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Research Article

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In-vitro antibacterial activity of *Peristrophe paniculata*

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Abstract

Peristrophe paniculata is a traditional medicinal plant having different medicinal usages. The current study was aimed to investigate antibacterial activity of *P. paniculata* extracts on different pathogenic bacterial strains. The antibacterial activity of hexane, ethyl acetate and hydro alcoholic extracts of *P. paniculata* was carried using cup-plate method. The extracts of of *P. paniculata* have showed presence of dose dependent zone of inhibitions on tested bacterial strains along with the standard drug. The hexane extract of *P. paniculata* showed lower activity compared to ethyl acetate and hydroalcoholic extracts and hydroalcoholic extract showed better activity. The inhibition activity on growth of different bacterial strains is may be presence of different phytochemical compounds in them. Further research is worthful in isolation of pure compounds and evaluation of pharmacological activities.

Key words: *P. paniculata*, Stem, Bacteria, Gram Positive, Gram Negative and Antibacterial activity.

1. Introduction

Natural products have been playing a crucial role in the development of human needs such as food, shelter and primary medicines (traditional medicine) (Yan *et al.*, 2016). Traditional medicine is mainly depends on immeasurable medicinal plants (Cumali Keskin, 2018; Samal, 2016). The medicinal plants are core precursors for various biologically active pharmaceutical products. As human development rises, the rising of new diseases are increased and different pathogenic microorganisms becoming resistance to current day using drugs (Ventola, 2015; Aslam *et al.*, 2018). The synthetic drugs and advanced therapies usage in the treatment of different diseases also causing a mixture of side effects (Cooper, 2016; Creagh *et al.*, 2018). Therefore, the search for new broad spectrum bioactive compounds has been increased since last few decades from different natural products including medicinal plants (Shi *et al.*, 2010; Pan *et al.*, 2013). Recent studies around the globe stating that importance of traditional medicines, availability and unexplored of various traditional medicinal plants (Atanasov *et al.*, 2015; Mohanraj *et al.*, 2018; Thomford *et al.*, 2018). So, the current study was aimed to investigate the antibacterial activity of one of such unexplored traditional medicinal plant *Peristrophe paniculata.*

Peristrophe paniculata belongs to family Acanthaceae, available around subtropical and tropical regions of Africa, East Asia - China, India, Nepal, Myanmar and Australia (Pullaiah *et al.*, 2010). The plant *P. paniculata* can be used as a green manure and has medicinal potential (Kirtikar and Basu, 1975). Leaf juice have been used for healing fractured bones and plant material maceration used as antidote to snake poison and the plant material was also used for treatment of hypertension, cariovascular diseases (Kirtikar and Basu, 1975; Pullaiah *et al.*, 1998; Pullaiah, 2006; Pullaiah *et al.*, 2010; Abdulazeez,2012).

2. Materials and Methods

2.1 Chemicals and Drugs

The chemicals and solvents used in the current study were analytical grade from S.D. Fine Chemicals Pvt. Ltd., Mumbai. The standard drug rifampicin was purchased from local medical shop.

2.2. Collection and preparation of plant extracts

The plant material was collected at Palnadu region, Andhra Pradesh, India, during the month

November, 2017. The authentication of the plant was done by Dr. Prayaga Murthy. Pragada, Department of Botany, Government Degree College, Yeleswaram, East Godavari, Andhra Pradesh. The collected stem part was washed cleanly, dried under shade and then made it coarse powder. The 1 kg powder was used for preparation of extracts using maceration with solvents hexane, ethyl acetate, and hydroalcoholic (ethanol (70%v/v)) successively and was concentrated to dryness under vacuum using rotavapour. The extracts were stored in desiccator for further use.

2.3. Evaluation of antibacterial activity

2.3.1 Selected bacterial species for antibacterial activity

Gram positive organisms:

Staphylococcus epidermidis (S. e),

Bacillus megaterium (B. m),

Lactobacillus acedophillus (L. a).

Gram negative organisms:

Escherichia coli (E. c),

Slmonella typhi (S. t),

Klebsiella pneumonia (K. p).

2.3.2. Antibacterial activity

The cup-plate method is based on measuring the diameter of zone of inhibition of microbial growth surrounding the cups containing various dilutions of extracts. The Nutrient agar media was inoculated (1ml culture) with the test organism at a temperature of 45ºC and was poured into sterile petri-plates by pour plate method. After solidification, a sterile metal borer was used to prepare the wells of 4mm diameter in the agar plates. Then the test samples (100µl) and the standards (50µl) were added into the wells using a micropipette. All the Nutrient agar plates were incubated at 28 ºC for 48-72hr. The presence of definite zone of inhibition of any size around the well indicated antimicrobial activity. The solvent controls were tested simultaneously to assess the activity of DMSO which was used as a vehicle. The experiment was performed thrice. The diameter of the zones was measured and recorded (Indian Pharmacopoeia, 1996; Mallikarjuna Rao *et al.*, 2012; Rajanada Swamy and Ganga Rao, 2018).

3. Results and Discussion

Now a day, traditional medicines have receiving massive interest in treatment of different diseases because of their diversity, low cost and mainly less side effects (Ekor, 2014). The medicinal properties of medicinal plants are due to the presence of different phyochemical compounds present in them. These phytochemical compounds are secondary metabolites produced to protect themselves from their predators or byproducts of different metabolisms (Guerriero *et al.*, 2018; Wink, 2015). The development of drug resistance in human pathogens against commonly used antibiotics is resulting from the excessive and inappropriate use of antimicrobial agents, which in turn lead to potentially serious public health problems and has necessitated a search for new antimicrobial substances from other sources including plants (Wink, 2015; Tungmunnithum *et al.*, 2018). The identification of new pharmaceutical products from those phytochemical compounds is always an interest and worthy research to treat different diseases. There is still many medicinal plants are unexplored about their phamacological/biological activities. So, the current study was carried out to investigate antibacterial activity of *P. paniculata* stem extracts.

Table 1. Antibacterial activity of *Peristrophe paniculata* stem extracts.

Name of the extract	Dose (µg/cup)	Zone of inhibition# (Diameter in mm) gram (+)ve			gram (–)ve		
		S.e	***B.m***	***L.a***	***E.c***	***S.t***	***K.p***
Hexane extract	100	6	-	-	8	7	7
	200	8	6	7	10	9	10
	400	10	8	8	12	11	12
	800	14	11	11	15	12	14
Ethyl acetate extract	100	7	7	-	6	7	8
	200	9	9	6	8	10	11
	400	12	12	8	11	12	14
	800	15	14	10	13	15	16
Hydro-alcoholic extract	100	8	8	7	8	8	6
	200	11	10	9	10	10	9
	400	13	12	11	13	13	12
	800	16	15	14	16	17	16
Rifampcin	50	26	24	22	24	23	22
DMSO		-	-	-	-	-	-

- =No activity; #Values Includes the cup diameter (4mm)

The results of current study explore the presence of dose dependent antibacterial activity in different

extracts of *P. paniculata* stem part. Among three extracts, hydroalcoholic extracts posses more activity compared to other extracts as standard drug rifampicin (Table 1). The extracts showed more activity at 800µg/100µL dose and low activity at 100µg/100µL. All extracts showed more activity on gram negative bacterial strains compared to gram positive bacterial strains. The hexane extract showed more activity on *E. c*, ethyl acetate extract showed more activity on *K. p* and hydroalcoholic extract showed more activity on *S .t.* In our previous studies, we reported the presence of different phytochmical compounds in stem extracts of *P. paniculata* such as phenols, sterols, alkaloids, terpenoids, flavanoids and etc and also presence of antioxidant activity in them (Srikanth *et al.,* 2018). The variation in the antibacterial activity on different strains may be due to presence of phytochemical compounds and their solubility in different solvents used for their extraction. In recent studies, there were many scientific reports on medicinal plants about presence of different phytochemical compounds and their antibacterial activities in different medicinal plants (Altemimi *et al.,* 2017; Thavamoney *et al.,* 2018). So, the results of the present study provide scientific evidence of antibacterial activity of *P. paniculata*.

Conclusion

In the conclusion, the stem extracts of *P. paniculata* posses dose dependent antibacterial activity on different pathogenic bacterial strains.

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Conflict of Interest

The authors have none to declare.

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