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GULMOHAR – A PROMISING MEDICINAL PLANT IN DISGUISE OF AN ORNAMENTAL PLANT

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ABSTRACT

Herbal remedies are considered as nature's one of the best gifts to mankind. Even in this 21st century, these are as important as it was earlier. The present paper reviews and summarizes the morphology, phytochemical constituents and biological activities of the plant *Delonix regia* raffin (Gulmohar). It is studied that it contains terpenoids, glycosides, sterols, phenols, tannins etc. and various parts of the plant are evaluated for antioxidant, hepatoprotective activity, antiulcer effect, anti-diabetic activity, etc. More research work is needed in the field of its isolation, characterization, dosage forms and its evaluation to make it established markets formulations of remarkable economical importance.

Keywords: *Delonix regia*, Gulmohar, antioxidant, hepatoprotective activity, antiulcer.

INTRODUCTION

Since ancient times plants have been used for health and medicinal purpose since human civilization and are preferred over synthetic medication because of their safety and cost effective and they act as a precursor of many useful drugs having therapeutic efficacy [1]. About three-quarters of the world population relies on plants and plant extracts for thousands of years, showing a keen interest in non-synthetic, natural drugs which are derived from plant sources having effective against various diseases [2-4].

Delonix regia also known as the flame of forest is native to Madagascar and found throughout the tropical climates especially during the period May to June. The fruits ripen in August to October. It is mainly a type of ornamental plant used for the decoration of playground, parks, street linings and any place of tourist interest [5]. *Delonix regia* also known as Royal Poinciana [6],belonging to the family leguminosae, Subfamily fabaceae is a stirringly ornamental medium sized tree planted in the garden in all the warmer and damper part of India native to Madagascar [3,7].

MORPHOLOGY

Some of its popular synonyms are Gulmohar (Hindi) and flamboyant (English) [8,9] Krishnachura (Bengali) and Gold Mohr [10]. The tree produces striking flame like scarlet - yellow flowers having four spoon shaped, spreading scarlet or orange-red petals and one upright slightly which is marked with yellow and white colours [11].The **Bark** is usually crooked and twisted with irregular branches and rough gray texture [12].The **leaves** are mainly of three types subulate, cauduceus and bipinnate. **Leaflets** are small and are many in number. **Petals** are five in number and its shape is nearly orbicular, imbricate clawed and margin is fimbriate.

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Stamens are ten in number, ovary is sub-sessile and multi ovulated. **Pod** is elongated, flat, woody and dehiscent.**Seeds** are transverse oblong [13].The upper petal has streaks of yellow and white and the stamens are prominent and curved slightly downward. When the tree becomes leafless seed pods are large, flat and about 40 to 70 cms by 2.5 to 4 cms in size. It becomes compressed, hard, brown or black when ripe were collected in the month of September to October. Distinct cavities of brown colour with a dark ridge and hard bony testa are found in seeds.They are oblongated in shape and measure about 1.5 to 2 cms in length [2, 14, 15].

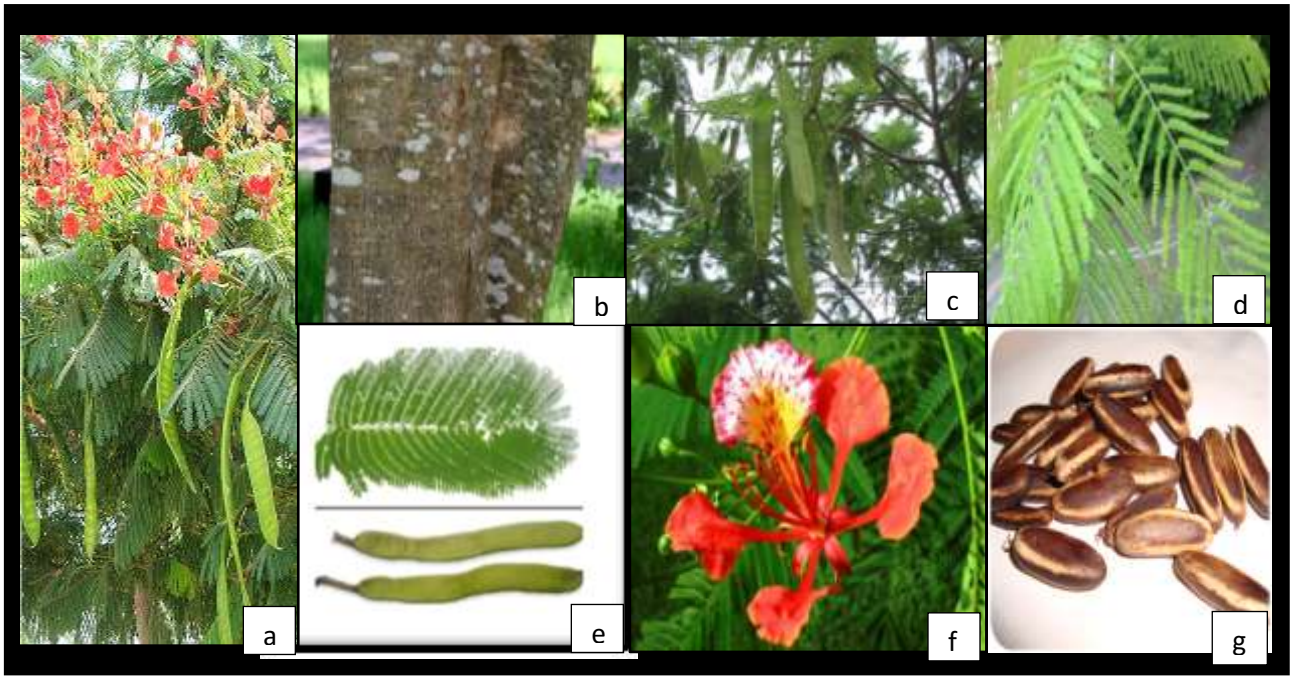

Fig.1 Various parts of the plant *Delonix regia.* a) A full grown tree b) bark c) seed pods d) leaves e) leaflets and seed pods f) flower g) seeds.

TRADITIONAL USES

Delonix regia Rafin have an impressive range of medicinal and biological properties. Traditionally plant is used as anthelmintic, antimicrobial [16, 17], anticancer, emetic, CNS depressant and in the treatment of anemia and fever. For several civilization leaves have been used in the folk medicine systems against constipation, arthritis,inflammation,rheumatism leucorrhoea and hemiplegi [13, 18-19]. It is also said that body pain, rheumatic pain of joints and gastro intestinal disturbance can be relieved using the decoction of the leaves of this plant. Flowers were used in gynecological disorders and diarrhea [2-4, 20-23]

PHYTOCHEMICAL INVESTIGATIONS

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The major Chemical constituents of different classes are terpenoids, glycosides, sterols, phenols, tannins etc. The glycosides are mainly Stigmasten-diol-3-o-glucoside, 12, 15-Dihydroxy-chol-8-en-24-oic-acid-3-oxy-6'-acetyl-glucoside and sodium, potassium adduct of 12, 15-Dihydroxy-5-chol-9-en-24-oic-acid-3-oxy-rhamnosyl-rhamnoside, phenolics, phytosterol are found in this plant. Steroids found are sterols, lanosterol.The main constituents of bark are phenolic compound, sorbic, gallic acid, ferulic, leucocyanidin, caffeic, lupeol, tannin, β-sitosterol , sinapic etc. In flower anthers are a rich source of zeaxanthin and also contains gallic, protocatechuic, trans-cinnamic chlorogenic acid and salicylic acid [24]. Leaves contain gallic, protocatechuic, salicylic acid [24], tannins, lupeol and β-sitosterol flavonoids [14,25-29].

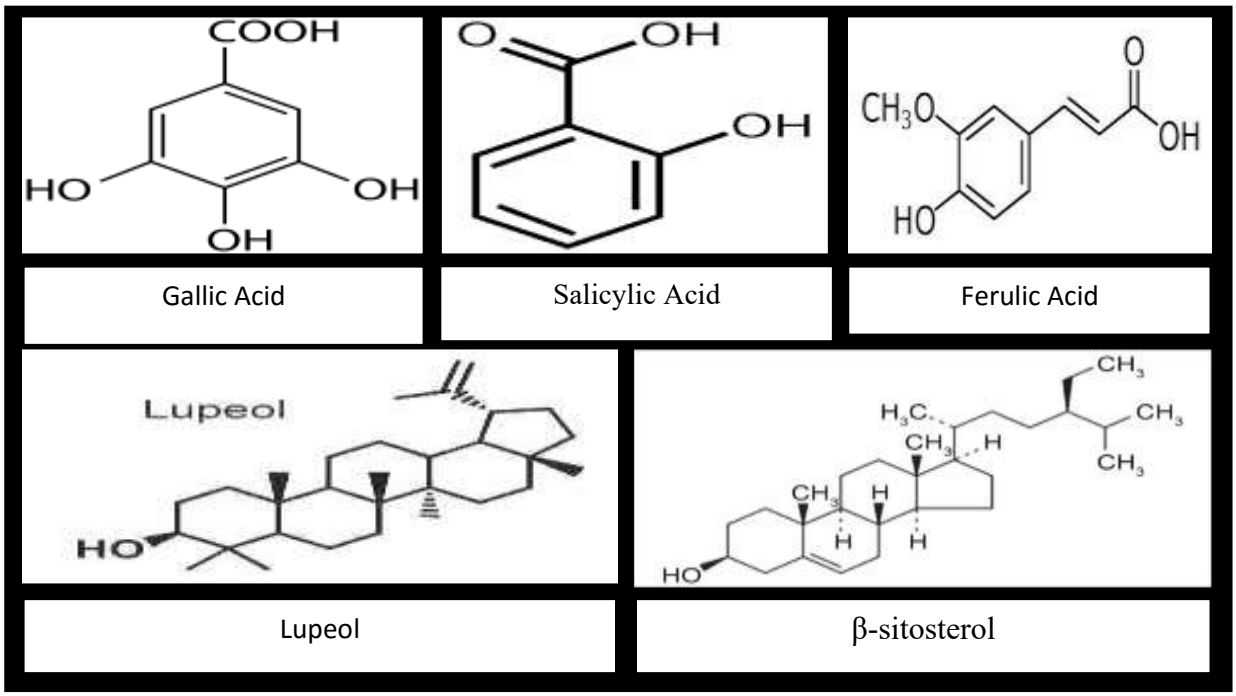

Fig. 2 Structures of some of the chemical constituents of *Delonix regia*

PHARMACOLOGICAL ACTIVITIES

Plant extract has been reported to possess anti-bacterial, anti-malarial and anti-fungal, antirheumetic spasmgenic, antioxidant, larvicidal, inflammatory, analgesic, nutritional, antiperiodic, antidiuretic activity. Information have reported that bark of this plant showed significant analgesic, anti-inflammatory activity, antiperiodic and febrifuge, anti-arthritic activity.The flowers of *Delonix regia* are claimed to be used as anti-diarrhoeal agents [21], natural colour and as an acid-base indicator. - Its aqueous and alcoholic extracts were active against roundworm. The leaves are reported for its

antimicrobial, antioxidant, ant nociceptive activity [28, 30].

ANTIOXIDANT ACTIVITY

Antioxidants are inhibitors of oxidation process and have diverse physiological role in the body. It has been known to prevent the formation of oxygen free radicals [31-33]. The reactive oxygen species in the body may affect certain enzyme systems such as Superoxide dismutase, Glutathione peroxidase, Catalase and the reducing agents such as Glutathione, Ascorbate and causes oxidative damage. This leads to conditions like cancer, ischemia, aging, adult respiratory distress syndrome, rheumatoid arthritis etc [11, 34].The leaves of *Delonix regia* (chloroform fraction of ethanol extract) have shown significant antioxidant activity when tested for DPPH radical scavenging assay, Hydrogen peroxide scavenging assay and reducing power assay [35].

ANTI INFLAMMATORY ACTIVITY

Inflammation is a protective response associated with local vascular reaction and cellular response [36] in the living tissue caused by prostaglandin [37], physical trauma and microbiological agents [38]. In other words, it is the body's effort to inactive or destroy invading organism and remove irritants. Those which reduce the inflammation are known as anti-inflammatory agents [39, 40]. The ethanolic extracts of powdered leaves of the Delonix regia were used for the study of anti-inflammatory activity. Experiments were carried out on models like carrageenan-induced rat paw edema,cotton pellet granuloma [22,41] when compared with standard showed significant dose dependent activity [22, 36, 41].

HEPATOPROTECTIVE ACTIVITY

Liver is one of the vital organs of body which metabolism the nutrients, excretes the waste metabolites, drugs and other xenobiotic and provides protection against foreign substances by detoxifying and eliminating them [35, 42]. Chemicals that cause liver injury are called hepatotoxins [43]. Most of the hepatotoxic chemicals damage the liver cells mainly by inducing lipid peroxidation and other oxidative damages [44]. The substances that protects the liver from toxins and maintain the working of liver is known as hepatoprotective [39]. Methanolic extracts of flowers of *Delonix regia* demonstrates the hepatoprotective activity against paracetamol induced hepatotoxicity in Sprague-Dawley albino rats and CCl_4 induced liver damage in Wistar albino rats[40].

WOUND HEALING

A physical or chemical injury or microbial infections can give rise to wound [45] which is a loss or breaking of cellular and anatomical continuity of living tissue. Healing of wound is a biological process which is associated with clotting, collagen synthesis,granulation tissue formation, tissue remodeling, inflammation, epithelization, and is assessed by the rate of wound contraction, tensile strength (skin breaking strength) and estimation of the hydroxyproline content. The ethanolic and aqueous extracts of *Delonix regia* flowers *have* shown wound healing properties in

albino rats using an incision and excision wound models using a group of five rats [46-48].

ANTIDIAHORRIAL ACTIVITY

Diarrhea is a condition which is caused by increased motility of the GI tract and decreased absorption of fluid [38] and leads to an increase in the water volume,content or frequency of stools. .. Ethanolic extract (70%) of *Delonix regia* flowers exhibited significant antidiarrhoeal activity against castor-oil challenged diarrhea, Prostaglandin-E2 induced to enter pooling and Charcoal induced gastrointestinal motility test in rats[21,41,49]

ANTI DIABETIC ACTIVITY

Diabetes may be defined as syndromes that are characterized by elevated blood glucose level due to relative or absolute deficiency of insulin in our body [38]. It refers to the increased cardiovascular mortality and morbidity.Mortality is associated with the increased cases of nephropathy, neuropathy and retinopathy [50,51].The main reason behind this rise includes increase in the sedentary lifestyle, consumption of energy-rich diet, obesity, higher life span, etc [51]. Diabetes mellitus is a meatabolic disorder characterised by hyperglycemia which refers to a condition in which an excess amount of glucose present in the blood plasma [27]. Antihyperglycemic agents reduce this elevated blood glucose level in our body, e.g., Gymnema , bitter guard , insulin e.t.c [28]. Methanolic extract of *Delonix regia* leaves had shown beneficial effects in reducing the elevated blood glucose level in glucose induced hyperglycemic mice [23,50-52].

ANTI ULCER ACTIVITY

The ulcer is a disease which is caused by the infection with gram negative *Helicobacter pyroli*, increase in hydrochloric acid secretion and inadequate mucosal defence against gastric acid [38, 52, 53]. Alcoholic extract(ethanol) of Delonix regia flower when used against ethanol induce ulcer model in experimental rat showed significant antiulcer activity in a dose dependent manner [54, 49].

ANTIARTHRITIC ACTIVITY

Arthritis is a characteristic chronic inflammatory disease which occurs in bones, joints and cartilages. Non-Steroidal Anti-inflammatory Drugs (NSAIDS) are used for the treatment of arthritis.*Delonix regia* flowers which are extracted with alcohol, showed antiarthritic activity against Freund`s incomplete adjuvant induced arthritis in experimental rat [11].

CONCLUSION

Traditional medicines play a major role in curing health problems around the world. About 75% of the world population rely on plants and plant extracts for thousands of years in healthcare. Herbal medicines are particularly used by the traditional practitioners since the ancient time. The rational design of novel drugs from traditional medicine offers new prospects in modern lifestyle. Therefore, plant products serve as an alternative to synthetic products because of local accessibility, eco-friendly in nature and much more cost effective as compared to synthetic products. *Delonix regia* commonly known as a flame of forest is found to be an important plant which may be served as multipurpose drug having

effects such as antioxidant, hepatoprotective activity, antiulcer effect, anti-diabetic activity etc. Further research works should be encouraged to find its application and economical value in the modern pharmaceutical industry.

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