Borneo Journal of Pharmacy
Vol 6 Issue 4 November 2023
Pages 349 – 359

https://journal.umpr.ac.id/index.php/bjop/article/view/5217
DOI: https://doi.org/10.33084/bjop.v6i4.5217
e-ISSN: 2621-4814

Mini Review

Diuretic Activity of Various Herbs in India: A Mini Review

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Keywords:
Diuretics
Herbal
India

Abstract

One of the primary uses of medicinal plants is as a diuretic. Both mono- and polyherbal-based diuretic formulations have been used in various parts of the world, including in India. One estimate states that more than 650 mono- and polyherbal formulations are in clinical use, including decoctions, tinctures, pills, and capsules made from over 75 plants. Many studies have been conducted supporting the diuretic properties of conventional herbal remedies. This article discusses many herbal plants from India that have historically been used as diuretics and identifies the chemical components with diuretic activity. In addition, this brief review also discusses several plant drugs and their pharmacological profile, concentrating on the administered dose and the bioactive extracts involved in the diuresis process. For researchers, searching for the best therapeutic plants for diuretic research may be a significant turning point in using various herbs from India.

Received: June 10th, 2022
1st Revised: September 30th, 2023
Accepted: November 27th, 2023
Published: November 30th, 2023

INTRODUCTION

Overall, the worldwide trend towards using regular plant cures has created a gigantic need for data about the properties and utilizations of restorative plants[1]. Indian conventional medicines like Ayurvedic, Siddha, and Unani dominate in using plant materials. Herbal drugs have acquired significance and prominence recently for their safety, efficacy, and cost adequacy[2]. The relationship of medicinal plants with different plants in their living space, too, impacts their restorative qualities now and again[3]. One of the significant and well–recorded utilization of plant items is their utilization as diuretic specialists. Diuretics are regularly characterized as medications that increment how much urine the kidneys yield[4]. These specialists fundamentally increase the renal discharge of sodium and either chloride or bicarbonate and water discharge secondarily[5].

Diuretic drugs promote urine output. They act directly on the kidneys and increase the excretion of water and ions (Na^+, Cl^-, or HCO_3^-) from the body[6]. Diuretics are also used to treat cardiac edema (accumulation of fluid in extravascular tissues), especially the one associated with congestive heart failure[7]. They are employed in the treatment of various disorders like nephrotic syndrome, diabetes insipidus, hypertension, nutritional edema, edema of pregnancy, and liver cirrhosis[8]. They also decrease the intracellular and cerebrospinal fluid pressure[9].

All over the taxonomical classification, description, chemical constituents, medicinal uses, and every detailed information of the plant or herbal material is described and studied in this review article. The studies and experiments concluded by various authors are also cited and described in summary. Moreover, a valuable display of herbals used as diuretics is depicted.

HERBALS UTILIZED AS DIURETICS IN INDIA

Herbs utilized as a diuretic have been utilized in India for quite a while and have been promoted the world over by driving drugs. Plant medication was generally utilized for conventional treatment of some renal sicknesses, and many plants have

How to cite: Shaikh SY, Shaikh AT, Shaikh MA. Diuretic Activity of Various Herbs in India: A Mini Review. Borneo J Pharm. 2023;6(4):349-59. doi:10.33084/bjop.v6i4.5217

been found to show massive diuretic activity[10]. Numerous specialists have shown that investigations of natural plants from India utilized in customary medication as diuretics have expanded in recent years; furthermore, they may be a valuable device in treating hypertension[11]. Hypertension is viewed as one of the principal and hazardous difficulties of diabetes mellitus[12].

PROFILE OF DIURETIC HERBAL PLANTS FROM INDIA

Mangifera indica

Mangifera indica (**Figure 1**) is a species of mango in the Anacardiaceae family (**Table I**). It is found in the wild in India, and cultivated varieties have been introduced to other warm regions worldwide. It is the most giant fruit tree in the world, capable of a height of one hundred feet. Major amino acids include lysine, leucine, cysteine, valine, arginine, phenylalanine, and methionine—the lipid composition increases during ripening, particularly the omega-3 and omega-6 fatty acids. The most important pigments of *M. indica* fruit include chlorophylls (a and b) and carotenoids[13]. Various parts of the plant are used as a dentifrice, antiseptic, astringent, diaphoretic, stomachic, vermifuge, tonic, laxative, and diuretic and to treat diarrhea, dysentery, anemia, asthma, bronchitis, cough, hypertension, insomnia, rheumatism, toothache, leucorrhoea, hemorrhage, and piles[14].

The diuretic activity of *M. indica* bark extract rodents was performed by Devi[15]. They use ethyl acetate, ethanol, and water extract of *M. indica* for assessment of diuretic activity. Diuretic impact was done in rodents (175-200 kgBW) by estimating the urine volume by 1, 2, 4, 6, and later at 24 hours. The positive control was provided by furosemide (20 mg/kg) IV and mannitol (100 mg/kg) IV. They managed the separate orally at the portion of 250 mg/kgBW. Diuretic concentrate revealed that the Na^+/K^+ proportion was higher in fluid concentrate, followed by ethanol and ethyl acetic acid derivation. The fluid separates show the best diuretic impact when analyzed with different concentrates.

Figure 1. *Mangifera indica* (source: https://en.wikipedia.org/wiki/Mangifera_indica).

Table I. Taxonomical classification of *M. indica*.

Taxon	Organism
Kingdom	Plantae
Division	Tracheophyta
Subdivision	Spermatophytina
Class	Magnoliopsida
Order	Sapindales
Family	Anacardiaceae
Genus	Mangifera
Species	*Mangifera Indica*

Lepidium sativum

Lepidium sativum (**Figure 2**) known as garden cress belongs to the family Brassicaceae (**Table II**). The seeds and leaves of the plant contain volatile oils. *Lepidium sativum* seeds are bitter, thermogenic, depurative, rubefacient, galactagogue, tonic, aphrodisiac, ophthalmic, antiscorbutic, antihistaminic and diuretic[16]. *Lepidium sativum* contained many bioactive constituents, including cardiac glycoside, alkaloids, phenolic, flavonoids, cardiotonic glycosides, coumarins, glucosinolates, carbohydrates, proteins, and amino-acids, mucilage, resins, saponins, sterols, tannins, volatile oils, triterpene, sinapic acid, and uric acid[17]. This plant is widely used as an analgesic, anti-spasmodic, anti-diarrhoeal, galactagogue, hepatoprotective, antioxidant, anti-inflammatory, and diuretic[18].

Urine volume was expanded by the two portions of watery and methanol separates in contrast with the control bunch. While the two concentrates likewise expanded sodium discharge, potassium discharge was just expanded by the watery concentrate at a portion of 100 mg/kg. There was no considerable change in the conductivity and pH of urine after the organization of the *L. sativum* was removed. The diuretic impact of the concentrates was tantamount to that of the reference standard (hydrochlorothiazide), and the methanol enjoyed the extra benefit of a potassium-moderating impact[19].

Figure 2. *Lepidium sativum* (source: https://ayurwiki.org/Ayurwiki/Lepidium_sativum_-_Charmahantri).

Table II. Taxonomical classification of *L. sativum*.

Taxon	Organism
Kingdom	Plantae
Division	Tracheophyta
Subdivision	Spermatophytina
Class	Magnoliopsida
Order	Brassicales
Family	Brassicaceae
Genus	Lepidium
Species	*Lepidium sativum*

Euphorbia thymifolia

Euphorbia thymifolia (**Figure 3**) belongs to the family Euphorbiaceae (**Table III**) is a small-branched, pubescent, annual prostate herb commonly known as *laghududhika* or *choti-dudhi*. The leaves, seeds, and fresh juice of the whole plant are used in worm infections as stimulants and astringent[20]. This plant contains alkanes, triterpenes, phytosterols, tannins, polyphenols, and flavonoids[21]. *Euphorbia thymifolia* is used as a blood purifier, sedative, hemostatic, aromatic, stimulant, and astringent in diarrhea and dysentery, anthelminthic, demulcent, laxative, and also in cases of flatulence and constipation[22].

Figure 3. *Euphorbia thymifolia* (source: https://species.wikimedia.org/wiki/Euphorbia_thymifolia).

Table III. Taxonomical classification of *E. thymifolia*.

Taxon	Organism
Kingdom	Plantae
Division	Tracheophyta
Subdivision	Spermatophytina
Class	Magnoliopsida
Order	Malpighiales
Family	Euphorbiaceae
Genus	Euphorbia
Species	*Euphorbia thymifolia*

Allium sativum

Allium sativum (**Figure 4**), commonly known as garlic, belongs to the family Liliaceae and genus Allium (**Table IV**). *Allium sativum* is used as a carminative, aphrodisiac, expectorant, and disinfectant in treating pulmonary conditions. *Allium sativum* contains hundreds of phytochemicals, including sulfur-containing compounds such as ajoenes (E-ajoene, Z-ajoene), thiosulfinate (allicin), vinyldithiins (2-vinyl-(4H)-1,3-dithiin, 3-vinyl-(4H)-1,2-dithiin), sulfides (diallyl disulfide (DADS), diallyl trisulfide (DATS)) and others that accounted 82% of the overall *A. sativum* sulfur content[23]. *Allium sativum* is reported to be an incredible medicinal plant owing to its preventive characteristics in cardiovascular diseases, regulating blood pressure, lowering blood sugar and cholesterol levels, effective against bacterial, viral, fungal, and parasitic infections, and enhancing the immune system[24].

It has been noticed that *A. sativum* brought down the pulse and cholesterol level and has solid antimicrobial action. The intravenous organization of decontaminated parts of *A. sativum* shows a huge biphasic and natriuretic reaction. Chloride particles follow the natriuretic profile, yet potassium particles do not. No progressions were noticed in the blood vessel pulse or the electrocardiogram[25]. The cleaned *A. sativum* divisions likewise achieve a suppressive portion subordinate impact on Na^+-K^+-ATPase. In this way, it might cause diuresis by expanding the urine volume[26].

Figure 4. *Allium sativum* (source: https://xatianrui.en.made-in-china.com/product/tXZQlkydpScw/China-Garlic-Allium-Sativum-L-Extract-Powder.html).

Table IV. Taxonomical classification of *A. sativum*.

Taxon	Organism
Kingdom	Plantae
Division	Tracheophyta
Class	Magnoliopsida
Order	Asparagales
Family	Amaryllidaceae
Genus	Allium
Species	*Allium sativum*

Hibiscus sabdariffa

Hibiscus sabdariffa or roselle (**Figure 5**) is a species of flowering plant in the genus Hibiscus (**Table V**) native to Africa, most likely West Africa, and also found in India, especially Maharashtra, with the local name *Ambali*. The chemical components that are the main active principles in the physiological activities of *H. sabdariffa* calyx are anthocyanins and polyphenols (protocatechuic acid and quercetin)[27]. This plant is beneficial for high blood pressure[28]. The fruit acids in *H. sabdariffa* might work like a laxative[29]. Other chemicals in *H. sabdariffa* can lower blood pressure, reduce levels of sugar and fats in the blood, reduce swelling, and work like antibiotics[30].

Rats with adrenalectomy were given with this plant's aqueous extract, and fractions were produced using solvents with various polarities. The diuretic impact was assessed with deoxycorticosterone acetate (aldosterone analog). Finally, the impact of diuretic active extracts on the gene expression of the α subunit from the transporter (areas) of the renal epithelial cell was measured. This effect and the influence on renal filtration were assessed in an *in situ* kidney model. Spironolactone, the aqueous extract of *H. sabdariffa*, the acetonitrile : methanol 5 : 5 combination and the acetonitrile extract all dramatically reduced the expression of the *aENaC* gene when it was evaluated in rats with adrenalectomy. According to this study's findings, the diuretic and potassium-sparing properties of *H. sabdariffa* are partially attributable to the modulation of aldosterone activity caused by the presence in the plant's extract of compounds that may be responsible for this modulation, such as anthocyanins, flavonoids, and chlorogenic acid[31].

Figure 5. *Hibiscus sabdariffa* (source: https://healthiersteps.com/roselle-hibiscus-sabdariffa/).

Table V. Taxonomical classification of *H. sabdariffa*.

Taxon	Organism
Kingdom	Plantae
Division	Tracheophyta
Subdivision	Spermatophytina
Class	Magnoliopsida
Order	Malvales
Family	Malvaceae
Genus	Hibiscus
Species	*Hibiscus sabdariffa*

Crataegus monogyna

Crataegus monogyna (**Figure 6**), known as common hawthorn, one-seed hawthorn, or single-seeded hawthorn, is a species of flowering plant in the rose family Rosaceae (**Table VI**). It is native to Europe, northwestern Africa, and West Asia but has been introduced in many other parts of the world. The study of the chemical composition of this extract showed the presence of triterpenic acids, flavonoids, and coumarins[32]. *Crataegus monogyna* is used primarily to treat cardiovascular conditions due to its ability to reduce important risk factors such as inflammation, hypertension, and thrombosis[33]. It has been traditionally used in many states of India as a diuretic[34]. *Crataegus monogyna* fruit thick extract with a blood-red distinctive expression has antidepressant properties[35].

Figure 6. *Crataegus monogyna* (source: https://www.amazon.com/Hawthorn-Berry-Fructus-Crataegi-Nature/dp/B01CCAJGVE).

Table VI. Taxonomical classification of *C. monogyna*.

Taxon	Organism
Kingdom	Plantae
Division	Tracheophyta
Subdivision	Spermatophytina
Class	Magnoliopsida
Family	Rosaceae
Genus	Crataegus
Species	*Crataegus monogyna*

Mimosa pudica

Mimosa pudica (**Figure 7**), known as shameplant, is a species of flowering plant in the rose family Fabaceae (**Table VII**). In young plants, the stem is upright; as the plant ages, it becomes creeping or trailing. It may droop dramatically and become floppy. The stem, which can reach 1.5 m, is thin, branched, and sparsely to densely thorny. *Mimosa pudica* typically grows to around 30 cm. With one or two pinnae pairs and 10–26 leaflets per pinna, the leaves are bipinnately compound. Also thorny are the petioles. Mid-summer pedunculate (stalked), light pink or purple flower heads with progressively more blossoms appear from the leaf axils as the plant ages. Chemical analysis has shown that *M. pudica* contains various compounds, including "alkaloids, flavonoid C-glycosides, sterols, terpenoids, tannins, saponin, and fatty acids." The plant roots have been shown to contain up to 10% tannin[36]. A substance similar to adrenaline has been found within the plant's leaves. It possesses antibacterial, antivenom, antifertility, anticonvulsant, antidepressant, aphrodisiac, and various other pharmacological activities. The herb has been used traditionally for ages in treating urogenital disorders, piles, dysentery, sinus, and also applied on wounds[37].

Diuretic trials of fluid concentrate of *M. pudica* leaves were assessed utilizing the Lipschitz test in regularly taken care of pale-skinned person rodents. The control group was given 0.9% NaCl, the three experimental groups were treated with the fluid concentrate of leaves of *M. pudica* in portions of 100, 200, and 400 mg/kg separately, and the standard gathering got furosemide. Urine biochemical investigation was finished by colorimetry. The fluid concentration of *M. pudica* leaves is at 100 mg/kg showed critical diuretic activity with expanded electrolytes discharge ($p < 0.01$ for urine yield, $p < 0.01$ for Cl^-, $p < 0.05$ for K^+, and $p < 0.01$ for Na^+). Expanding the portion of the test drug, in any case, does not bring about expansion in the diuretic properties[38].

Figure 7. *Mimosa pudica* (source: http://plantamor.com/species/info/mimosa/pudica).

Table VII. Taxonomical classification of *M. pudica*.

Taxon	Organism
Kingdom	Plantae
Division	Tracheophytes
Class	Angiosperms
Order	Fabales
Family	Fabaceae
Subfamily	Caesalpinioideae
Genus	Mimosa
Species	*Mimosa pudica*

Ficus glumosa

Ficus glumosa (**Figure 8**), known as shameplant, is a species of flowering plant in the rose family Moraceae (**Table VIII**). The bark is cream-colored and flaking, with the branchlets densely covered with yellow-brown hairs. Leaves are alternate, broadly elliptical, 30 to 140 x 15 to 95 mm in size, 3-veined from the base, and veins are raised on the underside of the leaf. *Ficus glumosa* are 8 to 15 mm in diameter, hairy, and red when ripe, singly or paired in leaf axils, clustered toward branch ends. The fruit is favored by birds, bats, antelope, monkeys, and baboons. Some unraveled pharmacological activities of *F. glumosa* mainly include antidiabetic, antihypertension, diuretic, hypolipidemia, antimalarial, antirheumatic, antioxidant, antibacterial, antifungal, and anticancer[39]. Previous studies linked the antioxidant, antibacterial, antitumor, and hypoglycemic properties of *F. glumosa* to its secondary metabolites profile, which is composed of alkaloids, flavonoids, saponins, triterpenoids, tannins, phenolic acids, steroids, and coumarins[39,40].

As suggested by traditional healers, the use of *F. glumosa* extract as a diuretic in treating hypertension was tested in experiments. Furosemide and amiloride hydrochlorothiazide, two synthetic pharmacological diuretics used as a check, were used in the trials under identical settings. The aqueous extract of *F. glumosa* sped up the evacuation of excess fluid leaves. Compared to controls, urine osmolarity dramatically reduced at the peak of the diuretic reaction. Twenty-four hours after the extract was administered, the single dosage therapy with the aqueous extract of *F. glumosa* leaves significantly increased urine volume. The aldosterone level's consistency, the lack of a link with sodium levels in the plasma, and the enhanced clearance of free water in the animals given the extract demonstrate that increased diuresis and a modest rise in natriuresis are of tubular origin. The extract's rise in Na^+, K^+, and Cl^- made the urine more alkaline and showed a potent inhibitory impact on saluretic and carbonic anhydrase. The 375 mg/kg dosage was mostly where these effects were noted. These findings support the traditional usage in the management of hypertension and the significance of preserving both the biodiversity of Cameroon and local knowledge[41].

Figure 8. *Ficus glumosa* (source: https://es.123rf.com/photo_133942322_frutos-de-un-higo-sic%C3%B3moro-ficus-sycomorus-en-etiop%C3%ADa.html).

Table VIII. Taxonomical classification of *F. glumosa*.

Taxon	Organism
Kingdom	Plantae
Division	Tracheophytes
Class	Angiosperms
Order	Rosales
Family	Moraceae
Genus	Ficus
Species	*Ficus glumosa*

CONCLUSION

The current review is expected to outline the ongoing information encompassing the utilization of natural medications from India as diuretics. In everyday practice, diuretics can be utilized as a first-line treatment for quite a while. Natural medications are viral in the created and non-industrial nations for essential medical care because of their comprehensive natural and restorative exercises, higher well-being edges, and lesser expenses. The audit has included the plant's herbal attributes, which help in the plant's ID. Such proof is expected to give logical confidence to the fable's utilization of conventional prescriptions and, surprisingly, be helpful in the improvement of future medications and medicines and treatment rules. By this review, it tends to be reasoned that countless plants have decisive diuretic action in the center of nature. Natural meds are liberated from side impacts and harmfulness, not at all like allopathic meds. This review will outline information connecting the herbal drugs utilized as diuretics.

ACKNOWLEDGMENT

None.

AUTHORS' CONTRIBUTION

All authors contributed equally to the preparation of this review.

DATA AVAILABILITY

None.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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