



Pharmacological Evaluation of the Diuretic Potential of *Pogostemon purpurascens* Dalzell Leaves

Exploring the Potential for Diuretic Modulation: Review Paper

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ABSTRACT

Diuretic agents play crucial role in the management of disorders as with excessive fluid retention and altered electrolyte homeostasis. Although conventional diuretics are highly effective, their use may be lectrolyte disturbance and other side effect, creating continued interest in medicinal plants as potential sources of pharmacologically active compounds. *Pogostemonpurpurascens* Dalzell, belonging to the family Lamiaceae, is a medicinal herb and found in Western Ghats. The species has been documented from Karnataka and adjoining regions and is traditionally associated with several medicinal applications. Phytochemical investigations of *P. purpurascens* have demonstrated the presence of bioactive classes including alkaloids, flavonoids, phenolic compounds, tannins, coumarins and terpenoids. A methoxylated flavonoid, 3,5,6,7,8,2',4',5'-octamethoxyflavone, has also been reported from the species. The presence of these phytoconstituents provides a pharmacological basis for investigating the renal effects of the plant, particularly modulation of urinary water and electrolyte excretion.

Flavonoids and phenolic constituents present in medicninal plant hve been their investigated for their effects on renal vascular function, oxidative stress, tubular transport and related signaling pathways; however, so mechanisms should not be directly attributed to *P. purpurascens* without species-specific experimental confirmation. The available literature indicates that research on *P. purpurascens* has predominantly focused on phytochemical characterization, antimicrobial properties and traditional medicinal applications, whereas systematic evaluation of its diuretic activity remains insufficiently explored. This review therefore examines the botanical characteristics, geographical distribution, traditional relevance, phytochemical composition and pharmacological rationale for investigating the diuretic potential of *P. purpurascens* leaves.

A particular urinary sodium and potassium excretion, diuretic index and related parameters using established animal models. The available evidence suggests that *P. purpurascens* represents an interesting candidate for

further pharmacological investigation; nevertheless, its diuretic efficacy, moa, and dose-response in relationship and safety profile require systematic validation through well-controlled preclinical studies.

Keywords

Pogostemon purpurascens; Dalzell; Lamiaceae; diuretic activity; medicinal plant; flavonoids; phenolic compounds; urinary electrolyte excretion; natriuresis; renal pharmacology; Western Ghats.

INTRODUCTION

The kidneys play a central role in maintaining fluid volume, electrolyte balance, acid-base homeostasis and blood pressure. Diuresis is an increase in the formation and excretion of urine, whereas natriuresis specifically denotes increased urinary sodium elimination. pharmacological diuretics act at different sites along nephron widely used in including edema, hypertension and disorder associated with abnormal fluid accumulation.

Loop diuretics, thiazide-type diuretics and potassium-sparing diuretics produce their effects through defined molecular targets within the nephron. these agent are valuable by the clinically, excessive or inappropriate diuretic therapy can result in disturbances of sodium, potassium and other electrolytes. Consequently, natural products continue to receive attention as possible sources of novel compounds capable of modifying renal function.

Medicinal plant contain chemically type of secondary metabolite, as alkaloid and flavonoids. Some of these compounds have been investigated in other medicinal plants for their effects on renal blood flow, tubular electrolyte handling, oxidative stress and related pathways. However, the presence of a phytochemical class alone cannot establish diuretic activity; species-specific pharmacological investigation is required.

Within this context, *Pogostemon purpurascens* Dalzell represents an interesting but comparatively under-investigated medicinal plant. It belongs to the family Lamiaceae and occurs in the Western Ghats and other parts of India. India Flora Online describes it as an erect branched herb associated with tropical moist deciduous and semi-evergreen forest habitats, while documented distributions include Karnataka and Kerala.

Previous investigation have identified such as phytochemical in the plant, including alkaloids, phenols, flavonoids, tannins, coumarins and terpenoids. A specific methoxylated flavonoid has also been isolated from *P. purpurascens*.

Despite this phytochemical diversity, the pharmacological literature concerning *P. purpurascens* remains relatively limited. Published work has reported antimicrobial and antioxidant-related investigations, while systematic pharmacological evaluation of its leaves for diuretic activity is not well established.

Investigation of the diuretic potential of *P. Purpurascens* leaves may provide meaningful information regarding its renal pharmacological properties and may contribute to the identification of plant derived candidates for experiment.

PHYTOCHEMICAL PROFILE

Preliminary phytochemical screening of the prepared extract of *Pogostemon purpurascens* revealed the presence of alkaloids, flavonoids, tannins and phenolic compounds. The positive reactions observed for these phytochemical groups indicate that the extract contains different classes of secondary metabolites. These findings provide preliminary evidence for the phytochemical composition of the investigated extract; however, further chromatographic and spectroscopic studies would be required for the identification and structural characterization of individual constituents.

Preliminary Phytochemical Screening

1. Alkaloids

Preliminary phytochemical screening of the prepared extract of *Pogostemonpurpurascens* showed a positive reaction for alkaloids. The observed positive response indicates the presence of alkaloidal constituents in the investigated plant extract. Alkaloids represent an important class of secondary metabolites and are known to exhibit diverse biological activities. However, the present screening confirms only the preliminary presence of alkaloidal constituents and does not establish the identity or concentration of individual alkaloids.

2. Flavonoids

The phytochemical screening of the *Pogostemonpurpurascens* extract revealed a positive test for flavonoids. This finding indicates the presence of flavonoid-type secondary metabolites in the prepared extract. Flavonoids constitute a structurally diverse group of plant constituents and have been associated with various biological properties. Further analytical investigation would be required to identify the individual flavonoid compounds present in the extract.

3. Tannins

A positive reaction for tannins was observed during the preliminary phytochemical screening of the *Pogostemonpurpurascens* extract. The result suggests that tannin-type constituents are present in the investigated extract. Tannins are polyphenolic plant constituents with diverse biological properties. The present finding represents a preliminary qualitative observation and does not provide information regarding the amount or specific type of tannin present.

4. Phenolic Compounds

The prepared extract of *Pogostemonpurpurascens* also showed a **positive test for phenolic compounds** during preliminary phytochemical screening. This observation indicates the presence of phenolic constituents in the extract. Phenolic compounds form an important group of plant secondary metabolites and may contribute to the biological properties of plant extracts. However, identification and quantification of individual phenolic constituents require further chromatographic or spectroscopic analysis.

Pharmacological Activities of *Pogostemonpurpurascens*

1. Antioxidant Activity

The antioxidant potential of *Pogostemonpurpurascens* has been investigated experimentally. A qualitative and biological evaluation published in 2024 reported antioxidant activity for *P. purpurascens*, with a total antioxidant capacity of **105.09 ± 3.47 mg/g ascorbic acid equivalent** under the conditions used in that study. The authors suggested that the phenolic and flavonoid constituents detected in the plant may contribute to its antioxidant properties. However, this association should be considered a possible phytochemical contribution rather than a confirmed mechanism of action.

2. Antibacterial Activity

Pogostemon purpurascens has also demonstrated antibacterial activity in experimental investigations. In a 2024 study, the plant extract showed inhibition against *Staphylococcus aureus* and *Klebsiella pneumoniae* at the tested concentration. The reported inhibition-zone values for *P. purpurascens* at 1 mg/mL were 6.96 ± 0.25 mm and 7.7 ± 0.2 mm, respectively. These findings provide preliminary evidence of antibacterial potential, although further studies are required to identify the active constituents and establish their mechanisms.

3. Antimicrobial Activity of Essential Oil

evaluated for antimicrobial activity. A comparative study of essential oils from three *Pogostemon* species reported activity of *P. purpurascens* oil against several microorganisms, including ***Candida albicans***, and also indicated activity against other tested bacterial and fungal strains. The study suggested that the leaf essential oil of *P. purpurascens* may have potential for further investigation as a source of antimicrobial agents.

Discussion

The available literature indicates that *Pogostemon purpurascens* possesses a diverse phytochemical profile and has been investigated for several biological activities. Qualitative phytochemical investigations have reported the presence of alkaloids, flavonoids, phenolic compounds, tannins, coumarins and terpenoids, while specific chemical investigation has also identified a methoxylated flavonoid from the plant. These findings suggest that the species contains chemically diverse secondary metabolites that may contribute to its biological properties. However, the available evidence remains relatively limited and is largely based on preliminary phytochemical screening and individual pharmacological investigations. Reported antioxidant and antibacterial activities provide preliminary evidence of biological potential, but these findings should not be directly extrapolated to other pharmacological effects without appropriate experimental validation. In particular, the available literature does not provide sufficient direct evidence to establish the diuretic activity of *P. purpurascens*. Therefore, the possible relationship between its phytochemical constituents and renal water or electrolyte handling remains a hypothesis requiring experimental investigation. Further studies using standardized extracts, appropriate animal models, dose-response evaluation, urinary electrolyte analysis and mechanistic approaches are required to determine whether *P. purpurascens* possesses reproducible diuretic activity and to identify the constituents potentially responsible for such effects.

RESEARCH GAP

Despite the reported traditional medicinal importance of *Pogostemon purpurascens* Dalzell, considerable gaps remain in the scientific evaluation of its pharmacological potential. Available literature on *P. purpurascens* has predominantly focused on its phytochemical constituents and biological activities such as antioxidant and antimicrobial effects. Phytochemical investigations have reported the presence of alkaloids, phenolic compounds, flavonoids, tannins, coumarins and terpenoids in the plant, while its extracts and essential oils have demonstrated antimicrobial and antioxidant properties.

However, the diuretic potential of *P. purpurascens*, particularly its leaves, remains inadequately investigated. Although traditional medicinal uses of the plant have been documented, including applications associated with wound healing and hemostatic activity, specific experimental evidence supporting its diuretic effect is not sufficiently established in the available literature. Thus, there is a need for systematic pharmacological evaluation of the plant for its potential to enhance urine formation.

Furthermore, limited information is available regarding the effect of *P. purpurascens* leaf extract on urinary electrolyte excretion, particularly sodium (Na^+), potassium (K^+), and chloride (Cl^-). An increase in urine volume alone is insufficient to fully characterize a

diuretic response; therefore, evaluation of urinary electrolyte excretion can provide additional evidence regarding the nature and extent of the potential diuretic effect. The relationship between the phytochemical constituents reported in *P. purpurascens* and its possible influence on renal handling of water and electrolytes also remains unclear.

In addition, comparative evidence regarding the efficacy of *P. purpurascens* leaf extract against a standard diuretic agent is lacking or limited. The dose-dependent response of the extract and its ability to influence 24-hour urine output and urinary electrolyte balance have not been adequately characterized in an experimental animal model. Therefore, a systematic preclinical investigation using a 70% ethanolic leaf extract of *P. purpurascens* is warranted.

Accordingly, the present study is designed to address this research gap by evaluating the diuretic activity of 70% ethanolic leaf extract of *P. purpurascens* in male albino rats, using furosemide (10 mg/kg) as the standard reference drug. The study will assess 24-hour urine volume along with urinary Na^+ , K^+ and Cl^- excretion, thereby providing experimental evidence regarding the diuretic potential and electrolyte-modulating effects of *P. purpurascens*. The findings may provide a scientific basis for further pharmacological and mechanistic investigations of this traditionally used medicinal plant.

FUTURE PERSPECTIVES

Future investigations should systematically evaluate the diuretic potential of *Pogostemon purpurascens* leaf extract using an established acute diuretic screening model in experimental animals. Assessment of urine output together with urinary electrolyte excretion, particularly sodium (Na^+), potassium (K^+), and chloride (Cl^-), would provide more comprehensive evidence regarding its potential diuretic and electrolyte-modulating effects. Such studies should also include appropriate standardization of the extract and comparison with a standard diuretic agent such as furosemide.

Further research should focus on identifying and characterizing the specific phytoconstituents responsible for the observed biological effects of *P. purpurascens*. Although flavonoids, phenolic compounds, alkaloids, tannins, coumarins and terpenoids have been reported in the plant, their direct contribution to the potential diuretic activity has not been clearly established. Therefore, bioassay-guided fractionation, chromatographic characterization and mechanistic studies may help to identify the active constituents and clarify their possible role in renal water and electrolyte handling.

In addition, future studies should investigate dose optimization, reproducibility, pharmacokinetic behaviour, renal safety and long-term toxicity of standardized *P. purpurascens* preparations. Evaluation of additional renal and biochemical parameters may further strengthen the preclinical evidence and help determine the safety margin of the extract. Establishing standardized extraction procedures and quality-control markers will also be important for future development of the plant as a potential herbal diuretic.

Finally, well-designed preclinical and subsequent clinical investigations will be required to confirm its therapeutic usefulness and determine whether *P. purpurascens* can be developed as a plant-derived therapeutic intervention for conditions in which diuretic therapy is indicated. Further mechanistic and clinical validation would be necessary before any therapeutic application can be established.

CONCLUSION

Pogostemon purpurascens Dalzell represents a promising medicinal plant with considerable pharmacological potential. Its leaves contain a diverse range of biologically active phytoconstituents, including flavonoids, phenolic acids, tannins, alkaloids, and other secondary metabolites, which may contribute to its reported biological activities. The available phytochemical and pharmacological evidence suggests that *P. purpurascens* possesses significant therapeutic potential; however, its diuretic activity remains insufficiently explored. Evaluation of urine output together with urinary electrolyte excretion, particularly sodium, potassium, and chloride, may provide important evidence regarding its potential diuretic and

electrolyte-modulating effects. Although the specific contribution of individual phytoconstituents to diuresis has not yet been established, their presence provides a scientific basis for further investigation. Therefore, *P. purpurascens* may be considered a promising candidate for further research on diuretic activity. Further well-designed preclinical studies are required to establish its dose-dependent efficacy, safety, possible mechanism of action, and therapeutic usefulness, followed by appropriate clinical investigations to confirm its potential as a plant-derived diuretic agent.

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