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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

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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**):

Table-1: List of the plants collected from Panchet and Panchokot hills with traditional uses

Common Name	Scientific Name (Family)	Used as traditional medicine as reported
Talmuli/Kali Mushli	*Curculigo orchioides* (Amaryllidaceae)	Rhizomes used to treat piles, asthma, jaundice, diarrhoea, colic and gonorrhea. Paste of root is applied on scorpion bites and to stop bleeding from cuts of cattle; with curd given to women to treat white discharges, paste with long pepper given to cure stomach ulcers, root bark juice mixed with milk and sugar given to treat bleeding piles.
Haldi	*Curcuma longa* (Zingiberaceae)	It is widely used as a food coloring and is one of the principal ingredients in curry powder. Turmeric has long been used in both Ayurvedic and Chinese medicine as an anti-inflammatory, to treat digestive disorders and liver problems, and for the treatment of skin diseases and wound healing. Turmeric also has amazing benefit at reducing neurotoxicity, especially in patients with *Alzheimers* disease.
Karpur	*Limnophila indica* (Scrophulariaceae)	It is considered to be carminative, antiseptic and a liniment prepared from the plant is used in elephantiasis. The juice of the plant is rubbed over the body in pestilent fevers and useful in dysentery, when given internally. The plant has been accepted for 'Amragandha' in Ayurvedic system of medicine.
Kala Karpur	*Limnophila rugosa* [*syn. L. roxburghii*] (Scrophulariaceae)	It is used in the treatment of various diseases like pestilent fever, elephantiasis, diarrhoea, dysentery and dyspepsia. The essential oil of the plant exhibits significant anti-bacterial and anti-fungal activities; the essential oil is also used as a flavouring agent of food and perfuming of hair oils. The plant had been accepted for '*Sougandhabala*' as it responded to Ayurvedic description of the drug.
Vanasarpagandha	*Rauvolfia tetraphylla* (Apocynaceae)	Roots of the plant are often used substitute and adulterant of *R. serpentine*. It is used for remedy of cholera, fever, eye disease and diarrhoea, it is also used for the treatment of hypertension as well as in dysentery and intestinal disorders. Roots are considered as an antidote to snake venom. Extracts of this plant root is valuable for intestinal troubles and believed to stimulate uterine contraction in cases of difficult delivery. Fruits yield black dye and the extract of the plant mixed with castor oil is applied to various skin ailments.
Radhachura	*Peltophorum pterocarpum* (Fabaceae)	Different parts of this tree are used to treat many diseases like stomatitis, insomnia, skin troubles, constipation, ringworm and its flower extract is known to be a good sleep inducer and used in insomnia treatment. Its bark is used as medicine for dysentery, as eye lotion, embrocation for pains and sores. The traditional healers use the leaves in the form of decoction for treating skin disorders. Stem infusion is used in dysentery, for gargles, tooth powder and muscular pain. Flowers are used as an astringent to cure or relieve intestinal disorders after pain at childbirth, sprains, bruises and swelling or as a lotion for eye troubles, muscular pains and sores.

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 cutted into small pieces and adequate 90% ethanol is added. The whole content is taken in a large glass bottle. After few days, the liquid in the glass bottle is distilled and the semi-solid mass left in the distillation flask is collected as extract of the plant.

2.3 Preparation of stock culture [8]

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 37^0C 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 37^0C 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^{0}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^{0}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^{0}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-2: Antibacterial activity of the plant extracts and the class of natural products present in each extract

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

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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