INTERNATIONAL JOURNAL OF PHARMACEUTICAL SCIENCES
[ISSN: 0975-4725; CODEN(USA): IJPS00]
Journal Homepage: https://www.ijpsjournal.com

OPEN ACCESS

Review Article

Development and Assessment of Herbal Formulation for Kidney Stone

Kirtana Gajul*, Vrunal More, Vaibhav Gaikwad, Ahemad Noormahamad Nadaf, Shailaja Devsani

SVERIs college of pharmacy, Pandharpur

ARTICLE INFO

Published: 22 Jun. 2025
Keywords:
Urolithiasis, urinary system, Ayurvedic, anti-urolithiatic, diuretic, polyherbal, clinical trial, therapeutic efficacy.
DOI:
10.5281/zenodo.15712225

ABSTRACT

One of the most prevalent conditions, urolithiasis (also known as stone disorders) affects the urinary system and causes extremely serious issues all over the world. A safer and more efficient in this area of treatment, alternatives are needed. There are various different ways to treat the urolithiasis problems among which the below Ayurvedic approach is used to showcase the anti-urolithiasis property with the use of *Crataeva nurvala* leaves, *Tribulus terrestries* fruit, *Rubia cordifolia* leaves and *Punica granatum* peel. These substances show anti-urolithiatic as well as diuretic properties. This polyherbal approach helps to clear the urinary tract, anti-inflammation as well as kidney stone problems. Thorough clinical trials and combining knowledge of conventional herbal remedies with contemporary technologies are on the immediate future agenda in order to increase therapeutic efficacy for patients with urolithiasis.

INTRODUCTION

A kidney stone is a crystallized deposit that typically forms inside the kidneys. It is a growing urological condition that affects roughly 12% of people worldwide. It has been linked to a higher chance of developing end-stage renal failure. There are various causes for kidney stone formation. The most prevalent kind of kidney stone is calcium oxalate, which develops at Randall's plaque on the surfaces of the renal papillaries. Supersaturation, nucleation, development, aggregation, and retention of urinary stone ingredients within tubular cells are some of the physicochemical processes that contribute to the intricate mechanism of stone formation. There are lot of commercially available kidney stone treatment solutions on the market, however many of those medications contain synthetic substances that may be hazardous to health. To control this disease work relates the herbal tablet. It contains *Crataeva nurvala* leaves, *Tribulus terrestries* fruits, *Rubia cordifolia* leaves and pomegranate peel it acts as a diuretic & anti-urolithiatic

***Corresponding Author:** Kirtana Gajul
Address: SVERI's College of Pharmacy, Pandharpur
Email : kirtanagajul@gmail.com

Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

properties. It reduces the pain, soothes the urinary tract & prevents persistent kidney stone problems.

Urolithiasis

Urolithiasis, commonly referred to as kidney stones, is a complex condition that is influenced by dietary, environmental, and hereditary variables. The primary risk factor for kidney stones is genetics, and it has been demonstrated that a family history of the ailment increases the risk by many times. Numerous mutations have been found to affect the development of stones, primarily concerning the metabolism of calcium, oxalate, and other urine solutes. Additionally, because these circumstances increase the concentration of urine that causes crystallization, weather, dehydration, and low fluid intake all contribute to the production of stones. Another significant element that contributes to the production of stones is dietary habits. Stone formation is more likely when there is a high consumption of sodium, animal protein, and foods high in oxalate and a low intake of liquids.

However, diets high in fruits, vegetables, and other because calcium dilutes urine and inhibits the chemicals that cause stones, it has a preventive effect. Since excess oxalate is known to induce the over-formation of calcium oxalate stones, the most frequent type of kidney stone, the balance between calcium and oxalate in urine must be crucial. Many metabolic conditions, such as hypocitraturia, hyperoxaluria, and hypercalciuria, have been linked to the development of stones. Specifically, hypercalciuria is detected by the increased calcium excretion from urine. One of the main metabolic risk factors for the development of calcium-based stones, particularly oxalate calcium stones, has been found to be hypercalciuria. In a similar vein, hyperoxaluria raises the risk of oxalate crystals forming, which then combine with calcium to create stones. Conversely, hypocitraturia is associated with lower urine citrate levels, which, under normal circumstances, hinder the production of stones because they can precipitate calcium salts in the kidneys and aid in the stone-forming process.

Kidney Stone

Kidney stones also known as nephrolithiasis, are small, hard mineral deposits that form inside the kidneys when there is an imbalance of water, salts, and other substances in the urine. Kidney stones are hard deposits of acid salts and minerals that stick together in the concentrated urine. It contents calcium content, calcium oxalate, calcium phosphate to ensure the risk of kidney stone the risk factors may include hypercalciuria, hyperoxaluria, hyperuricemia, hypocitraturia. The unbalanced pH can cause abnormality the development of kidney stone can formed by low pH of urine, high pH can cause calcium phosphate stones but the stones that form at various pH level are the calcium oxalate kidney stones.

They can be painful when passing through the urinary tract, but usually don't cause permanent damage. Various medicinal plants with diuretic, antispasmodic, and antioxidant activities exert inhibitory effects on crystallization, nucleation, and aggregation of crystals making them useful for treatment of urolithiasis as well as in ayurvedic system medicines shows the good results as compare to this synthetic medications for kidney stone treatment.

Types of Kidney Stone

1. **Calcium stones:** Most type is common, excess amount of calcium is seen in the urine.
2. **Uric acid stones:** Typically occur in people with gout or those who don't drink enough water.
3. **Cysteine stones:** This type of stones are seen rarely and in genetic disordered patients.

4. **Struvite stones:** Typically occur in people with urinary tract infections (UTIs).

Causes of Kidney Stone

a. **Dehydration:** Not drinking enough water can cause a decrease in urine production, allowing minerals to concentrate and form stones.
b. **Diet:** Consuming foods high in salt, sugar, and animal protein can increase the risk of developing kidney stones.
c. **Family History:** Having a family history of kidney stones increases the risk.
d. **Medical conditions**: Certain conditions, such as gout, inflammatory bowel disease, and kidney disease, can increase the risk.

Mechanism Action of Herbal Syrup for Kidney Stone

The *Crataeva nurvala* increases citrate level in the urine it help to prevent the formation of kidney stones. *Tribulus terrestries* extracts inhibit the formation of calcium oxalate stones by reducing oxalate concentration in the urine & relaxes the muscle in the urinary tract, reduces pain and discomfort. *Rubia cordifolia* and pomegranate peel exhibits anti-inflammatory properties reduce inflammation also it acts as antioxidant to protect kidneys from oxidative damage caused by free radicals.

About Plant Materials

A. Crataeva nurvala

Crataeva nurvala Buch. Ham. is a significant medicinal plant from India that is considered rare and environmentally endangered. With the exception of Australia and New Caledonia, *Crataeva nurvala*, also known as C. magna, is found in tropical regions of the world and is named after the Greek herbalist Kratevas (BC 132–63). This plant, a moderately sized deciduous tree, is one of 11 species found in the warm, tropical, and occasionally desert regions of both hemispheres that make up the family Capparaceae, which also contains trees, shrubs, and, infrequently, herbs. The plant grows in India's semi-arid regions.

According to the Ayurvedic medical system, a person's overall health and well-being are determined by how well the five main elements of nature—space, air, fire, water, and earth—are balanced. All bodily functions are controlled by the balance of the three doshas (pitta, kapha, and vata). C. nurvala is thought to be helpful in treating pitta (metabolic problems and fever), kapha (joint lubrication, skin moisture, wound healing, strength and vigor, memory loss, heart and lung weakness, and weakened immune systems), and vata (blood flow, waste removal, and breathing). The plant's bark is utilized in the Unani medical system to increase appetite and reduce phlegm and bile output.

B. Tribulus terrestries

Out of all the herbs that were studied, the puncture vine, or *Tribulus terrestries*, was found to be an effective treatment for urolithiasis. The medical community has recently given this natural cure a lot of attention as a kidney stone intervention because it was originally indicated for diuretic effect and to prevent an inflammatory response. Tribulus may, in fact, inhibit the crystallization of calcium oxalate, a chemical molecule that is one of the primary causes of kidney stones, according to laboratory tests. Its antioxidant properties may also shield renal tissues from oxidative stress caused by the development of stones.

Tribulus terrestries has advantages for both preventing the creation of new stones and aiding in the removal of existing ones, according to recent studies. *Tribulus terrestries* seems to be a strong, natural supplement to conventional pharmacological treatment of urolithiasis by boosting urine flow and decreasing the production

of calcium oxalate crystals. *Tribulus terrestries* is becoming a more appealing option in the burgeoning field of herbal medicine for the treatment of kidney stones due to the rising incidence of kidney stones worldwide and the growing interest in natural therapies.

C. Rubia cordifolia

The plant *Rubia cordifolia* which is a member of the Rubiaceae family, is utilized in many Asian, Russian, and European countries as a traditional remedy for kidney stones and bladder problems. Experimental evidence supported the anti-inflammatory, antioxidant, hepatoprotective, and antibacterial therapeutic qualities of RT both in vivo and in vitro. *Rubia cordifolia* L. (RT) has been used extensively to treat kidney stones, according to a local survey conducted in Morocco. To our knowledge, nonetheless, no experimental investigation has documented RT's anti-urolithiatic effects. Thus, an experimental model of urolithiasis in rats using ethylene glycol (EG) and ammonium chloride (AC) was used for this investigation. The purpose of this work was to assess the possible protective impact of *Rubia cordifolia* L. ethyl acetate and ethanolic extracts (EA-RT and E-RT, respectively) in this model. The next goal was to evaluate the antioxidant activity of the RT extract and determine which polyphenols in the E-RT and EA-RT extracts might be responsible for these effects.

D. Pomegranate peel

Because of its healing qualities, *Punica granatum* has long been regarded with respect in traditional medicine. Notable are its fruit, peel, seeds, and leaves for possible health advantages. The health advantages of P. granatum are attributed to the presence of special chemical constituents, including tannins, flavonoids, and polyphenols. The plant's anti-inflammatory, anti-cancer, antioxidant, and antibacterial qualities are attributed to these ingredients, which make it an important natural resource for general health. There is growing interest in investigating P. granatum's potential for urolithiasis prevention and treatment due to its historical use and proven medical efficacy**.**

REFERENCES

1. Jha, S., Singh, P. P., Rajpoot, P., & Sengar, A. (2024). ADVANCING UROLITHIASIS TREATMENT THROUGH HERBAL MEDICINE: A FOCUS ON TRIBULUS TERRESTRIS FRUITS.
2. Arra, K., Pasupula, R., & Anandam, S. (2024). In Vivo Assessment of Punica granatum Leaf Extract: Anti-Urolithiatic and Nephroprotective Effects. *Natural Product Sciences*, *30*(2), 80-92.
3. Shingala, H., Rangpariya, A., Rupapara, H., Parmar, A., & Kotadiya, M. (2023). FORMULATION, DEVELOPMENT AND EVALUATION OF POLYHERBAL ANTI UROLITHIATIC TABLET BY WET GRANULATION METHOD FOR ANTI-UROLITHIATIC ACTIVITY.
4. Rathod, N. R., Biswas, D., Chitme, H. R., Ratna, S., Muchandi, I. S., & Chandra, R. (2012). Anti-urolithiatic effects of Punica granatum in male rats. *Journal of ethnopharmacology*, *140*(2), 234-238.
5. Bopana, N., & Saxena, S. (2008). Crataeva nurvala: a valuable medicinal plant. *Journal of herbs, spices & medicinal plants*, *14*(1-2), 107-127.
6. Varicola, K. S., Siddiqua, A. A., Dintyala, K. E. E. R. T. H. I., & Ventrapati, G. A. N. D. H. I. (2018). Fruit peel extracts with potential for dissolving simulated renal stones in in vitro conditions. *Int J Pharm Sci*, *10*(11), 71-74.
7. Marhoume, F. Z., Aboufatima, R., Zaid, Y., Limami, Y., Duval, R. E., Laadraoui, J., ... &

Bagri, A. (2021). Antioxidant and polyphenol-rich ethanolic extract of Rubia cordifolia L. prevents urolithiasis in an ethylene glycol experimental model in rats. *Molecules*, *26*(4), 1005.

8. Ansari, R., Karimzadeh, I., Nimrouzi, M., Hamedi, A., & Zarshenas, M. M. (2022). An overview of multi-ingredient kidney stone dissolving formulations from Traditional Persian Pharmacy. *Trends in Pharmaceutical Sciences*, *8*(4), 283-292.
9. Alelign, T., & Petros, B. (2018). Kidney stone disease: an update on current concepts. *Advances in urology*, *2018*(1), 3068365.
10. Bahmani, M., Baharvand-Ahmadi, B., Tajeddini, P., Rafieian-Kopaei, M., & Naghdi, N. (2016). Identification of medicinal plants for the treatment of kidney and urinary stones. *Journal of renal injury prevention*, *5*(3), 129.
11. Ahmed, S., Khan, A. A., Yadav, P., Akhtar, J., Akram, U., & Shamim, L. F. (2020). Gokhru (Tribulus terrestris Linn.): Pharmacological actions and therapeutic applications: A Review. *International Journal of Herbal Medicine*, *2020*.
12. Mehrabi, S., Shakeri, Z., & Sadeghi, H. (2025). Evaluating Efficacy of Nigella Sativa, Urtica Dioica, and Peganum Harmala Extract Compared with Tamsulosin for Renal and Ureteral Stone Expulsion and Pain Management. *Translational Research in Urology*, *7*(1), 28-33.
13. William, S., Riaz, M., Ahmad, R., Akhtar, M. F., & Anwar, F. (2025). Antiurolithic activity of Zaleya pentandra (L.) C Jeffrey in ethylene glycol-induced calcium oxalate crystal rat model; A scientific validation of traditional use for kidney stone prevention. *Journal of Ethnopharmacology*, *337*, 118905.
14. Mani, R. R., Ranganathan, V., Panneerselvam, J., Begam, S., Chinnappan, S., & Anbalagan, M. (2025). Therapeutic Applications of Oxalate-degrading Bacteria in Kidney Stone Prevention. *The Natural Products Journal*.
15. Wang, Y., Yang, J., Amier, Y., Yuan, D., Xun, Y., & Yu, X. (2025). Advancements in Nanomedicine for the Diagnosis and Treatment of Kidney Stones. *International Journal of Nanomedicine*, 1401-1423.
16. Susanto, V., Pradana, R., Nugraha, E. D., Sumintadireja, P., Modibo, O. B., Rosianna, I., ... & Tokonami, S. (2025). A Bioassay Analysis of Uranium and Lead in Urine Samples from a High Natural Background Radiation Area in Indonesia. *Environments*, *12*(2), 51.
17. Popova, E., Tkachev, S., Shapoval, A., Karpenko, A., Lee, Y., Chislov, P., ... & Timashev, P. (2025). Kidney Stones as Minerals: How Methods from Geology Could Inform Urolithiasis Treatment. *Journal of Clinical Medicine*, *14*(3), 997.
18. Liang, D., Liu, C., & Yang, M. (2025). The association between urinary lead concentration and the likelihood of kidney stones in US adults: a population-based study. *Scientific Reports*, *15*(1), 1653.
19. Huang, M., & Scotland, K. (2025). Usefulness and Ease of Use of an Artificial Intelligence Chatbot for Kidney Stone Formers. *Cureus*, *17*(1).
20. Akram, M., Jahrreiss, V., Skolarikos, A., Geraghty, R., Tzelves, L., Emilliani, E., ... & Somani, B. K. (2024). Urological guidelines for kidney stones: overview and comprehensive update. *Journal of clinical medicine*, *13*(4), 1114.
21. Aiumtrakul, N., Thongprayoon, C., Suppadungsuk, S., Krisanapan, P., Pinthusopon, P., Mao, M. A., ... &

Cheungpasitporn, W. (2024). Global trends in kidney stone awareness: a Time Series Analysis from 2004–2023. *Clinics and Practice*, *14*(3), 915-927.

22. Peerapen, P., & Thongboonkerd, V. (2023). Kidney stone prevention. *Advances in Nutrition*, *14*(3), 555.
23. Vishwakarma, H., Thakur, K., Purohit, A., Jain, S., Nema, P., & Jain, P. K. (2022). A herbal approach for the treatment of kidney stone. *International Journal of Medical Sciences and Pharma Research*, *8*(1), 1-9.
24. Siener, R. (2021). Nutrition and kidney stone Disease. Nutrients. 2021; 13: 1917. *Recent Advances and Remaining Challenges*, 219.
25. Wang, Z., Zhang, Y., Zhang, J., Deng, Q., & Liang, H. (2021). Recent advances on the mechanisms of kidney stone formation. *International journal of molecular medicine*, *48*(2), 149.

HOW TO CITE: Kirtana Gajul, Vrunal More, Vaibhav Gaikwad, Ahemad Noormahamad Nadaf, Shailaja Devsani, Development and Assessment of Herbal Formulation for Kidney Stone, Int. J. of Pharm. Sci., 2025, Vol 3, Issue 6, 3033-3038. https://doi.org/10.5281/zenodo.15712225