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## A mini review on phytochemical and therapeutic potentiality of *Hibiscus*: An ornamental plant species

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### Abstract

China rose (*Hibiscus rosa-sinensis*), often known as the "Queen of Tropics," is a prominent flower throughout the Asian subcontinent's tropical regions. It is known as Joba in Bengali. This name was first postulated by Carolus Linnaeus. It is abundant in subtropical and tropical locations, and it is commonly grown as a decorative plant. It typically blooms in various colors of red, with yellow pollen. Overall, the *Hibiscus* is a dicot with solitary (axillary), beautiful flowers with a superior ovary, uniform symmetry, and axile placentation. They have five carpels, five locules, and five sepals, with a variable number of stamens. The root is a taproot with branches. This review explicates the distribution and description of the *Hibiscus* plant, along with its phytochemical as well as various bioactive chemical composition and their structures, the ethno-medicinal and botanical benefits on human health, and toxicity research. Altogether, this study provides an all-inclusive understanding of the plant *Hibiscus*, including its physical, chemical, and structural characteristics.

**Keywords:** *Hibiscus rosa-sinensis*, phytochemistry, bioactive compounds, ethno-medicinal properties

### Introduction

The gorgeous flowering plant *Hibiscus rosa-sinensis*, also known as China rose or the "Queen of Tropics," is primarily found in southeast China and certain Pacific and Indian Ocean islands. This flower symbolizes both Malaysia and Haiti's national flower, thus makes it unique [1]. These flowering species are well-known for their big, colorful flowers, which are commonly referred to as "Hibiscus" or, on occasion, rose mallow. Other names for this plant include hardy Hibiscus, rose of Sharon, and tropical Hibiscus. In some areas, the common garden Hibiscus, scientifically known as *Hibiscus syriacus*, is also known as the "rose of Althea" or "rose of Sharon" (though it should not be confused with the unrelated *Hypericum calycinum*, also known as "rose of Sharon") [2]. In tropical and subtropical regions, the Chinese Hibiscus (*H. rosa-sinensis*) with its various spectacular hybrids is still the most popular choice. Hawaii has a specific fondness for the Hibiscus, which is considered one of their most prized national flowers, and they frequently wear it in their hair for cultural occasions. Carolus Linnaeus first named the plant [3]. This plant thrives in subtropical and tropical climates and is widely grown for decorative purposes. It possesses large flowers on its luxuriant hedges, which are deep crimson and lack scent. This plant belongs to the subkingdom Magnoliophyta and the class Magnoliopsida, which means it is a vascular plant that reproduces through seeds. There are more than 300 species under the genus *Hibiscus*, which belongs to the Malvaceae family. Furthermore, the extract collected from the leaves and flowers has long been utilized as a natural medicine for various diseases and uncomfortable symptoms, as well as in herbal cosmetics such as wilted [4, 5].

The leaves are simple oblong or ovate-lanceolate, with coarse teeth at the apex. Flowers feature pedicels and are made up of five crimson petals. In Nigeria's Akwa Ibom State, the young leaves are commonly consumed as a vegetable and are reputed to have therapeutic benefits. *Hibiscus rosa-sinensis* has played an important role in human health because it contains unique biologically active chemical components [6]. Over 50% of all modern clinical medications are derived from natural products. Hibiscus has traditionally been utilized as an anti-asthmatic agent, analgesic, anti-inflammatory, antipyretic, anti-tumor, and anti-convulsant [7].

The rise of antibiotic-resistant strains of bacteria and fungi is common, necessitating the search for and use of alternate sources of antimicrobial agents against the majority of human pathogens and microorganisms capable of causing disease in humans. Several investigations have found antibacterial activities in the blooms of *Hibiscus rosa-sinensis*. The leaf extracts of *H. rosa-sinensis* L. include varying amounts of alkaloids, tannins, saponins, flavonoids, cardiac glycosides, anthraquinones, and phlorotannin, that enhances their therapeutic potentiality [8-10].

### Review of Literature

Distribution and Description India possesses a wealth of traditional medicinal systems and abundant biodiversity to support the herbal requirements of the treatment provided by its traditional medical systems. Ayurveda, Siddha, and Unani are the acknowledged Indian systems of medicine, utilizing herbs and minerals in their formulations. In India, across 15 agro-climatic zones, 4700 plant species of which 15000 are reported to have medicinal properties varying degrees. *Hibiscus rosa-sinensis* is cultivated in tropical and subtropical regions and the region of tropical Asia. *Hibiscus rosa-sinensis*

is a bushy plant; it is an evergreen shrub of 2.5-5 m (8-16 ft) tall and 1.5-3 m (5-10 ft) wide. It has glossy leaves. The color of the flowers vary from red, brilliant red, white, pink, orange, peach, to purple and yellow and, generally, flowering occurs in summer and autumn. The flower is five-petaled and is 10 cm in diameter, with a red tip anther. At the bottom of every Hibiscus bud, green colour calyx is present and the ends of the points are called sepals. It is commonly grown as an ornamental plant [11, 12].

The Hibiscus flower contains the ovary and other female parts within the pistil, a long tubular structure. A single flower possesses both male and female components, with pollen being gathered at the top of the stigma and the style in the middle, allowing pollen to reach the ovary. The ovary is situated at the base of the blossom, and the hibiscus has a single superior ovary. Additionally, the Hibiscus boasts numerous stamens. The stem is aerial, green, cylindrical, and branched, while the leaf is simple with alternate phyllotaxy and a petiole. The leaf is ovate, with an acute tip and serrated margins. These herbs are not only cost-effective but also easily accessible compared to modern alternative pharmaceutical agents [13].



Fig 1: *Hibiscus* flower and leaf

### Chemical composition

The preliminary phytochemical analysis showed that *Hibiscus rosa-sinensis* was found to have a variety of compounds such as tannins, anthraquinones, quinines, phenols, flavonoids, alkaloids, terpenoids, saponins, cardiac glycosides, protein, free amino acids, carbohydrates, reducing sugars, mucilage, essential oils, and steroids. Additionally, it also contained cyclopropanoids, methyl sterulate, methyl-2-hydroxy sterulate, 2-hydroxysterulate, malvalate, and beta-sitosterol. The primary anthocyanin present in the flower was cyanidin 3-sophoroside, while the flowers were found to contain four different types of flavonoids: rutin, quercetin, kaempferol, and myricetin. The flowers also contained substantial quantities of proanthocyanidins and anthocyanins [14-16].

Other compounds found in *Hibiscus rosa-sinensis* are campesterol, stigmasterol, cholesterol, taraxeryl acetate, beta-sitosterol fructose, glucose, and flavonoids. Hibiscetin, cyanin glucosides and alkanes are also present. *Hibiscus rosa sinensis* was reported to contain proteins, carbohydrates, fats, and fibre contents. It also contains appreciable amounts of vitamins, iron,  $\beta$ -carotene, and calcium. The stem and leaves contain stigma sterol, taraxeryl acetate,  $\beta$ -sitosterol, and three cyclopropane compounds. The flowers are abundant in Quercetin-3-diglucoside, cyanidin-3-sophoroside-5-glucoside,

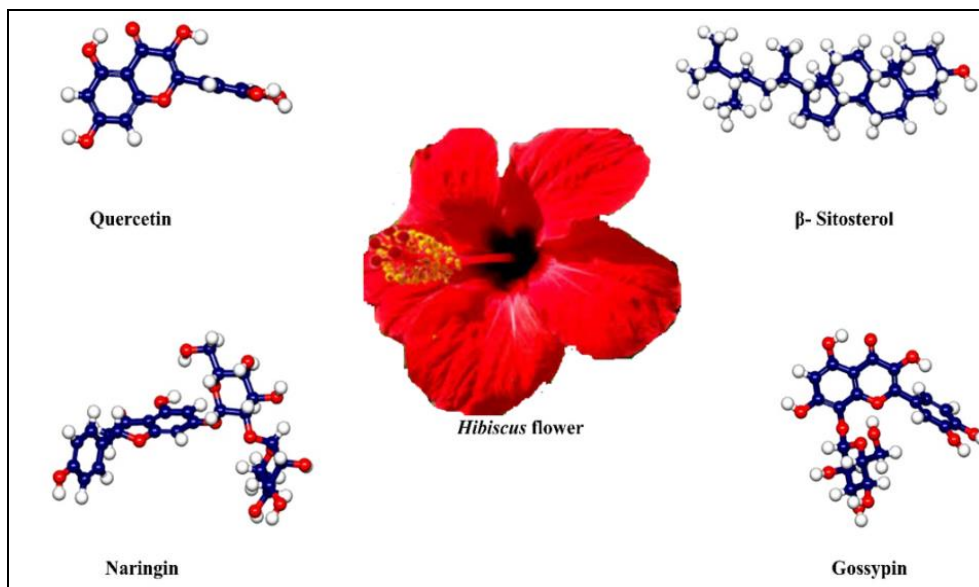
kaempferol-3-xylosylglucoside, cyanidin-3, 5-diglucoside, and 3, 7-diglucoside. Plant extracts serve as a source of numerous potential antioxidants and anticancer compounds, including quercetin, glycosides, riboflavin, niacin, carotene, malvalic acid, gentisic acid, margaric acid, and lauric acid. The roots are particularly rich in tannins, mucilage, flavonoids, and saponins. Saponins are useful for patients of hypercholesterolemia as they bind with cholesterol, form insoluble complexes, and excrete through bile, to lower blood pressure [17, 18].

### Major Bioactive constituents

The plant consists of plant acids, comprising citric acid, malic acid, tartaric acids, and also-hydroxy citric acid lactone, commonly known as hibiscus acid. These acids make up approximately 15%-30% of the plant's composition and are unique to this plant species. Hibiscus leaves contain carotene, riboflavin, anthocyanins, ascorbic acid, niacin, calcium, iron and vitamin C. Several studies reported that *H. rosa-sinensis* contains flavonoids, cyanidin, quercetin, hentriacontane, calcium oxalate, thiamine, riboflavin, niacin, ascorbic, citric, tartaric, and oxalic acid. Recently, four new phytoconstituents (n -hexacos-3-one-20, 21-diol, n - triacontane n -triacontan-15-one and n - hentriacontane) have been isolated from the

alcoholic extracts of leaf and flower. The leaf extract displayed notable antioxidant and anticancer properties because of elevated levels of flavonoids and terpenoids. The phytochemical analyses revealed that the components identified (flavonoids, terpenoids, saponins, tannins, and glycosides) contribute to the observed pharmacological effects. Flowers have been reported to contain cyaniding diglucoside, flavonoids and vitamins - thiamine, riboflavin, niacin and ascorbic acid; leaves contained beta-sitosterol,

sigma sterol, taraxerol, acetate and three cyclopropane compounds and their derivatives Pharmacologically, leaves, stem and root of *H. rosa-sinensis* contain a remarkable quantity of flavonoids which are associated with antioxidant, fever-reducing, pain-relieving and spasm-inhibiting activities and the flower has soothing properties which are used to relieve menstrual cramps and relax spasms and general cramping and treating inflammations [19-21].



**Fig 2:** *Hibiscus* Bioactive constituents

### Molecular Diversity

The RAPD method is dependable and full of potential for the assessment of the *Hibiscus* germplasm [22]. Utilizing molecular markers for plant characterization is a valuable approach to the preservation of plant genetic diversity. Molecular characterization aids in identifying the breeding patterns of species, individual reproductive achievements, and the presence of gene flow, which involves the transfer of alleles among populations of the same or closely related species, along with its implications. DNA extraction can be performed by the CTAB method. Spectrophotometric analysis was carried out to determine the concentration and purity of the DNA [23]. The research was conducted to identify and analyze genetic differences among four varieties of *Hibiscus rosa-sinensis* L. with varying colors (red, pink, orange, and white) using inter-simple sequence repeat (ISSR) and isozyme analysis. The ISSR findings revealed distinct banding patterns that were measurable. The study was to find out the genetic relationship within the 9 varieties of *Hibiscus rosa-sinensis* through random amplified polymorphic (RAPD) markers. The research indicates a high level of genetic diversity. The genetic similarity was found to be significant among the various types. By utilizing RAPD analysis alongside morphological traits, it is possible to distinguish and assess the genetic differences among different types and species of *Hibiscus*. The RAPD method is dependable and encouraging for the classification of *Hibiscus* germplasm, allowing for the creation of Sequence Characterized Amplified Regions (SCAR) primers for numerous *Hibiscus* types and species. Consequently, these RAPD markers hold promise for recognizing and characterizing genetic diversity within the various types of species. This may also be helpful in *Hibiscus* breeding programs and provides a major input into

conservation biology [24, 25].

### Ethno-medicinal uses

*Hibiscus* is renowned for its antibacterial properties. *Hibiscus* plants have the potential to provide compounds that enhance the effectiveness of antibiotics against bacterial diseases. The roots of *H. rosa-sinensis* contain aqueous and alcohol extracts that exhibit notable antiulcer activity. The extract of *H. rosa-sinensis* was found to have hypolipidemic potential. It is also helpful in wound healing. Aqueous extract and ethanolic extract of the flowers and leaves have anti-diabetic effects. The antithetic potential of the aqueous extract from *Hibiscus rosa-sinensis* flowers was assessed *in-vitro*. *Hibiscus rosa-sinensis* is an effective treatment for leucorrhoea, chronic cough, urinary diseases, and psychiatric ailments, offering a cost-effective solution without any adverse effects [26-29].

With special mention, *Hibiscus* tea is found to content rich in vitamin C. It also has the property of analgesic [30]. It may be due to the presence of alkaloids which produce narcotic analgesic activity mediated through the opioidergic receptor. The flower has antioxidant properties and is considered a natural antioxidant [31]. *Hibiscus. r-sinensis* have wound-healing properties too. *Hibiscus rosa-sinensis* flowers and leaves contain important constituents that confer its antibacterial activity and may be used in treating pathological conditions caused particularly by isolates (*P. aeruginosa*, *Serratia*, *Micrococcus*, *Enterobacter*, and *Salmonella*). As per the study *in-vitro*, the antibacterial activity of *H. rosa-sinensis* flower extract against human pathogens has been studied. Table 1 below shows the other therapeutic benefits obtained from the *Hibiscus rosa-sinensis* plant [32, 33].

**Table 1:** Table showing Ethno-medicinal benefits of *Hibiscus*

Parts of the Plant	Benefits
Roots	Antifungal, Anti-diabetic, pyretic, and Neuroprotective, In the treatment of venereal diseases, treatment of coughs and colds
Stem	Gastroprotective, Good quality fiber can be obtained
Leaves	Anti-bacterial, Antifungal, antioxidant, anti-cancer, and diabetic, hair growth promoting activity, wound healing activity, anti-inflammatory, cardioprotective, antipyretic, Helps in digestion Hepatoprotective, anti-asthmatic
Flower	Antihyperlipidemic, gastroprotective, cardioprotective, anti-inflammatory, improves immune response, wound healing activity, anti-fertility, hair growth promoting activity, For painful menstruation, cystitis, venereal diseases, feverish illnesses, bronchial catarrh, coughs. Hibiscus flower extracts have demonstrated the ability to impede the proliferation of various cancer cells, address hypertension, and regulate cholesterol synthesis. It has phytochemical and pharmacological benefits., anti-tumor, convulsive

### Toxicological study

*Hibiscus rosa-sinensis* is not a toxic plant; it is found to be safe in the recommended dosage. It has abortifacient properties and should not be used by a pregnant woman or by infants. It causes abortion in pregnant women. For infants, it should be avoided as it contains alcoholic constituents and persons who are undergoing detoxification should avoid it. The oil also has hallucinogenic effects. The administration of *Hibiscus rosa-sinensis* flower extract at doses ranging from 100 to 800 mg/Kg did not elicit any noteworthy alterations in behavior, skin, respiration, defecation, posture, food intake, water consumption, or hair related issues [34].

But a dose of 1600 mg/kg showed 20% mortality. *Hibiscus rosa-sinensis* exhibits notable medicinal characteristics. Numerous prior investigations have demonstrated the plant's beneficial anti-fertility properties, anti-ovulatory, anti-spermatogenic, androgenic, analgesic, anti-inflammatory, wound healing, and antidiabetic agent. Some *in-vitro* studies also described that *Hibiscus rosa-sinensis* shows notable antioxidant activity [35].

### Conclusion

Based on data gathered from earlier research, *Hibiscus rosa-sinensis* demonstrated a variety of pharmacological properties, including anti-inflammatory, antioxidant, antimicrobial, and anti-diabetic effects, contingent upon the specific extracts employed and the plant portion examined. According to phytochemical analysis, every portion of the plant is made up of a diverse spectrum of chemical elements, some of which are responsible for the pharmacological effect shown in the studies.

More research is needed to turn this plant into a medicinal formulation, however extracts of *Hibiscus rosa-sinensis* flowers and leaves are already sold in the market as conventional therapies for a variety of illnesses.

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### Conflict of interest

The author hereby declares, regarding the publishing of this paper, that there is no conflict of interest.

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