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A review on *Hibiscus rosa-sinensis*; chemical components, pharmacological activities, and medicinal applications

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Abstract

The phytochemical study revealed the presence of quinines, anthraquinones, phenols, flavonoids, alkaloids, saponins, terpenoids, carbohydrates, free amino acids, protein, reducing sugars, mucilage, essential oils, and steroids in *Hibiscus rosa-sinensis*. Past study on the pharmacological properties of *Hibiscus rosa-sinensis* has shown that it has several impacts, including those connected to reproduction, immunomodulation, cytotoxicity, antiparasitic, antimicrobial, anti-hemolytic, dermatology, hepatoprotective, urinary, antitussive, neuroprotective, & immunomodulatory. The chemical components, effect of drug actions, and treatment significance of *Hibiscus rosa-sinensis* will all be covered in this summary.

Keywords: Chemical components, pharmacology, therapeutics, and side effects of *Hibiscus rosa-sinensis*.

1. INTRODUCTION

Herbs offer considerable potential as treatments for a variety range of infectious factors due to their extensive spectrum of actions i.e pharmacological, which comprises of antibacterial, anti-oxidant, anti-inflammatory, anti-cancer, and cytotoxic features. Since *Hibiscus rosa sinensis* is primarily noticed in south-east China and a few islands in the Pacific and Indian Oceans, it is commonly referred to as the "China rose" or the "Queen of the Tropics." One of Hawaii's most beloved national plants, hibiscus, is frequently worn in hair for ceremonial purposes [1, 2]. The traditional uses of hibiscus blossoms include antipyretic, analgesic, anti-asthmatic, and anti-inflammatory effects. They have also been found to have anti-cancer qualities. Numerous investigations have demonstrated the anti-oxidant, antifungal, and antibacterial qualities found in *Hibiscus rosa-sinensis* flowers [3]."China rose" or "Queen of the Tropics" is frequently used. The tropical evergreen shrub *Hibiscus rosa-sinensis L.* (Malvaceae family), which has red blossoms, is traditionally used to cure brons stomach ache, diarrhoea, dysentery, and the flu. It is also used to promote blood circulation and control menstruation [4].

2. DESCRIPTION AND DISTRIBUTION

2.1 Plant an overview

Hibiscus festalis Salisb, Hibiscus liliiflorus Griff. Hibiscus arnottii Griff. Ex Mast., Hibiscus rosiflorus Stokes, Hibiscus boryanus DC., Hibiscus cooperi auct., Ex Mast., and *Hibiscus storckii* Seem are synonyms for this species [5].

Name: *Hibiscus Rosa Sinensis*

Kingdom: Plantae

Subkingdom: Tracheobionta

Super division: Spermatophyta

Division: Magnoliophyta

Class: Magnoliopsida

Subclass: Dilleniidae

Order: Malvales

Family: Malvaceae

Genus: Hibiscus L.-Rosemallow

Species: Hibiscus rosa sinensis L.-Shoe black plant

2.2 Plant Common Name in India

Names in State	Plant Common Name
Marathi	Dasindachaphula, Jasvand, Jasund
Assamese	Jiwa, Joba
Mizoram	China Pangpar, Midumpangpar
Bengali	Oru
Hindi	Guthur, Jassoon, Jasum, Jasut, Java, Odhul
Gujarati	Jasvua, Jasunt
Andhra Pradesh	Dusanna
Manipuri	Jabakusum
Malayalam	Dasavala
Kannasa	Dasavala
Manipuri	Jabakusum

Fig. Depiction of *Hibiscus rosa sinensis* Plant

In milder climates, *Hibiscus rosa-sinensis* can freeze because to its extreme sensitivity to frost. It flourishes most effectively in brightly lighted and appropriately drained, organic matter-rich soil. It is abundant in Thailand, South Africa, the Philippines, Burma, China, Sri Lanka, Pakistan, India's south-western areas, & Sri Lanka's tropical areas. [6]. Although this plant was cultivated for a long time in China, Japan, and the Pacific Islands, its likely origin was in tropical Asia. Originally, it was said to have come from in South China. This term "rosa-sinensis," which means "rose of China," refers to the plant whose bright ruby blossoms are thought to have Asian ancestry. It is currently growing extensively [7-10].

3. Chemical Constituents

The *Hibiscus rosa-sinensis* plant contains tannins, quinines, anthraquinones, phenols, flavonoids, alkaloids, saponins, terpenoids, cardiac glycosides, proteins, carbohydrates, free amino acids, reducing sugars, mucilage, essential oils, &steroids, according to a preliminary phytochemical investigation [11-15]. Cyclopropanoids, sterculic acid methyl ester, methyl-2-hydroxy sterculate, 2-hydroxysterculate, malvalate, & beta-sitosterol were found in this plant. The major anthocyanin in the flower was cyanidin 3-sophoroside [16].

There are several chemicals present in each part of *H. rosa sinensis.* It was claimed that the leaves, flowers, stem, and roots contain glycosides, phlobatannins, flavonoids, saponins, and terpenoids in addition to other elements involving niacin, riboflavin, and thiamine [17].

The edible flowers often include phosphorus, calcium, iron, fat, moisture, nitrogen, and crude fibre. Yellow blossoms contain many flavones, including cyanidin-3,5-diglucoside and cyaniding-3-sophoroside.3-5-glucoside These substances include quercetin-3,5-diglucoside and quercetin-3,7-diglucoside. White flowers contain kaempferol-3-xylosylglucoside isolate in addition to the already mentioned components [18].

Hibiscus rosa-sinensis flowers were also used to extract cyanidin-3-sophoroside. It worked well as an indicator for a variety of acid-base titrations in this investigation, and it even required smaller quantities of acids and bases than the more traditional indicators, including methyl orange and phenolphthalein.[19] Furthermore, in comparison to manufactured colours, natural pigments like cyanidin-3-Sophoroside are non-carcinogenic, eco-friendly, and biodegradable [19-20].

4. Physicochemical characteristics

The root extract's physicochemical parameters consist of a 0.53% loss upon dry, ash values of total ash, acid insoluble ash of 0.75%, and Ash that dissolves in water 6.32%; values extracted from 2.80%, 5.30%, and 15.60% for carbinol extraction-based, 2.60% for ethanol soluble extraction-based, and 1.45% for petroleum ether soluble extraction-based; and a 2.5% swelling index [21]

5. Pharmacological Effect

5.1 Anti-oxidant effect

By assessing the total flavonoid levels, DPPH free radical elimination action, overall phenolic content and of fatty acid oxidation capability, several different solvent-based extracts of *Hibiscus rosa-sinensis* were assessed for their antioxidant potential. The ethanol & methanol extracts of this plant demonstrated total flavonoids equivalent to 53.28 ± 1.93 & 32.25 ± 1.21 mg/100g for catechins, and total phenolics equivalent to 61.45 ± 3.23 & 59.31 ± 4.31 mg/100 g for gallic acid. The results indicate that the DPPH free radical saving action, was 64.98 ± 2.11% and the percentage of inhibition of the linoleic acid oxidation potential was 75.8 ±3.22 and 61.6 ± 2.01%, respectively.[29] The antigenotoxic and antioxidant (in vitro) properties of ethanolic extracts from *Hibiscus rosa sinensis* flowers were the subject of another investigation. Lipid oxidation was prevented and the free radical scavenging potential was increased in a way dependent on dosage by ethanolic extract [23].

5.2 Anti-diabetic effect

Streptozotocin-treated diabetic rats were examined for the anti-diabetic properties of *Hibiscus rosa sinensis* aqueous alcohol extract. Over the course of four weeks, a single dose of 500 mg/kg of extract was administered. High levels of urea, creatinine, uric acid, and blood glucose were all significantly reduced, according to the study. Additionally, the treatment raised albumin, insulin, and C-peptide activity and restored the level of marker enzymes [24].

5.3 Dermatological effect

Three different rat models of wound healing excision, incision, and dead space wound were studied using the ethanolic extract of *Hibiscus rosa-sinensis* flowers (5 to 10% in terms of weight). The extract increased the number of cells and production of collagen at the wound site, which resulted boost in the total protein, collagen content, DNA, and granulation tissues. Improvements in the rates of wound contraction and epithelialization revealed that the wounds treated with extract healed much more quickly. *Hibiscus rosa-sinensis* extract considerably ($P<0.001$). Three various models of rats' wound-healing abilities: dead space wound, incision wound, and excision wound. The extract promoted growth of cell & creation of collagen at the damaged site, which resulted in increases in the number protein, collagen content, DNA, and granulation tissues. It was evident from improvements in the rates of wound contraction and epithelialization that the extract-treated wounds healed substantially faster. Extracts from *Hibiscus rosa-sinensis* significantly ($P<0.001$) [25].

5.4 Anti-Microbial Effect

By using well diffusion method, Escherichia coli, Pseudomonas aeruginosa, Enterobacter aerogenes (ETA), and S.pyogenes was used to test the antibacterial properties of a methanol solution of *Hibiscus rosa-sinensis* leaves. Following one day period of incubation at 37 ºC, the highest inhibitory region was seen against Escherichia coli and Enterobacter aerogenes, measuring 13 ± 00 and 12 ± 00 mm, respectively [26].

Using the disc diffusion method, a second study was carried out to look in to the antibacterial properties of a water extract of *Hibiscus rosa-sinensis* leaves. The extract was found to be most effective against Staphylococcus aureus, Bacillus subtilis, and Escherichia coli at a concentration level of 40 mg/ml (11.00 ± 1.20, 14.00 ± 1.05, and 12.30 ± 0.95 mm, respectively). Incredibly, a different study that used hexane and fluid extracts of *Hibiscus rosa-sinensis* flowers reported findings that were comparable. The highest inhibitory region against *Bacillus subtilis* and *Escherichia coli* was obtained using aqueous extract (15.00 ± 2.81 and 15.00 ± 2.81 mm, respectively). The highest

inhibitory region of hexane extract was observed against Bacillus subtilis (19.86 ± 0.15 mm) and *Escherichia coli* (18.00 ± 1.53 mm), respectively.[27].

5.5 Anti-bacterial effect

Escherichia coli, *Pseudomonas aeruginosa*, *Enterobacter aerogenes*, and *Streptococcus* pyogenes were all proven to be susceptible to the antibacterial properties of methanol extracts made from *H. rosa-sinensis* leaves. Utilizing the well diffusion method, the greatest observed zone of inhibition at 80 µg/ml of the leaves. alcohol extraction was 13 ± 00 mm against *E. coli* and 12 ± 00 mm towards both *S. aureus* and *E. aerogenes* during a period of 24 hours at 37° C. These microbes were isolated from skin infections, and the study's identification of flavonoids, tannins, terpenoids, saponins, and alkaloids may have contributed to the chemical compounds' antibacterial action [28]

5.6 Anti-fungal effect

A range of *Candida albicans*, *Candida parapsilosis*, *Aspergillus niger,* and *Trichophyton rubrum* strains have been successfully treated with methanol extracts derived from *Hibiscus rosa-sinensis* leaves in previous studies. During a 24-hour incubation period at 37 °C, the well diffusion method yielded the greatest observed zone of inhibition, measuring 9.3 ± 0.57 mm against *Aspergillus niger*. At an 80 µg/ml concentration of leaf methanol as extract, the zone of inhibition towards Candida albicans was found to be 6.6 ± 0.57 mm. The investigation identified alkaloids, flavonoids, tannins, terpenoids, or saponins as putative chemical components in charge of the fungi's antifungal activity that were isolated from afflicted skins [29].

5.7 Reproductive effects

When given Intraperitoneally (Ip) to adult male albino mice at different two levels of dose (125 and 250 mg/kg bw), chloroform benzene & ethanol extracts of H. rosa sinensis blooms lowered the proliferative components in the testes and epididymal count of sperm for a duration of 20 days. Reduced androgen production could be the cause of a high testicular cholesterol level [30].

5.8 Anti-cancer effect

It was investigated acetone extracts on the viability of HeLa cell-lines was studied. At a dosage of MTT experiment, it was found that only 12.96% of the cells were viable at a amount of 1000 µg/ml. Spectra of the FT-IR reveal the appear of flavonoids, tannins, and saponins, which are likely to be involved in this activity [31].

5.9 Anti-haemolytic effect

In vitro study was done on the anti-hemolytic properties of this plant's flowers. After incubating the floral extract at different concentrations with erythrocytes, lipid peroxidation and hydrogen peroxide cause blood loss were measured like markers for blood injury. In vitro lipid peroxidation and hemolysis caused by hydrogen peroxide were considerably decreased by the extract [32].

Conclusion

Hibiscus rosa sinensis is a common traditional medicinal plant in China, the other tropical nation is a member of the Malvaceae family. Its constituents have been utilized as contraceptive agents as well as to treat fever, inflammation, and bacterial infections. The primary phytochemicals include tannins, flavonoids, terpenoids, saponins, and alkaloids since these are found in various extracts and in charge of the biological impacts. This plant's decreased toxicity may work to its favor as a novel medicinal agent. A thorough summary of current research on the phytochemistry & medicinal product of *H. rosa sinensis* has been provided in this study. Because there hasn't been much study done in some areas, more work has to be done to investigate the mechanisms of action of phytochemicals, like their anti-cancer properties. These biological substances must be first properly extracted and recognized, though. Furthermore, to evaluate this plant's safe use and desired side effects, clinical investigations on its toxicity and pharmacological effects need to be conducted.

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