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**DIURETIC HERBS ON SIDDHA SYSTEM OF MEDICINE - A REVIEW**

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**ABSTRACT**

Diuretic is a substance that promotes the production of urine. All diuretics increase the excretion of water from bodies. In general, diuretics are used to treat heart failure, liver cirrhosis, hypertension and certain kidney diseases. They are classified into High ceiling or Loop diuretic, Thiazides, Carbonic-anhydrase inhibitors, Potassium-sparing diuretics, Calcium-sparing diuretics, Osmotic diuretics and Low ceiling diuretics. The main adverse effects of diuretics are hypovolemia, hypokalemia, hyperkalemia, hyponatremia, metabolic alkalosis, metabolic acidosis and hyperuricemia. Siddha system is a unique Indian System of Medicine which is followed by the people of South India giving promising results in managing diseases like Renal failure, Renal calculi, Liver failure, Hypertension etc. The aim of this review is to highlight the work on diuretics of Siddha plant origin. Many Siddha herbs have diuretic property and also lithotriptic, hepato-protective and haematinics which also related to diuresis. The use of safety Siddha herbal products in healthcare is growing because of society's interest. This review may give a good reference in selection of medicinal plant for diuretics.

**KEY WORDS**

Hydrochlorothiazide, Furosemide and Traditional Indian Medicine.

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**INTRODUCTION**

Siddha herbs constitute an effective source for maintaining health in South India. Siddha, literally meaning the "science for soul and longevity" in olden Tamil, is the one of the oldest healing system of India, based on way of life, diet and herbs. Indian medicinal plants and their products are used to control the various types of diseases such as bronchitis, pneumonia, diarrhoea and ulcer. In Siddha system of medicine there are more than 600

plants are quoted in the literatures. In that around 120 plants have diuretic property according to the Siddha texts. The main thing regarding Siddha herbs they not only have single activity but also have some related activities. For example according to the Siddha text *Aerva lanata* is not only a diuretic it also have lithotriptic action which is important for the use of renal calculi<sup>1</sup>. Like that all the herbs contain related activities. This is why the Siddha herbs are still in practice in this modern world. Because of this we do not need more and more herbs to be used for a single disease. Siddha herbs are widely available, so we can avail them in very cheap rate a priceless use. But in concern with the modern society it is important to give a scientific validation of use of herbs for health purpose. In large number of countries human population depends on medicinal plants for treating various illnesses as well as source of livelihood. One of the main advantages of using medicinal plants is that, these do not produce or cause any side effects when compared with synthetic drugs, because medicinal plants have high content of antioxidant compounds<sup>2</sup>. Using herbs for all over the globe the scientific validation is the key part. Now the incidence of life style disorders and Non-communicable diseases such Hypertension, Chronic renal failure, Liver diseases, Myocardial infarction is high. In these diseases diuretics have the key role for homeostasis. But like modern diuretics still Siddha diuretics are not classified whether they are loop diuretic or osmotic diuretic etc. This review dealt with the various diuretics used in Siddha system and their scientific validation.

### **Diuretics**

Diuretic is a substance that promotes the production of urine. This includes forced diuresis. There are several categories of diuretics. All diuretics increase the excretion of water from bodies, although each class does so in a distinct way. Alternatively, an antidiuretic such as vasopressin is an agent or drug which reduces the excretion of water in urine.

### **Therapeutic uses**

In medicine, diuretics are used to treat heart failure, liver cirrhosis, hypertension and certain kidney diseases. Some diuretics, such as acetazolamide,

help to make the urine more alkaline and are helpful in increasing excretion of substances such as aspirin in cases of overdose or poisoning. Diuretics are often abused by sufferers of eating disorders, especially bulimics, in attempts at weight loss.

The antihypertensive actions of some diuretics (thiazides and loop diuretics in particular) are independent of their diuretic effect. That is, the reduction in blood pressure is not due to decreased blood volume resulting from increased urine production, but occurs through other mechanisms and at lower doses than that required to produce diuresis. Indapamide was specifically designed with this in mind, and has a larger therapeutic window for hypertension (without pronounced diuresis) than most other diuretics.

### **TYPES**

#### **1. High ceiling/loop diuretic**

High ceiling diuretics may cause a substantial diuresis – up to 20% of the filtered load of NaCl (salt) and water<sup>3</sup>. Examples of high ceiling loop diuretics are furosemide, ethacrynic acid and torsemide.

#### **2. Thiazides**

Thiazide-type diuretics such as hydrochlorothiazide act on the distal convoluted tubule and inhibit the sodium-chloride symporter leading to retention of water in the urine, as water normally follows penetrating solutes.

#### **3. Carbonic anhydrase inhibitors**

Carbonic anhydrase inhibitors inhibit the enzyme carbonic anhydrase which is found in the proximal convoluted tubule. This results in several effects including bicarbonate retention in the urine, potassium retention in urine and decreased sodium absorption. Drugs in this class include acetazolamide and methazolamide.

#### **4. Potassium-sparing diuretics**

These are diuretics which do not promote the secretion of potassium into the urine; thus, potassium is retained and not lost as much as with other diuretics. The term almost always refers to two specific classes that have their effect at similar locations:

- Aldosterone antagonists: spironolactone, eplerenone and potassium canrenoate.
- Epithelial sodium channel blockers: amiloride and triamterene.

#### 5. Calcium-sparing diuretics

The term "calcium-sparing diuretic" is sometimes used to identify agents that result in a relatively low rate of excretion of calcium.<sup>4</sup> The thiazides and potassium-sparing diuretics are considered to be calcium-sparing diuretics.<sup>5</sup> In contrast, loop diuretics promote a significant increase calcium excretion.<sup>6</sup> This can increase risk of reduced bone density.<sup>7</sup>

#### 6. Osmotic diuretics

Compounds such as mannitol are filtered in the glomerulus, but cannot be reabsorbed. Their presence leads to an increase in the osmolarity of the filtrate. To maintain osmotic balance, water is retained in the urine.

#### 7. Low ceiling diuretics

The term "low ceiling diuretic" is used to indicate a diuretic has a rapidly flattening dose effect curve (in contrast to "high ceiling", where the relationship is close to linear). It refers to a pharmacological profile, not a chemical structure. However, certain classes of diuretic usually fall into this category, such as the thiazides.<sup>8</sup>

#### Adverse events

The main adverse effects of diuretics are hypovolemia, hypokalemia, hyperkalemia, hyponatremia, metabolic alkalosis, metabolic acidosis and hyperuricemia.<sup>9</sup>

#### *Cynodon dactylon*

The extract of *Cynodon dactylon* was evaluated for its diuretic activity at the dose of 1.25ml and 2.5ml/kg in Guinea Pig models. Hydrochlorothiazide 2.5ml/kg was used as a standard drug. All the drugs were administered and diuretic activity was evaluated. After 5h of drug administration urine volume, sodium, potassium and chloride were estimated. 2.5ml/kg plant administered groups showed high urine output, sodium, potassium and chloride extraction compared to other groups. From the study, it was finalised that *Cynodon dactylon* have diuretic activity when compared to standard drug<sup>11</sup>.

#### *Solanum nigrum*

The chloroform and ethanol extracts of the leaf of *Solanum nigrum* were investigated to assess its diuretic effect in normal rats. Chloroform and ethanol extracts of *Solanum nigrum* were administered to experimental rats orally at doses of 250 mg/kg p.o. Furosemide (25 mg/kg i.p) was used as positive control in study. The diuretic effect of the extracts was evaluated by measuring urine volume, sodium, choride and potassium content. Urine volume was significantly increased by the two doses of chloroform and ethanol extracts in comparison to control group. While the excretion of sodium was also increased by both extracts of the *Solanum nigrum*. The diuretic effect of the extracts was comparable to that of the reference standard (furosemide) and the extracts had the additional advantage of a potassium-conserving effect. So, it was concluded that the extracts of *Solanum nigrum* have significant diuretic effect in experimental rats<sup>12</sup>.

#### *Boerhavia diffusa*

The study was aimed at evaluating the diuretic effect of aqueous extract of *Boerhaavia diffusa* roots. Aqueous extract of *Boerhaavia diffusa* was administered to experimental rats orally at the doses of 300mg/kg, frusemide 10mg / kg was used as a standard. The diuretic effect of the extract was evaluated by measuring urine volume, sodium, potassium and chloride content by electrolyte analyzer. Urine volume was significantly ( $P < 0.0001$ ) increased by aqueous extract in comparison to control group, excretion of Na, K & Cl was also significantly ( $P < 0.0001$ ) increased. The diuretic effect of the extract was comparable to that of the reference standard. Aqueous extract of *Boerhaavia diffusa* produced a notable diuretic effect<sup>13</sup>.

#### *Hygrophila auiculata*

The study was carried out to investigate the diuretic properties of the seeds of *Hygrophila auriculata* in normal Wistar Albino rats (dose- 300 mg/kg and 500 mg/kg p.o.) for diuretic activity by measuring the total urine output over 24hrs and electrolytes (Sodium, Potassium and Chloride) estimation in Wistar rats. Frusemide (20 mg/kg, p.o), a high

ceiling diuretic served as positive control. The urine volume was  $3.33 \pm 0.13$  ml,  $9.12 \pm 0.25$  ml,  $3.1833 \pm 0.15$  ml and  $5.52 \pm 0.18$  ml for control, frusemide, extract at 300mg/kg and 500mg/kg dose respectively. There was significant increase in sodium, potassium and chloride ion excretion in the 500mg/kg alcohol extract as compared to control group ( $107 \pm 2.11$  m.mol/L,  $55 \pm 4.09$  m.mol/L &  $87.33 \pm 2.33$  m.mol/L respectively) ( $P < 0.001$ ). So, it was concluded that the alcoholic extract of *H.auriculata* have significant diuretic property<sup>14</sup>.

#### ***Hemidesmus indicus***

Root part of this plant is commonly used as tonic, alternative, blood purifier, diaphoretic, diuretic and skin diseases. Crude hydro-ethanolic extract of root of *Hemidesmus indicus* was evaluated for its diuretic activity by Lipschitz model in a dose of 250 and 500 mg/kg body weight by oral route. The trial drug showed significant ( $p < 0.01$ ) increase in urine volume along with increased excretion of sodium, potassium, creatinine and chloride ions as compared to control group. It showed delayed diuretic effect (after 4 hours of administration) as compared to furosemide. Thus, study concluded that hydro-ethanolic extract of root of *Hemidesmus indicus* have diuretic potency<sup>15</sup>.

#### ***Aerva lanata***

The diuretic activity of concentrated ethanolic extract of *Aerva lanata* (Linn) on healthy albino rats was studied with frusemide as reference drug. The urine output increased with concentrated ethanolic extract of *Aerva lanata* only. In this case the levels of electrolytes in urine were also increased. But the diuretic activity was mild as compared to frusemide. The concentrated ethanolic extracts were evaluated for the diuretic activity according to the method of Lipschitz. The Na<sup>+</sup> and K<sup>+</sup> ion concentration in the urine samples was determined using Flame Photometer. So, it was concluded that the ethanolic extract of *Aerva lanata* have significant diuretic property<sup>16</sup>.

#### ***Allium cepa***

The study was aimed to explore the diuretic actions of n-butanol extract of *Allium cepa* bulbs in male Westar albino rats. The n-butanol extract of *Allium*

*cepa* was administered at three doses (10, 20 and 30 mg/kg, p.o.) to wistar rats in the present diuretic model. Furosemide, a standard diuretic was used as reference drug. In this study urine volume and urine electrolyte levels were determined. The n-butanol extract of *Allium cepa* bulbs increased urine volume and urine electrolytes excretion with a dose of 20 mg/kg, p.o. The study concluded that n-butanol extract of *Allium cepa* bulbs possesses the acute diuretic activity, thus validating the traditional use of this plant as diuretic<sup>17</sup>.

#### ***Coriandrum sativum***

The aqueous extract of coriander seed was administered by continuous intravenous infusion at two doses (40 and 100 mg/kg) to anesthetized Wistar rats to assess its diuretic activity. Furosemide (10 mg/kg), a standard diuretic was used as the reference drug. The crude aqueous extract of coriander seeds increased diuresis, excretion of electrolytes, and glomerular filtration rate in a dose-dependent way; furosemide was more potent as a diuretic and saluretic. The aqueous extract of *Coriandrum sativum* possesses diuretic and saluretic activity. It was found that the mechanism of action of the plant extract appears to be similar to that of furosemide<sup>18</sup>.

#### ***Commelina diffusa***

The study was undertaken to investigate diuretic effect of aqueous and ethanolic extracts of the stem and leaves of *Commelina diffusa* in rats orally at doses of 200 and 400 mg/kg p.o. Hydrochlorothiazide (10 mg/kg) was used as positive control in study. The diuretic effect of the extracts was evaluated by measuring urine volume, sodium and potassium content. Urine volume was significantly increased in ethanol extracts of *Commelina diffusa* leaves with comparison to control group and the excretion of sodium and potassium was also increased in same extract of *Commelina diffusa* leaves. While there is no significant effect of aqueous extracts of leaves and stem. The diuretic effect of the extracts was comparable to that of the reference standard (hydrochlorothiazide). So it can be concluded that the ethanol extract of *Commelina diffusa* leaves

produced notable diuretic effect and it is comparable with the reference diuretic, hydrochlorothiazide<sup>19</sup>.

**Acorus calamus**

The study was evaluated to know the diuretic activity of ethanolic extract of *Acorus calamus* rhizome (EEAC) in rats at the dose of 750 mg/kg. Treatment with a dose of 750 mg/kg EEAC revealed

significant improvement in urine output as compared to control animals. There was also increase in excretion of sodium and potassium ions in EEAC (750 mg/kg) as compared to control group. So it can be done that the ethanolic extract of *Acorus calamus* Linn. Rhizome possesses significant diuretic activity<sup>20</sup>.

**Table No.1: Adverse effect and symptoms of allopathy medicine**

S.No	Adverse effect	Diuretics	Symptoms
1	Hypovolemia	loop diuretics, thiazides	lassitude, thirst, muscle cramps, hypotension
2	Hypokalemia	acetazolamides, loop diuretics, thiazides	muscle weakness, paralysis, arrhythmia
3	Hyperkalemia	amilorides, triamterenes, spironolactone	arrhythmia, muscle cramps, paralysis
4	Hyponatremia	thiazides, furosemides	CNS symptoms, coma
5	Metabolic alkalosis	loop diuretics, thiazides	arrhythmia, CNS symptoms

**Table No.2: Herbal Diuretics in Siddha Medicine**

S.No	Plant name	Name in Siddha system	Family	Parts used	Other Pharmacological actions quoted in Siddha texts <sup>10</sup>
1	<i>Cyanodon dactylon</i>	Arugampul	Poaceae	Whole plant	Demulcent, Astringent
2	<i>Solanum nigrum</i>	Manathakkali	Solanaceae	Whole plant	Expectorant, Diaphoretic
3	<i>Boerhaavia diffusa</i>	Mookkirattai	Nyctaginaceae	Whole plant	Hepato-protective, Diuretic
4	<i>Hygrophila auriculata</i>	Neermulli	Acanthaceae	Whole plant	Tonic, Demulcent, Coolant
5	<i>Hemidesmus indicus</i>	Nannaari	Asclepiadaceae	Root	Diaphoretic, Demulcent, Tonic
6	<i>Aerva lanata</i>	Sirupeelai	Amaranthaceae	Whole plant	Lithotriptic
7	<i>Allium cepa</i>	Vengayam	Liliaceae	Root tuber	Expectorant, Emmenagogue
8	<i>Coriandrum sativum</i>	Kothamalli	Apiaceae	Whole plant	Stomachic, Carminative
9	<i>Commelina diffusa</i>	Kanamvazhai	Commelinaceae	Whole plant	Febrifuge, Aphrodisiac
10	<i>Acorus calamus</i>	Vasambu	Acoraceae	Root	Anti periodic

## CONCLUSION

Siddha medicinal plants are available throughout India. These are still in day to day practice. A thing which could be less harmful and cost effective only can survive in the hands of ordinary human. Practice of Siddha herbs in India is very ancient one. Because of their safety and cost effective, it is still in use. But getting it to the global community the scientific validation is must. As we before said now days the incidence of NCDs and life style disorders is more than communicable diseases. The money we are spending for NCDs and life style disorders also more and more. The current diuretics have more side effects and post effects. So, for a healthy and wealthy future we have to concentrate research in the Siddha diuretics. So this may be a helpful review for further studies in application of Siddha herbal diuretics in various conditions.

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## CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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