



## *Hibiscus Rosa Sinensis* and its Phytochemical Investigations

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### Abstract

Medicinal Plants were widely used in medicines since ancient times. In India, hibiscus, also known as *Hibiscus rosa sinensis* L (*H. rosa sinensis*), is used as a herb in Ayurvedic or complementary medicine to treat colds, promote wound healing, soothe injured or irritated tissue, and revitalise the skin. The flowering plant is an upright annual with lobed leaves, vivid flowers, and woody branches. It contains crimson flowers that are followed by capsules and a fleshy, enlarged, and vividly red calyx. Herbal medicines use the fresh and dried epicalyces and calyces. Antioxidant, androgen-like anticonvulsant, and hypoglycemic *H. rosa sinensis* properties have been noted. The leaves of this plant are used in traditional medicine to treat diarrhoea and dysentery.

**Keywords:** Malvaceae; Antioxidant; Hibiscus

### Introduction

Hibiscus react to acids and bases in the environment like litmus paper, changing colour when mixed with a substance that has an opposite pH. Polysaccharides are high-molecular-weight macromolecules that can be easily dissolved and dispersed in water under appropriate conditions [1]. They are frequently employed as food thickeners, texture modifiers, stabilisers, and emulsifiers for a variety of applications because they can change the rheological properties of foods. Plant. Polysaccharides were frequently extracted from plant matter using ultrasound. There are roughly 50 species of shrubs and trees in the genus *Hibiscus*, which is a member of the Malvaceae family, as well as a large number of hybrids. The tropical hibiscus, *H. rosa-sinensis* L., features enormous, vivid, and stunning flowers along with glossy, thick leaves. With its orange-red blossoms, *H. schizopetalus* Hook, f., sometimes known as "Fringed Hibiscus," has been widely grown in Asian nations. Yellow-flowered *H. sabdariffa* L. is used for its garden hedges and for its medicinal properties. In various regions of the world, a sizable number of hybrids and mutants are grown. Flowers' shape, size, and colour were utilised as morphological traits to distinguish be-

tween species or variations. Its 250 species are found in tropical and subtropical areas and are said to have a variety of therapeutic qualities, including anticancer, antihypertensive, Antioxidant, and antiammonemic effects. Ancient literature has made reference to the medical benefits of *Hibiscus rosa sinensis* (Chinese rose) blossoms for treating heart conditions. Hibiscus teas produced from its flowers, leaves, and roots are frequently ingested. In addition to being consumed in moderation, hibiscus is also utilised as a herbal remedy to treat cancer development, high cholesterol, and hypertension. Reports indicate that hibiscus extracts can inhibit the growth of cancer cell types including mammary carcinoma, leukemia, and melanoma. For instance, recent research shown that *Hibiscus* polyphenols reduce the viability and development of cancer cells. *H. rosa-sinensis* flowers are commonly used to make medicinal tea, these previous studies were performed with organic solvent extracts of leaves from different strains, namely *Hibiscus sabdariffa*. Internationally, the flower is used for a wide range of applications including hair care, herbal shampoo, antifungal cream as well as an emollient agent. The flowers are rich in anthocyanin.



**Figure 1:** Hibiscus Rosa Sinensis.

The red flower of *Hibiscus rosa sinensis* (HRS) also known as China rose belongs to Hibisceae tribe of family Malvaceae. Anthocyanins are natural colorants with a wide range of colours. The plant known as the “Chinese rose” is a shrubby species that is most likely native to tropical Asia and is utilised extensively as an ornamental species. There are many names for it, including Chinese rose, Shoe flower (English), Arkapriya, Japapushpa (Sanskrit), Jasund (Hindi), Angharee-hind (Persian), and Wadamal (in Sri Lankan). The ubiquitous garden ornamental plant known as the “china rose plant” is commonly grown in India and Burma. A perennial shrub known as *H. Rosa-sinensis* that is frequently grown as an ornamental in Southern China is vegetatively propagated. For the collection of flowers May month is best. Hibiscus is popular ornamental plant widely grown in Florida, California, and Hawaii. In many states of U.S. different hibiscus species are grown and potted hibiscus plants are transported to other parts of the United States and Canada. It is a rather exotic evergreen shrub with solitary flowers in summer and autumn, well adapted in South Greece.

The isolated compounds-quercetin, cyanid and hentricontane from the total benzene extract. However, the remaining mother liquor still showed activity.

It is a conspicuous evergreen shrub and is abundantly available throughout the Middle East and eastern Asia. *H. rosa-sinensis* Linn is a potent medicinal plant and originates from China. It is native to India and China. *Hibiscus rosa-sinensis*, a folk medicine named Zhujin in China. Vernacular name is Semparuthi It is a common Indian garden perennial shrub often planted as a hedge or fence plant. Around 6 days are taken for the flower to complete its development from bud sepal opening (showing colour) to full petal in-rolling. Flower produced throughout the year.

Enhanced abundance of a lot of hydrolytic genes, including aspartic and cysteine proteases, vacuolar processing enzymes, and nucleases. Is related to the senescence of the flower. In *Hibiscus* spp., abssisic acid and ethylene both accelerate floral senescence, with ABA doing so despite lowering the quantity of ethylene in the petal tissue [2]. All flowers that bloom during a day do so at precisely the same time. clock and light Light and an internal clock accurately time the development of hibiscus blossoms. This shows that a crucial regulator of the formation of hibiscus flowers is the circadian clock. Four gene clusters related to light signalling were found in the tissues of hibiscus flowers.

Over 190 potential transcription factor genes were discovered by analysis of the hibiscus transcriptome. Increased ethylene production was linked to the senescence of separated petals from *Hibiscus rosa sinensis* L. (cv Pink Versicolor) flowers. Petal in-rolling, a sign of senescence, and ethylene production were both enhanced by ethylene exposure (10 microliters per litre). Despite not being a native plant to Kuwait, HRS was brought there in the 1970s, and Kuwait now has access to its blossoms all year round [3]. The genus *Hibiscus* has 200 different species. The flowers are abundant in anthocyanin.

Natural colourants with a variety of hues are anthocyanins. The plant known as the “Chinese rose” is a shrubby species that is most likely native to tropical Asia and is utilised extensively as an ornamental species. Chinese rose, Shoe flower (English), Arkapriya, Japapushpa (Sanskrit), Jasund (Hindi), Angharee-hind (Persian), and Wadamal (Sinhalese) are the names given to it in many languages. In some areas, HRS blossoms are consumed raw or cooked, turned into a type of pickle, or used as a dye to colour meals like cooked vegetables and preserved fruits. The roots are also edible but fibrous, mucilaginous, and flavourless, and the young leaves are occasionally used as a substitute for spinach. *H. rosa sinensis*, also known as hibiscus, is a member of the Malvaceae family of plants. *Hibiscus Rosa sinensis* Linn is known as Japa in Sanskrit. Guamela and kangaya are the common names in Batan Island. About 50 species of shrubs, trees, and several hybrids make up the genus *Hibiscus*, which belongs to the Malvaceae family. The tropical hibiscus, *H. rosa-sinensis* L., features enormous, vivid, and stunning flowers along with glossy, thick leaves. With its orange-red blossoms, *H. schizopetalus* Hook, f, sometimes known as “Fringed Hibiscus,” has been widely grown in Asian nations. Yellow-flowered *H. sabdariffa* L. is grown for medicinal and garden hedge purposes. Southern China’s *Hibiscus*

*rosa-sinensis* L. (Malvales: Malvaceae) is a significant and valuable horticultural plant. Shevtchenkella biseta (Nalepa), described from the Malvaceae *Hibiscus rosa-sinensis* L., was assigned to the *Phytopytidae*, *Sierraphytoptinae*, upon deeper examination [4]. UV was high for *Hibiscus rosa-sinensis* (0.67).

Taxonomical classification of *Hibiscus rosa-sinensis* [5]

#### TAXONOMIC HIERARCHY

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

#### Distribution

*Hibiscus rosa-sinensis* L. (Malvaceae) is a perennial shrub distributed in tropical and subtropical regions of the world. *Hibiscus rosa-sinensis* L. (Malvaceae; HRS) is an ornamental plant native to China, and found in India and Philippines. *Hibiscus rosa sinensis* (HRS) is an abundantly available plant in Kuwait that was explored for extraction of the red dye to colour camel wool permanently. Roseira (*Hibiscus rosa-sinensis*), an ornamental plant, is abundant in Mozambique. Botanical species belonging to the genus *Hibiscus* are widely distributed in the Brazilian landscape and are employed both as small trees and as shrubs [6].

#### Cultivation

The herb *Hibiscus rosa-sinensis* Linn. (Malvaceae) is a glabrous shrub widely cultivated in the tropics as an ornamental plant and has several forms with varying colours of flowers. *Hibiscus rosa sinensis* (china rose plant) is a common garden ornamental plant cultivated widely throughout India and Burma. *H. rosa-sinensis* is a vegetatively propagated perennial shrub widely grown as ornamentals in many regions of Southern China. The red flowers of *Hibiscus rosa-sinensis* L. were collected in the month of May. *Hibiscus* is popular ornamental plant widely grown in Florida, California, and Hawaii<sup>7</sup>. Different hibiscus species are grown in many U.S. states and potted hibiscus plants are transported to other parts of the United States and Canada. It is a rather exotic evergreen shrub with solitary flowers in summer and autumn, well adapted in South Greece. The flower life is limited to 24 h from corolla opening to senescence.

#### MORPHOLOGY OF *HIBISCUS ROSA-SINENSIS*

##### Leaves

- Colour: glossy dark green
- Texture: medium
- Size: 4–6 inch wide and up to 8 inch long
- Shape: oval and lobed
- Margin: entire

##### Flowers

- Height: 7-12 feet
- Size: short, up to 5-5.5cm
- Shape: showy
- Color: red flowers, followed by capsules, surrounded by an enlarged, fleshy and brightly red calyx
- Whole Plant: 1-3m tall height: 4-5m

##### Leaves mucilage

- Physical properties Observation
- Appearance: Brownish powder
- Odour: Characteristic
- Solubility: Progressive soluble in water
- Forming viscous solution
- Percentage yield (g/kg): 21.58 g/kg
- % of moisture content: 14.70 ± 0.77
- % of weight loss on drying: 12.82 ± 0.58

##### Chemical constituents

The isolated compounds – quercetin cyanidin and hentricontane - from the total benzene extract. However, the remaining mother liquor still showed activity.

The phytochemical studies showed that *H. Rosa sinensis* contains a variety of sterols, carbohydrates, glycosides, tannins, and flavonoids. In addition to above mentioned constituents, the root bark of *H. rosa sinensis* also contains aliphatic enone ethers : oclade(-1)-yn-1-oic acid methyl ester 10-oxa, dec-9-ynoic acid methyl ester, non-8-ynoic acid methyl ester, nonadec-trans-10-enoic acid, 11-methoxy- 9-oxo-methyl ester, octadec-11-ynoic acid, 10-oxo methyl ester, octadec-9-ynoic acid, 8-oxo methyl ester octadecanoic acid, 10-methylene-9-oxo methyl ester and cyclopropenoids. Phytochemical studies revealed the presence of many chemicals, including flavonoids, flavonoid glycosides, hibi-scetin, cyanin glycoside, taraxeryl acetate, sitosterol, campesterol,

stigmasterol, ergosterol, citric, tartaric and oxalic acids [8], cyclopropanoids and anthocyanin pigments. Cyanidin-3-sophoroside, an anthocyanin contained in the red petals of *H. rosa-sinensis* has been suggested as the major active compound. Chemical constituents like quercetin, carotene, niacin, riboflavin, malvalic acid, gentisic acid, margaric acid, lauric acid, anthocyanin, and anthocyanidine. *H. rosa-sinensis* contains numerous compounds like flavonoids, cyclopeptide alkaloids and vitamins. *H. rosa-sinensis* (the herbal constituents of Shemamruthaa) are reported to contain a variety of phenolic compounds such as chlorogenic acid, hydrolysable tannins, flavonols and their glycosides, anthocyanins, quercetin, 3- $\beta$ -D-glucopyranoside, kaempferol 3- $\beta$ -D-glucopyranoside, isocorilagin, quercetin and kaempferol. Many chemical constituent such as calcium oxalate, Thiamine, riboflavin, niacin and ascorbic acid have been isolated from this plant. Cyclopropanoids, methyl sterulate, 2-hydroxysterulate, malvalate,  $\beta$ -sitosterol found in root leaf and flower. The major anthocyanin found in *H. rosa-sinensis* flowers was identified as cyanidin-3-sophoroside, cyanidin-3-sambubidoside [9].

**Storage condition for anthocyanin:** Greater stability of anthocyanin in *hibiscus rosa sinensis* when they were stored at 4 ° C, and storage at 25 ° C resulted in much faster degradation. Similar results were reported by Janna, *et al.* who also studied the stability of *Melastoma malabathricum* and found that the suitable storage condition for anthocyanin pigment is acidic solution in dark and low temperature (4°C). The result of this investigation was also consistent with other similar studies where they found that anthocyanin pigments degrade faster as the temperature increases to 25°C and the stability is maintained at low temperatures (i.e., 4°C) [12,21,23].

#### Varieties/species of hibiscus

- H1 - *Hibiscus rosa-sinensis* "Acc. no. 1"
- H2 - *Hibiscus rosa-sinensis* "Australian Rose"
- H3 - *Hibiscus rosa-sinensis* "Prolific"
- H4 - *Hibiscus schizopetalus* "Japanese Lantern"
- H5 - *Hibiscus rosa-sinensis* "H. D. Maity"
- H6 - *Hibiscus rosa-sinensis* "Albus"
- H7 - *Hibiscus rosa-sinensis* "Scarlet Brilliant"
- H8 - *Hibiscus rosa-sinensis* "Scarlet"
- H9 - *Hibiscus rosa-sinensis* "Snow Flake"
- H10 - *Hibiscus rosa-sinensis* "Tiki"
- H11 - *Hibiscus rosa-sinensis* "Acc. no. 2"

- H12 - *Hibiscus rosa-sinensis* "Juno"
- H13 - *Hibiscus rosa-sinensis* "Moorea"
- H14 - *Hibiscus sabdariffa*
- H15 - *Hibiscus rosa-sinensis* "Red Satin"
- H16 - *Hibiscus rosa-sinensis* "Acc. no. 3"
- H17 - *Hibiscus rosa-sinensis* "Toreador"
- H18 - *Hibiscus rosa-sinensis* "Acc. no. 4"

#### Uses of *H. Rosa Sinensis*

- The temperature dependences of delayed luminescence parameters were determined for the leaves of *H. Rosa sinensis*.
- The production of lipase by twenty-nine yeasts isolated from the phylloplane of *Hibiscus rosa-sinensis* was evaluated.
- Two killer yeast strains (HB55 and HB88) capable of inhibiting human pathogenic fungi were isolated from leaves of *Hibiscus rosa-sinensis* in Brazil. They inhibited all *Cryptococcus neoformans* (vars. *neoformans*, *grubii* and *gattii*) strains tested, including reference, clinical and environmental isolates.
- The isolation of yeasts (*Candida tropicalis*) from *Hibiscus Rosa sinensis* and evaluated the xylitol production from yeasts isolates utilizing D-xylose as a sole carbon source.
- Silver nanoparticles (AgNPs) were synthesized using petal extracts of *Hibiscus rosa-sinensis*.
- Water evaporation rate was significantly reduced in all zinc treated flower parts.
- Nectar production was increased after treatment with 10–12–10–6 ZnCl<sub>2</sub> reaching a maximum of 10–10 M. However, in dense solutions (10–4–1 M ZnCl<sub>2</sub>) the nectar secretion was notably decreased or stopped entirely.
- The concentrations of zinc, calcium, magnesium and manganese increased significantly in flower parts, sepals and petals, under excess zinc.
- Salinity promoted several physiological and biochemical changes in *Hibiscus* plant tissues including reduction of flower biomass and parameters associated with the functioning of the photosynthetic apparatus as well as fluctuation of ABA levels and increase in electrolyte leakage.
- The saline treatment significantly affected the anthocyanin composition of *Hibiscus* flowers reducing its content.
- In *Hibiscus rosa sinensis*, the addition of exogenous nitrite generated sufficient nitric oxide such that EPR could be used to detect its production using endogenous spin traps.
- Most nitrite-treated samples but dichloromethane extracts of *Hibiscus rosa-sinensis* and water extract of *Hibiscus rosa-sinensis* were mutagenic.

### Use of other hibiscus varieties

Crude hibiscus (*Althaea officinalis*) extract exhibited strong antiviral effects against H5N1 highly pathogenic avian influenza viruses (HPAIV) strains.

Hayashi, *et al.* reported the anti-human influenza virus activity of a red-fleshed potato anthocyanin.

### Hybridisation of hibiscus rosa sinensis

Low temperature exposure reduces growth rate, severely damages leaves, and eventually kills plants. Somatic hybridization with the frost-tolerant *Lavatera thuringiaca* has been used to attempt to improve *Hibiscus rosa-sinensis* for greater frost resistance. *A. tumefaciens* carrying plasmids bearing selectable genes coding for kanamycin and hygromycin resistance, respectively, was used to transform cell suspensions from *Hibiscus* and *Lavatera* [10].

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