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Review Article

A Comprehensive Review on The Phytochemistry, Pharmacological Potential, And Traditional Uses of *Hibiscus Hispidissimus* Griffith

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ABSTRACT

Hibiscus hispidissimus Griffith belonging to the family, Malvaceae is a traditionally valued but little-studied medicinal plant with substantial pharmacological potential. Comprehensive information about its phytochemistry, ethnobotanical significance, and medicinal qualities is compiled in this review. Its strong antioxidant, anti-inflammatory, anti-arthritic, and hepatoprotective properties are attributed to flavonoids, terpenoids, saponins, tannins, glycosides, and phenolic chemicals, according to phytochemical research. Tribal healers have long utilized the plant to cure eye infections, stomach problems, and liver illnesses. Preclinical studies show that the plant is highly effective. Its safety within a specified dose range is confirmed by toxicological assessments, which show no notable side effects at therapeutic levels. Clinical research and standardization initiatives are scarce, despite encouraging results. In order to determine dosage guidelines, pinpoint molecular targets, and create innovative formulations, this review emphasizes the necessity for additional research. There is great potential for incorporating H. hispidissimus into the development of nutraceuticals and evidence-based herbal therapy.

INTRODUCTION

In this century, unparalleled medicinal inventions have been achieved to resolve incalculable diseases, including cancer and AIDS. However, the majority of research studies have been carried out worldwide to combat recently identified illnesses. As a result, we no longer remember our traditional medical systems, including Siddha, Ayurveda, and Unani [1].Modern surgical methods and synthetic drugs like steroids and antibiotics act faster and offer rapid relief, but they can also have deadly adverse effects. Furthermore, continuous use of antibiotics and other

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medications may cause the liver to produce harmful chemicals. Because of their lifestyle, which was totally dependent on nature, ancient people lived longer than modern humans. Traditionally, life-threatening illnesses have been treated with herbal medicines, which are eaten as food instead of as medicine or pharmaceuticals. Phytochemicals in fruits and vegetables may reduce the risk of some diseases by preventing the oxidative damage brought on by free radicals [1]. There is a sharp rise in the number of patients seeking alternative and herbal treatments. In addition to being less costly, herbal medicines are becoming more and more popular in the poor countries for primary healthcare due to their reduced side effects, enhanced biological compatibility, and cultural acceptability [2]. *Hibiscus hispidissimus* "Comfort root," "Big Thicket Hibiscus," or "Pine Hibiscus" are the English names for Griffith (syn. Hibiscus furcatus DC. non Willd., Hibiscus aculeatus Roxb. non. Walter.), a member of the Malvaceae family, and "Uppanacham" in Malayalam. It is available all over India. Standing between 60 and 150 cm tall, it is a thorny, rambling, suffrutescent herb. Keralan tribal healers utilize it to treat liver conditions. After being cooked, the acidic leaves are consumed. They are regarded as anthelmintic and are claimed to aid in digestion. When treating eye conditions, a mixture of honey and leaf juice is administered. A decoction of the root bark is used as a treatment for toxins, swellings, and kidney cleansing, while an infusion of roots in water is used as a cooling beverage during hot weather [3].

1. Botanical Overview:

Scientific Name: *Hibiscus hispidissimus* Griffith

Common Names: Wild hibiscus, Malai-p-puliccai, Betta bende, Njaaranpuli

Taxonomic Classification: [4]

Kingdom	Plantae
Order	Malvales
Family	Malvaceae
Genus	*Hibiscus*
Species	*hispidissimus* Griffith

Vernacular names: [5]

English	Hill hemp bendy, Wild hibiscus
Tamil	Malai-p-puliccai
Kannada	Betta bende
Malayalam	Njaaranpuli
Sanskrit	Nathambasthi

Botanical Description:

Distribution:

Hibiscus hispidissimus Griffith is a member of the Malvaceae (mallow) family of plants [6]. One of the undiscovered medicinal plants, *Hibiscus hispidissimus* Griffith, is found in China, Thailand, Sri Lanka, and the Western Ghats of India. "Comfort root" and "Hill hemp bendy" are common names [7]. Tropical Africa, China, India, Sri Lanka, Myanmar, Bangladesh, Nepal, Myanmar [Burma] (Yangon), India (Bihar, West Assam, Meghalaya, Tamil Nadu, Kerala), Thailand, Sri Lanka, and Pakistan are among its many locations [5].

Morphological Description: [5,6]



Fig.no.01: *Hibiscus hispidissimus* Griffith Plant [8]

The plant is a large climber having reddish stems that are covered with hooked prickles (2-6).

Leaves: They are alternately arranged, 6-8cm, palmately 3-5 lobed, hairy and heart shaped at the base. Leaf margins are toothed, lobes are long pointed, leaf stalks 5-10cm long and prickly. Stipules are lane shaped.

Flowers: They are yellow in color and arise singly from leaf axils which are carried on 3-5cm long prickly stalks. 8-12 bracts below the flowers with leafy appendages. The flowering period is November-January.

Seed: capsules are 1cm long, ovoid, pointed, enclosed in enlarged sepal cup.

Branch: erect, linear-lanceolate, outer branch oblong-ovate.

2. Phytochemistry of *Hibiscus hispidissimus:*

Saponins, tannins, glycosides, diterpenes, and quinones were detected by phytochemical examination. The existence of saponins, tannins, glycosides, diterpenes, and quinones is investigated using phytochemistry. Numerous substances were identified by analysing the spectroscopic features, including alkaloids, steroids, pigments such as chlorophyll a and b, phenolic compounds, primarily gallic acid, and flavonoids, such as anthocyanins, flavanols, flavanones, and isoflavones [6]. Flavonoids, terpenoids, steroids, tannins, glycosides, and saponins are found in *Hibiscus hispidissimus* Griffith-like leaves, stems, flowers, and blossoms [9]. Chlorophylls, phycobilins, cytochromes, saponins, terpenoids, alkaloids, and glycosides are examples of photosynthetic pigments that are highly present in the ethanolic extract of leaves, according to spectroscopic research. The flower bud of *H. hispidissmus* Griffith has a high content of anthroquinones, phycobilins, flavanoids, and a higher class of phenolic compounds in its ethanolic extract. The stem portion of *Hibiscus hispidissimus* Griffith was rich in chemicals such flavanoids, tannins, triterpenoids, and colors like cytochromes and anthocyanins [6].

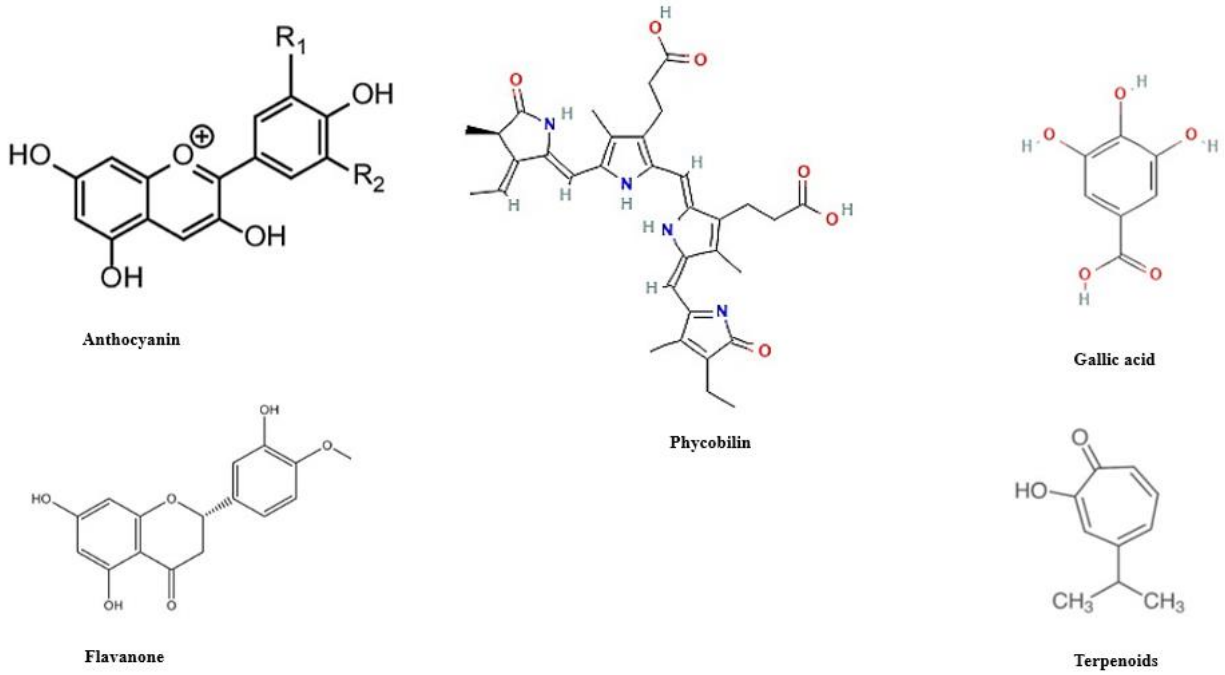


Fig.no.02: Chemical constituents of *Hibiscus hispidissimus* Griffith

3. Medicinal Use:

An anthelmintic, antibacterial, antioxidant, anti-inflammatory, antidiabetic, anti-arthritic, diuretic, nephroprotective, and hepatoprotective plant has long been used by tribal healers. [3] They are regarded as anthelmintic and are claimed to aid in digestion. The leaves' juice is combined with honey and applied to eye conditions. The plant's roots steeped with water are used as a refreshing beverage in the summer. The root bark decoction is used as a treatment for renal cleansing, swellings, and toxins. [7]. In fact, prior research has demonstrated that the entire plant, *Hibiscus hispidissimus* Griffith, has hepatoprotective activity and that its aerial components have anti-arthritic qualities [9].

4. Ethnobotanical And Traditional Uses

Keralan tribal healers utilize it to treat liver conditions. After being cooked, the acidic leaves are consumed. They are regarded as anthelmintic and are claimed to aid in digestion. When treating eye conditions, a mixture of honey and leaf juice is administered. A decoction of the root bark is used as a treatment for toxins, swellings, and kidney cleansing, while an infusion of roots in water is used as a cooling beverage during hot weather. Friedelin, beta-sitosterol, and taraxerol are examples of triterpene components that were obtained from the petroleum ether extract of *H. hispidissimus* leaves [3]. The sour leaves are utilized as a culinary element in South Indian cooking. The ayurvedic medication "Sathambasthi" is derived from the leaves. This medication is a key component of pancamlatailam, an oil preparation used for body anointing and one of the five acidic medications. Additionally, the leaves are a component of the Ayurvedic medications Abhram and Annabhedi Sinduram. The leaves have anthelmintic and anti-inflammatory properties. This herb is used to treat liver ailments by tribal healers in the Kerala region. It possesses anthelmintic properties and is supposed to aid in digestion. The leaves' juice is combined with honey and applied to eye conditions. Water is absorbed into the plant's roots during the summer and consumed as a refreshing beverage. The root bark decoction is used to treat renal cleaning, swellings, and toxins. [6]

5. Pharmacological Activities:

5.1. Antioxidant Activity:

The inclusion of bioactive substances such steroids, triterpenes, and saponins supported the substantial antioxidant activity shown by the ethanolic extract of Hibiscus hispidissimus Griff. (Malvaceae). Many natural compounds' scavenging properties are studied using the DPPH radical as the model system. Antioxidants scavenge DPPH by donating a proton, resulting in reduced DPPH, which is measured by a drop in absorbance. HH's strong free radical scavenging ability was demonstrated by the substantial quenching of DPPH radicals. [10]

5.2. Hepatoprotective Effects:

Significant hepatoprotective effects against liver damage caused by PCM and CCl4 were observed in Hibiscus hispidissimus Griff., as demonstrated by decreased levels of serum enzymes, including glutamate oxaloacetate transaminase (SGOT), glutamate pyruvate transaminase (SGPT), serum alkaline phosphatase (SAKP), and serum bilirubin (SB). According to earlier research, rats treated with 100, 200, and 300 mg/kg p.o. of HH extract prior to paracetamol administration showed a notable reduction in the rise of serum marker enzymes caused by paracetamol. This was corroborated by a liver biopsy, which revealed that the rat liver treated with HH had less histological damage from PCM. Additionally, HH

considerably reduced the elevated serum enzyme activity brought on by CCl4, which showed an improvement in the liver's functional state and was corroborated by the histological results [3].

5.3. Anti-Arthritic Activity:

Using in vitro models, such as proteinase (trypsin) inhibition tests, membrane stabilization, and inhibition of protein denaturation, the anti-arthritic properties of the ethanolic extract of Hibiscus hispidissimus were assessed. One of the primary causes of RA is protein denaturation, which results in the generation of autoantigens. The findings suggest that by inhibiting protein denaturation, the plant extract may regulate the synthesis of autoantigens. One of the factors contributing to the anti-inflammatory action is the prevention of lysosomal membrane lysis. Plant extract had a protective effect against RBC membrane lysis caused by heat and hypotonicity in the study. Hence it can be concluded that the plant extract may also stabilize the lysosomal membrane which is similar to the RBC membrane and there by induce anti-inflammatory effect.[9]

6. Toxicity And Safety Profile:

6.1. Acute And Subacute Toxicity Studies:

Male Swiss albino mice weighing 25–30 g were used to test the ethanolic extract of Hibiscus hispidissimus (HH) for its acute toxicity profile. The purpose of this study was to ascertain the fatal dose range and safety of HH when taken orally as a single dose. Each group of mice received one of the following doses: 100, 200, 400, 800, 1600, 3200, or 6400 mg/kg body weight. There were ten mice in each of the seven groups. For one hour following injection, the animals were closely watched for any poisoning symptoms or sudden behavioral changes. In the following six hours and again at the 24-hour mark, sporadic observations were made. The findings showed that at doses up to 3200 mg/kg, neither death nor obvious toxic consequences were observed. However, 50% of the animals (5 out of 10) perished at the highest dose of 6400 mg/kg, indicating systemic toxicity at this level. This finding led to the determination that, when given orally to mice, the median lethal dose (LD_{50}) was roughly 6400 mg/kg. This suggests that at dosages lower than 3200 mg/kg, the HH extract has a comparatively large margin of safety and low acute toxicity. [3]

6.2. Subacute Toxicity and Therapeutic Doses: [3]

Wistar albino rats weighing 270–300 g was used to evaluate subacute toxicity in the hepatoprotective activity experiments. In the experimental model (hepatotoxicity caused by paracetamol or CCl_4), dosages of 100, 200, and 300 mg/kg body weight was given for rats, every day for five to six days. Rats were observed for behavioural changes, distress indicators, behaviour towards food or water consumption, and mortality throughout the experiment. No groups which has received HH extract showed any symptoms of toxicity or negative results. At every tested dosage, the extract was well tolerated. The extract found to reduce the damages brought on by paracetamol and CCl_4, according to biochemical analysis of liver function markers such as serum glutamate oxaloacetate transaminase (SGOT), serum glutamate pyruvate transaminase (SGPT), serum alkaline phosphatase (SAKP), and serum bilirubin (SB). Histopathological analyses of liver tissue, showed significant improvement and nearly normal hepatic structure in HH-treated groups, supported these findings. Crucially, no additional protection was increased at higher doses, suggesting a possible dose plateau, and the protective effects were noticeable even at the lowest dose of 100 mg/kg.

6.3. Adverse Effects: [3]

At therapeutic levels, there is no visible side effects were noted throughout the acute or subacute toxicity tests. Animals administered 100–300 mg/kg of the HH extract showed no physical abnormalities, behavioral changes, or indications of hepatotoxicity. As evidenced by lower serum enzyme levels and better liver histology, the extract indeed showed strong hepatoprotective and antioxidant activity. However, 50% of mice died from the extract at very high dosages (6400 mg/kg), suggesting systemic toxicity most likely brought on multiple organ damage. The significance of following therapeutic dosage ranges is shown by these findings.

7. Comparative Phytochemical and Pharmacological Review of Related Species:

Both *Hibiscus rosa-sinensis* and *Hibiscus sabdariffa* are rich in bioactive substances, including flavonoids (like quercetin and kaempferol), anthocyanins (like delphinidin-3-sambubioside and cyanidin-3-sambubioside in H. sabdariffa), phenolic acids (like protocatechuic acid and chlorogenic acid), saponins, and sterols. Pharmacologically, H. rosa-sinensis exhibits strong anti-inflammatory, antimicrobial, wound-healing, and anti-cancer characteristics, which makes it a common choice for traditional medicine and cosmetic applications [10–12]. Eventhough its anthocyanins and organic acids contribute to its cardiometabolic health advantages, H. sabdariffa is well known for its potent antioxidant, antihypertensive, antihyperlipidemic, antidiabetic, hepatoprotective, and nephroprotective activities [14–16].

8. Recent Advances and Patents:

There are still many unanswered questions about the precise molecular mechanisms of action, pharmacokinetics, and long-term safety profiles of Hibiscus species, despite a wealth of evidence demonstrating their antioxidant, anti-inflammatory, and hepatoprotective qualities. Furthermore, the diversity in phytochemical composition caused by processing and environmental conditions has not been fully standardized, which limits clinical translation and reproducibility. Isolating new bioactive components, investigating synergistic effects with other phytochemicals, and assessing the effectiveness of hibiscus extracts in chronic illness models like diabetes, cardiovascular diseases, and neurodegeneration are the main goals of emerging research[17, 18]. The extraction, purification, and use of Hibiscus bioactives—especially those high in anthocyanins and flavonoids—with an emphasis on their antioxidant and skin-protective qualities have been the subject of numerous patents. Stabilized Hibiscus extract formulations for usage in cosmeceuticals to prevent photoaging and hyperpigmentation, as well as nutraceutical products to manage hypertension and hyperlipidemia, are examples of innovations. Some patents also address the use of chemicals obtained from hibiscus as natural food preservatives and in antimicrobial coatings, demonstrating the plants' versatility beyond conventional applications[19]. Hibiscus extracts have benefited from recent developments in drug delivery technology, which have improved their bioavailability and therapeutic effectiveness. These include the creation of polymer-based nanoparticles, liposomal carriers, and nanoemulsions that enhance the solubility, stability, and targeted delivery of active ingredients. To provide controlled dosage and reduce side effects, transdermal patches and sustained-release formulations containing hibiscus bioactives are also being researched. These

delivery methods increase the potential of hibiscus extracts in medicines, cosmetics, and functional foods while also optimizing pharmacological results[20].

9. Challenges And Future Prospects:

Many preclinical studies show that Hibiscus species have pharmacological potential, including anti-inflammatory, hepatoprotective, cardioprotective, and antioxidant effects. But there aren't many well designed clinical trials to confirm . When there is a luck of participant, short durations, or a lack of placebo controls limit many of the clinical investigations that are currently available. Establishing consistent protocols and conducting well-designed randomized controlled trials (RCTs) are crucial to validate efficacy, define appropriate dose, assess safety, and understand long-term impacts. This clinical validation is essential for regulatory approval and broader acceptance of evidence-based treatment [21,22]. The main obstacles to turning hibiscus extracts into medicinal or nutraceutical products are the heterogeneity in phytochemical content caused by variations in plant species, growth circumstances, harvesting time, and extraction techniques. This has great impact on repeatability and efficacy resulting in fluctuations in the amounts of bioactive compounds. Morover, it is challenging to identify and measure marker compounds for standardization due to the complicated composition of Hibiscus phytochemicals. Other formulation obstacles are limited bioavailability, poor solubility, and stability problems of important ingredients. To overcome these obstacles, standardized extraction procedures, verified analytical techniques, and sophisticated delivery systems has to be developed. [23,24]. Due the diverse range of bioactive chemicals found in Hibiscus species and their multi-target therapeutic effects, It can be used as promising plant for creating new nutraceuticals and phytopharmaceuticals. This plant may be used to treat common long-term illnesses such liver disorders, diabetes, metabolic syndrome, and hypertension. It is possible to improve patient compliance and efficacy by the developments in formulation technology, including combination medicines, liposomal administration, and nanoencapsulation., Moreover patenting novel formulations and extraction methods can stimulate business interest. Regulatory agencies, business, and university researchers working together will be essential to converting traditional knowledge into standardized, safe products. [25,26].

10. CONCLUSION:

A historically important but neglected medicinal plant, Hibiscus hispidissimus Griffith has a complex phytochemical profile that includes flavonoids, terpenoids, saponins, tannins, and glycosides. Preclinical research validates its wide range of pharmacological properties, including hepatoprotective, anti-inflammatory, anti-arthritic, and antioxidant actions. According to histological and biochemical results, ethanolic extracts from various plant sections have demonstrated a strong defense against oxidative stress and chemically caused liver damage. Its potential for further development is shown by toxicity tests that show a broad safety margin at therapeutic levels. However, due to lack of standardization, few human trials, and diversity in phytochemical content, clinical applicability is still restricted. Future research must concentrate on clarifying mechanisms of action, developing standardized extraction procedures, and carrying out extensive clinical trials in order to fully realize its medicinal potential. The incorporation of H. hispidissimus into contemporary phytopharmaceutical and nutraceutical products may be supported by developments in formulation technologies such as

nanoencapsulation, which may improve bioavailability and therapeutic efficacy.

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