

**PAVONIA ODORATA WILLD: A REVIEW****Vandhana Vijayakumar*, Radha Ramalingam, Bindhu Ravi**Department of Pharmacognosy, College of Pharmacy, Madras Medical College, Chennai –
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Accepted on 17 Jan. 2020DOI: <https://doi.org/10.17605/OSF.IO/DCAES>***Corresponding Author****Vandhana Vijayakumar**Department of
Pharmacognosy, College of
Pharmacy, Madras Medical
College, Chennai –
600003, India.**ABSTRACT**

Pavonia odorata Willd., is also known as Fragrant swamp mallow belongs to Malvaceae family. This plant widely distributed in Indian subtropical areas and used in folk medicine. The phytoconstituents present in *Pavonia odorata* are β -sitosterol, palmitic, stearic, oleic, linoleic, isovaleraldehyde, aromadendrin, azulene, pavonene, pavonenol. The traditional impact of this plant have been confirmed by the recent pharmacological studies. The data analyzed in numerous reports on the chemical and pharmacological characteristics of *Pavonia odorata* sustain the view that the plant retains many therapeutic properties, signifying its prospects in herbal remedy. In traditional medicine, it used for inflammation, microbial infection, diabetes, fever,

skin disease, athletes' foot disease, dysentery, gonorrhoea, intestinal haemorrhage, ulcers and bleeding disorders. Based on the literature review, thorough pharmacological evaluations have been not carried out yet, only a few biological activities have been examined. This article aim is to provide a comprehensive review on pharmacological aspects of *Pavonia odorata*.

KEYWORDS: *Pavonia odorata*, Phytoconstituents, and Therapeutic properties.**INTRODUCTION**

Pavonia odorata is commonly known as Sugandhabala in native Indian sub-tropical areas and one of the most valuable medicinal plant species under the family Malvaceae.^[1] Over 70 species of herbs comprises under the genus of *Pavonia* which was primarily found in America. About 6 species of the genus are widely distributed throughout the Indian subcontinent. It possess beautiful and pleasant smelling flower. The roots and shoots of this

plants are extremely aromatic. In Ayurveda, the use of *Pavonia odorata* herb and its extract as cooling, demulcent, carminative, diaphoretic, and diuretic, fever.^[2]

Taxonomical classification^[3]

Kingdom	: Plantae
Sub Kingdom	: Viridiplantae
Division	: Tracheophyta
Class	: Magnoliopsida
Order	: Malvales
Family	: Malvaceae
Sub family	: Malvoideae
Tribe	: Hibisceae
Genus	: <i>Pavonia</i>
Species	: <i>Pavonia odorata</i>

Other Names

English: Fragrant swamp mallow; *Tamil*: Anantai, Anantavariti, Avibattam, Peramutti; *Hindi*: Bala, Sugandhabala; *Kannada*: Bala Raakshasi, Bala-Rakkasi-Gida; *Malayalam*: Iruveli, Kuruntotti; *Marathi*: Kaalaavaala, Randodaki, Sugandhabala; *Sanskrit*: Ambunamaka, Balaka, Barhishtha, Harivera, Hrivela; *Irula*: Theengai pillai; *Telugu*: Chirubenda, Chitlebunda, Chitti Benda, Errakooti; *Tibetan*: Ba-La-Ka.^[4]

Habitat

P.odorata is widely distributed in Africa, Sri lanka, Pakistan, Myanmar and in Indian subcontinent. In India mostly found in Andhra Pradesh, Bihar, Karnataka, Kerala, Orissa, Maharashtra, Punjab, Rajasthan, Tamilnadu, Uttar Pradesh and Bengal.^[5]

Botanical description^[6,7]

P. Odorata is an annual branching pubescent herb that found in plains of India. It reaches the height of 45-90 cm.

Root – Cylindrical, somewhat tortuous 0.5 to 1 cm in diameter, faintly longitudinally striated and fissured. Well developed, with branching lateral rootlets or the scars left by them and fibrous fracture, externally Pale brownish in colour internally buff. Musk like odour; taste, slightly bitter.

Stem – Cylindrical 2 to 7 mm in diameter, straight or occasionally slightly bent; surface is longitudinally ridged, distinctly anastomosing in older stems, nodes swollen, internodes 1.5 to 2 cm in length; fracture outer short, inner splintery, pale green externally, whitish internally. Slightly hairy, variable in length and thickness; faint and characteristic odour; taste, slightly bitter and mucilaginous.

Leaf – Simple, alternate, stipulate, cordate to roundish ovate, entire or 3 to 5 angled or lobed or pinnatifid, 2.5 to 5 cm in length, lobes acute, distantly toothed, both surfaces highly pubescent. Odour mild aromatic, taste bitter.

Petiole – Cylindrical, lower surface longitudinally ridged, pulvinus at the base, longer than the blades, 5 to 6 cm in length.

Flower – Pinkish but sometimes white; solitary, occasionally clustered, axillary with an involucre of 10 to 12 linear bracteoles, each about 8 to 10 mm in length, covered with long hairs, peduncle 2.5 to 3.7 cm in length; calyx gamosepalous, fivefid, petals 5, connate at the base and adnate to stamina tube, stamens many, filaments are united to form a stamina tube or column, truncate or more often five-toothed at the apex, filaments become free or separate in groups at various levels on the tube. Pistil 5 carpellary, syncarpous, ovary-5 chambered with one ovule in each loculus and with 10 stylar branches ending in capitate stigma, carpels on ripening separate from axis.

Fruit – Indehiscent capsule enclosed within the persistent involucre of bracteoles each carpel is wedge shaped, rounded at the back or dorsal side, glabrous, slightly wrinkled.

Seed – Minutely pubescent, brownish black.

Microscopic characters

Root – TS of the root is irregularly circular in outline with broken margin at places of the lenticels, shows outermost cork about 10 to 15 rows, very narrow cortex which are parenchymatous consisting of 5 to 6 rows and wider phloem tissue traversed with groups of fibres running in tangential bands in the inner region, alternating with medullary rays (uni- to biseriate) and sieve tissue, traversed with mucilage cells and large number of cluster crystals of calcium oxalate, xylem is very wide occupying the major area and getting easily detached from the cambium. It is composed of isolated vessels embedded in the thick-walled fibres and in continuation with that of phloem.

Leaf - TS shows upper and lower epidermis covered with cuticle and bearing plenty of simple unicellular and stellate trichomes, the former being very long or short, straight or bent, some of the trichomes of the midrib are very stout, thick walled, with narrow lumen, lignified and occasionally two armed, underneath both the epidermii lies 5 to 6 rows of collenchymatous tissue and an arc of conjoint collateral meristemes in the centre of the parenchymatous ground tissue which is embedded with cluster crystals of calcium oxalate, both the epidermal cells of lamina are embedded with stomata, the cells of the upper being bigger in size than the lower one; a row of palisade cells lies underneath the upper epidermis, the spongy parenchymatous tissue being embedded with vascular strands, mucilage cells and cluster crystals of calcium oxalate.

Phytochemistry

The characteristic secondary metabolites encountered in the plant have considerably enhanced its importance in the arena of medicinal plants and medicines.^[8] The phytoconstituents present in *P.odorata* are β -sitosterol, palmitic, stearic, oleic, linoleic, isovaleraldehyde, aromadendrin, azulene, pavenone, pavenol.^[6] The essential oil in roots contain isovaleric acid, n-caproic acids, α - pinene and methylheptenone.^[9] The major compounds in the volatile oil from *P.odorata* were ageratochromene(11.95%), hexahydrofarnesyl acetone(5.96%), β - eudesmol(4.53%) and β -caryophyllene oxide(3.08%).^[2] The active principles present in the chloroform fractions of *Pavonia odorata* roots have identified namely 5aH, 3a, 12-Methano-1H- cyclopropa [5', 6'] cyclodeca [1',2',1,5] cyclopenta [1, 2- d][1,3]dioxal-13-one; ethyl isoallochololate; 2,7-Dipheny 1,1,6-dioxopyridazino [4, 5, 2', 3'] pyrrolo [4', 5'- d] pyridazine; bicyclo [4, 3, 0] nonan-7- one,1-(2-methoxyvinyl); cedran diol,8S,13 and four major compounds has identified in the ethyl acetate extract namely Phenyl alcohol; 9,12,15- octadecatrienoic acid 2,3-bis [(trimethyl silyl)oxy] propyl ester [Z,Z,Z]; 1,5-bis (3-cyclopentylpropoxy)-1, 13, 3, 5, 5-hexamethyltrisiloxane; benzoic acid-2- hydroxy,ethylester.^[1]

Therapeutic uses

Diarrhoea, Burning sensation, Heart disease, Nausea, Fever, skin diseases, ulcers and Bleeding disorder.^[6] Anti-inflammatory, spasmolytic, stomachic, astringent,demulcent.^[10]

Pharmacology

The traditional implications of *P. odorata* have been confirmed by the recent pharmacological studies. The traditional uses of this species possess a broad spectrum of

medicinal properties. For example, it has been used to treat tumor, inflammation, microbial infection, diabetes, fever, skin disease, athletes' foot disease, dysentery, gonorrhoea, intestinal haemorrhage, ulcers and bleeding disorders. But, based on the literature review, thorough pharmacological evaluations have been not carried out yet. Only a few biological activities have been examined from this species involving mosquitocidal, antitumor, antioxidant, antidiabetic, antimicrobial, anti-inflammatory, anthelmintic, and reduction in blood pressure.

Mosquitocidal activities

Mosquito-borne diseases are flourishing worldwide even though the control efforts have been going on for centuries. These diseases are responsible for substantial global morbidity and mortality which significantly affect children and adolescents. Mosquitoes are the vectors of several disease causing pathogens that affects the millions of people. Malaria is one of the most common mosquito-borne diseases caused by *Anopheles* mosquitoes and other disease like dengue, lymphatic filariasis, Japanese encephalitis, leishmaniasis, onchocerciasis, schistosomiasis and trypanosomiasis. Though the effective vaccine/antiviral therapy is absence, the only way is vector control. The conventional pesticides generally used for mosquito control such as malathian, DDT and pyrethroides causes environmental pollution, residual effects and resistance of mosquito species. These problems forced to search for new, alternative and safer control measures especially from plant source.

So this study is to determine the larvicidal and repellent activities of benzene and methanol extract of *P. odorata* against *Aedes aegypti*, *Anopheles stephensi* and *Culex quinquefasciatus*. Twenty five 3rd instar larvae of selected mosquitoes species were exposed to various concentrations (60-300ppm) and were assayed. The repellent efficacy was determined against selected mosquitoes at three concentrations viz., 1.0, 2.0 and 3.0 mg/cm² under the laboratory conditions. The LC₅₀ and LC₉₀ values of benzene and methanol extract of *P. odorata* against *Aedes aegypti*, *Anopheles stephensi* and *Culex quinquefasciatus* larvae in 24 h were recorded respectively. In repellent activity, the two extracts were tested among that *P. odorata* methanol extract had strong repellent action against selected mosquitoes as it provided 100% protection against *Aedes aegypti*, *Anopheles stephensi* and *Culex quinquefasciatus* for 280min. so the study proves that the *P. odorata* extract was an excellent potential for controlling *Aedes aegypti*, *Anopheles stephensi* and *Culex quinquefasciatus* mosquitoes.^[11]

Anti-tumor activity

The study investigated the efficacy of methanol extracts of *P. odorata*, for its clonogenic inhibition on Human Breast cancer (MDMB-231), Prostate cancer (PC-3) and Lung cancer (Calu-6). When evaluated at different concentration (0-500 µg/ml) it was observed that in a dose dependent manner the extract of *P. odorata* was effective in inducing cytotoxic effect upon MD-MB-231, PC-3 and Calu-6 cell lines. When compared with doxorubicin(positive control) the methanol extract of *P. odorata* exhibited significant cytotoxicity up to ~80%. Based on the IC50 values it was observed that the methanol extract *P. odorata* showed significant cytotoxicity against MD-MB-231 and Calu-6, when compared to PC-3cells.^[12]

Another study confirms that the two different doses (200 and 400 mg/kg) of the methanol extract from *P. odorata* shows anticancer activity in the mice transplanted with Erlich's ascites carcinoma (EAC). The methanol extract was fractionated through successive solvent fractions and antitumor effect was evaluated at the doses of 140 mg/kg for chloroform fraction, 80 mg/kg for ethyl acetate fraction and 180 mg/ kg for remaining hydroalcoholic fraction. 5-fluorouracil (20 mg/kg) was used as standard drug. Ethyl acetate and hydro alcoholic fractions showed *in- vitro* cytotoxicity against EAC cells. Among the three fractions, hydroalcoholic and ethyl acetate fractions significantly inhibited the ascites tumor in EAC bearing mice after 9 days treatment. Cytotoxic effect of the methanol extract of *P.odorata* and the hydroalcoholic, and ethyl acetate fractions were evaluated and the IC50 values were recorded. These experimental results proves that the methanol extract of *P.odorata* and its hydroalcoholic, and ethyl acetate fractions possessed cytotoxic and anticancer activity.^[13]

Anti-oxidant activity

The antioxidant activity of the volatile oil obtained from *P. odorata* was examined through Oxygen Radical Absorbance Capacity (ORAC) assay employing fluorescein as the fluorescent probe. The ORAC value of the oil was found to be 594.2±25.9 mM TE/g. The results proves that the volatile oil extracted from aerial parts of *P. odorata* could be considered as a natural antioxidant agent.^[2]

Antidiabetic activity

The study evaluated the antidiabetic activity for *P. odorata* plant extracts at a dose levels of 100 mg/kg of CHCl₃, 100 mg/kg of EtOAc and 200 mg/kg of MeOH in Alloxan induced diabetic rats. The toxic effect of MeOH extract of *P. odorata* root was also studied at a dose

level up to 2000 mg/kg, the plant extracts have not produced any toxic symptoms within the treated animals. The results, indicates that *P. odorata* root extracts have reduced the blood glucose(157.00 ± 4.36) levels at after the oral administration of 100 mg/kg of CHCl₃ extract of *P. odorata* root. So it was concluded that the reduction of blood glucose levels in diabetic rats were found to be dose dependent and also dependent on duration of action. So it might be useful in the treatment of diabetes without toxicity.^[14]

Antimicrobial activity

The essential oil from the rhizomes of *P. odorata* Willd was extracted in an yield of 0.2% by hydrodistillation, and screened for antibacterial and antifungal activity against ten bacteria and thirteen fungi using paper disc agar diffusion technique. The oil was found to inhibit the growth of bacteria and fungi. So it proves that *P. odorata* has antibacterial and antifungal activity.^[15]

Anti-inflammatory activity

The anti-inflammatory activity of the *P. odorata* was evaluated on male albino rats by carrageenan induced paw edema method. The effect of methanol, chloroform and ethyl acetate extracts of *P. odorata* on carrageenan induced rat paw edema at one hour interval study was compared to control group. Significant inhibition of paw oedema was observed with chloroform, ethyl acetate and methanol extract doses tested till the fifth hour. Ethyl acetate extract has higher activity than methanol and chloroform extract. The higher activity may due to the bioactive components present in the plant extract and this can used to discover bioactive natural products that may serve as leads for the development of new pharmaceuticals.^[1]

Anthelmintic activity

Study on alcoholic and aqueous root extracts of *P. odorata* was evaluated on *Pheretima postuma* of nearly equal size (8 ± 1 cm) which was designed in dose-dependent manner and the parameters observed as paralysis time and death time. The alcoholic extract was more potent than the aqueous extract. The alcoholic extract of the drug had shown comparable activity than the piperazine citrate, this shows that some constituents responsible for the anthelmintic action.^[16]

Reduction in blood pressure

In anaesthetized dog, *P. odorata* oil extracts when administered intravenously (60 mg/kg) showed remarkable reduction in blood pressure that lasted for around three minutes but considerable reduction in blood pressure happened when a dosage of 120 mg/kg was injected. Even, atropine sulfate and pheniramine maleate (both 1mg/kg) was unable to check the oil's hypotensive effect.^[17]

CONCLUSION

We conclude from the vast literature study and experimental results analysis that *Pavonia odorata*, is a traditional remedy for various diseases including cancer. The plant is beneficial in treating microbial infections. It also finds immense utility in hypertensive problems, anthelmintic, inflammation and diabetic problems. Taking great concern of the useful benefits of the plant, it can be advocated as a safe, highly important, medicinal plant for general mankind.

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