



Review Article

ANTIUROLITHIATIC EFFECT OF SOME POLYHERBAL FORMULATIONS USED IN EXPERIMENTALLY INDUCED UROLITHIASIS: A REVIEW

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ABSTRACT

Urolithiasis is a common problem afflicted for many centuries with high recurrence. The aim of this review is to provide comprehensive information about six polyherbal formulations used in treatment of urolithiasis. Traditionally, antiurolithiatic plants and combination of plants have been reported for their scientifically proved pharmacological activities like diuretic, litholytic, antiurolithiatic, antioxidant, astringent, demulcent, lithotriptic, antispasmodic, analgesic, anti-inflammatory, ACE inhibition and Phospholipase A2 inhibition as a mechanism of action. Mostly for treatment of renal calculi diuretics or surgical procedure is used. Cystone (750mg/kg) appears to be safe and beneficial in patients who have renal stone. It showed an increase in expulsion rate of calculi. Antiurolithiatic effect of *Rilith* (500mg/kg) has determined on ethylene glycol induced lithiasis in male albino rats also showed prophylactic and curative regimen. Polyherbal I, Polyherbal II and Neeri-KFT also proved to have antiurolithiatic effects.

Keywords: Urolithiasis, Polyherbal formulations, Antiurolithiatic, Antioxidant, Diuretic.

INTRODUCTION

Stone formation in kidney is the oldest and the most widespread medical affliction known to human¹. Mechanism of formation of stone depends on concentration of phosphate, calcium, sodium, oxalate, and uric acid ions; urinary volume, concentration of natural inhibitors of calculi (e.g. Tamm-Horsfall mucoprotein, citrate magnesium bikunin); and pH of urine². It is a common disorder occurs in 12% of the world population with a recurrence rate of 70-80% in males and 40-60% in females. There are main three factors which determine stone formation by assessing urinary composition: quantity of inhibitors (glycosaminoglycan, citrate etc), increase in level of stone forming elements and promoter (i.e.-sodium, urates etc.) in

urine³. Promoters of stone formation are calcium, sodium, oxalate, urates, cystine, low urine pH, Tamm-Horsfall protein and inhibitors of stone formation are divided in two parts, inorganic (magnesium, pyrophosphate and citrate) and organic (nephrocalcin Tamm-Horsfall protein, protease inhibitors, glycosaminoglycans and high urine flow)⁴.

Some medical conditions that increase the risk of development of nephrolithiasis include gout, diabetes, obesity and primary hyperparathyroidism. Dietary factors are there which also play an important role in the development of nephrolithiasis that is, low fluid intake and high dietary calcium. However, evidence is mixed for diets with low dietary magnesium, increased animal protein, low dietary potassium and increased sodium.

Table 1: Urinary stone promoters & inhibitors⁵⁻¹⁰

S.No.	Promoters	Inhibitors	
		Inorganic	Organic
1	Calcium	Citrate Pyrophosphate Magnesium Glycosaminoglycans	High urine flow Tamm-Horsfall protein Protease inhibitors Nephrocalcin
2	Sodium		
3	Urate		
4	Cystine		
5	Oxalate		
6	Low urine pH		
7	Tamm-Horsfall protein		

Epidemiology

Urolithiasis occurs in one out of 20 people at some time in their lives. Calcium stones are mostly found in the patients and the average age of onset is third to fourth decade (30-40years). 5% of populations is effected from kidney stone, with a lifetime risk of passing a kidney stone about 8-10%. In India, approximately 5-7 million people suffer from this disease and at 1/1000 of population of our country needs hospitalization due to

urolithiasis and the prevalence increasing throughout the industrialized world¹¹. 12% of the population is estimated to have urinary stones, out of which 50% may end up with loss of kidneys or renal damage. Repeated stone formation is a frequent problem with all types of stones and consequently an important part of the medical care of patients with stone disease¹².

Etiology

Reasons of development of kidney stone in some people are not totally understood. Beside from the risk factors, metabolic condition e.g. cystinuria, hyperuricosuria, xanthinuria, hyperoxaluria, hyperthyroidism and distal tubular acidosis are some common cause of stone formation¹³.

Pathogenesis

Urinary stone is developed on the basis of urinary volume; concentration of phosphate, oxalate, sodium, uric acid and calcium ions and also on the concentration of natural inhibitors (e.g. magnesium, Tamm-Horsfall mucoproteins, bikunin and citrate); and pH of urine also a major case for development of urinary stone.

Table 2: Major cause of calcium stone formation¹⁴⁻¹⁵

Condition	Definition	Causes
Hyperoxaluria (>40mg/dl)	Urinary oxalate excretion excessive dietary intake	Genetic oxalate overproduction Increase G.I absorption
Hypomagnesuria (<50mg/dl)	Urinary magnesium excretion	Limited intake of Mg rich foods
Hypercalciurea (>200mg/dl)	Urinary calcium excretion Impaired renal calcium	Absorptive hypercalciurea Absorption Primary hyperparathyroidism
Hypocitraturia (<320mg/dl)	Urinary citrate excretion Excretion	Impaired renal tubular acid Thiazide induced hypokalemia High animal protein diet High sodium intake
Hyperuricosuria (>600mg/dl)	Urinary acid excretion	Dietary protein excess

There are five categories in which urinary stone are classified. Classification of Stone is based on their composition: calcium oxalate (70%), struvite (15-20%), uric acid (10%) calcium phosphate(5-10%), and cystine (1%).

Mechanism of stone formation

After that physico-chemical change in the state of supersaturation and abnormal crystalluria, crystal's aggregations, crystal's growth is formed → stone formation.

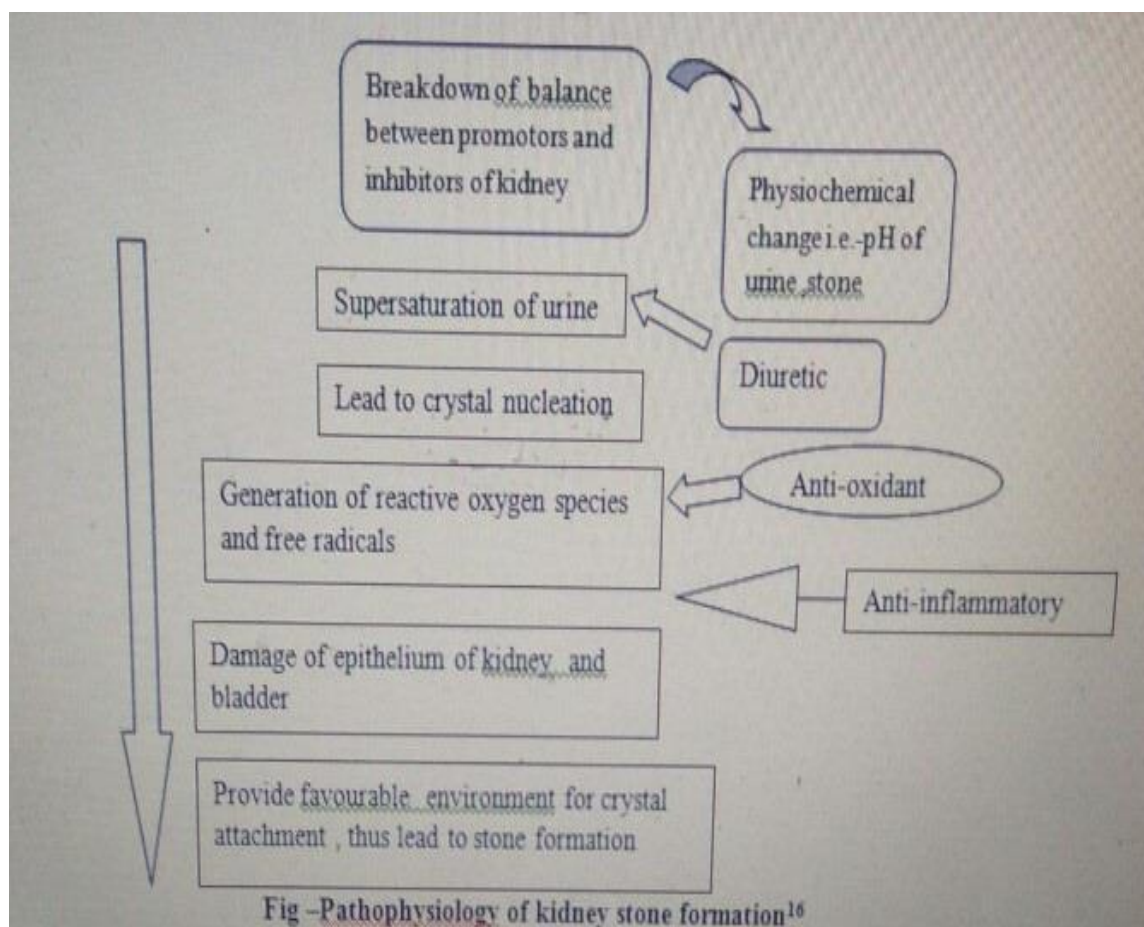


Fig -Pathophysiology of kidney stone formation¹⁶

From different age, profession, nutrition, sex, mentality, climate, constitutions, race and inheritance → atypical renal morphology, disturbed renal flow, urinary tract infection, metabolic abnormalities and genetic factors. Due to these factors, excretion of stone forming constituents will increased and decreased the excretion of inhibitors.

Types of stones

Urinary stones are basically of following type-

- Calcium based stones
- Cystine stone

- Struvite stone
- Uric acid stone
- Drug induced stone.

Calcium stone is commonly found in the patients with urolithiasis¹⁷⁻¹⁸.

Signs and symptoms: Main symptom in kidney stone is pain depend on the location

Table 3: Relationship between stone location and symptoms

S.No.	Stone Location	Common Symptoms
1	Kidney	Vague flank pain, hematuria
2	Proximal ureter	Renal colic, flank pain, upper abdominal pain
3	Middle section of ureter	Renal colic, anterior abdominal pain, flank pain
4	Distal ureter	Renal colic, dysuria, urinary frequency, anterior abdominal pain, flank pain

POLYHERBAL DRUGS IN UROLITHIASIS

Polyherbal drug

Formulation containing two or more than two herbs are called polyherbal formulation in Ayurveda. Now a days polyherbal formulations achieved its popularity at worldwide, due to the fact that polyherbal possesses various advantages which is not available in allopathic drugs¹⁹.

At present scenario is that medicinal plants play a significant role in various ancient traditional systems of medication in individual and also in combination form. Even today, plants are proven as a cheap source of drugs for majority of world’s population. Many pharmacological investigations on the herbal plants used in traditional antiurolithic therapy have reported their therapeutic potential in both *in-vitro* or *in vivo* models²⁰. Mostly all the remedies are related and derived from plants and their traditional applications are proven to be useful to chiefly decreasing the development of urolithiasis without cause any potential side effects²¹. Many polyherbal formulations which have different mechanism for treatment of urolithiasis. However, in addition to the traumatic effect of shockwaves, persistent residue stone fragments and the possibility of infection suggests that ESWL (Extracorporeal shock wave lithotripsy) may cause decrease in renal function, an increase in stone recurrence and acute renal injury. Polyherbal formulations shows their effects by different types of mechanism²²

- Alteration of physiological pH
- Diuretic activity
- Antioxidant property
- Inhibition of oxalate synthesizing enzyme
- Mixed action

Urine pH is the leading factor that is predominantly identifies the type of urine calculus is present in the urinary tract. Oxalate crystals deposition is pH dependent. Uric acid at Ph (5.2- 5.8), oxalates (5.0- 6.0) and hydroxyl apatite (7.0) are precipitated. Solubilization of these calculi can be achieved by alteration of urinary pH. Increases in urinary pH have reported to responsible for dissolving complex of calcium & oxalate²³.

Diuretic activity of polyherbal formulations increased the urinary volume which prevents the crystal precipitation which caused by supersaturation of the urine. The type of fluids should be carefully preferred to achieve the suitable change of urine composition depending on stone composition²⁴. All herbal

medicine used for treatment of urolithiasis has diuretic action and some known to alkalize the urine. Synthetic diuretics cause inhibition of potassium secretion leading to potassium retention that has some toxic effects e.g. loop diuretic and thiazide. On contrast, many herbs and herbal formulations have been explored and found to show a potent diuretic activity without any toxic and side effects²⁵.

ROLE OF ANTIOXIDANT IN UROLITHIASIS²⁶

Epithelial cell injury in kidney in presence of calcium is mediated by overproduction of reactive oxygen species (ROS), produced mostly from mitochondria or nicotinamide adenine dinucleotide phosphate (NADPH) oxidase. Urinary calculi is form due to the interaction between injured renal tubular epithelium and CaOx crystals or oxalate ions. Many natural antioxidants have proved to their antilithiatic effect e.g.- Vitamin E(major lipid per oxidation chain breaking antioxidant), Phycocyanin(free radical scavenger & antioxidant activity), Lupeol(antioxidant activity), PGG(protect against ROS induced renal cell injury and reduce renal hyaluron expression), gallotannin(inhibit COM crystal growth and adhesion to renal epithelial cells), berberine(antioxidant activity), apocynin (NADPH oxidase inhibitor), rottlerin(PKC- α inhibitor), curcumin(PKC- α inhibitor), thymoquinone(Antioxidant and antibacterial activity), fucoidans(Normalize the redox status), atorvastatin(Inhibit renal crystal retention), taurine (antioxidant activity). These are natural antioxidants which have showed their effect to reduce.

Oxalate synthesizing enzyme also an important factor to increase the risk of stone formation. Some medicinal plants which also used as a part of polyherbal formulation for urolithiasis have an inhibiting effect for oxalate synthesizing enzyme (e.g.-*Arva lanata*, *Tribulus terrestris*). Such plants contains flavonoid, alkaloid, steroid, polysaccharides, tannins, saponins etc, which have a supportive property to inhibit the formation of oxalate crystals. Glycolate oxidase (GOX) is one of the enzyme which involves in the pathway of oxalate synthesis in which glycolate converts to glyoxylate by oxidation and finally to oxalate²⁷.

OESTEOPOROSIS AND KIDNEY STONE

In case of oestoporosis, calcium supplementation is needed for treatment. There was some risk of occurrence of kidney stone

due to calcium supplementation during treatment of osteoporosis.

But now it has proved, calcium supplements in the treatment of osteoporosis alone or in combination with another type of treatment does not significantly increase the risk of nephrolithiasis of renal colic²⁸.

Different polyherbal formulations

1. Cystone
2. Rilith
3. Renomet
4. Polyherbal I
5. Polyherbal II
6. Neeri –KFT
7. Polyherbal formulation III
8. Gokshuradi polyherbal Ayurvedic formulation
9. Craschal
10. Lithocare

Table 4: Some Polyherbal Formulations and their contents

Name of polyherbal formulation	Contents
Cystone	<i>Didymocarpus pedicellata, Saxifraga lingulata, Rubia cordifolia, Cyperus scariosus, Achyranthes aspera, Onosma bracteatum, Vernonia cineria</i> ²⁹
Rilith	Pasanbhed (<i>Bergenia ligulata</i>), punarnava (<i>Boerhavia diffusa</i>), gokshur (<i>tribulus terrestris</i>), ashwagandha (<i>Withania somnifera</i>), varuna (<i>Crataeva nurvala</i>) ³⁰
Renomet	<i>Saxifraga lingulata, Tribulus terrestris, Dolichos biflorus, Crataeva nurvala</i> ³¹
Polyherbal I	<i>Plectranthus mollis Spreng, Didymocarpus pedicellata, Teraxacum officinale, Dendrophthoe elastic desr, Citrus medica</i> ³²
Polyherbal II	<i>Aerva lanata, Asteracantha longifolia, Cucumis sativus, Cuminum cyminum, Hemidesmus indicus, Lagenaria siceraria, Tribulus terrestris</i> ³³
Polyherbal III	<i>Hemidesmus indicus, Zinziber officinale, Terminalia chebula, Nelumbo nucifera, Myristica fragrans</i> ³⁴
Neeri-KFT	<i>Boerhavia diffusa, Butea monosperma, Tinospora cordifolia, Nelumbo nucifera, Tribulus terrestris, Moringa oleifera, Vetiveria zizanioides, Crataeva nurvala, Amaranthus spinosus</i> ³⁵
Gokshuradi polyherbal Ayurvedic formulation	<i>Tribulus terrestris, Hygrophila spinosa L. Ricinus communis L, Solanum anguivi Lamk., Solanum surattense Burm</i> ³⁶
Craschal	<i>Bergenia ligulata, Dolichos biflorus, Mimosa pudica, Boerhavia diffusa, Tribulus terrestris, Crataeva nurvala, Triphala, Asphaltum, Commiphora mukul, Hajrul Yahoood Bhasma and lupeol</i> ³⁷
Lithocare	<i>Crataeva nurvala, Boerhavia diffusa, and Asteracantha longifolia</i> ³⁸

PHARMACOLOGICAL ACTIVITIES

CYSTONE

Cystone is polyherbal formulation (The Himalaya Drug Company, Bangalore, India) which have proved to an effective formulation for the treatment of urolithiasis. Antilithiatic effect of cystone is due to its complex spectrum of actions including antimicrobial, diuretic, antispasmodic, litholytic, anti-inflammatory and anticalcifying activities of its ingredients. *D. pedicellata* has reported to exhibit diuretic activity. Afzelechin

and bergenin are the active principles of *S.lingulata* which possess astringent properties, which makes it an effective antimicrobial agent. Bergenin is a known diuretic and it is effective in urolithiasis induced by glycolic acid as well as in the inhibition of growth of urinary crystals by acting on the crystalloid-colloid balance. *R. cordifolia* has reported to exhibit anti-inflammatory, diuretic and antioxidant activity. Dose dependent increase in urine volume and electrolyts excretion as well as its effects²⁹.

Table 5: Different pharmacological activities of contents of Cystone

Contents	Activity
<i>Didymocarpus pedicellata</i>	Diuretic ³⁹
<i>Saxifraga lingulata</i>	Diuretic, Antiurolithiatic, Antioxidant, anti-inflammatory, Antimicrobial ⁴⁰
<i>Rubia cordifolia</i>	Diuretic, Antioxidant, Anti-inflammatory ⁴¹
<i>Cyperus scariosus</i>	Spasmolytic ⁴²
<i>Achyranthes aspera</i>	Antioxidant, Diuretic, Litholytic, anti-inflammatory ⁴³
<i>Onosma bracteatum</i>	Diuretic, spasmolytic ⁴⁴
<i>Vernonia cineria</i>	Antibacterial, anti-inflammatory, analgesic ⁴⁵⁻⁴⁶

C. scariosus is reported to inhibit acetylcholine induced contraction of guinea pig ileum indicating nonspecific spasmolytic action and inhibition of histamine action. *A. aspera* has effect on inhibition of mineralization of urinary stone forming minerals using four models that included simultaneous flow dynamic model, reservoir static model, simultaneous flow static model, and reservoir dynamic model and the results revealed inhibition of mineralization. *O. bracteatum* is found to its diuretic and spasmolytic action. *V. cineria* is also reported for

its antibacterial, anti-inflammatory and also for analgesic properties.

RILITH³⁰

Rilith is a polyherbal formulation which contains Punarnava, Varuna, Gokshur, Ashwagandha and Pasanbhed. This formulation has reported to antilithiatic effect on ethylene glycol induced urolithiasis in rats.

Table 6: Different pharmacological activities of contents of Rilith

Contents	Activity
<i>Bergenia ligulata</i>	Antioxidant ,diuretic, astringent, lithotriptic ⁴⁷
<i>Boerhavia diffusa</i>	Antioxidant ,diuretic, litholytic, Anticancer ⁴⁸
<i>Tribulus terrestris</i>	Diuretic, litholytic, antioxidant , Antidiabetic, Anti-inflammatory, Hepatoprotective ⁴⁹
<i>Withania somnifera</i>	Diuretic, Antilithiatic ⁵⁰⁻⁵¹
<i>Crataeva nurvala</i>	Antioxidant Diuretic, Anti-inflammatory, Lithotriptic, Anthelmintic ⁵²

Above mentioned herbs which present in this formulations have properties like antioxidants, diuretic, urinary tonic, demulcent, and hepatoprotective activity. *Bergenia ligulata* has reported to their Antioxidant, diuretic, astringent and also for its lithotriptic activity.

Boerhavia diffusa found to its Antioxidant, diuretic, litholytic and Anticancer activity. *Tribulus terrestris* reported to its Diuretic, litholytic, antioxidant, Antidiabetic, Anti-inflammatory and hepatoprotective activity due to the presence of some flaonoids, glycosides, alkaloids, saponins etc. *Withania somnifera* also reported for its diuretic, antilithiatic activity due to the presence of saponins, tannins, flavonoids, glycosides and alkaloids. *Crataeva nurvala* reported to its antioxidant diuretic, anti-inflammatory, lithotriptic and also for its anthelmintic

activity. A combination of a variety of pharmacological activities makes this polyherbal formulation very effective to treat urolithiasis or kidney stone.

RENOMET³¹

Renomet is a polyherbal formulation which contains *Saxifraga lingulata* (150mg), *Tribulus terrestris*(100mg), *Dolichos biflorus* (100mg), *Crataeva nurvala*(100mg). Renomet have proved to safe and effective in not only reducing the size stones but is also effective to eliminate the stones.

Saxifraga lingulata have reported to its diuretic, antiurolithiatic, antioxidant and also for its anti-inflammatory activity due to the presence of *berginin*.

Table 7: Different pharmacological activities of contents of Renomet

Contents	Activity
<i>Saxifraga lingulata</i>	Diuretic, Antiurolithiatic, Antioxidant, Anti-inflammatory ⁴⁰
<i>Tribulus terrestris</i>	Diuretic, Litholytic, Antioxidant, Anti-diabetic, Anti-inflammatory, Hepatoprotective ⁴⁹
<i>Dolichos biflorus</i>	Antiurolithiatic ⁵³
<i>Crataeva nurvala</i>	Antioxidant , Anthelmintic, Diuretic, Lithotriptic ⁵²

Tribulus terrestris reported to its Diuretic, litholytic, antioxidant, antidiabetic, anti-inflammatory, hepatoprotective due to the presence of some flaonoids, glycosides, alkaloids, saponins etc. *Dolichos biflorus* has proved to its antiurolithiatic activity and presence of phenolic compounds and flavonoids are responsible for its antilithiatic activity. *Crataeva nurvala* evaluated for its antioxidant, anthelmintic, diuretic and also for its lithotriptic activity.

POLYHERBAL I

It is a polyherbal formulation, which have proved to show antilithiatic effect against calcium oxalate induced urolithiasis in rats. *Plectranthus mollis Spreng* has reported to its different type of pharmacological activities such as antioxidant, cytotoxic, anti-tumor promoting activity which have proved to as a support antiurolithiatic effect

Table 8: Different pharmacological activities of contents of Polyherbal I

Contents	Activity
<i>Plectranthus mollis Spreng,</i>	Antioxidant, Cytotoxic ,Anti-tumor promoting activity ⁵⁴
<i>Didymocarpus pedicellata,</i>	Diuretic, Litholytic, Antioxidant ⁵⁵
<i>Teraxacum officinale</i>	Antioxidant, Anti-inflammatory, Diuretic , Litholytic ⁵⁶
<i>Dendrophthoe elastic desr</i>	Diuretic, Astringent, Cooling agent, AntilithiaticImmunimodulatory activity ⁵⁷
<i>Citrus medica</i>	Astringent, Diuretic, Narcotic, Anti-ulcer, Anthelmintic, Blood purifier ⁵⁸

Didymocarpus pedicellata has found to its diuretic, litholytic and antioxidant activities which directly support to antiurolithiatic effect of this polyherbal formulaion. *Teraxacum officinale* found to its antioxidant, anti-inflammatory, diuretic and also for its litholytic activity. *Dendrophthoe elastic desr* mentioned as a medicinal plant due to its diuretic, astringent, antioxidant, cooling agent,antilithiatic, cytotoxic and its immunomodulatory activity. *Citrus medica* has reported to its astringent, diuretic, narcotic, anti-ulcer, anthelmintic and Blood purifying activity.

POLYHERBAL II³³

This polyherbal formulation made by the aqueous decoction of *Aerva lanata*, *Astercantha longifolia*, *Cucumis sativus*, *Cuminum cyminum*, *Hemidesmus indicus*, *Lagenaria siceraria*,

Tribulus terrestris experimentally used to check out antiurolithiatic effect on the beses of the pharmacological activities of its contents³³.

Aerva lanata has found to its antioxidant, diuretic, litholytic activities. *Astercantha longifolia* reported to diuretic, antioxidant, anti-inflammatory and also for its hepatoprotective effect. *Cucumis sativus* have litholytic effect. *Lagenaria siceraria* has reported to its diuretic and litholytic activity. *Astercantha longifolia* reported to diuretic, antioxidant, anti-inflammatory, and also for its hepatoprotective effect. *Cucumis sativus* have litholytic effect. *Lagenaria siceraria* has reported to its diuretic and litholytic activity. *Hemidesmus indicus* has reported to its anti-inflammatory and antimicrobial activity. *Cuminum cyminum* has found to its may pharmacological activities some of those are antioxidant, anti-inflammatory and analgesic activity. It is a multifunctional medicinal plant.

Table 9: Different pharmacological activities of contents of Polyherbal II

Contents	Activity
<i>Aerva lanata</i>	Antioxidant, Diuretic, Litholytic ⁵⁹
<i>Astercantha longifolia</i>	Diuretic, Antioxidant, Anti-inflammatory, Hepatoprotective ⁶⁰
<i>Cuminum cyminum</i>	Antioxidant, Anti-inflammatory, Analgesic ⁶¹
<i>Cucumis sativus</i>	Litholytic ⁶²
<i>Hemidesmus indicus</i>	Anti-inflammatory, Antimicrobial ⁶³
<i>Lagenaria siceraria</i>	Diuretic, Litholytic ⁶⁴
<i>Tribulus terrestris</i>	Diuretic, Litholytic, Antioxidant, Anti-diabetic, Anti-inflammatory, Hepatoprotective ⁴⁹

Tribulus terrestris is widely using medicinal plant also have multifunctional properties such as diuretic, litholytic, antioxidant, anti-diabetic, anti-inflammatory and hepatoprotective activity.

NEERI –KFT

NEERI is a perfect polyherbal sugar free syrup which manufactured by AIMIL Pharmaceuticals (India) Ltd developed and formulated on the scientific concept, which exerts overall therapeutic activity with protection in various types of urinary disorders like urinary calculi (kidney stone), urinary tract

infections and prostate associated disorders. It is an experimented, documented and clinically proven herbal regime to treat both the causes and effects in urinary disorders. NEERI contains herbal extracts that have been scientifically validated all over the world for their safety and efficiency. These extracts are the enriched sources of a number of phyto-constituents like arbutin, quinolone derivatives, bioflavonoids, glycosides, tannins and several micronutrients that help tone the functioning of kidneys, ureters, urinary bladder and prostate gland. *Boerhaavia diffusa* has reported to its various pharmacological activities some of them antioxidant, diuretic, litholytic, anticancer etc.

Table 10: Different pharmacological activities of contents of Neeri –KFT

Contents	Activity
<i>Boerhaavia diffusa</i>	Antioxidant ,Diuretic, Litholytic, Anticancer ⁴⁸
<i>Tinospora cordifolia</i>	Antioxidant, Litholytic, Anti-inflammatory ⁶⁵
<i>Nelumbo nucifera</i>	Antioxidant , Diuretic(seeds), Anti-analgesics, Hepatoprotective ⁶⁶
<i>Butea monosperma</i>	Antioxidant, Anti-inflammatory, Astringent ⁶⁷
<i>Tribulus terrestris</i>	Diuretic, Litholytic, Antioxidant , Antidiabetic, Anti-inflammatory, Hepatoprotective ⁴⁹
<i>Moringa oleifera</i>	Antioxidant, Diuretic, Litholytic, Anti-inflammatory ⁶⁸
<i>Veteveria zizanioides</i>	Antioxidant ,Antifungal, Hepatoprotective ⁶⁹
<i>Crataeva nurvala</i>	Antioxidant , Anthelmintic, Diuretic ,Lithotriptic ⁵²
<i>Amaranthus spinosus</i>	Diuretic, Antioxidant, Anti-inflammatory, Antidiabetic, Hepatoprotective ⁷⁰

Tinospora cordifolia also found to its antioxidant litholytic and also for anti-inflammatory activity. *Nelumbo nucifera* reported to its antioxidant, diuretic (seeds), anti-analgesics, hepatoprotective activity which makes it a valuable plant.

Butea monosperma also have many pharmacological properties such as antioxidant, anti-inflammatory, astringent and also useful for liver. *Tribulus terrestris* reported to its diuretic, litholytic, antioxidant, anti-diabetic, anti-inflammatory and hepatoprotective activity. *Moringa oleifera* also reported for antioxidant, diuretic, litholytic and for anti-inflammatory activity. *Veteveria zizanioides* found to its antioxidant, antifungal, hepatoprotective properties. *Crataeva nurvala* found to its antioxidant, anthelmintic, diuretic and lithotriptic properties. *Amaranthus spinosus* evaluated for its diuretic, antioxidant, anti-inflammatory, analgesic antidiabetic, hepatoprotective.

POLYHERBAL III³⁴

This formulation have reported for its antiurolithiatic effects on experimentally induced urolithiasis in rats. Antiurolithiatic affect may be due to the presence of different contents with their different type of activities. *Hemidesmus indicus* have reported for its anti-inflammatory and also for antimicrobial activity. *Zinziber officinal* found to its antioxidant, anti-inflammatory, antispasmodic, litholytic and analgesic activities. *Terminalia chebula* has been found to its antilithiatic, anti-inflammatory, hypolipidemic, antidiabetic and renoprotective effects. *Nelumbo nucifera* reported to its antioxidant, diuretic (seeds), anti-analgesics, hepatoprotective activity.

Table 11: Different pharmacological activities of contents of polyherbal III

Contents	Activities
<i>Hemidesmus indicus</i>	Anti-inflammatory, Antimicrobial ⁶³
<i>Zinziber officinal</i>	Antioxidant, Anti-inflammatory, Antispasmodic, Litholytic Analgesic ⁷¹
<i>Terminalia chebula</i>	Antilithiatic ,Anti-inflammatory, Hypolipidemic, Antidiabetic, Renoprotective ⁷²
<i>Nelumbo nucifera</i>	Antioxidant , Diuretic(seeds), Anti-analgesics, Hepatoprotective ⁶⁶
<i>Myristica fragrans</i>	Antioxidant, Hepatoprotective, Anti-inflammatory Hypoglycemic, Antidiabetic ⁷³

Myristica fragrans have found to its antioxidant, hepatoprotective, anti-inflammatory, hypoglycemic and Antidiabetic actions. Different types of pharmacological

properties of this formulation make it a very potent antiurolithiatic formulation.

GOKSHURADI POLYHERBAL AYURVEDIC FORMULATION³⁶

Gokshuradi Yog (GY) is a polyherbal ayurvedic formulation which used for several decades in Indian tradition for the treatment of urolithiasis^[137] Formulatory contents of this

formulation provide a high effectiveness to it due to their pharmacological properties, which are; *Tribulus terrestris* is widely using medicinal plant also have multifunctional properties such as diuretic, litholytic, antioxidant, anti-diabetic, anti-inflammatory and hepatoprotective activity. Using at a large scale for different type of herbal formulations.

Table 12: Different pharmacological activities of contents of Gokshuradi polyherbal Ayurvedic formulation

Contents	Activities
<i>Trubulus terrestris</i>	Diuretic, Litholytic, Antioxidant, Antidiabetic, Anti-inflammatory, Hepatoprotective ⁴⁹
<i>Hygrophila spinosa</i>	Diuretic Anti-inflammatory, antioxidant, Hepatoprotective, Analgesic, Antidiabetic ⁷⁴
<i>Ricinus communis</i>	Antioxidant, Anti-inflammatory, Litholytic, Hepatoprotective, Antidiabetic ⁷⁵
<i>Solanum anguivi Lam</i>	Antioxidant, Antiperoxidative, Antihyperlipidemic ⁷⁶
<i>Solanum surattense</i>	Hepatoprotective, Anti-inflammatory ⁷⁷

Hygrophila spinosa has evaluated for its diuretic, anti-inflammatory, antioxidant, hepatoprotective, analgesic and antidiabetic. *Ricinus communis* has reported for its antioxidant, anti-inflammatory, litholytic, hepatoprotective and antidiabetic

action. *Solanum anguivi Lam* and have *Solanum surattense* also have reported for its diuretic, litholytic, antioxidant, antiperoxidative, antihyperlipidemic, hepatoprotective and anti-inflammatory effects.

LITHOCARE³⁸

Table 13: Different pharmacological activities of contents of Lithocare

Contents	Activities
<i>Crataeva nurvala,</i>	Antioxidant, Anthelmintic, Diuretic, Lithotriptic ⁵²
<i>Boerhaavia diffusa</i>	Antioxidant, Diuretic, Litholytic, Anticancer ⁴⁸
<i>Asteracantha longifolia</i>	Diuretic, Antioxidant, Anti-inflammatory, Hepatoprotective ⁶⁰

Lithocare is a polyherbal formulation (Bacfo Pharmaceuticals India Limited, Noida) that consist of above mentioned medicinal drugs as *Crataeva nurvala* (200 mg), *Boerhaavia diffusa* (200 mg), and *Asteracantha longifolia* (100 mg). These all have scientifically documented for their different type of pharmacological activities such as Diuretic, Antioxidant, Anti-inflammatory, Hepatoprotective, Litholytic, Anticancer etc. At present many polyherbal formulations available

CRASHCAL³⁷

Crashcal, a polyherbal formulation have evaluated for its antiurolithiatic effect on ethylene glycol induced urolithiasis in rats. All contents of Crascal already have well proved antiurolithiatic activity *Bergenia ligulata*, *Dolichos biflorus*, *Boerhavia diffusa*, *Tribulus terrestris*, *Mimosa pudica*, *Crataeva nurvala*, Triphala, Asphaltum, *Commiphora mukul*, Hajrul Yahoood Bhasma and lupeol are contents of crashcal. Some of the plants in Crashcal also having diuretic, antioxidant, immunomodulating and antibacterial property.

in market for the treatment of kidney stone. Lithocare (LC) is one of them. Lithocare have proved to show preventive effect and reduced the growth of urinary stone on ethylene glycol induced urolithiasis model.

Table 14: Different pharmacological activities of contents of Crashcal

Contents	Activities
<i>Bergenia ligulata,</i>	Antioxidant, diuretic, astringent, lithotriptic ⁴⁷
<i>Dolichos biflorus,</i>	Antiurolithiatic ⁵³
<i>Boerhavia diffusa,</i>	Antioxidant, Diuretic, Litholytic, Anticancer ⁴⁸
<i>Tribulus terrestris,</i>	Diuretic, Litholytic, Antioxidant, Antidiabetic, Anti-inflammatory, Hepatoprotective ⁴⁹
<i>Mimosa pudica,</i>	Anti-inflammatory, antioxidant
<i>Crataeva nurvala</i>	Antioxidant, Anthelmintic, Diuretic, Lithotriptic ⁵²
<i>Commiphora mukul</i>	Antioxidant, Anti-inflammatory

DISCUSSION AND CONCLUSION

Urolithiasis is a complex process that results due to some physicochemical events including supersaturation, crystal nucleation, crystal growth, aggregation and retention within the kidneys. Treatment of urolithiasis involves either conventional therapy or interventional procedures. The primary agents for treatment in medical management for urolithiasis, has been investigated with steroids calcium channel blockers, phenolic compounds, antioxidants, nonsteroidal anti-inflammatory drugs (NSAIDs), and 1-adrenergic receptor antagonists. It has been well documented that urolithiasis affects 12% of the world population. Currently, in the management of urinary stones extra

corporeal shock wave Lithotripsy and surgical procedures commonly employed.

Polyherbal treatment and phytotherapy will may be an option to treat urolithiasis without cause any side effects in contrast of the side effects causing by the long time use of synthetic diuretics and it may be also a good approach to avoid surgical procedure for the treatment of renal calculi.

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