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EXPLORING THE PHARMACOLOGICAL PROPERTIES OF HIBISCUS SABDARIFFA: A MULTIDIMENSIONAL REVIEW

Omkar Jadhav* and Nilam Nile

*School of Pharmacy, CSMU, Panvel Old Pune Highway, Navi Mumbai, 410206, India.
Faculty of Pharmacy Chhatrapati Shivaji Maharaj University, Panvel, Navi Mumbai, India.

***Corresponding Author: Omkar Jadhav**

School of Pharmacy, CSMU, Panvel Old Pune Highway, Navi Mumbai, 410206, India.

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ABSTRACT

Traditional uses of Hibiscus sabdariffa L. (Hs, roselle; Malvaceae) include food, herbal drinks, hot and cold beverages, food industry flavoring, and herbal medicine. The majority of the data for phytochemically poorly characterized has extracts comes from in vitro and in vivo investigations as well as a few clinical trials. In addition to their antibacterial and antioxidant properties, the extracts also demonstrated nephro- and hepato-protective, renal/diuretic, lipid metabolism (anti-cholesterol), anti-diabetic, and anti-hypertensive activities. Strong antioxidant properties, α-glucosidase and α-amylase inhibition, angiotensin-converting enzyme (ACE) suppression, direct vaso-relaxant effects, or calcium channel modulation may all be connected to this. Anthocyanins (delphinidin-3-sambubioside and cyanidin-3-sambubioside), organic acids (hydroxycitric acid and hibiscus acid), and phenolic acids (particularly protocatechuic acid) are probably involved in the effect of hibiscus sabadariffa.

KEYWORDS: Malvaceae; Roselle; Lipid metabolism; Hepatoprotective or renal protective; Diuretic & renal effects; antioxidant Acid.

1. INTRODUCTION

The nutritive and therapeutic herb Hibiscus sabdariffa, commonly referred to as roselle, belongs to the Malvaceae family. It is an annual summer shrub that grows straight and typically branches, with a taproot that penetrates deeply. It has large, short-peduncled blooms with a dark center, and its leaves are green to crimson in color. Both humans and animals eat roselle, which is a significant vegetable. While the immature fruit, exquisite calyces, and sensitive shoots are chopped and put to the sauce, the young roselle herbs are consumed fresh in a salad preparation. The portion of the plant that is most frequently used is its calyces, which can be red, green, or dark green.

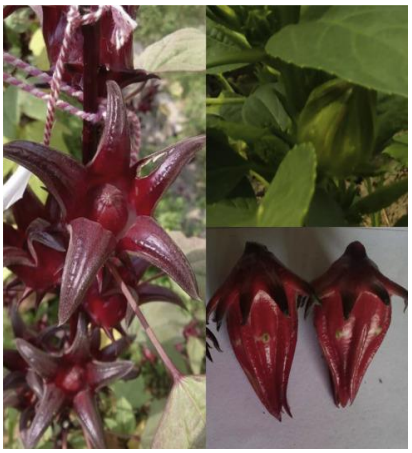
Zobo is an aqueous extract made from the dried reddish-brown petals (calyces) of Hibiscus sabdariffa. Originating in Malaysia and India, the plant is widely cultivated in numerous tropical countries throughout both hemispheres. This dicotyledonous plant is often grown in the south-western regions of Nigeria, including Ondo and Osun, as well as in the middle belt states, including Plateau, Nasarawa, and Benue. Phytochemicals including anthraquinones, glycosides, alkaloids, tannins, polyphenols, and saponins have been found to be present in roselle.

In addition to being an antihypertensive, antibacterial, stringent diuretic, and purgative, the plant is said to be an excellent treatment for cancer, abscesses, cough, debility, dysuria, scurvy, and fever. Usually sweetened with sugar to taste, the extract is also occasionally flavored with natural flavors like pineapple and lime juice, artificial flavors like strawberry vanilla, and spices like ginger hot pepper. According to reports from past research, Hibiscus sabdariffa has a significant amount of ascorbic acid. Builders et al. (2010) and Teye et al. (2019) claim that H. sabdariffa has a low sugar content and a high calcium, iron, riboflavin, and niacin content. Anthocyanins, a colored byproduct of the flavonoid pathway, are believed to be the cause of H. sabdariffa's alleged health advantages. The anthocyanins found in H. sabdariffa have been found to have antioxidant activity, which protects against atherosclerosis and cancer. They also have something to do with better cholesterol action and liver protection. Evidence suggests that the antioxidant potential is significantly higher than that of common antioxidants such as ascorbate.

(Hibiscus sabdariffa)
Morphology of the plant

Hibiscus sabdariffa is a shrub that is a member of the genus Hibiscus and family Malvaceae. With a reddish or green stem that is either nearly branchless or bears branches at the base, it is an annual erect shrub. The stem bears little tubercles and is glabrous, or slightly hairy. The upper leaves are palmately 3-5 lobed, while the lower leaves are oblong and undivided. The leaves are serrated. The epicalyx is joined at the base with a dark red to purple calyx, and the fleshy capsules are ovoid-shaped and contain several seeds. The flowers are huge yellow with a dark crimson eye.

Cultivation and Collection



Hibiscus sabdariffa, commonly referred to as Roselle or Hibiscus tea plant, requires regular watering, lots of sunlight, and well-drained soil. For best results, start with seeds or seedlings, give them enough space, and keep them consistently moist. When the calyces are fully grown, harvest them for tea or other culinary purposes. Bushier growth can be encouraged through pruning. India is home to the cultivation of H. sabdariffa (Mesta, Roselle) on an area of roughly 1.5 lakh hectares, with an average production of About 11 q/ha 6 of crop is produced. It is also grown for a variety of purposes, including medicinal, nutrition, fiber collecting, and food consumption in numerous nations, including Sudan, America, South Africa, and others. The Roselle is a perennial shrub that requires five months to harvest after planting, making it an annual event shrub.

ENVIRONMENTAL REQUIREMENTS

Climate and Soil: The first three to four months of roselle plant growth require 130 to 250 nm of rainfall; dry weather is necessary for the plant to flourish as intendedis either merited or well accepted. When harvesting and drying, rain or excessive humidity might reduce the amount and output of Roselle calyces 5. It grows during the Kharip season and is poorly resistant to flooding. Although it may thrive in a range of soil types, including lateritic loam and both fresh and old alluvium, it needed rich loamy soil. Acid soils are inappropriate without the right kind of amendment. The Sabdariffa experience chlorosis when the soil's pH is elevated to

Planting: The rosella plant is extremely sensitive to variations in day length. Instead of the amount of rainfall that the plant needs. The planting conditions are 45–60 cm apart and 1 m between rows. If the planting rate is lower, the larger calyx is generated. Either a grain drill machine or manual labor is used for the sowing process. As an additional instrument, the Roselle seed is also sown using the corn planter. The plant should be thinned by hand using labor. H. Sabdariffa has more than 100 cultivars, or seed variants; the many commercial cultivars are grown in China, Mexico, Thailand, and Africa.

PHARMACOGNOSY

BIOLOGICAL NAME: Hibiscus sabdariffa
Synonyms: Furcaria, sabdariffa Ulbr
Scientific name: Hibiscus sabdariffa Linn.
Biological Source: The plant species Hibiscus sabdariffa, also referred to as roselle or hibiscus, is grown mostly for its calyces.
Family: Malvaceae

HIBISCUS SABDARIFFA PHYTOCONSTITUENTS

Numerous phytoconstituents, such as anthocyanins, flavonoids, polyphenolic compounds, and organic acids, are present in Hibiscus sabdariffa. These substances support its antioxidant qualities and possible health advantages. The plant is frequently used to produce hibiscus tea, which has a bright red color and a cooling flavor.

Anthocyanins: The dried flowers of Haematyssapdariffa contain a natural pigment called anthocyanins, which is a class of flavonoid derivatives. pH 12 causes color

changes. The majority of the chemical research done on the Hibiscus sabdariffa flower extract has gone toward characterizing its pigments. 13. Anthocyanins based on delphinidin and cyanidin, such as delphinidin-3-Sambubioside (hibiscin), gossypicyanidin-3-Sambubioside (cyanidin-3), and others 7. An anthocyanin called "hiviscin," also known as "hibiscin," was extracted by Yamamoto and Oshima (1932) from the calyx of H. Sabdariffa. Later, they gave this anthocyanin the name Delphinidin-3-Sambubioside and determined its structure. Hydroxyanidin-3-glucoside Later on, this was modified to delphinidinpentoside-glucoside 12, 13. DU and Francis (1973) isolate this pigment even further. The pigment had three distinct anthocyanins that were separated out.

Flavonoid's: Plant polyphenolic flavonoids and phenolic acids have garnered significant attention in recent decades owing to their potent antioxidant propertiesand safeguarding influence against the onset of cancer and cardiovascular disorders 13. H. sabdariffa contains the flavonoid and polyphenol classes, either in their simple or polymerized forms. H. Sabdariffa extracts include the flavonoids quercetin, lute Olin, bicysteine (bicysteine-3-glucoside), eugenol, pelargonidic acid, protocatechuic acid, hydroxyeugenol, and the sterols ergosterol and β-sitosterol. The hydroxy flavone known as sapdaretine was produced by acid hydrolysis of the three monoglucosides of biscetin (Hibiscitrin), seven glucosides of gossypectine (Gossypitrin), and sapdaritrin found in H. sabdariffa flowers. Hibiscitrin was the main component and these flavonol glycosides were low.

USES

The calyx, or outer leaves, of the adaptable roselle plant are used extensively to make jelly, jam, juice, wine, syrup, gelatin, pudding, cake, ice cream, and flavoring. Another name for calyx is natal sorrel. It is a prized culinary item because of its unique flavor and stunning crimson color. Roselle is an annual crop used in food, animal feed, cosmeceuticals, nutraceuticals, and medicines. The calyces, stems, and leaves all have an acidic flavor. The juice is marketed as a health-promoting beverage because of the calyces' high concentration of vitamin C, anthocyanins, and other antioxidants. In addition to being used to produce tea, jam, marmalade, ice cream, sorbets, butter, pies, sauces, tarts, and other delicacies, the dried calyx is used to make a delicious and nourishing beverage. The seeds have been used as a stimulant instead of coffee.

NUTRITIVE VALUE

The roselle plant contains 68.7% carbohydrates, 14.6% crude fiber, 12.2% ash, and other nutrients, according to Luvonga et al. (2010). It has been demonstrated that the plant is rich in minerals, especially potassium and magnesium. Vitamins such as pyridoxine, niacin, and ascorbic acid were also found in significant amounts. The physicochemical components of the fresh calyses and leaves of H. sabdariffa were described by Nmahadevan and Pradeep (2009).

THERAPEUTIC ACTION: Infusions of H. sabdariffa leaves or calyces have long been used for their diuretic, cholerectic, febrifugal, and antihypertensive qualities, as well as to reduce blood viscosity and promote intestinal peristalsis. In Egypt, calyces formulations are used as cooling agents, to encourage urination, and to treat problems of the heart and nervous system. In Sudan, H. sabdariffa calyces are used to treat flu, cold symptoms, and high blood pressure. The plant's edible calyces are used as a cancer treatment in Zimbabwe. H. sabdariffa has been used to treat all types of cancer, according to a survey on ethnomedicinal plants used by traditional healers in Zimbabwe. Throughout Mauritius, H. sabdariffa is used to treat type 2 diabetes.

The following therapeutic properties of Hibiscus sabdariffa are discussed: antimicrobial, antioxidant and hepatoprotective, effect on lipid metabolism, antihyperten-sive properties and antidiabetic activty.

ANTI-INFLAMMATORY ACTION

On the one hand, inflammation is an uncontrollable reaction caused by conditions such as allergies, autoimmune diseases, metabolic disorders, and cardiovascular disorders; on the other hand, it is our body's reaction to potentially harmful stimuli like tissue damage. Numerous steroids, non-steroidal anti-inflammatory drugs, and immune suppressants are used to treat and suppress inflammatory crises. There are two types of inflammatory responses: acute inflammation and chronic inflammation. While chronic inflammation lasts for more than four weeks, acute inflammation lasts for seven days or a week. Inflammatory conditions like cardiovascular disease and disorders related to inflammation may benefit from the use of hibiscus

sabdariffa. Though the initial results are encouraging, more study is required to completely comprehend the mechanisms and efficacy of hibiscus sabdariffa.

ANTI-OXIDANT ACTIVITY

The antioxidant and free radical scavenging effects of two fractions of the ethanol extract (chloroform soluble fraction and ethyl acetate soluble fraction) obtained from its dried flowers were investigated44 and found that both the fractions scavenge hydrogen peroxide (79-94%) at the dose of 500µg. Similarly, the extracts showed inhibitory (70- 80%) effects on superoxide anions radicals (O2 -) at a dose of 1000µg. The antioxidant activities of three varieties using liposome system have also been reported. Methanol and ethyl acetate extracts showed higher COX-1 enzyme inhibition than COX-2 inhibition45.

ANTI- DIABETIC ACTIVITY

A treatment approach based on α-amylase and α-glucosidase inhibition is utilized to reduce postprandial hyperglycemia. It illustrates how the pancreatic α-amylase and intestine α-glycosidase inhibitors can block both enzymes. The study found that when taken at a dose level of 200 mg/kg, roselle polyphenolic extract can lower hyperinsulinemia and hyperglycemia.

ANTI- MICROBIAL ACTIVITY

Roselle is commonly used to treat medical conditions. Olaleye (2007) used an aqueous-methanolic extract of the plant to investigate the phytochemical components, antibacterial activity, and cytotoxicity of roselle. He discovered that the extract includes alkaloids, flavonoids, saponins, and cardiac glycosides. It shown antibacterial action against the following microorganisms: Staphylococcus aureus, Bacillus stearothermophilus, Micrococcus luteus, Serratia mascences, Clostridium sporogenes, Escherichia coli, Klebsiella pneumoniae, Bacillus cereus, and Pseudomonas fluorescence. While Fullerton et al. (2011) found that roselle extract was effective and that it might be possible to isolate antibacterial and anticancer agents based on its antimicrobial activity on isolates of Salmonella enterica, Escherichia coli O157:H7, and Listeria monocytogenes from food, veterinary, and clinical samples.

ANTI- HYPERTENSIVE

The connection between hypertension and the development of cerebrovascular diseases, cardiac ischemia, and cardiac and renal failure is now acknowledged as a global health concern. Puro et al. (2014) found a significant decrease in the difference between systolic and diastolic pressures when compared to the control group in their study on the efficacy of aqueous extract in hypertensive humans, while Mckay et al. (2011) only found a significant decrease in systolic pressure.

CONCLUSION

Ginseng has long been recognized as a supertonic herb that can be used to treat a wide range of illnesses, including cancer, cardiovascular disorders, impotence, diabetes, palpitations, insomnia, hyperdynamic disorders, anorexia, and many more. This is true of traditional medical systems such as the Chinese and Ayurvedic systems. Techniques for collecting and cultivating unique plants are discussed. Saponins, glycosides, sugars, amino acids, peptides, volatile oil, and enzymes are among the primary groups of phytochemicals that have been reported. The pharmacological properties of miraculous ginseng, which include anti-inflammatory and antioxidant properties, are explored.

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