Antibacterial activity of some medicinal plants available in Panchet and Panchokot Hills, Purulia, West Bengal, India

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ABSTRACT

Cold ethanol extracts of some medicinal plants, collected from Panchet and Panchokot hills, have been prepared and antibacterial study of the extracts have been performed by the filter paper disc method against Staphylococcus aureus (Gram positive bacteria) and Escherichia coli (Gram negative bacteria). The method is based on the diffusion of an antibiotic from a filter paper disc through the solidified culture media of a Petri dish used for study. Besides, the presence of different classes of chemical compounds in each extract has been detected.

Keywords: Staphylococcus aureus, Escherichia coli, Antibacterial activity

INTRODUCTION

Herbal medicine represents one of the most important fields of traditional medicine all over the world. To promote the proper use of herbal medicine and to determine their potential as sources for new drugs, it is essential to study medicinal plants. Over the past 20 years, there has been an increased interest in the investigation of natural products as sources of new antibacterial drugs.

Different extracts from traditional medicinal plants have been investigated to identify the source of the therapeutic efficacies [1-2]. As a result some natural products have been approved as new antibacterial drugs, but there is still an urgent need to identify novel substances that are active towards pathogens with high resistance [3-5]. The present resume deals with the antibacterial activity of cold ethanolic extract of some traditional medicinal plants against Staphylococcus aureus (Gram positive bacteria) and Escherichia coli (Gram negative bacteria) along with the presence of different classes of chemical compounds in each extract. The aim of this manuscript is to grow interest among the scientific communities to do more research work on these plants in order to develop new antibacterial drugs for future development.

MATERIALS AND METHODS

Six traditional medicinal plants are screened for the study and as per the literature survey [6-7]; these plants are well established as folk-medicine as given below (Table-1):

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From the cultures, which were maintained on nutrient agar slants, one loopful of the respective organisms were taken and carefully transferred to 100 ml of sterile nutrient broth in a flask, which was shaken thoroughly and this was further diluted 10 times with sterile water till 10^{-1} dilution was obtained. Standardization of the seeded broth was done by inoculating 0.2 ml of each dilution on solidified nutrient agar medium by spread plate method. After incubation at 37°C for 48 hours, the number of well-formed colonies on the plates was counted. The seeded broth was then correctly diluted to contain between 107–108 microorganisms c.f.u./ml (colony forming unit per ml). This was designated as the working stock that was used for antibacterial studies.

### 2.1 Collection and authentication of plant material

The plants were collected in the month of January, 2013 from Panchet and Panchokot hills and authenticated by taxonomist Dr. H. R. Choudhury, Department of Botany, Visva-Bharati, Santiniketan.

### 2.2 Preparation of plant extract

Dry-shaded whole plants (about 100-200 gms.) are cut into small pieces and adequate 90% ethanol is added. The plants were collected in the month of January, 2013 from Panchet and Panchokot hills and authenticated by taxonomist Dr. H. R. Choudhury, Department of Botany, Visva-Bharati, Santiniketan.

### 2.3 Preparation of stock culture

From the cultures, which were maintained on nutrient agar slants, one loopful of the respective organisms were taken and carefully transferred to 100 ml of sterile nutrient broth in a flask, which was shaken thoroughly and incubated at 37°C for 24 hours.

### 2.4 Standardization of stock culture

1 ml of the seeded broth was diluted with 9 ml of sterile water in a culture tube. This was shaken thoroughly and about 1 ml of this suspension was transferred to a second culture tube, which in addition contains 9 ml of sterile water. This was shaken thoroughly and this was further diluted 10 times with sterile water till 10^{-10} dilution was obtained. Standardization of the seeded broth was done by inoculating 0.2 ml of each dilution on solidified nutrient agar medium by spread plate method. After incubation at 37°C for 48 hours, the number of well-formed colonies on the plates was counted. The seeded broth was then correctly diluted to contain between 107–108 microorganism c.f.u./ml (colony forming unit per ml). This was designated as the working stock that was used for antibacterial studies.
2.5 Procedure
Antibacterial activity of cold ethanolic extracts was screened by filter paper disc method. A previously liquefied medium, appropriate for the test is inoculated with the requisite quantity of the suspension of the microorganism; the suspension was added to the medium at a temperature between 40–50°C and the inoculated medium was poured immediately into dried Petri dishes to occupy a depth of 3 to 4 mm. The paper disc (No. 2 Whatmann) was cut downed into small disc (6 mm diameter) and sterilized at 180°C for 35 minutes in a hot air oven impregnated with the test solution and the standard solution. The dried discs were placed on the surface of the medium and left standing for 2–4 hours at room temperature. The discs were then incubated for about 20 hours at about 38°C and the diameters of the circular inhibition zone were measured.

RESULTS AND DISCUSSION
The presence of different classes of natural products present in the extracts was detected by usual tests found in the literature [9-12] and the results are summarized in the following table (Table-2).

The antibacterial activity of the ethanolic extracts of the investigating plants were studied against both Gram positive (Staphylococcus aureus) and Gram negative (Escherichia coli) organism at 100 mg/mL concentration and the antibacterial activity were compared with that of the standard drug Cefuroxime (Table-2).

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Name of the Plant extracts</th>
<th>Nature of chemical compounds present</th>
<th>Action on Gram positive bacteria (Zone of inhibition in mm)</th>
<th>Action on Gram negative bacteria (Zone of inhibition in mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Talmuli/Kali Mushli</td>
<td>Flavonoids, Steroids</td>
<td>Moderate (12)</td>
<td>Moderate (11)</td>
</tr>
<tr>
<td>2</td>
<td>Haldi</td>
<td>Flavonoids, Coumarins, Quinonoids</td>
<td>Strong (25)</td>
<td>Strong (23)</td>
</tr>
<tr>
<td>3</td>
<td>Karpur</td>
<td>Flavonoids, Terpenoids</td>
<td>Moderate (13)</td>
<td>Moderate (14)</td>
</tr>
<tr>
<td>4</td>
<td>Kala Karpur</td>
<td>Flavonoids, Terpenoids, Steroids</td>
<td>Moderate (12)</td>
<td>Moderate (13)</td>
</tr>
<tr>
<td>5</td>
<td>Vanasarpagandha</td>
<td>Terpenoids, Steroids, Alkaloids</td>
<td>Strong (22)</td>
<td>Moderate (12)</td>
</tr>
<tr>
<td>6</td>
<td>Radhachura</td>
<td>Terpenoids, Steroids, Flavonoids</td>
<td>Strong (21)</td>
<td>Moderate (11)</td>
</tr>
<tr>
<td>7</td>
<td>Cefuroxime (Standard)</td>
<td></td>
<td>(7-10)</td>
<td>(7-9)</td>
</tr>
</tbody>
</table>

The results show that the cold ethanol extract of all these plants exhibited higher antibacterial activity against both Gram positive and Gram negative organisms than that of standard Cefuroxime; the plant Haldi exhibited the highest antimicrobial activity.

CONCLUSION
The present resume deals with the antibacterial activity of cold ethanolic extract of some traditional medicinal plants against Staphylococcus aureus (Gram positive bacteria) and Escherichia coli (Gram negative bacteria) along with the presence of different classes of chemical compounds in each extract. The result shows that all the investigated plant has higher antibacterial activity than that of standard Cefuroxime. As we know that the presence of natural compounds in a plant makes it to exhibit different biological activities, therefore different classes of natural compounds detected in our experiment may be accounted for such plants to show their antibacterial activity. Thus, our present study will surely grow interest among the scientific communities to do more research work on these plants in order to develop new antibacterial drugs for future development.

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REFERENCES


