



Pharmacological Activities of *Gongura* (Roselle) Leaf: Recent Advances

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Abstract

Gongura (*Hibiscus sabdariffa*) is an annual herbaceous plant widely used in folklore practice for its leafy vegetable, belonging to the family Malvaceae. Over the past decade, various pharmaceutical and phytochemical studies of this plant has shown significant outcome, which are currently accepted and used in therapeutics. The presence of organic acids in higher quantity enhances the medicinal value of this plant. Activities observed in the deferent parts of the plant, such as diuretic, antihypertensive, antibacterial, antifungal, antiparasitic, antipyretic, anti-inflammatory, antioxidant, anticancer, antiobesity, antidiabetic, antihypertensive, antianemic, and anti-pyreticactivity. Based on the mentioned medicinal significance of *H. sabdariffa* plant, we planned to review the recent studies of all parts of the plant, their nutritional value, and phytoconstituents.

Keywords: *Hibiscus sabdariffa*, Medicinal Significance, Nutritional Value

1. Introduction

Gongura, (Figure 1) scientific name is *H. sabdariffa*, commonly known as Roselle, which is an annual herbaceous plant grown for its edible leaves and also as a commercial substitute for jute.

Kingdom-Plante
Family-Malvaceae
Genus-Hibiscus
Species-Sabdariffa

2. Origin

H. sabdariffa Linn., also called Sorrel/*Gongura*/Roselle, is commonly found in countries having warm humidity like India, Tropical Africa, Florida, Indonesia, Philippines, Brazil, Australia, Malaysia, Hawaii, etc. They are also cultivated presently in tropical and subtropical regions¹.



Figure 1. *Hibiscus sabdariffa* plant.

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3. Nutrition Value

The nutritional composition in the leaves and calyces of *Gongura* plant² is shown in Table 1.

Table 1. Nutritional composition of *Gongura* plant

Carbohydrate	9.2 gm
Protein	3.3 gm
Phosphorus	214 mg
Fat	0.3 gm
Iron	4.8 mg
Thiamine	0.45 gm
Riboflavin	0.45 mg
Ascorbic acid	54 mg
The calyces of <i>Gongura</i> plant:	
Protein	1.9 gm
Fat	0.1 gm
Carbohydrates	12.3 gm
Fiber	2.3 gm
Vitamin C	14 mg
Calcium	1.72 mg
Iron	57 mg

4. Phytoconstituents

Phytoconstituents are the secondary metabolites of plants, responsible for protecting the plant. *Gongura* extracts contain a high number of various acids (malic hibiscus, citric, hydroxy citric acid and tartaric) as a major component. Saponins, alkaloids, flavonoids, anthocyanins tannins, phenols, and flavonoids were present in the dried petals of the plant³.

Niacin, carbohydrates, cellulose, fatty acids, ash, thiamine, cholesterol, riboflavin, starch, fiber, and minerals are present in the leaves of the plant. The aqueous extract of the flowers contains higher amounts of citric and malic acids than other components. The dried flowers of *Gongura* contains a major amount of phenolic acid. Methanolic extracts reported to contain quercetin, luteolin, and its glycoside⁴.

5. Methods

The Science Direct, Google Scholar, Scopus, PubMed, etc., used for the recent literature studies by using different terms. All experimental observations of *H. sabdariffa* plant of the given database were collected from the recent year.

The *H. sabdariffa* plant and its constituents showed significant medicinal potential such as: anti (microbial, inflammatory, cancer, diabetic, oxidant, pyretic, hypertensive, anemic) activity, atherosclerotic, and hepatoprotection. The detail studies are listed in the following sections.

6. Antimicrobial Activity

Gongura calyx extracts were compared with six different types of commercial mouth cleaners and chlorhexidine on *S. mutans*, *S. sanguinis*, *C. gingivalis*, and *S. aureus*. It showed greater antimicrobial effect than mouthwashes⁵.

H. sabdariffa extracts can be used as natural antibacterial additives. The results revealed that the phenolic hibiscus extract increases the duration of the meats shelf life⁶.

H. sabdariffa L. ethanol extract showed high antimicrobial potential against the food borne pathogens. Based on the experimental results *H. sabdariffa* L. can be used as natural food grade additive pathogen⁷. The acetone extract of *H. sabdariffa* (calyces) showed good antimicrobial activity against Salmonella strain and *E. coli* bacteria⁸. Crude aqueous extract of *H. sabdariffa* showed MIC of 6.6 mg/ml against EPEC growth⁹.

The water extract of calyx of *Gongura* showed anti-bacterial, anti-fungal due to the presence of protocatechuic acid (5mg/ml). This was used in inhibiting the growth of methicillin resistant *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, *Staphylococcus aureus*, and *A. baumannii*¹⁰.

6.1 Anti-Inflammatory Activity

The aqueous extracts (leaves) of *H. sabdariffa* showed poor anti-inflammatory activity against albino rats in both the model (carrageenan-induced acute model and formalin-induced chronic model) of inflammation¹¹. The methanol extract of *H. sabdariffa* showed potent anti-inflammatory potential against carrageenan-induced inflammation compare to the standard¹².

6.2 Anti-Cancer Activity

Based on the experimental evidence, *H. sabdariffa* was used as a herbal supplement for cancer treatment and prevention. The main advantage of the plant is no side effects compared with other treatments¹³.

The ethanol, ethyl acetate, and hexane extracts of *H. sabdariffa* L. on the A549 lung cancer cell line showed potent anticancer activity¹⁴.

The root extract of *H. sabdariffa* L. showed potent antineoplastic efficacy against Ehrlich ascites carcinoma cells¹⁵.

The flower extract of *H. sabdariffa* showed potent anticancer activity against human liver cancer (Hepg2) cells¹⁶. The leaf extract of *H. sabdariffa* showed potent effects in the prevention of cancer against human prostate cancer cells¹⁷.

6.3 Anti-Diabetic Activity

The methanol extract of *H. sabdariffa* L. (fruit fraction) results showed potent antidiabetic activity by inhibiting the α -glycosidase enzyme¹⁸.

The antidiabetic activity of phenolic extract of *H. sabdariffa* showed a significant effect on the condition of Type 2 diabetes which is currently accepted and used therapeutically in the control of postprandial hyperglycemia. This mechanism includes a delay of carbohydrate digestion into absorbable monosaccharide form. It is also used to treat urinary problems associated with diabetes mellitus and traditionally is believed to clean the liver and blood¹⁹.

6.4 Anti-Oxidant Activity

The *H. sabdariffa* L. extracts showed potent antioxidant activity due to the presence of phenols and flavonoids. Different extracts of the plant are made by using an ultrasound-assisted extraction process²⁰.

Based on the experimental results reveals that just a variation in the power (325 watts) and time (5 min) showed potent antioxidant activity²¹. The antioxidant activity of *H. sabdariffa* extracts' results reveal that *H. sabdariffa* calyces can be used as food antioxidants²².

The aqueous and ethanol extract of *H. sabdariffa* (flower and seed) showed potent antioxidant activity²³. The aqueous extract of *H. sabdariffa* L. with a single dose showed a significant decrease in oxidative stress²⁴.

6.5 Anti-Pyretic Activity

H. sabdariffa meal improves the iron status of the child. The results found that feeding the HSM (1.9kg/day) improved the iron status of women²⁵. Based on the experimental observation, the aqueous extract of *H. sabdariffa* L. corrects the iron deficiency²⁶.

6.6 Anti-Hypertensive Activity

The *H. sabdariffa* herb effect on antihypertensive activity in hypertensive rats. The experimental results of *H. sabdariffa* extracts showed a significant antihypertensive effect against induced hypertensive rats²⁷.

The mild hypertensive activity in the water extracts of *H. sabdariffa* calyx and consumption of tea for four weeks duration was seen to decrease blood pressure. This sour tea was also found equally effective in the condition of hyperlipidemia, which decreases the lipid content in the blood by increasing HDLP and decreasing the total cholesterol²⁸.

6.7 Anti-Anemic Activity

The *H. sabdariffa* L. dry calyces contain various minerals such as iron, calcium, zinc, etc. It can be used as an alternative source of iron and that leads to the prevention of anaemia^{29,30}.

6.8 Anti-Atherosclerotic

The extract of *H. sabdariffa* induced in rabbits along with cholesterol diet revealed that there was a decrease in triglyceride and cholesterol levels^{29,31}.

H. sabdariffa petals aqueous extract decreases the plasma concentration in rats which shows the cardiovascular properties²⁹⁻³².

6.9 Hepatoprotection

The leaf extracts of *H. sabdariffa* showed potent hepatoprotection in hyperammonemia experiments due to the presence of antioxidants²⁹. Natural plant extraction and its medicinal potential and also the previous research observation of our group contribution in the same field which includes molecules like pyrimidine, coumarin, and benzimidazole derivatives and various biological activities³³⁻⁴⁴.

7. Conclusion

The review analysis of Roselle showed that different parts of *H. sabdariffa* plant are being used and all these parts contain different phytoconstituents. An overall analysis of this plant extract showed the presence of alkaloids, fibers, and organic acids in higher quantities. Anthocyanins, phenols, and flavonoids are present in dried petals. Leaves contain vitamin C, phenolic acid, quercetin. Tartaric acid and saponins in roots, flowers, and fruits contain ascorbic acid, protocatechuic acid, citric acid in higher amounts. The aqueous extract of *H. sabdariffa* flowers showed high amounts of citric and malic acids. The different pharmacological activities of *H. sabdariffa* are diuretic, antihypertensive, antibacterial, antifungal, antiparasitic, antipyretic, anti-inflammatory, antioxidant, anticancer, antiobesity, antidiabetic, antihypertensive, antianemic activity, and anti-pyretic.

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9. References

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