

Potential of Herbal Extracts as Anti-urolithiasis And Diuretic Effect

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Abstract: Minerals and acid salts that clump together in concentrated urine and form kidney stones are known as urolithiasis (renal calculi, nephrolithiasis, or kidney stones). Although travelling through the urinary tract can be uncomfortable, they often don't result in long-term harm. The most prevalent symptom is acute pain, which is typically in the side of the abdomen and is frequently accompanied by nausea. The complex process of kidney stone development involves a number of physicochemical processes, such as supersaturation, nucleation, growth, aggregation, and retention inside the kidneys. In industrialized nations, 12–14% of the population suffers from urinary stones and associated symptoms like pain, and inflammation. In order to help the stone pass, treatment options include painkillers and drinking lots of water. Larger stones may need to be removed or broken apart using medical techniques. 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 effects. Electronic databases like MEDLINE, LILACS, Cochrane Library, dissertation Abstract (USA), National Research Register, Current Controlled trials, CenterWatch Trials Database, and PsychINFO Journal Article bases were used to search for information related to studies done on plants in the past years for kidney related health issues. Researchers may find this review article useful in locating potential lead substances or herbal remedies that are responsible for urolithiasis activity.

Key Word: Nephrolithiasis, Renal calculi, Anti-inflammatory, Mulberry extract, *Viti's vinifera* extract.

Introduction

Renal stones/urinary calculi are the most frequent ailment, affecting 12 out of every 100 people worldwide (Alelign and Petros, 2018). Calculi are more common nowadays as a consequence of western food habits, environmental variables, and bad behaviour/lifestyle. Urolithiasis/nephrolithiasis refers to calcium stones that form in the kidney and/or urinary system. Nearly 80% of the calculi were prepared up of a combination of calcium oxalate and phosphate. Humans get urolithiasis, although the chance of developing it is substantially higher in males (12 in 100) than in women (6 in 100). Surgically operated lithotripsy and high-grade laser treatments are used to eliminate and cleanse the calculi.

It is extremely luxurious, and repetition is common due to requiring the preventative medication (Durner et al., 2016). The repetition speed of calculi is drastically augmented by 10% in the first year, 33% in five years), and 50% in ten years owing to the require of prophylactic medication (10 years). According to the study, urolithiasis was connected to a variety of clinical issues including eruption, urosepsis, urethral scar, urine extravasation, and kidney weakness in certain criteria. There are currently no viable urolithiasis treatments available in modern medicine (Gouru et al., 2018). Treatments have been developed for eliminating kidney stones with little renal damage. The most common medical treatments for urolithiasis are blockers of calcium channels and steroids like thiazide dilaurate, allopurinol, and alkali-citrate; all of these drugs have common side effects like rash, diarrhoea, nausea, and increased gout attacks. Allopathic therapy among thiazide and diuretics and alkali citrate was specified as a precaution, excluding it was unable to liquefy the calculi

(Zisman, 2017). Urolithiasis and nephrolithiasis patients were treated with invasive and expensive critical measures. To break down the calculi, cutaneous nephrolithotomy and extracorporeal distress gesture Lithotripsy – (ESWL) treatments might be employed (Aboelkher et al., 2017).

Thus Extracorporeal shock-wave lithotripsy (ESWL), endourological techniques such as ureteroscopy or percutaneous extraction procedures are the only non-invasive stone therapy options However, not all patients tolerate this medicine or method, and some people continue to produce stones following therapy.

Even after substantial urological study, urolithiasis remains a perplexing condition. The exact aetiology and mechanism of urolithiasis have remained a mystery despite the use of sophisticated instruments and investigations. The therapy for kidney stones in contemporary medicine is costly and not accessible to everyone. There are no satisfactory drugs in modern medicine to dissolve kidney stone.

The physical process of stone production is a complicated series of processes that begin with the growing of crystals and end with the formation of stones. The production of stones is influenced by the amount of urine and the quantities of calcium, phosphate, oxalate, and sodium ions present. Urinary calculi pathogenesis is the outcome of a sequence of fundamental multi-step physicochemical processes. Urolithiasis is caused by a combination of genetic, metabolic, environmental, and dietary variables, all of which favour the crystallization of salts generated inside renal tubules. Crystalluria can occur in healthy people if crystals stay behind and separated from one another. They cause them to clump together. The crystals clump together and adhere to the epithelium, allowing them to develop and become stones (Jayaraman and Gurusamy, 2018).

In each of the three major conceptual categories, kidney stone production necessitates An excessive concentration of solutes in the urine that exceeds their miscibility.

- Crystallization in the urine and an imbalance of modifiers (promoters and inhibitors).
- Abnormalities in the epithelial layer that allow crystals to connect and develop into stone.
- Furthermore, calcium oxalate (Caox) crystals, the main component of human urinary calculi, may adhere to the plasma coating of epithelial cells in a specific way, leading to endocytosis and cell damage or death (Abou-Elala, A. 2017).

Damaged cells respond by proliferating and increasing fibrogenic production, providing extra stimulation for crystal development. Calcium stone formation is divided into four stages: rising Caox and restrict accumulation, gemstone development, crystal aggregation, and crystal retention. Stone formation is described because a supersaturated clarification in which standardized or diverse nucleation can lead to the commencement of crystal formation, which can subsequently aggregate and expand, according to the physico-chemical analysis (Boim et al., 2010).

These procedures are less pleasant for patients and can result in complications such as bleeding, tubular necrosis, and renal fibrosis. Those therapy methods are costly, and patients

should be required to follow up for an extended length of time. As a result, new therapeutically improved anti-urolithiatic medications are urgently needed to prevent recurrences, avoid side effects, and be cost efficient (Liu et al., 2018). Because of their simple availability, cheap cost, and few side effects, the World Health Organization (WHO) is also interested in using herbal drugs/traditional medicines. Cystone is a poly-herbal dosage form based on a orientation originate in the antique Ayurvedic School of medicine and has been widely used to treat urinary/renal calculi for a long time (Hiremath and Jalalpure, 2016). Various tribes of different region of india uses powder and juice of pepper as traditional medicine for gall bladder and kidney stone. (*Pandhare et al.,2021*)

Ammonium chloride is a urine acidifier that is used to treat metabolic-alkalosis, dissolve some forms of urinary stones sometimes called as struvite stones, alleviate toxicities and boost the efficiency of antimicrobials. A chloride is known to used to prevent the formation of certain kind of kidney and bladder Stone, this makes the urine more acidic. This can also be used to increase the elimination of certain kinds of toxin or drugs substances from body.

Type of Kidney stones

A kidney stone is a solid item that is created from urine-based compounds. Kidney stones can be made of calcium oxalate, uric acid, struvite, or cystine. Diverse wastes are dissolved in urine. Crystals start to develop when there is too much waste in too little liquid. The crystals draw in additional substances and combine to produce a solid that will only grow unless it is eliminated from the body through urination. The kidney, the body's chief chemist, often eliminates these compounds in the urine. Most people's kidney stones are either washed out by adequate liquid or prevented from developing by other substances in urine.

The stone may remain in the kidney once it forms or it may go through the ureter and into the bladder. Sometimes, very little stones leave the body through the urine without causing too much discomfort. However, immobile stones can result in a urine backup in the kidney, ureter, bladder, or urethra. **Calcium Oxalate:** The most typical kidney stone is calcium oxalate, which is produced when calcium and oxalate mix in urine. Inadequate calcium and fluid intake, among other factors, may aid in their development.

Uric Acid: Another prevalent form of kidney stone is uric acid. Foods rich in purines, a naturally occurring chemical component, include organ meats and shellfish. Increased monosodium urate production results from excessive purine intake, and under the correct

circumstances, this substance may produce kidney stones. These kinds of stones frequently develop in families.

Struvite: These less frequent stones are brought on by upper urinary tract infections.

Cystine: These extremely uncommon stones frequently run in families (Aboelkher et al., 2017).

Causes of urolithiasis

Possible contributing factors include inadequate hydration, excessive or insufficient activity, obesity, weight loss surgery, and a diet high in salt or sugar. For certain people, family history and infections may be significant. Consuming excessive amounts of fructose is associated with a higher risk of kidney stone formation (Alelign and Petros., 2018).

Signs and symptoms of renal calculi

Significant lower back ache on either side.

More nebulous pain or a persistent stomachache.

Red blood cells can occasionally be seen in urine in very minute numbers that are invisible to the human eye. Fever and chills, nausea, and vomiting.

Urine that is hazy or has a foul smell. A strong want to use the bathroom.

Frequent urination or a burning sensation when urinating.

Men may experience discomfort near the tip of the penis (Durner et al., 2016).

List of herbs for the treatment of Urolithiasis

***Bixa orellana*:** is a shrub or small tree that is commonly cultivated in the West Indies, tropical Asia, and Africa for its seeds or as an aesthetic plant. Bixa leaves have been used to treat leishmaniasis and malaria. Significant diuretic activity is exhibited by the methanolic extract of *Bixa orellana* leaves by increasing the volume of urine produced as well as the excretion of sodium, potassium, and chloride (Kaushik, et al. 2014).

***Euphorbia thymifolia*:** Also known as laghududhika or choti-dudhi, is a small-branched, glabrous, annual herb that grows in the Euphorbiaceae family. In worm infestations, the leaves, seeds, and fresh juice of the entire plant are used as stimulants and astringents. Effectiveness of fractionated extract in treating urolithiasis (kaushik, et al. 2014).

***Piper nigrum*:** It mainly showed antimicrobial, anticancer, antioxidant, antidiarrheal, hepatoprotective, anticonvulsant, immunomodulatory, antidepressant, anti-inflammatory, antiplatelet, anti-asthmatic, antiulcer, hypolipidemic, and anti-diabetic activities. Recently it was reported that piperine also witnessed for antiurolithiatic activity (*Suvarna-Rahaman et*

al.,2020). In-vivo study reported that piperine 40mg/kg has shown significant anti-urolithiatic activity in urine analysis, serum analysis and kidney histopathological studies when compared with standard drug Cystone. (*Suvarna-Rahaman et al.*,2020).

C. nurvala: Pharmacologically many studies showed that the *C. nurvala* extract content an important chemical constituent lupeol, which may be the main reason for this anti-urolithiasis activity (Pantha et al., 2020).

Vitis Vinifera: Studies revealed that *Vitis vinifera* leaves showed good efficacy against ethylene glycol induced urolithiasis in in-vivo model (Edla and Challa., 2018). Fruit of *V. vinifera* also contain lupeol however no scientific data available which claims anti-urolithiasis activity of grapes fruit.

It was found that *V. vinifera* act as hepatoprotective agent which can be used as a good therapeutic agents against liver toxicity and also for the successful development of drug delivery in near future (Sharma et al., 2021).

Mangifera Indica: *Mangifera indica* is a species of mango that belongs to the Anacardiaceae family. It grows naturally in India, and cultivated forms have been brought to other warm climates. In experiments conducted on rats, *Mangifera indica* bark extract was found to have a highly effective diuretic function (kaushik, et al. 2014).

Aerva lanata: The quercetin and betulin isolated from *Aerva lanata* (L) *Pashanabheda* (stone breaking) plant have shown mild diuretic and antiurolithiatic activity. *A. lanata* (Amaranthaceae) is a wild species of weed that may be found in practically every region of India, and it has been used in Ayurveda, Shiddha, and Unani medicine to cure urolithiasis. It was discovered that adding *A. lanata* leaf decoction (3.0 ml/kg body weight (b.w), twice a day) greatly increases urine volume and aids in the passage of the stone (Dinnimath et al., 2014).

Taraxacum officinale: The common dandelion, or *Taraxacum officinale*, is a herbaceous perennial blooming plant of the family Asteraceae. High doses of an aqueous dandelion leaf extract (2 g per kg body weight) have been reported to have diuretic efficacy comparable to furosemide in experimental studies on mice. Some experts believe that dandelion can replace potassium lost due to diuresis because it is a rich source of potassium as well (kaushik, et al. 2014).

Mulberry: *M. alba* plant contains carotene, folic acid, Vitamin B1, isoquercetin, tannins, quercetin, flavonoids and saponins, which act as a good source of natural antioxidants (Devi et al., 2013). Studies reported that leaves and shoots of mulberry (*M. Alba*) showed several

medicinal activities which included diuresis as well as kidney protecting activity. *Morus alba* leaves extract resulted a promising role against Urolithiasis in-vitro models. (Maya and Pramod., 2014).

Mimosa pudica: A creeping annual or perennial herb known by the names sensitive plant and drowsy plant, *Mimosa pudica* is frequently planted for its unusual appearance. *Mimosa pudica* Linn. leaves' aqueous extract's diuretic test was assessed. With an increase in electrolyte excretion, the aqueous extract of *M. pudica* leaves at 100 mg/kg p.o. displayed considerable diuretic action (kaushik, et al. 2014).

Allium sativum: Garlic, also referred to as *Allium sativum*, is a member of the Liliaceae family and the genus *Allium*. Garlic is used to treat pulmonary disorders as a carminative, aphrodisiac, expectorant, and disinfectant. Additionally, the purified garlic fractions have a dose-dependent inhibitory impact on Na⁺-K⁺-ATPase. As a result, it might induce diuresis by raising urine production (kaushik, et al. 2014).

Conclusion

Urolithiasis disease is very common nowadays and spreading among adults and old-aged persons. So far no such treatment is available for this disease, NSAIDs and other medicines are frequently being used to stop the pain but again these medicines have major side effects on the kidney and liver hence cannot take much more. Surgery is the last option but reoccurrence is a major problem even after surgery. In Ayurveda lot of herbal medicines are available to treat these kidney stone conditions but again so far no as such promising medicine or herbal drug is available that can be guaranteed to treat this problem. So we are trying to find out that promising drug which can act as a diuretic as well as antiurolithiatic based on the traditional claim of herbs.

As diuretics, mono- and poly-herbal formulations are available. According to one estimate, there are a number of mono and poly-herbal proprietary medicines in clinical use, including decoctions, tinctures, tablets, and capsules made from plants. A large number of studies have been conducted to support the diuretic effects of traditional herbal medicines. This article discusses the various herbal plants that have traditionally been used as diuretics, as well as the identification of the plant's chemical constituents that promote diuresis. The current paper also includes various plant drugs and their pharmacological profiles, with a focus on the dose administered, as well as a bioactive extract involved in the diuresis mechanism.

The intent of this review article is to suggest the requirement for the development of novel therapeutic drugs for Urolithiasis and as a diuretic using a available data on herbs. Furthermore, herbs or extracts can be examined for the responsible molecule for the efficacy. Combination of herbal drugs may prove to be preventive as well as can come out to be a better therapeutic option, which can be patented for the community benefits and societal prosperity. This Study would also help the researcher to provide the scientific proof for the expected application of the ethno medicines.

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