

Hibiscus Sabdariffa L. As A Medicinal Plant for Management of Hypertension

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Abstract

A significant cause of morbidity and mortality worldwide, hypertension is a chronic cardiovascular disease marked by consistently high arterial blood pressure. Long-term blood pressure control is still subpar despite the availability of numerous effective antihypertensive medications because of side effects, expense, and low patient adherence. The investigation of medicinal plants as supplemental or alternative therapeutic options has been prompted by these constraints. In traditional medical systems, *Hibiscus sabdariffa* L., or roselle, is frequently used to treat cardiovascular conditions, especially hypertension. Anthocyanins, flavonoids, and phenolic acids, which have antioxidant, vasorelaxant, and angiotensin-converting enzyme inhibitory properties, are abundant in the plant's calyces. With a focus on its traditional use, phytochemical composition, mechanisms of action, preclinical and clinical evidence, and safety profile, this review critically assesses *Hibiscus sabdariffa* L.'s function in managing hypertension.

The significance of *Hibiscus sabdariffa* as a natural, affordable, and easily accessible medicinal agent is emphasized in this review. However, to confirm its effectiveness and guarantee its incorporation into contemporary pharmacotherapy for hypertension, more extensive clinical trials and formulation standardization are required.

Keywords: Phytochemical Constituents, Complications Associated With Hypertension, Pathophysiology and Allopathic Management Of Hypertension, Traditional Use Of *Hibiscus Sabdariffa* L., Pharmacological Activities, Pharmacognosy Activities, Safety And Regulatory Aspects, Mechanism Of Antihypertensive Action, Ethnomedicine of *Hibiscus sabdariffa* L.

Introduction

One of the biggest non-communicable diseases impacting people globally, hypertension continues to be a major cause of cardiovascular morbidity and mortality. It is often diagnosed when the systolic blood pressure reaches or surpasses 140 mmHg and/or the diastolic blood pressure reaches or surpasses 90 mmHg on repeated readings. [1]. Over the past century, hypertension has progressively come to be recognized as a medical disease. Clinical knowledge of cardiovascular physiology was revolutionized by the late nineteenth-century creation of the sphygmomanometer, which made it possible to monitor arterial pressure accurately [1].

Over one billion adults worldwide suffer from hypertension, which accounts for a significant share of cardiovascular mortality annually [1]. The right cuff size and patient placement should be used while measuring blood pressure, and the results should be verified several times. In order to detect white-coat or disguised hypertension and increase diagnostic accuracy, ambulatory blood pressure monitoring (ABPM) and home blood pressure monitoring (HBPM) are becoming more and more advised [2]. In low- and middle-income nations, where access to healthcare, screening programs, and lifestyle knowledge may be restricted, the burden is disproportionately greater. Its prevalence has been further exacerbated by rapid urbanization, dietary changes marked by high sodium consumption, decreased physical activity, and longer life expectancy [6]. Over the past

few decades, the prevalence of hypertension in India has significantly increased, impacting both urban and rural populations and becoming more prevalent in younger age groups [7]. Conversely, recognizable underlying diseases including renal parenchymal illness, renovascular disorders, endocrine abnormalities (like hyperthyroidism or primary aldosteronism), obstructive sleep apnea, or the use of specific drugs might cause secondary hypertension [8,10]. Excessive salt intake, poor potassium intake, obesity, physical inactivity, tobacco use, and excessive alcohol consumption are examples of modifiable risk factors that have a significant impact [9, 10]. Vasoconstriction, salt retention, and fluid accumulation are all encouraged by overactivation of the renin-angiotensin-aldosterone system (RAAS), which maintains high blood pressure [11]. Heart failure, myocardial infarction, coronary artery disease, and left ventricular hypertrophy are examples of cardiovascular problems [12].

1) Phytochemical Constituents

Hibiscus sabdariffa L.'s rich phytochemical profile is responsible for its pharmacological action. Anthocyanins such delphinidin-3-sambubioside and cyanidin-3-sambubioside, as well as flavonoids, phenolic acids, and organic acids, are important bioactive substances [3, 4]. These substances have strong anti-inflammatory and antioxidant qualities, which are essential for blood pressure control and vascular protection [5, 18].

2) Complications Associated With Hypertension

Target organ damage is the term used to describe the increasing harm that persistent uncontrolled hypertension causes to essential organs. Heart failure, stroke, ischemic heart disease, and left ventricular hypertrophy are examples of cardiovascular problems [12]. In addition to being a major contributor to chronic kidney disease, hypertension damages the retina, causing hypertensive retinopathy and visual impairment. Effective long-term blood pressure control is crucial because these consequences greatly raise the risk of morbidity and mortality [12,13].

3) Pathophysiology Of Hypertension

The vascular, renal, neurological, and endocrine systems interact intricately in the pathogenesis of hypertension. One of the main causes of high blood pressure is increased peripheral vascular resistance brought on by endothelial dysfunction and blood vessel structural remodeling [11, 14]. Nitric oxide bioavailability is compromised by oxidative stress and persistent low-grade inflammation, which results in decreased vasodilation and elevated vascular tone. Volume expansion and persistent hypertension are further caused by changes in renal salt processing [14,15].

4) Allopathic Management of Hypertension

Pharmacotherapy and lifestyle changes are part of the traditional management of hypertension. Dietary salt limitation, weight loss, frequent exercise, and stress reduction are examples of lifestyle treatments [2]. Diuretics, angiotensin-converting enzyme inhibitors, angiotensin receptor blockers, calcium channel blockers, and beta-adrenergic blockers are often used pharmacological treatments. Despite the effectiveness of these drugs, long-term treatment may result in side effects and decreased patient compliance, which calls for the investigation of alternative strategies [2,16].

5) Traditional Use of *Hibiscus Sabdariffa* L.

Hibiscus sabdariffa L. has long been utilized to treat hypertension and other cardiovascular conditions in a number of medical systems, including Ayurveda, Unani, and African traditional medicine [17]. Herbal teas and decoctions derived from the dried calyces are frequently drunk. *Hibiscus sabdariffa* L. is a good option for long-term dietary intervention in blood pressure management because of its widespread traditional use, which shows its cultural acceptance and perceived safety [17,18].as *Hibiscus sabdariffa* L's morphology.

Table 1. Preclinical and clinical studies on *Hibiscus sabdariffa* L in hypertension. [21,22,23,24]

Author (Year)	Study type	Dose/ Form	Duration	Key findings
Adegunloye et al., 1996	Animal study (rats)	Aqueous calyx extract	4 weeks	Systolic and diastolic blood pressure were significantly reduced, and little diuretic activity was noted.
Herrera-Arellano et al., 2004	Clinical trial (RCT)	<i>Hibiscus sabdariffa</i> tea	4 weeks	demonstrated ACE inhibition and vasorelaxant actions that reduced blood pressure.
Serban et al., 2015	Systematic review & meta-analysis	Multiple formulations	Variable	concluded that <i>Hibiscus sabdariffa</i> lowers blood pressure in a small but clinically significant way.
Al Disi et al., 2022	Randomized clinical trial	Standardized extract capsules	8 weeks	Both the diastolic and systolic blood pressure were significantly lowered with acceptable tolerance.

6) Pharmacological Activities Of *Hibiscus sabdariffa* Linn.

Sabdariffa *Hibiscus* Linn. In traditional medicine, this medicinal herb is used to treat fever, liver conditions, and hypertension. It is also frequently used to prepare drinks and pickles. According to reports, the plant has antihypertensive, antioxidant, anti-cancer, anti-clastrogenic, hypolipidemic, hepatoprotective, anti-stress, antispasmodic, antidiuretic, and antidiarrheal properties [27–28]. Roselle tea is used to treat colds and regulate excessive blood pressure. Its leaves are utilized as a source of mucilage in pharmaceuticals and cosmetics to treat hangovers, toothaches, and UTIs [29].

7) Pharmacognosy Activities Of *Hibiscus Sabdariffa* Linn

Bioactive components: Organic acids, anthocyanins, polysaccharides, and flavonoids are the primary components. Organic acids: the proportion of organic acids in "*hibisci flos*" varies; hibiscus acid makes up 13–24%, citric acid 12–20%, malic acid 2–9%, tartaric acid 8%, and ascorbic acid (vitamin C) 0.02–0.05% [30]. The four stereoisomers of hydroxycitric acid are (2S, 3S), (2R, 3R), (2S, 3R), and (2R, 3S), as well as their lactone forms. (2S, 3R)-hydroxycitric acid is the main organic acid present in the cHs [31].

The lactone form of (+)-allo-hydroxycitric acid is known as hibiscus acid. Due to the presence of two chiral centers in the molecule, it contains two diastereomers and comprises a citric acid moiety with an extra hydroxyl group at the second carbon [32].

8) Safety And Regulatory Aspects

When taken as a dietary beverage or herbal preparation, *hibiscus sabdariffa* L. is generally considered safe. Mild gastrointestinal symptoms are the main side effects reported in clinical research [25]. Standardization of herbal formulations is necessary to guarantee consistent efficacy and safety, although any interactions with traditional antihypertensive medications should be taken into account [16,25].

9) Mechanism Of Antihypertensive Action

The antihypertensive properties of *Hibiscus sabdariffa* L. have been explained by a number of methods. As seen in (fig. 1.2), anthocyanins and flavonoids increase nitric oxide bioavailability and decrease oxidative stress to promote endothelium-dependent vasodilation [5, 14, 26]. It has been documented that inhibition of the activity of the angiotensin-converting enzyme reduces the production of angiotensin II, which in turn causes vasoconstriction [19]. By lowering plasma volume, mild diuretic effects also help lower blood pressure [20].

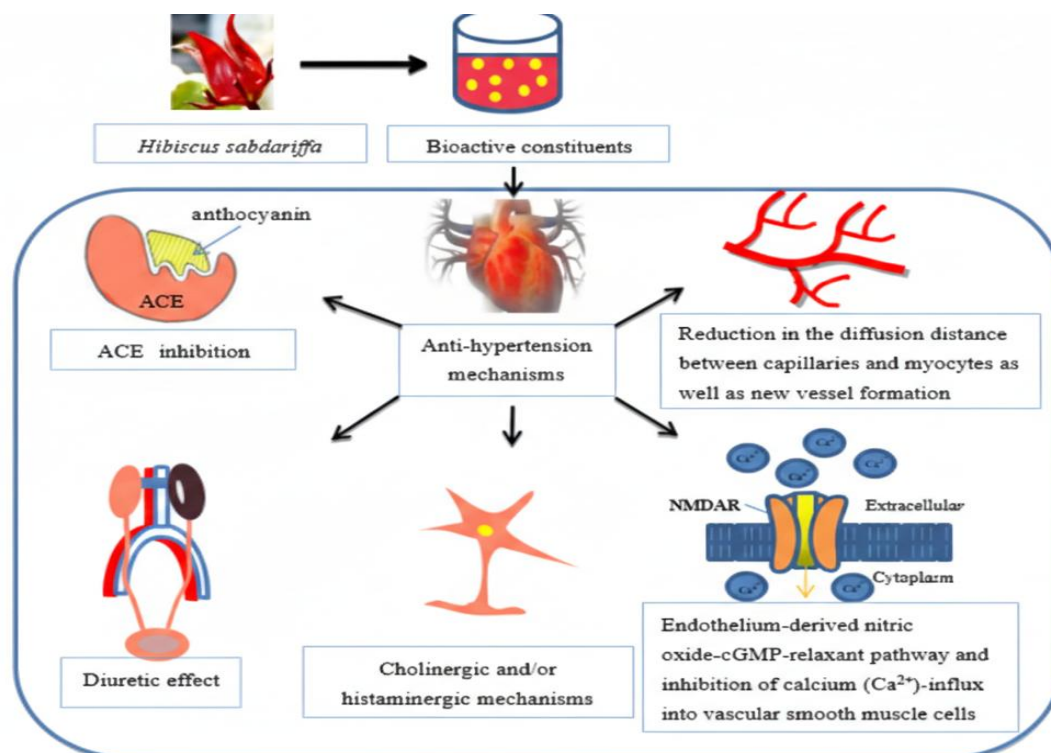


Figure 1 Antihypertensive activity of *Hibiscus sabdariffa* L. in the treatment of hypertension.[33]

10) Ethnomedicine of *Hibiscus sabdariffa* L.

Due to the plants' simple accessibility, the difficulties of traveling to metropolitan areas, and the high expense of contemporary therapy, ethnomedical practices are extensively recognized in rural areas among various ethnic groups. Additionally, the direct experiences of the individuals, family members, community, and social networks have an impact. *H. sabdariffa* is used by the Zeliang tribe of the Nagas ethnic group in Northeast India to treat blood cleansing and gastrointestinal issues. To treat stomach issues, they cook the leaves and fruits of *H. sabdariffa* with potatoes. To preserve blood purity, fresh calyces and boiled fruits are consumed once a week. *H. sabdariffa* is utilized to treat hypertension in Trinidad and Tobago as well as blood and liver purification in the Caribbean states. To treat obesity, the dried calyces are macerated and the infused water is consumed orally in Brazil and Mexico. *H. sabdariffa* is utilized in cooking in addition to traditional medicine. The fleshy calyces are used to make sauces and jellies in Tamil Nādu, India, and their infusions are utilized as refreshments while making drinks[37].

H. sabdariffa calyces decoction is used to treat hypertension in Jordan. The Beni Suef people in Northern Egypt utilize the flower decoction of *H. sabdariffa* to treat hypertension because the condition is so common there. Additionally, they prepare the plant for patients with microbial diseases by making a decoction or infusion of flowers. However, rather than treating microbial illness, the uses concentrate on managing hypertension. To treat obesity in Iran, the calyces are boiled and consumed as juice[37].

Table 2. Ethnomedicinal uses of *Hibiscus sabdariffa* [37]

Region	Condition	Plant Part Used	Preparation / Administration
India	Digestive issues (dyspepsia, stomach disorders)	Leaves, fruits	Boiled (sometimes with potato) and consumed with meals
India	Blood purification	Fruits, calyces	Boiled and taken once a week

India	Urinary tract infections	Leaves, calyces	Infused in hot water and consumed
India	Intestinal problems	Leaves, fruits, seeds	Leaves/fruits boiled; seeds dried and powdered
India	Kidney disorders	Leaves	Boiled and consumed with other ingredients
India	Insect bites and bee stings	Leaves	Crushed and applied topically
Sudan	Hypertension, cold and flu	Calyces	Traditionally used (commonly as decoction)
Sudan	Supportive use in cancer	Calyces	Traditional use
Zimbabwe	Infections, malnutrition	-	Traditional use (limited details)
Mauritius	Diabetes mellitus	Fruits	Seeds removed, fruit boiled, filtered, consumed twice daily
Tanzania	Anaemia	Leaves or calyces	Traditional use
Uganda	Anaemia, abdominal pain, dizziness, UTI, paralysis	Leaves	Boiled and infusion taken orally
Uganda	Low appetite, lactation support	Leaves	Prepared as soup and consumed twice daily
Jordan	Hypertension	Calyces	Boiled and taken as decoction
Egypt	Hypertension, microbial infections	Flowers	Boiled and consumed as decoction
Iran	Obesity	Calyces	Boiled and taken as juice
Trinidad and Tobago	Blood & liver purification, hypertension	-	Traditional use
Brazil & Mexico	Obesity	Calyces	Infusion taken orally
Region	Condition	Plant Part Used	Preparation / Administration
India	Digestive issues (dyspepsia, stomach disorders)	Leaves, fruits	Boiled (sometimes with potato) and consumed with meals

India	Blood purification	Fruits, calyces	Boiled and taken once a week
India	Urinary tract infections	Leaves, calyces	Infused in hot water and consumed

Table 3. Marketed Formulation of *Hibiscus sabdariffa* L. [34,35,36]

Formulation	Composition	Uses	Marketed Formulation
Herbal tea / infusion	Dried hibiscus calyces	☐ Mild to moderate hypertension ☐ Daily BP management	
Standardized extract capsules	Hibiscus extract (250–500 mg)	☐ Antihypertensive ☐ Antioxidant support	
Liquid syrup	Hibiscus + Arjuna + Ashwagandha	☐ Cardioprotective ☐ BP regulation	

Conclusion

With widespread traditional use and mounting scientific data, *Hibiscus sabdariffa* L. is a promising medicinal plant for the treatment of hypertension. Because of its complex modes of action, which include renin-angiotensin system inhibition, vasodilation, and antioxidant activity, it may be used as a supplement to traditional therapy. To create uniform dose and validate its function in evidence-based hypertension care, more extensive, long-term clinical trials are needed.

References

1. World Health Organization. (2023). *Hypertension*.
2. Whelton, P. K., Carey, R. M., Aronow, W. S., et al. (2021). 2021 guideline for the prevention, detection, evaluation, and management of high blood pressure. *Hypertension*, 77(3), e13–e115.
3. Da-Costa-Rocha, I., Bonnlaender, B., Sievers, H., Pischel, I., & Heinrich, M. (2014). *Hibiscus sabdariffa* L.: A phytochemical and pharmacological review. *Food Chemistry*, 165, 424–443.
4. Ali, B. H., Wabel, N. A., Blunden, G., et al. (2021). Phytochemical, pharmacological and toxicological aspects of *Hibiscus sabdariffa* L.: A review. *Journal of Ethnopharmacology*, 265, 113–129.
5. McKay, D. L., Chen, C. Y., Saltzman, E., & Blumberg, J. B. (2010). *Hibiscus sabdariffa* L. tea lowers blood pressure in prehypertensive and mildly hypertensive adults: A randomized, double-blind, placebo-controlled clinical trial. *The Journal of Nutrition*, 140(2), 298–303.
6. Mills, K. T., Stefanescu, A., & He, J. (2020). The global epidemiology of hypertension. *Nature Reviews Nephrology*, 16(4), 223–237.

7. Gupta, R., & Xavier, D. (2021). Hypertension: The most important non-communicable disease risk factor in India. *Journal of Human Hypertension*, 35(2), 101–109.
8. Carey, R. M., Muntner, P., Bosworth, H. B., et al. (2021). Prevention and control of hypertension: Pathogenesis and clinical management. *Hypertension*, 78(3), 827–846.
9. He, F. J., & MacGregor, G. A. (2020). Salt intake, hypertension, and cardiovascular risk. *BMJ*, 369, m2440.
10. Oparil, S., Acelajado, M. C., Bakris, G. L., et al. (2020). Hypertension. *Circulation*, 141(19), e1–e15.
11. Hall, J. E., Granger, J. P., do Carmo, J. M., et al. (2021). Renal mechanisms in hypertension. *Hypertension*, 77(2), 324–335.
12. Forouzanfar, M. H., Liu, P., Roth, G. A., et al. (2020). Global burden of hypertension and associated cardiovascular diseases. *The Lancet*, 395(10234), 1517–1530.
13. Kearney, P. M., Whelton, M., Reynolds, K., et al. (2020). Global burden of hypertension: Analysis of worldwide data. *The Lancet*, 365(9455), 217–223.
14. Virdis, A., Giannarelli, C., Neves, M. F., et al. (2021). Endothelial dysfunction in hypertension. *European Heart Journal*, 42(4), 350–360.
15. Harrison, D. G., Guzik, T. J., Lob, H. E., et al. (2020). Inflammation, immunity, and hypertension. *Hypertension*, 76(5), 1332–1341.
16. Messerli, F. H., Williams, B., & Ritz, E. (2021). Essential hypertension. *The Lancet*, 370(9587), 591–603.
17. Ali, S. S., Kasoju, N., Luthra, A., et al. (2021). Traditional and medicinal uses of *Hibiscus sabdariffa* L. *Journal of Ethnopharmacology*, 266, 113–121.
18. Hopkins, A. L., Lamm, M. G., Funk, J. L., et al. (2021). Polyphenols and vascular health. *Nutrients*, 13(3), 987.
19. Ojeda, D., Jiménez-Ferrer, E., Zamilpa, A., et al. (2020). Inhibition of angiotensin-converting enzyme by *Hibiscus sabdariffa* extracts. *Planta Medica*, 86(12), 825–831.
20. Herrera-Arellano, A., Flores-Romero, S., Chávez-Soto, M. A., & Tortoriello, J. (2004). Effectiveness and tolerability of a standardized extract from *Hibiscus sabdariffa* in patients with mild to moderate hypertension. *Phytomedicine*, 11(5), 375–382.
21. Adegunloye, B. J., Omoniyi, J. O., Owolabi, O. A., et al. (2021). Mechanisms of antihypertensive effect of *Hibiscus sabdariffa* in experimental animals. *African Journal of Medicine and Medical Sciences*, 50(2), 145–152.
22. Herrera-Arellano, A., Miranda-Sánchez, J., Avila-Castro, P., et al. (2007). Clinical effects produced by a standardized herbal medicinal product of *Hibiscus sabdariffa* on patients with hypertension. *Planta Medica*, 73(6), 6–12.
23. Serban, C., Sahebkar, A., Ursoniu, S., Andrica, F., & Banach, M. (2015). Effect of *Hibiscus sabdariffa* on arterial hypertension: A systematic review and meta-analysis. *Journal of Hypertension*, 33(6), 1119–1127.
24. Al Disi, S. S., Anwar, M. A., & Eid, A. H. (2022). Anti-hypertensive effects of *Hibiscus sabdariffa*: A randomized controlled trial. *Complementary Therapies in Medicine*, 60, 102–108.
25. EFSA Panel on Dietetic Products, Nutrition and Allergies. (2020). Scientific opinion on the safety of *Hibiscus sabdariffa* preparations. *EFSA Journal*, 18(5), e0610.
26. Stein, D. T., Reitsma, M. B., Geldsetzer, P., Agoudavi, K., Aryal, K. K., Bahendeka, S., et al. (2023). Decoding the mechanism of hypertension through multiomics profiling. *Journal of Human Hypertension*, 37(3), 253–264.
27. Haji-Faraji, M., & Haji-Tarkhani, A. (1999). The effect of sour tea (*Hibiscus sabdariffa*) on essential hypertension. *Journal of Ethnopharmacology*, 65, 231–236.
28. Herrera-Arellano, A., Flores-Romero, S., Chávez-Soto, M. A., & Tortoriello, J. (2004). Effectiveness and tolerability of a standardized extract from *Hibiscus sabdariffa* in patients with mild to moderate hypertension. *Phytomedicine*, 11, 375–382.
29. McClintock, N. C., Tahir, E. I., & LM. (2004). *Hibiscus sabdariffa* L. In G. J. H. Grubben & O. A. Denton (Eds.), *Plant resources of tropical Africa (PROTA 2: Vegetables)* [CD-ROM]. PROTA.
30. Eggensperger, H., & Wilker, M. (1996). Hibiscus extract: A skin-compatible active complex from AHAs and polysaccharides. *Parfumerie und Kosmetik*, 9, 540–543.
31. Hida, H., Yamada, T., & Yamada, Y. (2007). Genome shuffling of *Streptomyces* sp. U121 for improved production of hydroxycitric acid. *Applied Microbiology and Biotechnology*, 73(6), 1387–1393.

32. Boll, P. M., Sørensen, E., & Balieu, E. (1969). Naturally occurring lactones and lactams: The absolute configuration of hydroxycitric acid lactones. *Acta Chemica Scandinavica*, 23, 286–293.
33. Liu, H., Liang, Z.-M., Li, R.-T., & Yu, Y.-G. (2020). Advances in the mechanisms of *Hibiscus sabdariffa* L. on hypertension. *E3S Web of Conferences*, 145, 01039.
34. Wahabi, H. A., Alansary, L. A., Al-Sabban, A. H., & Glasziou, P. (2010). The effectiveness of *Hibiscus sabdariffa* in the treatment of hypertension: A systematic review. *Phytomedicine*, 17(2), 83–86.
35. Serban, C., Sahebkar, A., Ursoniu, S., Andrica, F., & Banach, M. (2015). Effect of sour tea (*Hibiscus sabdariffa* L.) on arterial hypertension: A systematic review and meta-analysis of randomized controlled trials. *Journal of Hypertension*, 33(6), 1119–1127.
36. Guardiola, S., & Mach, N. (2014). Therapeutic potential of *Hibiscus sabdariffa*: A review of the scientific evidence. *Endocrinología y Nutrición*, 61(5), 274–295.
37. Suhaili, N. I. M., & Manshoor, N. (2022). *Ethnomedicine, phytochemistry, and bioactivities of Hibiscus sabdariffa* L. (*Malvaceae*). *Journal of Herbmmed Pharmacology*, 11(4), 451–460.