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Review

Importance of Herbal Plants in the Management of Urolithiasis

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Abstract. Medicinal plants have been known for millennia and are highly esteemed across the world as an abundant source of therapeutic agents for prevention of various ailments. Today large number of population is suffering from urinary calculi, kidney stone and gall stone. Stone disease has gained increasing relevance as a consequence to changes in living conditions, due to malnutrition and industrialization. Changes in incidence and prevalence, the occurrence of stone types and stone location, and the way in which stone removal are explained. Therapeutic plants (*Armoracia lopathifolia, Cassia fistula, Diospyros melaoxylon* etc.) are being used from centuries because of its safety, efficacy, ethnical acceptability and less side effects when compared with synthetic drugs. The present review deals with options to be followed for the potential of medicinal plants in stone dissolving activity.

Keywords: medicinal plants, traditional medicines, urolithiasis

Introduction

Urolithiasis or nephrolithiasis is the oldest and endemic unpleasant urological disorder (Gilhotra and Christina, 2011). Urolithiasis or nephrolithiasis are generally known as stone formation in virtually any part of the urinary system such as, ureters, urinary bladder, kidneys and urethra and it is the third widespread disorder in urinary tract (Vidhya *et al*., 2013). Urinary stones are generally induced by bacterial infection while kidney stones are formed because of physicochemical or hereditary derangements resulting in super saturation of the urine with stone forming salts or, less commonly, from repeated urinary tract infections with urease producing bacteria like *Pseudomonas aeruginosa*, *Proteus vulgaris*, *Enterobacter* spp., *Staphylococcus epidermitis*, *Serratia* spp. and *Staphylococcus aureus* (Alok *et al*., 2013). Stone formation is a complicated process which occurs because of the successive physicochemical occurrences such as excellent saturation, growth, nucleation, retention and aggregation within the renal tubules (Yadav *et al*., 2011).

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Renal calculi can be broadly categorized in significant organizations: tissue connected and unattached. Connected calculi are mainly included by using calcium oxalate monohydrate (COM) renal calculi, with a detectable connection site to the renal papilla and essentially as well as a middle located near the connection website (concave area) and notably striated concentrically laminated peripheral layers. Unattached calculi, without detectable website of connection to papilla, are developed in renal cavities of low or reduced urodynamic efficacy and might showcase numerous composition and structures (Kuo *et al*., 2003; Grases *et al*., 2002).

Health professionals typically do not treat kidney stone, they just medicate the ache before the stones released out of the body. Vegetarian food programme, heavy on herbal products and drinks, may be helpful inside the cure and prevention of kidney stone. Therefore, the first-rate manner to save lots of kidney stone is to drink lots of water and have a vegetarian eating regimen excessive in magnesium. The typical pills used to save urolithiasis are not powerful in every sufferer, and lot of them have unfavorable effects therefore stop their permanent use. The modern day management of

urolithiasis with open up renal surgery is not unusual and frequently used most reliable because that introduction of extracorporeal surprise wave lithotripsy (ESWL) which includes almost end up being the standard way of postponing off kidney stones. However, further to the irritating effect of shockwaves, continual residue stone fragments and the opportunity of contamination shows that ESWL can also motive severe renal injury, a lesser in renal feature and growth in stone recurrence. Hence, the hunt for antilithiatic pills to be powerful devoid of side effects from herbal resources has received huge capacity.

In the present article, a strive has been designed to emphasize on powerful herbs used in treatment for urinary stones. Herbs and natural tablets have created interest to some of the humans using its clinically examined results like adaptogenic, immuno-modulation, and antimutagenic. Additionally, the overuse of artificial capsules, which results in higher prevalence of destructive drug reactions, has inspired humans to return to nature for secure remedies. The origins, consistent with many, can be sourced to the industry fitness business enterprise's Canberre Convention in 1976, which marketed the idea of 'standard' prescription drug treatments for the growing countries. The trouble of urinary stones or calculi is an extremely historical one and many remedies have been used by people of different age groups in which stones are identified in all parts of the urinary system, the kidney, the ureters and the urinary bladder and can range significantly in size. Weight-reduction plan containing low levels of inferior exceptional proteins and high consumption of animal proteins might augment the chance of stone formation. The incident of urolithiasis is very common in northern areas of Pakistan when compared with Bangladash. It's far speculated that higher incident may be because of whole wheat diets. People living in rocky regions, wherein the local climate is warm and dry, appear to more prone to urinary calculi sickness. Treatment of urinary tract stones was revolutionized with the introduction of ESWL in the 1980s that resulted in 68-86% treatment succession of upper urinary tract stones which are treated on the basis of the size, type and location of the stone (Sarrafchi *et al.*, 2016; Havagiray *et al*., 2010).

Usage history of medicinal plants prove them harmless than synthetic drugs (Nasri and Shirzad, 2013) that is why main focus of today's research is drug discovery from medicinal plants (Mohsenzadeh *et al*., 2016).

Various studies had demonstrated efficacy of medicinal plant extracts on kidney and urinary tract disorders (Gupta and Chaphalkar, 2016).Hayatdavoudi *et al*. (2016) evidenced that Kurd tribes treated kidney stones in Abdanan and Dehloran districts of Ilam Province, Iran using *Alhagi persarum* Boiss & Buhse and *Rubia tinctorum*, *Linum usitatissimum* L., *Tribulus terrestris* L., *Prunus cerasus* L. and *Foeniculum vulgare* Mill.

Mechanism of stone formation. (Available from: https//www.healingrosacea.com/urinary-stone-diseases/ 2), (Fig. 1).

Review of literature. Anand *et al*. (1994) made a comprehensive research on antiurolithiatic activity of *Tribulus terrestris* and *Crateva nurvala* in albino rats. The effective constituent isolated from *Crateva nurvala* was lupeol and it was thoroughly researched. Anti-urolithiatic activity of lupeol was evaluated in rats by

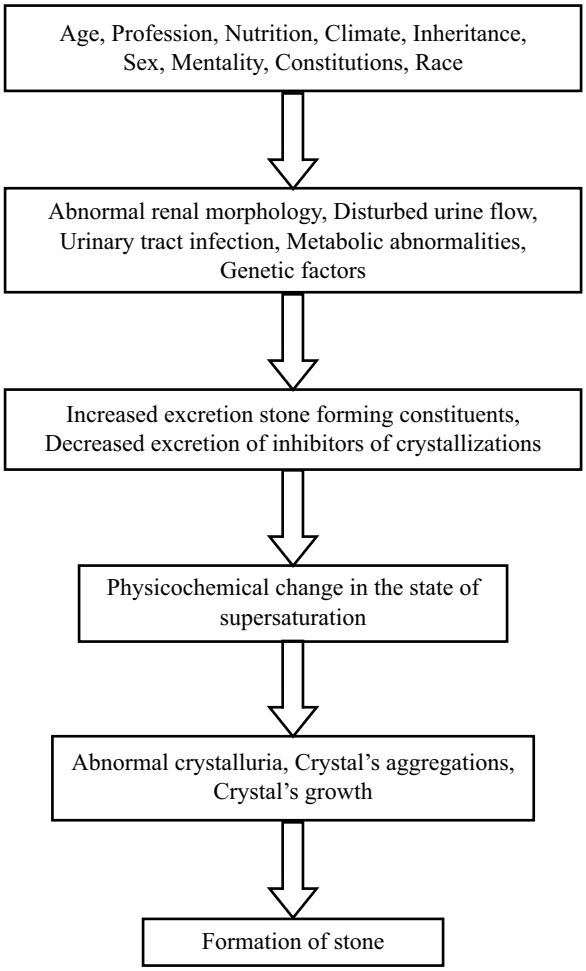

Fig. 1. Mechanism of stone formation.

observing the weight of the stone, biochemical examination of serum and urine and histopathology of bladder and kidney. Lupeol not only prevented the forming of vesicle calculi but also reduced the size of the existing stones. They have concluded that lupeol have significant antiurolithiatic activity. Atmani *et al*. (2003) had experienced that *Hibiscus sabdariffa* Linn. has curative influence on stone formation induced by ethylene glycol. Joyamma *et al*. (2003) experienced that *Mimosa pudica* have good antiurolithiatic property. Ravindra *et al*. (2006) made a report on *Moringa oleifera* root in the management of renal calculi (Kokate *et al*., 1996; Seftel *et al*., 1990). Bahuguna *et al*. (2009) discovered that *Jasminum auriculatum* flowers have effective antiurolithiatic activity. The result of this plant on calcium oxalate nephrolithiasis has been analyzed in male albino rats. Ethylene glycol feeding led to hyperoxaluria as well as increased renal excretion of calcium and phosphate. Supplementation with alcoholic and aqueous extract of *Jasminum auriculatum* flowers significantly reduced the elevated urinary oxalate significantly, showing a regulatory action on endogenous oxalate synthesis. The increased deposition of stone forming constituents in the kidneys of calculogenic rats were also reduced by this extract treated groups. The effect that shows the flowers of *Jasminum auriculatum* is endowed with antiurolithiatic activity. Jarald *et al*. (2011) made a comprehensive research work on Unex for its antiurolithiatic property. The study mainly focused to judge the potency of Unex capsule on albino rats as a preventive agent resistant to the development of kidney stones. Activity of Unex capsule was researched using the ethylene glycol induced urolithiasis model and the study work shows that Unex capsule restored the urine pH to normal, and increased the urine volume significantly.

Gilhotra *et al*. (2011) made a report on the result of *Rotula aquatic* on ethylene glycol induced urolithiasis in rats. The alcoholic extract reduced the oxalate, calcium and phosphate in urine. In addition, it increased the urine volume, reducing the tendency for crystallisation. Anbu *et al*. (2011) made a study on antiurolithiatic activity of ethyl acetate root extract of *Ichnocarpus frutescens* using ethylene glycol induced method in rats. Supplimentation with ethyl acetate draw out of *Ichnocarpus frutescens* significantly reduced the increased urinary oxalate, showing a regulatory action on endogenous oxalate synthesis. The increased deposition of stone developing constituents in the kidneys of calculogenic rats were also decreased by this extract cured groups. The final result that the root of *Ichnocarpus frutescens* is endowed with antiurolithiatic activity. Ahmadi *et al*. (2012) studied effects of *Alcea rosea* root extract as a preventive and curative agent in ethylene glycol induced urolithiasis in rats. Regarding their research idea, *Alcea rosea* demonstrated a beneficial impact in protecting against and eliminating calcium oxalate deposition in the kidney of rat. This effect is possibly due to diuretic and anti-inflammatory effects or occurrence of mucilaginous polysaccharides in the plant. It could also be related to decrease of urinary concentration of stone-forming constituents. Suganya *et al*. (2012) made a research work on formulation and analysis of capsule containing poly herbal ingredients as an antiurolithiatic agent. Pre-formulation, formulation and in process quality control tests have been completed and the product was significant in nature (Kulkarni, 2009; Patwardhan *et al*., 1990).

WHO has approved the utilization of traditional drugs as part of its health programmes. According to a WHO survey, 80% of the populace surviving in developing countries rely almost exclusively on traditional medicines for primary health care needs i.e., in all the system of traditional medications, plants play a significant role and constitute its back bone. There are many possibilities available in the management of uretheral stones. Treatment selection will depends on stone size, composition and location, efficacy of every modality and associated morbidity, equipment available, physician skill, patient health preference and finally its costs. In many cases, the management of urolithiasis is combined with surgical and medical approach using percutaneous nephrolithotomy (PCNL), extracorporeal shock wave lithotripsy (ESWL) and antibiotics. These treatments tools are relatively costly, painful and require expert hands and availability of appropriate equipment. For the treatment of larger renal stones they are effective but recurrence rate are high and having their own side effects. Endoscopic stone removal and extracorporeal great shock wave lithotripsy (ESWL) brings about traumatic ramifications of shockwaves; persistent residual stone fragments and possibility of infection, very few of literatures suggest that ESWL may cause traumatic renal injury, decrease in renal function and increase in stone recurrence (WHO, 1998). Allopurinol, Cystone etc. are few drugs used in the treatment of renal calculi but these drugs are experiencing their own side effects. It has given rise to activation in the

Table 1. Lists of plant drugs used in kidney stone, gall stone, urinary calculi (Prachi *et al*., 2009; Nidal, 2005)

S.No.	Botanical names	Common name	Part use	Used
1.	*Alhagi mannifera* (Leguminosae)	Camels thorn	Roots	For kidney pebbles and Sands
2.	*Armoracia lopathifolia* (Brassicaceae)	Horse radish	Seeds	Diuretic, Kidney Stones
3.	*Aerva javanica* (Amaranthaceae)	No Common name	Seed heads	Herb Diuretic, Purgative, Demulcent
4.	*Aerva lanata* (Amaranthaceae)	Gorkhabundi	Leaves	Cough, Sorethroat, Diabetes, Lithiasis
5.	*Ammannia baccifera* (Lythraceae)	Dadamari,	Root	Ringworm, Parasitic skin affection, Anti-typhoid, Anti-tubercular properties
6.	*Arctostaphylos ura ursi* (Asteraceaer)	Bearberry	Fruits	Diuretic, Diaphoretic, Gout, Skin affection
7.	*Ascyrum hypericoides* (Asclepidaceae)	Ascus	Root/Leaves	Emetic and Catharatic
8.	*Asparagus racemosus* (Liliaceae)	Satavar	Root	Herb tonic, Diuretic, Galactagogue
9.	*Abutilon indicum* (L.) Sweet (Malvaceae)	Indian Mallow	Seed & Leaf extract	Extract is given for urinary disorder
10.	*Abutilon indicum* (L.) (Malvaceae)	Indian Mallow	Leaves	Juice taken twice daily for two weeks
11.	*Aegle marmelose* (L.) (Rutaceae)	Wood apple, Bael	Leaves and fruit	1 spoon of Fruit pulp powder is taken orally with coconut milk for 14 days to dissolve kidney stones
12.	*Amaranthus spinosus* (L.) (Amaranthaceae)	Spiny amaranth	Root or plant	1 cup of whole plant is taken
13.	*Amaranthus viridis* (L.) (Amaranthaceae)	Slender Amaranth, Green Amaranth.	All parts	Given in kidney stone
14.	*Argemone maxicana* (L.) (Papaveracea)	Slender Amaranth	Root	Root powder is given for burning urination
15.	*Ageratum conyzoides* (L.) (Asteraceae)	Goat Weed	Leaves	Leaf extract is given twice a day
16.	*Amaranthus caudatus* (L.) (Amaranthaceae)	Love-lies-bleeding	Leaves	Extract is given in kidney stone
17.	*Asphodelus tenuifolius* (Cav.) (Liliaceae)	Weed of fields	Leaves	Decoction of leaves
18.	*Apium graveolens* (Apiaceae)	Lavender	Flowers	Decrease cholesterol level, Condiment.
19.	*Barbarea vulgaris* (Brassicacaea)	Rocket	Roots, Leaves	For kidney stone
20.	*Berginia ligulata* (Saxifragaceae)	Pasanabheda	Rhizomes	Astringent, Diuretic, Lithontriptic
21.	*Bridolia montana* (Euphobiaceae)	Chikitsa silianam	Bark	Bark Astringent, Anthelminetic
22.	*Beta vulgaris*	Sugar beet	Rhizomes	Daily two glass of rhizomes juice is given in kidney stone
23.	*Bombex ceiba* (L.) (Bombacaceae)	Cotton tree	Stem and bark	Given for urinary problems
24.	*Borhaavia difffusa* (Nyctagenaceae)	Hogweed, Punarnava	Root	Root decoction is given daily for one month in kidney stone
25.	*Blumea balsamifera* (Asteraceae)	Sambong	Flowering plant	Diuretic, common cold, urolithiasis expectorant, an anti-diarrheal
26.	*Capsella Bursa-pastori* (Brassicaceae)	Shepherd's-purse	Entire plant	Diuretic, For bladder & kidney spasm
27.	*Cucumis sativus* (Cucurbitaceae)	Cucu	Leaves	Kidney stones, Emollient
28.	*Caesalpinia huga* (Caesalpinioceae)	Nicker nut	Root	Root Diuretic, Lithontriptic
29.	*Citrus japonica* (Rutaceae)	Celery	Whole plant	Antispasmodic, Eczema
30.	*Celosia argentla* (Amararanthacea)	Plumed cockscomb	Leaves/Stem	Diarrhoea, Eye troubles, Sore mouth
31.	*Chelidonium majus* (Papaveraceae)	Chel	Leaves	Diuretic, Antispasmodic, bitter
32.	*Cassia fistula* (L.) (Caesalpinioideae)	Golden shower tree	Fruit	Fruit powder is given with water for 3–4 month to expel the kidney stone
33.	*Ceropegia bulbos* (L.) (Asclepidaceace)	Caudiciform	Tubers	Decoction of tubers is used to remove urinary bladder stone
34.	*Chenopodium album* (L.) (Chenopodiaceae)	Lamb's Quarters	Leaves	Coked leaves is given in urinary trouble
35.	*Coculus hirsutus* (L.) (Menispeermacea)	Cocculus Indicus	Leaves	Leaf dried powder is given during burning urination
36.	*Corbichonia decumbens* (Forrsk.) (Molluginacae)	Forssk	Leaves	Crushed leaves given orally
37.	*Costus speciosus* (Koen.) (Costaceae)	Keukand	Tubers	Decoction of tubers orally for stones
38.	*Cynodon dactylon* (L.) (Poaceae)	Dog's tooth grass	Root	Root decoction is given in case of urolithiasis
39.	*Chimaphila numbellata*(Cruciferae)	Prince's pine	Flower	Diuretic, Expectorant, Stimulant
40.	*Curcuma longa* (Zingiberaceae)	Haldi	Rhizome	Diuretic, Choleretic, Hepatoprotective
41.	*Desmodium styracifolium* (Papilionaceae)	Osbeck	Rhizome	Roots Emmenagogue, Stomachic
42.	*Didymocarpus pedicellata*	Stone Flower	Leaves	Lithontriptic
43.	*Daucas carota* (L.) (Apiaceae)	Wild carrot	Rhizome	One glass juice is given midnight to remove kidney stone

(*Continued* .....)

(*Table 1 cont'd*)

44.	*Digera Muricata* (L.) (Amaranthaceae)	Digera Muricata	Leaves	Once in a day for urinary complains
45.	*Diospyros melaoxylon* (Rox) (Ebenaceae)	Digera Muricata	Fruit and bark	Fruit is given in urinary disorders
46.	*Dolichos biflorus* (Leguminaceae)	Horse gram	Seeds	Diuretic, Astringent, Tonic
47.	*Elettaria cardamomum* (Zingiberaceae)	Cardamom	Seeds	Diuretic, Carmintive, Aromatic stimulant
48.	*Equisitum arvense* (Equisetaceae)	Horsetail	Seeds	Diuretic, Dropsy, Graval, Renal affection
49.	*Fogonia bruguieri* (Umbelliferae)	Fagonia	Fruit	Diuretic, Mildly carminative
50.	*Ficus carica* (Moraceae)	Fig	Fruit, latex	Destroy urinary & gall Stone
51.	*Garcinia pictoria* (Guttiferae)	Tamal. Pers.	Leaves	Dropsical affection
52.	*Gynocardia odorata* (Flacourtiaceae)	Coffee Plum	Fruit	Fish poision, Insecticidal, Skin aliments
53.	*Gomphrena celosioidest* (Amaranthaceae)	Gomphrena Weed	Whole plant	Juice is given twice a day for ten days
54.	*Grewia flavescens* (A.Juss) (Tiliaceae)	Sandpaper Raisin	Root	Decoction of root powder to stop bleeding in urine
55.	*Hygrophila spinosa* (Acanthaceae)	Gokulakanta	Leaves	Strongly Diuretic
56.	*Lavendula officinalis* (Lamiaceae)	Ginger	Rhizomes	Stop bleeding, Ant rheumatism
57.	*Mentha piperita* (Lamiaceae)	Peppermint	Entire herb	Treatment in stone disease
58.	*Mimosa pudica* (Mimosaceae)	Touch-me-not	Leaves	Gravel, Urinary complaints
59.	*Ocimum* (Labiatae)	Holy Basil, tulsi	Leaves	Stomachic, alexipharmac, antipyretic, antihelminitic
60.	*Onosma bracteatum* (Boraginaceae)	Sedge	Leaves	Tonic, Demulcent, Diuretic, Spasmolytic
61.	*Olea europeae* (Oleaceae)	Olive	Oil	Treatment of kidney stone
62.	*Pavonia odorata* (Malvaceae)	Fragrant Swamp Mallow	Rhizomes, Leaves	Antipyretic, Stomachic, Refrigerent, Dysentery
63.	*Pimpinella anisum* (Umbelliferae)	Anise	Fruit	Antispasmodic, Diuretic, Treatment of kidney stones
64.	*Pedalium murea* (Pedaliaceae)	Burra Gokhru	Fruits	Decoction of fruit is used for urinary complains
65.	Phy1llanthus emblica (L.) (Euphorbiaceae)	Gooseberry or amla	Seed Powder	Given to avoid burning urination
66.	*Phyllanthus fraternus* (Webster.) (Euphorbiaceae)	Gulf leaf-flower	Whole plant	Plant extract is given orally for 3–4 day to dissolve the stones
67.	*Rosmarinus officinalis* (Lamiaceae)	Rosemary	Leaves	Relive menstrual cramps, increase, urine flow, and reduce kidney pain
68.	*Rubia cordifolia* (Rubiaceae)	Madder or Indian Madder	Leaves, Roots	Antidysentric, Antiseptic, Deobstruent
69.	*Solanum surattence* (Solanaceae)	Yellow-Berried Nightshade	Roots	Root decoction is given for seven day
70.	*Santalum album* (Solanaceae)	White sandal	Oil	For urinary bladder.
71.	*Tectona grandis* (Verbenaceae)	Teak	Wood	Urinary discharge
72.	*Theobroma cocao* (Malvaceae)	Cacoa	Seed	urinary tracts diseases
73.	Tamarind indica (Fabaceae)	Tamarindus	Fruits	For kidney and gall stone
74.	*Tinospora cordifolia* (Wild L) (Menispermaceae)	Guduchi	Stem	Crushed stem to expel the stone
75.	*Tribulus terrestis* (L) (Zygophyllaceae)	Puncture Vine	Leaves	Used in treatment of kidney stone
76.	*Tridex procumbens* (L.) (Asteraceae)	Coat buttons	Leaves	Leaf paste is given for kidney stone
77.	*Tubiflora acaulis* (L.F.) (Acanthaceae)	Kuntze	Leaves	Leaf powder with water is given for urinary complains
78.	*Urgina maritime* (Asparagaceae)	Squill bulb	Bulb leaves	Diuretic
79.	*Urtica dioica* (Urticaceae)	Stinging nettles	Roots	Diuretic.
80.	*Vernomia cineea* (Compositae)	Little iron weed	Leaves	Anthelmintic, Diarrhoea
81.	*Zingiber officinale* (Zingiberaceae)	Ginger	Rhizomes	Stop bleeding, Ant rheumatism
82.	*Zea mays* (Poaceae)	Maize	Seeds Oil Tassel	For bladder & Kidney spasm. Given orally to expel the stone

search for looking into natural resources demonstrating anti-urolithiatic activity. There is a tremendous progress in the field of medicine, but still there is no absolutely satisfactory drug for the treatment of renal calculi. Most patients still have to go through surgery to relieve this painful disease. Plants and other natural substances have been used as the rich source of medicine (Prachi *et al*., 2009; Nidal, 2005). All traditional civilizations have recorded therapeutic uses of plant in their own ethnobotanical texts. The list of drugs obtained from plants source is intensively extensive. Many remedies have been employed through the ages to take care of urolithiasis. A lot of the remedies have been extracted from plants and become useful, although the rationale behind their use is not medically established except for a few plants and some amazing composite herbal drugs (Sharma *et al*., 2001).

Conclusion

On the basis of the above discussion, it has been concluded that nature is better combinatorial chemistry and has possible answers to all or many diseases for

mankind. Therapeutic plants play an essential role in stone diseases. The undesirable impact of the modern medication has recently diverted the interest of the individuals towards herbal medicines. To improve the acceptability and awareness among the people, there can be an urgent need to build up trust and faith for the safer indigenous system by establishing its validity in treatment for various diseases. Health care systems are more and more costly; therefore herbal medication systems must be introduced in our health care. Let us hope that in future natural basic products will be contending modern medications with added advantages of more basic safety and lower costs.

Conflict of Interest. The authors declare no conflict of interest.

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