A PHYTOCHEMICAL AND PHARMACOLOGICAL REVIEW ON 

PELTOPHORUM PTEROCARPUM (DC.) BAKER EX HEYNE

Dharmasoth Rama Devi* and Ganga Rao Battu

A.U College of Pharmaceutical Sciences, Andhra University, Visakhapatnam, A.P, India-530003.

ABSTRACT

In spite of great advances of modern scientific medicine, traditional medicine is still the primary form of treating diseases of majority of people in developing countries including India. The widespread use of herbal remedies and healthcare preparations is described in the Vedas and the Bible. Medicinal Plants have been used for thousands of years to flavor and conserve food, to treat health disorders and to prevent diseases including epidemics. The knowledge of their healing properties has been transmitted over the centuries within and among human communities. Active compounds produced during secondary metabolism are usually responsible for the biological properties of plant species used throughout the globe for various purposes, including treatment of infectious diseases. This review attempts to encompass the adequate information to develop suitable therapeutics and bioactive molecules out of these plant parts of peltophorum pterocarpum leaf.

KEYWORDS: peltophorum pterocarpum, Secondary metabolites, Ethno botanical uses

INTRODUCTION

Peltophorum pterocarpum (belonging to Fabaceae family) regarded as one of the most significant plant species in traditional system of medicine. The plant is used in different parts of the world for the treatment of several ailments like stomatitis, insomnia, skin troubles, constipation, ringworm, insomnia, dysentery, muscular pains, sores, and skin disorders and is the source of a diverse kind of chemical constituents such as aliphatic alcohols, fatty acids, amino acids, terpenoids, phenolics, flavonoids, alkaloids, steroids etc. The isolated phytochemicals as well as different extracts exhibited numerous biological activities.
including antimicrobial, antioxidant, cytotoxic, aldose reductase inhibition and antiglycaemic activities. Literature survey indicated that very little phytochemical and pharmacological research had been carried out on leaves of this plant. This formed the basis of my research work. Exhaustive and up to date survey of literature on botanical and ethanobotanical profile earlier phytochemical and pharmacological works done on the selected plant was conducted.

2.2 Introduction to family leguminaceae.[29]

The Leguminosae is one of the largest families of flowering plants with 18,000 species classified into around 650 genera (Polhill & Raven, 1981). This is just under a twelfth of all known flowering plants. The Leguminosae is an extremely diverse family. The Leguminosae family constitutes one of humanity’s most important groups of plants.

Legumes are used as crops, forages and green manures. The Leguminosae family is used for synthesis of a wide range of natural products such as flavours, drugs, poisons and dyes.

Characteristics of the Leguminosae

Legumes are a significant component of nearly all terrestrial biomes, on all continents (except Antarctica). Some are fresh-water aquatics, but there are no truly marine species. The species within the family range from dwarf herbs of arctic and alpine vegetation to massive trees of tropical forest. The principal unifying feature of the family is the fruit, a pod, technically known as a Legume. The Legume is modified in many ways to facilitate dispersal by animals, wind and water. Families: Papilionoideae, Caesalpinioideae and Mimosoideae. These sub-families are sometimes recognised as three separate families: Papilionaceae, Caesalpiniaceae and Mimosaceae. The three subfamilies are generally identifiable by their flowers.

Introduction to the genus peltophorum[2]

Peltophorum is a genus of between 5–15 species of flowering plants in the family Fabaceae, subfamily Caesalpinioideae. The genus is native to certain tropical regions across the world. The species are medium-sized to large trees growing up to 15-25 m (rarely 50 m) tall.[1-2]

Blatter and Millard (1937) state.[3]
**Systematic position**[^3]

- **Domain**: Eukaryota
- **Kingdom**: Plantae
- **Phylum/Division**: Magnoliophyta
- **Phylum**: Spermatophyta
- **Subphylum**: Angiospermae
- **Class**: Dicotyledonae
- **Order**: Fabales
- **Family**: Fabaceae / Leguminosae
- **Genus**: Peltophorum
- **Species**: Peltophorum pterocarpum[^4,^5]

**BINOMIAL NAMES**: *Peltophorum pterocarpum*(DC.) *Backer ex Heyne*

**Synonym(s)**[^4]

- Peltophorum ferrugineum (Decne.) Benth.
- Peltophorum inerme (Roxb.) Naves ex Fernandez-Villar
- Peltophorum roxburghii (G. Don) O. Deg.
- Baryxylum inerme (Roxb.) Pierre
- Caesalpinia ferruginea Decne.
- Caesalpinia inermis Roxb.
- Inga pterocarpa DC.[^4]

**International Common Name**

- English: copper-pod, rusty shield bearer, sagabark peltophorum, Yellow flam boyant, yellow flame, yellow gold mohur, yellow poinciana

**VERNACULAR NAME(S)**[^4,^5]

- **Telugu**: Konalachinta, bonmeza, ivavakai, perungondrai,
- **Hindi**: Peela gulmohar
- **Tamil**: Ivalvagai, Ivavakai, Peringondarai
- **Malayalam**: Poomarum

**Phytogeography and ecology**[^10]

- **Growth habit**: Deciduous tree
- **Habitat**: Tropical
Origin: native to tropical southeastern Asia
Status of plant in nature: ornamental and as an avenue tree

Morphology

Vegetative Morphology\cite{10}

*Peltophorum Pterocarpum* is a deciduous tree usually reaching a height of about 15 (-24) m, although it may attain 50 m (Lemmens and Wulijarni-Soetjipto, 1991) and a diameter of 50 (-100) cm. The bark is smooth and grey (De Guzman et al., 1986). *P. pterocarpum* has a dense, spreading crown (Merrill 1912; Steiner 1986). It has a deep root system (Hairiah et al., 1992), making it very windfirm (Lemmens and Wulijarni-Soetjipto, 1991).

Foliage

Leaves are large and much divided, 30-60 cm long, with 8-10 pairs of pinnae each bearing 10-20 pairs of oblong leaflets 0.8-2.5 cm long with oblique bases (De Guzman et al., 1986).

REPRODUCTIVE MORPHOLOGY

Inflorescences, flowers and fruits

The inflorescence is brown-tomentose (Merrill, 1912). Panicles are terminal with rust colouredbuds.

Flowers are orange-yellow in colour and each about 2.5 cm in diameter, fragrant, particularly at night. Fruits 1-4 seeded pods, flat, thin, winged, 5-10 cm long, dark red when ripe, then turning black (De Guzman et al.).
Economical importance\(^\text{\textsuperscript{22,4}}\)

The wood is used to make furniture, axe handles, buckets and ornaments; it is also used as fuel. Young leaves and pods are eaten by livestock. Flowers provide a high yield of nectar and pollen for bee-keeping. The timber can be used for furniture. The wood is good for fuel. It makes a good shade tree for both livestock and humans. Roots are used to heal wounds, toothache and throat sores; root, leaves and bark used to clear intestinal parasites and relieve stomach problems; bark relieves colic; stem and root used for diarrhoea and dysentery. It is also used to treat eyes.

Different ethno botanical uses reported with *peplophorum pterocarpum*.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Plant part used</th>
<th>Therapeutic uses in ethanomedicine</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Stem</td>
<td>Antimicrobial, antioxidant, tooth powder, muscular pain dysentery for gargles(^\text{[18]})</td>
</tr>
<tr>
<td>2.</td>
<td>Bark</td>
<td>Dysentry, eye lotion, embrocation for pains&amp;sores(^\text{[22]})</td>
</tr>
<tr>
<td>3.</td>
<td>Leaves</td>
<td>Alzheimers, skin disorders(^\text{[18,19,20]})</td>
</tr>
<tr>
<td>4.</td>
<td>Flower</td>
<td>Insomnia treatment, anti inflammatory(^\text{[21,22]})</td>
</tr>
<tr>
<td>5.</td>
<td>Root</td>
<td>heal wounds, toothache and throat sores, in eye treatment(^\text{[20,19]})</td>
</tr>
</tbody>
</table>

General uses of genus (*peplophorum pterocarpum*)

The bark of *P. pterocarpum* has been an important component of the dark or black 'soga' dye in Java, used for batik work. It is also used for tanning leather, and preserving and dyeing fishing nets. In Indonesia, the bark is used for fermenting palm wine. In traditional medicine it is used as an astringent to cure or relieve intestinal disorders after pain at childbirth, sprains, bruises and swelling or as a lotion for eye troubles, muscular pains and sores.
Devi et al. (Lemmens and Wulijarni-Soetjipto, 1991; De Guzman et al., 1986). It is also used for gargles and tooth powders. It is suitable for use as a fodder for browsing herbivores (Nag and Matai, 1992). In India, it is a source of pollen for the dammer bee Trigona iridipennis (Ramanujam et al., 1993). Animal feed, fodder, forage, Agroforestry, Ornamental, Revegetation Dye/tanning Green manure, Charcoal, For light construction, Marquetry Wood carvings, Woodware.\[^4\]

**Selected species\[^{1-3}\]**
- *Peltophorum acutifolium* (J.R.Johnst.) J.R.Johnst.
- *Peltophorum africanum* Sond.
- *Peltophorum dasyrhachis* (Miq.) Kurz
- *Peltophorum dubium* (Spreng.) Taub.
- *Peltophorum pterocarpum* (DC.) Backer ex K.Heyne
- *Peltophorum linnaei*
- *Peltophorum. adnatum* (Abey Macho
- *Peltophorum. berterianum*
- *Peltophorum berteroanum*
- *Peltophorum. Brasiliense*
- *Peltophorum dasyrachis*
- *Peltophorum dasyrachis var. tonkinensis*
- *Peltophorum dasyrhachis*
- *Peltophorum dasyrhachis*
- *Peltophorum dasyrhachis var. dasyrhachis*
- *Peltophorum dasyrhachis var. tonkinense*
- *Peltophorum dubia* (Horsebush)
- *Peltophorum dubium* (Arbol De Artigas)
- *Peltophorum dubium var. adnatum*
- *Peltophorum ferrugineum*
- *Peltophorum grande*
- *Peltophorum inerme*
- *Peltophorum linnaei* (Braziletto)
- *Peltophorum. Massaiense*
- *Peltophorum pterocarpa* (Yellow Flamboyant)
- *Peltophorum pterocarpum* (Copper Pod Tree)
- Peltophorum. Racemosum
- Peltophorum rufum
- Peltophorum. Scioanum
- Peltophorum suringari
- Peltophorum tonkinense
- Peltophorum. Venezuelense
- Peltophorum vogelianu

2.16 Phytochemical review on *peltophorum pterocarpum*.\(^{[23]}\)

<table>
<thead>
<tr>
<th>S. No</th>
<th>Plant Part</th>
<th>Compound Isolated</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Stem bark(^{[34]})</td>
<td>Isosativen, (+)-Cycloisosativene, (-)-α-Panasins, 2,5,5-Trimethyl-3-hexyn-2-ol, 1-Ethyl-4,4-dimethylcyclohex-2-en-1-ol, Epiglobulol, Viridiflorol, Bicyclogermacrene, Cordinol, δ-Cedrol, Jatamansone, Valeranone, Valerenal, Megastigma-4,6e,8e triene Valerenic acid 1,2-benzendicarboxylic acid Hexadecanoic acid, Hypocholesterol-mic, 12-Octadecadienoic acid, 9-Octadecenoic acid ethylester1-Docosene, 1-Tricosanol Di-N-Octyl phthalate, β-Sitosterol, Cholesteryl propanoate, Cholesta-4,6-dien-3-ol, Benzoate Vitamin E acetat Lupeol, 3 Stigmast-4-en-3-one, 17-[5-(1-Hydroxy-1-methylethyl)-2-methyl-tetrahydrofuran-2-yl] 1.10 Cholest-4-ene-3,6-dione.(^{[31]})</td>
</tr>
<tr>
<td>2.</td>
<td>Leaves.(^{[28,31]})</td>
<td>5-Hydroxy-7-methoxy-2-(3,4dihydroxy)phenoxychromone, 5-Hydroxy-7-methoxy-2-(3'-O-β-glucopyranosyl, 4'hydroxy) phenoxychromone, Naringenin, Ophioglonin, 7-Methoxy ophioglonin, Kaempferol Isorhamnetin, luteolin, chrysoeriol, 3,7-Dimethylquercetin28, 3,7-Dimethylquercetin28, Quercetin-3-O-β-D-galactopyranoside 31.</td>
</tr>
<tr>
<td>3</td>
<td>Flowers</td>
<td>Bergenin, an isocoumarin, Tannins, saponins, flavonoids, alkaloids, and several other aromatic compounds.(^{[22]}) Lysine.(^{[28]})</td>
</tr>
<tr>
<td>4.</td>
<td>wood and bark</td>
<td>Leuco cyanidin-3-O-α-D-galactopyranoside(^{[27]}) Contains tannins.(^{[13]})</td>
</tr>
<tr>
<td>5</td>
<td>Seeds</td>
<td>Aspartic acid, Glutamic acid, Serine, Glycine, Alanine, Cystine, Phenylalanine, Valine, Methionine, Leucine, Isoleucine, Arginine, Histidine., Proline, Tyrosine, Tryptophan, Peltopterin.(^{[25]})</td>
</tr>
<tr>
<td>6</td>
<td>Bark and root</td>
<td>Gallotannin.(^{[34]})</td>
</tr>
<tr>
<td>6</td>
<td>Fruit</td>
<td>Rhamnetin(^{[29,30]}) Melanoxetin, Meratin (-)-Epicatechin</td>
</tr>
<tr>
<td>7</td>
<td>Seed oil</td>
<td>Linoleic acid(^{[10]}) Linolenic acid Oleic acid Palmitic acid Stearic acid</td>
</tr>
</tbody>
</table>

\(\text{Linoleic acid}^{[10]}\) Linolenic acid Oleic acid Palmitic acid Stearic acid
Known compound structures of *peltophorum pterocarpum*

![Compound Structures](image)

**Previous pharmacological work**

*Peltophorum pterocarpum* can be used as herbal medicines in the control of *E. coli* and *S. aureus* induced medical diseases. The phytochemical investigation on *Peltophorum pterocarpum* leaves resulted in the isolation of eight flavonoids among which a unique flavone was able to inhibit acetylcholinesterase as well as possesses cardiotonic activity. Stem extracts also reported hexadecanoic acid, ethyl ester and n-hexadecanoic acid, unsaturated fatty acid, docosatetraenoic acid and octadecatrienoic acid as antimicrobial, anti-inflammatory, antioxidant, hypocholesterolemic, cancer preventive, hepatoprotective, antiarthritic, antihistimic, antieczemic and anticoronary properties.

The leaf and bark extracts of *Peltophorum pterocarpum* were evaluated for their DPPH, ABTS, and galvinoxyl radicals scavenging activity, phenolic content. Peltogynoids and 2-phenoxychromones from *Peltophorum pterocarpum* and evaluation of their estrogenic activity from leaf.

*Peltophorum Pterocarpum* inhibits cholinesterase and thus may be relevant in the treatment of memory dysfunctions and neurodegenerative disorders such as Alzheimer’s disease. Antimicrobial, free radical scavenging activities and chemical composition of *Peltophorum pterocarpum* Baker ex K. Heyne stem extract.
Assessment of total phenolic content and antioxidant potential of methanol extract of Peltophorum pterocarpum (DC.) Backer ex K.Heyne.[6] In vivo cytotoxicity of flower extract of Peltophorum pterocarpum along with their analgesic and antibacterial activities.[12,13] Petroleum ether and ethanol extracts of P. pterocarpum flowers were found to exhibit cardiotonic activity on frog heart[24], Petroleum ether extract produced significant positive inotropic and positive chronotropic actions.

Biswas et al.[42] reported that 70% ethanolic extract of P. pterocarpum leaves may have the potential therapeutic value in the treatment of paracetamol induced hepatic damage and some liver diseases of Wistar albino rats.

REFERENCES
10. Thamilvaani Manaharan; Ling Lai Teng; David Appleton; Cheng Hwee Ming; Theanmalar Masilamani; Uma Devi Palanisamy.
15. R. C. Jagessar et al. 4 reported antibacterial and antifungal activity of leaf extracts of Luffa operculata, vs Peltophorum pterocarpum. against Candida albicans, Staphylococcus aureus and Escherichia coli on a hexane, dichloromethane, ethyl acetate and ethanol. The solvents had, 2007.
27. Karunai Raj M, Balachandran C, Duraipandiyan V, Agastian P, Ignacimuthu S and 
    Vijayakumar A: Isolation of terrestribisamide from Peltophorum pterocarpum (DC.) 
    Baker ex. K. Heyne and its antimicrobial, antioxidant, and cytotoxic activities. Medicinal 
    Chemistry Research 2012, DOI 10.1007/s00044-012-0393-3, published online: 11th 
    December, 2012.
28. Polasek J, Queiroz EF, Marcourt L, Meligova AK., Halabalaki M, Skaltsounis AL, Alexis 
    MN, Prajogo B, Wolfender JL and Hostettmann K: Peltogynoids and 2-
    phenoxychromones from Peltophorum pterocarpum and evaluation of their estrogenic 
29. Menon PS, Gangabai G, Swarnalakshmi T, Sulochana N and Amala B: Chemical and 
    pharmacological studies on Peltophorum pterocarpum. Indian Drugs, 1982; 19: 345–347.
30. Jain SC, Pancholi B and Jain R: Antimicrobial, free radical scavenging activities and 
    chemical composition of Peltophorum pterocarpum Baker ex K. Heyne stem extract. Der 
31. Manaharan T, Teng LL, Appleton D, Ming CH, Masilamani T and Palanisamy UD: 
    Antioxidant and antiglycemic potential of Peltophorum pterocarpum plant parts. Food 
32. Karunai Raj M, Balachandran C, Duraipandiyan V, Agastian P, Ignacimuthu S and 
    Vijayakumar A: Isolation of terrestribisamide from Peltophorum pterocarpum (DC.) 
    Baker ex. K. Heyne and its antimicrobial, antioxidant, and cytotoxic activities. Medicinal 
    Chemistry Research 2012, DOI 10.1007/s00044-012-0393-3, published online: 11th 
    December, 2012.
33. Rahman W, Ilyas M and Hameed N: Flower pigments: flavonoid glycosides from 
34. Jain SC, Pancholi B and Jain R: Antimicrobial, free radical scavenging activities and 
    chemical composition of Peltophorum pterocarpum Baker ex K. Heyne stem extract. Der 
    effect of leaves of Peltophorum pterocarpum against paracetamol induced acute liver 
    001(001): 10-10.