



A COMPREHENSIVE REVIEW ON CHEMICAL AND PHARMACOLOGICAL ACTIVITIES OF HIBISCUS SPECIES

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ABSTRACT

Medicinal plants or botanical medicines have been used traditionally by mankind for the prevention and treatment of various ailments. The plants are the major source of various compounds that are widely used in pharma industries and other nutraceutical sectors. Hibiscus species has been used in many herbal mix and drinks. The phytochemical analysis showed that Hibiscus species contained tannins, anthraquinones, quinines, phenols, flavonoids, alkaloids, terpenoids, saponins, cardiac glycosides, protein, free amino acids, carbohydrates, reducing sugars, mucilage, essential oils and steroids. Pharmacological studies revealed that *Hibiscus* species possessed reproductive,

antidiabetic, fibrinolytic, hypolipidemic, antioxidant, anti-inflammatory, antipyretic, analgesic, immuno-modulatory, anticonvulsant, antidepressant, memory enhancement, cytotoxic, antimicrobial, antiparasitic, dermatological, anti-haemolytic, urinary, hepatoprotective, neuroprotective, antitussive and many other activities. The natural plant products are widely used nowadays because of increasing the burden of diseases. Hibiscus species (Malvaceae) is a plant which is widely distributed throughout the world. Its leaves, barks, roots and flowers have been used in the Indian traditional system as medicine to treat various diseases. The current review discussed the chemical constituents, pharmacological effects and therapeutic importance of Hibiscus species.

KEYWORDS: Antioxidant, Hibiscus, Malvaceae, flavonoid.

INTRODUCTION

Herbal medicine is the oldest form of healthcare known to mankind. Herbs have been used by all cultures throughout history. As a result of accumulated experience from the past generations, today, all the world's cultures have an extensive knowledge of herbal

medicine.^[1-4] Plants are a valuable source of a wide range of secondary metabolites, which are used as pharmaceuticals, agrochemicals, flavours, fragrances, colours, biopesticides and food additives. The current review discuss the chemical constituents, pharmacological effects and therapeutic importance of *Hibiscus* species.



Medicinal plants have been a part of the human life for thousands of years. The rise in population, inadequate supply of drugs, side effects of allopathic medicines, resistance to drugs and high cost treatments have made human beings to use plant as a source of medicine for a variety of diseases.

Green plants which are usually the reservoir of many biochemical products can be extracted and used for various scientific experiments thus leading to the development of plant based non-toxic, non-reactive product.^[5]

The leaves are alternate, ovate to lanceolate, often with a toothed or lobed margin. The flowers are large, conspicuous, trumpet-shaped, with five or more petals, colour from white to pink, red, orange, peach, yellow or purple, and from 4–18 cm broad. Flower colour in certain species, such as *H. mutabilis* and *H. tiliaceus*, changes with age. The fruit is a dry five-lobed capsule, containing several seeds in each lobe, which are released when the capsule dehisces (splits open) at maturity.

There are 232 species of hibiscus. Some of the more common varieties include the Hawaiian red hibiscus, the Red Rosemallow, the Foulsapate Marrow and the China rose (the *Hibiscus rosa-sinensis*). *Hibiscus abelmoschus*, *Hibiscus sabdariffa*, *Hibiscus radiatus*, *Hibiscus scottii*, *Hibiscus socotranus*, *Hibiscus mutabilis*, *Hibiscus tiliaceus*, *Hibiscus macrophyllus*, *Hibiscus heterophyllus*, *Hibiscus calyphyllus* (native to Africa), *Hibiscus esculentus*, *Hibiscus manihot*, *Hibiscus trionum* are some of the species of *Hibiscus*.

Chemical Constituents

A number of compounds have been reported from *Hibiscus* species. The preliminary phytochemical analysis showed that *Hibiscus* species contained tannins, anthraquinones, quinines, phenols, flavanoides, alkaloids, terpenoids, saponins, cardiac glycosides, protein, free amino acids, carbohydrates, reducing sugars, mucilage, essential oils and steroids.^[10-14]

Vitamins - thiamine, riboflavin, niacin and ascorbic acid have been reported from its flowers. Crushed red and magenta flower varieties yield dark-purplish dye. An anthocyanin pigment, cyanidin diglucoside, is also reported in its flowers.

Deep yellow flowers of its variety furnished quercetin-3-diglucoside, quercetin 3,7-diglucoside, cyanidin-3,5 -diglucoside and cyanidin-3-sophoroside-5-gIucoside where as ivory white flowers of its variety afforded kaempferol-3-xylosylglucoside in addition to above mentioned compounds, two cyclopeptide alkaloids I & II isolated from flowers of Pakistani plant *H. rosa sinensis* (Khokhar *et al.*, 1992), a sterol, p-rosasterol has been isolated from Chinese species (*H. rosa sinensis*).

The leaves contain carotene and two compounds namely taraxeryl acetate and p-sitosterol were isolated from leaves and stem bark of the plant.

An acidic polysaccharide, composed of rhamnose, galactose, galacturonic acid and glucuronic acid in molar ratio of 5.0: 8.0: 3.0: 2.0 respectively, reported in the mucilage

called Hibiscus mucilage RL, was isolated from the leaves of *Hibiscus* species.

8-Nonynoic and 9-decynoic acids and their methyl esters were isolated and synthesized from stem bark.

The aliphatic esters, namely methyl 10-oxo-11-octadecynoate, methyl 8-oxo- 9-octadecynoate, and methyl 9-methylene-8-oxoheptadecanoate, were isolated from stem bark.^[31] Methyl (R) 2-hydroxysterculate along with methyl sterculate and methyl malvalate, isolated from roots, bark.^[35]

Two aliphatic enone ethers isolated from roots and characterized as methyl (E) 11-methoxy 9- oxo-10-nonadecenoate and (E) 10-methoxy-8-oxo-9-octadecenoate along with three cyclopropenoids, methylsterculate, methyl malvalate and methyl (R)-2-hydroxysterculate (Nakatani *et.al.*, 1994). Campesterol, sitosterol, stigmasterol and a sterol ester have been reported from this plant.

The three major components of hibiscus flowers are: delphinidin, esculetin, and cyanidin. They also contain gossypetin, anthocyanin, and glycoside hibiscin.^[32] The flowers also contained substantial quantities of proanthocyanidins and anthocyanins.^[20] It contains protein, fibers, calcium, iron, carotens and vitamin C.^[37]

The antimicrobial activity of plant is due to phenolic compounds. The flowers contained four types of flavonoids, rutin, quercetin, kaempferol and myricetin.^[15-19]

Crushed red and magenta flower varieties yield dark-purplish dye, anthocyanin pigment and cyanidin diglucoside, while many flavanoids and cyanidin compounds (quercetin-3-diglucoside, quercetin 3,7-diglucoside, kaempferol-3-xylosylglucoside, cyanidin- 3,5 - diglucoside and cyanidin-3-sophoroside-5-gIucoside) were isolated from other varieties.^[23-24]

Medicinal uses

The flowers are considered as demulcent, emollient, refrigerant, aphrodisiac and emmenagogue. Paste of the flowers are applied to swellings and boils. A decoction of the flowers is given in bronchial catarrh. Ghee fried flowers are beneficial in menorrhagia. Crushed flowers yield a dark purplish dye which was formerly employed for blackening shoes.

In China, the dye is used for colouring hair, eyebrows, foods and liquors (kirtikar and Basu, 1993; Wealth of India. 1997).

In Indian medicinal system the flowers of *H. rosa-sinensis* have been quoted for their antifertility efficacy and to treat menstrual disorders.^[36]

The flower buds are prescribed in the treatment of vaginal and uterine discharges, whereas stalk extract is applied to sore eyes.

Alcoholic (50%) extract of aerial parts showed antispasmodic action on isolated smooth muscles due to the presence of cholinergic and papaverine - like substances, CNS depressant and hypotensive action, whereas alcoholic extract of leaves displayed antipyretic, analgesic and anti- inflammatory action.^[21-22]

The leaves are also emollient, aperients, anodyne, laxative and a decoction of leaves and stem bark is used for abortion.

In Malaya, a decoction of the leaves with *Vernonia cinerea*, less juice is recommended to stimulate expulsion after child birth. Various parts of plants are used in urinary complaints and in hysteria. A tea made from hibiscus flowers is known by many names around the world and is served both hot and cold. The beverage is known for its red colour, tart flavour, and vitamin C content.

In Samoa roots and other parts are taken as remedies for gonorrhoea, vomiting of blood and in stomach trouble. *Hibiscus* mucilage, isolated from the leaves of *H. rosa-sinensis*, showed considerable anticomplementary activity.^[34]

The plant also possess nephroprotective and hepatoprotective activity as per the present study. *In vivo* an antilithiatic effect was also observed. Roots are also used in certain cattle's diseases in India.^[25-27]

Nowadays *Hibiscus* species are widely used in herbal cosmetics. Aqueous and alcoholic extract of leaves are recommended to colour the hair and beard (Ambasta, 1986). Its aqueous and alcoholic extracts are also used as an antidandruff, antiinfective, prophylactic against skin diseases and in allergic conditions. It also checks hair-loss, stimulates hair growth and darken the hair (Folicon).

Traditional uses

In medicine, the red flowered variety was preferred. Roots and leaves, were anodyne and emmenagogue. They were used to regulate menstruation and stimulate blood circulation. Leaves were also used as abortifacient and to stimulate expulsion of placenta after childbirth.

Flower were used for regulation of menstrual cycle, for liver disorders, high blood pressure as antitussive, in stomach pain, for eye problems, as abortifacient and as an aphrodisiac. Young leaves and flowers were used in headache.^[28-31]

Decoction of leaves, root and fruits were helpful in treatments of arthritis, boils and coughs. Fruits were employed externally in cases of sprains, wounds and ulcers.^[6-9]

Several studies have showed that extracts of *Hibiscus species* have a lipid lowering activity, which could prevent diseases like hyperlipidemia and cardiovascular diseases (atherosclerosis and coronary heart disease). The plant decoction was also found to possess antihypertensive and antidiabetic activity.^[33]

CONCLUSION

The current review discussed the chemical constituents, pharmacological effects and therapeutic importance of Hibiscus species as a promising medicinal plant with wide range of pharmacological activities which could be utilized in several medical applications because of its effectiveness and safety.

The treatment of diseases in humans using plants, plant extracts and pure compounds is increasing day by day. Medicinal plants and the active principles isolated from them are an important discovery in human beings to fight against diseases and disorders.

Plants contain various phytochemicals like alkaloids, Terpenoids, Glycosides, Phenols, Tannins, and saponins which have an important role in the defense mechanism of the body.

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