

Antiuro lithiatic activity of phytochemical extracts: A review

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ABSTRACT

Phytochemical extracts are constantly being evaluated for possible antiuro lithiatic activity in a progressive manner. Hyperoxaluria and hypercalciuria are among the major risk factors in pathogenesis of urinary stone formation; evaluation of various medicinal plants are done mainly against calcium oxalate and magnesium ammonium phosphate types of kidney stones, through making use of various experimental models of urolithiasis. Attempt was taken to review the antiuro lithiatic activity of certain herbal extracts to provide information for further research.

Keywords: Medicinal plants, antiuro lithiatic activity, hyperoxaluria

Introduction

Herbal medicines have several phytoconstituents which exert their beneficial effects in urolithiasis by multiple mechanisms. Drugs with multiple mechanisms of protective action may be one way forward in decreasing tissue injury in human disease.^[1]

Urolithiasis denotes stones originating anywhere in the urinary tract including kidneys and bladder. Herbs are used as medicine since time immemorial. Bladder stones form almost exclusively as a result of urinary stasis and recurrent infections due to bladder outlet obstruction or neurogenic bladder.^[2]

Traditional plants are constantly being evaluated for possible antilithiatic activity in a systemic manner. The present-day medical management of urolithiasis is either costly or not without side effects.^[3]

Phytochemical Extracts

Dichrostachys cinerea

Family: *Fabaceae* – *mimosoideae*

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Common names: English - bell mimosa, Chinese lantern tree, Kalahari Christmas tree. Tamil - Vadataram

Parts used: Roots, Shoots

Beneficial effects

Effective in cough, dysentery, diarrhea, fracture, gonorrhea, leprosy, toothache, wounds, and syphilis [Figure 1].

Antiuro lithiatic activity

Dichrostachys cinerea used as phytotherapeutic agent.^[4] The root is astringent and used in rheumatism, urinary calculi, and renal troubles.^[5] The effect of ethanolic and aqueous extract of root of *D. cinerea* was studied for antiuro lithiatic and diuretic



Figure 1: *Dichrostachys cinerea*

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activity at 200 mg/kg dose level in male Wistar albino rats. Ethylene glycol feeding resulted in hyperoxaluria as increased renal excretion of calcium and phosphate.

Supplementation with aqueous and ethanolic extract of plant significantly reduced the elevated urinary oxalate, showing a regulatory action on endogenous oxalate synthesis. Compared to ethanolic extracts, aqueous extract exhibited significant antilithiatic activity. Hyperoxaluria is reported to be a more significant risk factor in the pathogenesis of stone formation.^[6]

Asparagus racemosus

Family name: *Asparagaceae*

Common names: Aherbuli, Asparagus, Asparagus root, Aspergesauvage.

Parts used: Root is used to make medicine; this plant is used in traditional Indian medicine (Ayurveda).

Beneficial effects

- Recommended in ayurvedic texts for prevention and treatment of gastric ulcers, dyspepsia.^[7]
- Used as a galactagogue for the production of breast milk in nursing mothers.
- Used successfully for nervous disorder, inflammation, liver diseases, and certain infectious diseases [Figure 2].

Antiurolithiatic activity

Ethanolic extract of *A. racemosus* is conducted in rats models by inducing urolithiasis by calcium oxalate or ethylene glycol alone or in combination with ammonium chloride is most commonly used to study the pathogenesis of urolithiasis.

After 10 days, blood samples were collected and analyzed for serum concentrations of calcium, phosphorous, urea, and creatinine. The kidneys were removed and sectioned for histopathological examination.



Figure 2: *Asparagus racemosus*

The data were presented as mean standard error of mean and analyzed using one-way analysis of variance histopathological revealed less tissue damage. Increased excretion of phosphorus has been reported in stone formers.^[8]

The ethanolic extract significantly reduced the elevated level of calculogenic ions in urine, and it elevated the urinary concentration of magnesium.^[9]

Saccharum spontaneum

Family: *Gramineae*

Common name: Wild sugarcane, ahlek, loa, wild cane.

Beneficial effects

- Used in urinary tract infection
- Used as a coolant
- Used in bleeding piles [Figure 3].

Antiurolithiatic activity

In a study, the effect of alcoholic extract of *S. spontaneum* against glycolic acid-induced urolithiasis.^[10] Urolithiasis can be produced in rats by induction of acute or chronic hyperoxaluria using a variety of agents such as ethylene glycol, sodium oxalate, ammonium oxalate, hydroxy-L-proline, and glycolic acid. Lithiasis was induced in rats by fed with calculi-producing diet for 28 days with manifested by high urinary calcium and low urinary magnesium content. The results have shown that these species plays a key role in preventing factor associated with kidney stone formation, dissolving urinary stones.

Swertia chirata

Family: *Gentianaceae*

Common name: Chirata



Figure 3: *Saccharum spontaneum*



Figure 4: *Swertia chirata*

Beneficial effects

These drugs possess the tonic properties of gentian and similar bitters. Valued in Hindustan, much employed in urinary complaints with uneasiness in the region of kidneys, frequent urging to urinate, accomplished with difficulty. Much used in cases of uric acid deposits. It is a remedy for convalescence from exhausting sickness and for atonic and nervous forms of dyspepsia [Figure 4]^[11].

Antiuro lithiatic activity

In a study^[12], rats were induced to produce renal stone by providing them 0.75% v/v ethylene glycol in drinking water for 28 days. In addition, methanolic extract of *Swertia chirata* low dose and high dose was administered drug with ethylene glycol for 28 days. After 28 days, the urine, blood, and kidney samples were collected from each animal. Finally, estimation of various levels of promoters, inhibitors, antioxidant parameters is achieved and increased levels of promoters with a decreased level of inhibitors as compared to normal control rats.

Nymphaea alba

Family: *Nymphaeaceae*

Common names: White Lotus, Waterlily, European White Waterlily.

Beneficial effects

Nymphaea alba belongs to the family *Nymphaeaceae*, commonly known as white waterlily, is an aquatic plant with perennial rhizomes. It is used as an aphrodisiac, anodyne, antiscrophulatic, astringent, cardiotonic, demulcent, antioxidant, sedative, and anti-inflammatory.

It also produces calming and sedative effects on the nervous system and is useful in the treatment of insomnia, anxiety, and similar disorders. Its anticarcinogenic action and inhibition of renal oxidative stress and hyperproliferative response were reported [Figure 5]^[12].



Figure 5: *Nymphaea alba*

Antiuro lithiatic activity

In a study, urolithiasis was induced by inserting zinc disc in the urinary bladder which was followed by supplementing 1% ethylene glycol in drinking water. The reduction in weight of the stones was used as criteria for assessing the preventive or curative regimen, ethanolic extract of dried leaves of *N. alba* Linn. was administered orally in Wistar albino rats.^[13] This was evaluated for its antiuro lithiatic potential; the study reported that the oral administration of the *N. alba* Linn. has resulted in significant reduction in the weight of bladder stones compared to the control group used^[13].

Conclusion

Supersaturation of urinary salts and crystal retention in urinary tract are the bases for urinary stone formation. Hyperoxaluria and hypercalciuria can be considered as the major risk factors in the pathogenesis of urinary stone formation; evaluation of various medicinal plants is done against calcium oxalate and magnesium ammonium phosphate types of kidney stones, making use of various experimental models of urolithiasis. With regard to reducing oxalate significant levels in kidney tissue, Phycocyanin a known antioxidant is reported to have potential antiuro lithiatic activity. The present review has provided a preliminary outcome of the use of phytochemical extracts in order to treat and prevent urolithiasis.

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