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RESEARCH ARTICLE

Descriptions, Ethnobotany and Diuretic activity of Indian medicinal plants

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ABSTRACT

The Ayurvedic system of medicine, 'Pashanabheda' group plants, claimed to be useful in the treatment of urinary stones. 'Pashanabheda' is the Sanskrit term used for a group of plants with diuretic. Diuretics cause increase in the rate of urine flow rate thus employed in numerous disorders like hypertension, anxiety, cardiovascular disorders, diabetes mellitus and liver degeneration diseases. Hence, in the present review an attempt has been made to enumerate the studies carried out on these plants. This could serve as a source of information on the present trends in research on plants accredited with diuretic activity.

Keywords: Ethnobotany, Diuretic activity, Family, Allium sativum.

INTRODUCTION

There is growing interest in the health benefits of herbs and botanicals. In line with this there are an increasing number of published articles claiming that plants or plant-derived actives may function as mild diuretic agents. Diuretics are substances that act within the kidney and promote the loss of fluid from the body.[1] To be clinically effective, however, such compounds must induce the loss of sodium.[2] This is achieved by compounds interfering with the reabsorption of ions, as well as water, through the walls of the kidney tubules and this promotes their excretion from the body.[3] Diuretics work by promoting the expulsion of urine (measured as the urine volume [UV] excreted) and urinary sodium (UNa) from the body and this helps reduce the volume of blood circulating through the cardiovascular system.[4] A large majority of this research has determined the degree of clinical support for the traditional use of common or folklore medicines.

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Chemistry of plant diuretics-

Wide ranges of phytoconstituents were responsible for diuretic activity includes alkaloids, glycosides, tannins, phenolics coumarins, triterpenoids etc. These phytoconstituents present inplant exert desired pharmacological effect on body and thus act as natural diuretic. Phenolics (flavanoids and tannins) of Tribulus terrestris, Urtica dioica, Olea europaea; alkaloids of Aerva lanata, Foeniculum vulgare, Azima tetracantha; Allium sativum; triterpenes of Taraxacum officinale, Abutilonindicum; saponins of Asparagus racemosus, Tribulus terrestris; sesquiterpenes lactones of Taraxacum officinale; glycosides of Opuntia ficus indica, Moringa oleifera might be involved in the mechanism of diuretic activity.[5-7]

Pharmacological activities-

Natural Diuretics acts by increasing the urine output as well as urinary electrolyte concentration. Lepidium sativum, Costus speciosus, Phyla nodiflora, Withania coagulans, Tylophora indica, Thespesia populnea, Phyllanthus fraternus, Mimosa pudica increases the sodium and potassiumion concentration in urine. Spilanthes acmella, Tribulus alatusacts as loop diuretics and Rungia repens might causes risk of hypo kalemia due to increase in potassium level in urine. There are many Indian medicinal plants reported for their remarkable diuretic activity.[5, 6]

Tribulus terrestris: Zygophyllaceae

It is an herbaceous perennial plant growing as a summer annual in colder climates. Its stems branch from its crown to a width between 10 and 100 cm, and are usually flat in appearance. Its leaves are pinnate and quite short (~0.5 in length). Tribulus terrestris is characterised by small (4–10mm wide) yellow petal flowers and thorny fruits.Tribulus terrestris is widely distributed in Africa, Southern Europe, China, Japan, Korea and western parts of Asia. [6, 7]

Ethnobotany-

In Ayurvedic medicine, the fruits of Tribulus terrestris are recommended for the treatment of urinary disorders and in traditional Chinese medicine it has been used as an anti-hypertensive, coronary heart disease and to treat erectile dysfunction by increasing serum testosterone levels. [7] It is also suggested to stimulate melanocyte proliferation and therefore is a putative treatment for vitiligo and it is reputed to have anti-bacterial and cytotoxic activities. [7, 8]

Diuretic activity-

The Diuretic activity of an ether and aqueous extract was studied from the fruit of Tribulus terrestris in anaesthetised dogs. Urine flow was significantly increased by the ether extract (37–52 ml [versus baseline]) but not by the aqueous extract. The ether extract was also shown to

increase glomerular filtration (as shown by a significant increase in creatinine clearance).[8]

The diuretic effect of an aqueous Tribulus terrestris decoction prepared from its fruit and leaves were also tested. Urine was collected for the 24 h after administration and shown to increase UV (5.6 ml versus 16.2 ml) and UNa (0.5 ml versus 0.7 mEq l−1) compared with placebo. These effects were similar to responses achieved with a 120 mg kg−1 dose of furosemide (15.6 ml 24 h−1 and 1.3 mEq l−1 24 h−1).[6]

Urtica dioica: Urticaceae

Urtica dioica grows up to 2m high during the summer months and dies down during the winter. It has leaves that are soft and serrated at their edges. They are roughly 3–15 cm in length and have a cordate base and an acuminate tip. Brittle, hollow, silky hairs cover the leaves and stems and contain formic acid which serves as a defence. Urtica dioica is an herbaceous flowering plant that is native to Africa, Asia, Europe and North America. [9, 10]

Ethnobotany-

This plant has traditional uses as an anti-inflammatory, to stimulate the proliferation of human lymphocytes, and as a therapy against prostate enlargement. [9, 10] Urtica dioica is also reported to be an anti-diabetic medicine in Mexico and Morocco [11, 12] as an antihypertensive in Morocco6 and to treat urinary ailments in Guatemala.[13, 14]

Diuretic activity-

Two studies have tested the diuretic effects of Urtica dioica. In the first study14, Urtica dioica was one of 67 plants investigated for its purported diuretic effects. The authors, however, failed to show any change in UV up to 6 h after administration and owing to this lack of efficacy changes in urinary solute excretion were not tested.

The second studywas in anaesthetised rats.[9] Blood pressure was measured in the femoral artery and the bladderwas cannulated for urine collection. A placebo group was not included and so changes were compared to the baseline. Urtica dioica was infused for 60 min at doses of 4 and 24 mg−1 kg−1 and decreased arterial blood pressure by 17 and 43 mmHg, respectively (from 114 mmHg). The change at the highest dose being not too dissimilar to that achieved with 2mg−1 kg−1 of furosemide (−31 mmHg).This data would suggest that Urtica dioica, when directly infused, has dilatatory effects on arterial tone and acts as a diuretic and natriuretic.

Imperata cylindrica: Poaceae

Imperata cylindrica grows up to 3m high and has leaves that are roughly 2 cm wide, which narrow to a point at their tips. The leaf edges are fine toothed and embedded with sharp silica crystals. The dorsal

surface of the leaf is hairy whilst the ventral side is not. Imperata cylindrica is a perennial rhizomatous grass native to south-east Asia. [15]

Ethnobotany-

In Thailand and Vietnam, Imperata cylindrica is deemed a medicinal plant by the Vietnamese Ministry of Health. [16]

Diuretic activity-

Sripanidkulchai et al. prepared an aqueous extract from the root of Imperata cylindrical and fed it to adult Sprague-Dawley rats. UV was collected for 4 h. No changes in UNa were observed and assessment of UV showed a general retention of water (15.6 ml versus 26.3 ml [the highest dose versus placebo]). The second study also used a root extract. Thiswas a randomised, placebo designed cross-over trial in healthy volunteers (Doan et al., 1992). The study was conducted in 40 subjects (2 cohorts of 20 subjects) and lasted 4 days. On the first day subjects reported to the laboratory and provided blood samples for the measurement of haemoglobin, creatinine, sodium and potassium. The second and fourth days served as intervention days and the third was treated as a washout day. On intervention days, subjects were monitored in the test facility and dietary intake was restricted. UV was collected every morning at 8 a.m. and prior to any intervention. It was then collected for 24 h and measured after 14 h, respectively. None of the interventions tested changed UV or UNa (or its electrolytes).[17]

Olea europaea: Oleaceae

Olea europaea is an evergreen tree or shrub that is around 8–15m in height. Its leaves are silver-green, oblong in shape and measure 4–10 cm in length and 1–3 cm in width. It has a trunk that is gnarled and twisted and it has a drupe shaped fruit that is 1–2.5 cm in length. Olea europaea is native to Europe, Asia and Africa and cultivated for its fruit and oil. [18]

Ethnobotany-

Olea europaea has traditional uses as a diuretic, anti-hypertensive, emollient, febrifuge, a tonic for urinary and bladder infections and headaches, and in cardiovascular disease.[19, 20]

Diuretic activity-

Somova et al. investigated the diuretic effects of Olea europaea which was cultivated in African, Greece or Christ town. Ursolic acid and oleanolic acid were also tested. Urine was collected at 5 and 24 h after intraperitoneal application of the various extracts. Urea (1 g kg−1) and hydrochlorothiazide (25 mg kg−1) were used as a placebo and positive control, respectively.[19]

Equisetum bogotense, Equisetum fluviatile: Equisetaceae

Equisetum is a genus of perennial plants that reproduce by spores rather than seeds. Plants normally grow to between 0.2 and 1.5m high. All Equisetum species are herbaceous perennials and can be found in temperate (e.g., Equisetum hiemale) and tropical regions. Equisetum giganteum is native to southern and central America and found in hot, humid environments. In contrast, Equisetum fluviatile is found in the Northern Hemisphere and grows in shallow watery areas like marshes and streams.

Ethnobotany-

In Chile and Mexico, Equisetum has traditional uses as a diuretic and a means of treating kidney stones. It has also been used for polishing copper utensils, cleansing teeth 21, 22 to have anti-diabetic23 and platelet sedating effects. [24]

Diuretic activity-

Two studies have tested the effects of Equisetum. In first study extracts were prepared in distilled water and administered orally. Urine was then collected every 2 h over a 6 h period. All species increased UV after 6 h with the largest change being observed with Equisetum hiemale var. affine (9.0 ml versus 2.9 ml [versus placebo]) and the smallest with Equisetum giganteum (5.0 ml versus 2.9 ml [versus placebo]). For comparison, hydrochlorothiazide (25 mg kg−1) was administered and was not so different (7.1 ml). Analysis of urinary electrolytes showed a similar trend. [21]

The second study also reported positive effects with Equisetum. This was a clinical trial in humans in which a 10% solution of Equisetum bogotense (equivalent to 0.75 g day−1) was given for 2 days. Urine was collected for 24 h on the second day and water balance was assessed from the difference between liquid intake and UV. Equisetum bogotense significantly decreased the water balance (the net loss was 496 ml) and increased UNa (+65 from 157 mEq l−1). This was accompanied by significant increases in urinary potassium and chloride. [22]

Phyllanthus amarus, Phyllanthus corcovadensis and Phyllanthus sellowianus: Euphorbiaceae

Phyllanthus is suggested to be made up of some 750 species and comprise trees, bushes, and annual or biennial herbs (Hnatyszyn et al., 1999).[23, 24] Phyllanthus amarus is an annual, glabrous herb that grows to between 30 and 60 cm. Its stems are angular with distichously, elliptic-oblong shaped leaves and its flowers are yellow and numerous. Its fruits are capsule shaped, very small and smooth and its seeds are longitudinally ribbed on the back. Phyllanthus is found in tropical areas, although it is found in subtropical regions and is usually quite scattered in its distribution.[25, 26]

Ethnobotany-

Traditional uses vary from place to place, but Phyllanthus has been medicinally to treat urolithiasis [27, 28] as an anti-hypertensive [29], an anti-diabetic [30], an analgesic [31], a treatment for liver diseases[32], as an anti-viral agent [33], as a laxative and anti-septic [34].

Diuretic activity-

Phyllanthus corcovadensis[29] and Phyllanthus sellowianus[34] have been assessed in rats. Phyllanthus sellowianus was given at a dose of 400 mg kg−1 and changes in UV and urinary electrolytes were monitored for the subsequent 8 h.UVwas shown to be significantly increased compared to a placebo control (3.6 ml versus 2.7 ml), as was UNa which was 178 mEq l−1 (versus 136 achieved with the placebo). Urinary potassium and chloride were measured and a significant increase in the latter was reported. Comparisons were also made with hydrochlorothiazide which increased UV 2 h after it was given. In bladder cannulated rats, Phyllanthus corcovadensis was also shown to increase UV (5.9 ml versus 1.6 ml [versus placebo]) 4 h after its administration. Significant increases were also seen after 2 h. This study did not, however, measure changes in urinary electrolytes.

Allium sativum: Alliaceae

Allium sativum is a perennial herb and grows top a length of roughly two feet (Grover et al., 2002). The bulb is the part used in traditional medicine and consists of between 4 and 20 cloves. Originally it comes from central Asia, but is now cultivated throughout the world.

Ethnobotany-

Allium sativum is commonly used as a flavorings agent and has been used as a traditional medicine for thousands of years.[35] Its main active is allicin, which is responsible for its characteristic smell and has been used for its anti-bacterial properties.36 Allium sativum is reputed to offer protection against strokes, coronary thrombosis, atherosclerosis and platelet aggregation, and work as an anti-hypertensive, anti-hyperglycaemic and anti-hyperlipidemic agent.[37-41]

Diuretic activity-

Five studies have tested the diuretic effect of Allium sativum.[37-41] Pantoja et al. has performed three trials in anaesthetized animals.[39-41] The first used anaesthetised, saline hydrated dogs and urine flow was monitored following cannulation of the ureters. A powdered extract Allium sativum was administered intra-gastrically and increased UV and UNa, with between 30 and 40 min. Blood pressure was also decreased by this extract. Unfortunately, however, no statistical comparisons

were performed and responses were deemed indifferent.[39]

Aerva lanata: Amaranthaceae

It is an erect herbaceous weed with many branches with spikes (shades ranging from white to pink) that are clustered and range between 1 and 1.5 in length.[42, 43] It is common in India, Sri Lanka, Arabia, Egypt, Ceylon, tropical Africa, Java and the Philippines.[43]

Ethnobotany-

It is usually prepared as an herbal drink.44 It has traditional uses in Sri Lanka, being commonly prescribed by Ayurvedic doctors, alone or in combination, as a treatment for urinary infections. This is not its only use, however, as it is suggested to possess analgesic, anthelmintic, antidiabetic, anti-inflammatory, anti-malarial, anti-venin, diuretic and sedative properties. It is also suggested to be of use in the treatment of bronchitis, coughs, fractures, hematemesis, nasal bleeding, scorpion stings, spermatorrhoea, to clear the uterus after delivery, to prevent lactation and urinary calculi.[43-45]

Diuretic activity-

Three studies, of which two were carried out in humans and one in conscious rats. Udupihille and Jiffry concluded that its leaves and flowers evoked a higher increase in UV than the whole herb itself. Unfortunately, however, this study did not include a placebo group for comparison and no numbers or statistics were reported in the text. [44, 46, 47]

Foeniculum vulgare: Apiaceae

Foeniculum vulgare is a glabrous, glaucous perennial or biennial plant growing up to 2.5 cm high. It has 3–4 pinnate leaves that are triangular in shape, long (5–50 mm) and filiform, with acuminate lobes which are cartilaginous at their apex. Its petals are yellow and oblong in shape. The fruit are also oblong, 4–10.5mmlong.[48] It is found across Europe (except the north), India, Java, Japan, Egypt, Guatemala and Morocco.[48, 49]

Ethnobotany-

Foeniculum vulgare is believed to exert natural analgesic, anti-inflammatory, anti-spasmodic, antidiabetic and antihypertensive.[48-50]

Diuretic activity-

Three studies have investigated the diuretic properties of Foeniculum vulgare used administered a hydroalcohol root extract to saline loaded rats.[48-51]

Taraxacum officinale: Asteraceae

It is a perennial weed roughly 15–30 cm in length with large, serrated leaves (5–40 cm in length) clustered in a rosette around the base of the plant. Its flowering stalks stand upright, are 5–40 cm long

and carry a solitary terminal inflorescence. It is widely distributed inwarm temperate areas of the Northern Hemisphere, inhabiting fields and road and railway sides.[52]

Ethnobotany-

Taraxacum officinale has traditional uses in Germany, North America, Turkey and China.[52] Briefly, in Germany it has been used in the treatment of gout, diarrhoea, blisters, and spleen and liver complaints. In North America, it has been used in kidney disease, dyspepsia and heartburn. In Mexico is suggested to aid the control of Diabetes. In Turkey the herb is applied as a laxative, diuretic and used as an anti-diabetic medicine. In Traditional Chinese Medicine, Taraxacum folium is used to treat hepatitis and upper respiratory tract infections (i.e., bronchitis and pneumonia). Other uses include the treatment of arthritis and rheumatoid arthritis, certain skin conditions (e.g., eczema), weight control.[52, 53]

Diuretic activity-

The effect of Taraxacum folium (herb) and Taraxacum radix (root) on diuresis and weight loss, in conscious rats, have been compared and investigated previously. The concentration of the extracts ranged between 0.5 and 6% and effects were assessed on 2 days—days 1 and 30. UV and UNa were assessed using indices of diuretic and sodium excretion (i.e., the ratio of responses to placebo). This comparison showed that the herb had more marked effects that the root both acutely (diuretic index, 1.9 versus 1.4; and, sodium saliuretic index, 6.3 versus 2.6) and chronically (diuretic index, 2.1 versus 1.7; and, sodium saliuretic index, 4.0 versus 1.3). Numbers on days 1 and 30 seem to be similar, although this was not equivocal as no statistics were provided.[52, 54]

Lepidium latifolium and Lepidium sativum: Brassicaceae

Lepidium latifolium is a perennial plant growing to between 30 cm and even as tall as 2m. This plant has woody stems, waxy leaves and small white flowers arranged in clusters. The plant produces fruits in the form of two reddish seeds and roughly measures 1.6mm in diameter. Lepidium sativum is a perennial plant and eaten as a garnish. Lepidium is native to southern Europe.[55-57]Lepidium latifolium, but not Lepidium sativum, is also native to Asia and nowadays can be found growing in the wild across North America.

Ethnobotany-

The Lepidium latifolium has traditional uses as anti-escrobte, stomach tonic, aperitif and diuretic. In Morocco, Lepidium sativum is considered a herbal medicine and recommended in the treatment of hypertension, diabetes and renal disease.[55-57]

Diuretic activity-

Navarro et al. determined the urinary effects of an aqueous leaf extract (from Lepidium latifolium) over a 6 h period. When given intra-gastrically, UV increased (~60 ml kg−1 versus ~40 ml kg−1 [versus placebo]) but UNa and potassium were unchanged. These effects were seen at two doses (50 mg kg−1 and 100 mg kg−1). The authors also tested the responses following the intra-peritoneal injection of Lepidium. This time, only the highest dose increased UV (~50 ml kg−1 versus ~40 ml kg−1).[55]

Sambucus mexicana and Sambucus nigra: Caprifoliaceae

The genus Sambucus contains between 5 and 30 species of fast-growing shrubs and small trees growing that grow to less than 10m high. Its leaves are serrated and arranged in opposition to one another in a pinnate with 5–9 leaflets that are 5–30 cm in length and around 3–5 cm in width. In late Spring Sambucus flowers and this is followed the production of bunches of small red, bluish or black berries that are 3–5mm in diameter. The genus Sambucus is found in temperate to subtropical regions of the Northern and Southern Hemispheres, with its distribution being more widespread in the Northern than Southern Hemisphere.[58]

Ethnobotany-

Sambucus nigra is consumed in preserves, wine and juice, and is recognised as potentially having health benefits owing to its antioxidant and antiviral properties, and immune system modulation via cytokines.58 Thus, areas in which Sambucus nigra has been postulated as beneficial include diabetes, lipid lowering and protection against vital infections such as HIV, influenza and herpes simplex. In complete contrast, Sambucus Mexicana is not as commercialised and not considered for its medicinal properties.[59]

Diuretic activity-

Beaux et al. tested the leaves from Sambucus nigra and Caceres et al. used an ethanol extract of Sambucus Mexicana.51, 60 Both species are used in traditional medicines although the actives are unclear and could involve di- and tri-terpene, glycosides and phenols (e.g., flavanoids, tannins and coumarins).[51]

Cecropia leucocoma and Cecropia pachystachya: Cecropiaceae

Cecropia is a genus with roughly[59] species of trees. Cecropia is identified by its large, circular palmate lobed leaves that are between 30 and 40 cm in width and deeply divided into 7–11 lobes. In northeast Argentina, Paraguay and southern Brazil, Cecropia pachystachya can reach heights of around 10m with large, dual coloured leaves that are dark-green on their upper-side and silver-grey on their underside. In central Argentina, Cecropia pachystachya is not as tall and reaches heights of

less than 1m.61 This tree can is found in the forests of neotropical regions in paranaense phytogeographical province in Northeast Argentina, Paraguay and southern Brazil, and the temperate hilly grasslands of central Argentina.[61, 62]

Ethnobotany-

Cecropia pachystachya is a traditional medicine and used as a dietary supplement, a treatment for coughs and asthma, a cardiotonic and as a diuretic[62] indeed, studies in rats show it may lower blood pressure and this could be explained by diuresis. The traditional use of Cecropia leucocoma is not so well described. Although, we are led to believe that in the state of S¨ ao Paulo in Brazil it is a medicinal plant popularly used for its diuretic and hypertensive properties.[63]

Diuretic activity-

Cecropia leucocoma was administered to rats implanted with a urinary catheter. UV was collected for 4 h after its administration and shown to increase, compared with a placebo control, after 30, 120 and 240 min. Indeed, at the end of the recording phase UV was 5.5 ml in the treatment group and 1.6 ml in the placebo group.[62] The second trial explored the cardiovascular effects of Cecropia pachystachya and showed a lowering of steady state blood pressure with extracts obtained from neotropical and temperate regions.[61]

Spergularia purpurea: Caryophyllaceae

This is a glabrous or pubescent plant that inhabits sandy soil with a stem that is around 2–2.5 cm in width and about 5–15 cm in height. Its leaves are arranged in a rosette and between 8 and 40mm in length. Its flowers are a rose-purple colour and 3–4.5mmin length. This plant originates from Asia and Europe.[64]

Ethnobotany-

Spergularia purpurea is documented as being used in traditional Moroccan medicine and a water extract is prepared from the whole plant and used in the treatment of renal disease, hypotension and diabetes.[65]

Diuretic activity-

Jouad et al. administered Spergularia purpurea, furosemide (10 mg kg−1) and a placebo to normal rats and measured UV and urinary electrolytes every week for 4 weeks. Data showed significant increases in UV with Spergularia purpurea and were seen after 1 week of intervention and sustained till week 4 (~23 ml 24 h−1 with 400 mg kg−1 of Spergularia purpurea).[64]

Cucumis melo and Cucumis trigonus: Cucurbitaceae

Cucumis melo is oval in shape, measures up to around one foot in length, has smooth skin interspaced by length-wise grooves. Cucumis trigonus, like Cucumis melo, is a fruit and

resembles a small egg streaked with yellow and green, and is extremely bitter. Cucumis melo is found Worldwide and Cucumis trigonus can be located in North India.[66, 67]

Ethnobotany-

Cucumis trigonus and Cucumis melo are from the Cucurbitaceae family.32, 33 In India the seeds from Cucumis melo are produced to provide a sweet edible oil that has nutritional value and analgesic, anti-inflammatory and diuretic properties. In contrast, Cucumis trigonus has no traditional usage, but the alcohol extract contains a glycoside fraction which, via its anti-inflammatory properties, may promote diuresis.[66-68]

Diuretic activity-

The diuretic effect of Cucumis trigonus was tested in conscious albino rats and the study included a placebo group and a positive test group (i.e., hydrochlorothiazide). After oral administration, UV was measured for 6 h.[66]

Elephantopus scaber: Equisetaceae

Elephantopus scaber is a shrub that grows in the wild. It grows to a height of between 20 and 40 cm, has a high rosette of leaves. Its leaf stems are very short, white, and hairy and can be found close to the ground. Elephantopus scaber is a small herb that grows in hotter regions of India and throughout America.[69]

Ethnobotany-

Elephantopus scaber has a wide range of reported uses in traditional medicine. Indeed, it has been used as an analgesic, anti-emetic, anti-inflammatory, anti-microbial. It has been used in conditions such as bronchitis, smallpox, diarrhoea and suggested to have cytotoxic and anti-tumoral properties.[69-72]

Diuretic activity-

Two studies have tested its diuretic properties; ine in conscious rats and the other in a human trial gave Elephantopus scaber to conscious rats and showed no effect on UV after 3 h. Its effect on UNa not tested.[73]

Orthosiphon stamineus: Lamiaceae

Orthosiphon stamineus comes from little oval, green leaves that are finely toothed and rolled like ordinary tea. Orthosiphon stamineus is an herb that is found growing in tropical areas and is popular medicinal plant in Southeast Asia where it is consumed as an herbal tea.[26, 74, and 75]

Ethnobotany-

Orthosiphon stamineus is traditionally used to treat hypertension, diabetes, urinary disorders, rheumatism, tonsillitis and menstrual disorders.[60, 76-78] It is also documented in the German Pharmacopoeia DAB 9 and considered effective in

humans by the Commission E of the Federal Health Authority (BGA).[76, 77]

Diuretic activity-

Three trials have been conducted in rats. Englert and Harnischfeger tested the diuretic effect of a mixture of leaves and stems from Orthosiphon in conscious, volume loaded rats. UV was unchanged by this intervention, but UNa increased (~2-fold, compared with placebo, at a dose of 750 mg kg−1), as did urinary potassium (~2-fold) and chloride (~3-fold). However, no statistics were reported and for this reason we scored these effects as not being significantly different and conclude Orthosiphon stamineus had no effect.[76]

An overview of plants with putative diuretic effects

Family	Species	Common names	Traditional diuretic use?	Part used
Alismataceae	Echinodorus grandiflorus (Cham. & Schltdl.) Micheli	Amazon sword plant specie	N (anti- hypertensive)	Leaf
Alliaceae	Allium sativum L.	Garlic	N (anti- hypertensive)	Bulb
Amaranthaceae	Aerva lanata Linn.	Common Sri Lankan Herb, Kapurijadi, Katumpangan Ayer	Y (urinary infections)	Plant; leaf; flower
Apiaceae	Alepidea amatymbica Eckl. & Zeyh.	Larger tinsel flower, Kalmoes, Iqwili	N	Rhizome
Apiaceae	Foeniculum vulgare L.	Fennel	Y	Root
Apiaceae	Foeniculum vulgare Mill	Fennel	Y	Root; rhizome
Apiaceae	Foeniculum vulgare var dulce	Fennel	Y	Fruit
Apiaceae	Petroselinum sativum Hoffm.	Parsley	Y	Seedlings
Asteraceae	Artemisia thuscula Cav.	Artemisia thuscula, an endemic species of the Canary Islands	Y	Aerial part
Asteraceae	Centaurea	A common weed	N (anti-	Leaf

	phyllocephala Boiss.		hypertensive)	
Asteraceae	Solidago gigantea Ait.	Giant goldenrot (Herb)	N	Plant
Asteraceae	Tanacetum vulgare L.	Common tansy	Y	Leaf
Brassicaceae	Eruca sativa Mill.	Rocket, garden rocket, rocketsalad	N (anti-hypertensive)	Leaf
Brassicaceae	Lepidium latifolium L.	Pepperweed (broad leaved)	Y (renal disorders)	Seed
Bromeliaceae	Ananas comosus (L.) Merr.	Pineapple, Nana of the Tupi Indians	Y (renal disorders)	Root
Cactaceae	Opuntia ficus-indica (L.) Mill.	Prickly pear, cactus pear, Indian fig	Y	Cladode;
Caprifoliaceae	Sambucus mexicana Presl ex DC.	Elderberry (Mexican)	N	Flower
Caricaceae	Carica papaya L.	Papaya, Pawpaw, Melon tree	Y (dysuria)	Root
Cucurbitaceae	Sechium edule Sw.	Chayote	N (anti-hypertensive)	Leaf; seed
Equisetaceae	Elephantopus scaber	Elephant's Foot, Bull's Tongue	Y	Plant
Lamiaceae	Marrubium vulgare L.	Horehound	N (anti-hypertensive)	Leaf
Leguminosae	Vicia faba L.	Broad bean	N	Seedlings
Moringaceae	Moringa oleifera Lam.	Horseradish tree	N (anti-hypertensive)	Bark; stalk; leaf
Myristicaceae	Myristica fragrans Houtt.	Nutmeg	N (anti-hypertensive)	Seed
Oleaceae	Fraxinus excelsior L.	Ash tree	Y (facilitate renal excretion)	Leaf
Piperaceae	Piper chaba Hunter	Long pepper	N	Bark
Poaceae	Coix lacryma-jobi L.	Job's tears	N (anti-hypertensive)	Leaf
Poaceae	Imperata cylindrica Beauv.	Cogon grass, Cotton grass, Lalang	Y	Rhizome
Rosaceae	Rubus brasiliensis Mart.	Brazilian/Mauritius raspberry	N (anti-hypertensive)	Leaf

Rubiaceae	Palicourea marcgravi A.St.-Hil.	Cafezinho	N (anti-hypertensive)	Leaf
Rubiaceae	Randia echinocarpa Sess´e & Moc. ex DC.	Papache	Y (urinary disease)	Fruit
Scrophulariacea e	Digitalis purpurea	Common foxglove, purple foxglove	N	Fruit
Solanaceae	Solanum paniculatum L.	Jurubeba	N (anti-hypertensive)	Leaf
Solanaceae	Withania somnifera Dunal	Winter cherry, ashwagandha	N	Root
Urticaceae	Urtica dioica L.	Stinging nettle	Y (urinary ailments)	Leaf; aerial part
Zingiberaceae	Alpinia speciosa	Shell plant	Y	Plant
Zingiberaceae	Hedychium coronarium J.Koenig	White ginger, butterfly ginger, ginger lily, white butterfly ginger lily, garland flower	N (anti-hypertensive)	Leaf blade

CONCLUSION

The current review is intended to provide an overview of the current knowledge surrounding the use of herbal medicines as diuretics. We think the present findings are of interest where herbal medicines are used according to folklore. This is extremely important and potentially very useful in countries that have limited resources for the production and importation of modern medicines as they are accessible, cheap and applicable to the local population.

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