



Diuretic Activity of Some Known Medicinal Plants: A Review

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ABSTRACT

Diuretics are one of the important class of drugs, act within the kidney and promote the loss of fluid from the body. Mechanism behind diuretics is compound interfere with the reabsorption of electrolytes their by promote sodium, potassium, chloride excretion in the body. Nowadays herbal medicine use becoming popular due to toxicity and side effects of allopathic medicines. Diuretic activity study mainly conducted in animals. Most commonly preferred *in vivo* method is Lipschitz method. Rats or mice are the most commonly used animals. Diuretic activity study concluded that majority of plant extract possess diuretic activity similar to standard drugs like furosemide and hydrochlorothiazide. Diuretic activity determined by measuring urine volume, osmolarity, concentration of electrolytes, and pH. This review summarizes the herbal medicine used as diuretics and their botanical characteristics, ethnobotany, distribution and diuretic activity study. This review provide knowledge regarding surrounding herbal medicine used as diuretic and their significance in quality of life.

Keywords: Diuretics, Herbs, Ethnobotany, Medicinal plants, Diuretic activity

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INTRODUCTION

Diuretics are among the most commonly prescribed drugs and used for more than fifty years for the treatment of several diseases. All diuretic agents are mainly acts by impairing sodium reabsorption in the renal tubules and thus increasing fractional secretion of electrolytes like sodium, potassium, chloride ions and thus helps to reduce the volume of blood circulating through the cardiovascular system¹.

Diuretics are mainly used for edematous disorder like cardiac failure, nephrotic syndrome, hepatic cirrhosis, blood pressure, hypertension. Certain diuretic combination effective in volume control in difficult to treat patients with multiple underlying problems. Certain diuretic drugs used for the treatment of more specific conditions like glaucoma, cerebral edema, hypocalcaemia, hypercalciuria and diabetes insipidus².

Use of synthetic compounds has significant drawbacks, such as increasing cost and may leads to negative health consequences. Synthetic medicinal plants are replaced by medicinal plants. Medicinal plants are cheaply available and have little side effects. One of the important and well documented use of plants is their use as diuretic agents. Mono and polyherbals are more commonly used as diuretic in the form of decoction, tincture, tablets and capsules. Herbal drugs gained importance and popularity in recent years because of their safety, efficacy and effectiveness. Wide range of phytochemicals responsible for diuretic activity includes alkaloids, glycosides, tannins, phenolics, coumarins, triterpenoids etc. These phytochemicals exert desired pharmacological activity in the body by acting either individually or combination may produce significant diuretic activity. Herbal medicines are free from side effects and toxicity unlike the allopathic medicines³. Natural diuretics acts by increasing the urine output as well as urinary excretion. There are many Indian medicinal plants reported for their remarkable diuretic activity. Some of them given below.

***Hibiscus sabdariffa* L. (Malvaceae)**

It is an annual herbaceous plant subshrub that can grow up to 2.4 m in tall, with smooth cylindrical red stems. The leaves are alternate, 3-5 cm long, green with reddish veins and long or short petioles. The leaves of young seedlings and upper leaves of older plants are simple, lower leaves are deeply 3-5 or even 7 lobed; the margins are toothed , flowers are yellow, rose, maroon, pink colour. Capsules are 5 valved and each valve containing 3-4 kidney shaped, light brown seeds. Plants found in almost all countries like India, Saudi Arabia, Malaysia, Indonesia, Thailand, Philippines, Vietnam and Egypt⁴.

Traditionally used as antihypertensive, diaphoretic, diuretic, collogue, emollient and they are capable of relaxing vascular smooth muscle by a Ca antagonism effects and also act as an inhibitor of angiotensin converting enzyme.^{4,5}

Diuretic activity: Diuretic activity of aqueous extract was studied from the calyces of *Hibiscus sabdariffa* L. in male albino Sprague-Dawley rats. The negative control group received 1.5 ml of distilled water/200 g; Positive control administered furosemide drug (13 mg/kg) and caused urine excretion of 4.8ml. The experimental groups received the extract dissolved in water at doses of 500 mg/kg, 1000 mg/kg, 1500 mg/kg, 2000 mg/kg, and 2500 mg/kg and this induced excretion of 3.0, 4.3, 4.4 ml urine. The other methods involved like diuresis in the *in situ* kidney model. This method involves the rat kidney exposed to a left lateral surgical incision. The renal artery, vein as well as ureter were channeled. Then kidney perfused with Ringer- Krebs's solution. Urine samples collected with catheter. Then kidney removed, weighed and homogenized to determine protein count by Bradford method. Then glomerular filtration rate determined. Kidney perfused with various solvents that may results variation in glomerular filtration rate.⁵

***Mimosa pudica* (Fabaceae)**

Mimosa pudica is a creeping annual or perennial herb. Roots are cylindrical with secondary or tertiary branches. Stems are cylindrical with light brown color, flowers are pink in globose head, ovary sessile and numerous ovules. Glabrous and straw coloured fruit, seeds are numerous in number. Plant is native of tropical America and all through tropical and subtropical parts of India⁶. Ethnobotany: Mainly used as anti-asthmatic, aphrodisiac, analgesic, antidepressant, sedative, emetic, alopecia, diarrhea, dysentery, insomnia, tumor and various urogenital infections⁶.

Diuretic activity: Ethanol root extract of *Mimosa pudica* obtained by using soxhlet apparatus. Diuretic study was carried out in albino rats. Rats were divided into five groups of six rats per each. The control, standard, furosemide and extract with various dose administered. 5hr later urine volume analysed for electrolytes. The extract doses at 100, 200 mg/kg enhancing elimination of Na⁺, K⁺ and chloride ions⁷.

***Smilax canariensis* (Smilacaceae)**

Smilax canariensis is a climbing winter green plant. The flowers are unsexual. It occurs mainly in Madeira and the Canary Islands.

Ethnobotany: Traditionally used as diuretic, laxative, depurative, hypoglycemic and also experimental study proved they have anticancer, cytotoxic, anticonvulsant, antioxidant, anti-diabetic, antimicrobial, antiviral, anti-inflammatory, ant nociceptive properties⁸.

Diuretic activity: Solvents like n-butanol, ethyl acetate, dichloromethane and methanol used to extract the leaves, stems and rhizomes of *Smilax canariensis*. Diuretic activity conducted in male Swiss mice. Initially mice are divided into 11 groups and the eight group received various dose of plant extract. The positive control administered hydrochlorothiazide and furosemide. Urine collected by estimate electrolyte concentration, pH and conductivity. n-butanol and ethyl acetate extract produce diuretic effect very close to the value of hydrochlorothiazide and furosemide⁸.

***Tribulus terrestris* (Zygophyllaceae)**

It is a tap rooted herbaceous perennial plant. Stems are grown 10 cm to 1 m, often branching leaves are pinnately compound with leaflets less than quarter –inch long. Flowers are 4-10mm wide with 5 lemon yellow petals. The seeds are hard and bear 2-3 sharp spines⁹.

Ethnobotany: *Tribulus terrestris* mainly used as diuretic, kidney stones, cough remedy and insect repellent. Literature survey revealed it has hypotensive, cardiac depressant, contractile activities on smooth muscles, effective in treating angina pectoris and improve cardiac circulation⁹.

Diuretic study: This involves study of diuretic activity of *Tribulus terrestris* compared with *Zea.mays*. Diuretic study conducted on male wistar rats (250-300 g). Then 30 animals are allocated to five groups of 6 animals each and treated orally with saline, furosemide (120 mg/kg) as standard diuretic, aqueous extract of leaves and fruits of *Tribulus terrestris* 5g/kg, *Z mays* extract 5g/kg, the combination of *Z mays* and *Tribulus terrestris* 5g/kg of each. 24 hrs. later urine collected. K⁺ level determined by using corning EEL flame photometer model 450. Chloride in urine determined by chloride meter model 92C. The urine volume increased by 189% of control, which was slightly more than furosemide (179%). Sodium and chloride concentration in the urine also increased. *Z. mays* alone or in combination with *Tribulus terrestris* failed to show significant diuretic activity¹⁰.

***Peganum harmala* L (Nitrariaceae)**

Peganum harmala L. is a perennial herbaceous, branched into 5-13 stems, glabrous in nature which grows up to 30-100 cm in height. The leaves are 3-5 linear lobes. Flowers are whitish-yellow petals in colour and arise from apexes of branches. Fruits are globular capsule with 3 chambers and containing angular blackish seeds. It is widely distributed from Texas to Mexico, Central Asia and Southern United States.¹¹

Ethnobotany: Plant can be used to treat rheumatism, hypertension, diabetes, asthma, Jaundice. Seeds also possess hallucinogenic and hypothermic properties and used for the treatment of fever, malaria, neuralgia, asthma.¹²

Diuretic activity: Methanol extract of *Peganum harmala* compound compared with the diuretic activity of furosemide (10 mg/kg) in albino rats. The extracts are administered at doses like 150,

300, 450 mg/kg. Then 5, 24 hour later urine collected and evaluate urine pH, urinary electrolytes level and diuretic effects. The dose at 150 mg/kg produce moderate effect and the doses like 300 and 450 mg/kg produce significant diuretic effects.¹²

***Ampelozizyphus amazonicus* Ducke (Rhamnaceae)**

Ampelozizyphus amazonicus is a cylindric striatal and rust colored stem with brownish lenticels. Leaves are large, alternate or sub opposite, petiolate with ovate to oblong contour. Flowers are thick and monoclinors with 3-4 mm long pedicel, with sepals. Fruits are capsular, obovate, angular, glabrous. Seeds are present oval contour and brilliant brownish colour. Mainly found in Amazonian Peru, Colombia, Venezuela, Guyana, French Guiana and Brazil.¹³

Ethnobotany: one of the important use is treatment of Malaria and other pharmacological actions like antimicrobial, trypanocidal, cytotoxic, antiviral and hepatoprotective activities.¹⁴

Diuretic activity: Diuretic effects of an ethanol crude extract of roots of *Ampelozizyphus amazonicus* (CEAaD-100-400mg/kg), a chemically characterized saponin mixture (SAPAAaD-50-200mg/kg), as well as saponin –free fraction (SAPAAaD-free) obtained from CEAaD on diuresis in male Wister rats. The extract also stimulated diuresis in rats under free access to water. CEAaD (150mg/kg) produced a diuresis of 0.9 ± 0.1 ml. The presence of CEAaD (100mg/kg) urine volume was 1.4 ± 0.3 ml and 3.0 ± 0.5 ml respectively.¹⁴

***Desmostachya bipinnata* (L.) Stapf (Poaceae)**

Desmostachya bipinnata is a coarse perennial plant widely spreading scaly rhizomes. 80-100 cm tall and 7 mm in diameter. Culms rigid, branched at base and covered with leathery yellowish sheaths. The leaves have small hair like structures. The seeds are 1cm long, flat in nature. The plant distributed in Ethiopia, Somalia, Sudan, Algeria, Egypt, Saudi Arabia, Yemen, China, Iran, Iraq, Syria, India, Nepal, Pakistan, Burma, Thailand and Vietnam.¹⁵

Ethnobotany: decoction made from leaves was used to treat fever, root was used as astringent, diuretic, galactagogue, litholytic and for the treatment of dysentery, diarrhea, thirst, urinary calculi, dysuria and other disease of bladder.¹⁵

Diuretic activity: Hydro alcoholic extract of whole plant obtained by soxhlet apparatus. Initially 24 male rats (180-200 g) divided into four groups. The first group of animals serving as control, received normal saline (15ml/kg), the second group received furosemide (20 mg/kg), third and fourth group receives hydro alcoholic extract at the doses of 250 and 500 mg/kg (p.o) respectively. 5 hours later urine collected and subjected to analysis. Urine volume, pH and conductivity estimated by pH meter and a conductometer. Concentration of Na⁺ and K⁺ in urine was measured by flame photometer. Compared to furosemide at higher at higher dose they produce similar action

to furosemide. The extract at 500 mg/kg produce 6.43 ± 0.13 and furosemide (20 mg/kg) produce 8.23 ± 0.23 . At lower dose comparatively urine volume is less, pH and conductivity is high.¹⁶

***Thymus serrulatus* (Lamiaceae)**

Thymus serrulatus is a perennial herb, woody at the base and 5-40 cm high. Inflorescence is crowded into globose and oblong heads with pink corollas. *Thymus serrulatus* is distributed around Bale, in the highlands of Semien Shoa, in Tigray, Wollo and Gonder.¹⁷

The essential oil from leaves of *Thymus serrulatus* is used for the treatment of hypertension, renal diseases and used as diuretic, anthelmintic, disinfectant, antispasmodic, carminative, expectorant, sedative, tonic, anti-inflammatory, antibacterial, antiviral, antifungal and libido enhancer.¹⁷

Diuretic activity: diuretic activity study concluded in swiss albino mice by the aqueous extract of leaves of *Thymus serrulatus*. Mice were divided into six groups (five animals per each). The control group received normal saline (25 ml/kg), reference group received hydrochlorothiazide (10 mg/kg). Group III to group VI received the extract at dose levels of 125, 250, 500 and 1000 mg/kg orally. Five hours later urine collected and the concentration of Na^+ , K^+ are determined. The findings show that crude aqueous extract of *Thymus serrulatus* leaves showed significant diuretic, natriuretic, kaliuretic effects. Both the crude aqueous extract of the leaves of *Thymus serrulatus* and its n-butanol fraction have diuretic activity with high concentration of urinary electrolytes in mice.¹⁸

***Moringa stenopetala* (Baker f.) Cufod. (Moringaceae)**

Moringa stenopetala, is a deciduous tree in the flowering plant genus *Moringa* growing to a height of 6-12 cm. Bark is smooth and whitish to light gray or silver colour. Crown is nearly branched; younger shoots are characterized by a dense, velvety pubescence. The leaves are light green, long and alternatively attached to the stem by short petioles. Flowers are bisexual, aromatic inflorescence. Ovary is densely haired, long and ovoid in shape. Plant is mainly distributed in Kenya, Ethiopia.¹⁹

Ethnobotany: They possess potential antimalarial, antihypertensive, antispasmodic, antiulcer, diuretic, hepatoprotective and cholesterol lowering activities.²⁰

Diuretic activity: study involves assess the diuretic activity of aqueous crude extract and hot tea infusion of *Moringa stenopetala* leaves in male Wister rats. Rats are divided into ten groups. Control received distilled water (5ml/kg), reference group received furosemide (10mg/kg). Group III-X received different doses of extract (62.5, 125, 250 and 500 mg/kg) and hot tea infusion (1, 2, 4 and 6) teaspoons. Five hours later urine volume collected. The extract (125 mg/kg) and hot tea infusion (2 Tsp) possess highest diuretic activity (101% and 96%) compared to furosemide.

The aqueous extracts except 92.5 mg/kg and hot tea infusion possess significant diuretic, natriuretic and kaliuretic effects.²⁰

***Acorus calamus* (Acoraceae)**

Acorus calamus is a perennial plant extensively branched, aromatic rhizome, cylindrical up to 2.5 cm thick, externally purplish-brown to light brown and white internally. Leaves have prominent midvein and divided into secondary and tertiary veins. Plants are very rarely flower or set fruit, flowers are cylindrical in shape, greenish brown in colour. The fruits are small and berry like, containing few seeds. *Acorus calamus* is probably indigenous to India, Europe, Southern Russia, China, Japan, Burma, Sri Lanka and Northern USA.²¹

Ethnobotany: The rhizomes are used to cure several disease like fever, asthma, cough and bronchitis. Decoction used as carminative and digestive problems.²¹

Diuretic activity: The ethanol extract of rhizome of *Acorus calamus* administered into albino rats. Thirty albino Wister rats divided into five groups consisting of six rats in each group. Control group receives carboxy methylcellulose (10 ml/kg), standard receives furosemide (15 ml/kg), group III- V receives ethanol extract of *Acorus calamus* orally at a dose of 250, 500 and 750 mg/kg. 7 hour later urine volume collected. Na⁺, K⁺ determined by flame photometry and compared with standard and control. The ethanol extract of *Acorus calamus* at the dose of 750 mg/ kg show significant increase in urine, Na⁺, K⁺ excretions compared to control and standard group.²²

***Crocus sativus* (Iridaceae)**

Crocus sativus herbaceous perennial plant with 10 to 25 cm in height. Saffron has two types of roots: fibrous and thin root at the base of mother bulb. Leaves are very narrow and dark green in colour vary from five – eleven per bud. Flowers are composed of six petals with purple colour. Flowers are protected by whitish membranous bracts. The pistil is composed of an inferior ovary. Stigma composed of three filaments of intense red colour. Its origin in the Middle East, Central Asia or the Islands of South West Greece. It spread to India, China and Middle East.²³

Ethnobotany: Saffron used as antidepressant, treating sexual dysfunction, Antioxidant, Anticarcinogenic, Antispasmodic, Anti- inflammatory and analgesic²³

Diuretic activity: diuretic activity evaluated by aqueous extract of dried stigma of *Crocus sativus* in rats. The extract administered orally at the dose of 60, 120 and 240 mg/kg, compared with Hydrochlorothiazide (10 mg/kg) as standard drug and normal saline as control. Then total urine volume, urine electrolyte concentration such as sodium, potassium, creatinine and urine concentration are measured. The extract at the dose of 120 and 240 mg/kg shows higher urine output compared to control group. Hydrochlorothiazide (10 mg/kg) shows 35.67 ± 3.73 ml and

extract at 240 mg/kg shows 28.39 ± 1.9 ml. The value indicates they produce action similar to furosemide.²⁴

***Withania aristata* (Solanaceae)**

It is one of the most precious evergreen branched shrub and grows up to 30-60 cm. Flowers are small, Green and bell shaped. The ripe fruit is orange red in colour. Mainly distributed in subtropical and semi areal regions. In India it grows in Uttar Pradesh, Maharashtra, and Madhya Pradesh²⁵.

Ethnobotany: Roots and herbs are mainly used as tonic, sedative, diuretic, antiulcer, anti-stress, anti-inflammatory, anti-tumor properties and used to treat various disease associated with nerve tissue damage, heart disease, atherosclerosis, cancer and aids.²⁵

Diuretic activity: leaves of flowering and immature fruiting *Withania aristata* extracts used to evaluate diuretic activity in Male albino Sprague-Dawley rats (180-200 g). First, Rats are divided into seven groups of eight animals per each. Five groups of rats were orally administered 5 ml/kg of the fractions of *Withania aristata*. One group receives hydrochlorothiazide (10mg/kg) and control received normal saline. Urine collected at two hour interval for eight hours. Then electrolyte like Na⁺, K⁺, Cl⁻ concentration, pH, density, and conductivity are measured. Na⁺, K⁺, Cl⁻ concentration determined by flame photometry. All the different fractions of *Withania aristata* produce an increase in the urinary volume excretion, except the fraction of n-hexane, because that produced a small increase in urine volume. The study proved that polarity of solvents increased with increased with increase in urine volume. Fraction of methanol: H₂O produced a notable and highly significant increase in urinary excretion (25%) compared to control, but similar to reference drug²⁶.

***Cyclea peltata* (Menispermaceae)**

It is a slender much branched twinning shrub, usually climbing up on tall trees. Roots are tuberous, cylindrical, grayish brown in colour. Fruits are drupaceous reniform in nature. Leaves are simple, petioles are long, alternate and 2-5 cm long. Flowers are small, greenish yellow in colour. Plants have pungent smell, bitter in taste. *Cyclea peltata* mainly distributed in India to Malaysia, Including Srilanka, Andaman and Nicobar islands. In India mainly found Karnataka, Tamilnadu, Maharashtra and Kerala²⁷.

Ethnobotany: one of the widely used folk medicine for the treatment of cough, fever, kidney disorder, urinary disorder and snake poisoning. In tribes mainly used to treat chickenpox, diarrhea, wounds, and scabies. Leaves are used coolant, antidandruff, antipyretic and diuretic²⁸.

Diuretic activity; diuretic activity of ethanolic extract of *Cyclea peltata* determined by using Lipschitz method. Initially Wister rats divided into six groups of six animals each. Furosemide (20mg/kg) used as standard. Control receives as saline. Group III and group IV receives petroleum extract (200 mg/kg and 300 mg/kg). Group V and VI received oral ethanolic extract of *Cyclea peltata* 200mg/kg, 300 mg/kg. Five hours later urine collected and volume of urine, electrolytes are estimated. Na⁺, K⁺ are estimated by flame photometry. The Cl⁻ ion concentration was estimated by titration with AgNO₃ using 5 % potassium chromate solution as indicator. Ethanolic extract of *Cyclea peltata* at 200 and 300 mg/kg produce urine volume 6.94 ml/kg and 9.73 ml/kg compared to petroleum ether extract (urine volume of 3.65 and 3.93 ml). Ethanolic extract of *Cyclea peltata* showed more rapid and higher excretion of urine than petroleum ether extract based on the pattern of excretion of H₂O, Na⁺ and K⁺. It appears that active principle present in these two extracts having furosemide like activity.²⁸

***Spilanthus acmella* Murr (Compositae)**

It is an annual or short lived perennial herb grows up to 20-60 cm tall. Stems are prostrate or ascending, branched, cylindrical and hairy in nature. Leaves are simple and opposite without stipules. Flowers are Non-fragrant yellow in colour with five petals. Herbs are mainly distributed in India, Sri Lanka and other topical countries. Commonly found in moist places²⁹.

Ethnobotany: Traditionally in Sri Lanka cold infusion of flowers of *Spilanthus acmella* used as potent diuretic and it have anti urolithiatic activity. Flowers are used in the form of a tincture for toothache and to stimulate flow of saliva. It is also used for paralysis of tongue and sore mouth in children. Flowers are used for itching and psoriasis.²⁹

Diuretic activity: diuretic activity study conducted in male albino rats. Animals are divided into five group's six animals per each. Group I and II treated with distilled water and 13 mg/kg of furosemide. Group III, IV, V are treated with 500, 1000, 1500 mg/kg of extract. 5 hours later urine collected. pH determined by pH meter. Na⁺ and K⁺ levels determined by flame photometry. Osmolality determined by Osmometer. Specific gravity, glucose and proteins are estimated. Higher dose of extract increase cumulative urine output. Finally, these study proved that *Spilanthus acmella* mainly act as a loop diuretic.²⁹

***Ajuga remota* Benth (Lamiaceae)**

Ajuga remota plant grows up to 5-50 cm tall. Leaves are opposite and attractive. Flowers are blue, purple or yellow in colour. Petals are fused in upper and lower lip. Mainly found in Africa, Asia, China and Kenya³⁰.

Traditionally used as an herbal remedy for fever, infection, malaria and mycobacterial infection.³⁰

Diuretic activity: aqueous and 80% methanol extracts of *Ajuga remota* leaves in mice are carried out by evaluate diuretic activity. Male albino mice are divided into eight groups each consist of eight male mice for diuretic test. One group treated with normal saline as control. Furosemide (10 mg/kg) used as positive controls. Three groups are treated with aqueous extract doses like 250 mg/kg, 500 mg/kg, 1000 mg/kg. Remaining three groups are treated with hydro alcoholic extract of 250 mg/kg, 500 mg/kg and 750 mg/kg doses. Urine then collected and measured 1,2,3,4 and 5 hour after dosing. Sodium and potassium determined by flame photometry. Chloride concentration measured by using Ion selective electrode analyzer. pH of the urine determined by using pH meter. Study results show that compared to methanol extract, the aqueous extract produced a better diuretic effect. Lower dose of both extract did not produce significant effect. Highest dose of both extract produce similar action to furosemide. Aqueous extract have diuretic activity even more than the standard drug. The highest dose of extract also possess significant increase in electrolyte excretion.³¹

***Vepris heterophylla* (Rutaceae)**

Vepris heterophylla plant belongs to the family Rutaceae. Mainly found in Africa, Cameroon, Ghana, Mali.

Traditionally used for malaria, arterial hypertension, cardiovascular disorders and edematous disorder.³²

Diuretic activity: aqueous extract of leaves of *Vepris heterophylla* were administered into Wister rats by evaluate diuretic activity. The extract at doses 50 mg/kg, 100 mg/kg, 150 mg/kg, 200 mg/kg, 250 mg/kg administered into five groups. Group I and group II receives standard drugs like furosemide (5 mg/kg) and hydrochlorothiazide (10 mg/kg). Control group receives normal saline. Finally urine volume collected by determine diuretic activity. Results indicates extract at doses ranging from 150-250 mg/kg caused significant increase in urine volume and electrolyte excretion. Aqueous extract at higher dose produce diuretic effect similar to standard drugs like furosemide and hydrochlorothiazide.³²

***Euphorbia granulata* (Euphorbiaceae)**

Roots are typical taproot system. Primarily root is cylindrical in shape and lateral roots are arising and spreading below the ground. Stems are cylindrical in shape and reddish or green in appearance. Leaves are simple with very short petiole. These may be green or red in colour. Flowers are monoecious, androecium and gynoecium are assembled. Seeds are reddish brown in colour It is native to north and tropical Africa, Iran, Pakistan, Palestine, North India, Afghanistan, Japan and China.

Ethnobotany: latex of *Euphorbia granulate* internally used to expel intestinal worms and externally for snake bite and scorpion stings. Latex used as purgative, anthelmintic, diuretic as well as blood purifying characters also show inhibitory effect against HIV- Protease³³.

Diuretic activity: diuretic activity of aqueous methanolic extract of *Euphorbia granulata* determined by study conducted in albino rats. Rats are divided into five groups. Group I treated with normal saline as control. Group II treated with standard drug like furosemide (10 mg/kg) and Group III, IV, V treated with three doses of extract like 30 mg/kg, 50 mg/kg, 100 mg/kg. Urine volume was measured after 6 and 10 hour interval and monitored. Sodium, potassium determined by flame photometer and pH determined by pH meter. Extract at dose 100 mg/kg shows (3.7 ± 0.4 ml) diuresis compared with furosemide (4.1 ± 0.4 ml). Lower dose of extract (50 mg/kg) also showed significant diuretic activity (3.4 ± 0.5 ml). Plant extract significantly enhanced the excretion of electrolyte compared to furosemide.³³

DISCUSSION

One of the important and well documented use of herbal medicine as diuretic agents. Diuretics are mainly associated in clinical conditions like edematous disorder including congestive heart failure, hepatic cirrhosis, nephrotic syndrome, renal insufficiency, hypertension in kidney disease, diabetes insipidus, glaucoma, metabolic alkalosis. Diuretics are acts by impairing sodium reabsorption in the renal tubules and increasing the excretion of electrolytes. Synthetic diuretics have major drawbacks like increasing costs and side effects. So, the replacement of herbal medicine instead of synthetic medicine will ensure quality of life. The active constituents like alkaloids, glycosides, coumarin, flavonoids, terpenoids are responsible for the diuretic activity. Medicinal plants diuretic activity study mainly conducted by Lipschitz method. The plants like *Hibiscus sabdariffa*, *Mimosa pudica*, *Smilax canariensis*, *Tribulus terrestris*, *Peganum harmala*, *Ampelozizyphus amazonicus*, *Desmostachya bipinnata*, *Thymus serrulatus*, *Moringa stenopetala*, *Acorus calamus*, *Crocus sativus*, *Withania aristata*, *Cyclea peltata*, *Spilanthus acmella*, *Ajuga remota*, *Vepris heterophylla*, *Euphorbia granulate* possess significant diuretic activity. The diuretic activity study proved that majority of plant extract possess diuretic activity similar to standard drug furosemide. Herbal medicines are easily available and no side effects associated compared to synthetic medicine.

CONCLUSION

This review summarize diuretic activity study of medicinal plants in animals their by evaluate diuretic activity. Plant extract obtained by various solvents like chloroform, alcohol, acetate, water, methanol and ethanol. Lipschitz method is most commonly used for testing diuretic activity in rats.

This study concluded that plant extract possess diuretic activity similar to standard drug furosemide. Polarity of solvents increases with increase in diuretic activity and electrolyte excretion. Also, extract dose increase with increase in activity. Herbal medicine are more safe and effective. This review provide knowledge regarding medicinal plants possess diuretic activity.

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