Nature of Pharmaceutical Technology
ISSN: 2231 – 0436 (Print)

OPEN ACCESS JOURNAL

Potential of antibacterial activity of selected plants of Tirunelveli District, India

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Received: 23 Juanuary 2020 / Accepted: 30 September 2020/ Published Online:15 March 2020
http://www.gtrpcompany.com/npt.htm

Citation: Maridass M, Raju G. Potential of antibacterial activity of selected plants of Tirunelveli District, India. Nature of Pharmaceutical Technology,2020;10(4):3-5.

Abstract
Medicinal plants are considered as a rich resources of ingredients, which can be utilized in medication improvement either pharmacopoeial, non-pharmacopoeial or engineered drugs. In the present study, ethanolic extract of 12 medicinal plants of *Azadirachta indica* A. Juss., *Cassia auriculata* L., *Ocimum sanctum* Linn., *Ocimum gratissimum* L., *Pongamia pinnata* (L.)Pierre, *Adhatoda vasica* Nees, *Aristolochia indica* L., *Murraya koenigii* (L.) Spreng, *Solanum trilobatum* L., *Solanum nigrum L.*, *Phyllanthus emblica* L., and *Vitex negundo* L. was evaluated for antibacterial activity against tested bacteria viz. *S. aureus, Bacillus subtilis, E. coli, K. pneumoniae*, *Salmonella typhi* and *P. aeruginosa*. The experimental study of an anti-bacterial activity was performed by agar disc diffusion method. The results of all the plant extracts were observed that good antibacterial activity. The selected medicinal plants is traditionally used for curing several diseases by traditional man of Tirunelveli, Tenkasi and Kanyakumari District in Tamil Nadu,India.

Keywords: Medicinal plants. Antibacterial activity, extract,phytochemicals

1 INTRODUCTION

The development of plant based antimicrobial compounds have great therapeutic potential as they have lesser side effects. About 80% of the world population relies chiefly on the plant based traditional medicine especially for their primary healthcare needs (WHO). Plant Product are in great demand in the developed as well as developing countries for primary healthcare because of their wide biological and medicinal activities, higher safety margins and lesser costs [1,2]. Medicinal plants have an amazing capacity to produce a wide variety of active principles, like alkaloids, glycosides, terpenoids, saponins, steroids, flavonoids, tannins, quinones and coumarins[3]. These active principles are the source of plant-derived antimicrobial substances[4]. Several active compounds are highly efficient and treatment of bacterial infections[5]. The plant parts were used in the herbal therapy include seeds, berries, roots, leaves, fruits, bark, flowers, or even the whole plants. Therefore, in the present study of antibacterial activity of twelve medicinally important plants of flowers viz. *Azadirachta indica* A. Juss. (Meliaceae), *Cassia auriculata* L. (Caesalpiniaceae), *Ocimum sanctum* Linn. (Lamiaceae), *Ocimum gratissimum* L.(Lamiaceae), *Pongamia pinnata* (L.)Pierre (Fabaceae), *Adhatoda vasica* Nees (Acanthaceae), *Aristolochia indica* L. (Aristolochiaceae), *Murraya koenigii* (L.) Spreng (Rutaceae), *Solanum trilobatum* L. (Solanaceae), *Solanum nigrum* L.(Solanaceae), *Phyllanthus emblica* L.(Euphorbiaceae), and *Vitex negundo* L. (Verbenaceae) were evaluated in the disk diffusion method.

2. MATERIALS AND METHODS

2.1 Collection of and authentication of Medicinal Plants

The traditional medicinal plants viz. *Azadirachta indica* A. Juss., *Cassia auriculata* L., *Ocimum sanctum* Linn., *Ocimum gratissimum* L., *Pongamia pinnata* (L.)Pierre, *Adhatoda vasica* Nees, *Aristolochia indica* L., *Murraya koenigii* (L.) Spreng, *Solanum trilobatum* L., *Solanum nigrum L.*, *Phyllanthus emblica* L., and *Vitex negundo* L.were collected from local area of Tirunelveli District, Tamilnadu. These plants were identified by local flora and Voucher specimens were deposited in the Research Institute of Conservation Ecology, Tirunelveli, Tamilnadu.

2.2 Extraction

10g of each flower samples were extracted with 250 ml petroleum ether in soxhlet apparatus in 2 hrs. The excess of solvent was removed by distillation method. The dried extracts were made up to a concentration of 10 mg/ml (stock solution) in petroleum ether to be used in subsequent assays and stored at 5°C in tightly stoppered glass tubes.

2.3.1 Antibacterial activity

2.3.1.1 Culture of Bacteria

Stock bacterial cultures were obtained from Microbial Type Culture Collection, Chandigarh, India. The selected tested bacteria used for the present study viz. *Staphylococcus aureus* , *Bacillus subtilis* , *Escherichia coli* , *Klebsiella pneumonia*, *Pseudomonas aeruginosa* and *Salmonella typhi*. All the bacterial cultures were maintained in the nutrient agar medium and stored at 4°C.

2.3.1.2 Preparation of inoculation medium

Fresh culture of few stock colonies were transferred in to sterile peptone water (5 ml) from the sub cultured bacteria. The suspensions were mixed for 15 seconds to ensure homogeneity and subsequently diluted to match the turbidity of a 0.5 McFarland standard (i.e. OD = 0.12–0.15 at k = 530 nm, corresponding to 1-5 x 10^6 CFU/ml).

2.3.1.4 The antibacterial assay

The antibacterial activity was performed by agar disc diffusion method. Mueller Hinton agar (MHA) was prepared in plates as the media for test bacteria. The bacterial inoculum was spread evenly on the surface of the MHA plates using a sterilized cotton swab. For agar disc diffusion method, sterile filter paper discs (6mm) were saturated with different concentrations of the test compound, allowed to dry and introduced on the upper layer of the seeded agar plate. The plates were incubated overnight at 37°C For each bacterial strain were maintained where pure solvents were used instead of the extract. Sterile distilled water served as negative control. The result was obtained by measuring the inhibition zone diameter (mm). The experiment was done thrice and the mean values are presented. The results were compared with the standard antibiotics as gentamicin (10 mg/disc).

3. RESULTS AND DISCUSSION

The results of the dried flowers materials of all the selected plants were extracted with Petroleum ether to yielded seen in the table-1. The yield of the petroleum ether extract in varies in all plants are represented in the table-1. The medicinal plants of *Cassia auriculata* had the highest yield (3.67%), followed by *Solanum nigrum* (3.24%). The lowest extraction yield was obtained with *Pongamia pinnata* 1.22% seen in the table-1. Previous study observed that yield of extract was varies from 27 Combretaceae species are reported [6]. According to Eloff, (2000) who reported that extraction yield from a plant has a great effect on the overall efficacy and selection for bioprospecting and in the calculation of total activities [7].

Table 1: Yield of the petroleum ether extract of some medicinal plants

Sl. No	Plants	% of the extract(s)
1	*Azadirachta indica*	1.24
2	*Cassia auriculata*	3.67
3	*Ocimum sanctum*	1.56
4	*Ocimum gratissimum*	1.23
5	*Pongamia pinnata*	1.22
6	*Adhatoda vasica*	1.54
7	*Aristolochia indica*	1.78
8	*Murraya koenigii*	2.87
9	*Solanum trilobatum*	3.10
10	*Phyllanthus emblica*	1.65
11	*Solanum nigrum*	3.24
12	*Vitex negundo*	2.89

The antibacterial investigation of petroleum ether extract was tested against human pathogens seen in the table-1. The results of the potential of antibacterial activity in selected medicinal plants observed that significant antibacterial activities against all the tested bacteria. The antibacterial activity of *Azadirachta indica* was observed that maximum activity against *E. coli* (16 mm) and *S. typhi* while medium level activity against *S. aureus, B. subtilis* and *K. pneumoniae* respectively. The crude flower extract of *C. auriculata* leaves was significantly active against all tested bacteria and except *Staphylococcus aureus* was observed by minimum activity. The study thus reveals the effectiveness of the tested plant extracts against some pathogenic bacteria commonly associated with various human infections. *Staphylococcus aureus* is a usual member of the microbiota of the body, it is frequently found in the upper respiratory tract and on the skin. It is a major bacterial human pathogen that causes a wide variety of clinical manifestations[8]. In the present study observed that 12 medicinal plants active against *S. aureus*. Both plants of *O. sanctum* and *S. trilobatum* was observed maximum activity against *S. aureus* seen in table-2.The conclusion of the study, the selected medicinal plants can be used as potential source for the development of a phytomedicine to act against infectious bacteria. The antibacterial activities can be enhanced if the active principles will be purified and adequate dosage determined for proper administration.

Table-1: Antibacterial activity of selected plants extract of human pathogens

Sl. No	Plants	Tested Bacteria Zone of Inhibition (mm in 12 hr)					
		S. aureus	*B. subtilis*	*E. coli*	*K. pneumoniae*	*P. aeruginosa*	*S. typhi*
1	*Azadirachta indica*	13	14	16	12	15	16
2	*Cassia auriculata*	11	13	12	15	16	14
3	*Ocimum sanctum*	16	18	16	18	16	17
4	*Ocimum gratissimum*	15	16	12	13	15	12
5	*Pongamia pinnata*	11	16	13	14	11	15
6	*Adhatoda vasica*	14	18	15	19	18	19
7	*Aristolochia indica*	11	9	14	14	13	15
8	*Murraya koenigii*	13	12	11	15	11	14
9	*Solanum trilobatum*	17	17	18	19	16	17
10	*Phyllanthus emblica*	11	16	18	12	15	18
11	*Solanum nigrum*	12	12	11	9	10	14
12	*Vitex negundo*	13	14	12	12	13	12

(Minimum level 6-11mm; medium level 12 -14mm; Maximum level 15-20mm)

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