AN OVERVIEW OF *DELONIX REGIA*: CHEMISTRY AND PHARMACOLOGICAL PROFILE

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Summary

*Delonix regia* (Caesalpiniaceae) has been used widely as medicine in Ayurveda. The chemical constituents reported from this plant belong to different classes such as carbohydrates, amino acids, tannins, flavonoids, phytosterols, alkanes, esters, and anthocyanin pigments. It has number of medicinal uses, many of which have been verified by scientific methods. This review article summarizes the chemistry and pharmacological profile of *D. regia*.

Keywords: *Delonix regia*, antioxidant, antimicrobial, antifungal, analgesic, anti-inflammatory, larvicidal, ovicidal, anthocyanins, carotenoids, zeaxanthins and lectin.

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Introduction

*Delonix regia* (Caesalpiniaceae) is a stirringly ornamental medium sized tree planted in garden in all the warmer and damper part of India, native to Madagascar. It is commonly known as Gulmohar (Hindi) and flamboyant or Royal Poinciana (English). Leaves are abruptly bipinnate, subulate and quickly caduceus. Leaflets are small and are many in number. This aptly named tree produces striking flame-like scarlet and yellow flowers. Petals are five, orbicular, imbricate clawed, sub equal or the uppermost dissimilar and margin is fimbriate. Stamens are ten, ovary is sub-sessile and many-ovulated. Pod is elongated, flat, woody and dehiscent. Seeds are transverse oblong¹. Bark contain leucocyanidin, lupeol, tannin, β-sitosterol and free OH-proline as major amino acid and is used as antiperiodic and febrifuge. Flower anthers are a rich source of zeaxanthin. Its aqueous and alcoholic extracts were active against roundworm. Leaves contain tannins, lupeol and β-sitosterol. Plant is used as antirheumatic and spasmogenic.²

Chemistry

Various chemical constituents isolated from different parts of the plant *D. regia*, have been given in table-I and structures of some of the constituents are given in Fig. I.
**Table I: Phytoconstituents of Delonix regia.**

<table>
<thead>
<tr>
<th>Plant part investigated</th>
<th>Chemical constituents isolated</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flower</td>
<td>Anthocyanins, Cyanidine 3-o-glucoside, Cyanidine 3-o-rutinoside, Pelargonidine 3-o-rutinoside, Zeaxanthin, Carotenoids and Natural dyes.</td>
<td>17, 18, 19, 20</td>
</tr>
<tr>
<td>Floral parts</td>
<td>1,2-Benzene dicarboxylic acid.</td>
<td>21</td>
</tr>
<tr>
<td>Seeds</td>
<td>Lectin, Fatty acid, Protein and free amino acid.</td>
<td>22, 23, 24</td>
</tr>
<tr>
<td>Fruit</td>
<td>Activated Carbon</td>
<td>25</td>
</tr>
<tr>
<td>Misc.</td>
<td>Phytotoxins-4-hydroxybenzoic acid, Chlorogenic acid, 3,4-dihydrobenzoic acid, Gallic acid, 3,4-dihyrodycinnamic acid, 3,5-dinitrobenzoic acid, L-azetidine-2-carboxylic acid and 3,4-dihydroxybenzaldehyde. L-Azetidine-2-carboxylic acid and Amino acids.</td>
<td>25, 26, 27</td>
</tr>
</tbody>
</table>

**Figure I: Structures of Chemical Constituents.**

Anthocyanins

Cyanidine 3-o-glucoside

Cyanidine 3-o-rutinoside
Pelargonidine 3-o- rutinoside

Caroténoïdes

Zeaxanthin

Phytotoxins 4-hydroxybenzoic acid

Chlorogenic acid

3. 4-dihydroxy benzoic acid

Gallic Acid
3. 4-dihydroxy cinnamic acid

Azetidine-2-carboxylic acid  3, 4-dihydroxy benzaldehyde

**PHARMACOLOGICAL ACTIVITY**

**Antimicrobial activity:**
Aqueous extract of *D.regia* plant exhibited marked activity against species of Aspergillus such as *A. candidus, A.columnaris, A.laviceps, A.fumigatus, A.niger, A.ochraceus* and *A.tamari.* Crude alcoholic extract and fractions of *D.regia* (flowers) exhibited broad spectrum antibacterial and antifungal activities and potency was tested against nine bacteria, six filamentous fungi and a yeast *Candida albicans* by agar diffusion method. MIC was found in the range of 4.5-12.5 mg/ml against *C. albicans.*

Aqueous and methanolic extract of *D.regia* plant was evaluated on bacterial strains like *Bacillus cereus* (ATCC11778), *Staphylococcus aureus* (ATCC25923), *Enterobacter aerogenes* ATCC13048, *Escherichia coli* (ATCC25922) and *Klebsellia pneumoniae* (NCIM2719). The significant antibacterial activity of active extracts, piperacillin (100 µg/disc) and gentamicin (10 µg/disc). Aqueous and methanolic extract of *D.regia* L. plant shows antibacterial activity against bacterial strains, namely *Bacillus subtilus* (ATCC6633), *Staphylococcus epidermis* (ATCC12228), *Pseudomonas pseudologicaligens* (ATCC17440), *Proteus vulgaris* (NCTC8313) and *Salmonella typhimurium* (ATCC23564) was determined by agar disk diffusion and agar well diffusion method. Ethanolic extract of *D.elata* and *D.regia* have shown good antimicrobial activity (40 mg/10ml).analgesic activity at the dose of 200 mg/kg body weight. Ethanolic extract and some fractions of *D.regia* (flowers) showed a broad spectrum of antibacterial activity with an inhibition zone size of 11 mm to 27 mm, against all the test bacteria. Antibacterial activity was observed in acetone and in the methanol fractions. Acetone and methanol fractions of *D.regia* (flowers) was located for antimicrobial activity and showed broad spectrum antibacterial activity against all (MRSA) strains with inhibition zone size of 11 mm to 27 mm. Invitro efficacy of bioactive extracts of 15 medicinal plants against ESβL-producing multidrug-resistant enteric bacteria.
Antioxidant and Free Radical Scavenging Properties

Methanolic crude extracts of *D. regia* was screened for their antioxidant and free radical scavenging properties using α-tocopherol and butylated hydroxyl toluene as standard antioxidant, measured by ferric thiocyanate (FTC) assay and compared with the thiobarbituric acid (TBA) method. Free radical scavenging activity was evaluated using diphenyl picryl hydrazyl (DPPH) radicals. The extract showed significant antioxidant activity.  

Anti-inflammatory and Analgesic activities:

Analgesic activity at the dose of 200 mg/kg body weight. The extract of *D. regia* bark, and *D. regia* flowers used at the dose rate of 300 mg/kg, p.o. Aspirin (300 mg/kg, p.o.) was employed as a reference drug which exhibited significant anti-inflammatory activity, were also tested for analgesic activity, using Randall-Selitto method in rats.

Larvicidal activity:

The extracts of *D. regia* was effective at higher concentrations showed larvicidal effect was tested against third and fourth instar larvae of *Culax quinquefasciatus*. Flower extracts of *D. regia* showed the percentage of hatching of eggs was significantly reduced. It is also highly toxic to larvae and pupae. Third instar larvae are more susceptible to extract than final instar larvae. The adult emergence from the treated pupae was completely inhibited at a concentration of 200 ppm.

Inhibition of Tomato Spotted Wilt Virus:

The extract of *D. regia* showed high percentage (about 85 percent) of inhibition of T.S.W. virus.

Nutritional and Haemagglutination properties:

The Haemagglutinating activity of the seed extract of *D. regia* plant was evaluated against a range of animal and human erythrocytes by a serial dilution method. Nutritional performance of rats fed upon diets containing seeds was achieved without expensive pre-treatment of the seeds or for supplementation of the diets with individual amino acids. These seeds of *D. regia* contained only low levels of essentially non-toxic lectin and they have great potential for development as source of dietary protein for man and animals.

References


25. Mohammad Masbahuddin Hawaldar, Quazi Sohel Hussain, Sarwaruddin Choudhry AM, Mustafa AI, Motalib MA. Activated Carbon from Krishnachurna Fruit (*Delonix regia*) and Castor seed (*Ricinus communis* L.). Ind. J. Chem. techn. 1991; v.6, no.3: 146-151
