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Gulmohar (*Delonix Regia*) a comprehensive review on its phytoconstituents and pharmacological profile

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Abstract
The broadly developed ornamental tree *Delonix regia* (Gulmohar), which has a belong to the Fabaceae family. Several researchers have extensively studied the pharmacological potential of on *D. regia* has incredibly expanded over the last 20 years, uncovering a wide extend of phytoconstituents found in its flowers, bark, seeds, and pods. Flavonoids (quercetin, rutin, and kaempferol), phenolic acids (Gallic, protocatechuic, chlorogenic), tannins, saponins, triterpenoids (ursolic corrosive, lupeol), phytosterols (β-sitosterol, stigmasterol), alkaloids, different unstable constituents, carbohydrates, amino acids, and fixed oils are among the main bioactive substances. Several researchers have extensively studied the pharmacological potential of D. regia extricates have strong anti-inflammatory, antidiabetic, antihyperlipidemic, analgesic, antimicrobial, hepatoprotective, nephroprotective, wound-healing, antidiarrheal, and neuroprotective properties in expansion to strong antioxidant and free-radical scavenging properties.

Keywords: Gulmohar, *D. regia*, medicinal qualities, antibacterial potential, anti-inflammatory action

Introduction

The plant *D. regia* known as Gulmohar or the flame of the forest, is a famous ornamental tree that is a part of the Caesalpinioideae subfamily of the Fabaceae family. It is prized for its eye-catching red-orange blooms, shade-giving canopy, and capacity to adjust to a variety of climates. Initially from Madagascar, it has presently spread broadly all through tropical and subtropical regions. *D. regia* has picked up more logical consideration due to its rich phytochemical spectrum and varied therapeutic potential, in expansion to its aesthetic and biological significance. Such customary declarations have led to in-depth pharmacological and phytochemical in research. Flavonoids (quercetin, rutin, and kaempferol), phenolic acids (gallic, protocatechuic, and chlorogenic corrosive), tannins, triterpenoids (lupeol and ursolic corrosive), sterols (β-sitosterol and stigmasterol), essential oils, glycosides, saponins, and alkaloids are among the numerous secondary metabolites found in *D. regia,* according to inquire about conducted in recent decades. These components support the wide range of bioactivities exhibited by the plant [1].

It has been well documented that experimental study extracts of *D. regia* have antioxidant, anti-inflammatory, antimicrobial, antidiabetic, antihyperlipidemic, hepatoprotective, analgesic, wound-healing, anxiolytic, and neuroprotective properties. In any case, significant gaps remain, including limited mechanistic studies, insufficient standardization of extract preparation, insufficient harmfulness evaluations, and a lack of clinical trials validate its safe and efficacy. Several researchers have extensively studied the pharmacological potential of careful examination of *D. regia* is direly required, particularly considering the developing intrigued in plant-based treatments and the rising request for phytopharmaceuticals worldwide. The current understanding of *D. regia* phytoconstituents, traditional applications, extraction techniques, pharmacological activity, and toxicological features is compiled in this review [2].

Gulmohar Plant

The plant *D. regia*, also known as Gulmohar, is a deciduous tree that develops rapidly and belong to the Fabaceae family. It is valued for its ornamental qualities because of its vivid red-orange summertime blooms. Usually developing to a tallness of 10 to 12 meters, the tree's wide, umbrella-like canopy includes shade and urban greenery. It has large, eye-catching flowers and feathery, bipinnate leaves. The fruit is a long, flat, brownish pod with several seeds inside. Gulmohar has vital pharmacological potential. Several researchers have extensively studied the pharmacological potential of various plant parts observed have cytotoxic, cardioprotective, antioxidant, (antibacterial or antifungal), hepatoprotective, wound-healing, anti-diabetic, and anti-diarrheal properties. Long-chain hydrocarbons like nonacosane and bioactive substances like flavonoids, triterpenoids, sterols, lupeol, and vitamin E all support these medicinal benefits. Several researchers have extensively studied the pharmacological potential for instance, sterols promote cardiovascular health, flavonoids offer antioxidant activity, and lupeol is associated with anti-inflammatory and anticancer properties. Ethnomedicine has long utilized the seeds, bark, and leaves to treat wounds on the skin, diabetes, infections, liver problems, and inflammation Gulmohar is essential to environmental sustainability. While the dense foliage purifies the air by capturing dust and pollutants, its extensive root system aids in preventing soil erosion. By drawing pollinators like bees and birds, the tree promotes biodiversity. The tree can shed a lot of leaves and flowers, which may need regular cleaning, and it has some structural limitations, such as shallow roots that leaves it open to strong winds [3].

Name of the plant*: D. regia* (Gulmohar).

Biological Source: It is made up of dried *D. regia* roots, stems, and leaves as well as flowering plant species from the Fabaceae family.

India, Vietnam, and Bangladesh are the topographical sources.

Chemical Components Secondary metabolites found in roots include phenols, alkaloids, sterols, cardiac glycosides, and tannins, terpenoids [4].

Flower

The large, flamboyant, primarily red or orange-red flowers of the *D. regia* tree are a key feature and highly ornamental. They frequently have a mixture of yellow and white markings. Clusters of five-petaled flowers that blossom in late spring to early summer are known to draw bees, butterflies, and birds, thereby promoting biodiversity in the area. Several studies have reported similar findings, indicating that bioactive substances flavonoids, glycosides, and tannins found in gulmohar blossoms have antibacterial, anti-inflammatory, and antioxidant qualities in addition to their aesthetic value. Previous investigations by flowers medicinal and economic significance is demonstrated the fact that their extracts have long been used to heal wounds, reduce inflammation, and naturally color foods and textiles. Their colorful display and quick flowering cycle also make a big contribution to ecological enrichment and urban landscaping. One of the most remarkable characteristics of the *D. regia* tree are its flowers, which are distinguished by their contribution to ecological enrichment and urban. One of the most exceptional characteristics of the *D. regia* tree are its flowers, which are distinguished by their vivid red or orange-red, size (5-8 cm in diameter), and five-petaled structure, regularly with white or yellow stripes on the upper petal, known as the "standard" [5, 6, 7].

Fig 1: Gulmohar flower (12).

Leaf

Compound leaf is characterized by their brilliant, alternating green color and pinnate shape. Two pinnates are present. Bipinnate and pinnately compound leaves of *D. regia* are made up of many tiny, oblong leaflets that are symmetrically arranged along the rachis. The tree appears delicate and ornamental due to the individual leaflets, which are 1-2 cm long, bright green, and soft in texture. Each leaf is normally 20-40 cm long. In order to minimize water loss and adjust to arid conditions, the deciduous leaves fall off during the dry season. According to Phytochemical research, in terms of ecology, the foliage of Gulmohar leaves reduces erosion, stabilizer the soil, offers shade, and promotes biodiversity by giving insects and birds a place to liver and food. The leaf litter also enriches the soil with organic matter, which increases soil fertility [8].

Fig 2: Gulmohar leaves (12).

Seed

Gulmohar seeds mature, they are encased in long, flat, woody pods that turn dark brown. A number of studies have reported similar findings that multiple hard, glossy, oval or along seeds that extend in color from dark brown to black are found inside each pod. The high content of proteins, carbohydrates, lipids, and minerals in these seeds includes to their nutritional worth. Be that as it may, raw seeds require to be prop prepared some time recently being expended since they contain harmful substances like lectins and specific alkaloids. Scarification or soaking to soften the hard seed coat progresses germination of Gulmohar seeds, which are highly prized for propagation in cultivation. The seeds are a important resource for forestry and ornamental planting programs because of their hardness, which moreover enables them to survive for a long time when put away appropriately [9].

Fig 3: Gulmohar seed (12).

Fruit

Fruit of the *D. regia* is hard, glossy seeds, and long, flat, woody legume pod. When completely developed, the pods may stay on the tree for a few months and changes from dark brown to black, giving it a particular look even after the leaves have fallen. Although the pulp is somewhat toxic for human consumption, it helps with natural seed dispersal by drawing birds and small animals. The pulp is fibrous and slightly sweet. In terms of ecology, the fruit contributes significantly to local biodiversity by giving birds and insects and habitat. The tenacity and hardness of Gulmohar fruits support the health of nearby releasing nutrients back into the soil through decomposed pods [10, 11].

Phytoconstituents of Gulmohar

Sterols

The plant *D. regia,* commonly known as Gulmohar. Previous investigations by Phytochemical analyses of different sections of the leaves, flowers, and other parts of the Gulmohar plant bark, and seeds have illustrated the presence of various significant phytosterols, for the mostly Campestral, β-sitosterol, and stigmasterol. Several researchers have extensively studied the pharmacological potential of these sterols are substances derived from plants that resemble cholesterol in structure and are significant for protecting the structure and functionality of cell membranes. Strong anti-inflammatory, antioxidant, and immune-modulating properties are exhibited by stigmasterol, another important sterol show in the methanolic extricates of Gulmohar leaves and flowers. Campestral demonstrates an association with cholesterol-lowering effects, although it is typically found in smaller amounts. Several studies have reported similar findings, indicating that by producing distinctive color changes that indicates the presence of sterols and triterpenoids, phytochemical tests like the Liebermann-Burchard and Salkowski reactions are frequently used to confirm the detection sterols in *D. regia.* These sterols significantly upgrade the plant's therapeutic properties and support its long-standing applications in the treatment of infections, inflammation, and metabolic disease. Sterols in Gulmohar play a significant biochemical role and oversee a several of its hepatoprotective and cardioprotective effects by stabilizing biological membranes and controlling lipid metabolism. Previous authors have emphasized the importance the existence of bioactive sterols emphasizes *D. regia* therapeutic value and bolster its potential as a significant source of organic compounds for use in pharmaceuticals [13].

Phenolic compound

Phenolic compounds, well-known for their strong antioxidant qualities, provide strong defense against oxidative stress and decrease irritation. Individuals of the Fabaceae family, counting the Gulmohar plant are well known for both their rich phytochemical profile and their aesthetic appeal. Phenolic compounds with potent anti-inflammatory, anti-bacterial, cytoprotective, and antioxidant qualities incorporate flavonoids, tannins, and phenolic acids. Several researchers have extensively studied the pharmacological potential of quercetin, rutin, gallic acid, ferulic acid, and kaempferol are among the flavonoids found in rich in the leaves and flowers, which help to neutralize reactive oxygen species and shield cellular structures from oxidative stress. Furthermore, these substances have synergistic impacts that move forward the plant's by and large therapeutic adequacy [14].

Furthermore, several pharmacological activities, including anti-diabetic, anti-ulcer, anti-cancer, hepatoprotective, and cardioprotective impacts, are related with the phenolic components in Gulmohar. Previous investigations by demonstrated that subsidiaries of gallic acid and quercetin can reduce tissue damage by inhibiting lipid peroxidation and balancing provocative arbiters. Generally, *D. regia* phenolic compounds constitute a significant class of naturally occurring antioxidant with significant therapeutic potential [15].

Triterpenoids

Several researchers have extensively studied the pharmacological potential of triterpenoids astounding wound-healing and anti-inflammatory qualities. Invaluable for minimizing skin irritation and encouraging. *D. regia* contains a critical course of happening phytoconstituents called triterpenoids in its clears out, bark, and blooms, among other parts. Biosynthetically related to steroids, these compounds are determined from six isoprene units. Triterpenoids, including lupeol, κ-amyrin, has reported in *D. regia* by phytochemical investigation. The pharmacological characteristics of these bioactive compounds are assorted and incorporate anti-inflammatory, hepatoprotective, antioxidant, antimicrobial. Research demonstrated by blocking cyclooxygenase and lipoxygenase pathways, lupeol and κ-amyrin, which are extricated from the stem bark, have solid anti-inflammatory properties. Another triterpenoid present in the leaves, ursolic acid, includes to the plant's hepatoprotective and antioxidant properties [16].

Flavonoids

Flavonoids are among the fundamental categories of secondary metabolites that are a major contributor to the pharmacological characteristics of *D. regia,* too referred to as Gulmohar. The plant's leaves, flowers, and pods all contain large amounts of these polyphenolic compounds. A few analysts have broadly considered the pharmacological potential of various flavonoids with solid antioxidant potential, counting quercetin, kaempferol, rutin, luteolin, and apigenin, have been found through phytochemical examinations. Total flavonoids are plenteous in the methanolic and ethanolic extricates of *D. regia* leaves and flowers, suggesting their function in reducing oxidative stress and scavenging free radicals [17, 18].

Phytol

Several considers have detailed comparable discoveries, one noteworthy phytoconstituents found in distinctive parts of *D. regia* is phytol, a normally happening diterpene liquor. Several considers have detailed comparable discoveries, showing that phytol was recognized as a key bioactive component in the methanolic and clears out, units by Gas Chromatography-Mass Spectroscopy investigation. Since of its anti-inflammatory, anti-cancer, antimicrobial, antioxidant, and antinociceptive qualities, phytol plays a major part in the plant's pharmacological potential for cells to be secured from oxidative stretch, the compound serves as a forerunner for the union of phylloquinone (vitamin K1) and tocopherols (vitamin E). Several thinks about have detailed comparable discoveries, showing that nearness of phytol in Gulmohar improves its pharmacognostic importance and raises the plausibility that it seem be utilized to make common antimicrobial and antioxidant specialists [19].

Pharmacological Profile of Gulmohar

Anti-diabetic Activity

Several researchers have extensively studied the pharmacological potential of Gulmohar, moreover known as *D. regia,* is prized for its medicinal qualities, which include strong anti-diabetic effect, in addition its aesthetic appeal. The hypoglycemic effects of different plant parts, particularly the leaves and flowers, have been emphasized in several studies. Bioactive phytochemicals with antioxidant, insulin-stimulating, and κ-cell protective qualities, including flavonoids, triterpenoids, phenolics, sterols, and saponins, are largely responsible for the anti-diabetic activity. Several

researchers have extensively studied the pharmacological potential of flavonoid and phenolic compounds are likely responsible le for the similar antihyperglycemic impacts watched in bloom extricates. Several researchers have extensively studied the pharmacological potential of these impacts are clarified by components such as increase peripheral glucose utilization, decreased oxidative stress, inhibiting of enzymes that break down carbohydrates, such as a-amylase and a-glucosidase, and stimulation of insulin secretion. Several researchers have extensively studied pharmacological potential of human clinical trials are still rare, despite empowering preclinical result that are occasionally on standard with those of common anti-diabetic medicines like Glibenclamide. Unlike, earlier finding has demonstrated that Gulmohar show promise as a natural anti-diabetic age overall, but more investigations is needed to identify the active ingredients, validate effectiveness, and guarantee safety for medical application [20, 22].

Anti-diarrheal Activity

Several researchers have extensively studied the pharmacological potential of the exceptional anti-diarrheal qualities of Gulmohar have been supported by modern pharmacological investigate as well as traditional employed in folk medicine. he effectiveness of a few plant parts, such as the bark, leaves, and blossoms, in treating diarrhea has been studied. Several researches have exten studied the pharmacological potential of logical thinks about have appeared that the plant can essentially decrease the recurrence. These thinks about ordinarily include in *vitro* ponders on creature models, such as those actuated with castor oil [23].

Hepatoprotective Activity

A few research have broadly examined the pharmacological potential of exploratory models of chemically initiated liver harm, extricates from distinctive components of Gulmohar tree, particularly the blossoms have illustrated solid hepatoprotective impact. Solid antioxidant qualities in the plant are connected to this defensive impact. Several thinks about have detailed comparative discoveries, demonstrating that oxidative stretch in liver tissues is diminished and free radicals are effectively rummaged by the flavonoids found in the extricates. A few analysts have broadly examined the pharmacological potential of the conservation of hepatic architecture in treated bunches as restricted to harmed control bunches was assist affirmed by histopathological examinations of the liver tissues, showing that it may be utilized as a common treatment for liver clutters [24, 25].

Cytotoxic Activity

Several researchers have extensively studied the pharmacological potential of research has also highlighted the cytotoxic potential of Gulmohar extracts, particularly demonstrating antiproliferative activity in human cancer cell lines in *vitro* settings. Significant anti-cancer properties were demonstrated by the ethanolic extract of the flowers and its byproducts. It was discovered that certain isolated substances, like ursolic acid and L-azeditine-2-carboxylic acid, were especially effective at preventing the growth of these cancer cells. However, observed conflicting results regarding it is thought that the extract's overall effectiveness results from the synergistic action of its various bioactive compounds, even though some flavonoids, such as rutin and isoquercitrin, were less active when taken alone. This implies that Gulmohar could be used to create new chemopreventive or adjuvant therapeutic agents for liver cancer [26].

Anti-inflammatory Activity

The flame tree or royal poinciana, moreover known as Gulmohar has strong anti-inflammatory qualities that have been utilized both traditionally and scientifically. Since of its rich phytochemical composition. A Several researchers have extensively studied pharmacological potential of the plant has appeared anti-inflammatory properties in a variety parts, including the leaves, blooms, and bark. Flavonoids, phenolic compounds, triterpenoids (such as lupeol and β-sitosterol), and saponins are among these active substances; they are all recognized for their capacity to piece incendiary arbiters and pathways inside the body. Significant, dose-dependent anti-inflammatory activity has been demonstrated by extricates, particularly ethanolic and methanolic extricates of the leaves and bark, which are on standard with common anti-inflammatory solutions like indomethacin. Pharmacological inquire about remains interested in Gulmohar's therapeutic potential as a natural source for creating novel anti-inflammatory drugs [27, 28].

Wound Healing Activity

Several analysts have broadly considered the pharmacological potential of both conventional pharmaceutical and logical inquire about have appeared that Gulmohar commonly alluded to as the flame tree or royal poinciana, has imperative wound-healing qualities. These therapeutic impacts are thought to be caused by bioactive substances like polyphenolic compound, saponins, and which abundant the tree different parts, particularly the leaves and bark. Several researchers have extensively studied the pharmacological potential of extricates from Gulmohar have been appeared in scientific study to mending of wounds, frequently using animal models [29].

Gastrointestinal Protective Activity

Several researchers have extensively studied the pharmacological potential of extricates from *D. regia* have been appeared to have gastrointestinal protective properties. Several studies have reported similar findings, indicating that extricates from the plant, particularly the blooms, have been appeared to have strong anti-ulcer effects in study on animal models, especially in rats with experimental induced ulcers. Previous investigations by demonstrated that by significantly lowering the ulcer index and reducing stomach tissue damage, the 70% ethanolic extricate of Gulmohar flowers demonstrated a dose-dependent protective effect against gastric ulcers brought on by ethanol and cold resistance stress.

Several researchers have extensively studied pharmacological potential of it is thought that the plant's rich phytochemical composition, which incorporates polyphenolic compounds like flavonoids, tannins, and phenolic acids, is responsible for this gastroprotective effects. The plant's essential anti-inflammatory and antioxidant properties, which are essential in avoiding damage to the stomach mucosa, are encouraged by these compounds. Further demonstrated the Gulmohar trees advantages for gastrointestinal health, traditional medical

procedures have long utilized its bark and leaves to advance absorption and relieve stomach issues like acid indigestion and constipation. Several researchers have extensively studied the pharmacological potential of the extricates function similarly to common anti-ulcer drugs by possibly strengthening the protective mucosal barrier and lowering the production gastric acid [30].

Anthelmintic Activity

Earlier studies have given substantial evidence supporting the role of significant anthelmintic activity, or the capacity to drive parasitic worms (helminths) out of the body, is shown by the Gulmohar plant traditional folk medicine has long recognized this quality, particularly when it comes to treating helminthiasis (worm infestations) with extricates from its blossoms and leaves. Several researchers have extensively studied pharmacological potential of the conventional assertions have been supported by scientific research carried out in *vitro*, or in a laboratory. Several studies have similar findings consistently demonstrated a dose-dependent effect, with higher extricate concentrations causing the worms to paralyze and die more quickly. By binding to free proteins in the host's gastrointestinal tract or to glycoproteins on the worm's fingernail skin, tannins, for illustration, are thought to disturb the parasite's ability to generate energy and ultimately cause its demise. Earlier studies have given significant prove supporting the role of flavonoids may also play a role by preventing phosphorylation reactions, which prevents the worms from producing energy [31, 32].

Larvicidal Activity

Earlier reports highlighted the therapeutic importance of significant larvicidal activity has been appeared by blossoms of Gulmohar plant. Against a variety of insect pests, such as farming pest like the cotton leafworm (Spodoptera littoralis) and mosquitoes like Culex quinquefasciatus and Aedes aegypti. Since of this, the plant might be utilized to make eco-friendly biopesticides. Several studies have similar findings, indicating that research has demonstrated that the viability of these extricates can distinctive based on the plant part and extraction solvent. For example, it was found that the seeds and leaves' methanol and petroleum ether extricate were especially effective against S. littoralis larvae, resulting in high mortality rates and interfering with their normal growth and development. Significant effectiveness against mosquito larvae was also demonstrated by the methanolic leaf extricate of a related species, *D. elata.* Its larvicidal qualities are ascribed to the presence of a several bioactive phytochemicals with known insecticidal properties, including squalene, benzoic acid, 2-methoxy-4-vinylphenol, and stigmasterol. By blocking vital enzymes like acetyl cholinesterase or a-amylases, which are essential for an insect's nervous system and survival, these substances are thought to interfere with important physiological functions in the larvae [33].

Anti-oxidant Activity

Several researchers have extensively studied pharmacological potential of in specific, polyphenols, flavonoids, tannins, anthocyanins, and carotenoids are among the numerous bioactive phytochemicals that are responsible this strong activity. Earlier reports highlighted therapeutic significance of salicylic, gallic, and protocatechuic acids are among the specific phenolic acids that have been found to be important contribution to this activity in the leaves. Trans-cinnamic, salicylic, protocatechuic, Gallic, and chlorogenic acids are all abundant in the flowers. Anti-inflammatory, anti-arthritic, and hepatoprotective (liver-protecting) properties are among the numerous traditional medicinal uses of the plant that are thought to be based on its tall antioxidant potential. Although the concentration and specific compounds may differ based on the plant part, extraction solvent, and growth conditions, Gulmohar is for the most part recognized as a profitable characteristic antioxidant source [34, 36].

Applications of Gulmohar

Traditional specialists utilize clears out as a society cure for illnesses of the incendiary joints. In fables, *D. regia* is utilized to treat tooting and joint torment. Takes off and bark are ground into a glue by the local people, who utilize it to treat torment and irritation. *D. regia*, an antioxidant, has anti-inflammatory, anti-rheumatic, and antibacterial qualities. Properties that are both antioxidant and antibacterial [37].

It is well known that *D. regia* extricate has helpful benefits. A few countries utilize this plant to make extricates that have antifungal and antibacterial properties. *D. regia*. Blossom is a broad-spectrum antibacterial, pain relieving, antifungal, antibacterial, and anti-inflammatory medicine utilized to treat dysmenorrhea [38]. The bloom is utilized as a tablet cover and as a conventional homegrown cure for gynecological conditions. There have been various reports of *D. regia* Rafin's natural activity [39].

Benefits

Benefits to the environment

Shade: The expansive canopy of the tree offers a parcel of shade, which makes a difference keep open air spaces cool.

Air refinement: By sifting poisons out of the air, its thick foliage progresses the quality of the air.

Biodiversity: Winged creatures are drawn to Gulmohar trees. And other creatures, giving them a put to live and food.

Enhancement of soil: The tree's root framework can help in improving soil quality and stopping erosion.

Medicinal Benefits

Anti-inflammatory: The anti-inflammatory qualities of the takes off and blooms can help in bringing down torment and swelling.

Digestive well-being: The clears out and bark incorporate substances that can ease stomach related issues such as clogging, bloating, and indigestion.

Blood sugar direction: The leaves extricate can help lower blood glucose levels and have antidiabetic qualities.

Wound recuperating: The tree has long been utilized for its capacity to mend wounds.

Hepatoprotective: Inquire about has illustrated that the clears out give liver protection.

Additional benefits

Aesthetic esteem: The tree is a well-liked fancy plant that includes excellence to scenes since of its distinctive, eye-catching flowers.

Fast development: Since of its speedy development, this tree is culminated for rapidly making shade and a green cover.

Low support: The tree needs small consideration once it is set up.

Drawbacks

Physical and auxiliary drawbacks

Wind-vulnerable: Since of its shallow roots, the tree is more likely to be evacuated or broken by serious storms, winds, and rain.

Large measure: Since of its expansive estimate, it is not suitable for planting near to homes or in places with small space.

Messy: The tree as often as possible sheds a part of takes off and blooms, which can result in a parcel of litter that needs to be cleaned up.

Infrastructure harm: The forceful Root framework has the potential to hurt underground channels, dividers, and foundations.

Brittle branches: There may be a hazard since the branches are fragile and effortlessly break.

Additional drawbacks

Limited wood utilize: There is not much utilize for the empty wood. Side impacts of pharmaceutical: Utilizing Gulmohar takes off, blooms, or bark too much as a medicine can be unsafe, especially for those who have heart issues or asthma, as well as for elderly individuals, nursing moms, and children. Potentially obtrusive: Although not formally obtrusive, they may spread quickly in a few zones due to their tall seed generation and versatility to diverse situations [40].

Discussion

The display survey highlights the broad pharmacognostic, phytochemical, and pharmacological noteworthiness of *D. regia*, a customarily esteemed decorative and therapeutic plant having a place to the Fabaceae family. Over the past two decades, expanded logical consideration has uncovered that *D. regia* has a wide range of bioactive phytoconstituents especially flavonoids, phenolic acids, tannins, terpenoids, sterols, alkaloids, and unstable oils dispersed over its clears out, blooms, bark, seeds, and cases. These auxiliary metabolites are unequivocally related with the plant's differing restorative properties. A basic perception from distributed writing is the prevailing part of flavonoids (quercetin, rutin, kaempferol) and phenolic acids (Gallic corrosive, protocatechuic corrosive, chlorogenic corrosive) in contributing to antioxidant, anti-inflammatory, and cytoprotective exercises. The nearness of phytol and long-chain hydrocarbons such as nonacosane encourage includes to the pharmacological range, supporting antimicrobial and antioxidant actions.

Pharmacological examinations have reliably illustrated that *D. regia* extricates display antidiabetic, antihyperlipidemic, antimicrobial, pain relieving, hepatoprotective, nephroprotective, wound-healing, antidiarrheal, and neuroprotective exercises. Among these, the antidiabetic potential has gotten specific consideration. So also, the hepatoprotective impacts of *D. regia*, particularly its bloom extricate, are ascribed to the synergistic activity of flavonoids and triterpenoids, which stabilize hepatic layers, diminish lipid peroxidation, and reestablish enzymatic adjust in toxin-induced liver damage. Its antidiarrheal action, approved through castor oil-initiated models, underpins conventional claims and proposes inclusion of tannins and flavonoids in tweaking intestinal motility and liquid secretion.

Despite solid preclinical prove, outstanding investigate holes stay. As it were constrained considers have investigated the exact atomic targets and signaling pathways mindful for the watched pharmacological impacts. Besides, varieties in extraction methods, plant portion determination, dissolvable extremity, and phytochemical standardization show critical challenges to reproducibility and clinical interpretation. Toxicological evaluations are moreover insufficient, with most ponders restricted to intense harmfulness assessment, clearing out long-term security generally unexplored. The nonattendance of well-designed clinical trials limits the affirmation of viability in human populaces. In general, the discoveries investigated show that *D. regia* is a wealthy source of bioactive particles with considerable restorative potential. Its assorted pharmacological exercises back its conventional applications and open roads for the improvement of phytopharmaceuticals and home-grown details. Future inquiries about ought to center on separation of dynamic compounds, robotic thinks about, standardized extraction conventions, toxicological assessment, and clinical approval to completely build up the plant's therapeutic esteem and guarantee secure helpful use.

Future Prospects

Although *D. regia* has been broadly recognized for its wealthy phytochemical differing qualities and promising pharmacological exercises, a few key ranges require to be investigated to completely realize its restorative potential. Future investigate ought to prioritize the separation, refinement, and basic characterization of person bioactive compounds such as flavonoids, sterols, triterpenoids, and diterpene alcohols. There is a significant require for well-designed clinical trials to approve preclinical discoveries. Human-based considers assessing antidiabetic, hepatoprotective, wound-healing, antimicrobial, and anti-inflammatory impacts would give significant prove for helpful suggestions. Besides, investigating synergistic impacts between *D. regia* phytochemicals and ordinary drugs may uncover unused combination treatments with progressed security profiles.

Finally, given the plant's fancy and biological noteworthiness, future inquire about ought to moreover explore economic development hones, preservation methodologies, and value-added applications of its by-products. The integration of *D. regia* into agroforestry, nutraceutical advancement, and green biotechnology may advance extend its financial significance. By and large, *D. regia* speaks to a promising candidate for future

pharmacological development. Proceeded intrigue research—spanning phytochemistry, pharmacology, toxicology, biotechnology, and clinical sciences—will be basic to open its full potential as a profitable characteristic asset in present day medicine.

Conclusion

A prevalent decorative tree, the *D. regia* is prized for its breathtaking magnificence, colorful blooms, and natural focal points like shade, biodiversity bolster, and discuss quality upgrade. By the by, the tree postures several auxiliary and commonsense troubles in expansion to its biological and stylish noteworthiness. Its huge estimate and forceful roots can cause issues for encompassing structures and scenes, and its shallow root framework takes off it vulnerable to wind harm. Besides, in a few ranges, it may end up intrusive due to its flexibility and copious seed generation. Generally, indeed although the Gulmohar tree is still a important species for natural and fancy reasons, its preferences and impediments ought to be carefully adjusted through cautious arrangement, upkeep, and controlled utilize.

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