



Phytopharmacological review on Plants with Anti-Urolithiatic Potential

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ABSTRACT

The complex process of kidney stone development involves a number of physicochemical processes, such as super saturation, nucleation, growth, aggregation and retention inside the kidneys. In industrialized nations, 10-12% of the population suffers from urinary stones. Stone disease is uncommon only in a small number of places, such as Germany and the coastal regions of Japan. Therefore, the purpose of the current review is to provide information on current developments in the study of medicinal plants that have been shown to have antiurolithiatic effect. Researchers may find this page useful in locating potential lead substances or herbal remedies that are causing urolithiatic activity.

Keywords: kidney stones, nucleation, growth, aggregation, urinary stones, urolithiatic activity

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1. Introduction

According to WHO 75% of the people rely on traditional mrdicins for the treatment and prevention of various ailments. Lithias is the process through which stones are formed, and urolithiasis refers to accumulation of solid non-metallic minerals in the urinary tract.¹ Approximately 12% of the world's population suffers from various forms of urolithiasis, with a recurrence rate of 47–60% for females and 70–80% for males. Similar to this, the majority of people in the globe utilize a variety of plants to treat issues with the urinary tract, of which urolithiasis is the primary cause.² Since the past 20 years, the prevalence of urolithiasis (kidney stones) has increased to; 5-15% of people globally are affected.³ Since the past 20 years, Stones form as a result of phase transition, in which dissolved salts solidify due to supersaturation.⁴ The most typical kidney stone kind is calcium oxalate, which is one of several varieties. These

stones arise as a result of crystal nucleation, aggregation, and retention in the urinary system. Excruciating pain may occur if a stone obstructs the urine flow.⁵ Recurrent stone development is a typical complication of treatment for people with stone disease.⁶ According to Ayurveda, using plants medicinally lowers the likelihood of urolithiasis recurring while having no negative side effects.⁸ Treatment options for calculi include surgery, lithotripsy, and local laser ablation of the calculus.⁹ However, the cost of these treatments and the likelihood of recurrence make necessary preventative care¹⁰. The rate of recurrence can be decreased by phytotherapy¹¹. Plants have been investigated for antiurolithiatic action.¹² It takes time and an experimental investigation to validate herbal medicines.¹³ Reduced urine production or increased excretion of substances that might form stones, such as calcium oxalate, urate, cystine,

xanthine, and phosphate, are linked to the development of stones. The kidney's pelvis is where the stones originate, and they can be of any size, from microscopic to staghorn-sized, equal to the diameter of the renal pelvis.¹⁴

2. Anti-Urolithiatic Potential

Aerva lanata:

In Ayurvedic literature, herbs are described using synonyms that do not precisely indicate the botanical origin but rather emphasize the plant's medicinal value. As a result, under one name, several plants are identified in various regions of the nation according to the depiction, making the drug contentious. One of these controversial medications utilized in Ayurveda is pashanabheda. Comparative investigations of the pharmacology and phytochemistry of a contentious drug are an innovative concept since they reveal important details regarding the scientific basis for its conventional use. Numerous plant sources are utilised, including *Plectranthus amboinicus*, *Bergenia ciliata*, *Rotula aquatica*, and *Aerva lanata*. *Aerva lanata* has considerable antiurolithiatic action and several active phytochemicals. As a result of the study's findings, *Aerva Lanata* might be taken into account as a reliable alternate source for Pashanabheda.³⁰

Modern analytical methods were used to separate two components from *Aerva lanata* and identify them as quercetin and betulin. These two compounds were tested for in vivo antiurolithiatic activity on calculi generated by ethylene glycol (0.75% v/v) in male Wistar albino rats. The screening was based on an in silico research via docking into Oxalate oxidase (ETE 2). Both quercetin and betulin were discovered to be similarly powerful, and their antiurolithiatic activity was discovered to be connected to the diuretic function. However, betulin and quercetin are both effective treatments for urolithiasis.



Figure.1: *Aerva lanata*

Crateva magna:

The plant *Crateva magna*, which is a member of the capparaceae family, is well-known in the herbal community for its diverse variety of medicinal uses. It serves as an antispasmodic, analgesic, hypotensive, anti-inflammatory, hypoglycemic, anti-protozoal, and anti-inflammatory agent. Additionally, it is used to enhance appetite and cure a number of illnesses, such as rheumatism, nephrotoxicity, arthritis, and urinary problems. The root, bark, and leaf are used to treat skin eruptions, urinary calculi, urticaria, snake bite poisoning, disorders of the vatam, and more. Since the dawn of time, medicinal hepatitis, cancer, diabetes, arthritis,

peptic ulcers, acute and chronic inflammations, and neurological disorders.³¹ The bark of *Crateva magna* exhibited notable antiurolithiatic action. Additional research will focus on in-depth analysis, separation, and purification of active phytoconstituents with strong antiurolithiatic activity.³²



Figure.2: *Crateva Magna*

Moringa Oleifera

A widely used plant in many tropical and subtropical nations is the *moringa oleifera* lam (moringaceae). It is highly nutritious and has a wide variety of medical applications. This plant has varied components that includes a range of significant minerals and are also a strong source of protein; vitamins, beta-sitosterol, caffeoyl/quinic acid, kaempferol are present in the *moringa* plant in a rich or in rare combination. *Moringa oleifera* is crucial for the plant possess therapeutic potential as well as high nutritional content. Various parts of plant such as the leaves, roots, seed, bark, fruit, flower, and immature pods, stimulates the heart improves blood circulation, acts again antitumor, antipyretic, antiepileptic, anti-inflammatory, antiulcer, antispasmodic, diuretic, antihypertensive, cholesterol-lowering, antioxidant, antidiabetic, hepatoprotective, antibacterial, and antifungal properties, and are used to treat various illnesses.³³ The solubility product of crystallizing salts such calcium oxalate and calcium phosphate is reduced as a result of the decreased kidney retention of elements that might cause kidney stones, which may help to explain the anti urolithiatic function of the root bark of *Moringa oleifera*.³⁴



Figure.3: *Moringa Oleifera*

Tribulus terrestris:

Tribulus terrestris (family Zygophyllaceae), commonly referred to as Gokshur, Gokharu, or puncture vine, has long been utilized in both Indian and Chinese medical systems to

cure a variety of illnesses. The plant part include a range of chemical components that are crucial for medicine, including alkaloids, steroids, steroidal saponins, flavonoids, and flavonol glycosides. It has a variety of beneficial effects on the body. Including diuretic, aphrodisiac, antiurolithiatic, immunomodulatory, antidiabetic, absorption-enhancing, hypolipidemic, cardiotoxic, central nervous system, hepatoprotective, anti-inflammatory, analgesic, antispasmodic, anticancer, antibacterial, anthelmintic, larvicidal, and anticariogenic properties. Extensive study has been conducted in the last few decades to demonstrate its biological activities and the pharmacology of its extracts³⁵. The ethanolic extract of *Tribulus terrestris* fruits in albino rats with urolithiasis brought on by the implantation of glass beads by Anand et al. Leukocytosis, an increase in blood urea levels, and the deposition of calculogenic material around the glass bead were all significantly inhibited by it in a dose-dependent manner. The ethanol extract's activity decreased as a result of subsequent separation.³⁶



Figure.4: *Tribulus terrestris*

In a dose-dependent way, other biochemical values in the urine, serum, and the histology of the urinary bladder were recovered. A new antilithic protein with cytoprotective potential and a molecular weight of 60 kDa was isolated from *Tribulus terrestris*. Aggarwal investigated the activity Trivulus on the nucleation and growth of calcium oxalate (CaOx) crystals as well as oxalate-induced cell injury in NRK 52E renal only has the potential to prevent CaOx crystals from forming and growing, but also possesses cytoprotective properties.³⁷ In several models of urolithiasis employing sodium glycolate and ethylene glycol. It was discovered that the plat has inhibited the production of stones³⁸

One of the key enzymes involved in the route of oxalate formation, glycolate oxidase (GOX), converts glycolate glycolate to glyoxylate via oxidation and then to oxalate. Its GOX inhibition is thought to be responsible for *Tribulus terrestris*'s antiurolithic action. The active ingredients. in present the plant are quercetin and kaempferol. Which were discovered to inhibit GOX in no-competitive and competitive ways, respectively.³⁹

***Ocimum gratissimum*:**

Ocimum gratissimum, (family Lamiaceae), commonly known as basil, basil clove, or alfavaca, serves as a condiment in human food and is also widely known and

used for its therapeutic properties. Since ancient times, *Ocimum gratissimum* has been utilized in India to cure a variety of diseases, such as diabetes, cancer, inflammation, anaemia, diarrhoea, pain, fungal and bacterial infections, including urinary stones. Using the nucleation assay and the synthetic urine assay, it was determined that *Ocimum gratissimum* extract inhibits the growth of calcium-oxalate crystals in- vitro. While the goal of the synthetic urine method was to examine the percentage inhibition and growth of the calcium oxalate monohydrate crystals from synthetic urine at various percentage concentrations of extract (25-100%), the nucleation assay's objective was to assess the effectiveness of different concentrations of the extract (100-1000 mg/ml) on calcium oxalate crystallization in-vitro. Assay results for calcium oxalate crystal formation were shown to be directly proportional to the rise in plant extract concentration, with a maximum inhibition of 66.08% at 1000 mg/ml, while the greatest inhibition for the synthetic urine assay was 62.07% at 100% concentration of extract. As a result, *Ocimum gratissimum* was discovered to be an effective and promising antiurolithiatic agent, which is consistent with its use in traditional medicine⁴⁰



Figure.5: *Ocimum gratissimum*

***Bergenia ligulata*:**

Bergenia ligulata belongs to the family of Saxifraga ligulate. One of the highly prized medical plants, *Bergenia ligulata*, is also a key example of a controversial drug known as "paashanbheda" (meaning "to dissolve the stone") in Indian medical practices. Numerous secondary metabolites from coumarins, flavonoids, benzenoids, lactones, carbohydrates, tannins, phenols, and sterols have been identified by phytochemical research. *Bergenia ligulata* crude extracts and isolated compounds exhibit a broad range of pharmacological activities, including antiurolithic, antiviral, free radical scavenging, antidiabetic, -hepatoprotective, diuretic, antipyretic, antioxaluria, antitumor, antibacterial, anti-inflammatory, anti-implantation, and cardioprotective activities.⁴¹ *Bergenia ligulata* is taken orally to dissolve kidney stones.⁴²

The urolithiatic activity of the methanolic extract of *Bergenia ligulata* rhizomes and its isolated constituents such bergenin were compared in albino rats. In invitro experiments, conducted on rhizomes has prevented the growth of CaC₂O₄ crystals as well as crystal aggregation and showed antioxidant activity against 1,1-diphenyl-2-picrylhydrazyl free radicals and lipid peroxidation. Methanolic extract (5-10 mg/kg) of rhizomes inhibited CaC₂O₄ crystal deposition in the renal tubules in a modified

animal ethylene glycol to drinking water. This extract also reduced polyuria, weight loss, impaired renal function, and oxidative stress brought on by the lithogenic therapy. Unlike the untreated rats, ethylene glycol consumption did not result in severe hyperoxaluria and hypocalciuria. There was a noticeable rise in the urine mg^{2+} in the *Bergenia ligulata*'s antiurolithic activity may have been through CaC_2O_4 crystal inhibition, diuretic, hypermagnesiumuric and antioxidant effects which rationalizes its medicinal use in urolithiasis.⁴³



Figure.6: *Bergenia ligulata*

Urinary calculi were significantly dissolved by a methanolic extract of *Bergenia ligulata* and bergenin in both kidney and urine constituents.⁴⁴ Different *Bergenia ligulata* and *Dilichos biflorus* extracts were examined singly and in combination for their in-vitro antilithiatic / anti calcification effects. Method of homogenous precipitation. The extracts' effects were compared to those of an aqueous extract "cystone" (a imitation made by the Himalaya Company, India). *Dilichos biflorus* extract had activity that was nearly comparable to "cystone", however *Bergenia ligulata* extracts had less activity and the combination was less effective than the separate extracts. It was determined following this analysis that the active component(s) appear to be non-protein, non-tannin molecules that may work by inhibiting calcium and phosphate accumulation. In a comparative study, *Bergenia ligulata* produced the highest levels of growth inhibition of calcium monohydrate (COM) crystals then *Tribulus terrestris*.⁴⁶ The results of this investigation led to the hypothesis that *Bergenia ligulata* biomacromolecules may be crucial in the inhibition of COM crystals.

***Dolichos biflorus*:**

The plant *Dolichos biflorus*, often known as horse gram, is a member of the Fabaceae family and is grown for its seed, which is popularly referred to as the poor man's pulse in southern India. *Dolichos biflorus* is one of the most well-known plants is recognized as a beneficial diet in the prevention and treatment of kidney stones. Kidney stone formation is prevented by the chemicals found in *Dolichos biflorus* seeds. Citrate, magnesium, potassium, and vitamin B6 are some of these constituents. *Dolichos biflorus* grain contains a protein that has been found to be antimicrobial and stone-formation-inhibitory. The impact of *Dolichos biflorus* extract on kidney stone break down and prevention has been looked at in a number of studies. In addition to

their nutritional value, *Dolichos biflorus* seeds can be used as a safe medication to inhibit stone formation in individuals with kidney stones.⁴⁷

Dolichos biflorus plant species with antiurolithiatic properties have been identified. *Dolichos biflorus* aqueous, chloroform, and benzene extracts were used in this study. Using an in-vitro model, Linn and standard for dissolving kidney stones-calcium oxalate. *Dolichos biflorus* seeds were used as an in-vitro model to test their potential to dissolve calcium oxalate kidney stones that had been artificially created, along with cystone as a standard compound procured from the market. From the aqueous portion of the seed, phenolic compounds were separated from benzene, aqueous, flavonoids and steroids. When compared to other fractions, aqueous fractions demonstrated the greatest stone disintegration. Calcium oxalate was more easily dissolved ($48.5 \pm 0.022\%$) in the aqueous fraction. When compared to the phenolic and flavanoids fraction, reference standard-formulation Cystone was shown to be more effective ($53.5 \pm 0.02\%$).



Figure.7: *Dolichos biflorus*

***Boerhaavia diffusa*:**

Boerhaavia diffusa also known as punarnava in Sanskrit, is a nyctaginaceae herbaceous plant. Ayurveda, charaka Samhita. And sushrita Samhita all highlight the medicinal efficacy of this plant in the disorders. This plant's root decoction is used to treat kidney stones by indigenous and tribal people in India. Some clinical and preclinical investigations have shown that this herb is useful in treating various renal illnesses such as nephritic syndrome, kidney regeneration the plant *Boerhaavia diffusa* is commonly used in India as a traditional medicine for the treatment of renal problems, including urolithiasis. The current investigation seeks to assess the antiurolithiatic efficacy of *Boerhaavia diffusa*. Root aqueous extract (BDAE) and explain its rationale for usage in the treatment of renal stones.⁴⁸

***Nymphaea alba*:**

The aquatic plant *Nymphaea alba*, often known as the white water lily, is a member of the Nymphaeaceae family and has perennial rhizomes. It functions as an anodyne, antiscrophulatic, astringent, cardiotoxic, and aphrodisiac, sedative, anti-inflammatory, demulcent and antioxidant. Additionally, it has relaxing and calming effect on the nervous system, making it effective in the treatment of

illnesses including insomnia and anxiety. Its ability to reduce renal oxidative stress and hyperproliferative response, as well as its anticarcinogenic effect, were documented.⁴⁹ Anti urolithiatic activity of this plant was investigated urolithiasis was created by inserting a zinc disc into the urine bladder, followed by the addition of 1% ethylene glycol to the drinking water. The weight reduction of the stones was employed as a in order to examine the preventative or therapeutic regimen, an ethanolic extract of dread leaves of *Nymphaea alba* linn. Was fed orally to wistar albino rats. This was investigated for its antiurolithiatic ability; the study found that oral administration of *Nymphaea alba* Linn. resulted in a considerable reduction in the weight of bladder stones when compared to the control group.⁵⁰



Figure.8: *Nymphaea alba*

***Asparagus racemosus*:**

Asparagus racemosus (Shatavari) is a common medicinal plant in the *Asparagaceae* family. This species is widespread in subtropical and tropical regions such as India, Asia, Australia, and Africa. The phytochemical elements of the plant differ based on its availability zone. Under hot climatic circumstances, the plant has rhizomes, aerial portions, and tuberous roots. The aerial component of the plant withers when it enters dormant phase. *Asparagus racemosus* is commonly utilized in ayurveda medicinal remedies since it is known to alleviate ailments including aging, increase immunity, improve longevity, energy, and mental function. *Asparagus racemosus* is also used to treat neurological diseases, hepatopathy, malignancies, and dyspepsia. The root of *Asparagus Racemosus* has numerous medicinal properties that are well documented in ancient ayurveda literature. The presence of numerous pharmacological qualities such as antioxidant, anti-inflammatory, antiseptic, and antibacterial properties contributes to the therapeutic property.⁵¹



Figure.9: *Asparagus racemosus*

The pathogenesis of urolithiasis is commonly studied using ethanolic extract of *Asparagus racemosus* in rats models, where urolithiasis is induced by calcium oxalate or ethylene glycol alone or in combination with ammonium chloride. After 10 days, blood samples were taken and analyzed for serum concentrations of calcium, phosphorous, urea, and creatinine. The kidneys were then removed and sectioned for histopathological examination. Increased excretion of phosphorus has been recorded in stone formers, and the data were given as mean standard error of mean and evaluated using one-way analysis of variance. Histopathology revealed less tissue damage.⁵² The ethanolic extract considerably lowered the high level of calculogenic ions in urine while increasing the urinary magnesium concentration.

***Swertia chirata*:**

Swertia chirata (Chirata) belongs to the family of Gentianacea, has roughly 135 species of annual and perennial herbs. *Swertia* species are commonly used in many kinds of herbal medicines. The entire plant is commonly utilized by locals to treat hepatitis, inflammation, and digestive disorders. A wide range of medicinal uses include the treatment of chronic fever, malaria, anemia, bronchial asthma, hepatotoxic disorders, liver disorders, hepatitis, gastritis, constipation, dyspepsia, skin diseases, worms, epilepsy, ulcers, scanty urine, hypertension, melancholia, and certain types of mental disorders, bile secretion, blood purification, and diabetes.⁵³ Tis medications have the tonic qualities of gentian and other bitters. In India, it is widely used in urinary symptoms characterized by discomfort in the kidney region, frequent urge to urinate, and trouble urinating. Uric acid deposits are frequently encountered. It is used to treat tiring illness, as well as atonic and nervous dyspepsia.⁵⁴



Figure.10: *Asparagus racemosus*

In one study⁵², rats were given 0.75 v/v ethylene glycol in their drinking water for 28 days to induce kidney stone formation. Furthermore, a low and high dose of methanolic extract of *Swertia chirata* was provided medication with ethylene glycol for 28 days. Each animal's urine, blood, and kidney samples were taken after for 28 days. Finally, various amounts of promoters, inhibitors, and antioxidant parameters are estimated, with increased levels of promoters and decreased levels of inhibitors when compared to normal control rats.

Saccharum spontaneum:

Saccharum spontaneum often known as Kasa (Family: Poaceae), is a traditional herb with exceptional therapeutic value; it has been advocated in the treatment of gynecological problems and pulmonary sickness. In the ayurvedic system, roots are used as an astringent, emollient, refrigerant, diuretic, purgative, tonic, and aphrodisiac, and are beneficial in the treatment of dyspepsia, burning feeling piles, and sexual weakness. The stems (culm) are beneficial in vitiated states of pitta and vata sensation of burning strongly, renal and vesical calculi dyspepsia. Haemorrhoids, menorrhagia, dysentery, agalactia, phthisis, and general debility. This study summarizes the effect of an alcoholic extract of *Saccharum spontaneum* on glycolic acid-induced urolithiasis in albino rats. Lithiasis was created in rats by feeding them a calculi producing (COD: commercial food combined with 3% glycolic acid) for 28 days, and it was characterized by high urine calcium, phosphate, oxalate, protein, and low urinary magnesium content. In the curative group, therapeutic treatment with plant extract (200 and 300mg/kg b.wt. dose-1 day-1 oral-1) has considerably improved to near normalcy. It also increased urine volume, which reduced the tendency for crystallization. According to the results of this investigation, *Saccharum spontaneum* can play a crucial part in the prevention of disorders related with kidney stone formation.⁵

Figure.11: *Saccharum spontaneum***Dichrostachys Cinerea**

Dichrostachys cinerea is utilized as a phytotherapeutic agent.⁵⁶ The root is astringent and used to treat rheumatism, urinary calculi, and renal problems.⁵⁷ The impact of ethanolic and aqueous extracts of *Dichrostachys cinerea* root on anti-urolithiatic and diuretic activities was examined in male wistar albino rats at 200 mg/kg dose level. Ethylene glycol feeding caused hyperoxaluria due to increased renal excretion of calcium and phosphate. Aqueous and ethanolic extracts of the plant dramatically reduced the increased urine oxalate, indicating a regulatory influence on endogenous oxalate production. When in comparison with ethanolic extracts, aqueous extract had strong antilithiatic efficacy. Hyperoxaluria has been demonstrated to be a more substantial risk factor in the pathophysiology of stone formation.⁵⁸

Figure.12: *Dichrostachys Cinerea***Terminalia chebula:**

The plant *Terminalia Chebula* (family: Combretaceae) is significant in pharmaceuticals, largely because of the variety of therapeutic applications it has. It is often referred to as Hritaki. Its Hindi name is harad, and its English name is black myroban. Indian system of traditional medicine According to Ayurveda, this plant is a necessary herb. In ayurveda, *Terminalia chebula* is renowned for curing all dosas, stimulating digestion, rasayana, and vriseya, and exhibiting immune modulatory qualities that aid in enhancing the body's defense mechanism. It has the moniker "king of the medicines" in Tibet.⁵⁹ The analysis of *Terminalia Chebula's* in vitro anti-urolithiatic efficacy.

Figure.13: *Terminalia chebula*

The *Terminalia chebula* ethanol extract was shown to have the maximum calcium oxalate crystal dissolution. It was discovered that the *Terminalia Chebula* ethanol extract effectively dissolves calcium oxalate⁶⁰. The *terminalia chebula* mediated silver nanoparticle inhibitory effect in struvite crystals was discovered using the single gel diffusion approach. It was discovered that the inhibition efficacy was 87.9%. showed that silver nanoparticles mediated by *T. chebula* were an effective struvite crystal inhibitor. The phyto components present in *T. chebula* bark are what contribute for the anti-urolithiatic activity, according to the change in band values of FTIR spectra⁶¹. Oxalate and phosphate concentrations in urine and renal tissue homogenate were reduced by extract treatment. Additionally, the supplementation with the extract stopped the rise in blood urea nitrogen, uric acid, and creatinine levels in the serum. A histopathological examination showed that the *terminalia chebula* fruit extract preserved the usual architecture of kidney tissue while reducing histological alterations. This result suggests that the fruit of

Terminalia chebula had antiurolithiatic activity in its aqueous extract.⁶²

Acorus calamus:

By effectively reducing different urolithiatic promoters in blood, urine, and kidney tissue, Ethanolic extract of *A. calamus*(EEAC) demonstrated excellent protection from ethylene glycol-induced urolithiasis. Additionally, EEAC has a strong diuretic effect that can aid in further flushing out those promoters in the urine as well as speed up the process of dissolving already-formed stones and preventing their recurrence. The current discovery so stresses that *A. calamus*'s rhizomes may be useful as a medicine and advantageous in avoiding of kidney stones.⁶³



Figure.14: *Acorus calamus*

Cucumis melo:

Ayurvedic literature from Sri Lanka was used to guide the selection of the cucumber plant for this remedy. *Cucumis melo* seeds' methanolic extract has a high concentration of Compared to the common polyherbal medicine, the anti-urolithiatic drug hascystone. The main proof for the claims made in this study is *Cucumis melo* seeds have an anti-urolithiatic component.⁶⁴



Figure.15: *Cucumis melo*

Curcuma zedoaria:

The Zingiberaceae family includes the medicinal herb *Curcuma zedoaria*. The study's aim is to examine the phytoconstituents in the ethyl acetate extract of *C. zedoaria* rhizomes and assess their potential for preventing urolithiatic activity using both an in vitro single gel diffusion approach and an in vivo ethylene glycol-induced model. Model for urolithiasis. Both qualitative and quantitative analyses revealed that terpenoids

predominated. The Crystals of struvite were produced in a gel media. The gel was created after the addition of the extract in various quantities. Using a portable microscope, the increase in crystal size was tracked for five days. Results from both in vitro and in vivo studies "conclude potent antiurolithiatic activity of *C. zedoaria* which can be explained by the presence of terpenoids. The in vivo anti-urolithiatic activity was evaluated in wistar rat models. Histopathological study of the kidney of treated rats indicated a normal architecture similar to control.⁶⁵



Figure.16: *Curcuma zedoaria*

Daucus carota:

DCRE has an in vitro antiurolithiatic potential against CaOx urolithiasis. DCRE demonstrated strong suppression of all CaOx stone formation phases, including nucleation, growth and aggregation, which encouraged the emergence of more hospitable Crystals of COD. Although additional in vivo and clinical investigations required to demonstrate *D. carota*'s effectiveness as an antiurolithiatic, however Considering the widespread use and accessibility of *D. carota* throughout the planet and its potential antilithic function, *D. carota* could act as a simple, helpful alternative to, or supplemental treatment for CaOx urinary lithiasis.⁶⁶In lithogenic rats, *D. carota* extract dramatically reduced aberrant urine concentrations of calcium, oxalate, phosphate, magnesium, citrate, protein, and uric acid. Following *D. carota* treatment, serum BUN, creatinine, and uric acid levels as well as calcium, phosphate, and oxalate deposits in kidney tissue returned to normal. Additionally, both preventatively and therapeutically, *D. carota* extract halted renal tissue deterioration caused by oxidative stress.⁶⁷



Figure.17: *Daucus carota*

Mentha piperita:Figure.18: *Mentha piperita*

To assess the *Mentha piperita* medicinal plant's in vitro anti-urolithiatic effect. The maximal efficacies of methanolic extract were demonstrated in the dissolving of calcium oxalate crystals. Our findings made it abundantly evident that *Mentha piperita*'s methanolic leaf extracts were Quite encouraging for further research in this area. Neeri was the standard medication in this trial.⁶⁸The anti-urolithiasis prophylactic and therapeutic potential of Mp .Cr, as it gives scientific support to the folklore claims against kidney stone illness. The combined effect of crystal inhibitory, antioxidant, anti-inflammatory, spasmolytic, and diuretic activities of Mp.Cr may mediate its antiurolithiatic properties. Mp.Cr also improves urine and serum biochemistry, making it a safer and more affordable option for treating kidney stone disease.⁶⁹

Kigelia africana:

Fruit extracts from *Kigelia africana* showed anti-lithogenic effects in in vivo and in vitro antilithiatic models. The in-vitro model's crystal disintegration was seen under a microscope, and its confirmation came from the discovery of a rise in the concentration of calcium and oxalate during elemental ion analysis. There were lower levels of calcium, oxalate, inorganic phosphorus, and magnesium ions in the urine in the in-vivo model. Overall findings from both lithiatic models suggest that *Kigelia Africana* has strong anti-urolithogenic properties and will aid in the removal and dissolving of renal stones.⁷⁰

Figure.18: *Kigelia africana***3. Causes**

Several variables may be to blame for kidney stones, which frequently lack a clear, identifiable cause. Kidney stones develop when the fluid in urine does not sufficiently dilute the amount of crystallizing chemicals, such as calcium,

oxalate, and uric acid, present in the urine. Additionally, urine can be deficient in chemicals that keep crystals from clumping together, which makes it more probable for kidney stones to develop. Low fluid consumption, a high diet that consists of animal protein, sodium, refined sugars, calcium oxalate, grapefruit juice, apple juice, fructose, and high fructose corn syrup, as well as cola beverages, are dietary factors that enhance the chance of stones forming.⁷¹Inadequate urine drainage, foreign bodies in the urinary system, microbiological infections, vitamin abnormalities such as vitamin A deficits, excessive vitamin D, and metabolic illnesses like hyperthyroidism, cystinuria, gout, intestinal dysfunction, etc. are other causes of stone formation.⁷²Urine must be oversaturated for the precipitating crystalline component to form stones within the urinary system. Agents that can alter nucleation, crystallization, aggregation, and urine pH are also key factors in the development of kidney stones. According to some reports, vegetarians are less likely to develop stones than non-vegetarians.⁷³Kidney stone risk is enhanced by a family history of the condition (which triples risk), insulin resistance, a history of hypertension, primary hyperparathyroidism, a history of gout, chronic metabolic acidosis, and surgical menopause. Decongestants (ephedrine, guaifenesin), diuretics (triamterene), protease inhibitors (indinavir), and anticonvulsants (felbamate, topiramate) are just a few of the medications that raise the risk of stones disease.

Renal stone pathogenesis relies on two fundamental factors⁷³ -

1. Increased stone formation in the urine elements such as calcium, phosphorus, and uric acid, Cysteine and oxalate.
2. Physical and chemical alterations that affect the accumulation of stones such as urine's pH, the matrix of stones, and urine contains protecting chemicals.

Kidney stones' symptoms include:

- Colicky discomfort,
- Oliguria, pyuria,
- Dysuria, hematuria and
- Nausea/vomiting.

4. Conclusion

The study makes it abundantly evident that medicinal plants are effective in treating a wide range of illnesses. Many therapeutic plants and their extracts have been documented to have significant anti-urolithiatic action. This study suggests that kidney damage may get benefited from medicinal plants. Natural therapeutic is considered to be more valuable than other treatments. It has fewer side effects, cost effective and does not pose a risk to long term fertility (or) recurrence. Moderant medicine lacks satisfactory drugs, so herbal remedies are used as an additional therapy for better relief at different stages of stone pathophysiology. The current review provides empirical evidence about the mechanism of action of medicinal herbs against urolithiasis. The anti urolithiatic activity of all the medicinal herbs is most likely caused by the presence of phenolic and flavanoids. It is therefore concluded that the herbal drugs with urolithiatic activity,

has been demonstrated by several opportunities to develop for future needs.

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