayurveda and Siddha medicine system use *Alpinia galanga* to treat various kinds of disease[8].

Material and Methods

The roots of *Alpinia galanga* was collected from the surroundings of Dehradun city located in Uttarakhand (India). The plant was properly identified and authenticated in the Department of Pharmacognosy Himalaya Wellness Company Dehradun.

Extraction- The roots were collected, washed, air dried in shadow and grinded by mixer grinder. After grinding, 300 gm of plant material was extracted in 1.2 liters of different solvents (methanol, hexane, and water) separately three times at 40°C to 45°C for 6 hours. The organic solvent was filtered by whatman filter paper till clear solution was obtained. Solvent was evaporated in a rotatory evaporator (Buchi, Switzerland) under reduced pressure (vacuum) at 40°C and the semi solid crude extract was placed in a vacuum oven at 40°C for dryness. The crude extra was stored in air tight container at dark place[9].

Screening for Antibacterial and Antifungal Activity-The antibacterial and antifungal (anticandidal) activity was carried out by employing 24h cultures of *Staphylococcus aureus, Escherichia coli* and *Candida albicans*. Activity of aqueous and methanolic and Hexane extracts of *Alpinia galanga* was tested separately using Agar well diffusion method[10, 11,12,13,14]. The medium was sterilized by autoclaving at 121 ◦C (15 lb/in 2). About 30 ml of the Agar medium with the respective strains of bacteria and fungi was transferred aseptically in to each sterilized Petri plate. The plates were left at room temperature for solidification. A well of 6mm diameter was made using a sterile cork borer. The standard drug and extracts were placed in 6mm diameter well. Antibacterial assay plates were incubated at 37 ± 2˚C for 24h, antifungal(anticandidal) assay plates were incubated at 28 ±2˚C for 48 h. The Ciprofloxacin solution was used as a positive control for antibacterial activity, whereas Clotrimazole was used as positive control for antifungal (anti-candidal) activity, and diameter of the zone of inhibition was measured.

Results and Discussion

Table-1 and 2 showed the antibacterial and antifungal(anticandidal) activity of the crude aqueous, Hexane and methanolic extracts of *Alpinia galanga* on *Staph. aureus, E. coli and Candida*

albicans. The methanolic extract of *Alpinia galanga* showed the highest antibacterial activity with the diameter of zone of inhibition Ranged 15-20mm against *Staph.aureus and E.coli. Hexane and aqueous extract* showed the least range with 10-15 mm as the zone of inhibition while no zone of inhibition observed in aqueous extract against *E.coli*. Against *Candida albicans* methanolic extract showed the highest zone in the range of 15-20 mm followed by aqueous extract in the range of 10-15mm while no activity was detected in Hexane extract as depicted in table-2.

The results obtained in this study revealed antimicrobial efficacy of extracts of *Alpinia galanga* roots. The active components of these plants may be due to their high nonpolar compounds. Methanol extracts were the most potent of all the extracts suggesting that the active component must be a highly nonpolar compound.

The antimicrobial activities of methanolic extracts appeared to be broad spectrum since both the Gram-positive and Gram-negative bacteria were sensitive to their inhibitory effects.

The choice of these microorganisms used in the work was made due to the fact that some of them are causative agents of intestinal, wound and skin infection in human.

Table-1 Antibacterial activity of different extract of *Alpinia galanga*

Test organism	**Diameter of zone of inhibition (mm)**			
	Hexane extract	**Methanol extract**	**Aqueous extract**	**Ciprofloxacin**
E.coli	1+	2+	NAD	3+
Staph. aureus	1+	2+	1+	3+

*1+; 10-15 mm diameter of zone of inhibition 2+; 15-20 mm 3+; 20-25 mm 4+; Above 25 mm

NAD; No Activity Detected

Table-2 Antifungal activity of different extracts of *Alpinia galanga*

Test organism	**Diameter of zone of inhibition(mm)**			
	Hexane extract	**Methanol extract**	**Aqueous extract**	**Clotrimazole**
Candida albicans	ND	2+	1+	3+

*1+;10-15 mm diameter of zone of inhibition 2+;15-20 mm 3+;20-25 mm 4+; Above 25 mm

Conclusion

It was clearly evident from the study that *Alpinia galanga* possess antibacterial/ antifungal properties. When the antibacterial activity of each of the plant extracts were compared for aqueous, Hexane and methanol extracts, significant difference was noticed in their activity. The antibacterial activity of the extracts could be enhanced if the components are purified. These plants therefore, are potential sources of new drugs for treating infections caused by these clinical pathogens.

Further investigation using bioassay guided fractionation to isolate and characterize the active constituents is under progress.

Disclaimer Statement

Authors declare that no competing interest exists. The products used for this research are commonly used products in research. There is no conflict of interest between authors and producers of the product.

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