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ANTIBACTERIAL ACTIVITY OF LEAF EXTRACTS OF *PASSIFLORA FOETIDA* LINN.

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ABSTRACT
Passiflora foetida Linn. (Passifloraceae) is an ethnomedicinal plant used in asthma, biliousness wounds and a decoction medicine. The main aim of this study demonstrates that the leaves extracts of *passiflora foetidal* (petroleum ether, chloroform, acetone and methanol) was evaluated for its antibacterial activity against six bacterial strains (*Bacillus cereus, Staphylococcus aureus, Streptococcus pneumonia, Klebsiella pneumoniae, Salmonella typhi* & *Proteus vulgaris*) by disc diffusion method. All the extracts showed various levels of activity on different test organisms and their activity is quite comparable with the standard antibiotics. The acetone extracts showed remarkable antibacterial activity. This study fortifies that methanol and chloroform extracts found to be better antibacterial activity against all the test organisms than petroleum and ether extract. The results from these investigations encourage that the plant extracts may be used as anti-infective agents.

INTRODUCTION

The frequency of life-threatening infections caused by pathogenic microorganisms has increased worldwide and is becoming an important cause of morbidity and mortality in immune compromised patients in developing countries [1]. Many infectious microorganisms have developed resistance against many synthetic antibiotics due to the indiscriminate use of antimicrobial drugs and sometimes they are associated with side effects [2]. There is an urgent need to discover an alternative new, more active, broad spectrum and safer antimicrobial agents [3]. Plant materials remain an important resource to combat serious diseases in the world. The pharmacological investigations of plants were carried out to find novel drugs or templates for the development of new therapeutic agents [4]. One of the most important and common species *Passiflora foetida* was chosen in this study. The ethnobotanical views of *P. foetida*, reports the decoction of leaves and fruits to treat asthma and biliousness, leaves and root decoction is emmenagogue, used in hysteria [5] and leaf paste is applied on the head for giddiness and headache [6]. In Brazil, the herb is used in the form of lotions or poultices for erysipelas and skin diseases with inflammation [7].

The major phytoconstituents of this plant contain alkaloids, phenols, glycoside flavonoids and cyanogenic compounds [8] and passifloricins, polyketides and alpha-pyrones in *P. foeida* [9]. The present research is focused on the antibacterial activities of *P. foetida* a fast growing and spreading vine (*Mossukkattan, Poonaipudukku* (in tamil) and *stinking passion flower* (in English), found in riverbeds, dry forest floors, way side thickets, covering the top of thorny shrubs and also growing near hamlets.

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MATERIALS AND METHODS

Plant Materials

The leaves of *P. foetida* were collected from Kollidam River, Tiruchirappalli District, Tamil Nadu identified and authenticated at the Botanical Garden of St. Joseph's College, Tiruchirappalli, Tamil Nadu, India. The leaves were washed with tap water, shade dried, and powdered.

Preparation of Extracts

About 25 grams of plant material was separately extracted by cold percolation at room temperature in solvents (petroleum ether, chloroform, acetone and methanol) for three days. The extracts were filtered by using Whatman No. 1 filter paper than kept it for air dry and stored at 4°C until further use. The extractions were re-suspended in 1 ml of dimethylsulphoxide (DMSO) for antimicrobial activities.

Microorganisms

Microbial strains were obtained from the clinical laboratories, Salem District, Tamilnadu. Amongst six microorganisms investigated three were gram positive bacterial strains viz., *Bacillus subtilis*, *Staphylococcus aureus*, *Streptococcus pneumoniae* while the other three were gram negative bacterial strains viz. *Klebsiella pneumoniae*, *Salmonella typhi*, *Proteus vulgaris*. The test organisms were prepared by inoculated a loop full of culture in a 5ml of nutrient broth and incubated at 37 °C for 24 hours.

Antibacterial Activity

Antimicrobial activity was carried out by the disc diffusion method. The antimicrobial assays of crude extracts were performed by Bauer *et al*. [10]. Approximately 15 to 20 ml of Mueller Hinton Agar (MHA) (Hi Media) were poured into sterile petridish and allowed to solidify, of each test strains were spread over nutrient agar plates. Sterile paper discs (6 mm in diameter) prepared from Whatman No. 1 filter paper was impregnated with drug, containing solution placed on the inoculated agar. The inoculated plates were incubated at 37°C for 24 h. The antibacterial activity was evaluated by measuring the diameter of the inhibition zone for the test microorganisms

Minimum inhibitory concentration (MIC)

For determination of MIC, 1 ml of broth medium was taken into 10 test tubes for each bacterium. Different concentrations of plant extracts ranging from 0.125 to 8 µg/ml-1 concentration were incorporated into the broth and the tubes were then inoculated with 0.1 ml of inoculums of respective bacteria (10^5 CFU ml^{-1}) and kept at 37°C for 24 h. The test tube containing the lowest concentration of extract which showed reduction in turbidity when compared with control was regarded as MIC of that extract.

Table 1. Effect of solvent extracts of *P. foetida* on Microbes

S.no	Microbial strains	Zone of Inhibition (100 µg/ml) (cm) mean± SD				
		Ethanol	Chloroform	Pet.ether	Ethyl acetate	Streptomycin
1	*B. subtillis*	0.56±0.06	0.50±0.05	0.27±0.00	0.31±0.10	0.47±0.10
2	*S. aureus*	0.66±0.01	0.67±0.01	0.42±0.01	0.20±0.00	0.57±0.20
3	*S. pneumoniae*	0.73±0.03	0.23±0.03	0.53±0.02	0.47±0.20	0.63±0.10
4	*K. pneumoniae*	1.07±0.03	1.00±0.03	0.73±0.00	0.53±0.10	0.99±0.02
5	*S. typhi*	1.81±0.03	1.63±0.04	0.9±0.09	0.23±0.40	1.66±0.03
6	*P.vulgaris*	1.43±0.07	1.23±0.06	0.9±0.09	0.23±0.09	1.28±0.01

Table 2. The MIC of crude extracts of *P. foetida*

S.no	Microbial strains	MIC (µg/ml)			
		Ethanol	Chloroform	Pet.ether	Ethyl acetate
1	*B. subtillis*	0.500	1	4	0.250
2	*S. aureus*	0.125	0.250	2	0.500
3	*S. pneumoniae*	0.250	0.500	4	0.500
4	*K. pneumoniae*	1	1	4	4
5	*S. typhi*	2	4	1	2
6	*P.vulgaris*	2	4	4	4

Table 3. The Minimum Bactericidal Concentration (MBC) of crude extracts of *P. foetida*

S.no	Microbial strains	MBC (µg/ml)			
		Ethanol	Chloroform	Pet.ether	Ethyl acetate
1	*B. subtillis*	1.0	2	-	0.500

2	*S. aureus*	0.250	0.500	2	1.0
3	*S. pneumoniae*	0.500	1.0	-	1.0
4	*K. pneumoniae*	2	2.0	-	-
5	*S. typhi*	4	-	2	4
6	*P.vulgaris*	4	-	-	-

RESULTS AND DISCUSSION

The use of medicinal plants play a vital role in covering the basic health needs in developing countries and these plants may offer a new source of antibacterial, antifungal and antiviral agents with significant activity against infective microorganisms. The results of present investigation showed broad spectrum antibacterial activity against the tested bacteria. The results of the antimicrobial activity by the disc diffusion method of *P. foetida* different extracts were presented in Table 1. All the extracts were inhibited growth of almost all the selected bacteria in the range of 0.2-1.8 cm. Among them ethanol extract showed great activity against *S. typhi*, and moderate activity were reported against *K. pneumonia* and *P.vulgaris*. The same extract showed least activity against *Streptococcus pneumonia* and *Staphylococcus aureus* followed by *Bacillus subtillis.* Similar results were recorded by several workers [11-13].

The chloroform extract exhibited significant activity against *Klebsiella pneumonia*, *S. typhi*, *P. vulgaris*, *S. aureus B. subtillis* followed by *S. pneumonia* and *S. aureus.* The remaining bacterial pathogens found to be least activity.

The petroleum ether and ethyl acetate extract showed moderate activity against all selected bacterial pathogens. Ethanol extract showed least MIC value that is, 0.125 µg/ml (MBC = 0.250 µg/ml) against *S. aureus* while the other extracts had moderate activity from 0.250 – 4.0 µg/ml (MBC = 0.500 – 4.0 µg/ml) concentration (Table 2 & 3). Our results support this view as ethanol extracts had comparatively more inhibition action than other extracts [14]. The results of present research highlights, the fact that the solvent extracts exhibited greater antimicrobial activity because the antimicrobial principles were either polar or non-polar and they were extracted only through the organic solvent medium [15]. The present observation suggests that the solvent extraction was suitable to verify the antimicrobial properties of medicinal plants and they supported by many investigators [16]. The present study justifies the claimed uses of *Passiflora foetida* L. in the traditional system of medicine to treat various infectious diseases caused by the microbes. This study also encourages cultivation of the highly valuable plant in large-scale to increase the economic status of cultivars in the country.

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CONFLICT OF INTEREST:

The authors declare that they have no conflict of interest.

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