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## Review Article

### Medicinal value of hibiscus rosa sinensis: a review

Chinju M Sivaraman<sup>1</sup>, Fels Saju<sup>2\*</sup>.

<sup>1</sup> Department of Pharmaceutics, Nirmala College of Pharmacy, Muvattupuzha, Kerala, India

<sup>2\*</sup> Assistant professor, Department of Pharmaceutics, Nirmala College of Pharmacy, Muvattupuzha, Kerala, India

| Article History                                                                                        | Abstract                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Received on: 13-01-2021<br>Revised On : 01-01-2021<br>Accepted on : 06-02-2021                         | This aim of the review is to give an idea about various pharmacological and pharmaceutical applications of Hibiscus rosa sinensis. The article covers selected literatures that are based on the studies conducted on Hibiscus rosa sinensis. It is a very common shrub native to tropical areas. There are different varieties of Hibiscus rosa sinensis . The pharmaceutical field is more interested in the red variety as majority of the medicinal properties are shown by this. The source, distribution, chemical constituents, propagation, soil conditions, etc. are provided in the article. The various studies that have utilized Hibiscus rosa sinensis for pharmacological and pharmaceutical applications are also mentioned in this article. The pharmaceutical field mainly utilises the mucilage from Hibiscus rosa sinensis as an excipient for many formulations. The pharmacological activity of each and every part of the plant is clearly provided in this work. Overall, this gives an idea about the medicinal properties of plant Hibiscus rosa sinensis Linn. |
| <b>Keywords:</b> Pharmacologica medicinal properties , hibiscus rosa sinensis, excipient.              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
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#### \*Corresponding Author

Dr. Fels Saju

Associate Professor

Department of Pharmaceutics

Nirmala College of Pharmacy, Muvattupuzha

Kerala, 686661

Email: [fels.academics@gmail.com](mailto:fels.academics@gmail.com)

#### Introduction

Nature is gifted with lots of herbs and medicines, and a number of drugs have been isolated from nature. India is a land of diversities with rich traditional medical systems. The most acceptant traditional medical practices are Ayurveda, Unani and Siddha. These systems utilize natural herbs in the formulations. Hibiscus rosa sinensis is also known as Chinese Hibiscus, tropical Hibiscus, etc. It belongs to the family of Malvaceae. This is a perennial ornamental shrub that is widely seen in the tropical regions. The height of the plant is around 7–2 feet. It is available in various colors,

but red flower is preferred for medicinal purposes. The word Rosa sinensis means rose of China. The uses of Hibiscus rosa sinensis are wide, and it includes pharmacological, pharmaceutical and cosmetical applications. The juice extracted from leaves and flowers are used as natural remedy to treat various diseases. It is used to make eyeliners and shoe polishes. Several studies have already proved that both the flower and leaf possess analgesic, antioxidant and anti fungal properties. There are studies that report that the herb possesses anti cancer properties. It has the ability to remove free radicals that can damage the DNA. Some of the major chemical constituents of Hibiscus rosa sinensis are Cholesterol, Compestrol, Stigmasterol, Glucose, Fructose, Flavanoids, Hibiscetin, Cyanin, Glycosides, Alkanes, etc [1-3].

**Table: 01 Description of Hibiscus rosa sinensis [3]**

|   |                         |                                                                                                                                                                                                      |
|---|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1 | Biological source       | It is obtained from flowers and leaves of Hibiscus rosa sinensis Linn                                                                                                                                |
| 2 | Family                  | Malvaceae                                                                                                                                                                                            |
| 3 | Common names            | Chembarathi(Malayalam),Semparutti(Tamil), Rudrapuspa(Sanskrit), Gurhal(Hindi), Shoe flower plant,Chinese hibiscus(English)                                                                           |
| 4 | Soil condition          | Preferably sandy and loamy clay and well-drained soil.                                                                                                                                               |
| 5 | Propagation             | Cutting, layering or grafting in springs.                                                                                                                                                            |
| 6 | Origin and distribution | Native to tropical Asia, China and Philippines. This is the national flower of Malaysia.                                                                                                             |
| 7 | Leaves                  | Simple ovate or ovate lancolate in shape and are rich in mucilage.                                                                                                                                   |
| 8 | Flowers                 | Corolla consists of five petals. They are pedicillate, actinomorphic and complete in nature.                                                                                                         |
| 9 | Chemical constituents   | Flowers: Ascorbic acid, Thiamine, Citric acid, Glucose, Fructose, Oxalic acid and Riboflavin<br>Leaves: Alkaloids, Reducing sugars, Fatty acid, Fatty alcohol, Glycosides, Resins and Hydro carbons. |

**Table: 02: Scientific classification of Hibiscus rosa sinensis Linn [4]**

|            |                        |
|------------|------------------------|
| Kingdom    | Plantae                |
| Subkingdom | Tracheobionta          |
| Division   | Magnoliophyta          |
| Class      | Magnoliopsida          |
| Subclass   | Dilleniidae            |
| Order      | Malvaceae              |
| Genus      | Hibiscus               |
| Species    | Hibiscus rosa sinensis |

**Traditional Uses of Hibiscus rosa sinensis**

- The roots of Hibiscus rosa sinensis Linn can be used as a cough suppressant.
- Leaves and flowers can be used as a hair growth promoter and to prevent premature graying and to treat scalp disorders.
- Leaves possess emollient properties, and it can be used in the treatment of Dysentery and Diarrhea.
- The flowers are reported to be good for the treatment of heart diseases, diabetes, epilepsy, leprosy, etc.
- The decoction of root can be used to treat venereal diseases.
- Leaves can be used as abortifacient and to stimulate the expulsion of placenta after labour.
- The roots and leaves can be used to stimulate blood circulation and thereby they help to regulate menstruation.
- The flowers of Hibiscus rosa sinensis can be used to control high blood pressure, stomach pain, liver diseases, etc.
- Hibiscus rosa sinensis can be used as a diuretic.
- The fruits can be used in sprains, wounds etc [5,6].

**Pharmacological Activities of Hibiscus rosa sinensis**

The pharmacological activities reported by Hibiscus rosa sinensis are immense. Studies are still ongoing to develop Hibiscus rosa sinensis into various formulations. The major advantages are its easy availability, low cost, biocompatibility, least side effects, etc. The various activities reported by Hibiscus rosa sinensis are tabulated below [7].

**Table 03: Pharmacological Activity of Hibiscus rosa sinensis.**

| Sl no | Part with activity | Activity observed                     | Author                        |
|-------|--------------------|---------------------------------------|-------------------------------|
| 1.    | Leaves             | Antioxidant                           | Afshari et. al [8]            |
| 2.    | Leaves             | Antioxidant                           | Ghaffar et. al [9]            |
| 3.    | Leaves             | Antioxidant                           | Prasad et. al [10]            |
| 4.    | Leaves and stem    | Antioxidant                           | Deepa garg et. al [11]        |
| 5.    | Leaves, stem ,root | Antioxidant                           | Patel et. al [12]             |
| 6.    | Leaves and flowers | Antioxidant                           | Wong et. al [13]              |
| 7.    | Flower             | Antioxidant                           | Anusha Bhaskar et. al [14]    |
| 8.    | Flower             | Antioxidant                           | Sheth and De et. al [15]      |
| 9.    | Flower             | Antioxidant and Anti bacterial        | Mak et. al [16]               |
| 10.   | Flower             | Antioxidant and Anti bacterial        | Zulfiqar Ali Khan et. al [17] |
| 11.   | Flower             | Antioxidant and Antigenotoxic effects | Khatib et. al [18]            |
| 12.   | Flower             | Antioxidant and Anti diabetic         | Sankaran et. al [19]          |
| 13.   | Leaves             | Hypoglycemic and antioxidant          | Zaki I H et.al [20]           |
| 14.   | Leaves             | Antidiabetic                          | Ojiako et.al [21]             |
| 15.   | Leaves             | Antidiabetic                          | Moqbel et.al [22]             |
| 16.   | Leaves             | Hypoglycemic                          | A Sachdewan et.al [23]        |
| 17.   | Flowers            | Antidiabetic                          | S Venkitesh et.al [24]        |
| 18.   | Leaves             | Diabetes with dyslipidemia            | Mamun et.al [25]              |
| 19.   | Flowers            | Antidiabetic                          | Afiune L A F et.al [26]       |
| 20.   | Flowers            | Antidiabetic                          | Pethe M et.al [27]            |
| 21.   | Flowers            | Antidiabetic                          | Sharma k et.al [28]           |
| 22.   | Root               | Antidiabetic                          | Kumar V et.al [29]            |
| 23.   | Flower             | Gastroprotectant                      | Kumar et.al [30]              |
| 24.   | Leaves             | Ameliorative                          | Kandhare et.al [31]           |
| 25.   | Flower             | Ameliorative effect                   | Meena et.al [32]              |
| 26.   | Leaves             | Renal dysfunction                     | Kate et.al [33]               |
| 27.   | Leaves             | Anti-inflammatory                     | Raduan et.al [34]             |
| 28.   | Leaves             | Anti-inflammatory                     | Tomar et.al [35]              |
| 29.   | Leaves             | Analgesic                             | Sarwkar et.al [36]            |
| 30.   | Leaves and flowers | Antibacterial                         | Uddin et.al [37]              |
| 31.   | Leaves and flowers | Antibacterial                         | Tiwari U et.al [38]           |
| 32.   | Leaves             | Antibacterial                         | Hemarana K et.al [39]         |
| 33.   | Leaves             | Antibacterial                         | Udo I J et.al [40]            |
| 34.   | Flower             | Antibacterial                         | Ruban et.al [41]              |
| 35.   | Flower             | Antibacterial                         | Agarwal S et.al [42]          |
| 36.   | Leaves             | Antifungal                            | Sanjesh R et.al [43]          |
| 37.   | Flowers            | Antifungal                            | Nilima W et.al [44]           |
| 38.   | Flower             | Antihyperlipidemic                    | Sikarwar et.al [45]           |
| 39.   | Flower             | Hepatoprotective effect               | Biswas et.al [46]             |
| 40.   | Leaves             | Hepatoprotective effect               | Sahu CR et.al [47]            |
| 41.   | Flower             | Cytotoxic effect                      | Ali et.al [48]                |
| 42.   | Leaves and stem    | Cytotoxicity                          | Arullappan et.al [49]         |
| 43.   | Leaves             | Cardioprotective                      | Kate I E et.al [33]           |
| 44.   | Flower             | Cardioprotective                      | Khandelwal et.al [50]         |
| 45.   | Flower             | Cardioprotective                      | Gauthaman et.al [51]          |
| 46.   | Flower             | Immunomodulatory                      | Desai et.al [52]              |

|     |                    |                            |                        |
|-----|--------------------|----------------------------|------------------------|
| 47. | Flower             | Immunomodulatory           | Gaur et.al [53]        |
| 48. | Flower             | Antidepressant             | Shewale et.al [54]     |
| 49. | Flower             | Antifertility effect       | Jana et.al [55]        |
| 50. | Flower             | Antilithiatic              | Nirmaladevi et.al [56] |
| 51. | Leaves             | As coagulant aid           | Awang et.al [57]       |
| 52. | Leaves             | Wound healing activity     | Ali A et.al [58]       |
| 53. | Leaves             | Wound healing activity     | Mondal S et.al [59]    |
| 54. | Flower             | Wound healing activity     | Nayak B S et.al [60]   |
| 55. | Leaves             | Alopecia                   | Upadhyay et.al [61]    |
| 56. | Leaves             | Hair growth promoter       | Pathan A et.al [62]    |
| 57. | Leaves             | Hair growth promoter       | N Singh et.al [63]     |
| 58. | Flowers and leaves | Hair growth promoter       | Adhirajan N et.al [64] |
| 59. | Leaves             | Anticancer                 | Hinaz N et.al [65]     |
| 60. | Leaves             | Anticancer and antioxidant | Divya et.al [66]       |
| 61. | Flowers            | Anticancer                 | Goldberg K et.al [67]  |

### Pharmaceutical applications of Hibiscus rosa sinensis mucilage

Hibiscus rosa sinensis mucilage has wide range of applications in the pharmaceutical field. The researchers are now utilizing these natural resources as an adjuvant in various formulations. Hibiscus rosa sinensis mucilage is used as an excipient in formulations like tablets. The mucilage can be used as binder, disintegrant, release retardant, etc.

**Table: 04 Pharmaceutical Applications of Hibiscus rosa sinensis Mucilage**

| Sl no | Part used | Application        | Formulation             | Inference                                                                                                                     | Literature                  |
|-------|-----------|--------------------|-------------------------|-------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| 1     | Leaves    | Binder             | Tablets                 | Tablets with Hibiscus rosa sinensis mucilage possess excellent physical characteristics than tablets with synthetic polymers. | A S Jadhav et.al [68]       |
| 2     | Leaves    | Binder             | Tablets                 | Mucilage is used as a binder and it shows significant property to sustain the release of drug.                                | Hindustan Abdul et. al [69] |
| 3     | Leaves    | Binder             | Tablets                 | Prolonged release on increasing the concentration of mucilage                                                                 | Ameena et. al [70]          |
| 4     | Leaves    | Binder             | Tablets                 | Mucilage is used as a binder, and it shows significant property to sustain the release of drug.                               | Prakash et.al [71]          |
| 5     | Leaves    | Binder             | Tablets                 | Hibiscus mucilage possesses binding and hypoglycemic effect.                                                                  | Bahadur et.al [72]          |
| 6     | Flower    | Binder             | Tablets                 | Flower petal is a better substitute for expensive binder.                                                                     | Priti et.al [73]            |
| 7     | Leaves    | Super disintegrant | Tablets                 | Natural disintegrants show better disintegrating property than synthetic ones.                                                | Bala et.al [74]             |
| 8     | Leaves    | Super disintegrant | Fast dissolving tablets | Natural disintegrants have better disintegrating property than synthetic disintegrants in fast dissolving tablets.            | Swathi et.al [75]           |
| 9     | Leaves    | Super disintegrant | Fast dissolving tablets | Mucilage possesses better disintegrating property.                                                                            | Kumari et.al [76]           |

|    |        |                          |                              |                                                                                                                            |                        |
|----|--------|--------------------------|------------------------------|----------------------------------------------------------------------------------------------------------------------------|------------------------|
| 10 | Leaves | Super disintegrant       | Oral disintegrating tablet   | Hibiscus rosa sinensis mucilage is a better disintegrant which needs very less time.                                       | Gupta et.al [77]       |
| 11 | Leaves | Super disintegrant       | Immediate release tablets    | Hibiscus rosa sinensis mucilage shows better disintegrant property on combination with gum karaya.                         | Kalyani et.al [78]     |
| 12 | Leaves | Super disintegrant       | Fast dissolving tablets      | Hibiscus rosa sinensis mucilage is a better superdisintegrant than synthetic disintegrants.                                | Sukhavasi et.al [79]   |
| 13 | Leaves | Disintegrant             | Mouth disintegrating tablets | Maximum bioavailability and better disintegration are achieved with this mucilage.                                         | Prabhuet.al [80]       |
| 14 | Leaves | Disintegrant             | Mouth dispersible tablets    | Superior disintegrating agent than synthetic one and shows disintegration at low concentrations.                           | Shah et.al [81]        |
| 15 | Leaves | Sustained release matrix | Tablets                      | Better drug release retardant on increasing concentration of mucilage                                                      | Basavaraj et al [82]   |
| 16 | Leaves | Sustained release matrix | Floating matrix tablets      | Mucilage possesses excellent tablet characteristics and release retarding effects.                                         | Harikrishna et.al [83] |
| 17 | Leaves | Sustained release matrix | Tablets                      | It is an effective polymer to retard the drug release and on increasing polymer concentration, the drug release decreases. | Kaleemullah et.al [84] |
| 18 | Leaves | Sustained release matrix | Tablets                      | Hibiscus rosa sinensis mucilage is better matrix forming polymer to sustain the drug release                               | Abdul et.al [69]       |
| 19 | Leaves | Sustained release matrix | Tablets                      | Mucilage shows release retarding property for about 12 hours.                                                              | Girish et al [85]      |
| 20 | Leaves | Moisturizer              | Topical preparation          | Hibiscus rosa sinensis mucilage possesses skin moisturizing effect, and it can be incorporated into cosmetic products.     | Pimporn et.al [86]     |

### Extraction of Mucilage from Leaves

The fresh leaves of Hibiscus are collected and washed with water to remove any dirt and dried. After drying grind the leaves and soak them in water for about 6 hours. Then boil the mixture for about 30 minutes and keep aside for 1 hour for the complete release of mucilage. After this, strain through an eight-fold muslin cloth and add three times the volume of Acetone to the filtrate. The precipitate thus formed is collected and dried in an oven at about 50 degree Celsius until it is completely dried and then powder it and pass through sieve no 80. Finally, store it in an air tight container protected from light [84,85].

### Purification of Mucilage [87]

The extracted mucilage can be homogenized with cold dilute Trichloro acetic acid solution after that centrifuge the mixture for 20 minutes at 3500rpm. The mixture is

then neutralized with Sodium hydroxide and dialyzed for 30 hours with distilled water. Ethanol is added to precipitate the mucilage and the mucilage thus collected is dried under vacuum and passed through sieve number 80 and is then stored in desiccators.

### Characterisation of Isolated Mucilage [87,88]

#### FTIR:

FTIR studies of the isolated mucilage are carried out in order to determine the various functional groups present in the mucilage. Mucilage in a dry state is normally subjected to this study.

#### Quantification of Mucilage

The percentage yield of extracted mucilage is calculated based on the amount of powdered leaf used for the extraction process and the amount of dry mucilage obtained individually depending upon solvents and temperature and expressed as percentage (%).

% Yield = Wt. of dried mucilage obtained  $\times$  100 / wt. of leaf powder taken

#### Identification Test

Add 2.5 ml of absolute alcohol into 2 ml of mucilage extract. The presence of mucilage in the extracted material is confirmed by performing Molisch's and Ruthenium red tests.

- a. **Molisch's Test:** Add a few drops of alcoholic alpha Naphthol, followed by a few drops of concentrated Sulphuric acid through the side of the test tube and observe for the formation of purple violet ring.
- b. **Ruthenium Red Test:** Add a few drops of Ruthenium red to the test solution and observe the presence of pink colour.

#### Physicochemical Characterisation of the Isolated Mucilage

- a. **Organoleptic Characterisation of the Isolated Mucilage:** The organoleptic features such as color, odor and texture of the isolated mucilage are observed.
- b. **Solubility study:** Disperse mucilage in cold water, hot water and acetone and observe the solubility.
- c. **pH of Solution:** The pH value of mucilage (1% solution) is recorded using pH meter.
- d. **Moisture content:** Moisture content is determined on appropriate quantity of dried mucilage at 105°C for 2 hours in hot air oven. The dried mucilage is weighed initially and is then further dried to a constant weight.
- e. **Swelling ratio:** The swelling ability can be measured as the mucilage swells on coming in contact with water.
- f. **Flow properties:** The various properties like angle of repose, bulk density, tapped density, Carr's index, Hausners ratio, etc. can be measured.

#### Conclusion

This review gives an idea on the medicinal herb Hibiscus rosa sinensis. The applications are wide, and the mucilage from Hibiscus rosa sinensis can be used as a disintegrant and binder. This plant is an alternative medicine for many diseases. The red variety is mainly chosen for studies since it has more therapeutic importance. The extracts of Hibiscus rosa sinensis flowers and leaves are now available in market for various ailments. More studies are needed on Hibiscus rosa sinensis to develop it into a marketed formulation.

Presence of wide range of chemical constituents reveals that this plant can be used as a lead for the development of various formulations.

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