ABSTRACT

The in-vitro antimicrobial activity in aqueous extract of Colocasia esculenta (AECE) leaves were studied against gram positive bacterial strains i.e., Streptococcus mutans (MTCC-890), Bacillus subtilis (MTCC-121), gram negative bacterial strains i.e Klebsiella pneumoniae (MTCC-109), Pseudomonas fragi (MTCC-2458), Escherichia coli (MTCC-483) and fungal strains Aspergillus niger (MTCC-281) and Candida albicans (MTCC-227). The antimicrobial activity of AECE was determined by agar well diffusion methods at the concentrations ranging from 100-500µg/ml. Standard antibiotic discs were used as positive controls. AECE gave maximum activity against Streptococcus mutans amongst the selected microbial strains. In conclusion, the Colocasia esculenta extract exhibited good antimicrobial activity against some of tested bacteria and fungus at low concentration. The results provide promising information for the potential use of Colocasia esculenta aqueous extract in the treatment of infection.

INTRODUCTION

Various medicinal plants have been used for years in daily life to treat disease all over the world. They have been used as a source of medicine. The widespread use of herbal remedies and healthcare preparations, such as those described in ancient texts like the Vedas and the Bible, has been traced to the occurrence of natural products with medicinal properties. In fact, plants produce a diverse range of bioactive molecules, making them a rich source of different types of medicines. Higher plants, as sources of medicinal compounds, have continued to play a dominant role in the maintenance of human health since ancient times. Over 50% of all modern clinical drugs are of natural product origin and natural products play an important role in drug development programs in the pharmaceutical industry. There has been a revival of interest in herbal medicines. This is due to increased awareness of the limited ability of synthetic pharmaceutical products to control major diseases and the need to discover new molecular structures as lead compounds from the plant kingdom. Plants are the basic source of knowledge of modern medicine. The basic molecular and active structures for synthetic fields are provided by rich natural sources. This burgeoning worldwide interest in medicinal plants reflects recognition of the validity of many traditional claims regarding the value of natural products in health care. The relatively lower incidence of adverse reactions to plant preparations compared to modern conventional pharmaceuticals, coupled with their reduced cost, is encouraging both the consuming public and national health care institutions to consider plant medicines as alternatives to synthetic drugs. Plants with possible antimicrobial activity should be tested against an appropriate microbial model to confirm the activity and to ascertain the parameters associated with it. The effects of plant extracts on bacteria have been studied by a very large number of researchers in different parts of the world. Much work has been done on ethno medicinal plants in India. Interest in a large number of traditional natural products has increased. It has been suggested that aqueous and ethanol extracts from plants used in allopathic medicine are potential sources of antiviral, antitumor and antimicrobial agents.

Since time immemorial, traditional knowledge and indigenous evidences suggest that a variety of wild edible plant species in the Himalayan region have played a prominent role in providing food and medicine for human beings as well as animals. Majority of the wild edible plants are a good source of nutrition being rich in proteins, minerals and vitamins. During the recent past, wild edibles have featured prominently in the discussions and framework of rural development and biodiversity conservation. Poor rural and tribal people depend on a wide variety of plants, animals and fungi for their own consumption and for income generation. Some of these wild edibles have huge economic potential to generate income.

The need of the hour is to screen a number of medicinal plant parts for promising biological activity. Considering the aforesaid, the single traditionally used medicinal plant Colocasia esculenta Schott. (PSN-748) belonging to Arecaceae family was screened. The plant is commonly known as Arbi in northern India. In the present study we used the leaves of the plant. The plant is a hearty succulent herb, with clusters of long heart or finger shaped leaves that point earthwards. It grows on erect stems that may be green, red or variegated. The young leaves are rich in Vitamin C, and the roots are rich in starch. It contains thiamine, riboflavin, niacin, oxalic acid, calcium oxide and saponins. Traditionally it is used to settle the stomach, to prevent swelling and pain and to reduce fever. Its corn is used as an abortifacient, to treat tuberculosis ulcers, pulmonary congestion, crippled extremities, fungal abscesses in animals, and as an anthelmintic. Its foliage is used as a styptic and poultice. The stem sap is used by the Warao as a treatment for wasp stings. Poi, a fermented product made from corm shavings, is used to improve muscle tone by bathing the sickly person in it and allowing the poi to dry on the body. It is also used as a poultice on infected sores. This work was based on scientific investigation of the widely acclaimed medicinal values of Colocasia esculenta to establish its antimicrobial activity against selected microbial strains.

MATERIALS AND METHODS

Plant material:

The leaves of Colocasia esculenta were collected from Uttarakhand Himalayan region with the help of local plant collector. The plant was identified by Forest Research Institute, Dehradun, India. The plant was authenticated and a voucher specimen (Dis/2010-Bot./4-12 (Herb.) is maintained in the systematic botany discipline Botany Division, FRI, Dehradun.

Preparation of the extract:

The leaves of Colocasia esculenta were shade-dried and crushed powder was preserved for further use. Took ten gm of crushed form of leaves were dissolved in 40 ml of distilled water and the solutions were centrifuged at 10,000 rpm for 10 minutes, and the supernatant was taken for the antimicrobial assay.

Antimicrobial assay:

Antimicrobial activity of AECE was determined by modified agar well diffusion method at four different concentrations, i.e., 100 mg/ml, 200 mg/ml, 300 mg/ml, 400 mg/ml using specified growth media for different test organisms (2% agar used for media solidification and agar was procured from Marc). The experiments were repeated for another 2 times and antimicrobial activity was determined by measuring the diameter of the zone of inhibitions after 18 h incubation for bacterial and 36 h incubation for fungal test organisms. Chloramphenicol (200 µg/ml) and Rifampicin (10,000 rpm for 10 minutes, and the supernatant was taken for the antimicrobial assay.

The antimicrobial activity of AECE leaves were studied against gram positive bacterial strains i.e., Streptococcus mutans (MTCC-890), Bacillus subtilis (MTCC-121), gram negative bacterial strains i.e Klebsiella pneumoniae (MTCC-109), Pseudomonas fragi (MTCC-2458), Escherichia coli (MTCC-483) and fungal strains Aspergillus niger (MTCC-281) and Candida albicans (MTCC-227). The antimicrobial activity of AECE was determined by agar well diffusion methods at the concentrations ranging from 100-500µg/ml. Standard antibiotic discs were used as positive controls. AECE gave maximum activity against Streptococcus mutans amongst the selected microbial strains. In conclusion, the Colocasia esculenta extract exhibited good antimicrobial activity against some of tested bacteria and fungus at low concentration. The results provide promising information for the potential use of Colocasia esculenta aqueous extract in the treatment of infection.

Key words: Medicinal Plants, Colocasia esculenta, antimicrobial, strains, Uttarakhand Himalayan.
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Table 1: The results of in vitro preliminary activity in terms of zone of inhibition in millimeter around the agar wells.

<table>
<thead>
<tr>
<th>Test Organisms</th>
<th>Diameter of Zone of Inhibition (mm)</th>
<th>Concentration of AECE (mg/ml)</th>
<th>Chloramphenicol (200 µg/ml)</th>
<th>Rifampicin (200 µg/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>100</td>
<td>200</td>
<td>400</td>
</tr>
<tr>
<td>B. subtilis</td>
<td></td>
<td>8.2±0.13</td>
<td>9.6±0.08</td>
<td>12.3±0.10</td>
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<tr>
<td>S. aureus</td>
<td></td>
<td>3.8±0.16</td>
<td>4.6±0.12</td>
<td>8.5±0.09</td>
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<td>S. mutans</td>
<td></td>
<td>10.0±0.15</td>
<td>13.6±0.10</td>
<td>15.3±0.10</td>
</tr>
<tr>
<td>B. subtilis</td>
<td></td>
<td>7.5±0.09</td>
<td>9.0±0.06</td>
<td>12.0±0.20</td>
</tr>
<tr>
<td>E. coli</td>
<td>(MTCC 483)</td>
<td>5.9±0.06</td>
<td>11.6±0.09</td>
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<tr>
<td>K. pneumoniae (MTCC109)</td>
<td>10.0±0.21</td>
<td>13.0±0.06</td>
<td>33.0±0.20</td>
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<td>Fungal Strains</td>
<td></td>
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<tr>
<td>A. niger (MTCC 281)</td>
<td>5.6±0.20</td>
<td>11.6±0.09</td>
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<tr>
<td>C. albicans (MTCC 227)</td>
<td>10.0±0.17</td>
<td>12.7±0.13</td>
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</tbody>
</table>

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References: