

Review Article

A REVIEW ON ANTI-UROLITHIATIC ACTIVITY OF HERBAL FOLK PLANTS

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Abstract

Objective: Urolithiasis is a common problem of various centuries with high recurrence. The present review is an attempt to share traditionally used antiurolithiatic plants with their mechanism of action. Chemical principles from herbal sources have become much simpler and have contributed significantly to the development of new drugs from medicinal plants. Urolithiasis is a common disorder expected to occur in approximately 12% of the population, with a recurrence rate of 70-81% in males, and 47-60% in females. It causes serious health problems such as severe pain, urinary tract obstruction and infection that adversely affect well-being of individuals. Treatment option includes like surgical, ureteroscopy, percutaneous nephrostolithotomy (PCNL), and open or laparoscopic stone removal which are costly and painful. Many synthetic drugs used like diuretics and narcotic analgesics are being used in treatment of kidney stone but overuse of synthetic drugs, which produce higher incidence of adverse drug effect, have forced humans to return to nature for safe remedies herbal treatment. **Conclusion:** The present review covered all the information about litholytic medicinal plants. The use of herbal remedies for prevention and cure of ailments is of increasing interest due to the superiority and efficiency of activity provided by natural constituents in herbs and undesirable effects of modern medicine. Evidences prove that natural therapy is more valuable than other available treatments, with lesser side effects, economic nature, no risk of long term fertility and reoccurrence. We covered all potent indigenous herbs which are used in treatment of urolithiasis disease. This review will give the opportunities for the future research and for the development of new antiurolithiatic compounds.

Keywords: Medicinal Plants, Urolithiasis, Adaptogenic, Preclinical studies

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Introduction

Stone formation is one of the painful urologic diseases that occur in around

12% of the global population and its occurrence rate in males is 70-81% and 47-60% in female (Soundararajan et al., 2006).

It is assessed that at least 10% of the population in industrialized part of the world are suffer with the problem of urinary stone formation. The occurrence of the renal calculi is less in the southern part when compared with other parts (Singh et al., 2010). The rate of occurrence is three times more in men than women, due to enhancing capacity of testosterone and inhibiting capacity of oestrogen hormone in stone formation (Devi et al., 1993). It has been found that the development of urinary calculi dates back not only to 4000 B.C in the tombs of Egyptian mummies also in graves of North American Indians from 1500 to 1000 B.C (Bahuguna et al., 2009). The problem of stone formation is careful as a medical challenge due to its multifactorial etiology and high rate of reoccurrence. Stone formation is also caused due to imbalance system of body. From ancient periods, a number of herbal medicines have been established with potential effect in treating the problem of renal calculi (Khan et al., 2010). Scientific studies expose the mechanism action, these antiurolithiatic herbal plants and responsible for at different stages of urolithiasis, such as, the diuretic action increases the quantity of fluid going pass through the kidneys as a consequence flush out the deposits. as a result, the increase in urine volume decreases the saturation of the salts and prevents the precipitation of the crystals at physiological pH. Breaking, disintegration and dissolution of preformed stones (litholytic activity) and binding inhibition among particles to form stones (lithotriptic activity) play an important role in this pathological condition. Crystal inhibitors decrease crystal nucleation, aggregation and growth. Furthermore, they inhibit crystallization by their

adsorption to the crystal surface which makes them unable for renal tubular attachment (crystallization inhibition activity) (Pareta et al., 2011).

Reasons for stone formation diseases

Stone formation usually occur due to insufficient urinary discharge, microbial infection in urinary tract, diet with excess oxalates and calcium, vitamin abnormalities like vitamin A deficiencies, excess vitamin D, and metabolic diseases like hyperthyroidism, cystinuria, gout, intestinal dysfunction etc., (Suman Kumar Mekap 2011). Kidney stone formation or urolithiasis is a complex procedure that occurs due to imbalance between promoters and inhibitors in the kidneys. The factor affecting stone formation are urine output (hence the concentration). The concentration of specific constituent, urine pH, and infection or damage within the urinary tract (Michell et al., 1989).

Pathophysiology of urolithiasis diseases

There are basic two aspects in the pathogenesis of kidney stone like as

- (a) Increased urinary flow of stone forming constituent elements like calcium, phosphorus, uric acid, oxalate and cysteine.
- (b) Physico-chemical change that influence stone formation like pH of urine, stone matrix and protective substance in urine.

For a stone to form within the urinary tract, Urine must be supersaturated for precipitating crystalline component. The agents who can modify nucleation, crystallization, and aggregation, pH of the urine also play important role in stone formation (Malhotra et al., 2008)

Signs and symptoms of urolithiasis diseases

Symptoms like as of kidney stones include- Colicky pain, Nausea/vomiting Hematuria, Pyuria, Dysuria, Oliguria etc.

Diagnosis of urolithiasis diseases

Following technologies used such as x-ray, computed tomography, ultrasound is used to verify the diagnosis and a number of other tests

can be undertaken to help find both the possible cause and consequences of the stone.

Treatment and prevention of urolithiasis diseases

For treatment of urolithiasis various types of procedure is carried out. 1. Surgical treatment like (a) Shock wave treatment which is the only non-invasive treatment for stone disease, (b) Endoscopic process, ureteroscopic and percutaneous nephrolithotomy provides an efficient way to treat stones. The severe nature of renal colic has promoted a lower threshold at which narcotic analgesic, thiazide like diuretic and potassium citrate is prescribed (Orson et al., 2006)

Following foods enhance the risk of calculi formation

1. Fruit juices like Grape fruit juice, cranberry juice, and apple juice and dark colas
2. Organic acids rich foods (oxalates) like spinach, rhubarb, nuts and wheatbran.
3. Animal protein rich foods like meat, eggs and fish
4. Others like vitamin C & D
5. Alcohol, Beer and wine to a little extent as they contain purines High intake of salt

Following foods that inhibit calculi formation

1. Lemon and citrus fruit juice, coffee, tea and citrates rich soft drinks
2. Foods like as radish, beet root and horse gram
3. Low protein diet and rich fiber foods
4. Others like Vitamin E, B6, and magnesium
5. Low salt diets

Available treatments

1. Medicine Therapy

Like as Thiazide diuretics (e.g. Hydrochlorothiazide), Alkali (e.g. Potassium citrate), Allopurinol, Sodium cellulose phosphate (SCP), Penicillamine (Cuprimine), Analgesic (Diclophenac sodium), Bisphosphonates,

Potassium phosphate, Oxalobacter Formigenes and other probiotics etc.

2. Surgical Therapy

Like as Extracorporeal Shock Wave Lithotripsy, Percutaneous Nephrolithotomy, Ureteroscopic stone removal etc.

3. Herbal Therapy

Like as Cystone, Calcure, Chandraprabha bati, Trinapanchamool, Rencare Capsule, Patherina tablet, Ber Patthar Bhasma, Chander Prabha vati etc.

Herbal folk drugs produce following actions such as:

1. Diuretic activity (Beneficial in increasing the urinary volume that allows the easy passage of small calculi out of the body in urine)
2. Crystallization inhibition activity (Helps to inhibit the different stages of stone formation by maintaining the balance between inhibitors and promoters of stone formation)
3. Lithotriptic activity (Avoid binding mucin of calculi to prevent crystal aggregation to form a large stone), analgesic and anti inflammatory activities (Helps to escape the symptoms of stone formation)
4. Anti oxidant activity (Prevent renal tissue injury), Anti microbial activity (Prevent the occurrence of infections) (Charde et al., 2011)
5. Herbs also improve the renal function and regulate oxalate metabolism which help in reducing the re occurrence of renal calculi (Pareta et al., 2011).

Herbal folk drugs used in treatment of urolithiasis

Number of herbal folk drugs shows antiurolithiatic activity and play vital role in prevention of disease. Here an attempt has been made to emphasis on potent indigenous herb for urinary stone (Havagiray et al., 2010).

Table 1. Herbal folk drugs used in treatment of urolithiasis.

Botanical name	Family	Plant part	References
<i>Acalypha indica</i> Linn.	Euphorbiaceae	Whole plant	Sathyaa et al., 2011
<i>Abutilon indicum</i> L.		Leaf juice	Prachi et al., 2009
<i>Achyranthes aspera</i> L.	Amaranthaceae	Roots	Aggarwal et al., 2010
<i>Achyranthes indica</i> Linn.	Amaranthaceae	Roots	Pareta et al., 2011
<i>Aegle marmelose</i> L.Corr.	Rutaceae	Fruit pulp, Leaves.	Ghatapanadi et al., 2010
<i>Aerva lanata</i> L.	Amaranthaceae	Whole plant	Soundararajan et al., 2006
<i>Ageratum conzoides</i> L.	Asteraceae	Whole plant	Khan et al., 2011
<i>Alhagi mannifera</i> Desv (L.) Juzepcz.	Fabaceae	Roots	Choubey et al., 2010
<i>Alismatis rhizome</i> (Sam.)	Alismataceae	Whole plant	Koji et al., 1999
<i>Amaranthus caudatus</i> L.	Amaranthaceae	Leaves	Sharma et al., 2011
<i>Amaranthus spinosus</i> L.	Amaranthaceae	Roots	Sharma et al., 2011
<i>Amaranthus viridis</i> L.	Amaranthaceae	All parts	Sharma et al., 2011
<i>Ammannia baccifera</i> Linn	Lythraceae	Leaves	Prasad et al., 1994
<i>Amni visnaga</i> (L.) Lam	Apiaceae	Whole plant	Yadav et al., 2011
<i>Argemone maxicana</i> L.	Papaveraceae	Roots	Ghatapanadi et al., 2010
<i>Armoracia lopathifolia</i> Gilib.	Cruciferae	Seeds	Choubey et al., 2010
<i>Asperagus racemosus</i> Willd.	Asperagaceae	Roots	Kumar et al., 2009
<i>Asphodelus tenuifolius</i> Cav.	Liliaceae	Leaves	Sharma et al., 2011
<i>Barbarea vulgaris</i> R.Br.	Brassicaceae	Roots, Leaves	Choubey et al., 2010 and Garg et al., 2016.
<i>Benincasa Hispida</i> (Thumb)	Cucurbitaceae	Seeds	Patel et al., 2011
<i>Berberis vulgaris</i> L.	Berberidaceae	Root bark	Bashir et al., 2010
<i>Bergenia ciliata</i> Wall.	Saxifragaceae	Rhizomes	Saha et al., 2011
<i>Bergenia ligulata</i> Wall.	Saxifragaceae	Rhizomes	Harsoliya et al., 2011
<i>Beta vulgaris</i> L.	Amaranthaceae	Roots	Sharma et al., 2011
<i>Bombex ceiba</i> Linn.	Bombacaceae	Stem and bark	Sharma et al., 2011
<i>Borrhaavia diffusa</i> L.	Nyctaginaceae	Root	Prachi et al., 2009
<i>Bridelia crenulata</i> Roxb.	Euphorbiaceae	Stem bark	Singh et al., 2007
<i>Bryophyllum calycinum</i> Salisb.	Crassulaceae	Leaves	Singh et al., 2007
<i>Bryophyllum pinnatum</i> (lamk.) oken.	Crassulaceae	Fresh leaf juice	Prachi et al., 2009
<i>Caesalpinia huga</i> L.	Caesalpinioideae	Root	Chitme et al., 2010
<i>Capsella bursapastor</i> L. Medik	Brassicaceae	Entire herb	Choubey et al., 2010
<i>Cassia fistula</i> L.	Caesalpinioideae	Fruits	Ghatapanadi et al., 2010
<i>Cedrus deodara</i> Roxb.	Pinaceae	Heart wood	Ramesh et al., 2010
<i>Ceropegia bulbosa</i> Roxb.	Asclepidaceae	Tubers	Sharma et al., 2011
<i>Chenopodium album</i> Linn.	Chenopodiaceae	Leaves	Sharma et al., 2011

Corbichonia decumbens Forrsk.(Jack).	Molluginaceae	Leaves	Sharma et al., 2011
Costus speciosus Koen.	Costaceae	Tubers	Sharma et al., 2011
Costus spiralis (jacq) Roscoe	Zingiberaceae	Whole plant	Araujo viel et al., 1999
Crateava nurvula Buch-Ham	Capparaceae	Bark	Prachi et al, 2009
Cucumis sativus L.	Cucurbitaceae	Leaves	Choubey et al., 2010
Cyclea peltata Lam	Menispermaceae	Root	Christina et al.,2002
Cynodon dactylon Linn.	Poaceae	Root	Prachi et al., 2009
Daucus carota Linn.	Apiaceae	Gajar juice	Prachi et al., 2009
Desmodium styracifolium(osbeck) Merr.	Leguminosae	Whole plant	Hirayama et al., 2008
Dichrostachys cinerea L.	Mimosaceae	Root	Jayakumari et al., 2011
Didymocarpus pedicellata Roxb.	Gesneriaceae	Leaves	Singh et al., 2007
Digera muricata L.	Amaranthaceae	Leaves	Sharma et al., 2011
Diospyros melaoxylon Roxb.	Ebenaceae	Fruit, Flower and bark	Sharma et al., 2011
Dolichous biflorus L.	Fabaceae	Seeds	Singh et al., 2010
Eleusine coracana Gaertn.	Poaceae	Grains	Bahuguna et al., 2009
Equisetum debile Roxb.	Equisetaceae	All parts	Sharma et al., 2011
Ficus carica L.	Moraceae	Fruit, Latex	Choubey et al., 2010
Gomphrena celosioides Mart.	Amaranthaceae	Whole plant	Sharma et al., 2011
Grewia flavescens A. Juss	Tiliaceae	Roots	Sharma et al., 2011
Helianthus annus Linn	Asteraceae	Leaves	Khan et al., 2010
Helichrysum plicatum DC.	Asteraceae	Flowers	Bayir et al., 2011
Herniaria hirsute Linn	Illecebraceae	Whole plant	Yadav et al., 2011
Homonoia riparia Lour.	Euphorbiaceae	Root	Chitme et al., 2010
Ichnocarpus frutescens L.	Apocynaceae	Roots	Anbu et al., 2011
Lantana camara Linn	Verbenaceae	Leaves	Mayee et al., 2011
Lawsonia inermis Linn	Lythraceae	Leaves	Kore et al., 2011
Macrotyloma uniflorum Lam.	Fabaceae	Seeds	Chaitanya et al., 2010
Mentha piperita L.	Lamiaceae	Entire herb	Choubey et al., 2010
Mimusops elengi L.	Sapotaceae	Bark	Purnima Ashok et al., 2011
Momordica charantia Linn	Cucurbitaceae	Fruits	Shah et al., 2011
Moringa oleifera Lam	Moringaceae	Pods, Bark, Root wood.	Vijayalakshmi et al., 2010
Musa bulbisiana Colla.	Musaceae	Roots	Prachi et al., 2009
Musa paradisiaca Linn	Musaceae	Ripe kernel juice	Devi et al., 1993
Nigella sativa L.	Ranunculaceae	Seeds	Harsoliya et al., 2011

<i>Olea europaea</i> L.	Oleaceae	Oil	Choubey et al., 2010
<i>Ocimum sanctum</i>	Lamiaceae	Leaves	Garg et al., 2016
<i>Parmelia perlata</i> L.	Parmeliaceae	Dried lichen	Chitme et al., 2010
<i>Paronychia argentea</i> Lam.	Caryophyllaceae	Aerial parts	Bouanani et al., 2010
<i>Pedaliium murex</i> Linn.	Pedaliaceae	Fruits	Anantha et al., 2011
<i>Pergularia daemia</i> Forssk.	Asclepiadaceae	Whole plant	Vyas et al., 2011
<i>Phyllanthus fraternus</i> Webster.	Euphorbiaceae	Whole plant	Ghatapanadi et al., 2010
<i>Phyllanthus niruri</i> L.	Euphorbiaceae	Whole plant	Mirian et al., 2010
<i>Pimpinella anisum</i> L.	Apiaceae	Fruit	Choubey et al., 2010
<i>Pinus eldarica</i> Medw.	Pinaceae	Fruits	Hosseinzadeh et al., 2010
<i>Plantago major</i> L.	Plantaginaceae	Whole plant	Sharifa Abdul Aziz et al., 2005
<i>Pyracantha crenulata</i> Roem.	Rosaceae	Fruit	Bahuguna et al., 2009
<i>Pyracantha crenulata</i> (Hance) Rehder	Rosaceae	Leaves	Yadav et al., 2011
<i>Raphanus sativus</i> Linn	Cruciferae	Bark	Vargas et al., 1999
<i>Ricinus communis</i> Linn.	Euphorbiaceae	Root	Sharma et al., 2011
<i>Rosmarinus officinalis</i> L.	Lamiaceae	Leaves	Choubey et al., 2010
<i>Rotula aquatica</i> Lour.	Boraginaceae	Roots	Gilhotra et al., 2011
<i>Rubia cordifolia</i> L.	Rubiaceae	Roots	Divakar et al., 2010
<i>Santalum album</i> L.	Santalaceae	Oil	Choubey et al., 2010
<i>Sesamum indicum</i> L.	Pedaliaceae	Tender leaves	Ghatapanadi et al., 2010
<i>Sesbania grandiflora</i> L.	Fabaceae	Leaf juice	Sujatha Doddola et al., 2008
<i>Solanum Indicum</i> Linn.	Solanaceae	Roots	Prachi et al., 2009
<i>Solanum surattense</i> Burn.	Solanaceae	Roots	Sharma et al., 2011
<i>Solanum xanthocarpum</i> Schrad & Wendi.	solanaceae	Berries	Patel et al., 2010
<i>Tamarindus indica</i> Linn.	Fabaceae	Fruit pulp	Kumar et al., 2009
<i>Terminalia arjuna</i> Roxb.	Combrataceae	Bark	Chaudhary et al., 2010
<i>Tinospora cordifolia</i> Willd (L.)	Menispermaceae	Stems	Ghatapanadi et al., 2010
<i>Trachyspermum ammi</i> L.	Umbelliferae	Seeds	Kaur et al., 2009
<i>Trianthema portulacastrum</i> Linn.	Ficoideae	Fresh leaf juice	Prachi et al., 2009
<i>Tribulus terrestris</i> L.	Zygophyllaceae	Fruits, Roots	Satish et al., 2010
<i>Tridax procumbens</i> L.	Asteraceae	Whole plant	Sailaja et al., 2011
<i>Tubiflora acaulis</i> L.F Kuntze.	Acanthaceae	Leaves	Sharma et al., 2011
<i>Zea mays</i> Linn.	Poaceae	Decoction of styles obtained from female inflorescence or immature cells.	Prachi et al., 2009

Zingiber officinale Rosc.

Zingiberaceae

rhizomes

Prachi et al., 2009

Conclusion

The present review covered all the information about litholytic medicinal plants. The use of herbal remedies for prevention and cure of ailments is of increasing interest due to the superiority and efficiency of activity provided by natural constituents in herbs and undesirable effects of modern medicine. Evidences prove that natural therapy is more valuable than other available treatments, with lesser side effects, economic nature, no risk of long term fertility and reoccurrence. As there are no satisfactory drugs in modern medicine, herbal remedies are proved to exert their effectiveness at different stages of stone pathophysiology, the plant based therapy is used as addition therapy for better relief. Supplementary research is needed to identify active principles from medicinal plants to evaluate their dosage and quality control, and investigate their interactions and adverse effects. Many herbs themselves possess inhibitory activity against crystallization. According to literature survey Kidney stone formation has been found to those people who were not taken food timely or irregular life style. The anti oxidant activity of the herbs also help in preventing the urolithiatic renal cell damage. Although use of herbal medicine is popular from traditional periods because of their potent activity and safety, it is of great importance to carry out further research to understand the pathophysiology of disease, mechanism of action of herbal medicines in order to develop an efficient and safe litholytic agent.

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