



Pavonia odorata- An Overview of Traditional, Phytochemical and Pharmacological Studies

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ABSTRACT

Medicinal plants are of great use in sustaining human health. The plant *Pavonia odorata* commonly called as fragrant swamp mallow, sugandhabala belonging to family Malvaceae is used traditionally for the treatment of haemorrhage, inflammation, fever, urinary disorders etc in traditional and alternative systems of medicine. The plant was known to contain sesquiterpene alcohol panonenol. The review article describes various pharmacological studies conducted on the plant species. Apart from that, molecular docking studies performed, and studies carried out in Ayurveda and Siddha systems of medicine on this plant species are also discussed in the manuscript. The study indicates that the plant has undergone fewer phytochemical studies, needs to be explored further.

Keywords: *Pavonia odorata*, phytochemistry, pharmacology.

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INTRODUCTION

Medicinal plants are one of the rich resource of medicaments useful as templates in drug design and development. They are part of traditional cultures in various parts of the world. In order to prevent biopiracy many countries started documenting ethnobotanical or ethno medicinal information of their traditional resources.^{1,2}



Figure 1: *Pavonia odorata* plant

(https://ayurwiki.org/Ayurwiki/Pavonia_odorata_Baalaka,_Sugandha_bala)

Pavonia odorata, or Sugandhabala, is one of the valuable medicinal plant species belonging to the family Malvaceae. The plant is known in various languages as fragrant swamp mallow (English), Sugandhabala, (Hindi), Hribera (Sanskrit), and Chittibenda (Telugu). It is distributed in tropical part of Indian subcontinent, Africa, Sri Lanka, Pakistan and yanmar³. The shoots and roots of this plant are exceptionally aromatic. The photograph of the plant is given in figure 1. The microscopical diagnostic features include cortex with more starch grains, druses and few raphides. The pericyclidic part consists of discontinuous arrangement of sclerenchymatous cells.⁴

Ethnomedicinal & Alternative Systems of Medicine Usage

The plant is used traditionally in the treatment of various chronic diseases like diabetes in Siddha⁵ and Ayurvedic system of medicine.⁶ It was referred to as analgesic and antipyretic herb in Siddha system of medicine.⁷ The plant extract acts as cooling, carminative, demulcent, diaphoretic, and anti-pyretic agent⁸. It is used in dysentery, ulcers and bleeding disorder. The roots are generally used in stomachache, as astringent, and demulcent.³ The aqueous extract of the plant is used in mineralization and demineralization reaction of ayurvedic formulatin.⁹ The plant is often adulterated with bala plants.¹⁰ It is one of the ingredients of Vasakadyaristam.¹¹

Phytochemistry

GC-MS analysis of volatile oil of the plant showed the presence of major phytochemicals such as a-eudesmol, b-caryophyllene oxide, ageratochromene, hexahydrofarnesyl acetone, and palmitic acid⁸. Palmitic acid, caporic acid, hexahydrofarnesyl acetone, alpha-terpinene, alpha-pinene, alpha-eudesmol etc. The most



aromatic compounds were 3-butylpyridine, 2-nonanone, a-caryophyllene oxide and (E)-pinocarveol⁸. Earlier a-pinene, a-terpinene, aromadendrene, azulene, caproic acid, isovaleric acid, isovaleraldehyde, methyl heptenone, pavenone, pavoneol and palmitic acid were studied from roots.^{12,13}

PHARMACOLOGICAL ACTIVITY STUDIES

Acute toxicity study:

It has been found out that methanol extract was non-poisonous and safe up to 2000 mg/kg.¹⁴

Urinary calculogenesis: Aqueous extract of whole plant inhibited calcium and phosphate ions deposition.^{9,15}

Antimicrobial activity:

Antibacterial activity: The essential oil of leaf showed antibiotic activity against *Staphylococcus aureus*, *Diplococcus pneumoniae*.¹⁶ The rhizomes of the plant were extracted for essential oil using hydro-distillation technique and tested against 13 fungi and 10 bacteria employing paper disc agar diffusion method for their antibacterial and antifungal response. The oil concentration of 0.55 inhibited the growth of *Diplococcus pneumoniae*, *Escherichia coli*, *Klebsiella sp.*, *Staphylococcus aureus*. The root extracts showed antimicrobial activity against five tested organisms namely, *Aspergillus niger*, *Aspergillus flavus* and *Candida albicans*.¹⁷

Antifungal activity:

The growth of *keratinophilic* fungi *Trichophyton mentagrophytes* and *Chrysosporium indicum* along with *Aspergillus sp.*, *Botrydiodia sp.* *Fusarium solani* was also found to be inhibited by the oil.¹⁸ The root extracts showed antimicrobial activity against organisms namely, *Aspergillus niger*, *Aspergillus flavus* and *Candida albicans*.¹⁷

Anti-oxidant activity

The antioxidant activity of the *P. odorata* volatile oil was examined by through oxygen radical absorbance capacity (ORAC) assay⁷.

Antitumour activity

Methanol extract of the plant hydroalcoholic, and ethyl acetate fractions were evaluated for their cytotoxic effects¹⁹. The effectiveness of methanol extract with respect to clonogenic inhibition on human breast cancer (MDMB-231), lung cancer (Calu-6) and Prostate cancer (PC-3) was examined¹⁴.

Anti-inflammatory Activity

Carrageen induced hind paw edema method was used to study the anti-inflammatory activity^{20, 17}.

Antidiabetic Activity

Tribal people in tropical and subtropical areas have been employing *P. odorata* extracts to treat diabetes. The plant root methanolic, chloroform, and ethylacetate extracts were studied by alloxan induced diabetic model in rats. The

results proved that plant extracts exhibited antidiabetic activity²¹.

Anthelmintic Activity

The aqueous and alcoholic extracts, were tested according to dose, times of paralysis and death were recorded. The alcoholic extracts gave significant and more potent results than the aqueous extract when compared to standard²².

MOLECULAR DOCKING STUDIES

Anthelmintic activity

Molecular docking studies were carried out against alcohol dehydrogenase found in *Entamoeba histolytica* treating it as receptor and the phytochemicals so far identified as ligands using Discovery studio module of Biovia software (Dassault Systems of France). It was found that palmitic acid, caporic acid and hexahydrofarnesyl acetone can form a strong bond with the enzyme successfully inhibiting the metabolic cycle of the microbe²³.

Dermatophytosis

Plant derived a few phytochemicals were docked against dermatophytosis and was found that the compounds were able to bind to target proteins²⁴.

Athletes' foot disease

Molecular docking-based screening of a few phytochemicals revealed that the phytochemicals effectively associate with the active site of the protein against *Epidermophyton floccosum* and hence bears diagnostic and therapeutic potentials against athletes' foot disease.²⁵

CONCLUSION

For centuries, extracts of plants have found use in traditional medicine across different regions of the world. The plant *P. odorata* possesses varied pharmacological activities and many bioactive compounds. Many of the phytochemicals were not yet isolated, quantified and studied for the pharmacological activities. Hence, further studies are required to explore the plant extensively for its phytochemical and pharmacological revealing.

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