

	International Journal of	<h1>Innovative Drug Discovery</h1>	e ISSN 2249 - 7609 Print ISSN 2249 - 7617
www.ijidd.com			

POTENT HERBAL WEALTH WITH LITHOLYTIC ACTIVITY: A REVIEW

Jyothi M Joy*, S Prathyusha, S Mohanalakshmi, AVS Praveen Kumar, CK Ashok Kumar

*Department of Pharmacognosy, Sree Vidyanikethan College of Pharmacy, Tirupathi-Andhra Pradesh, India.

ABSTRACT

The most painful urologic disorder is calculi or stone formation in the kidneys and urinary bladder due to imbalance between promoters and inhibitors of crystallization in urine. Stone formation is documented from traditional periods and is considered as a medical challenge due to its multifactorial etiology. Stone formation commonly occur due to inadequate urinary drainage, foreign bodies in urinary tract, microbial infections, 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., Herbal remedies are gaining their importance due to inefficiency of standard pharmaceutical drugs, and reoccurrence is possible by treating with ultrasonic energy and surgery. As investigations proved that phytotherapy is potent in preventing and curing renal calculi with less side effects and produced satisfactory results in preventing reoccurrence of renal stones, the present study is mainly focused on providing information on potent herbal wealth with litholytic property.

KEY WORDS: Litholysis, Crystallization, Phytotherapy, Renal calculi, Herbal wealth.

INTRODUCTION

Stone formation is one of the painful urologic disorders that occur in approximately 12% of the global population and its re-occurrence rate in males is 70-81% and 47-60% in female [1]. It is assessed that atleast 10% of the population in industrialized part of the world are suffering with the problem of urinary stone formation. The occurrence of the renal calculi is less in the southern part when compared with other parts [2]. The rate of occurrence is three times higher in men than women, because of enhancing capacity of testosterone and inhibiting capacity of oestrogen in stone formation [3]. It has been found that the formation 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 [4]. Stone formation is also documented in the early Sanskrit documents during 3000 and 2000 B.C [5]. The problem of stone formation is considered as a medical challenge due to

its multifactorial etiology and high rate of reoccurrence [2]. Stone formation is also caused due to imbalance between promoters and inhibitors. From ancient periods, a number of herbal medicines have been found with potential effect in treating the problem of renal calculi [6].

RENAL CALCULI

The problem of calculi formation is observed and reported in all parts of the urinary tract, the kidney, the ureter and the urinary bladder which may considerably vary in size [7]. Nephrolithiasis and urolithiasis are the oldest and wide spread diseases in which reoccurrence of stone formation is considered as the most serious problem [8]. Nephrolithiasis is characterized by formation of stones in the kidney, where as urolithiasis is characterized by formation of stones in urinary bladder. In more than 60% of the kidney stones the primary constituent responsible for the formation of crystals is calcium oxalate (CaOx) which exist in the form of

CaOx monohydrate (COM) and CaOx dihydrate (COD). Many steps like – nucleation, crystal growth, crystal aggregation and crystal retention are involved in the calcium oxalate stone formation. Various substances in body show effect in promoting or preventing these stone forming processes [5]. Life style and dietary factors are the important biological events that are responsible for formation of stones [9]. Stones that commonly occur are the calcium containing stones, especially calcium oxalate monohydrate (whewellite), calcium oxalate dehydrate (weddelite) and basic calcium phosphate (apatite) to an extent of 75 -90%, Magnesium ammonium phosphate stones (struvite) occur to an extent of 10-15%, uric acid 3-10%, and cystine stones 0.5-1% [10]. The inhibition of CaOx stone formation is limited to some minerals like selenium, magnesium and orthophosphates, some medicinal herbs also contain chemical compounds that inhibit CaOx formation [5].

REASONS FOR STONE FORMATION

Stone formation commonly occur due to inadequate urinary drainage, foreign bodies in urinary tract, microbial infections, 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.,[11]. Calcium oxalate is considered as main constituent in the renal calculi formed and its formation is attributed to intake of cereals rich in calcium and phosphorus besides lack of animal proteins and high intake of oxalate rich vegetables [2]. Oxalate is excreted in urine under normal conditions but causes stone formation under pathological conditions [12]. The use of Diuretics, Allopurinol, Tamsulosin and NSAIDS [13] can also alleviate risk factor like stone formation [14]. Along with these mechanisms stone formation may also occur due to oxidative stress, epithelial damage in kidney or bladder which offers suitable environment for crystal attachment [3]. The formed renal calculi have been divided into two categories namely tissue attached and tissue unattached. In development of renal calculi a prominent role is played by renal epithelial cell damage [15]. Abnormalities in renal morphology, disturbances in urine flow, genetic factors, bacterial infections in urinary tract : Urinary stone forming infection is caused by bacteria such as *Proteus vulgaris*, *Pseudomonas aeruginosa*, *Enterobacter spp.*, *Serratia spp.*, *Staphylococcus aureus*, *Staphylococcus epidermitis etc.*, Metabolic abnormalities like increased excretion of the stone forming constituents and decreased excretion of the inhibitors of crystallization [13]. Supersaturated urine is required for the stone formation and its supersaturation depends on urinary P^H, ionic strength, solute concentration and complexations [5].

PROBLEMS ENCOUNTERED

The presence of renal calculi is diagnosed by the symptoms explained by the patients and the stones are

recognized in the body with the help of X-rays. The analytical markers in urine and serum that are responsible for the clinical diagnosis of the urologic disorders are calcium, albumin, creatinine, urate and oxalate [11]. The problem of stone formation produces pain and obstruct the flow of urine as the stones formed are unable to travel through ureter, It also causes, severe back ache (the worst pain known as colicky pain is produced in the lower back), bloody, cloudy, and smelly urine, sickness, urge for urination, burning sensation during urination, fever, chills etc., less urine volume, change in urinary p^H, and infections [3]. Available standard pharmaceutical drugs used in preventing and curing renal calculi are not effective in all patients and may produce adverse effects on long term use [15].

WAYS TO RESTRICT CALCULI FORMATION

In order to avoid calculi formation there must be enough fluid intakes to produce atleast 2 lit of urine per day as drinking more water keeps the urine diluted which allow easy passage of materials that may aggregate to form stone. Studies suggested that *lemonade and citrus drinks* are helpful in reducing the problem of stone formation as the juices contain citrates which control growth of crystals to form stones. But the intake of juices like *grape fruit juice, cranberry juice and dark colas* may increase the risk of stone formation as these contain oxalates. Salt content in food must be reduced as the sodium in salt increases calcium excretion which results in increased risk of stone formation. To minimize the content of oxalates in urine the foods that are to be avoided are spinach, rhubarb, nuts and wheatbran. Alcohol and the supplements like vitamin C & D must also be avoided as they may contribute to increased risk of stone formation. Animal protein rich foods like meat, eggs and fish contain purines that can increase the risk of uric acid stones and calcium stone formation.

POSSIBLE TREATMENTS FOR THE CALCULI FORMED

The foremost treatment is considered with pain medication as the worst pain known as colicky pain is produced in the lower back. The formed calculi are most commonly removed by surgical methods, but the rate of reoccurrence is high in this case. The ultrasonic energy is used to break and reduce the size of the stone to make them easily pass in urine, but this is not beneficial in all the cases as some larger stones do not respond to this energy. Extracorporeal shock wave lithotripsy (ESWL) uses sound waves which are also known as shock waves to break the stones in to small pieces for their easy passage out. Many allopathic agents like 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 are used in

treating the stones formed which act by decreasing the excretion of stone forming agents such as oxalates, calcium, phosphates etc., [13]. The ayurvedic medicine used in the treatment are Cystone, Calcuri, Chandraprabha bati, Trinapanchamool, Rencare Capsul, Patherina tablet, Ber Patthar Bhasma, Chander Prabha vati

SIGNIFICANCE OF HERBAL THERAPY

The treatment of urolithiasis is mainly considered with the dissolution of existing stones and preventing the reoccurrence of stones. (DODOALA et al., 2010) Standard pharmaceutical drugs used to prevent and cure urolithiasis are not effective in all cases, costly, quite common reoccurrences, risks of long term fertility, potential side effects and no guarantee [17]. Surgical treatment causes some problems like long term renal damage, hypertension and reoccurrence of stones. Extracorporeal shock wave lithotripsy is considered as a revolution in treating renal stones, but this treatment also causes some problems like long term renal damage, hypertension and reoccurrence of stones and so an approach is being extensively investigated to prevent or inhibit the stone reoccurrence, which resulted in treatment with hydrochlorothiazide, orthophosphate, alkali-citrates and magnesium to reduce the rate of stone reoccurrence. It is a well known fact that glycosamino glycons and urinary proteins which are present in the matrices of the urinary stones are the strong inhibitors against CaOx crystal formation [18]. References prove that litholytic herbs for treatment of renal stones are used since ancient periods before inventing modern treatments [5]. Standard pharmaceutical drugs used to prevent and treat urolithiasis are not effective in all cases and also produce many adverse effects [8]. Scientific studies are mostly

focused on phytotherapy as it is proved to be vital in preventing reoccurrence of stones [9]. Herbal drugs are reported to be effective with no side effects. The drug for prevention of the disease or its reoccurrence is of great interest as no drug in clinical therapy is of satisfactory result [1].

MECHANISM OF ACTION IN PHYTOTHERAPY

Herbal agents act by allowing spontaneous passage of small calculi in urine by increasing the urinary volume, P^H. The herbs also act by regulating oxalate metabolism, by maintaining balance between inhibitors and promoters of crystallization, by producing anti-oxidant, anti-microbial, analgesic, anti-inflammatory activities [12]. Modern medicine are proved to target only one aspect of urolithiatic pathophysiology where as herbal remedies have been shown to exert effectiveness at different stages of stone pathophysiology. Herbal remedies produce multiple mechanism of action such as diuretic activity (Beneficial in increasing the urinary volume that allows the easy passage of small calculi out of the body in urine), crystallization inhibition activity (Helps to inhibit the different stages of stone formation by maintaining the balance between inhibitors and promoters of stone formation), 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), Anti oxidant activity (Prevent renal tissue injury), Anti microbial activity (Prevent the occurrence of infections) Herbs also improve the renal function and regulate oxalate metabolism which help in reducing the re occurrence of renal calculi [5].

Table 1. List of food and beverages that enhance and controls calculi formation

FOODS AND BEVERAGES THAT ENHANCE THE RISK OF CALCULI FORMATION	FOOD AND BEVERAGES THAT CONTROL THE RISK OF CALCULI FORMATION
Grape fruit juice, cranberry juice, apple juice and dark colas	Lemon and citrus juices, coffee, tea and soft drinks rich in citrates
Foods rich in organic acids (oxalates) like spinach, rhubarb, nuts and wheatbran.	Foods such as radish, beet root and horsegram
Animal protein rich foods like meat, eggs and fish	Low protein diets and fiber rich foods
Supplements like vitamin C & D	Supplements like Vitamin E, B ₆ and magnesium
Alcohol	Beer and wine to a little extent as they contain purines
High intake of salt	Low salt diets

Table 2. Available treatments for calculai

AVAILABLE TREATMENTS	
MEDICINE THERAPY	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
SURGICAL THERAPY	Extracorporeal Shock Wave Lithotripsy, Percutaneous Nephrolithotomy, Ureteroscopic stone removal etc.,
HERBAL THERAPY	Cystone, Calcuri, Chandraprabha bati, Trinapanchamool, Rencare Capsule, Patherina tablet, Ber Patthar Bhasma, Chander Prabha vati

Table 3. List of herbs with potent litholytic property

S.No	BOTANICAL NAME	COMMON NAMES	FAMILY	PLANT PART	REFERENCE
1	<i>Acalypha indica</i> Linn.	Indian nettle	Euphorbiaceae	Whole plant	Sathyaa et al 2011[8]
2	<i>Abutilon indicum</i> L.	Kanghi	Malvaceae	Leaf juice	Prachi et al, 2009 [20]
3	<i>Achyranthes aspera</i> L.	Putkhanda, Prickly chaff flower	Amaranthaceae	Roots	Anshu aggarwal et al, 2010 [21]
4	<i>Achyranthes indica</i> Linn.	Chirchira	Amaranthaceae	Roots	Surendra K.Pareta et al 2011 [5]
5	<i>Aegle marmelose</i> L.Corr.	Bael	Rutaceae	Fruit pulp, Leaves.	Ghatapanadi et al, 2010 [22]
6	<i>Aerva lanata</i> L.	Sirupoolai, Chaya	Amaranthaceae	Whole plant	Soundararajan et al 2006 [1]
7	<i>Ageratum conzoides</i> L.	Billygoat weed, Chick weed, White weed.	Asteraceae	Whole plant	Mohd. azaz Khan et al 2011 [23]
8	<i>Alhagi mannifera</i> Desv (L.)	Camels thorn	Fabaceae	Roots	Choubey ankur et al, 2010 [13]
9	<i>Alismatis rhizome</i> (Sam.) Juzepcz.	Takusha	Alismataceae	Whole plant	Koji sujuki et al 1999 [18]
10	<i>Amaranthus caudatus</i> L.	Love lies bleeding	Amaranthaceae	Leaves	Neha sharma et al, 2011 [24]
11	<i>Amaranthus spinosus</i> L.	Jangali Chauli	Amaranthaceae	Roots	Neha sharma et al, 2011 [24]
12	<i>Amaranthus viridis</i> L.	Mariro	Amaranthaceae	All parts	Neha sharma et al, 2011[24]
13	<i>Ammannia baccifera</i> Linn	Blistering ammania, Jangli mehandi	Lythraceae	Leaves	Prasad et al, 1994 [25]
14	<i>Amni visnaga</i> (L.) Lam	Bisnaga, Toothpickweed.	Apiaceae	Whole plant	Yadav et al, 2011 [19]
15	<i>Argemone maxicana</i> L.	Datturigida	Papaveraceae	Roots	Ghatapanadi et al, 2010 [22]
16	<i>Armoracia lopathifolia</i> Gilib.	Horse radish, Mountain radish, Red cole.	Cruciferae	Seeds	Choubey ankur et al, 2010 [13]
17	<i>Asperagus racemosus</i> Willd.	Shatavari, Shatamuli.	Asperagaceae	Roots	Satish Kumar et al, 2009 [26]
18	<i>Asphodelus tenuifolius</i> Cav.	Piazi	Liliaceae	Leaves	Neha sharma et al, 2011 [24]
19	<i>Barbarea vulgaris</i> R.Br.	Rocket, Bittercress, Wound rocket.	Brassicaceae	Roots, Leaves	Choubey ankur et al, 2010 [13]
20	<i>Benincasa Hispida</i> (Thumb)	Ash gourd, Winter melon.	Cucurbitaceae	Seeds	Patel et al 2011 [27]
21	<i>Berberis vulgaris</i> L.	European barberry, Jaundice berry, Ambarbaris, Barberry	Berberidaceae	Root bark	Samra bashir et al, 2010 [28]
22	<i>Bergenia ciliata</i> Wall.	Paashaanbhed	Saxifragaceae	Rhizomes	Sarmistha saha et al 2011 [29]
23	<i>Bergenia ligulata</i> Wall.	Paashaanbhed	Saxifragaceae	Rhizomes	Harsoliya et al 2011 [10]
24	<i>Beta vulgaris</i> L.	Ullam gadda	Amaranthaceae	Roots	Neha sharma et al, 2011 [24]

25	<i>Bombex ceiba</i> Linn.	Silk cotton tree	Bombacaceae	Stem and bark	Neha sharma et al, 2011 [24]
26	<i>Borrhaavia diffusa</i> L.	Bishkapra, Punarnava	Nyctaginaceae	Root	Prachi et al, 2009 [20]
27	<i>Bridelia crenulata</i> Roxb.	Adamaruthu, Maarivengai, Mulvengai and Oothiravengai	Euphorbiaceae	Stem bark	Amrit Pal Singh et al, 2007 [30]
28	<i>Bryophyllum calycinum</i> Salisb.	Patharkuchi	Crassulaceae	Leaves	Amrit Pal Singh et al, 2007 [30]
29	<i>Bryophyllum pinnatum</i> (lamk.) oken.	Patharchata, Ajubu, Ghavpatta, Parnbeej.	Crassulaceae	Fresh leaf juice	Prachi et al, 2009 [20]
30	<i>Caesalpinia huga</i> L.	Indian red wood	Caesalpinaceae	Root	Chitme et al, 2010 [7]
31	<i>Capsella bursapastor</i> L. Medik	Mothers heart	Brassicaceae	Entire herb	Choubey ankur et al, 2010 [13]
32	<i>Cassia fistula</i> L.	Kakke gida	Caesalpinioideae	Fruits	Ghatapanadi et al, 2010 [22]
33	<i>Cedrus deodara</i> Roxb.	Devadaru, Deodar cedar.	Pinaceae	Heart wood	Ramesh et al, 2010 [31]
34	<i>Ceropegia bulbosa</i> Roxb.	Khadula	Asclepidaceae	Tubers	Neha sharma et al, 2011 [24]
35	<i>Chenopodium album</i> Linn.	Chilua	Chenopodiaceae	Leaves	Neha sharma et al, 2011 [24]
36	<i>Corbichonia decumbens</i> Forrsk.(Jack).	Dhalaa, Lahg.	Molluginaceae	Leaves	Neha sharma et al, 2011 [24]
37	<i>Costus speciosus</i> Koen.	Mahalakri	Costaceae	Tubers	Neha sharma et al, 2011 [24]
38	<i>Costus spiralis</i> (jacq) Roscoe	'cana-do-brejo' or 'cana-de-macaco'	Zingiberaceae	Whole plant	Tania araujo viel et al, 1999 [32]
39	<i>Crateava nurvula</i> Buch-Ham	Barna, Varuna.	Capparaceae	Bark	Prachi et al, 2009 [20]
40	<i>Cucumis sativus</i> L.	Cucu, Cucumber	Cucurbitaceae	Leaves	Choubey ankur et al, 2010 [13]
41	<i>Cyclea peltata</i> Lam	Pathi	Menispermaceae	Root	Christina et al, 2002 [33]
42	<i>Cynodon dactylon</i> Linn.	Dhoob ghas, Doobra, Hari doob.	Poaceae	Root	Prachi et al, 2009 [20]
43	<i>Daucus carota</i> Linn.	Gajar	Apiaceae	Gajar juice	Prachi et al, 2009 [20]
44	<i>Desmodium styracifolium</i> (osbeck) Merr.	Korat nasi	Leguminosae	Whole plant	Hirayama et al, 2008 [34]
45	<i>Dichrostachys cinerea</i> L.	Sicklebush, Bell mimosa, Kalahari Christmas tree.	Mimosaceae	Root	Jayakumari et al, 2011 [35]
46	<i>Didymocarpus pedicellata</i> Roxb.	Stone flower, Shantapushpi, Charela, Patharphori.	Gesneriaceae	Leaves	Amrit Pal Singh et al, 2007 [30]
47	<i>Digera muricata</i> L.	Lesua, Latmahuria.	Amaranthaceae	Leaves	Neha sharma et al, 2011 [24]
48	<i>Diospyros melaoxylon</i> Roxb.	Timru, Tendu	Ebenaceae	Fruit, Flower and bark	Neha sharma et al, 2011 [24]

49	<i>Dolichous biflorus L.</i>	Kulaththa, Horsegram, Ulavalu.	Fabaceae	Seeds	Rana gopal singh et al 2010 [2]
50	<i>Eleusine coracana Gaertn.</i>	Mandva, African millet, Ragi	Poaceae	Grains	Bahuguna et al 2009 [4]
51	<i>Equisetum debile Roxb.</i>	Jod tod ki ghas	Equisetaceae	All parts	Neha sharma et al, 2011 [24]
52	<i>Ficus carica L.</i>	Fig	Moraceae	Fruit, Latex	Choubey ankur et al, 2010 [13]
53	<i>Gomphrena celosioides Mart.</i>	Gomphrena weed	Amaranthaceae	Whole plant	Neha sharma et al, 2011 [24]
54	<i>Grewia flavescens A. Juss</i>	Kali-siali	Tiliaceae	Roots	Neha sharma et al, 2011 [24]
55	<i>Helianthus annus Linn</i>	Sunflower	Asteraceae	Leaves	Khan et al 2010 [6]
56	<i>Helichrysum plicatum DC.</i>	Everlasting flower	Asteraceae	Flowers	Yasin bayir et al, 2011 [36]
57	<i>Herniaria hirsute Linn</i>	Hairy rupture wort	Illecebraceae	Whole plant	Yadav et al, 2011 [19]
58	<i>Homonoia riparia Lour.</i>	Attuvanchi, Kadallari, Neervanchi, Puzhavanchi.	Euphorbiaceae	Root	Chitme et al, 2010 [7]
59	<i>Ichnocarpus frutescens L.</i>	Black creeper	Apocynaceae	Roots	Anbu et al, 2011 [38]
60	<i>Lantana camara Linn</i>	Spanish flag, West Indian lantana	Verbenaceae	Leaves	Mayee et al, 2011 [15]
61	<i>Lawsonia inermis Linn</i>	Henna	Lythraceae	Leaves	Kore et al, 2011 [12]
62	<i>Macrotyloma uniflorum Lam.</i>	Horse gram, Horse grain, Kulthi bean, Poor man's pulse, Madras bean.	Fabaceae	Seeds	Anantha krishana chaitanya et al, 2010 [14]
63	<i>Mentha piperita L.</i>	Peppermint	Lamiaceae	Entire herb	Choubey ankur et al, 2010 [13]
64	<i>Mimusops elengi L.</i>	Spanish cherry, Bullet wood.	Sapotaceae	Bark	Purnima ashok et al, 2011 [39]
65	<i>Momordica charantia Linn</i>	Bitter melon, Bitter gourd.	Cucurbitaceae	Fruits	Shah et al, 2011 [40]
66	<i>Moringa oleifera Lam</i>	Drum stick tree, Horse radish tree, Clarifier tree.	Moringaceae	Pods, Bark, Root wood.	Vijayalakshmi et al, 2010 [41]
67	<i>Musa bulbisiana Colla.</i>	Kela	Musaceae	Roots	Prachi et al, 2009 [20]
68	<i>Musa paradisiaca Linn</i>	Banana plantain	Musaceae	Ripe kernel juice	Kalpna devi et al 1993 [3]
69	<i>Nigella sativa L.</i>	Black cumin seed	Ranunculaceae	Seeds	Harsoliya et al 2011 [10]
70	<i>Olea europeae L.</i>	Olive	Oleaceae	Oil	Choubey ankur et al, 2010 [13]

71	<i>Parmelia perlata L.</i>	Stone Flower, Lichen	Parmeliaceae	Dried lichen	Chitme et al, 2010 [7]
72	<i>Paronychia argentea Lam.</i>	Algerian tea	Caryophyllaceae	Aerial parts	Bouanani et al, 2010 [42]
73	<i>Pedaliium murex Linn.</i>	Dakhi gokhru	Pedaliaceae	Fruits	Anantha et al, 2011 [43]
74	<i>Pergularia daemia Forssk.</i>	Pergularia, Dustapuchettu, jittupaku.	Asclepiadaceae	Whole plant	Vyas et al, 2011 [44]
75	<i>Phyllanthus fraternus Webster.</i>	Nela nelli	Euphorbiaceae	Whole plant	Ghatapanadi et al, 2010 [22]
76	<i>Phyllanthus niruri L.</i>	Stone breaker	Euphorbiaceae	Whole plant	Mirian et al, 2010 [45]
78	<i>Pimpinella anisum L.</i>	Anise, Aniseed	Apiaceae	Fruit	Choubey ankur et al, 2010 [13]
79	<i>Pinus eldarica Medw.</i>	Goldwater pine, Afgan pine, Tehran pine.	Pinaceae	Fruits	Hosseinzadeh et al 2010 [46]
80	<i>Plantago major L.</i>	Greater plantain, Common plantain	Plantaginaceae	Whole plant	Sharifa Abdul Aziz et al, 2005 [47]
81	<i>Pyracantha crenulata Roem.</i>	Nepalese firethorn	Rosaceae	Fruit	Yogendr Bahuguna et al, 2009 [48]
82	<i>Pyracantha crenulata (Hance) Rehder</i>	Broad leaf firethorn, Chinese firethorn	Rosaceae	Leaves	Yadav et al, 2011 [19]
83	<i>Raphanus sativus Linn</i>	Radish, Rabano negro	Cruciferae	Bark	Vargas et al, 1999 [49]
84	<i>Ricinus communis Linn.</i>	Arandi, Arand andi, Chian.	Euphorbiaceae	Root	Neha sharma et al, 2011 [24]
85	<i>Rosmarinus officinalis L.</i>	Rosemary	Lamiaceae	Leaves	Choubey ankur et al, 2010 [13]
86	<i>Rotula aquatica Lour.</i>	Pashannabedha	Boraginaceae	Roots	Gilhotra Umesh Kr et al 2011 [9]
87	<i>Rubia cordifolia L.</i>	Common madder, Indian madder	Rubiaceae	Roots	Kalyani Divakar et al, 2010 [50]
88	<i>Santalum album L.</i>	White sandal	Santalaceae	Oil	Choubey ankur et al, 2010 [13]
89	<i>Sesamum indicum L.</i>	Ellu	Pedaliaceae	Tender leaves	Ghatapanadi et al, 2010 [22]
90	<i>Sesbania grandiflora L.</i>	Agati	Fabaceae	Leaf juice	Sujatha doddola et al, 2008 [52]
91	<i>Solanum Indicum Linn.</i>	Bari kateli	Solanaceae	Roots	Prachi et al, 2009 [20]
92	<i>Solanum surattense Burn.</i>	Ber kaleli, Neeli kateti	Solanaceae	Roots	Neha sharma et al, 2011 [24]
93	<i>Solanum xanthocarpum Schrad & Wendi.</i>	Yellow berried nightshade	solanaceae	Berries	Vina B Patel et al 2010 [52]
94	<i>Tamarindus indica Linn.</i>	Indian date	Fabaceae	Fruit pulp	Satish Kumar et al, 2009 [26]
95	<i>Terminalia arjuna Roxb.</i>	Arjuna, Arjun tree	Combrataceae	Bark	Chaudhary et al, 2010 [53]
96	<i>Tinospora cordifolia Willd (L.)</i>	Amruthaballi	Menispermeaceae	Stems	Ghatapanadi et al, 2010 [22]

97	<i>Trachyspermum ammi L.</i>	Ajwan seeds, Ajowan, Carom, Bishops weed	Umbelliferae	Seeds	Kaur et al, 2009 [54]
98	<i>TrianthOema portulacastrum Linn.</i>	Saunthi, Lalsubuni, Patharchata, Bishkapra.	Ficoidae	Fresh leaf juice	Prachi et al, 2009 [20]
99	<i>Tribulus terrestris L.</i>	Gokhuru, Chhota gokhuru	Zygophyllaceae	Fruits, Roots	Satish et al, 2010 [55]
100	<i>Tridax procumbens L.</i>	Coat buttons, tridax daisey, Gaddi chemanthi.	Asteraceae	Whole plant	Sailaja et al 2011 [56]
101	<i>Tubiflora acaulis L.F Kuntze.</i>	Patta chatta	Acanthaceae	Leaves	Neha sharma et al, 2011 [24]
102	<i>Zea mays Linn.</i>	Makki, Makka	Poaceae	Decoction of styles obtained from female inflorescence or immature cells.	Prachi et al, 2009 [20]
103	<i>Zingiber officinale Rosc.</i>	Ginger, Sunthi	Zingiberaceae	rhizomes	Prachi et al, 2009 [20]

CONCLUSION

The present review conveys information about the treasure trove of medicinal plants with litholytic nature. 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 phytoconstituents in herbs and undesirable effects of modern medicine. Evidences prove that herbal therapy is more effective 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 adjunct therapy for better relief. Further research is needed to identify active principles from medicinal plants to assess their dosage and quality control, and investigate their

interactions and adverse effects. Many herbs themselves possess inhibitory activity against crystallization. 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.

ACKNOWLEDGEMENT

Authors are thankful to Chairman Padmasree Dr. Mohan babu for providing all the facilities and to Mr.G. Avinash Kumar Reddy, Assistant Professor, Department of Pharmaccognosy for his gracious support during the work.

REFERENCES

1. Soundararajan P, Mahesh R, Ramesh T, Hazeena Begum V. Effect of *Aerva Lanata* on calcium oxalate urolithiasis in rats. *Indian journal of experimental biology*, 44, 2006, 981-986.
2. Rana Gopal Singh, Sanjeev Kumar Behura, Rakesh Kumar. Litholytic Property of Kulattha (*Dolichous Biflorus*) vs Potassium Citrate in Renal Calculus Disease: A Comparative Study. *JAPI*, 58, 2010, 287.
3. Kalpana Devi V, Baskar R, Varalakshmi P. Biochemical effects in normal and stone forming rats treated with the ripe kernel juice of Plantain (*Musa Paradisiaca*). *Ancient Science of Life*, 3 & 4, 1993, 451 – 461.
4. Bahuguna YM, Rawat MSM, Juya V, Gnanarajan G. Antilithiatic effect of grains of *Eleusine Coracana*. *Saudi Pharmaceutical Journal*, 17, 2009, 182.
5. Surendra K pareta, Kartik Chandra Patra, Ranjit Harwansh. In-vitro calcium oxalate crystallization inhibition by *Achyranthes indica* Linn. Hydroalcoholic extract: An approach to antilithiasis. *International Journal of Pharma and Bio Sciences*, 432.
6. Khan NI, Shinge JS, Naikwade NS. Antilithiatic effect of *Helianthus Annuus* Linn. leaf extract in ethylene glycol and ammonium chloride induced nephrolithiasis. *Int J Pharm Pharm Sci*, 2, 2010, 181.
7. Havagiray R, Chitme, Shashi Alok, JAIN SK, Monika Sabharwal. Herbal treatment for urinary stones. *IJPSR*, 1, 2010.
8. Sathya M, Kokilavani R, Ananta Teepa KS, Balakrishnan A. Supplementation of ethanolic extract of *Acalypha Indica* Linn prevents hyperoxaluria in experimental urolithic rats. *Journal for Bloomers of Research*, 4, 2011.
9. Gilhotra Umesh KR., Christina AJM. Effect of *Rotula aquatica* Lour. on ethylene-glycol induced urolithiasis in rats. *Int. J. Drug Dev. & Res*, 3, 2011, 273-280.

10. Harsoliya MS, Pathan J K, Khan N, Bhatt D, Patel VM. Effect of ethanolic extracts of *Bergenia Ligulata*, *Nigella Sativa* and combination on calcium oxalate urolithiasis in rats. *International Journal of Drug Formulation & Research*, 2, 2011, 268-280.
11. Suman Kumar Mekap, Satyaranjan Mishra, Sabuj Sahoo and Prasana Kumar Panda. Antiurolithiatic activity of *Crataeva magna* Lour. bark. *Indian journal of natural products and resources*, 1(2), 2011, 28-33.
12. Kore K J, Shete R V, Jadhav P J, Kabra M P Antiurolithiatic effects of hydroalcoholic extract of *lawsonia inermis* L leaves. *International Journal of Universal Pharmacy and Life Sciences*, 1(2), 2011.
13. Choubey Ankur, Parasar Amarchand , Choubey Adarsh, Iyer Deepa, Pawar R S, Patil U K potential of medicinal plants in kidney, gall and urinary stones. *Int.J.Drug Dev. & Res.*, 2(2), 2010, 431-44.
14. Anantha Krishna Chaitanya D, Santosh kumar M, Manohar Reddy A, Mukherjee N S V, Sumanth M H, Ramesh A. Anti urolithiatic activity of *Macrotyloma uniflorum* seed extract on ethylene glycol induced urolithiasis in albino rats. *JITPS*, 1 (5), 2010, 216.
15. Mayee R, Thosar A. Evaluation of *Lantana camara* Linn. (*Verbenaceae*) for antiurolithiatic and antioxidant activities in rats. *International Journal of Pharmaceutical and Clinical Research*, 3(1), 2011, 10-14.
16. Sujatha dodoala, Ranganayakulu diviti, Bharathi koganti, Prasad K V S R G. Effect of ethanolic extract of *Phyla nodiflora* (Linn.) Greene against calculi producing diet induced urolithiasis. *Indian journal of natural products and resources*, 1(3), 2010, 314-321.
17. Lipismita samal, Ashok Kumar Pattanaik, Chinmoy Mishra, Biswa Ranjan Maharana, Laxmi. Nutritional strategies to prevent urolithiasis in animals. 4, 2011, 142-144.
18. Koji Suzuki, Kenji Kawamura and Ryuzo Tsugawa. Formation and growth inhibition of calcium oxalate crystals by *Takusha (Alismatis rhizoma)*. 13 (2-3), 1999, 183-189.
19. Rahul Deo Yadav, S. K. Jain, Shashi Alok, Alok Mahor, Jay Prakash Bharti and Manoj Jaiswal. Herbal plants used in the treatment of urolithiasis: a review. *IJPSR*, 2(6), 2011, 1412-1420.
20. Prachi, Chauhan N, Kumar D, Kasana M S. Medicinal Plants of Muzaffarnagar district used in treatment of Urinary tract and Kidney stones. *Indian journal of traditional knowledge*, 8(2), 2009, 191-195.
21. Anshu Aggarwal A, Tandon S, Singla SK, Tandon C. Reduction of oxalate-induced renal tubular epithelial (NRK-52E) cell injury and inhibition of calcium oxalate crystallisation in vitro by aqueous extract of *Achyranthes aspera*. *Int J Green Pharm*, 4, 2010, 159-64.
22. Ghatapanadi S R, Nicky Johnson, Rajasab AH. Medicinal plants of north Karnataka used in treatment of kidney stones and urinary tract infections. *The Socioscan*, 2(3&4), 2010, 23-24.
23. Mohd. Azaz Khan, Debasish Pradhan. Antiurolithic activity of *Ageratum conyzoides* extract in rats. *Pharmacologyonline*, 3, 2011, 953-958.
24. Neha Sharma, Babeet Singh Tanwer, Rekha Vijayvergia. Study of medicinal plants in Aravali regions of Rajasthan for treatment of kidney stone and urinary tract troubles. *International Journal of PharmTech Research*, 3(1), 2011, 110-113.
25. Prasad K V, Bharathi K, Srinivasan K K. Evaluation of *Ammannia baccifera* Linn. for antiurolithiatic activity in albino rats. *IJEB*, 32 (5), 1994, 311-313.
26. Satish Kumar MC, Udupa AL, Sammodavardhana K, Rathnakar UP, Shvetha Udupa, Prabhath Kodancha G. Antiurolithiatic activity of aqueous extracts of *Asparagus racemosus Willd* and *Tamarindus indica* Linn. in rats. *Pharmacologyonline*, 2, 2009, 625-630.
27. Patel RK, Patel SB, Shah JG. Anti-Urolithiatic Activity of ethanolic extract of seeds of *Benincasa hispida* (Thumb). *Pharmacologyonline*, 3, 2011, 586-591.
28. Samra Bashir, Anwar H Gilani, Anwar A Siddiqui, Shahid Pervez, Saeed R Khan, Noor Jehan Sarfaraz, Abdul Jabbar Shah. *Berberis vulgaris* root bark extract prevents hyperoxaluria induced urolithiasis in rats. *Phytotherapy Research*, 2010, 1250-1255.
29. Sarmistha Saha, Ramej Jayram Verma. *Bergenia ciliata* extract prevents ethylene glycol induced histopathological changes in the kidney. *Acta Poloniae Pharmaceutica n Drug Research*, 68(5), 2011.
30. Amrit Pal Singh, *Didymocarpus pedicellata*: The Lithonriptic *Ethnomedicine*. *Ethnobotanical Leaflets*, 11, 2007, 73-75.
31. Ramesh C, Krishnadas, Nandakumar, Radhakrishnan, Rajesh, Rangappa, Srinath, Viswanatha, Gollapalle Lakshminarayana Shastry, Rajesh D, Gopal, Muruganathan, Talwar, Sahil. Anti-urolithiatic activity of heart wood extract of *cedrus deodara* in rats. *Journal of Complementary and Integrative Medicine*, 7 (1), 2010, 1-9.
32. Tânia Araújo Viel, Cristina Diogo Domingos, Ana Paula da Silva Monteiro, Maria Teresa Riggio Lima-Landman, Antonio José Lapa, Caden Souccar. Evaluation of the antiurolithiatic activity of the extract of *Costus spiralis* Roscoe in rats. 1998, 171-8.
33. Christina AJ, Packia Lakshmi M, Nagarajan M, Kurian S. Modulatory effect of *Cyclea peltata* Lam. on stone formation induced by ethylene glycol treatment in rats. *Methods Find Exp Clin Pharmacol*. 24(2), 2002, 77-9.
34. Hirayama H, Wang Z, Nishi K , Ogawa A, Ishimatu T, Ueda S, Kubo T, Nohara T. Effect of *Desmodium styracifolium-triterpenoidon* calcium oxalate renal stones. *British Journal of Urology* 71(2), 1993, 143-147.

35. Jayakumari S, Anbu J, Ravichandran V. Antiuro lithiatic activity of *Dichrostachys cinerea* (L.) Wight & Arn root extract. *Journal of Pharmacy Research*, 4(4), 2011, 1206-1208.
36. Yasin Bayir, Zekai Halici, Mevlut Sait Keles, Suat Colak, Ahmet Cakir, Yusuf Kaya, Fatih Akçay. *Helichrysum plicatum* DC. subsp. *plicatum* extract as a preventive agent in experimentally induced urolithiasis model. 2011.
37. Reena Laikangbam, Damayanti Devi M. Inhibition of calcium oxalate crystal deposition on kidneys of urolithiatic rats by *Hibiscus sabdariffa* L. extract. 2011.
38. Anbu J. Antiuro lithiatic Activity of Ethyl Acetate Root Extract of *Ichnocarpus frutescens* using ethylene glycol induced method in Rats. *Journal of Pharmaceutical Sciences and Research*, 2011.
39. Purnima ashok, Basavaraj C.Koti, A.H.M. Viswanathswamy. Anti-urolithiatic and Anti-oxidant activity of *Mimusops elengi* on Ethylene glycol induced urolithiasis in rats. *Indian journal of Pharmacology*, 42(6), 2010, 380-383.
40. Biren N. Shah, Khodidas D. Raiyani D. C. Modi. Antiuro lithiatic activity studies of *Momordica charantia* Linn. fruits. *International Journal of Pharmacy Research and Technology*, 1(1) 2011, 06-11.
41. Vijayalakshmi, Satish Kumar M.C, Fahad Jameel, Prabhath Kodancha G, Udupa A.L , Rathnakar U.P. Antiuro lithiatic activity of aqueous extract of *Moriga oleifera* (lam.) pod in rats *Pharmacologyonline*, 3, 2010, 716-721.
42. Bouanani S, Henchiri C, Migianu-Griffoni E, Aouf N, Lecouvey M. Pharmacological and toxicological effects of *Paronychia argenteain* experimental calcium oxalate nephrolithiasis in rats. *Journal of ethnopharmacology*, 129, 2010, 38-45.
43. Ananta Teepa KS, Kokilavani R, Balakrishnan A, Gurusamy K. Effect of ethanolic fruit extract of *Pedalium murex* Linn. in ethylene glycol induced urolithiasis in male wistar albino rats. *Ancient Sci Life* 2010, 29:29-34.
44. Vyas BA, Vyas RB, Joshi SV, Santani DD. Antiuro lithiatic activity of whole-plant hydroalcoholic extract of *Pergularia daemia* in rats. *Journal of young pharmacists*, 3(1), 2011, 36-40.
45. Mirian A. Boim, Ita P Heilberg, Nestor Schor. *Phyllanthus niruri* as a promising alternative treatment for nephrolithiasis. *Int. braz j urol.* 36 (6), 2010.
46. Hossein Hosseinzadeh, Ali-Reza Khooei, Zahra Khashayarmanesh, Vahideh Motamed-Shariaty. Antiuro lithiatic activity of *Pinus Eldarica* Medw. Fruits aqueous extract in rats. *Endourology and Stone Disease*, 7 (4), 2010.
47. Sharifa Abdul Aziz, Tan Lee See, Lim Yew Khuay, Khairul Osman & Mohd. Azman Abu Bakar In vitro effects of *Plantago major* extract on urolithiasis. *Malaysian Journal of Medical Sciences*, 12 (2), 2005, 22-26.
48. Yogendr M. Bahuguna, M S M Rawat, V Juyal K Gusain. Evaluation of *Pyracantha crenulata* Roem for antiuro lithogenic activity in albino rats. *African Journal of Urology*, 15(3), 159-166.
49. Vargas RS, RM Perez G, S Perez G, M.A Zavala S, C Perez G. Antiuro lithiatic activity of *Raphanus sativus* aqueous extract on rats. 1999.
50. Kalyani Divakar AT, Pawar SB, Chandrasekhar SB, Dighe Goli Divakar. Protective effect of the hydro-alcoholic extract of *Rubia cordifolia* roots against ethylene glycol induced urolithiasis in rats. 2010.
51. Sujatha Doddola, Hariatha Pasupulati, Bharathi Koganti and Koganti VSR, Prasad G. Evaluation of *Sesbania grandiflora* for antiuro lithiatic and antioxidant properties. *Journal of natural medicines*, 62(3), (2008), 300-307.
52. Vina B Patela, Isverbhai S Rathodb, Jaymin M Patela, Maitreyee R Brahmhatta. Anti-urolithiatic and natriuretic activity of steroidal constituents of *Solanum xanthocarpum*. *Der Pharma Chemica*, 2(1), 2010, 173-176.
53. Chaudhary A, Singla S K, Tandon C. In vitro evaluation of *Terminalia arjuna* on calcium phosphate and calcium oxalate crystallization. *Indian J Pharm Sci*, 72(3), 2010, 340-345.
54. Kaur T, Bijarnia RK, Singla SK, Tandon C. In vivo efficacy of *Trachyspermum ammi* anticalcifying protein in urolithiatic rat model. *Journal of ethnopharmacology*. 126(3), 2009, 459-62.
55. Satish H, Raman D, Kshama D, Shivananda BG, Shridhar KA. Study the relative effect of spironolactone and different solvent extract of *Tibulus terrestrison* urolithiatic rats. *Phcog Mag*, 5, 2009, 83-9.
56. Sailaja BK. Bharathi KVSRRG Prasad. Protective effect of *Tridax procumbens* on calcium oxalate urolithiasis and oxidative stress. *An international journal of advances in pharmaceutical sciences*, 2(1), 2011.