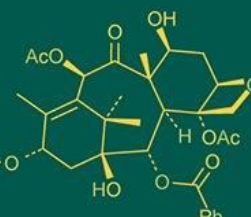
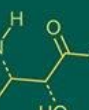
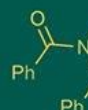


International Journal of Advanced Biochemistry Research



ISSN Print: 2617-4693
ISSN Online: 2617-4707
NAAS Rating: 5.29
IJABR 2025; 9(5): 644-647
www.biochemjournal.com
Received: 02-03-2025
Accepted: 05-04-2025

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A comprehensive overview of *Hibiscus-rosa-sinensis* and its uses: A review

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DOI: <https://www.doi.org/10.33545/26174693.2025.v9.i5h.4394>

Abstract

The traditional health and folk medicine systems have shown higher efficiency for solving health issues worldwide. *Hibiscus rosa sinensis* Linn., belonging to the Malvaceae family and also known as the China rose, is going to be the most vital contributor in the upcoming domain of herbal health supplements and medicinal products in the future soon. This botanical species has many critical therapeutic applications for the management of wounds, inflammation, hypertension, febrile conditions, coughs, diabetes, bacterial and fungal infections, alopecia, and gastric ulcers in many tropical countries. The main bioactive compounds established in *Hibiscus rosa sinensis* Linn. are flavonoids. Flavonoids include quercetin-3-diglucoside, quercetin-3,7-diglucoside, cyanidin-3,5-diglucoside, quercetin-3-sophorotrioside, kaempferol-3-xylosylglucoside, cyanidin-3-sophorotriose-5-glucoside, and other constituents such as cyclopeptide alkaloids, cyanidin chloride, hentriacontane, riboflavin, ascorbic acid, thiamine, taraxeryl acetate, β -sitosterol, cyclic acids like sterculic and malvalic acids. All the constituents of *Hibiscus rosa sinensis* Linn. and its chemical constituents have shown a variety of pharmacological activities, such as anti-tumor, antifertility, antiovaratory, anti-implantation, anti-inflammatory, analgesic, antiestrogenic, antipyretic, antispasmodic, antiviral, antifungal, antibacterial, hypoglycemic, spasmolytic, central nervous system depressant, hypotensive, and juvenoid activities. Very few studies on the toxicity profile of this plant have been conducted, and most of the extracts from its different parts are reported to be devoid of any toxicological effects, even at high dosages. This review compiles the phytochemical, pharmacological, and medicinal attributes of *Hibiscus rosa sinensis* Linn.

Keywords: *Hibiscus rosa sinensis* Linn, traditional use, hypertension, antioxidant, folk medicine

Introduction

Herbal medicine is the oldest form of medicine known to humanity. Through the ages, various cultures have used different herbs in their practices of medicine. This has collectively made the inherited knowledge from the past generations very holistic in nature regarding herbal medicine among all the cultures of the world. Plants are an invaluable reservoir of a myriad of secondary metabolites, which are used in pharmaceuticals, agrochemicals, flavorings, fragrances, colorants, biopesticides, and food additives [1, 2, 3]. The herb *Hibiscus rosa-sinensis* Linn (Malvaceae) is a glabrous shrub widely cultivated in tropical regions for ornamental purposes, showing multiple varieties characterized by an array of flower colors. In the realm of medicine, however, the variety featuring red flowers is predominantly favored [4].

Traditional literature confirms the long-known fact that *Hibiscus rosa-sinensis* leaves and flowers are hair growth-stimulating [5, 6] and anti-greying agents. The commercial herbal drugs for hair growth in India include extracts of various parts of *Hibiscus rosa-sinensis* [4]. Reports have been seen that the leaves and flowers are used to promote hair growth and to cure ulcers [5, 7, 8]. Flowers are also used in the treatment of arterial hypertension [9] and are significantly antifertility [10, 11].

Reports have indicated that Hibiscus flowers are antitumors, besides being a versatile list of analgesics, antipyretics, anti-asthmatics, and anti-inflammatory agents. Various studies have confirmed the presence of antioxidants, antifungal, and antimicrobial activity in the flowers of *Hibiscus rosa-sinensis* [12]. Research studies on extracts isolated from the stem, root, leaf, and flower parts of Hibiscus have shed light on the value-added role its phytoconstituents have in human well-being, notably through antioxidant effect, which would neutralize free

radicals that cause DNA damage ^[13].

More recent scientific studies show that over 50% of the new clinical drugs come from natural sources. Many of these substances have significantly influenced the pharmacological industry and have been pivotal in the advancement of improved therapeutic modalities for various ailments ^[14]. This plant holds considerable economic importance due to its herbal products and medicinal applications ^[14]. However, because there is a scarcity of current pharmacological data, there is little scientific research or clinical trials relating to the chemical extracts of *Hibiscus rosa-sinensis*, which might be useful for exploring

its speedy potential medicinal applications.

Taxonomical classification

The following table shows the taxonomical classification of *Hibiscus rosa sinensis* ^[15]:

Kingdom	Plantae
Family	Malvaceae
Order	Malvales
Class	Magnoliopsida
Species	Rosa-sinensis
Genus	Hibiscus



Chemical Constituent

The preliminary phytochemical screening revealed that *Hibiscus rosa-sinensis* contains a broad spectrum of compounds, such as tannins, anthraquinones, quinines, phenolics, flavonoids, alkaloids, terpenoids, saponins, cardiac glycosides, proteins, free amino acids, carbohydrates, reducing sugars, mucilage, essential oils, and steroids ^[16-20].

In addition, cyclopropanoids, methyl sterulate, methyl-2-hydroxy sterulate, 2-hydroxysterulate, malvalate, and beta-sitosterol have been isolated from *Hibiscus rosa-*

sinensis. Most importantly, the predominant anthocyanin found in the flower was cyanidin 3-sophoroside ^[21].

The quantitative phytochemical analysis of the flowers of *Hibiscus rosa-sinensis* explained the presence of flavonoids, total phenolics, tannins, carbohydrates, proteins, thiamin, niacin, ascorbic acid, riboflavin, calcium, phosphorus, and iron ^[22]. The flower extract of *Hibiscus rosa-sinensis* (Red) contained phenols, alkaloids, and tannins. On the other hand, the flower extract of *Hibiscus rosa-sinensis* (White) also contained phenols, alkaloids, and tannins, whereas the flower extract of *Hibiscus rosa-sinensis* (Yellow) showed similar constituents of phenols, alkaloids, and tannins ^[23].

Class of Compound	Chemical Constituents	Bioactivity/Properties	References
Flavonoids	Quercetin, Kaempferol, Rutin, Myricetin	Antioxidant, anti-inflammatory, antihypertensive, anticancer	[24]
Anthocyanins	Delphinidin, Cyanidin	Antioxidant, anti-inflammatory, improves circulation, hypotensive effects	[25]
Phenolic Acids	Caffeic acid, Chlorogenic acid, Ferulic acid	Antioxidant, anti-inflammatory, antidiabetic	[26]
Tannins	Ellagic acid, Gallotannins	Antioxidant, antimicrobial, anti-inflammatory	[27]
Alkaloids	Hibiscine	Antihypertensive, mild sedative	[28]
Terpenoids	Triterpenes, Saponins	Anti-inflammatory, anticancer, antioxidant	[29]
Organic Acids	Citric acid, Malic acid	Antioxidant, mild analgesic, improves metabolism	[30]
Sugars & Polysaccharides	Glucose, Fructose, Sucrose, Polysaccharides	Nutritional value, immunomodulatory effects	[31]
Essential Oils	Eugenol (trace)	Antimicrobial, anti-inflammatory	[32]

Pharmacological Activities

The following table shows the pharmacological activities of *Hibiscus rosa sinensis*

Plant part	Extraction solvent	Pharmacological activity	Therapeutic Profile	References
Flowers	Methanol, Ethanol, Aqueous	Antioxidant, Anti-inflammatory, Anticancer, AntiMicrobial, Hepatoprotective	Used to treat fever, inflammation, and as a general tonic.	[33, 34]
Leaves	Methanol, Ethanol, Water	Antidiabetic, Antioxidant, Anti-inflammatory, Antimicrobial	Used to manage Diabetes, improve liver function wound healing	[35, 36]
Bark	Ethanol, Methanol, Water	Antimicrobial, Antidiabetic, Antioxidant, Anti-inflammatory, Analgesic	Traditionally used in pain relief and managing diabetes.	[37, 38]
Seeds	Hexane, Ethanol, Methanol	Antidiabetic, Anti-inflammatory, Antioxidant, Anticancer	Used for managing blood sugar levels and improving skin health.	[39, 40]
Roots	Ethanol, Methanol. Water	Antioxidant, Antimicrobial, Anti-inflammatory, Antidiabetic, Hepatoprotective	Used for treating infections, diabetes, and liver problems.	[41]

Conclusion

Hibiscus rosa-sinensis is a versatile plant with significant botanical, medicinal, and economic importance. Its rich phytochemical profile, including flavonoids, polyphenols, and anthocyanins, underpins its wide range of therapeutic applications such as antioxidant, anti-inflammatory, antimicrobial, and anticancer activities. The plant's traditional uses in various cultures align with modern pharmacological findings, highlighting its potential in herbal medicine and natural product research. Despite its extensive benefits, further in-depth studies are needed to explore its bioactive compounds, clinical efficacy, and safety profiles. Advancing research in these areas could pave the way for the development of novel therapeutic agents derived from *Hibiscus rosa-sinensis*, contributing to both healthcare and the pharmaceutical industry.

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