



## Determination of Phytochemical Analysis and antibacterial activity of *Pedaliium murex* against diabetic wound pathogenesis

G. Abiraj<sup>1</sup> and R. Renugadevi<sup>1\*</sup>

<sup>1</sup>PG & Research Department of Microbiology, V.H.N. Senthikumara Nadar College (Autonomous), Virudhunagar, Tamilnadu, India

\*Corresponding Author e-mail id: [renugadevi.r@vhnsnc.edu.in](mailto:renugadevi.r@vhnsnc.edu.in)

### Abstract

The increasing prevalence of diabetes worldwide has led to a rise in diabetic-related complications, including chronic wounds that are highly susceptible to infection. The search for effective natural antimicrobial agents to treat diabetic wound pathogens has led to the exploration of various plant extracts. This study aims to evaluate the phytochemical composition and antibacterial activity of *Pedaliium murex*, a plant known for its medicinal properties, against common diabetic wound pathogens. The plant extracts were obtained using solvents of varying polarities and the phytochemical analysis was carried out to identify the presence of bioactive compounds such as alkaloids, flavonoids, saponins, and tannins. Antibacterial activity was assessed using the disc diffusion method against pathogens including *Escherichia coli*, *Staphylococcus sp*, *Salmonella sp* and *Klebsiella sp*. The results showed that *Pedaliium murex* extracts exhibited significant antibacterial activity. The phytochemical profile revealed the presence of several compounds known for their antimicrobial properties. These findings suggest that *Pedaliium murex* could be a potential source of natural antibacterial agents for the treatment of diabetic wounds. Further studies on its mechanism of action and in vivo efficacy are recommended to confirm its therapeutic potential.

**Keywords:** *Pedaliium murex*, phytochemicals, antibacterial activity, diabetic wound pathogens

### Introduction

*Pedaliium murex* L. (Pedaliaceae) is often referred to as Large Caltrops or Gokhru (with synonyms including *P. microcarpum decne* and *P. muricatum salisb*). Its significance is increasing due to its diverse medicinal properties (Anonymous 1966; Bhakuni *et al.*, 1992). In various regions of India, it is known by numerous names such as Brihat Gokshura, Kshourak,

Gokantaka, Trikantaka, and Shvasashttraa, while in the Unani medicinal system, it is called Khaar-e-Khasak Kalaan, Gokhru Kalaan, Khaar-e-Khasak Khurd, and Gokhru Khurd (Khare *et al.*, 2007). The entire plant is utilized to create various medicines for issues like cough and cold. It is a key ingredient in Ayurvedic preparations such as Gokhuradiguggul, Gokhurkwath, Gokhuradiawalaha, and Deshnularishta (Sivarajan and Balchandra *et al.*, 1994). Additionally, it is traditionally believed to effectively treat reproductive issues like male impotency (Sharma *et al.*, 2012), nocturnal emissions (Shukla and Khanuja *et al.*, 2004), gonorrhea, as well as conditions like leucorrhea in women (Singh and Panda *et al.*, 2005).

Digestive tonics (Agharkar *et al.*, 1991), as well as treatments for ulcers, fevers, wounds (Dey and Das *et al.*, 1995), and overall weakness are among the uses of this plant. Numerous studies have been published highlighting the significance of this plant in medicine (Imran *et al.*, 2015). Investigations into its phytochemistry may lead to the development of more effective drugs. This review offers a summary of the phytochemical, pharmacological, and therapeutic characteristics of *Pedaliium murex*.

The Indian medicinal system suggests the use of medicinal plants as alternative treatments for kidney stones and various other health conditions. According to traditional healers, the plant *Pedaliium murex* L. is utilized to dissolve and prevent the formation of kidney stones. Additionally, it is employed to address issues such as urinary incontinence, gonorrhea, facilitate lochial discharge, act as an antibilious agent, assist with dysuria, and manage abnormal white discharge. Furthermore, all parts of the plant can be utilized for treating urinary issues, acting as a diuretic, addressing male fertility disorders, and managing leucorrhea. In a similar vein, the fruit and dried fruit are employed to treat conditions such as diabetes, serve as a demulcent, address gonorrhea, and provide aphrodisiac and antispasmodic effects, as well as assist with incontinence of urine, strangury, and urinary stones. Various ailments, including ulcers, dysuria, splenic enlargement, diarrhea, gonorrheal rheumatism, aphrodisiac needs, and demulcent purposes, can be treated with the leaves (Al-Dhabi *et al.*, 2015, Barathikannan *et al.*, 2016, Al-Dhabi and Valan Arasu *et al.*, 2016). The seeds of this plant have been used to treat leucorrhea, urinary tract disorders, joint pain, lumbago, bladder issues, and gonorrhea (Cuong *et al.*, 2017, Elango *et al.*, 2017, Elango *et al.*, 2016a, Elango *et al.*, 2016b). The stem of *P. murex* has been applied in treatments for spermatorrhea, dysuria, ardor urinae, and gonorrhea (Imran *et al.*, 2015, Glorybai *et al.*, 2015, Fowsiya *et al.*, 2016, Haritha *et al.*, 2016). This plant has also been utilized in veterinary

medicine. Each part of the plant serves a medicinal purpose in curing a variety of diseases. Thus, the plant possesses numerous active components; however, there has been no research conducted on its use for treating struvite stones.

## Materials and Methods

### *Sample collection*

The fresh and healthy *Pedaliump murex* was collected from Ramanathapuram District surrounding.

### *Bioactive compounds extraction*

The collected leaves was cut and washed with sterile water then shade dried. The dried leaves was ground finely. To prepare four extracts four different solvents were mixed with leaf powder. ie, 20g leaf powder + 100ml acetone, 20g leaf powder + 100ml chloroform, 20g leaf powder + 100ml ethanol, 20g leaf powder+100ml petroleum ether and kept in shaker for 5-7 days at 150rpm at room temperature. After 5 days extract was filtered using whattman filter paper and the extracts were transferred in a sterile beaker and stored for future purpose

### *Phytochemical*

*Glycosides*: 0.5ml of each extract add 0.2ml of glacial acetic acid. Then 1 drop of 3.5% ferric chloride add 1ml concentrated  $H_2SO_4$  Observed brownish color

*Terpenoid*: 2ml of chloroform and 1ml of conc.  $H_2SO_4$  was added to 1mg of extract and observed for reddish brown colour that indigated the presence of terpenoid

*Steroid*: 0.5ml of extract was dissolved 3ml of chloroform, the solution in filter 2ml of concentration of  $H_2SO_4$  add the filtrate to a lower layer reddish brown color ring

*Tannin*: 0.5ml extract 5ml of distilled water then it was boiled then filter few drop of concentrated  $H_2SO_4$  and 1%  $FeCl_3$  was add to the filtrate, Deep green brownish green or blue black coloration was indicates.

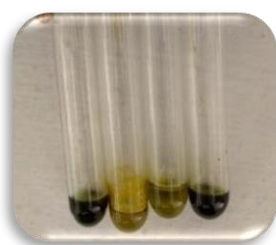
### *Isolation of pathogenic micoorganisms*

Pus samples were obtained from the wounds of diabetic patients in Virudhunagar. Prior to sample collection, oral informed consent was secured from the patients. A questionnaire was utilized to gather patients' personal information, details about their

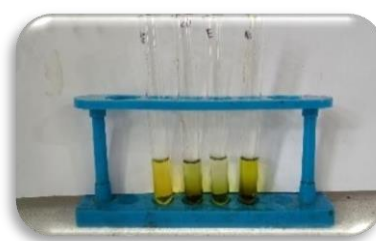
antibiotic treatment, and other pertinent data. The pus samples were taken using sterile cotton swabs that were moistened with sterile saline to avoid desiccation. Two swabs were utilized for each specimen. The swabs were transported to the laboratory in a sterile container within one hour of collection and were processed right away. One swab was designated for Gram staining, while the other was inoculated onto both Nutrient agar, EMB agar, MacConkey agar and SS agar for the purpose of pathogen isolation. The inoculated plates were incubated overnight at 37°C. Following incubation, the plates were examined for growth, and the resulting colonies were identified based on their morphological and biochemical properties.

## Result

### 1. Phytochemical



**Fig 1: Glycosides**



**Fig 2: Terpenoids**



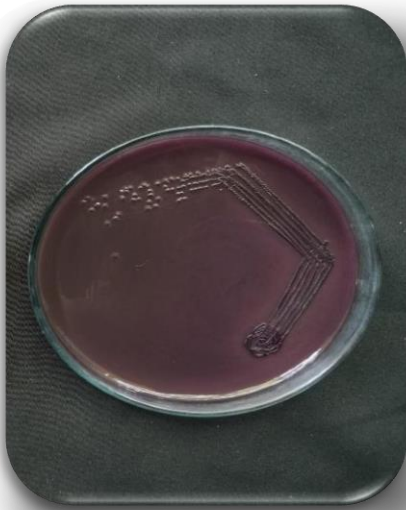
**Fig 3: Steroid**



**Fig 4: Tannin**

Phyto Compounds	Ethanol	Acetone	Chloroform	Petroleum Ether
Glycosides	-	-	-	+
Terpenoids	-	+	+	+
Steroid	-	+	+	+
Tannin	-	+	-	-

## 2. Bacterial isolation



**Fig 4: Isolation of EMB agar bacteria**



**Fig 5: Isolation of Mannitol salt agar**



**Fig 6: Isolation of MacConkey agar**



**Fig 7: Isolation of Salmonella Shigella agar**

## Discussion

The increasing prevalence of diabetes worldwide has made diabetic wound infections a significant clinical challenge. These wounds are particularly susceptible to bacterial infections, which can complicate healing and lead to more severe health issues. The search for alternative and effective treatments has led researchers to investigate plant-based

compounds with antimicrobial properties. *Pedaliium murex*, a plant known for its medicinal properties, has shown promise as a potential source of bioactive compounds capable of combating diabetic wound pathogens.

In this study, we examined the phytochemical composition and antibacterial activity of *Pedaliium murex* against common diabetic wound pathogens, including *Escherichia coli*, *Staphylococcus aureus*, and *Klebsiella pneumoniae*. Phytochemical screening revealed the presence of several bioactive compounds, including alkaloids, flavonoids, tannins, saponins, and terpenoids. These compounds are well-known for their antibacterial and antioxidant properties, which could contribute to the plant's potential in wound healing and infection control.

### Future aspects

The Anti-microbial activity of *Pedaliium murex* may show the minimum zone of inhibition or Maximum zone of according to the type of bacteria

### Conclusion

The phytochemical analysis of *Pedaliium murex* revealed the presence of bioactive compounds such as alkaloids, flavonoids, tannins, saponins, and phenols, which are known for their medicinal properties. These compounds contribute to the plant's antibacterial potential. The antibacterial activity of *Pedaliium murex* against diabetic wound pathogens demonstrated significant inhibitory effects, particularly against common bacterial strains like *Staphylococcus aureus*, and *Escherichia coli*. The plant extracts showed promising results, indicating their potential as natural alternatives for managing diabetic wound infections. Overall, the study suggests that *Pedaliium murex* possesses potent phytochemical constituents with effective antibacterial properties, making it a promising candidate for developing herbal-based treatments for diabetic wound infections. Further research, including in vivo studies and clinical trials, is recommended to explore its full therapeutic potential.

### References

- Ali, M., and Rauf, A. (2015). Phytochemical screening and biological activities of medicinal plants. *Journal of Pharmacognosy and Phytochemistry*, 4(1), 12-1.
- Banu, K. S., and Cathrine, L. (2015). General techniques involved in phytochemical analysis. *International Journal of Advanced Research in Chemical Science*, 2(4), 25-32.



- Chanda, S., and Rakholiya, K. (2011). Combination therapy: Synergism between natural plant extracts and antibiotics against infectious diseases. *Science Against Microbial Pathogens*, 520-529.
- Deshmukh, T. A., and Gaikwad, D. K. (2014). Phytochemical analysis and antibacterial properties of *Pedaliu murex* extracts. *International Journal of Pharmaceutical Sciences and Research*, 5(3), 100-105
- Devi, R., and Gupta, R. (2013). Antibacterial activity of medicinal plants against wound-infecting bacteria. *Journal of Medicinal Plants Research*, 7(20), 1329-1334.
- Dubey, R., Dubey, K., and Sridhar, C. (2010). Potential of medicinal plants in diabetic wound healing. *Asian Journal of Pharmaceutical and Clinical Research*, 3(4), 54-58.
- Gupta, A., and Tandon, N. (2015). Antimicrobial activity and phytochemical screening of medicinal plants. *Indian Journal of Microbiology*, 55(2), 126-132
- Harborne, J. B. (1998). Phytochemical methods: A guide to modern techniques of plant analysis. *Springer Science & Business Media*.
- Joshi, B., and Lekhak, S. (2009). Phytochemical screening and antimicrobial property of selected medicinal plants. *Journal of Medicinal Plants Research*, 3(2), 76-82.
- Kirtikar, K. R., and Basu, B. D. (1991). Indian medicinal plants. International Book Distributors.
- Kumar, S., and Pandey, A. K. (2013). Antimicrobial properties of flavonoids and their structure- activity relationship. *The Scientific World Journal*, 2013, 1-16.
- Manikandan, S., and Ramasamy, K. (2017). Phytochemical and antimicrobial activity of *Pedaliu murex* against bacterial pathogens. *Asian Journal of Pharmaceutical Research*, 10(1), 35-40.
- Parekh, J., and Chanda, S. (2007). Antibacterial activity of aqueous and alcoholic extracts of 34 Indian medicinal plants against some bacterial pathogens. *Turkish Journal of Biology*, 31, 231- 232

Prakash, P., and Gupta, N. (2005). Therapeutic uses of *Ocimum sanctum* (Tulsi) with a note on eugenol and its pharmacological actions: A short review. *Indian Journal of Physiology and Pharmacology*, 49(2), 125-131

Sofowora, A. (1993). Medicinal plants and traditional medicine in Africa. Spectrum Books Limited.

Trease, G. E., and Evans, W. C. (2002). Pharmacognosy. *Saunders Elsevier*.

Vijayakumar, R., and Mukherjee, P. K. (2011). Ethnobotanical and pharmacological studies on *Pedaliium murex* Linn. *Journal of Ethnopharmacology*, 134(1)