



A REVIEW ON THESPSEIA POPULNEA

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ABSTRACT

Thespesia populnea, commonly known as Hibiscus populnea, belongs to the *Malvaceae* family. It is an evergreen tree with alternate, simple leaves and petioles 5–10 cm in length. This large tree is native to tropical regions and coastal forests of India and is also cultivated in gardens. Currently, it has become naturalized in tropical climates worldwide, from the Caribbean to Africa. *Thespesia populnea* is particularly valuable as a coastal windbreak due to its resistance to wind and salt spray, thriving in sandy, saline soils. Among its various phytoconstituents, sesquiterpenes and phenolic compounds are the primary bioactive compounds. Experimental studies have shown that these compounds exhibit significant biological activities, including anti-inflammatory, anti-diabetic, analgesic, wound-healing, anti-Alzheimer's, anti-ulcer, and anti-psoriasis effects. This review article covers the taxonomy, synonyms, vernacular names, distribution, ethnomedical uses, phytochemicals, and pharmacological activities of *Thespesia populnea*.

KEYWORDS: *Thespesia populnea*, Malvaceae, Hibiscus populnea, traditional medicines, Phytochemicals, Pharmacological activity.

INTRODUCTION

For thousands of years medicinal plants have been used to treat health disorders, to add flavor and conserve food and to prevent diseases epidemics. Medicinal plants are regarded as rich resources of traditional medicines and from these plants many of the modern medicines are produced. Human beings have depended on nature for their simple requirements as being the sources for medicines, shelters, food stuffs, fragrances, clothing, flavours, fertilizers and means of transportation throughout the ages.^[1] In recent years, herbal medicine has experienced exponential growth and has gained popularity in both developing and developed countries due to its natural origin and minimal side effects.^[2] The reasons for the usage of specific medicinal plants for treatment of certain diseases were being discovered.^[3]

Thespesia populnea, also referred to as Hibiscus populnea, is a member of the Malvaceae family. This evergreen tree features alternate, simple leaves with petioles that measure between 5 and 10 cm in length.^[4] The flowers are yellow, bell-shaped, and resemble

hibiscus, measuring 5 to 7.5 cm long with five broad, rounded petals that overlap. The fruits are globe-shaped capsules, 2.5 to 5 cm across, divided into five compartments. They are flattened, covered in tiny peltate scales, and have a disc-like persistent calyx at the base. As they ripen, the fruits turn black.^[5] *Thespesia populnea*, commonly known as the portia tree or pacific rosewood, is a large medicinal plant native to India, typically found in tropical and coastal forests.^[6]

It is recognized for its remarkable biological potential, distinguishing itself among the seventeen species of the *Thespesia* genus.^[7] In traditional medicine, a paste derived from the fruits, leaves, and roots of *Thespesia populnea* is used topically to treat a range of skin ailments. Commonly referred to as "Bhendi," the plant is abundant in terpenes, lipids, glucosides, flavonoids, phenols, alkaloids, carbohydrates, saponins, tannins, and terpenoids, all of which contribute to its wide array of medicinal properties. The heartwood is particularly rich in sesquiterpenes and ortho-naphthoquinone compounds.^[9,10] The flowers are rich in kaempferol,

kaempferol-7-glucoside, and gossypetin, whereas the fruit kernels are said to contain sitosterol, ceryl alcohol, and a yellow pigment known as thespesin.^[11]

All parts of the plant are used in traditional medicine. The bark, leaves, and flowers are effective in treating skin infections such as scabies, psoriasis, eczema, ringworm, and guinea worm. A decoction of the bark is commonly used to treat skin and liver disorders.^[8] The bark is used to treat wounds, while the leaves are applied topically for their anti-inflammatory properties in swollen joints. In Ayurveda, the fruits of the plant are used to help manage diabetes. Various parts of the tree, including the leaves, flowers, bark, fruits, and seeds, are

utilized to treat a range of ailments. Both the bark and flowers have shown astringent, hepatoprotective, and antioxidant effects in rats.^[12,13]

In addition, *T. populnea* has been scientifically shown to possess various medicinal properties, including antibacterial, antifertility, and antinociceptive activities. It has also been found effective in treating Alzheimer's disease, enhancing memory, providing antioxidant and hepatoprotective benefits, exhibiting anti-psoriatic, diuretic effects, promoting wound healing^[11] and also plant has been used for astringent, haemostatic, anti-diarrhoeal and anti-inflammatory effects.^[14]



Fig. 1: *Thespesia populnea* flower.



Fig. 2: *Thespesia populnea* leaves.



Fig. 3: *Thespesia populnea* fruit.



Fig. 4: *Thespesia populnea* tree.



Fig. 5: *Thespesia populnea* stem and bark.

PLANT BIOGRAPH

Table no 1: Taxonomical classification.^[15]

Kingdom	Plantae
Subkingdom	Tracheobionta
Class	Magnoliopsida
Subclass	Dilleniidae
Order	Malvales
Family	Malvaceae
Genus	<i>Thespesia</i> . Sol. ex. Correa
Species	<i>Populnea</i>
Super-division	Spermatophyta
Division	Magnoliophyta

COMMON NAMES

Table no 2: Vernacular names of *Thespesia populnea*.^[16]

English	Annadine, Bendy tree, Bhendi tree, Indian Tulip tree, Portia tree.
Hindi	Bhendhi, Gajadanda, Paraspipal, Parasipu
Malayalam	Poovarasu, Chelantipatta, pooparutti
Bengali	Gajashundi, Palaspipal, Poresh
Gujarati	Paras Piplo
Kannada	Arasi, Bangali, Huvarasi
Marathi	Aastha, Aas, Parasbhendi, Parosapimpal, Parshvapimpal, Pimparani, Pimpari.
Tamil	Puvarasu
Telgu	Gangaravi
Sanskrit	Paarish, Gardhbhanda, Kandralla, Kapitana, Suparshvaka

Ayurvedic properties and pharmacological profile of the medicinal plant *Thespesia populnea*^[31]

Botanicalname : *Thespesia populnea* Sol. ex Correa

Family : Malvaceae

Pharmacodynamics : according to Ayurveda

Rasa : Kasaya

Guna : Laghu, Ruksha

Virya : sita

Vipaka : Katu

Doshakarma : Kaphapittashamaka

Karma : Mutrasangrahaniya, stambhana, Dahaprashmana, Visaghna, Medohara

Rogagnata : Prameha, Pradara Yoniog, Shotha, Daha, Atisara, Arsha, Medorog, Visha

SYNONYMS^[37]

English - Portia tree and Indian tulip tree

Hindi - Paraspipal

Bengali - Gajashundi

Kannada - Arasi, Huvarase

Sanskrit - Haripuchah, Parisha

Tamil - Poovarasum Kallal





Telugu - Gangaravi, Malligangaravi


Malayalam - Pupparrutti

Marathi - Bendi

Gujrati – Parasapiplo

PHYTOCHEMICAL CONSTITUENTS^[17,1,18,19,20,21]**Table no 3: Phytochemical constituents of *Thespesia populnea*.**

Plant part	Phytochemicals	Pharmacological Action
Flowers 	<ul style="list-style-type: none"> • Kaempferol • β-sitosterol • Gossypetin • Quercetin • Rutin • Herbecetin • Thespesin • Gossypol • anthroquinone 	<ul style="list-style-type: none"> • Astringent • Hepatoprotective • Antioxidant • Antiinflammatory activities • Antimicrobial • Antioxidant • Cytotoxic • Antiproliferative
Heartwood 	<ul style="list-style-type: none"> • Populene A-H • 6 - Sesquiterpenoid quinones • Mansonones C, D, E, F and H • Thespones • Thespesone 	<ul style="list-style-type: none"> • Ulcer pain • Colic pain • Antioxidant • Anti-inflammatory
Stem and bark 	<ul style="list-style-type: none"> • Alkaloids • Carbohydrates • Protein • Tannins • Phenols • Flavonoids • Gums and mucilage • Saponins • Terpenes • β-sitosterol • Daucosterol • Kaempferol • hentriacontanol • stearic acid • Betulin • Gossypol 	<ul style="list-style-type: none"> • Skin diseases • liver diseases • Urethritis • Gonorrhea • Diarrhoea • Arthritis • hemorrhoids • chronic dysentery
Leaves 	<ul style="list-style-type: none"> • Lupeol • β-sitosterol • Lupenone • Alkanes • Lupenone • β-sistosterol • Acacetin • Quercetin • Vanillic • Syringic • Melilotic • ferulic acid 	<ul style="list-style-type: none"> • Psoriasis • scabies • cutaneous diseases • Analgesic • Anti-inflammatory

<p style="text-align: center;">Fruit</p> 	<ul style="list-style-type: none"> • Alkaloids • Flavonoids • Carbohydrates • Phenols • Steroids • Glycosides • Tannins • Saponins 	<ul style="list-style-type: none"> • rheumatism sprains • Scabies • swellings • insect bites • Warts • Migrane • Piles • Antihyperglycemic • Antihyperlipidemic
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TRADITIONAL USES

This is an important medicinal plant used in the traditional medical systems throughout the world. All the parts of the tree are used to treat various diseases including diarrhea, skin and liver diseases, hemorrhoids and diabetes. In addition, the bark of the tree is been used for the treatment of cancers in Sri Lanka.^[22]

Bark

Thespesia populnea barks possess astringent, hepatoprotective activity and used to treat inflammation and pain.^[23] A decoction of the bark is commonly used for the treatment of skin and liver diseases.^[24] Oil of bark mixed with vegetable oil is useful in urethritis and gonorrhea.^[25]

Fruits

Villagers have traditionally used the poultice prepared from the fruits of *Thespesia populnea* to treat a variety of skin ailments including wounds.^[23] The aqueous extract of *Thespesia populnea* fruit showed significant wound healing activity in the excision wound and incision wound models in rats following topical and oral administration, respectively.^[26]

Leaf

Thespesia populnea Leaf has therapeutic use in cough, headache, scabies, psoriasis, skin disease, dysentery, diabetes, gonorrhea, indigestion, ulcers, worms and also possess diuretic effect.^[23] The leaves were reported to be employed locally as anti-inflammatory in swollen joints.^[25]

Flowers

Thespesia populnea barks flowers possess astringent, hepatoprotective and substantial antioxidative activity as determined by inhibition of lipid peroxidation level against carbon tetrachloride-induced liver injury in rats.^[23]

PHARMACOLOGICAL ACTIONS

Antimicrobial Activity^[27]

The antimicrobial activity of *Thespesia populnea* leaf extracts was assessed using disk diffusion and broth microdilution methods. Crude extract (300 mg/mL) and its 10- and 100-fold dilutions were prepared in 20% DMSO. Bacterial suspensions (1×10^8 CFU/mL) were

inoculated onto Mueller-Hinton Agar plates, and filter paper discs (6 mm) impregnated with 10 μ L of each extract were placed on the plates. Vancomycin (30 μ g/disc) was the positive control, and 20% DMSO served as the negative control. After incubation at 35°C ± 2 for 24 hours, inhibition zones were measured.

The minimum inhibitory concentration (MIC) was determined via broth microdilution using aqueous, ethanol, and acetone extracts at 600, 60, and 12 mg/mL, respectively. MIC was recorded as the lowest concentration without turbidity, while MBC was determined by subculturing onto blood agar. The study confirmed the antibacterial potential of *Thespesia populnea* extracts.

Hypoglycemic activity^[28]

Diabetes mellitus is a major health concern, prompting research into plant-based treatments. *Thespesia populnea* hydroalcoholic extract has shown significant hypoglycemic effects in STZ-induced diabetic rats without toxicity, likely by enhancing insulin secretion or activity. STZ damages pancreatic beta cells, reducing insulin production and increasing blood sugar levels. In diabetic rats, the extract significantly lowered fasting blood glucose and improved serum insulin levels over 28 days. Its high fiber content may aid glucose regulation by slowing carbohydrate absorption and reducing cholesterol and triglycerides. Diabetes-induced weight loss, muscle wasting, and liver damage—indicated by elevated SGOT, SGPT, and ALP enzymes—were mitigated by the extract, suggesting hepatoprotective effects.

Overall, *Thespesia populnea* extract demonstrates strong anti-diabetic and liver-protective properties, making it a promising natural therapy for diabetes management.

Hepatoprotective property^[29]

This study is the first to identify phenolic acids as the hepatoprotective compounds in *T. populnea* bark. These active compounds exhibit strong liver-protective effects against chemically induced liver damage, even at low doses. Additionally, in vitro studies suggest their potential anti-hepatitis B activity, making them a promising candidate for developing safe and effective treatments for liver diseases.

Diuretic activity^[30]

The aqueous, chloroform, ethanol, and ethyl acetate extracts of *Thespesia populnea* exhibited activity on the renal system in rodents. The data suggest that these extracts have aquaretic properties, as indicated by increased urine volume, similar to the reference diuretic, furosemide. However, the extracts also enhanced ion excretion. Furosemide doubled sodium excretion, while the extract at a 400 mg/kg dose increased it by 1–2 times. Potassium excretion was significantly higher ($P < 0.05$) compared to the water control, and chloride excretion showed a substantial rise. These findings indicate that *Thespesia populnea* extract functions as an aquaretic in rats while significantly promoting ion excretion, nearly matching the effects of furosemide.

Hypolipidemic activity^[31]

The aqueous extract of *Thespesia populnea* exhibits significant anti-obesity and hypolipidemic activity, as described in ancient Ayurvedic texts. The mean change in BMI before and after treatment is 1.13, indicating a notable reduction. The mean decrease in body weight is 3.27, which is highly significant. Additionally, reductions in excessive sweating (0.424), excessive hunger (0.515), and excessive sleep (0.424) were observed, all showing significant improvement. These effects can be compared with established medications used for long-term obesity treatment and its related complications. Furthermore, the therapy was found to be both effective and clinically safe, as no adverse events or reactions were reported during the study.

Antiulcer activity^[32]

The gastric secretion determination model using ligated pylorus demonstrated that treatment with *Thespesia populnea* extract (100, 200, and 400 mg/kg) and OMZ (20 mg/kg) significantly reduced gastric juice volume, free acidity, and total acidity while increasing gastric pH compared to the control group. Additionally, the extract significantly reduced gastric mucosal lesions. The inhibition percentages of mucosal lesions were 65%, 70%, and 73% for the groups treated with 100, 200, and 400 mg/kg of the extract, respectively, compared to 81% inhibition by OMZ (20 mg/kg).

In the ethanol-induced ulcer model, *Thespesia populnea* extract and OMZ significantly reduced gastric mucosal lesions. The ulcer inhibition rates were 61%, 67%, and 72% for the extract at doses of 100, 200, and 400 mg/kg, respectively, while OMZ (20 mg/kg) achieved 86% inhibition. These findings suggest that *Thespesia populnea* possesses significant gastroprotective properties, making it a potential natural alternative for ulcer prevention and treatment.

Antidiarrheal activity^[33]

The antidiarrheal effects of fractions derived from *Thespesia populnea* bark. Among the tested fractions, the residue fraction (RF) exhibited the highest efficacy in reducing diarrhea induced by castor oil and PG-E2, as

well as inhibiting intestinal motility. RF significantly suppressed contractions induced by acetylcholine, histamine, and BaCl_2 , suggesting that its antidiarrheal properties are mediated through both antisecretory and antimotility mechanisms. These findings support the potential use of RF in diarrhea management, with further research needed to identify its active constituents.

Antioxidant activity^[34]

T. populnea stem bark has been reported to have antioxidant activity, where it was shown to increase the levels of glutathione peroxidase, glutathione S-transferase, glutathione reductase, superoxide dismutase and catalase and decreased the level of lipid peroxidation CCl_4 induced liver toxicity in rat. From this it is clear that the stem bark of *T. populnea* not only enhances the inherent antioxidant system of the body, but also scavenges the free radicals. This dual pronged system works more efficiently in combating the damage due to free radical generation during disease process.

Memory enhancing activity^[35]

Thespesia populnea extract (i) reduced serum cholesterol levels in mice, (ii) increased acetylcholine levels in the brain, and (iii) enhanced memory in both young and aged mice. Given these effects, exploring the potential of this plant in managing Alzheimer's disease may be worthwhile.

Anticancer activity^[36]

Phenols and flavonoids were detected in alcohol and hydroalcohol extracts, while alkaloids, steroids, and carbohydrates were present in all extracts of *Thespesia populnea*. The hydro-alcohol extract contained pharmaceutically useful compounds, particularly phenolic compounds, which are valued for applications in pharmaceuticals, health, food, and cosmetics due to their antioxidant properties. The extract's anti-cancer potential was evaluated using the MTT assay on HeLa and K562 cancer cell lines at concentrations of 500, 250, 125, 62.5, and 32.75 $\mu\text{g/ml}$. The highest inhibition was observed at 500 $\mu\text{g/ml}$, with IC_{50} values of 2886 $\mu\text{g/ml}$ for HeLa and 2283 $\mu\text{g/ml}$ for K562 cell lines.

The results confirmed that *Thespesia populnea* extract inhibits cancer cell growth due to polyphenolic and flavonoid compounds.

CONCLUSION

This review highlights the rich therapeutic potential, pharmacological properties, and diverse bioactive compounds of *Thespesia populnea* (Linn), underscoring its importance to human well-being. It emphasizes the urgent need for further research and clinical studies, urging researchers and industry professionals to explore its value-added applications in the nutraceutical and pharmaceutical sectors.

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