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Thespesia Populnea: Phytochemical and Pharmacological Review

A. Poongothai

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Abstract

Thespesia populnea is a medicinally important tropical plant belonging to the family *Malvaceae*. The plant has been extensively used in traditional systems of medicine such as Ayurveda and Siddha for the management of inflammation, skin disorders, diabetes, wounds, liver diseases, and microbial infections. Various parts of the plant including bark, leaves, flowers, fruits, and roots contain numerous bioactive compounds responsible for its therapeutic properties. Phytochemical investigations have revealed the presence of flavonoids, alkaloids, tannins, terpenoids, glycosides, phenolic compounds, sesquiterpenoids, and sterols. Scientific studies conducted in recent years have validated several traditional claims and demonstrated a broad range of pharmacological activities such as antioxidant, anti-inflammatory, antimicrobial, hepatoprotective, antidiabetic, analgesic, wound healing, immunomodulatory, anticancer, and neuroprotective effects. The therapeutic efficacy of the plant is mainly associated with its ability to modulate oxidative stress and inflammatory pathways. Owing to its diverse biological activities and medicinal significance, *Thespesia populnea* has gained considerable attention in pharmaceutical and phytochemical research. This review summarizes the botanical characteristics, traditional uses, phytochemical constituents, and major pharmacological activities of *Thespesia populnea*, highlighting its importance as a potential source for the development of novel therapeutic agents.

Keywords: *Thespesia populnea;* Phytochemistry and Pharmacological activities.

1. Introduction

Medicinal plants have played a significant role in traditional healthcare systems since ancient times and continue to serve as an important source of therapeutic agents worldwide [1]. Among these medicinal plants, *Thespesia populnea* has attracted considerable scientific attention because of its wide range of pharmacological activities and therapeutic applications [2]. *Thespesia populnea* (L.) Sol. ex Corrêa belongs to the family Malvaceae and is commonly known as the Portia tree. The plant is widely distributed in tropical and subtropical coastal regions including India, Sri Lanka, Southeast Asia, and Pacific islands [3]. Traditionally, different parts of the plant such as leaves, bark, flowers, fruits, and roots have been used in Ayurveda and Sidsssdha medicine for the treatment of skin diseases, ulcers, inflammation, diabetes, dysentery, wounds, and liver disorders [4]. The medicinal value of the plant is mainly attributed to the presence of several bioactive phytochemicals including flavonoids,

***Corresponding author:** E-mail: poongothai@shctpt.edu
Affiliation: PG & Research Department of Biochemistry, Sacred Heart College (Autonomous), Tirupattur - 635 601. Tamilnadu, India.

alkaloids, tannins, terpenoids, glycosides, and phenolic compounds [5]. Recent pharmacological investigations have scientifically validated many traditional claims and demonstrated antioxidant, antimicrobial, anti-inflammatory, hepatoprotective, antidiabetic, wound healing, analgesic, and anticancer activities of the plant [6,7]. Because of its diverse medicinal properties and increasing demand for plant-based therapeutics, *Thespesia populnea* has become an important subject of phytochemical and pharmaceutical research [8]. This review summarizes the botanical features, traditional uses, phytochemical constituents, and pharmacological activities of *Thespesia populnea* with emphasis on its therapeutic significance and future medicinal potential.

2. Botanical Description

The Fig.1. Shows the *Thespesia populnea and its parts as below,*

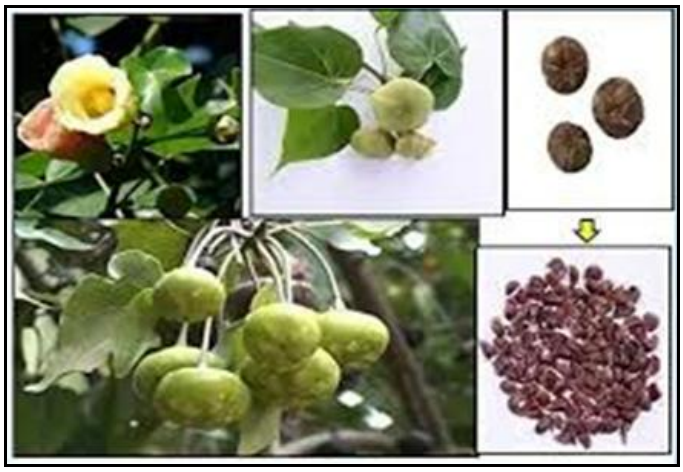

Fig.1. *Thespesia populnea* and its parts

Thespesia populnea is a fast-growing evergreen tree that usually attains a height of about 6–15 meters [3]. The plant grows well in coastal regions and shows high tolerance to saline, sandy, and rocky soils [9]. It possesses a short trunk with greyish-brown bark and spreading branches. The leaves are simple, alternate, glossy, broad, and heart-shaped with long petioles[10].

The flowers resemble hibiscus flowers and are yellow in color with a dark reddish-purple center. As the flowers mature, their color gradually changes from yellow to reddish-purple [3]. The fruits are globose woody capsules containing numerous hairy seeds [9]. The plant propagates through seeds and stems cuttings and is commonly cultivated in tropical coastal ecosystems due to its adaptability and medicinal importance [11].

3. Traditional and Ethnomedicinal Uses

In traditional systems of medicine, *Thespesia populnea* has been widely used for the treatment of various diseases and disorders [4]. Leaf paste and bark preparations are commonly applied externally to reduce inflammation, swelling, and skin infections [12]. The fruit juice is traditionally used for the treatment of psoriasis, scabies, migraine, insect bites, and fungal infections [13]. Bark decoctions are administered for dysentery, hemorrhoids, and gastrointestinal disorders, while flowers are used to relieve itching and skin irritation [14]. The seeds possess purgative properties and are occasionally employed in traditional remedies for constipation [15]. Oils prepared from bark and fruits are used in folk medicine for arthritis, gonorrhea, and wound healing [16]. In several indigenous coastal communities, the plant is also used as a remedy for liver disorders and chronic ulcers [17].

4. Phytochemical Constituents

Phytochemical studies have demonstrated that *Thespesia populnea* contains a wide variety of biologically active compounds responsible for its medicinal properties [5]. Major phytoconstituents identified in the plant include flavonoids, alkaloids, tannins, glycosides, terpenoids, sterols, saponins, phenolic compounds, and sesquiterpenoids [18]. Important bioactive compounds isolated from the plant include gossypol, kaempferol, rutin, quercetin glycosides, β-sitosterol, lupeol, and herbacetin [19]. Sesquiterpenoid quinones such as mansonones and thespesone derivatives have been isolated from the heartwood and bark [20]. Leaves and bark are particularly rich in flavonoids and phenolic compounds that contribute significantly to antioxidant and anti-inflammatory activities [21]. The presence of these phytochemicals supports the broad pharmacological profile exhibited by the plant [22].

5. Pharmacological Activities

5.1. Antioxidant Activity

Thespesia populnea possesses significant antioxidant activity due to the presence of flavonoids, phenolic compounds, and tannins that neutralize free radicals and reduce oxidative stress. Experimental investigations reported increased levels of antioxidant enzymes such as catalase, superoxide dismutase, and glutathione peroxidase after treatment with plant extracts [23,24]. Recent studies also demonstrated its neuroprotective antioxidant potential against cognitive impairment and oxidative damage [34].

The Table 1 shows the Phytochemical Constituents and Pharmacological Activities of *Thespesia populnea* as below,

Plant Part	Phytochemical Constituents	Pharmacological Activity	Therapeutic Significance
Leaves	Flavonoids, phenolic compounds, tannins	Antioxidant	Scavenges free radicals and reduces oxidative stress
Leaves	Flavonoids, terpenoids	Anti-inflammatory	Reduces inflammation and edema
Leaves	Phenolics, tannins	Antimicrobial	Inhibits bacterial and fungal pathogens
Bark	Gossypol, sesquiterpenoids	Analgesic	Relieves pain and inflammatory reactions
Bark	Flavonoids, phenolics	Hepatoprotective	Protects liver tissues against toxic injury
Bark	Tannins, flavonoids	Wound healing	Promotes collagen synthesis
Fruits	Glycosides, flavonoids	Antidiabetic	Reduces blood glucose levels
Flowers	Kaempferol, quercetin derivatives	Antioxidant	Enhances antioxidant enzyme activity
Roots	Alkaloids, phenolic compounds	Antimicrobial	Effective against pathogenic microorganisms
Seeds	Fatty acids, sterols	Antifertility	Exhibits anti-implantation effects
Heartwood	Mansonones, thespesone derivatives	Cytotoxic / Anticancer	Inhibits proliferation of cancer cells
Whole Plant	Flavonoids, phenolics, terpenoids	Immunomodulatory	Enhances immune response
Bark Extract	Neuroprotective phytoconstituents	Memory enhancing	Improves learning and cognitive function
Leaf Extract	Polyphenols	Antipyretic	Reduces fever and inflammatory response
Fruit Extract	Bioactive polyphenols	Antiulcer	Protects gastric mucosa and reduces ulcer formation

5.2. Anti-inflammatory Activity

The bark and leaf extracts of *Thespesia populnea* have demonstrated notable anti-inflammatory activity in

experimental models including carrageenan-induced edema and formalin-induced inflammation [25]. The activity is mainly attributed to inhibition of inflammatory mediators such as prostaglandins, histamine, and cytokines [26]. The presence of flavonoids and sesquiterpenoids contributes significantly to membrane stabilization and anti-inflammatory responses [27].

5.3. Antimicrobial Activity

Leaf, flower, and root extracts of *Thespesia populnea* exhibit broad-spectrum antimicrobial activity against pathogenic bacteria and fungi including *Staphylococcus aureus*, *Bacillus cereus*, *Escherichia coli*, and *Candida albicans* [28,29]. Methanolic extracts showed strong inhibitory activity against several microbial strains due to the presence of phenolics and flavonoids [30].

5.4. Antidiabetic Activity

Fruit extracts of *Thespesia populnea* have shown hypoglycemic and antihyperglycemic effects in alloxan-induced diabetic models [31]. The extracts help regulate blood glucose levels by improving insulin secretion and peripheral glucose utilization [32]. These findings scientifically support the traditional use of the plant in diabetes management [33].

5.5. Hepatoprotective Activity

Stem bark and leaf extracts possess hepatoprotective activity against chemically induced liver toxicity [17,35]. Experimental studies revealed reduction in serum liver enzymes such as SGOT, SGPT, alkaline phosphatase, and bilirubin after treatment with plant extracts [36]. Histopathological studies confirmed protection against hepatic necrosis and oxidative stress [23].

5.6. Wound Healing Activity

The aqueous and ethanolic extracts of *Thespesia populnea* have demonstrated significant wound healing activity by accelerating collagen synthesis, epithelialization, tissue regeneration, and wound contraction [37]. Recent studies involving nanoparticle formulations and topical gels further confirmed enhanced wound healing efficacy of bark and leaf extracts [38,39].

5.7. Analgesic Activity

Bark extracts of *Thespesia populnea* exhibit analgesic activity in acetic acid-induced writhing and formalin-induced pain models [25]. The analgesic effects are associated with suppression of peripheral inflammatory mediators and pain pathways [26]. Recent pharmacological investigations further validated its pain-relieving potential [40].

5.8. Immunomodulatory Activity

Methanolic leaf extracts have shown immunomodulatory effects by enhancing humoral antibody response and delayed-type hypersensitivity reactions in experimental animals [41]. The plant extract also demonstrated protective effects against cyclophosphamide-induced myelosuppression [42]. Flavonoids and phenolic constituents are believed to play an important role in immune modulation [27].

5.9. Memory Enhancing Activity

Experimental studies have indicated that bark extracts of *Thespesia populnea* improve memory and cognitive

functions through antioxidant and neuroprotective mechanisms [43]. The extract was found to reverse scopolamine-induced amnesia and enhance learning performance in animal models [34].

5.10. Cytotoxic and Anticancer Activity

Sesquiterpenoid quinones and flavonoids isolated from *Thespesia populnea* have exhibited cytotoxic activity against cancer cell lines including HeLa, MCF-7, HT-29, and KB cells [20,44]. These compounds inhibit cancer cell proliferation and induce apoptosis, suggesting their potential as natural anticancer agents [45].

6. Conclusion

Thespesia populnea is an important medicinal plant with remarkable therapeutic potential supported by both traditional medicinal practices and scientific investigations. The plant contains numerous bioactive phytochemicals including flavonoids, alkaloids, tannins, terpenoids, and phenolic compounds responsible for its wide range of pharmacological activities. Experimental studies have demonstrated antioxidant, anti-inflammatory, antimicrobial, hepatoprotective, antidiabetic, wound healing, immunomodulatory, neuroprotective, and anticancer effects. The diverse biological properties of *Thespesia populnea* validate many traditional medicinal claims and highlight its significance in herbal medicine and pharmaceutical research. However, further studies involving clinical trials, toxicity evaluation, isolation of active constituents, and standardization of herbal formulations are necessary to establish its safety and efficacy for therapeutic applications. Overall, *Thespesia populnea* represents a promising natural resource for the development of novel therapeutic agents and future pharmaceutical products.

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Conflict of Interest: Nil

References

[1] S. Balasubramanian, Pharmacogn. Rev. 15, (2021) 45–56.

[2] C.H.M. Suvarna, P. Sriya, M.D. Arshad, K. Pavan, J. Drug Deliv. Ther. 8 (4), (2018) 1–4.

[3] W.L. Wagner, D.R. Herbst, S.H. Sohmer, Manual of Flowering Plants of Hawaii, University of Hawaii Press, (2000).

[4] J.A. Parrotta, Thespesia populnea in Traditional Medicine, USDA Forest Service, (2000).

[5] Y. Mendhekar, K.R. Shinde, Eur. J. Pharm. Med. Res. 4 (12), (2017) 493–498.

[6] A. Shah, K. Alagawadi, J. Ethnopharmacol. 137, (2011) 1504–1509.

[7] M. Vasudevan, M. Parle, Phytomedicine 13, (2016) 677–687.

[8] S. Chandra, J. Herb. Med. 25, (2021) 100–110.

[9] F.R. Fosberg, M.H. Sachet, Smithson. Contrib. Bot. 7, (2020) 1–13.

[10] D. Mueller-Dombois, F.R. Fosberg, *Vegetation of Tropical Pacific Islands*, Springer, (2019).

[11] H. Panchal, M. Sah, Int. J. Pharmacogn. 7, (2016) 1–13.

[12] K. Ghosh, T. Bhattacharya, Indian J. Pharmacol. 36, (2014) 288–291.

[13] R. Pratap Chandran, S. Manju, M.V. Vysakshi, Int. J. Pharma Tech Res. 6, (2018) 290–297.

[14] T. Satyanarayana, Sarita, M. Balaji, Saudi Pharm. J. 12, (2019) 2–3.

[15] M.M. Goyal, K. Rani, Acta Ciencia Indica 11 (3), (2020) 163–164.

[16] A. Nagappa, B. Cheriyan, Fitoterapia 72, (2021) 503–506.

[17] P. Yuvaraj, A. Subramaniam, J. Basic Clin. Physiol. Pharmacol. 20, (2019) 169–177.

[18] D. Zhang, S. Zhang, J. Wu, Chin. J. Nat. Med. 18 (9), (2017) 2156–2157.

[19] S.C. Datta, V.V.S. Murti, N.N. Sharma, Indian J. Chem. 11, (2020) 506–507.

[20] S. Boonsri, C. Karalai, C. Ponglimanont, J. Nat. Prod. 71, (2018) 1173–1177.

[21] A. Sahu, H. Shivkumar, N.R. Rao, J. Pharm. Chem. 1 (1), (2017) 18–21.

[22] L. Puckhaber, R. Stipanovic, J. Nat. Prod. 67, (2014) 1571–1573.

[23] R. Ilavarasan, M. Vasudevan, S. Anbazhagan, J. Ethnopharmacol. 87, (2021) 227–230.

[24] A. Sahu, H. Shivkumar, N.R. Rao, J. Pharm. Chem. 1 (1), (2017) 18–21.

[25] M. Vasudevan, K.K. Gunnam, M. Parle, J. Ethnopharmacol. 109, (2020) 264–270.

[26] A. Shah, K. Alagawadi, J. Ethnopharmacol. 137, (2021) 1504–1509.

[27] C.H.M. Suvarna, P. Sriya, M.D. Arshad, K. Pavan, J. Drug Deliv. Ther. 8 (4), (2020) 1–4.

[28] R. Pratap Chandran, S. Manju, M.V. Vysakshi, Int. J. Pharma Tech Res. 6, (2021) 290–297.

[29] D. Senthil-Rajan, Trop. Biomed. 30 (4), (2023) 570–578.

[30] A. Saravanakumar, Pak. J. Pharm. Sci. 22 (3), (2019) 282–286.

[31] T. Satyanarayana, Sarita, M. Balaji, Saudi Pharm. J. 12, (2022) 2–3.

[32] D.K. Patel, Nat. Prod. Res. 37, (2023) 1221–1232.

[33] M. Rajalakshmi, Biomedicine 42, (2022) 215–228.

[34] M.B. Abdel Halim, Sci. Afr. 27, (2025) e02501.

[35] P. Yuvaraj, A. Subramaniam, J. Basic Clin. Physiol. Pharmacol. 20, (2019) 169–177.

[36] R. Ilavarasan, Nat. Prod. Sci. 9 (2), (2023) 83–86.

[37] A. Nagappa, B. Cheriyan, Fitoterapia 72, (2021) 503–506.

[38] M.B. Abdel Halim, BMC Complement. Med. Ther. 24, (2024) 85.

[39] A.H. Asif, Pharmacogn. Mag. 18 (79), (2022) 519–523.

[40] K. Jananai, Int. J. Basic Clin. Pharmacol. 10 (1), (2021) 115–121.

[41] S.B. Gaikwad, G. Krishna Mohan, Asian J. Pharm. Clin. Res. 4 (4), (2021) 99–101.

[42] S. Balasubramanian, Pharmacogn. Rev. 15, (2021) 45–56.

[43] M. Vasudevan, M. Parle, Pharm. Biol. 45 (4), (2020) 267–273.

[44] S. Boonsri, C. Karalai, C. Ponglimanont, J. Nat. Prod. 71, (2018) 1173–1177.

[45] M. Ibrahim, Cancer Cell Int. 22, (2022) 145–158.