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A Review on Pharmacological Validation of Genus Hibiscus with Main Emphasis on *Hibiscus rosa-sinensis*



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ABSTRACT

Hibiscus is a large genus that contains herbs, shrubs and trees widely distributed in tropical and sub-tropical part of world. Various species of Hibiscus are popular in indigenous system of medicine like Ayurveda, Siddha, Unani and Tibb. The plants are used in various ailments such as stimulant, stomachic, anti-spasmodic, purgative, aphrodisiac, anthelmintic, emollient, hair-growth stimulant and ulcer in folkloric system of medicine. Hibiscus is a genus that contains various species that have some medicinal value as well as used as fiber and vegetable. From the various species, about 40 species are found in India and many of these species valued as ornamental plants and are cultivated in gardens. The present review is, therefore, an effort to produce the detailed review of literature on pharmacognosy, phytochemistry and pharmacological activities of *Hibiscus rosa-sinensis*.

INTRODUCTION

Medicinal plants are the prestigious gift given by nature which is used in various ailments. Everything that is present in nature has some use for man or animal¹. Despite the major advance in modern medicine, the development of new drug from natural products is still considered important. The current estimates of the flowering species ranges between 200000-250000 in some 300 families and 10500 genera. Medicinal plants have been a major source of therapeutic agents since ancient times to cure human disease. India is considered as botanical garden of the world and more than 2200 species of medicinal and aromatic plants have been identified after studies². The revival of interest in natural drugs started in last decade mainly because of the widespread belief that green medicine is healthier than synthetic products. Nowadays, there is manifold increase in the interest of use of medicinal plants throughout the world which are growing at a rate of 7-15% annually. Despite the major advances in modern medicine, the development of new drugs from natural products is still considered important.

Hibiscus is a large genus that contains various species that have some medicinal value as well as used as fiber and vegetable. From the various species about 40 species are found in India and many of these species valued as ornamental plants and are cultivated in gardens³.

Habitat

India which use 15 agro-climatic zones, 4700 plants species of which 15000 are reported to have medicinal properties varying degree. 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 colors of flowers. It can be planted with advantage in group planting of shrubs or for beautifying parks and grassy plots. Numerous types adapted to sunny, semi-shady and shady locations and with single and double flowers of red, yellow, white, magenta, cherry and striped colors are in cultivation. Many of them are hybrids with allied species, such as *Hibiscus tiliaceus* and *Hibiscus schizopetalus*¹.

Hibiscus rosa-sinensis grows under moderate temperature and relatively high humid conditions. The plant thrives in any type of soil, but good results are obtained in well prepared, manured and irrigated soils. It can be propagated by cutting, preferably from mature wood of current growth. It blossoms almost throughout the year and seldom sets seeds under cultivation⁴.

Morphological Characters of flower

Flower of *Hibiscus rosa-sinensis* is ebracteate, pedicellate, complete, regular, actinomorphic, bisexual, protandrous hypogynous, cyclic. Epicalyx 5, free, green, linear. Calyx 5, gamosepalous, campanulate, inferior, green. Corolla 5, polypetalous, obovate, sinous upper margin, mucilaginous, twisted, inferior, red. Gynoecium pentacarpellary, syncarpous, superior, style united below and free at its tips, stigma 5, capitates, velvety red. Androecium many, monoadelphous, epipetalous, antisepalous. Odour fragrant, taste mucilaginous². Morphology and traditional uses of different species of genus *Hibiscus*⁴ are given in Table No. 1.

Table No. 1: Morphology and traditional uses of various species of genus *Hibiscus*^{1,3,4}.

Sr. No.	Hibiscus Species	Macroscopic Characters	Uses
1.	<i>H. abelmoschus</i>	Erect, hirsute or hispid herb, 2-6ft in height, leaves are palmately 5-7 lobed, large flower of yellow with crimson centre, fruit is capsule or pod, oblong-lanceolate, 1-3 inch long containing a large number of small grayish brown seeds.	Perfumery, flavouring agents, tonic, carminative, stomachic, stimulant & anti-spasmodic
2.	<i>H. cannabinus</i>	Erect herbaceous, 8-12ft long, lower leaves cordate, upper leaves deeply palmately 5-7 lobed, large axillary flower of yellow with crimson centre.	Fibres are used in many household things, leaves are purgative and aperient, stomachic, aphrodisiac etc.
3.	<i>H. esculentus</i>	Erect, tall and annual herb with 3-7 ft long, leaves are cordate, palmately 3-5 lobed, large flower of yellow with crimson centre, horn like pods with green or creamy green in colour.	As vegetable, blood volume expander.
4.	<i>H. ficulneus</i>	Much branched, prickly annual, 6-14 ft long, leaves rounded, cordate at base, upper leaves palmately lobed, white small flower with pink centre, seeds globose.	Flavouring and perfuming agent.
5.	<i>H. furcatus</i>	Erect or trailing, suffruticose, prickly herb, 2-5 ft long, leaves are entire in early stage and 3-7 lobed in later stage, yellow large flower with purple centre.	Digestive, anthelmintic, cooling drink, antidote.
6.	<i>H. macrophyllus</i>	Small or medium-sized, deciduous tree or large shrub covered with brown, long tufted hairs, leaves large, orbicular, deeply cordate, flower are axillary & terminal cyme.	Fibre is used in rope and cordage making.

7.	<i>H. manihot</i>	Tall, erect, stout, glabrous or hairy herb or undershrub, 3-9 ft long, leaves are deeply palmately lobed, yellow large flower with purple centre, kidney shaped seeds.	Stabilizing agent, emmenagogue, anti-inflammatory.
8.	<i>H. mutabilis</i>	Large bushy shrub or small tree, about 8ft high, leaves 4-9 inch in length, hairy, deeply cordate, flowers are white or pink in morning turning red by night, reniform seeds.	Expectorant, cooling, antidotal, anodyne, dysuria, emmolient.
9.	<i>H. rosa-sinensis</i>	Evergreen woody, glabrous, showy shrub, 5-8ft high, leaves bright green, ovate, entire below, coarsely toothed, flower solitary, axillary, bell shaped with pistil and stamens projecting from the centre.	Demulcent, emollient, refrigerant, aphrodisiac, laxative, hair growth stimulant.
10.	<i>H. sabdariffa</i>	Annual erect shrub with red green stem, leaves serrate, lower leaves ovate & undivided, upper one palmately lobed, flowers are yellow with dark crimson eye, seeds numerous large, reniform, black-brown in colour.	Cooling, laxative, used in high blood pressure, anti-scorbutic etc.
11.	<i>H. surattensis</i>	Weak stemmed, intensely prickly, trailing herb, leaves somewhat hairy, deeply palmately with serrate margin, flower large, yellow with dark centre.	Urethritis, gonorrhoea, emollient etc.
12.	<i>H. syriacus</i>	Deciduous, much branched shrub, 10 ft long, leaves glabrous, sub-rhomboid, 3-lobed, flower bell shaped, solitary in the axils.	Stomachic, diuretic, diarrhea, dysentery, ulcer and dysmenorrhoea etc.
13.	<i>H. trionum</i>	Pubescent herb, 1-2 ft long, leaves orbicular undivided, flower are pale yellow with dark purple centre, capsule oblong, obtuse, hairy.	Stomachic, diuretic and in skin disease.
14.	<i>H. tiliaceus</i>	Much branched shrub or small tree, 20-30 ft long, leaves roundish, leathery, flowers yellow with crimson centre, turning red on withering.	Ulcer and wounds, laxative, emollient, dysentery, diuretic etc.

Chemical Constituents

Hibiscus rosa-sinensis contains numerous compounds including quercetin, glycoside, riboflavin, niacin, carotene, anthocyanin, anthocyanidin, malvalic acid, gentisic acid, margaric acid and lauric acid^{1,5}.

Four novel aliphatic esters were isolated⁶ from the stem bark of *Hibiscus rosa-sinensis* and were characterized as methyl 10-oxo-11-octadecynoate, methyl 8-oxo-9-octadecynoate, methyl 9-methylene-8-oxoheptadecanoate and methyl 10-methylene-9-oxooctadecanoate.

The flower of *Hibiscus rosa-sinensis* contains flavones, quercetin-3,5-diglucoside, quercetin-3,7-diglucoside, cyanidin-3,5-diglucoside and kaempferol-3-xylosylglucoside. The flower also contains thiamine, riboflavin, niacin and ascorbic acid, apigenidin, fructose, oxalic acid.

Pharmacological activities on 'Rudrapuspa' (China Rose)

Anti-noceceptive and Anti-inflammatory Activity

The anti-noceceptive and anti-inflammatory activities of methanolic extract of *Hibiscus rosa-sinensis* leaves at dose of 250 and 500 mg/kg body weight were studied⁷. Result showed a significant dose dependent anti-inflammatory activity in carrageenin and dextran induced rat paw edema, animal model. In the same study, the significant dose dependent peripheral analgesic activity was also studied using acetic acid induced writhing response and tail flick method at same dose.

The analgesic activity of aqueous and alcoholic extract of *Hibiscus rosa-sinensis* leaves were studied⁸. Result showed that plant leaves have significant analgesic activity at dose of 100, 200 mg/kg body weight.

Anti-convulsant Activity

Different extract of *Hibiscus rosa-sinensis* flower was evaluated for anticonvulsant activity at a dose of 250 mg/kg body weight⁹. It showed significant anticonvulsant activity in maximum electroshock seizure (MES) method but did not show any significant activity in Isoniazid (INH) induced model. The result was analyzed by studying the various phases of convulsion viz. flexion, extensor, clonus, stupor, recovery and death.

Anti-ulcer Activity

Various extract of *Hibiscus rosa-sinensis* root were prepared by cold maceration method and evaluated for antiulcer activity¹⁰. The result revealed that aqueous extract of *Hibiscus rosa-sinensis* at dose of 500 mg/kg showed highly significant dose dependent antiulcer activity in pylorus ligation induced gastric ulcer model.

The gastroprotective activity was also performed on the various extract of flower¹¹. The result showed significant reduction in ulcer index and ulcer score.

Anti-diabetic Activity

The anti-diabetic activity of ethanolic extract of *Hibiscus rosa-sinensis* leaves at dose of 100 and 200 mg/kg body weight was reported¹². Result showed that plant has significant hypoglycemic activity in non obese diabetic (NOD) mice. In this study, various parameters such as blood glycosylated haemoglobin (HbA1c) level, Plasma insulin, Blood triglycerides, cholesterol, and blood urea were evaluated.

Aqueous and ethanolic extract of *Hibiscus rosa-sinensis* flower at 250 mg/kg body weight was evaluated for antidiabetic activity¹³. Result revealed that aqueous extract did not alter the glucose level in normoglycemic as well as in STZ induced diabetic but ethanolic extract of *Hibiscus rosa-sinensis* flower at doses of 250 and 500 mg/kg showed significant reduction in blood glucose level in both acute and sub acute treatment¹⁴.

The insulin secreting activity of *Hibiscus rosa-sinensis* leaf extract in Alloxan induced diabetic rat. Result demonstrated that treatment of leaf aqueous extract was enhanced the serum insulin level and had a therapeutic efficacy in recovering type- I diabetes in Wistar rats¹⁵.

Anti-pyretic Activity

Ethanolic extract of two varieties of *Hibiscus rosa-sinensis* flower, Lahina and China were evaluated for antipyretic activity¹⁶. The result showed that flower extract of China rose have significant antipyretic activity at dose of 300 mg/kg on Brewer's yeast induced pyrexia model.

Wound Healing Activity

The wound healing activity of ethanolic extract of *Hibiscus rosa-sinensis* flower at dose of 120 mg/kg/day was evaluated. The result showed significant reduction in wound area. The study was performed by using excision, incision, and dead space wound model and activity was assessed by the rate of wound contraction, period of epithelization, tensile strength, granulation tissue weight and hydroxyproline content¹⁷.

Hair growth Activity

The hair growth activity of petroleum ether extract of leaves and flower of *Hibiscus rosa-sinensis* was evaluated by *in-vitro* and *in-vivo* methods¹⁸. Result revealed that leaf extract exhibit more potency on hair growth than flower extract¹⁹.

The same activity on 2.0 % Ethanolic extract of *Hibiscus rosa-sinensis* flower was evaluated. The result showed that extract has potential hair growth activity in female Wistar rats²⁰.

Anti-bacterial Activity

Different extract of leaves and flower of *Hibiscus rosa-sinensis* was evaluated for its activity against Gram positive and Gram negative bacteria by agar well diffusion and agar disk diffusion methods. Result revealed that plant have highly positive antibacterial activity against some pathogens²¹.

Anti-fertility Activity

Ethanolic extract of *Hibiscus rosa-sinensis* root was evaluated for antifertility activity by and result showed its potential post-coital Antifertility, estrogenic and anti-implantation activity at dose of 400 mg/kg body weight²².

Anti-cancer Activity

The anticancer activity of *Hibiscus rosa-sinensis* extract was evaluated at dose of 3.5 and 7.0 mg/kg body weight and studied showed protective effect in the tumour promotion stage of cancer development against the single topical application of benzoyl peroxide (20 mg/0.2ml/animal) followed by UV radiation (0.420J/m²/s).

The role of gentisic acid in the chemopreventive activity of *Hibiscus rosa sinensis* extract on 7, 12-dimethyl benz(a)anthracene (DMBA)/croton oil-mediated carcinogenesis in mouse skin via 12-O-tetradecanoyl phorbol-13-acetate (TPA)-induced tumour promotion response and oxidative stress. The result revealed that extract and gentisic acid has a role in the modulating activity of *Hibiscus rosa-sinensis* that reduced the MDA formation and H₂O₂ content²³.

Immunomodulatory Activity

The immunomodulatory activity of hydro-alcoholic extract of *Hibiscus rosa-sinensis* flower was studied and observation showed significant immunostimulatory activity at 75, 150, 300 mg/kg in carbon clearance method, haem-agglutination antibody titre method and footpad swelling method²⁴.

Anti-estrous Activity

Benzene extract of *Hibiscus rosa-sinensis* flower was evaluated for anti-estrous activity on estrous cycle and reproductive organs in female albino mice. The result revealed that flower extract disrupt the estrous cycle and reduce the weight of ovaries, uterus and pituitary gland²⁵.

Aphrodisiac Activity

The aqueous and alcoholic extract of *Hibiscus rosa-sinensis* leaves was evaluated for its aphrodisiac activity in immature albino male rats. The gain in body weight and isolated sexual organs compared to control group confirmed its anabolic property²⁶.

Neurobehavioral Activity

Neurobehavioral activity of methanolic extract of *Hibiscus rosa-sinensis* roots (100-300 mg/kg) was studied and results showed protective role against dyskinesia and oxidative stress induced by reserpine. Co-administration of plant extract reduces the lipid peroxidation and reversed the decrease in brain levels of superoxide dismutase (SOD), catalase (CAT) and glutathione reductase (GSH) levels²⁷.

Nootropic Activity

The cognitive enhancing and anti-oxidant activity of ethyl acetate soluble fraction of the methanolic extract of *Hibiscus rosa-sinensis* roots was studied at doses of 25, 50, and 100 mg/kg showed protective role against age and scopolamine induced amnesia in albino rats. Result revealed that extract treated animal showed increased level of step-down latencies (SDL) and decrease level of superoxide dismutase (SOD) and glutathione reductase (GSH)²⁸.

Neuroprotective Activity

Neuroprotective activity of methanolic extract of *Hibiscus rosa-sinensis* was studied at dose of 100, 200 and 300 mg/kg/day for 6 days revealed its beneficial effect in ischemic brain lesion, cerebrovascular insufficiency, oxidative stress and in dementia²⁹.

Methanolic extract of *Hibiscus rosa-sinensis* roots was evaluated for Neuroprotective activity on muscle relaxant and analgesic activities. The plant extract prolonged the pentobarbitone induced sleeping, time spent in open arms, number of head dips in elevated maze and hole board test demonstrating sedative and anxiolytic activity. *Hibiscus rosa-sinensis* also significantly decreased the locomotor activity in dose dependent manner²⁷.

Cardioprotective Effect

The cardioprotective activity of *Hibiscus rosa-sinensis* flower was studied and observation showed cardioprotective effect at concentration of 125, 250 and 500 mg/kg in isoproterenol induced myocardial injury and study also founded that it also augments endogenous antioxidant molecules³⁰.

Hepatoprotective Activity

The hepatoprotective potential of anthocyanin extract from the petals of *Hibiscus rosa-sinensis* against carbon tetrachloride-induced acute liver damage in Wistar rats. Result revealed that pre-treatment with the anthocyanin fraction reduced the levels of these markers and hence, the degree of liver damage³¹.

Hypolipidemic Activity

The hypolipidemic activity of *Hibiscus rosa-sinensis* root extract (500mg/kg) was studied against triton and cholesterol-rich high fat diet (HFD)-induced hyperlipidemia in rats. Guggulipid (200mg/kg) was taken as standard drug. Result of histopathological findings in rat liver supported the protective role of *Hibiscus rosa-sinensis* root extract in both the models³².

Effect on CNS

The effect of methanolic extract of *Hibiscus rosa-sinensis* leaves on sedative, anxiolytic, depressant and skeletal muscle relaxant was studied. Result showed that methanolic extract have sedative, anxiolytic, CNS-depressant and skeletal muscle relaxant effects³³.

Anti-hypertension Activity

The effect of anthocyanidin fraction (100 and 300mg/kg) of *Hibiscus rosa-sinensis* on blood pressure in Deoxycorticosterone Acetate (DOCA)-salt hypertensive rats was studied. Blood pressure was measured by both non-invasive and invasive technique. The result was revealed that anthocyanidin fraction of *Hibiscus rosa-sinensis* have anti-hypertensive as well as antioxidant activity³⁴.

DISCUSSION AND CONCLUSION

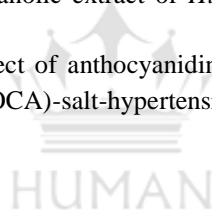
Medicinal plants are used from the ancient for the cure of various ailments. Medicinal plants are the gift for the human being. The phytoconstituents are firstly obtained from the plant extract than tested for the pharmacological potential. The genus hibiscus is widespread all over the world. The most of the work did on species *rosa-sinensis*. The review suggested that species *rosa-sinensis* have anti-inflammatory, anti-ulcer, anti-diabetic, nootropic, hepatoprotective, anti-hypertensive and hypolipidimic and many more activities. This species have various flavonoids, glycosides, alkaloids and various phytochemicals that makes it more important candidate for the researchers.


The review concludes that more research work will be required to explore the potential of the genus hibiscus.

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