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Diuretic Activity of Indian Medicinal Plant

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ABSTRACT

Diuretics are commonly defined as drugs that increase the amount of urine produced by kidney. Arecise definition is that diuretics are the agent which augment the renal excretion of sodium and either chloride or bicarbonate primarily,and water excretion secondarily.The term "saluretic" is sometime used to describe a drug that increase the renal excretion of sodium and chloride ion Diuretics are responsible for increase the rate of urine flow, sodium excretion and to maintain the volume and composition of body fluids in a various clinical Disorders. But drug-induced diuresis is very much beneficial in such type of life-threatening disorders like CHF, hypertension, renal failure, Liver cirrhosis and often pregnancy toxaemia . [1]

Keywords: Diuretics,Saluretic,Toxaemia.

INTRODUTION

Diuretics relieve pulmonary congestion and peripheral edema. This decreases cardiac workload, oxygen demand and plasma volume, thus decreasing blood pressure. Thus, diuretics play an important role in hypertensive patients.[2] Plant medicine is commonly used in the traditional treatment of some renal diseases, and many plants are reported to possess significant diuretic activity. The diuretic activity of a number of plants used in ethnomedicine as diuretic agents has been confirmed in experimental animal. [3] The progress of a polyherbal formulation is a tough job because of the large number of different chemical compounds present in the different medicinal plants.

Diuresis

Duresis is increased urination and the physiologic process that produces such an increase. It involves extra urine production in the kidneys as part of the body's homeostatic maintenance of fluid balance. [4] In healthy people, the drinking of extra water produces mild diuresis to maintain the body water balance. Many people with health problems such as heart heart failure and kidney failure need diuretic medications to help their kidneys deal with the fluid overload of edema. These drugs help the body rid itself of extra water via the extra urine. The concentrations of electrolytes in the blood are closely linked to fluid balance, so any action or problem involving fluid intake or output (such as polydipsia, polyuria, diarrhea, heat exhaustion, starting or changing doses of diuretics, and others) can require management of electrolytes, whether through self-care in mild cases or with help from health professionals in moderate or severe cases.•

Complication related to Diuretics

Hypokalemic, Hypochloremic, Metabolic, Alkalosis, Less Hypokalemia, Nephrolithiasis, Hypomagnesemia, And Hyperuricemia Interstitial Nephritis, Noncardiogenic Pulmonary Edema, Pancreatitis, And Myalgias. [5]**Metabolic Acidosis, Cardiovascular Hyponatremia, Permanent Neurologic Damage. Ototoxicity. Nephrocalcinosis,**

Introduction of Herbals

Plants have been used for medicinal purposes long before prehistoric period. Ancient Unani manuscripts Egyptian papyrus and Chinese writings described the use of herbs. Evidence exist that Unani Hakims, Indian Vaids and European and Mediterranean cultures were using herbs for over 4000 years as medicine. Indigenous cultures such as Rome, Egypt, Iran, Africa and America used herbs in their healing rituals, while other developed traditional medical systems such as Unani, Ayurveda and Chinese Medicine in which herbal therapies were used systematically.

Traditional systems of medicine continue to be widely practised on many accounts.

Importance of some herbs with their medicinal values

•Herbs such as black pepper, cinnamon, myrrh, aloe, sandalwood, ginseng, red clover, burdock, bayberry, and safflower are used to heal wounds, sores and boils.

•Basil, Fennel, Chives, Cilantro, Apple Mint, Thyme, Golden Oregano, Variegated Lemon Balm, Rosemary, Variegated Sage are some important medicinal herbs and can be planted in kitchen garden. These herbs are easy to grow, look good, taste and smell amazing and many of them are magnets for bees and butterflies.

•Many herbs are used as blood purifiers to alter or change a long-standing condition by eliminating the metabolic toxins. These are also known **as** 'blood cleansers'. Certain herbs improve the immunity of the person, thereby reducing conditions such as fever.

• A wide variety of herbs including Giloe, Golden seal, Aloe and Barberry are used as tonics. They can also be nutritive and rejuvenate a healthy as well as diseased individual.

•Honey, turmeric, marshmallow and liquorice can effectively treat a fresh cut and wound. They are termed as vulnerary herbs. [6]

Medicinal Plant As Diuretics

Mangifera Indica

Figure 1. Plant of Magnifera Indica

Mangifera indica is a species of mango in the Anacardiaceae family. It is found in the wild in India and cultivated varieties have been introduced to other warm regions of the world. It is the largest fruit-tree in the world, capable of a height of one-hundred feet and an average circumference of twelve to fourteen feet, sometimes reaching twenty. [7] . They use Ethyl acetate, ethanol and water extract of Mangifera indica for evaluation of diuretic activity. Diuretic effect was carried out in rats (175 – 200 kg body wt.) by measuring the urinevolume by 1, 2, 4, 6 hours and later at 24 hours. Positive control was supplied by furosemide (20mg/kg) i.p. and mannitol (100mg/kg) i.v. They administered the extract orally at the dose of 250 mg/kg body weight. Diuretic study revealed that Na+/ K+ ratio was higher in aqueous extract and followed by ethanol and ethyl acetate extracts. [8]

Mimosa pudica

Figure 2. Mimosa Pudica

Mimosa pudica also called sensitive plant, sleepy plant is a creeping annual or perennial herb often grown for its curiosity value: the compound leaves fold inward and droop when touched or shaken, to protect them from predators, re-opening minutes later. The species is native to South America and Central America. It grows mostly in shady areas, under trees or shrubs. Diuretic test of aqueous extract of Mimosa pudica Linn. leaves were evaluated using Lipschitz test in normally fed albino rats. The control group was given 0.9% NaCl, the 3 test groups were treated with aqueous extract of leaves of M. pudica in the doses of 100, 200 and 400 mg/kg respectively, and the standard group received furosemide. Urine biochemical analysis was done by colorimetry. The aqueous extract of M. pudica leaves at 100 mg/kg p.o. showed significant diuretic activity with increased electrolytes excretion Increasing the dose of the test drug, however, does not bring about increase in diuretic property .[9]

Lepidium sativum

Figure 3. Lepidium sativum

Lepidium sativum known as garden cress belongs to the family Brassicaceae. The seeds and leaves of the plant contain volatile oils. Garden cress seeds are bitter, thermogenic, depurative, rubefacient, galactogogue, tonic, aphrodisiac, ophthalmic, antiscorbutic, antihistaminic and diuretic. They are useful in the treatment of asthma, coughs with expectoration, poultices for sprains, leprosy, skin disease, dysentery, diarrhoea, splenomegaly, dyspepsia, lumbago, leucorrhoea, scurvy and seminal weakness. Seeds have been shown to reduce the symptoms of asthma and improve lung function in asthmatics. The main chemical constituents of L.sativum are flavonoids, coumarins, glycosides, glucosinolate, glucotropaeolin, triterpenes, sterols and alkaloids.[10] Urine volume was significantly increased by aqueous and methanolic extracts of the drug L. sativum. The aqueous and methanolic extracts of the plant increases the sodium excretion whereas the excretion of potassium is increased by aqueous extract only. The diuretic effect of the extracts was equivalent to that of the hydrochlorothiazide which is used as reference drug and

methanol had the supplementary benefit of a potassium conserving effect.[11]

Achyranthes aspera

Figure 4. Achyranthes aspera

Achyranthes aspera Linn (Amaranthaceae), commonly known as Apamarga in Ayurveda and is found as a weed that has been traditionally used for a number of ailments.The plant is indigenously used as diuretic, spermicidal, anti-allergic, cardiovascular, nephroprotective, antiparasitic, hypoglycaemic, analgesic and antipyretic. In the present study the methanolic extract of whole plant of Achyranthes aspera was investigated for its diuretic potential. The diuretic effect was found out by Lipschitz et. al. method using furosemide as standard drug. The methanolic extract treated rats showed high diuretic effect as compared to control but this effect was less than furosemide. Significant increase in renal clearance of sodium, potassium and chloride ions was observed in treated and standard groups.[12]

Bixa Orellana

Figure 5. Bixa Orellana

Bixa Orellana is a shrub or small tree widely cultivated for the seeds or as an ornamental in West Indies, tropical Asia and Africa. The plant has long been used by American Indians to make body paint, especially for the lips, which is the origin of the plant's nickname, lipstick tree. Extracts of the leaves of bixa possess antimicrobial activity against Gram positive microorganisms, with maximum activity against Bacillus pumilus.[13]

Euphorbia thymifolia

Figure 6. Euphorbia thymifolia

Euphorbia thymifolia (Euphorbiaceae) is a small branched, pubescent, prostate annual herb, commonly known as laghududhika or choti-dudhi. The leaves, seeds and fresh juice of whole plant are used in worm infections, as stimulant, astringent. Kane S R et. al. investigated the diuretic activity of crude ethanolic extract and fractions of Euphorbia Thymifolia linn in albino rats and was compared with standard drugs Furosemide (10mg/kg,p.o.). Fractions of the extract potentiated the diuretic activity with respect to the standard drug. The activities may be contributed by the phytoconstituents present in ethanolic extract of Euphorbia Thymifolia Linn.[13]

Taraxacum officinale

Figure 7. Taraxacum officinale

officinale, the common dandelion (often called "dandelion"), is a flowering herbaceous perennial plant of the family Asteraceae . Dandelion is commonly used as a food. The leaves are used in salads and teas, while the roots are sometimes used as a coffee substitute. Dandelion leaves and roots have been used for hundreds of years to treat liver, gallbladder, kidney, and joint problems.[12] Dandelion is traditionally considered as an alternative for conditions such as eczema and cancer. In experimental research on mice,

high amounts of an aqueous extract of dandelion leaf (2 gm per kg body wt.) have been shown to have diuretic activity comparable to furosemide. Since dandelion is also a rich source of potassium, some researchers think that it is capable of replacing potassium lost through dieresis.[6]

Allium sativum

Figure 8. Allium sativum

Allium sativum, commonly known as garlic, belongs to the family Liliaceae and genus Allium.Garlic is used as carminative, aprodisic ,expectorant and disinfectant in the treatment of pulmonary conditions. Oil of garlic is used as anthelmintic and rubefacient. It has been noticed that garlic lowered the blood pressure and level of cholesterol and also possesses strong antimicrobial activity. The intravenous administration of purified fractions of Allium sativum, exhibits a significant biphasic and natriuretic response. Chloride ions follow the natriuretic profile but potassium ions do not. No changes were observed in arterial blood pressure or in the electrocardiogram. The purified garlic fractions also bring about a suppressive dose dependent effect on Na+-K+-ATPase. Therefore it may cause diuresis by increasing the volume of urine.[7]

Tribulus terrestris:

Figure 9. Tribulus terrestris

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.[9,10] 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 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).[18]

Urtica dioica:

Figure 10. Urtica dioica

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. [1,2]

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.[2]

Imperata cylindrica:

Figure 11. Imperata cylindrical

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.[6,7] 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. [2]

Olea europaea:

Figure 12. Olea europaea

Olea europaea is an evergreen tree or shrub that is around 8–15m in height. Its leaves are silvergreen, 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.[2,4] .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.[5]

Equisetum bogotense, Equisetum fluviatile:

Figure 13. Equisetum bogotense

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. 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.[6]

Phyllanthus amarus, Phyllanthus corcovadensis and Phyllanthus sellowianus:

Figure 14. Phyllanthus amarus

Phyllanthus amarus or biennial herbs (Hnatyszyn et al., 1999). 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[4,5] Diuretic activity 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). [9]

Aerva lanata:

Figure 15. Aerva lanata

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[12,13] . 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. [7,8]

Conclusion

The current review is intended to provide an overview of the current knowledge surrounding the use of herbal medicines as diuretics. In modern day to day practice diuretics can be used as a first line therapy in hypertensive patients. The review has included the botanical characteristics of the plant which helps in identification of the plant, Ethnobotany which give traditional use of the plant, and the reported activities of the plant. However, the number of studies is limited and we recommend that further studies to be conducted to confirm reported activities.

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