An Overview on Herbal Medicines as Diuretics with Scientific Evidence
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Abstract: In the most ancient Indian traditional system of medicines (Ayurveda) diuretics are called as Muttra – Virechanya dravya. These agents are widely explored in Indian ancient system of medicines. Diuretics basically causes increase in the rate of urine flow thus being used to treat various disorders like diabetes mellitus, cardiovascular disorders, anxiety, hypertension, liver degeneration diseases. The main aim of this review article is to highlight the work on diuretics of plant origin and to identify which extract promotes diuresis, which has been assessed in terms of urine excreted and urinary sodium, potassium, and chloride excretion. In most of the study Na+ and K+ estimation was done by the Flame photometer and Cl– estimation was done by argenometric titration method. This study is to identify the research needed area. In this article we have identified number of genus and species recently reported as diuretic effects, some of them are Xanthium Strumarium L., Samanea Saman, Morinda Citrifolia, Holarrhena antidysenterica, Euphorbia thymifolia, Bryophyllum Calycinum, Achyranthes aspera. However, there the number of studies is limited and we recommend that further studies be conducted to confirm reported effects. Such evidence is needed to provide scientific credence to the folklore use of traditional medicines and even be helpful in the development of future medicines, treatments and treatment guidelines.

Keywords: Diuretic activity, Medicinal plants

INTRODUCTION

Herbal and natural products of folk medicines have been used for centuries in every culture throughout world. Scientists and medical professionals have shown increased interest in the field as they recognized the true health benefits of these remedies. “Let food be your medicine and let medicine be your food” was advised by father of medicine, Hippocrates, over the millennia ago. Various medicinal plants discovered by the ancestors; as traditional folk medicine as diuretic. Diuretic compounds that stimulate the excretion of water are potentially useful in many disorders including most of those exhibiting oedema such as congestive heart failure, nephritis, toxaemia of pregnancy, premenstrual tension, hypertension and also play an important role in hypertensive patients and pulmonary congestion [1]. Diuretics like Mannitol, Thiazides, Furosemide and Ethacrinic acid are used in now a days. Among these diuretics, had some toxic effects. These synthetic diuretics typically inhibits potassium retention [2]. The crud drug being always available easily in abundance, comparatively cheaper with negligible side effects and have frequently been described to patients of all age groups. The multiple therapeutic actions and uses of these drugs are sufficiently described in classical literatures on indigenous medicines in many medicinal plant books and Pharmacopoeias [3-4]. Therefore the present study, review the following plants, which has been recently shown to exhibit diuretic activity.

A. Xanthium strumarium

Xanthium Strumarium is a common weed found in India belonging to the family Compositae, the whole plant specially roots and fruits are used as medicine.

Pharmacological Activity

Xanthium strumarium L. grows as weed throughout on waste lands. Locally it is known as Gokharu and Kutta zad. Inter views with local hakims revealed that whole plant is used as blood purifier and in treatment of scabies [5]. Ayurveda it is called ‘Shankeshwara’and ‘Arisha’, and is considered anthelmintic, antipyretic, diuretic, cooling, laxative, alexiteric, tonic, digestive, appetizer, improves voice, complexion, used in epilepsy, leucoderma and as antidote for insect bite [6], diuretic activity [7].

Diuretic activity

P. Shravani et al. [7] studied the diuretic activity of Xanthium Strumarium L. in albino rats. The extract was administered at 250 and 500 mg/kg b.w. Frusemide at the dose of 5 mg/kg b.w. was used as the standard. The graded dose of petroleum ether extract in normal saline showed significant increase in diuresis, natriuresis, kaliuresis, Glomerular filtration rate. All extract causes increase in urine elimination and increase in Na+, K+, Cl– excretion compared to normal saline. They reported that the diuretic activity of the extract may be due to the presence of Flavanoids, Saponins, and Organic acid. It is also possible that defect of water could be due to another secondary active metabolites ; or it may be
indirect change of some physiological parameters before filtration step.

**B. Samanea saman (jacq) Merr**

Samanea saman (jacq) Merr is a large umbraculiform tree growing over 20 meters height with a stout trunk about 1.5m in diameter and large spreading canopy providing shade, bark is rough and furrowed. Alkaloid’s are said to be abundant in bark stem, leaves seeds; Leaves and stem have saponins and tannin, gum is present in trunk. Additionally steroids, cardiac glycosides, terpenoids are also present [8].

**Pharmacological activity**

The plant is being used in acute bacillary dysentery, enteritis, diarrhoea, cold, sore throats and head ache [9, 10]. Root decoction is used in hot bath for stomach cancer. The alcoholic extracts of leaves are used to treat Tuberculosis; fruit decoction is used as a sedative in Columbia.

**Diuretic activity**

Evaluation of diuretic activity of Samanea saman (Jacq) Merr bark in Albino Rats was performed by B. Komarapalayam et. al. [8]. Diuretic potential of methanol extract of the bark was performed by using in-vivo Lipschitz test model. Results indicated that methanolic extract at a concentration of 200 mg/kg and 400 mg/kg body weight shows an increase in the urine volume and electrolyte excretion when compared to control. Furosemide at a dose of 20 mg/kg b.w. was used as the standard. It was reported that it shows that the methanol extract of Samanea saman (Jacq) Merr, at high doses, may have equipotent diuretic activity as that of the standard drug furosemide. Diuresis was accompanied by marked increase in urine volume and urinary Na+, K+ and Cl−.

**C. Morinda citrifolia (Linn)**

Morinda Citrifolia Linn (Rubiacae) also known as Noni or Indian Mulberry, cultivated throughout the world, is a small evergreen tree. It is identifiable by its straight trunk, large bright green and elliptical leaves, tubular flower, Ovoid Yellow fruit. The mature fruit has a foul taste and odour [11].

**Pharmacological activity**

It has been reported to have a broad range of health benefits for cancer [12] infection, arthritis, diabetes, asthma, hypertension and pain [13], immune enhancing [14]; antithrombotic [15], antioxidant [16], analgesic [17], anti-inflammatory and xanthenes oxidase inhibitory [18]. Blood pressure lowering [19] and diuretic [20] properties.

**Diuretic activity**

Preethi G Pai et. al. [20] reported diuretic activity of Morinda Citrifolia Linn. The study was conducted in saline primed Wistar albino rats using furosemide (10 mg/kg) as the standard drug. Two oral doses, 5mg/kg and 10mg/kg of the fruit juice were administered. Urine volume and electrolytes (Sodium, Potassium and Chloride) excretion was estimated at the end of 24 hours and data was analyzed by Kruskall Wallis and Mann Whitney tests. Noni fruit juice statistically increased the volume of urine in a dose dependent manner increasing the diuretic index to 2.04 and 2.36 for 5ml/kg and 10ml/kg dose ranges respectively. There was a statistical significant decrease in sodium ion excretion. Though there was a similar decrease in potassium excretion it was not statistically significant. These findings indicate that the probable increase in urine formation might be due an aquaretic action of Noni fruit rather than a natruretic effect and further studies with larger doses and longer duration are warranted.

**D. HOLARRHENA ANTIDYSENTERICA**

Holarrhena Antidysenterica belonging to the family Apocyanaceae, commonly known as bitter oleander and locally as Kurchi, it is a small deciduous tree found at Himalaya and sub Himalaya tract [22].

**Pharmacological activity**

Traditionally H. antidysentrica is in various disorders like colic, diarrhea, dysentery and fever [21]. It is also used as carminative, astringent, lithontriptic, tonic, apher-disiac, cardio suppressant, diuretic and antihypertensive [22-24].

**Diuretic activity**

Anwarul-Hassan Gilani et al. [25] studied the crude extract of H. antidysentrica seeds and its fractions, n-hexane, n-butanol and aqueous, for their diuretic effect in Wistar rats. Hydrochlorothiazide at the dose of 10 mg/kg b.w. was used as the standard. Crude aqueous ethanolic extract caused dose-dependent (30 and 100 mg/kg) increase in urine output, indicating the diuretic effect. In addition, crude extract increased urine contents of Na+ and K+, increased urine volume, pH value and electrolytes level indicating the diuretic effects. None of the fractions exhibited diuretic effect comparable to that of the parent crude extract. Aqueous extract was devoid of diuretic effect, Butanol extract exhibited a mild diuretic effect at 30 mg/kg, whereas, Aqueous extract caused a significant increase in urine output only at 100 mg/kg, indicating that the diuretic activity is distributed among fractions in an order of increasing polarity of the solvent. The study reported that diuretic activity in the H. antidysentrica possibly mediated through its saluretic effect, which rationalizes its medicinal use as diuretic.

**E. EUPHORBIA THYMIFOLIA**

Euphorbia thymifolia Linn belonging to the family Euphorbiaceae is one of the important multipurpose species of desert and arid regions of Indian subcontinent. It provides vegetative cover in dry, hot and sandy desert areas where little else grows and is an extremely hardy species.
**Pharmacological activity**

In Sanskrit Euphorbia thymifolia means “Laghu dudhika or Raktavindachada”. It is widely used in the Ayurveda to cure many remedies. Leaves and seeds are given in worm case and in certain bowel affection of children. In India they are considered as stimulant and laxative also use in many diseases [26]. It also possesses anthelmintic properties [27], antioxidant and antiviral activity [28].

**Diuretic activity**

Sandeep R. Kane et. al. [26] 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.). The extracts was administered at the doses of 200 and 400mg/kg b.w. The extract was found to exhibit significant diuretic in dose dependant manner. Fractions of the extract potentiated the diuretic activity. The activities may be contributed to the phytocomponents present ethanolic extract of Euphorbia Thymifolia Linn. It increased urine output as well as electrolyte concentration at higher dose tested 400mg/kg p.o.; Di ethyl ether fraction was most effective.

**F. NYCTANTHES ARBOTRITIS**

Nyctanthes arbor-tritis belongs to the family Oleaceae. Nyctanthes arbor-tritis is well known in India and its neighboring countries as one of the most versatile medicinal plants having a wide range of biological activities. It is widely cultivated in tropical and subtropical regions all over the world. It is usually a shrub or a small tree having brilliant, highly fragrant flowers, which bloom at night and fall off before sunrise. Thus, during the day the plant loses all its brightness and hence is called "Tree of sadness" (arbor-tritis). It is also known as Coral Jasmine, Harsinghar, Parijat, queen of the night and night flowering jasmine [29]. Folk people of Tripura predict the rainfall variation through flowering phenoology which help them to plan agroforestry activities and disaster prevention [30]. Every part of the tree has been used as traditional medicine for household remedies against various human ailments from antiquity [31, 32].

**Pharmacological activity**

The various parts of the plant was found to possess diverse pharmacological activities like antibacterial, anethelmintic, anti-inflammatory, hepatoprotective, immunopotential, anti-pyretic, antioxidant, antifungal, ant-bilious, sedative, antifilarial, immunomodulatory, antileishmanial, antipyretic etc [33].

**Diuretic Activity**

D. Sasma et. al. [34] studied the diuretic activity of the water-soluble portions of the ethanolic extracts of its flowers, barks, seeds and leaves. The ethanolic extracts of different parts possess significant diuretic activity as reflected by rise in urine volume with cation excretion. The ethanolic extracts of the seeds and leaves found to possess higher electrolyte excretion at higher dose level. The extracts were showed to be safe up to the dose of 2.0 gm/kg. From these, doses of 200, 400 and 600 mg/kg body weight were selected for the evaluation of diuretic activity.

**G. ERYTHRINA INDICA LAM.**

Erythrina indica Lam. is a medium sized ,spiny , deciduous tree normally growing to 6-9 m tall and 60 cm young stem and branches are thickly armed with stout conical spines up to 8mm long. Leaves trifoliolate, alternate, bright emerald green on long petiolate 6-15cm, rachis 5-30 cm long, prickly leaflets smooth, shiny, broader than log, 8-20 by 5-15cm ovate to acuminate with an obtusely pointed end.

**Pharmacological activity**

It is being used traditionally for treatment of liver trouble, joint pain, dysentery, laxatives and anthelmintics [35-37].

**Diuretic activity**

Erythrina indica Lam is used in the traditional medicine as diuretic. M. Jesupillai et. al. [38] evaluated the diuretic activity of Ethanol, Chloroform and Ethyl acetate extract of leaves of Erythrina indica Lam. in Albino rats. The results were compared with furosemide as standard at 20 mg/kg b.w. All extracts exhibited significant diuretic activity as evidenced by increased total urine volume and the urine concentration of Na +, K + and Cl - at the dose of 250 mg/kg.

**H. ACHYRANTHES ASPERA LINN**

Achyranthes aspera Linn is commonly known as Apamarga in Ayurveda is a weed, in Hindi as Latjeera; belongs to the family Amaranthaceae, is an erect or procumbent, annual or perennial herb, found on road sides, fields boundaries and waste places as weed throughout the India up to an altitude of 2100m [39, 40].

**Pharmacological activity**

It is widely used as traditional medicines as alternative and antiperiodic, purgative, antiphlogistic, rheumatism, scabies and other skin disorders [41, 42]. The plant is also known as for its spermicidal, hypoglycaemic, hepatoprotective, anti inflammatory, analgesic, antipyretic, and anti arrhytmic activity [43-47].

**Diuretic Activity**

Saurabh Srivastav et. al. [48] reported diuretic activity of Achyranthes aspera methanolic extract of whole plant of Achyranthes aspera. The diuretic effect was found out by Lipschitz et al method using furosemide (100 mg/kg b.w.) as standard drug. The study was conducted using dose level of 400 mg/kg b.w. The results had shown diuretic effects in rats when compared with control but this effect was less than
CONCLUSION

The current review is intended to provide an overview of the current knowledge surrounding the use of herbal medicines as diuretics. Indeed, there are more than a 100 extracts purporting diuretic effects. Extracts which we regard as being potentially the most efficacious include species belonging to the genus Xanthium Strumarium as having a high level of efficacy. Others include Achyranthes aspera, Erythrina Indica Lam, Nyctanthes Arbo-Tritis. So what is the relevance of the current findings? 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. Another areas where the current knowledge can be applied include the substantiation of marketed products, where the evidence can be quite limited. The last issue for us to raise here is whether these results are relevant to the wider population? We have already outlined that diuretics are used to lower blood pressure in hypertension. What we have not dealt with is the safety of natural medicines when ingested for long periods, such as in the treatment of chronic diseases like hypertension. Indeed, some of the extracts we reviewed are recommended for acute disorders like urinary tract infections rather than ongoing diseases. This would also be required to compile monographs and recommendations for such extracts. In a clinical setting, we speculate that these extracts could, one day, offer another possible treatment to existing drug regimes. One benefit could be the offer of a more natural treatment or milder effects and fewer side effects. Milder effects are quite interesting as they could offer a first line of therapy or as an add-on to conventional medicines as their lower potency could improve tolerance to more potent drugs.

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