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**Review Article**

# A Detailed Study of *Hibiscus Rosa Sinesis* L: Phytochemistry, Pharmacological Activities Therapeutic Uses and Its Antimicrobial, Antioxidant Activities

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## A B S T R A C T

*Rosa canina* L., which is more commonly known as rosehip, has become a plant of great scientific interest due to its nutritional, cosmetic, and therapeutic applications. This review study highlights the fact that the high levels of vitamins, carotenoids, tocopherol, and phenolic acid in this substance are responsible for its anticarcinogenic, hepatoprotective, antioxidant, and anti-inflammatory properties. The German Commission E published a negative monograph on rose hip, rose hip and seed, and rose hip seed due to insufficient evidence of their effects and usefulness. As a result, a literature review was conducted to outline the pharmacological and clinical effects of *Rosa canina* L. in order to re-evaluate its usefulness in traditional medicine. Several rose hip and rose hip and seed formulations have been demonstrated to offer antioxidant and anti-inflammatory effects. Such action mechanisms involve lipophilic components. Litozin, a proprietary powder made from rose hips and seeds, has been shown to be beneficial in treating patients with osteoarthritis, rheumatoid arthritis, and low back pain in several exploratory investigations. In addition to vitamin C, a number of the components found in rose hips possess strong antioxidant and radical scavenging activities. The pharmacological and clinical effects that were found can be explained by a number of different components, including as phenolics, terpenoids, galactolipids, carotenoids, fruit acids, and fatty oils. In addition, anti-inflammatory effects include lowering the levels of pro-inflammatory cytokines and chemokines, NF-kB signalling, pro-inflammatory enzymes (COX1/2, 5-LOX, and iNOS), C-reactive protein levels, PMN chemotaxis and chemoluminescence, and pro-inflammatory metalloproteases.

**Keywords:** *Rosa canina*, NF-κB, MAPK, Anti-oxidant, Anti-inflammatory

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## INTRODUCTION

The genus Hibiscus, which belongs to the family Malvaceae, is comprised of more than two hundred different species of herbal plants that can either be annual or perennial in nature. Plants that belong to this genus are able to flourish in places with warm weather, as well as in tropical and subtropical regions. They originated in Southeast Asia. The magnificent, multicolored blossoms that they produce are well-known for their ability to serve as ornaments that are not only attractive but also useful [1]. *Hibiscus rosa-sinensis* is the flower that represents Malaysia as a nation. These flowers have been utilized in South Asian medicine for the treatment of bronchial catarrh and diarrhea according to traditional practices. When it comes to ornaments, these plants, which are known as "cayenos" in Colombia, are extremely popular due to the brightly colored blossoms that they produce. Little is known about the process that governs the generation of the pigments that give flowers of the *H. rosa-sinensis* species their bright colors fig.1 [2]. In the natural world, colors function as signals that either warn of danger (towards predators) or entice beneficial insects (pollinators). In other words, colors can protect or attract. In addition to betalains, carotenoids, flavonoids, and anthocyanins, the pigments that are responsible for the color of fruits and flowers are also included. There is a connection between the biological routes of betalains and carotenoids and the colors yellow and red. On the other hand, the anthocyanin biosynthesis pathway generates a wide spectrum of hues, beginning with yellow ($\lambda$ = 480 nm) and extending all the way to orange, blue, and red ($\lambda$ = 730 nm). Among the substances that are engaged in this metabolic pathway are flavonols and other colorless compounds, as well as anthocyanins, tannins, and proanthocyanidins [3].

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**Figure 1:** Plant parts of *Hibiscus rosa sinensis*

## Taxonomy

| | |
|---|---|
| Kingdom | Plantae |
| Clade | Angiosperms |
| Order | Malvales |
| Family | Malvaceae |
| Genus | Hibiscus |
| Species | *Hibiscus rosa sinensis* |

## Distribution

The ornamental appeal of the *Hibiscus rosa-sinensis* has led to its distribution around the globe, despite the fact that it was originally native to tropical Asia and in the Pacific Islands [4]. The Philippines, Indonesia, Malaysia, and India are just few of the countries that have abundant gardens of this plant, which thrives in climates that are warm and humid. There is a great deal of respect for it in Malaysian culture because it is the national flower and is known as "Bunga Raya." Not only is the plant well-liked in the southern United States, particularly in states such as Florida, Texas, and Hawaii, but it is also well-liked throughout the Caribbean, Central America, and South America [5]. Farmers in Africa are drawn to it in large part because of its vibrant flowers, while Polynesian people in Oceania and Australia place a high value on it. Despite the fact that it is most typically grown in the Mediterranean region, it is a popular houseplant in northern areas of Europe due to the mild winters that it experiences. Because of its ability to flourish in a diverse range of environments, it has become emblematic of the elegance and beauty that are associated with tropical environments all around the world [6].

## Phytochemistry

Among the substances that were discovered in the preliminary phytochemical investigation of *Hibiscus rosa-sinensis* were proteins, free amino acids, carbohydrates, reducing sugars, mucilage, essential oils, steroids, alkaloids, flavonoids, quinines, phenols, terpenoids, and cardiac glycosides [7]. Cyclopropanoids, malvalate, beta-sitosterol, 2-hydroxysterculate, methyl sterculate, and methyl-2-hydroxy sterculate were some of the additional components that were present. A total of four flavonoids, including rutin, quercetin, kaempferol, and myricetin, were found in the flowers of the flower. Cyanidin 3-sophoroside was the most prominent anthocyanin found in the flower. Additionally, the blooms contained high amounts of proanthocyanidins and anthocyanins throughout their entirety. Flavonoids, cholesterol, stigmasterol, glucose, taraxeryl acetate, betasitosterol fructose, and flavonoids are some of the additional substances that have been discovered in *Hibiscus rosa-sinensis*. The compound known as hibiscetin is present in addition to alkanes and cyanin glucosides [8]. It was stated that *Hibiscus rosa sinensis* contains a variety of components, including proteins, carbohydrates, lipids, and fiber. Additionally, it has a considerable amount of calcium, beta-carotene, iron, and vitamin A throughout its composition. The stem and leaves of the plant contain a number of compounds, including stigma sterol, β-sitosterol, taraxeryl acetate, and three cyclopropane molecules. Among the substances that have multiple blooms are fluorescein-3, 5-diglucoside, kaempferol-3-xylosylglucoside, cyanidin-3, 5-diglucoside, and 3,7-diglucoside. Plant extracts contain a wide variety of compounds that possess antioxidant and anticancer effects. Quercetin, glycosides, riboflavin, niacin, carotene, malvalic acid, gentisic acid, margaric acid, and lauric acid are some of the compounds that fall under this category. Among the compounds that are found in the roots, tannins, mucilage, flavonoids, and saponins are particularly prevalent. The binding of saponins to cholesterol results in the formation of insoluble complexes, which are then eliminated through the bile system. This process can assist persons with hypercholesterolemia in lowering their blood pressure [9].

There are several different types of plant acids that can be found in the plant, including hydroxy citric acid lactone, tartaric acid, malic acid, and citric acid. Horiscus acid is one of these acids. This particular species of plant is the only one that has these acids, which make up approximately 15–30% of the plant's overall composition. Hippocampus leaves contain a variety of nutrients, including vitamin C, carotene, riboflavin, niacin, ascorbic acid, calcium, and iron. Anthocyanins are also present in these leaves. Multiple investigations have revealed that *H. rosa-sinensis* contains a variety of essential nutrients, including folic acid, quercetin, cyanidin, hentriacontane, thiamine, riboflavin, niacin, ascorbic acid, citric acid, tartaric acid, and oxalic acid. n-hexacosa-3-one-20, 21-diol, n-triacontane, n-triacontan15-one, and n-hentriacontane are the four unique phytoconstituents that have been recovered from alcoholic extracts of leaves and flowers, according to study that was conducted not too long ago. The leaf extract exhibited extraordinary antioxidant and anticancer characteristics, which can be attributed to the high quantity of flavonoids and terpenoids that it contained. Flavonoids, terpenoids, saponins, tannins, and glycosides are the components that have been identified as having a contribution to the pharmacological effects that have been described, as indicated by the phytochemical research. Among the substances that are reported to be contained in the blossoms are cyaniding diglucoside and many vitamins, including thiamine, riboflavin, niacin, and ascorbic acid. It was discovered that the leaves included components such as beta-sitosterol, sigma sterol, taraxerol, acetate, and three cyclopropane chemicals or derivatives of these compounds. With regard to pharmacology, *H. rosa-sinensis* contains a high concentration of flavonoids, which possess properties such as anti-inflammatory, fever-reducing, pain-relieving, and spasm-inhibiting properties. The flower, on the other hand, possesses restorative properties that make it effective for treating a wide range of medical ailments, such as inflammation, menstrual cramps, spasms, and general cramping [10].

## Pharmacological activities

*H. rosa-sinensis* have different pharmacological activities includes: Anti-inflammatory activity, antibacterial, antidiabetic, antifertility, wound healing, hypertensive, antidepressant, gastroprotective, antimicrobial, and antioxidant activities fig.2.

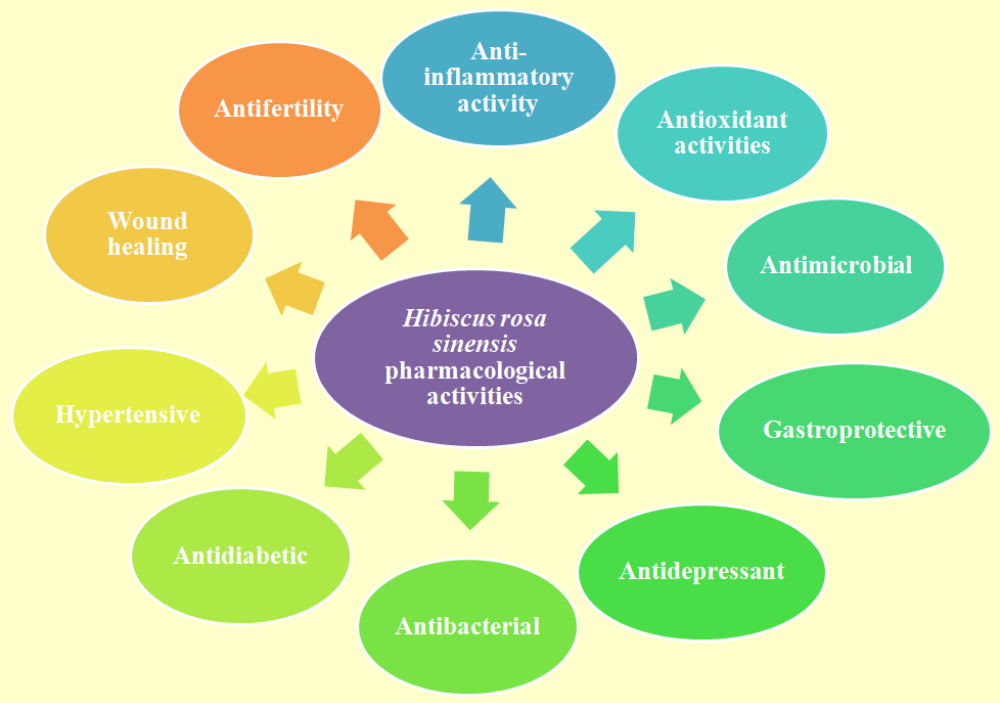


**Figure 2:** *Hibiscus rosa sinensis* pharmacological activities

## Anti inflammatory activity

Geeganage *et al*.,2024 stated that Vitamins, tannins, alkaloids, glycosides, saponins, terpenoids, and flavonoids and non-flavonoids are all examples of polyphenolic compounds that can be found in abundance in the flower of the *H. rosa-sinensis* plant. Additionally, it has been discovered that these molecules possess anti-inflammatory and antioxidant capabilities. The ability of the *H. rosa-sinensis* flower to modify the arachidonic acid route, reduce oxidative stress, and block the nuclear factor kappa-B and mitogen-activated protein kinase pathways, among other mechanisms, is responsible for the anti-inflammatory benefits of the flower. In addition to these tactics, decreasing the invasion of polymorphonuclear leukocytes and suppressing the action of caspase and the enzyme inducible nitric oxide synthase are alternative approaches [11].

Sruthi *et al*.,2021 examine that a number of various doses of diclofenac sodium and ethanolic extract were combined in this experiment, and the percentage of membrane stabilization was determined. A maximum level of membrane stability of 94.97% was attained by the hibiscus extract when it was administered at a concentration of 500 µg/ml. For these plant extracts, the most potent inhibitory impact on protein denaturation and membrane stability was seen to be 89.45% and 91.09%, respectively, when administered at a dosage of 500µg/ml [12].

Aziz *et al*., 2021 examine phytochemical analysis, and screening for heavy metals were all processes that were carried out in order to guarantee the safety of the extracts. Following the administration of Brewer's Yeast through the subcutaneous route to induce fever in rats, the first model administered four extracts to the rats at doses ranging from 5 to 50 mg/kg. Testing for acute toxicity was used to determine the doses that were used in the investigation. Ibuprofen at a dosage of 100 milligrams per kilogram was used as a reference drug. In order to determine the temperature of the rat, we utilized a digital thermometer. The results were analyzed using the SAS system, and the results were reported as the mean plus or minus the standard error of the mean. According to the findings of the study, the total temperature was significantly reduced ($p < 0.05$) by the administration of white flower extract at doses of 5mg/kg and 50 mg/kg. This was in comparison to the group that served as the positive control. As a result, the findings of this study lend credence to the hypothesis that it may function as an antipyretic drug derived from plants, which is a theory that is supported by practitioners of traditional medicine [13].

## Antibacterial activity

Ngan *et al*.,2021 worked on the rapid proliferation of antibiotic-resistant strains of *Helicobacter pylori* across the globe makes the utilization of plant resources as a potential therapeutic alternative all the more appealing. The antibacterial and urease inhibitory characteristics of a total of 43 clinical strains and two reference strains of *Helicobacter pylori* were evaluated with the help of ethanol extract and its fractions derived from the red flowers of *Hibiscus rosa-sinensis*. With minimum inhibitory concentrations (MICs) ranging from 0.2-0.25 mg/mL and minimum bactericidal concentrations (MBCs) ranging from 1.25-1.5 mg/mL, the ethyl acetate fraction demonstrated the most potent capacity to suppress the development of bacteria. This was observed across all of the strains that were tested, including 43 bacteria that were resistant to one or more drugs, including azithromycin, erythromycin, levofloxacin, and metronidazole, among others. Due to the fact that the fraction demonstrated the same antibacterial activities toward these test strains, it would appear that the preparation and the drugs do not share a common mechanism of anti-H. pylori activity. When compared to the other fractions and the ethanol extract, this particular fraction had a more significant influence on the production of *H. pylori* biofilms, the morphological transformation of the bacteria, and the activity of urease. The three human cell lines that were examined did not exhibit any

signs of toxicity when exposed to these floral preparations. Additionally, nine compounds were found and isolated from the ethyl acetate fraction following the testing. For the purpose of validating the potential benefits of the *H. rosa-sinensis* flower and its components for the treatment and prevention of *H. pylori* infection, additional in vivo research are necessary [14].

Abate *et al*.,2022 worked on the Ethiopian *Hibiscus rosa-sinensis* Linn plant is capable of producing a diverse array of biological effects due to the presence of bioactive phytochemicals and other compounds. During the course of this research project, aqueous crude extracts of *Hibiscus rosa-sinensis* will be examined for their potential to inhibit the growth of bacteria and to contain antioxidant properties. The geographical effects of the $Co_2Res_2$/Glassy carbon electrode will also be investigated, as will the improvement of the technology for producing the electrode. In order to investigate the secondary metabolites that were present in *Hibiscus rosa-sinensis* extracts, researchers utilized maceration techniques. The use of disc diffusion techniques allows for the achievement of antimicrobial activity against four distinct human pathogenic bacteria: *E. coli*, *K. pneumonia*, *S. aureus*, and *S. epidermidis*. We employed differential pulse voltammetry (DPV) to determine the antioxidant activity of the *Hibiscus rosa-sinensis* extracts, and we profiled their phytoconstituents using Fourier transform infrared spectroscopy and ultraviolet-visible spectroscopy. As a result of the phytochemical research that was carried out on *Hibiscus rosa-sinensis*, it was discovered that the crude flower has a greater concentration of phenols, flavonoids, and quinines than the leaf, which has a moderate concentration of flavonoids and quinines. On the other hand, the extract of the bark of the *Hibiscus rosa-sinensis* plant does not have any terpenoids, steroids, or cardiac glycosides. The plant extracts were shown to hinder the development of Staphylococcus aureus and Staphylococcus epidermidis within the dimension range of 6.33 ± 0.33 to 11.50 ± 0.29 mm. On the other hand, the plant extracts were found to inhibit the development of *K. pneumonia* and E. coli within the dimensions of 6.67 ± 0.33 to 13.00 ± 0.58 mm, for instance. According to the findings of the XRD examination, the metal-organic framework (MOF) that is based on Co(II), known as Co2Res2, has a nanoscale structure with an average crystal size of 27.17 nm. Furthermore, when the pure net current peaks and potentials of aqueous fresh *Hibiscus rosa-sinensis* flower, leaf, and bark extracts were compared to those of observed net modified current peaks and potentials, the DPV unequivocally indicated that the latter was not inferior to the former. It has been determined that these extracts of *Hibiscus rosa-sinensis* have been improved in terms of their antibacterial and antioxidant capabilities. In modified GCE, the processes that increase current and decrease potential are catalyzed by $Co_2Res_2$, which is a porous crystalline MOF that is stable both chemically and thermally. It is possible that this is due to the fact that the bioactive components and the catalyst interact together in a manner that is synergistic [15].

## Antidiabetic activity

Ansari *et al*.,2020 Using a rat model of type 2 diabetes, this study investigated the effects of an ethanol extract of HRS on glucose homeostasis and insulin release. The results of this investigation were presented. Both rat clonal β-cells (BRIN-BD11 cells) and isolated mouse pancreatic islets were utilized in order to evaluate the impact of an ethanol extract derived from ground *H. rosa-sinensis* (HRS) leaves on insulin release, membrane potential, and intracellular calcium levels. For the purpose of determining the impact on the activity of the DPP-IV enzyme, laboratory studies were carried out. The researchers investigated the effects of HRS on glucose tolerance, intestinal disaccharidase activity, gut motility, sucrose concentration, and in situ gut perfusion during a short period of time. For the purpose of determining the level of glucose homeostasis, streptozotocin-induced type 2 diabetic rats were given ethanol extract of HRS leaves at doses of 250 and 500 mg/kg for a period of 28 days. For example, it was discovered that isolated pancreatic islets from mice exhibited stimulatory activities that were comparable to those of GLP-1. Furthermore, it was discovered that HRS significantly increased insulin secretion from clonal rat BRIN-BD11 cells. HRS caused BRIN BD11 cells to experience membrane depolarization and an increase in intracellular $Ca^{2+}$ when it was administered in vitro. Additionally, HRS significantly decreased the activity of the DPP-IV enzyme. HRS therapy enhanced glucose tolerance in rats with type 2 diabetes, reduced postprandial hyperglycemia and glucose absorption during gut perfusion, and restored the gut's ability to pass unabsorbed sucrose following sucrose ingestion. All of these effects were observed in rats. In rats that did not have diabetes, HRS not only increased the motility of the gastrointestinal tract but also lowered the activity of the intestinal disaccharidase. The administration of human resveratrol at doses of 250 or 500 mg/kg resulted in a significant reduction in blood glucose, cholesterol, and triglyceride levels, while simultaneously increasing insulin, HDL cholesterol, and hepatic glycogen levels in rats with type 2 diabetes. This research was conducted over a period of 28 days. This resulted in the rats not gaining any weight at all.In light of these data, it appears that the mechanism by which HRS achieves its antihyperglycemic activity by inhibiting the digestion and absorption of carbohydrates is a dose-dependent increase in insulin secretion. As a result of this, HRS has the potential to be beneficial for individuals who have type 2 diabetes, either as a dietary supplement or as a novel type of diabetes treatment [16].

Chauhan *et al*.,2024 conclude that diabetes mellitus, a chronic metabolic ailment, can cause hyperglycemia, which is a sign of the condition. The antioxidant and anti-diabetic effects of *Hibiscus rosa sinensis* (HRS) are well-known within the scientific community. The purpose of this study was to investigate the potential anti-diabetic benefits of HRS flower extract by employing diabetic Wistar albino rats. There were a total of eighteen animals, and they were divided into three groups: (First Group): Normative control group, often known as Group 2: Group 3, which served as the diabetic control group, was given 125 milligrams per kilogram of HRS flower extract. The animals in Group 2 saw a progressive loss of weight, but the animals in Group 1 experienced a large increase in weight. In a manner comparable to that of Group 1, the animals in Group 3 demonstrated an increase in their body weight after overcoming the weight loss. The animals in Group 2 had blood glucose levels that were higher than 400 mg/dL during the entire experiment, whereas the animals in Group 1 had

blood glucose levels that were lower than 200 mg/dL. Following the same pattern as Group 1, the glucose levels of the animals in Group 3 decreased below 200 mg/dL after originally being higher than 350 mg/dL. Histological examination revealed vacuolation, necrosis, and degeneration in the pancreatic islets contained inside the animals belonging to Group 2. The pancreatic architecture of the animals in Group 3 seemed to have improved, and their islets of Langerhans had regenerated. In the same way that the animals in Group 1 returned to their normal weight and blood glucose levels, people in Group 3 also returned to their usual weight. However, these findings imply that it may have potential as an alternative treatment for diabetes. Additional research is required to fully understand the mechanisms of action and long-term advantages of Hibiscus rosa sinensis; however, these results suggest that further investigation is required [17].

## Antifertility activity

Gupta *et al*.,2024 examines the effects of *Hibiscus-rosa-sinensis* on fertility and reproductive outcomes in male albino mice following oral administration of several Hibiscus leaf extracts.The effects of oral administration of *H. rosa-sinensis* leaf extracts in three different solvents (aqueous, ethanol, and benzene) at a dose of 100 mg/kg BW/d for 35 days on albino mice's male reproductive organs, sperm parameters, biochemical markers, and fertility indices were studied. In addition to hematological research, toxicological studies were also conducted. Histologic changes in the testes, epididymis, and seminal vesicle were noticeable but not uniform after treatment with Hibiscus extracts. The effects on the reproductive organs and the quantity, movement, viability, and shape of caudal spermatozoa were more pronounced in mice treated with the benzene extract of Hibiscus compared to controls and animals treated with other plant extracts. Mice given Hibiscus had an unfavorable effect on epididymal sialic acid and seminal vesicle fructose levels, with no discernible changes between the treatment groups. Compared to controls, males treated with benzene extract had considerably lower fertility, whereas those treated with Hibiscus showed no change in libido. Hibiscus therapy also had no effect on hematological indices, serum ALT, AST, and creatinine levels, or kidney and liver histological features as compared to the control group [18].

Azawi *et al*.,2020 conclude that *Hibiscus rosa sinensis* L. is a part of the Malvaceae family, which includes species useful for medicinal purposes. The flowers of the Hibiscus plant have a wide range of applications, including the stimulation of hair growth, the healing of wounds, the elimination of parasites, and the reduction of blood sugar and cholesterol levels. Hibiscus species are used to cure a wide variety of ailments. in addition to a wide range of additional pharmacological effects, including those that work against infertility, fever, spasms, infections, inflammation, and a variety of other conditions. Within the context of albino male rats, the objective of this study was to investigate the impact that a phenolic extract derived from the blooms of *Hibiscus rosa-sinensis* L. had on the expression of genes and biomarkers. The scientific investigation was carried out within the biology department of the College of Science at the University of Babylon, which is located in Iraq.There were a total of 32 male rats in the sample, and their average age was between two and three months. After 30 and 60 days of therapy, it was discovered that the levels of Testosterone and Progesterone in the rats that were treated were significantly lower ($p<0.05$) in comparison to the groups that served as the control condition. When compared to the control groups, the testicular cells that were subjected to phenolic compounds derived from the flowers of *H. rosa-sinensis* at a dose of 300 mg/kg/day of body weight for a duration of sixty days exhibited a significant decrease ($p< 0.05$) in the expression of the androgen receptors and the progesterone receptor [19].

## Wound healing activity

Harini *et al*.,2024 investigate the effects of *Hibiscus rosa-sinensis* on cancer, diabetes, and wound healing in vitro in order to ascertain whether or not it possesses any potential medical advantages. The anticancer activity of the ethanolic extract of *H. rosa-sinensis* was investigated by means of the MTT (3- [4,5-dimethylthiazol-2-yl]-2,5 diphenyl tetrazolium bromide) assay. This assay indicated a decrease in cell proliferation and growth that was dependent on the quantity of the compound. In addition to exhibiting promising anticancer effects, the extract demonstrated the potential to be effective in controlling the progression of cancer. The evaluation of the antidiabetic activity was carried out using a colorimetric approach, which involved assessing the inhibition of α-amylase activities. The extract exhibited a comparable α-amylase inhibitory activity to that of the standard metformin, which is a noteworthy discovery. Consequently, it demonstrates potential for reducing the postprandial blood sugar spikes that are seen by diabetics. In order to quantify the amount of cell migration and proliferation that occurred during the in vitro wound healing activities, a scratch assay was utilized. Following the same pattern as the control group, the findings indicated that the *H. rosa-sinensis* extract was effective in facilitating the closure of wounds. Because of its wound-healing properties, the extract has the potential to be beneficial in the treatment of a wide variety of wounds at the same time. A phytochemical research confirmed that both the ethanolic and aqueous extracts of *H. rosa-sinensis* contained significant bioactive components. This finding lends credence to the therapeutic effects that were reported [20].

Mustaffa *et al*.,2020 Ethanol with a concentration of 95% was utilized in order to extract the rhizomes of *C. longa* and the flowers of *H. rosa-sinensis*. *Hibiscus rosa-sinensis*, lanolin, and petroleum jelly were the components that were utilized in the production of the ointment and paraffin wax, respectively. For a period of twenty days, an excision wound was treated with an ointment formulation that was applied once daily to Sprague Dawley rats. A significant difference was observed in the wound contraction rate between the treatment group (93.52 ± 1.38% on day 20) and the control group (87.62 ± 1.48%) on day 20 between the two groups. A significant amount of wound healing activity was demonstrated by the herbal ointment with regard to a rat excision wound model [21].

## Hypertensive activity

Amtaghri *et al*.,2022 An aqueous extract of *Hibiscus rosa-sinensis* flowers (AEHRS) was administered to rats in order to determine whether or not there were any changes in the

levels of blood pressure that were measured while the rats were at rest. In this study, we synthesized AEHRS and evaluated its effectiveness as an antihypertensive agent using animal models as well as laboratory models. Within the context of the in vivo study, rats with normotensive and hypertensive blood pressure were administered oral dosages of AEHRS (100 mg/kg) for a duration of six hours during the acute phase and for a period of seven days during the subchronic phase. Following that, a tail-cuff and computer-assisted monitoring equipment were utilized in order to record the cardiovascular rate, as well as the systolic and diastolic blood pressures, as well as the mean arterial blood pressure. In order to investigate the vasorelaxant action of AEHRS, isolated thoracic aortic rings were suspended in a tissue bath. A data capturing device was utilized in order to record changes in tension during this process. Our investigation into the potential pathways that contribute to the vasorelaxant effect was carried out with the use of a number of conventional pharmacological interventions [22].

## Antidepressant activity

Shewale *et al*.,2012 Behavioral procedures, including as the tail suspension test (TST) and the forced swim test (FST), were utilized in order to evaluate the potential anti-depressant effects of methanol extracts containing anthocyanins (MHR) and anthocyanidins (AHR) derived from flowers of the *H. rosa-sinensis* plant. The doses of MHR and AHR were thirty and one hundred milligrams per kilogram, of course. The mechanism of action of the antidepressant activity was investigated by examining the effects of the extract after it had been pre-treated with mild doses of haloperidol, prazosin, and para-chlorophenylalanine (p-CPA).During the course of this research, the duration of immobility in both TST and FST was dramatically decreased, just like the positive control group that was given imipramine at a dose of 10 mg/kg intravenously. When compared to the duration of immobility caused by Haloperidol (a classical D2-like dopamine receptor antagonist) (50 µg/kg, i.p.), Prazosin (62.5 µg/kg, i.p.), and p-chlorophenylalanine (100 mg/kg, i.p.,× 3 days; an inhibitor of serotonin synthesis), the extract significantly reduced the duration of immobility. This was determined by TST and FST [23].

Sucharitha *et al*.,2021 After administering doses of 30 and 200 mg/kg of an ethyl acetate extract of Hibiscus Rosa sinensis flower and leaf to mice, researchers compared the anti-depressant effects of the extract to those of a vehicle control group. Other behavioral evaluations were also included in the testing, such as forced swimming (30 and 200 mg/kg), tail suspension (30 and 60 mg/kg), and other tests. The tail suspension test, the forced swimming test, and the sleep-induced method were the three behavioral tests that were used to predict the clinical efficacy of a variety of novel antidepressant drugs. Extracts of *Hibiscus rosa sinensis* contain the components that are responsible for regulating the process of oxidation. At oral doses of 100 and 200 mg/kg for 14 days, the extract significantly ($P \leq 0.01$) reduced the duration of immobility in mice in a dose-dependent way. This was observed in the forced swim test, the sleep induced technique, and the tail suspension test [24].

## Gastroprotective activity

Agrawal et al.,2019 This investigation was conducted with the intention of determining whether or not the floral extracts of *Hibiscus rosa-sinensis* Linn. (Malvaceae) exhibited any protective effects on the gastrointestinal tracts of the animals who took part in the experiment. For the purpose of pylorus ligation and indomethacin-induced ulcers, albino wistar rats were utilized as models, and both water- and alcohol-based extracts were investigated. A number of different parameters, including pH, stomach volume, ulcer index, ulcer score, free and total acidity, and % protection, were measured using the pylorus ligation and Indomethacin-generated ulcer models, respectively. Phytochemical analysis was performed on both the water and alcohol extracts, and the results showed that the extracts included mucilage, alkaloids, glycosides, tannins, and flavonoids. The extracts, when administered at doses of 200 and 400 mg/kg, exhibited a significant reduction in gastric volume (1.20±0.17, 0.83±0.20, 0.90±0.12, 0.96±0.17) and ulcer index (1.50±0.19, 1.33±0.11, 2.16±0.03, 0.75±0.17, 0.92±0.22, 0.31±0.04, 0.42±0.06, 0.19±0.04) in comparison to the control group (1.47±0.15, 3.00±0.21, 1.64±0.13). It is possible that the presence of tannins, flavanoids, or mucilage is responsible for the gastro-protective qualities that both extracts possess [25].

Phani *et al*.,2014 In order to discover and evaluate the gastroprotective effects of floral extracts from *Hibiscus rosa sinensis* L. (malvaceae), we evaluated them using rat models of gastric ligation, aspirin-induced ulceritis, and ethanol-induced ulceritis. All of the models that were induced by gastric ulcers demonstrated a significant gastroprotective activity ($p < 0.05$) when compared to the reference standard. This was demonstrated by the presence of tannins, alkaloids, and flavonoids in the extracts that were analyzed for phytochemical and pharmacological properties. At a dose of 250 milligrams per kilogram, the aqueous extract offered the maximum level of protection in the pylorus ligation, aspirin-induced, and ethanol-induced ulcer models. The percentage of protection achieved was 84.17%, 77.12%, and 76.8%, respectively. It is considered to have a protective effect due to the fact that it has an effect on the production of mucus and the tannins and flavonoids in the crude extract have the ability to scavenge free radicals [26].

## *Hibiscus rosa sinensis* antimicrobial activity

Vijaykumar *et al*.,2018 The present study focused on the antimicrobial properties of *Hibiscus rosa-sinensis* blooms against pathogens that cause venereal diseases for the purpose of determining their effectiveness. Throughout the course of this investigation, the agar well diffusion method was utilized to evaluate the antibacterial properties of flower extracts in a variety of solvents. Comparatively, the results obtained from the floral extract of Hibiscus *rosa-sinensis* that was made using methanol are superior to those obtained from extracts that were made using other solvents. Seven different bioactive chemicals were discovered through the GC-MS analysis of the extract. In order to associate the *N. gonorrhoea* protein with these beneficial substances, the protein was used. As a conclusion, it is worth noting that among all the ligand molecules, benzene dicarboxylic acid demonstrated the highest glide docking XP scores (-7.055) and binding energy values (-38.692 kcal/mol). This chemical was therefore isolated by the use of flowers of the *H. rosa-*

*sinensis* plant. The subsequent phase consisted of putting different concentrations of 1,2-benzene dicarboxylic acid to the test on microbial strains that are responsible for human ailments. In that particular location, all concentrations exhibited powerful anti-gonorrheal activities against *Neisseria gonorrhoeae*. According to the findings of this inquiry, 1,2 benzene dicarboxylic acid has the potential to be an effective novel therapeutic candidate for the treatment of genital infections [27].

Priya *et al*.,2020 Alkaloids, terpenoids, tannins, flavonoids, saponins, phenolic compounds, carbohydrates, reducing sugar, and triterpenoids were found in the plants that were examined for their phytochemical content in this study. Further investigation into the saponin content revealed that HRlf had the lowest amount, which was 2.5 mg/g, followed by HRfr, which had the next highest amount, which was 3.1 mg/g, and HRrt, which had the greatest amount, which was 4.3 mg/g. In addition, the process of quantifying the zone of inhibition and evaluating the antibacterial capabilities of various plant extracts was carried out by employing the Agar well-diffusion method on gram-negative bacteria *S. aureus* at doses of 20, 50, and 100 µg/ml. In comparison to the other substances that were examined, the MeOH extract of leaves exhibited the most potent antibacterial activity. According to the findings of recent study, the MeOH extracts that are obtained from the *H. rosa sinensis* plant possess very potent antibacterial capabilities. There is a possibility that the antibacterial characteristics of *H. rosa* are due to the presence of saponin, tannins, and flavonoids [28].

### *Hibiscus rosa sinensis* antioxidant activity

Rengarajan *et al*.,2020 *Hibiscus rosasinensis*, a medicinal herb, is well-known for the several applications it has in the field of medicine. The objective of this work was to identify and describe the flavonoid component that was present in the flower petals of the *Hibiscus rosa sinensis* butterfly. The separation of the antioxidant compounds was accomplished through the use of chromatography on a Silica Gel G column. In terms of antioxidant activity, the fractions indicate that compounds with the C5 group perform better than compounds with the C3 and C4 groups. The protection of two principal bands of DNA, namely super coiled DNA and open circular DNA, was observed in the presence of different concentrations of a C5 chemical derived from the petals of Hibiscus rosa sinensis. These concentrations were 5 µg, 10 µg, 15 µg, and 20 µg with varying concentrations. The infrared absorption peaks are used to identify many compounds, including alcohols, phenols, α and β unsaturated aldehydes, ketones, and alkanes. Through the utilization of mass spectrometry and nuclear magnetic resonance (NMR), the molecule was recognized as Hibiscetin-3-glucoside, which has the chemical formula C21H20O14. It has been demonstrated through research that compounds that are abundant in flavonoids, which may have anticancer effects due to the phenolics and flavonoids that they contain, have efficient scavenging capabilities against cancer [29].

Garg *et al*.,2012 There are a large variety of illnesses that can be caused by free radicals. Two of these ways are lipid peroxidation and disruption of DNA. Extracts from a number of different plants have been discovered to exhibit antioxidant capabilities, which are capable of neutralizing free radicals. In order to study the antioxidant properties of a crude (aqueous and methanolic) extract of Hibiscus rosa sinensis (Malvaceae), six in vitro models were utilized. These models included the FRAP test, reducing power, radical scavenging activity utilizing the DPPH reduction assay, scavenging of sulfur dioxide, hydrogen peroxide, and nitrogen oxide, and reducing power measurement. It was determined by the researchers that the extract contained a significant amount of flavonoids and phenolic chemicals. The methanolic extract of Hibiscus rosa-sinensis exhibited a much higher level of antioxidant activity compared to the water-based extract obtained from the plant. According to these findings, hibiscus has the potential to be an attractive candidate for the development of a novel functional dietary agent that might be used in the treatment of hyperlipidemia and diabetes, two chronic metabolic illnesses [30].

### Therapeutic uses

*Hibiscus rosa-sinensis*, most commonly referred to as hibiscus, is a plant that serves multiple purposes and has multiple medical applications. The benefits it provides to the cardiovascular system include the regulation of blood pressure, the reduction of cholesterol levels, and the enhancement of heart health. Because it contains a large quantity of antioxidants, hibiscus contributes to the neutralization of free radicals, which in turn reduces the risk of oxidative stress and chronic diseases. As a result of its antibacterial and anti-inflammatory properties, it helps to maintain healthy skin, accelerates the healing process of wounds, and reduces the symptoms of inflammation. The usage of hair care products that contain hibiscus helps to promote new hair development, reduce dandruff, and improve the natural texture of the hair. The effects of this moderate laxative are beneficial in that it helps ease stomach pain while also assisting with digestion. The traditional applications of this substance for the health of women include the regulation of menstruation and the relief of cramps. In addition to assisting with weight loss, hibiscus also helps to regulate blood sugar levels and boosts the immune system due to the large amount of vitamin C that it contains. Tea, topical treatments, and extracts of hibiscus are just some of the ways that hibiscus can be utilized for therapeutic purposes. Because of the possibility of harmful effects and drug interactions, those who are breastfeeding a child or who are taking other medications should exercise caution if they are taking certain medications.

## CONCLUSION

The *Hibiscus rosa sinensis* plant, which belongs to the family Malvaceae, has a long history of being used for traditional medicinal purposes in China and other tropical locations. It has a wide range of applications in medicine, including the treatment of inflammation, fever, and bacterial infections, and it can even be used as a kind of birth control. Tannins, alkaloids, flavonoids, terpenoids, and saponins are the principal phytochemicals. This is due to the fact that they are present in a variety of extracts and are most likely responsible for the biological activity that they exhibit. Low toxicity is one of the potential advantages that could make this plant a suitable candidate for the development of a novel medicinal treatment. This article provides a summary of recent research that has been conducted on the phytochemistry and therapeutic uses of *H. rosa sinensis*. Due to the fact that there

is a dearth of data in particular domains, additional research is required in order to acquire a comprehensive understanding of the mechanism of action of phytochemicals, such as their effectiveness in combating cancer.

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