

EVALUATION OF PHYTOCHEMICAL AND ANTIBACTERIAL ACTIVITY OF *PEDALIUM MUREX* LINN. ROOT

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ABSTRACT

In the present study, the Petroleum ether, Chloroform, Acetone and Methanolic extract of *Pedaliium murex* L. root was subjected to preliminary phytochemical compounds and antibacterial activity of certain human pathogenic microorganisms. The extracts indicated the presence of flavonoids, glycosides, steroids, phenols, alkaloids and tannins. Maximum antibacterial activity was observed in methanolic extract against gram positive bacteria, *Streptococcus pyogenes* and *Enterococcus faecalis* than the gram negative bacteria.

KEYWORDS: *Pedaliium murex*, phytochemical, antibacterial activity and demulcent.

INTRODUCTION

Plants have a great potential for new drugs for human benefit. Plants used in traditional medicine contain a vast array of substances that can be used to treat chronic and even infectious diseases. According to a report of World Health Organization, more than 80% of world's populations depend on traditional medicine for their primary health care needs¹. The demand for more and more drugs from plant sources is continuously increasing. It is therefore essential for systematic evaluation of plants used in traditional medicine for various ailments.

Pedaliium murex is a small herb distributed in tropical Africa, Ceylon, India and Mexico². *Pedaliium murex* commonly called Gukhru in India belonging to the family Pedaliaceae, is distributed in the costal areas of southern India³. Many Indian medicinal plants show beneficial effects against renal injury⁴. *Pedaliium murex* is demulcent, diuretic and also found to be useful for the treatment of disorders of urinary systems such as gonorrhoea, dysuria, incontinence of urine, etc^{5,6}. Ayurveda, an ancient system of the Indian medicine, cites several plants that are useful in the treatment of urogenital disorders. Prostane, an herbal formulation consists of *Tribulus terrestris*, *Areca catechu*, *Pedaliium murex*, *Caesalpinia bonducella*, and *Asparagus racemosus*. *T. terrestris* and *Pedaliium murex* have been reported to be good diuretics^{7,8,9}. The knowledge of the chemical constituents of plants would further be valuable for discovering the actual value of folkloric remedies¹⁰.

The plant is sweet, cooling, mucilaginous, diuretic and inflammatory and used to treat digestive, carminative, tonic and puerperal, spermatorrhoea, spasmodic affections, amenorrhoea, dysmenorrhoea, vitiated conditions of pitta, inflammation and general debility. A decoction of leaves is given in cases of gonorrhoea while that root is said to be antibilious¹¹. Antimicrobial properties of medicinal plant are being increasingly reported from different parts of the world^{12,13}. Research on medicinal plants has been increased and for their antimicrobial activities screened in number of studies. Hence, an attempt was made to evaluate the phytochemical properties and antibacterial activities of *P. murex*.

MATERIALS AND METHODS

Pedaliium murex L. roots were collected from Sathiyathapuram, Theni District, and Tamilnadu, India. The fresh roots were shade dried and ground using mechanical motor at the PG and Research Department of Botany, Kongunadu Arts and Science College, Coimbatore. The powdered materials (50gm) were transferred into a Soxhlet apparatus containing 200ml of respective solvents (Petroleum ether, Chloroform, Acetone and Methanol). The extract was concentrated to dryness under vacuum desiccator. The extract was stored and used for phytochemical and antibacterial activities.

Human Pathogenic Bacterial Cultures

The microbes selected for the present study were *Streptococcus faecalis*, *S. pyogenes*, *Enterococcus faecalis*, *Bacillus subtilis*, *B. thuringiensis*, *Klebsiella pneumoniae*, *Proteus mirabilis*, *Proteus vulgaris*,

Salmonella paratyphi, *S. paratyphi A*, *S. paratyphi B*, and *Pseudomonas aeruginosa* were obtained from Mycology Laboratory, University of Madras, Chennai, Tamilnadu. All the test strains were sub cultured on Muller Hinton Agar (MHA) medium. These bacteria served as test pathogens for bacterial activity.

Preparation of Inoculum

Each organism was recovered by sub-culturing on fresh media. Loopful inoculum of each bacterium was suspended in 5ml of nutrient broth and incubated overnight at 37°C. These overnight cultures were used as inoculums.

Antibacterial Activity

Antibacterial activity was determined by Disc Diffusion method¹⁴. Sterile nutrient agar plates were prepared for respective bacterial organisms and inoculated by a spread plate method under aseptic conditions. The filter paper discs of 6mm diameter (What man No: 1 filter paper) were prepared and sterilized. The sterile impregnated discs with plant extract were placed on the agar surface with framed forceps gently pressed down to ensure complete contact of the disc with agar surface. Control discs were also prepared using respective solvents for extraction. All the plates were incubated at 37°C for 24 hrs. Finally, the inhibition zones observed, including the diameter of the disc (mm). All the experiments were done in triplicates.

Phytochemical Screening

Phytochemical screening was carried out to assess the qualitative chemical composition of crude extracts using commonly employed precipitation and coloration reaction methods to identify the major natural chemical groups such as alkaloids, saponins, steroids, phenols, flavonoids and tannins. General reactions in this analysis revealed the presence or absence of these compounds^{15, 16}.

RESULTS

This study on *Pedaliium murex* root extracts revealed the presence of alkaloids, flavonoids, tannins, glycosides, steroids and phenols (Table 1). The antibacterial activity of methanolic extract of *P. murex* root was very high in 75% concentration, in gram positive bacteria, and then followed by 100%, 50% and 25% of concentration (Table 2). The negative control (i.e. the respective solvents) did not produce any zone.

DISCUSSION

Ethanol was used as a solvent for the extraction of different secondary metabolites of this plant. Since the polarity of ethanol is higher, most of the secondary metabolites of *Pedaliium murex* dissolved in ethanol. Insecticidal activity of *P. murex* might be due to the presence of tannins and saponins¹⁹. Secondary plant

metabolites constitute an important source of micro biocides, pesticides and many pharmaceutical drugs²⁰. Plant derived compounds are main source and a major area of interest and are being most effective antimicrobial agents²¹.

Glycosides, flavonoids, tannins and alkaloids have hypoglycemic activities²². Flavonoids have been reported to have antibacterial and antimicrobial properties²³. Tannins have antimicrobial²⁴ and antioxidant properties. Alkaloids have pronounced physiological effect particularly on the nervous system²⁵. Flavonoids and tannins are phenolic compounds and plant phenolics are major group of compounds that act as primary antioxidants or free radical scavengers²⁶.

Gram positive bacteria were more susceptible than that of gram negative bacteria in response to the plant extract observed in the present study. It is in agreement with the previous reports^{27,28}. This could be attributed to outer layer of bacteria as suggested by²⁹. They reported that gram positive bacteria have outer peptidoglycon layer which is not an efficient barrier. The gram negative bacteria have on outer phospholipidic membrane that makes the cell wall impermeable to lipophilic solutes, while the prines constitute a selective barrier to hydrophilic solutes with exclusion limits of about 600Da³⁰. Many results confirmed these observations that most plant extracts were found to be more active against gram positive bacteria than against gram negative ones^{31, 32}. The similar types of results have been reported by³³. They evaluated antimicrobial activity of *Dendranthema zawadski*.

CONCLUSION

Pedaliium murex is a valuable plant source of medicinally useful compounds that have been traditionally used for several traditional ailments. Root extract in organic solvents exhibited the presence of many bioactive compounds whose presence were proved that they could be used for making antimicrobial drugs.

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Table 1: Phytochemical screenings of *Pedalium murex* Linn. root extracts

Phytochemical Constituents	Petroleum ether	Chloroform	Acetone	Methanol
Flavonoids	-	+++	++	+
Alkaloids	-	-	++	+++
Glycosides	-	++	+++	+++
Steroids	-	-	+	-
Phenols	-	-	+++	++
Tannins	++	+	-	-
Saponins	-	-	-	-
Resins	-	-	-	-

= absent, += present, += moderately present, +++= abundantly present

Table 2: The Antimicrobial activity of methanol extract of *Pedaliu murex* L. root.

Microorganisms	Zone of inhibition in diameter			
	25%	50%	75%	100%
<i>Streptococcus faecalis</i>	15	20	36	12
<i>Streptococcus pyogenes</i>	15	16	40	26
<i>Bacillus subtilis</i>	15	17	26	13
<i>Bacillus thuringiensis</i>	14	16	20	13
<i>Enterococcus faecalis</i>	18	16	42	30
<i>Klebsiella pneumoniae</i>	21	23	30	22
<i>Proteus mirabilis</i>	13	15	16	12
<i>Proteus vulgaris</i>	14	15	16	11
<i>Salmonella paratyphi</i>	16	16	18	15
<i>Salmonella paratyphi</i> A	20	22	30	25
<i>Salmonella paratyphi</i> B	13	16	18	15
<i>Pseudomonas aeruginosa</i>	14	14	19	12

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