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## THESPESIA POPULNEA LINN.: A REVIEW

S. Panchal Hiteksha <sup>\* 1</sup> and B. Shah Mamta <sup>2</sup>

Anand Pharmacy College <sup>1</sup>, Anand, Gujarat, India.

L. M. College of Pharmacy <sup>2</sup>, Ahmedabad, Gujarat, India.

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### Correspondence to Author:

S. Panchal Hiteksha

Department of Pharmacognosy,  
Anand Pharmacy College, Anand,  
Gujarat, India.

E-mail: hitekshapanchal22@yahoo.com

**ABSTRACT:** *Thespesia populnea* Linn. (Family- Malvaceae) is one of the important drugs used in Herbal medicines. It is known by the name Paras-pipal. It is often cultivated for ornament and shade, and it blooms throughout the year in the tropics. Various parts of this plant are found to possess useful medicinal properties, such as antifertility, antibacterial, anti-inflammatory, antioxidant, purgative, and hepatoprotective activities. The yellow juice of fruits is employed in treating certain hepatic diseases. A decoction of the bark is given internally in the diseases of skin and that of the fruits as an antidote for poisoning. The seed possess purgative properties. The plant has been shown to be effective in malaria. A wide range of biologically active compounds such as flavonoids, sesquiterpenoids, tannin, saponins, alkanes, essential oil, sugars, fatty acids and antioxidants are present in the plant. This contribution provides a comprehensive review of its ethno-medical uses, chemical constituents and pharmacological profile as a medicinal plant.

**INTRODUCTION:** *Thespesia populnea* Linn. (Family- Malvaceae) is a small evergreen tree averaging 6–10 m (20–33 ft) in height, with a short, often crooked stem and a broad, dense crown. It has glossy green, heart-shaped leaves and yellow hibiscus-type flowers. The tree grows well along warm coastal areas from the east coast of Africa and South and Southeast Asia to Melanesia, Micronesia, and Polynesia. It is currently naturalized in tropical climates throughout the world from the Caribbean to Africa. The tree is valuable as a coastal windbreak because it is highly resistant to wind and salt spray and grows well in sandy, saline soils <sup>1</sup>. It propagates easily and grows rapidly. It naturalizes easily and has become a weed in some areas, so it should not be planted in areas where it is not already present.

The tree grows best under full sunlight and tolerates drought conditions. The heartwood is resistant to dry wood termites. Milo has many uses including coastal protection, animal fodder, windbreaks, and living fences. The most common use in the Pacific today is probably as an ornamental tree, despite its valuable timber <sup>2</sup>.

It has a short, straight or crooked trunk and a dense crown with crowded lower horizontal branches. The bark is grey and smooth to highly fissured and dark brown in larger trees. Flowers are a typical hibiscus shape in appearance: bell-shaped, 4–7 cm (1.5–2.5 in) in length, with five over-lapping, broad, rounded petals. Colour is pale yellow with a maroon spot at the base of each petal and with star-shaped hairs on outer surface. Flowers open and close on same day, and the yellow flowers turn dark red, purple, or pink as the day progresses.

The alternate leaves are glossy green above and paler green below. Leaf blades are heart-shaped, Leaf stalks are long. Fruits are brittle, dry, woody or papery seed capsules, rounded and flattened, containing five cells and several seeds. The brown,

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hairy seeds are about 1 cm long and 0.6 cm broad. Seeds are blown short distances by wind but are more likely to be dispersed by water. Both the lightweight fruits and seeds can float from one island to another on ocean currents<sup>3</sup>.

Various parts of this plant are found to possess useful medicinal properties, such as anti-fertility, antibacterial, anti-inflammatory, antioxidant, purgative, and hepatoprotective activities. The bark, leaves, flowers and fruits are reported to be useful in cutaneous affections, such as scabies, psoriasis, ringworm, guinea worm, and eczema. The yellow juice of fruits is employed in treating certain hepatic diseases. A decoction of the bark is given internally in the diseases of skin and that of the fruits as an antidote for poisoning. Various parts of the plants have high tannin contents and plant extracts have been shown to have antibacterial and anti-viral activity. The compound oil of bark and capsule is useful in arthritis and gonorrhoea. The seed possess purgative properties. The plant has been shown to be effective in malaria<sup>4</sup>.

**Phytochemical Constituents:** Air-dried flowers of *T. populnea* contain kaempferol,  $\beta$ -sitosterol, gossypetin, quercetin, and a mixture of kaempferol 3-glucoside, quercetin 3-glucoside, kaempferol 5-glucoside separated, rutin, kaempferol 3-rutinoside, and kaempferol 7-glucoside<sup>5</sup>. A dextro-rotatory gossypol has recently been isolated from flowers, fruits and bark. The gossypol content in different parts of the tree are seed (3.14%), flower buds (3.37%), leaves (1.66%), roots (2.11%), stem (1.43%). Presence of herbecetin and thespesin has been reported from fruits<sup>6</sup>.

Heartwood is reported to contain sesquiterpenoids, named populene A-H (1-8)<sup>7</sup>. It also contains 6 sesquiterpenoidalquinones of the mansonone group containing the cadalene skeleton. Four were identified as mansonones C, D, E, and F. The other 2 are new natural products belonging to this group and are named thespesone I and thespone II. Based on spectral studies and chemical properties, their structures are assigned as 1,2,6,9-tetrahydro-7-hydroxy-1,5,8-trimethylnaphtho[2, 1-b]furan-6, 9-dione and 6,7-dihydro-1,5,8-trimethylnaphtho[2, 1-b]furan-6,7-dione, resp. Mansonone-D has been converted into both thespesone and thespone under

oxidation conditions<sup>7</sup>. A new mansonone, 7-hydroxy-2,3,5,6-tetrahydro-3,6,9-trimethylnaphtho[1,8-b,c]pyran-4,8-dione, in addition to mansonones D, E and F were isolated from the heartwood of *Thespesia populnea*<sup>8</sup>.

A new sesquiterpenequinone Thespesenone and Dehydrooxoperezinone-6-methyl Ether were isolated from *Thespesia populnea*<sup>9</sup>. Stem bark contains alkaloids, carbohydrates, protein, tannins, phenols, flavonoids, gums and mucilage, saponins and terpenes<sup>10</sup> of *Thespesia populnea* are reported to contain  $\beta$ -sitosterol-3-O- $\beta$ -D-glucopyranoside-6'-O-stearate,  $\beta$ -sitosterol, daucosterol, kaempferol, 1-hentriacontanol, stearic acid, betulin<sup>11</sup>. Leaves of *T. populnea* contain lupeol,  $\beta$ -sitosterol as the major constituents it also contain presence of lupenone, alkanes<sup>12</sup>.

### Pharmacological Activities:

**Anti-inflammatory, analgesic and antipyretic:** Oral administration of seed extract significantly reduced carrageenan induced paw edema and brewer's yeast-induced pyrexia. In tail immersion method also showed significant analgesic activity. GC-MS analyses showed the presence of fourteen fatty acids, predominant fatty acids were palmitic and stearic acid<sup>13</sup>.

The ethanolic extract of *Thespesia populnea* bark (TPE) was investigated for anti-inflammatory and analgesic activity for evaluation of inflammation carrageenan-, histamine- and serotonin-induced paw edema served as acute models and formaldehyde-induced arthritis served as a chronic model in rats. The acetic acid-induced writhing response and formalin-induced paw licking time in the early and late phases of mice were used to assess analgesic activity. Furthermore, phytochemical studies indicated that the ethanolic extract of bark contains alkaloids, carbohydrates, protein, tannins, phenols, flavonoids, gums and mucilage, saponins and terpenes<sup>14</sup>.

**Anti-diarrheal:** From the aqueous extract fractions namely methanolic fraction (MF) and residue fraction (RF) were made and studied for anti-diarrheal activity in castor oil induced diarrhea model, the RF and MF has significantly reduced the cumulative wet faecal mass, where as the, RF was found to be more potent than MF. RF had

shown significant inhibition of PG-E<sub>2</sub> induced secretions (anti-secretory) and decreased the movement of charcoal in charcoal meal test indicating its anti-motility activity. Furthermore, RF has showed significant inhibition of acetylcholine, histamine and BaCl<sub>2</sub> induced contractions on rat colon, guinea pig ileum and rabbit jejunum with EC<sub>50</sub> values of 241.7, 303.1 and 286.1 µg/mL, respectively indicating the anti-motility effect of RF. The phytochemical analysis of RF showed presence of gums and mucilage and the possible mechanism may be the combination inhibition of elevated prostaglandin biosynthesis and reduced propulsive movement of the intestine<sup>15</sup>.

**Hepatoprotective:** Leaf, flower and stem bark of *T. populnea* showed varying levels of protective action against CCl<sub>4</sub>-induced liver damage as evidenced from significant reduction in the activities of serum marker enzymes for liver damage (alanine transaminase, aspartate transaminase, and alkaline phosphatase), and bilirubin levels when compared with CCl<sub>4</sub>-intoxicated control rats. The stem bark suspension showed maximum hepatoprotection compared with leaf and flower. An ethanol extract of the stem bark was more active than n-hexane and water extracts, the hepatoprotective effect of this extract was almost comparable to that of silymarin (100 mg/kg), a reference herbal drug. Thus, the present study indicates that ethanol extract of *T. populnea* stem bark is promising for further studies leading to hepatoprotective drug development<sup>16</sup>.

*Thespesia populnea* (Malvaceae) bark was extracted with methanol and water. The extracts were vacuum dried to yield the resp. methanol (MET) and aq. ext. (AET). The extracts were evaluated for hepatoprotective activity against carbon tetrachloride (CCl<sub>4</sub>) induced liver damage at 2 dose levels (250 and 500 mg/kg). The biochemical parameters observed in serum were total bilirubin, alkaloid. phosphatase (ALP), serum glutamate oxaloacetate transaminase (SGOT), serum glutamate pyruvate transaminase (SGPT) levels and total protein. Aspartate transaminase (AST), alanine transaminase (ALT) and total protein levels in liver were also evaluated. Histopathology study on the liver tissue was also performed. The extracts exhibited dose dependent

reduction in total bilirubin, ALP, SGOT, SGPT, AST, ALT and increase in total protein (serum and liver) levels. The extracts also exhibited only mild hepatocytic damage compared to the CCl<sub>4</sub> treated group. MET was found to exhibit higher hepatoprotection than AET<sup>17</sup>.

**Memory enhancing activity:** Vasudevan *et al.*,<sup>11</sup> reported the effects of *T. populnea* bark on cognitive functions, total cholesterol levels and cholinesterase activity in mice. The learning and memory parameters were assessed using elevated plus maze and passive avoidance apparatus. Furthermore, TPE reduced significantly the central (brain) cholinesterase activity in mice. TPE exhibited a remarkable cholesterol lowering property comparable to simvastatin (a standard drug) in the present study. Furthermore, we observed that, *T. populnea* bark possessed a powerful memory enhancing activity in mice. Since diminished cholinergic transmission and increased cholesterol levels appear to be responsible for development of amyloid plaques and dementia in Alzheimer patients, Therefore, *T. populnea* bark appears to be a promising candidate for improving memory and it would be worthwhile to explore the potential of this plant in the management of Alzheimer patients<sup>18</sup>.

**The hypoglycemic and antihyperglycemic effects:** The hypoglycemic and antihyperglycemic effects of an alcoholic extract of the fruit of *Thespesia populnea* was investigated in both normal and alloxan-induced diabetes in rabbits. The present study clearly indicated a significant anti-diabetic activity of the fruit of *T. populnea* and supports the traditional usage of fruits by the Ayurvedic physicians for the control of diabetes<sup>19</sup>.

**Anti-implantation activity:** *Thespesia populnea* was tested for possible anti-implantation activity in Sprague-Dawley female rats of normal estrus cycle after overnight cohabitation with males of proven fertility. The day when spermatozoa were detected in vaginal smear was treated as 1st day of pregnancy. The compounds were administered to female rats from the 1st day to the 7th day of pregnancy. On the 10<sup>th</sup> day, the rats were laparotomized under light anaesthesia and the numbers of implantation sites and corpora lutea were noted. Result showed significant anti

implantation activity and they were found to be a mixture of two groups of long-chain fatty acids from GLC<sup>20</sup>.

**Antioxidant:** Antioxidant activity of the aqueous (AET) and methanolic extracts (MET) of the *Thespesia populnea* bark was investigated in rats by inducing liver injury with carbon tetrachloride: olive oil (1:1). The extracts exhibited significant antioxidant activity showing increased levels of glutathione per-oxidase (GPX), glutathione S-transferase (GST), glutathione reductase (GRD), superoxide dismutase (SOD) and catalase (CAT) and decreased level of lipid per-oxidation (LPO)<sup>21</sup>.

Antioxidant potential of the plant is evaluated against superoxide anion, hydroxyl radical and reducing power. The title plant exhibited concentration dependent antioxidant activity. Phytochemical studies indicated the presence of flavonoids and phenols in the tested extracts, which might have contributed to antioxidant activity. Further studies are in progress to isolate the antioxidant moiety of the tested extracts<sup>22</sup>.

**Wound healing activity:** The aqueous extract of *T. populnea* fruit showed significant wound healing activity in the excision wound and incision wound models in rats following topical and oral administration, respectively<sup>23</sup>.

**Immunomodulatory:** Methanolic ext. of leaves of *Thespesia populnea* (Family: Malvaceae). The methanolic extract of *T. populnea* (METP) The measurement of immunomodulatory property was carried out by Delayed Type Hypersensitivity (DTH), Humoral antibody (HA) titer response to SRBC, and Cyclophosphamide induced myelo-suppression. Phytochemical screening suggests the presence of flavonoids, triterpenoids, proteins, amino acids, phenolic and steroidal compounds the immunomodulatory activity of plant may be attributed to these phytoconstituents<sup>24</sup>.

**CONCLUSION:** The extensive literature survey revealed that *Thespesia populnea* is important medicinal plant with diverse pharmacological spectrum. The plant shows the presence of many chemical constituents which are responsible for varied pharmacological and medicinal property. The evaluation needs to be carried out on *Thespesia populnea* in order to uses and formulation of the

plant in their practical clinical applications, which can be used for the welfare of the mankind.

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## REFERENCES:

1. Mueller-Dombois, D., and F.R. Fosberg, Vegetation of the Tropical Pacific Islands, Springer, New York.1998.
2. Wagner, W.L., D.R. Herbst, and S.H. Sohmer, Manual of the Flowering Plants of Hawaii, rev. ed. University of Hawai'i Press and Bishop Museum Press, Honolulu,1999.
3. Fosberg, F.R., and M.H. Sachet, *Thespesia populnea* (L.) Solander ex Correa and *Thespesia populneoides* (Roxburgh) Kosteletsky (Malvaceae), Smithsonian Contributions to Botany, 1972, 7, 1-13.
4. Parrotta, J.A, *Thespesia populnea* (L.) Soland. Ex Correa. In: Silvics of Native and Exotic Trees of Puerto Rico and the Caribbean Islands. SO-ITF-SM-76. USDA Forest Service, International Institute of Tropical Forestry, Puerto Rico, 1994.
5. Datta, S. C.; Murti, V. V. S.; Sharma, N. N.; Seshadri, T. R., Glycosidic components of *Thespesia populnea* flowers, Indian Journal of Chemistry,1973, 11(5),506-7.
6. Wealth of India, A dictionary of Indian Raw materials and Industrial Products. Council of Scientific and Industrial Research, New Delhi, 1998, 10, 223-225.
7. Boonsri, S,Karalai C, Ponglimanont, C, Chantrapromma S, Cytotoxic and Antibacterial Sesquiterpenes from *Thespesia populnea*. Journal of Natural products, 2008, 71, 1173-1177.
8. Neelakantan, S.; Rajagopalan, V.; Raman, P. V, Thespesone and thespone, two new mansonones of heartwood of *Thespesia populnea* Sol. ex Corr. (Fam. Malvaceae), Indian Journal of Chemistry, Section B: Organic Chemistry Including Medicinal Chemistry, 1983, 22B(1), 95-6.
9. Mibrodt *et al.*, isolated mansonone, 7-hydroxy-2,3,5,6-tetrahydro-3,6,9-trimethylnaphtho[1,8-b,c]pyran-4,8-dione, and mansonones D, E and F from the heartwood of *Thespesiapopulnea*,1998.
10. Puckhaber L, Stipanovic R, Thespesenone and Dehydrooxoperezinone-6-methyl Ether, New Sesquiterpene Quinones from *Thespesia populnea*. Journal of Natural product.2004, 67, 1571-1573.
11. Vasudevan M, GunnamK, Parle M, Antinociceptive and anti-inflammatory effects of *Thespesia populnea* bark extract, Journal of Ethnopharmacology, 2007, 109, 264-270.
12. Zhang, Daojing; Zhang, Si; Wu, Jun, Chemical constituents of the bark of *Thespesia populnea*, 2007, 18(9), 2156-2157.
13. Goyal, M. M.; Rani, KumKum, *Thespesia populnea* - a rich source of  $\beta$ -sitosterol and lupeol, ActaCiencia Indica, Chemistry, 1985, 11(3), 163-164.
14. Shah A, Alagawadi K, Antiinflammatory, analgesic, antipyretic activity of *Thespesia populnea* seed extracts ant

- its fraction in animal models, Journal of Ethnopharmacology, 2011; 37, 1504-1509.
15. Viswanatha G, Hanumanthappa H, Rangappa S, Antidiarrhoeal effect of fractions from stem bark of *Thespesia populnea* in rodents. Pacific Journal of Tropical Medicine. 2011; 4, 451-456.
  16. Yuvaraj P, Subramoniam A, Hepatoprotective property of *Thespesia populnea* against carbon tetrachloride induced liver damage in rats, J Basic Clin Physiol Pharmacol, 2009; 20, 169-77.
  17. Ilavarasan, R.; Vasudevan, M.; Anbazhagan, S.; Venkataraman, S.; Sridhar, S. K. Hepatoprotective activity of *Thespesia populnea* bark extracts against carbon tetrachloride-induced liver toxicity in rats, Natural Product Sciences, 2003, 9(2): 83-86.
  18. Vasudevan M, Parle M, Pharmacological actions of *Thespesia populnea* relevant to Alzheimer's disease. Phytomedicine, 2006, 13, 677-687.
  19. Satyanarayana T, Sarita, Balaji M, Murthy K, Antihyperglycemic and Hypoglycemic effect of *Thespesia populnea* fruit in normal and alloxan induced diabetes in rabbits. Saudi Pharmaceutical journal, 2004; 12, 2-3.
  20. Ghosh K, Bhattacharya T, Preliminary study on the anti-implantation activity of compounds from the extracts of seeds of *Thespesia populnea*, Indian journal of Pharmacology, 2004, 36, 288-291.
  21. Iivarasan R, Vasudevan M, Anbazhagan S, Antioxidant activity of *Thespesia populnea* bark extracts against carbon tetrachloride-induced liver injury in rats. Journal of Ethnopharmacology, 2009, 87, 227-230.
  22. Amit, Sahu, Shivkumar H, Nagendra, Rao R, Jayakumar, Swamy B. H. M. and Prakash, T., Anti-oxidant activity of flower extracts of *Thespesia populnea*, Journal of Pharmacy and Chemistry, 2007, 1(1), 18-21.
  23. Nagappa A, Cheriyan B, Wound healing activity of the aqueous extract of *Thespesia populnea* fruit. Fitoterapia, 2001. 72, 503-506.
  24. Gaikwad, Switi B.; Krishna Mohan, G., Immunomodulatory activity of methanolic extract of *Thespesia populnea* leaves in wistar albino rats, Asian Journal of Pharmaceutical and Clinical Research, 2011, 4(4), 99-101.

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