Assessment of the Antiurolithiatic Potential of Ethanol-based Extract of Cinnamomum tamala

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Abstract

Kidney stone malady is a common issue in the urinary framework where difficult, crystal-like materials gradually shape interior the urinary tract. Among diverse sorts of kidney stones, calcium oxalate stones are the most common. Since of rehashed stone arrangement, inconvenience, and the confinements of conventional medications, individuals are looking for more secure options, like therapeutic plants, to offer assistance oversee stones.This ponder was done to check how well the leaf extricate of Cinnamomum tamala works against calcium oxalate stones utilizing a lab demonstrate that appears precious stone arrangement. The takes off were collected, dried in the shade, made into a powder, and at that point doused in ethanol to make the extricate. A straightforward test for plant chemicals found that the extricate has alkaloids, tannins, flavonoids, phenolic compounds, glycosides, terpenoids, and saponins.The extricate was tried to see how it influences the begin, joining, and development of calcium oxalate precious stones. The comes about appeared a solid capacity to halt precious stone arrangement compared to what happens without treatment. When looked at beneath a magnifying lens, the gems were littler and had a diverse shape, which implies they didn't adhere together as much.These discoveries appear that Cinnamomum tamala has great potential to avoid and oversee kidney stones actually. It might be a valuable home grown choice for managing with this condition.

Keywords

Urolithiasis, Cinnamomum tamala, Calcium oxalate, Crystallization, Antiurolithiatic activity, Herbal medicine.

Introduction

Urolithiasis is a obsessive condition including the improvement of stones inside the kidneys, ureters, bladder, or related urinary structures. It is considered one of the most predominant clutters influencing the urinary framework all inclusive. Kidney stones create when certain substances display in pee increment past ordinary levels and begin shaping precious stones. Among different stone categories, calcium oxalate calculi are dependable for the lion's share of detailed cases.

The instrument of stone advancement incorporates a few interconnected physicochemical stages such as supersaturation, nucleation, precious stone development, accumulation, and maintenance interior renal tissues. Different hazard components counting lack of hydration, corpulence, over the top dietary sodium admissions, metabolic unsettling influences, innate inclination, and repetitive urinary diseases contribute to the illness process.[1]

Modern medications like stun wave treatment, ureteroscopy, and surgery are commonly utilized to expel kidney stones, but stones may frame once more after treatment. In a few cases, these strategies can moreover be costly and may cause undesirable side impacts. Since of these confinements, analysts are presently appearing more noteworthy intrigued in restorative plants that may offer assistance secure the kidneys and diminish gem arrangement naturally.

Cinnamomum tamala, commonly known as Indian narrows leaf, has a place to the Lauraceae family and is broadly disseminated over the Indian subcontinent. In conventional pharmaceutical, this plant has long been utilized to oversee issues related to assimilation, irritation, and digestion system. The clears out are wealthy in a few characteristic bioactive compounds such as flavonoids, tannins, alkaloids, phenolic substances, and basic oils, which may contribute to its restorative properties.

These phytoconstituents are known to show antioxidant, anti-inflammatory, antimicrobial, and defensive exercises. Antioxidant compounds may minimize oxidative damage inside renal tissues and meddled with precious stone arrangement pathways. Considering these restorative properties, the current consider was carried out to explore the antiurolithiatic potential of the ethanolic leaf extricate of Cinnamomum tamala through an in vitro exploratory strategy.[2]

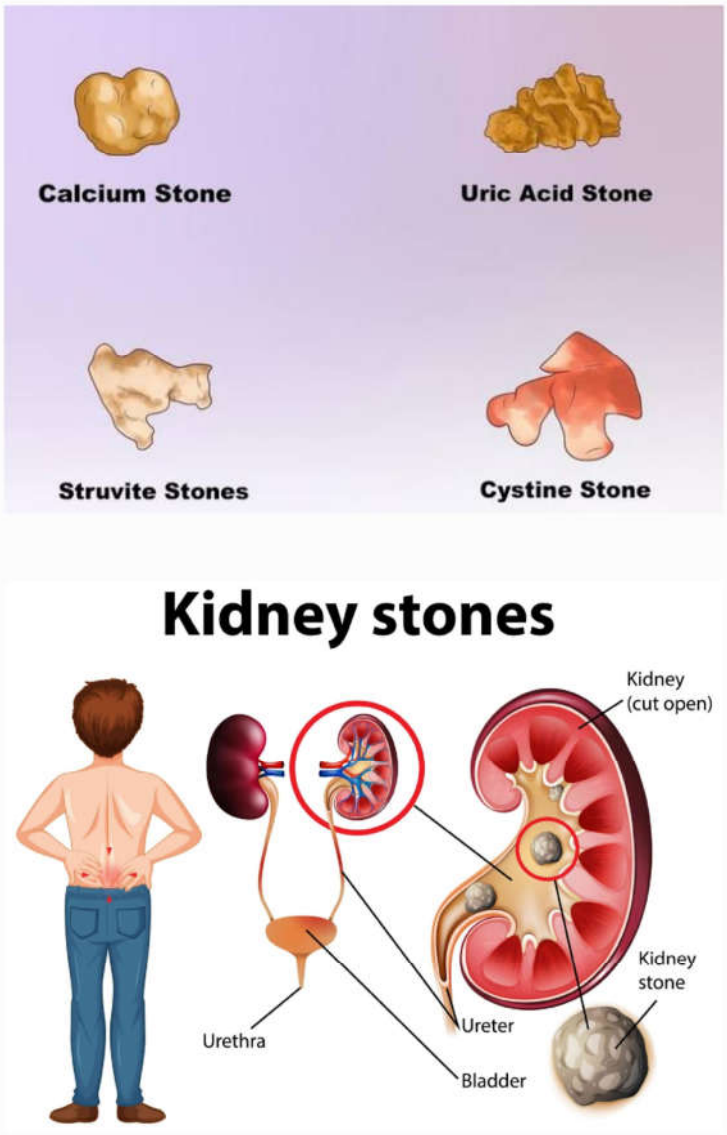


Figure 01 : *Kidneys Stones*

Material And Methods

Plant Material Collection and Authentication

Cinnamomum tamala, commonly referred to as Indian bay leaf, belongs to the family Lauraceae. This aromatic tree is widely distributed in tropical and subtropical regions, particularly across India, Nepal, and Bhutan. It is frequently used as a culinary spice as well as in traditional medicinal systems .[3]

Taxonomical Classification[4]

Kingdom: Plantae
Division: Magnoliophyta
Class: Magnoliopsida
Order: Laurales
Family: Lauraceae
Genus: Cinnamomum
Species: Cinnamomum tamala

Morphological Characteristics[5]

The plant is a medium-sized evergreen tree with smooth bark and a pleasant fragrance. Leaves are simple, alternate, and lance-shaped with three prominent veins running longitudinally. The surface appears glossy, while the underside is comparatively lighter. Flowers are small, pale yellow, and arranged in clusters. Fruits are dark-colored drupes containing a single seed .

Traditional Uses[6]

In traditional healthcare practices, the plant has been utilized for management of digestive disorders, respiratory conditions, and metabolic disturbances. It is also valued for its carminative, antimicrobial, and antioxidant effects.

Pharmacological Activities

It show actions including anti-inflammatory, antimicrobial, antioxidant, and antidiabetic effects. These activity suggest its effective application in preventing crystal formation and protecting renal function.[7]

Relevance to Antiurolithiatic Activity[8]

Polyphenolic constituents together with flavonoid derivatives are believed to play a protective role against the development of calcium oxalate deposits. Such phytochemical substances may disrupt crystal initiation, restrict enlargement of crystalline particles, and prevent their clumping within the urinary tract. Through these actions, these natural metabolites could lower the probability of renal calculus generation.

Collection of Herbal sample[9)]

Green leaves of Cinnamomum tamala will be obtained from a reliable natural source or local herbal supplier during the appropriate season to ensure optimal quality. The selected foliage will be free from disease, insect damage, and physical contamination.

Immediately after procurement, the collected material will be cleaned thoroughly using running water to remove dust, soil particles, and other impurities. The washed samples will then be air-dried under shade at room temperature to preserve active constituents and prevent degradation caused by direct sunlight.

After complete drying, the leaves will be coarsely powdered using a mechanical grinder. The prepared powder will be stored in an airtight container, protected from moisture and light until further use.

The collected botanical sample will undergo proper taxonomic examination and confirmation by an experienced plant scientist or an approved research organization. A reference herbarium specimen shall be documented, labeled, and stored systematically to facilitate subsequent verification and scientific study.

Preparation of Extract[10]

The gathered clears were allowed to dry at room temperature in a secure area after being thoroughly cleansed with water to remove any remaining contaminants. The dried fabric was ground into a coarse powder using a processor. Soxhlet was used to extract the powdered cloth using ethanol as a dissolvable. All of the phytoconstituents were eliminated. The extricated fabric was sorted and condensed into a semi-solid mass using dissipation.

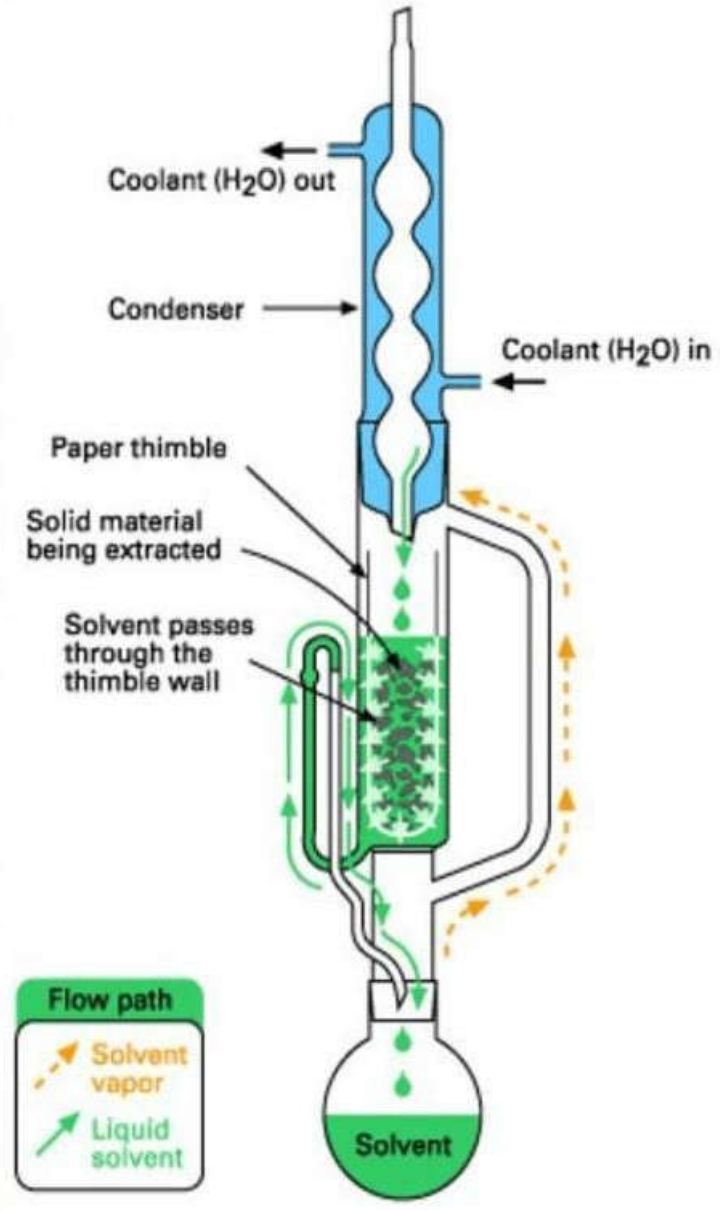


Figure 02 : *Extraction of Cinnamomum tamala*

Phytochemical Screening

Preliminary qualitative analysis was performed to detect the presence of alkaloids, flavonoids,glycosides, tannins, and saponins.

Sr No	Group	Test Performed	Observation	Inference
01	Alkaloids[11]	Dragendorff's Teat	Formation of orange or creamy precipitate	Alkaloidal compounds detected
02	Flavonoids	Shinoda reaction	Development of pink to red coloration	Flavonoid moieties present
03	Tannins[12]	Ferric chloride	Appearance of dark green or bluish-black shade	Tannin fractions confirmed
04	Saponins	Froth test	Foam present	Saponin present
05	Glycosides	Keller–Killiani procedure	Formation of brown ring at interface	Glycosidic components indicated
06	Terpenoids[13]	Salkowski reaction	Reddish-brown coloration at junction	Terpenoid compounds present
07	Phenolic compounds	Ferric chloride assay	Deep blue or green coloration	Phenolic present
08	Steroids[14]	Liebermann–Burchard test	Greenish color formation	Steroidal nucleus confirmed
09	Carbohydrates	Molisch's	Violet ring at interface	Carbohydrate content present
10	Proteins[15]	Biuret reaction	No Violet colour	Protein absent

Table 01 : *phytochemical Screening of C. Tamala*

Experimental Work

Apparatus

Analytical balance , Beakers (100 mL, 250 mL) , Conical flasks (250 mL) , Volumetric flasks , Incubator Burette , Measuring cylinders .[16]

chemicals

Calcium chloride, Sulphuric acid(2N),Hydrochloric acid(2 M)Sodium oxalate ,Ammonia solution,Potassium permanganate (0.9494 N),Tris buffer (0.1 M),Distilled water,Fresh hen eggs,Cystone.[17]

Step 1: Preparation of Artificial Calcium Oxalate Stones by Uniform Precipitation

To prepare synthetic calcium oxalate crystals, 1.34 g of sodium oxalate was dissolved in 100 mLof 2 N sulphuric acid. Separately, 1.47 g of calcium chloride dihydrate was dissolved in 100mL of purified water. Both solutions were combined slowly in equal proportion inside a beaker, resulting in formation of calcium oxalate precipitate.The deposited material was separated and treated with ammonia solution to eliminate residual acidity. Afterwards, the solid mass was repeatedly rinsed using distilled water and dried in a hot air oven at 60°C for four hours. The dried crystals were preserved for further analysis .[18]

Step 2: Isolation of Egg Semipermeable Membrane

The membrane required for the study was obtained from fresh hen eggs. A small opening was made at the pointed end of each egg with a glass rod, and all internal matter including yolk and albumin was removed carefully. The empty shells were washed thoroughly with distilled water.

Cleaned shells were immersed in 2 M hydrochloric acid overnight to dissolve the hard calcified outer covering completely. After decalcification, the remaining membrane was washed with water and transferred into ammonia solution for a short period to neutralize traces of acid. It was again rinsed with distilled water and stored under moist condition in a refrigerator at pH 7.0–7.4 until use.[19]]

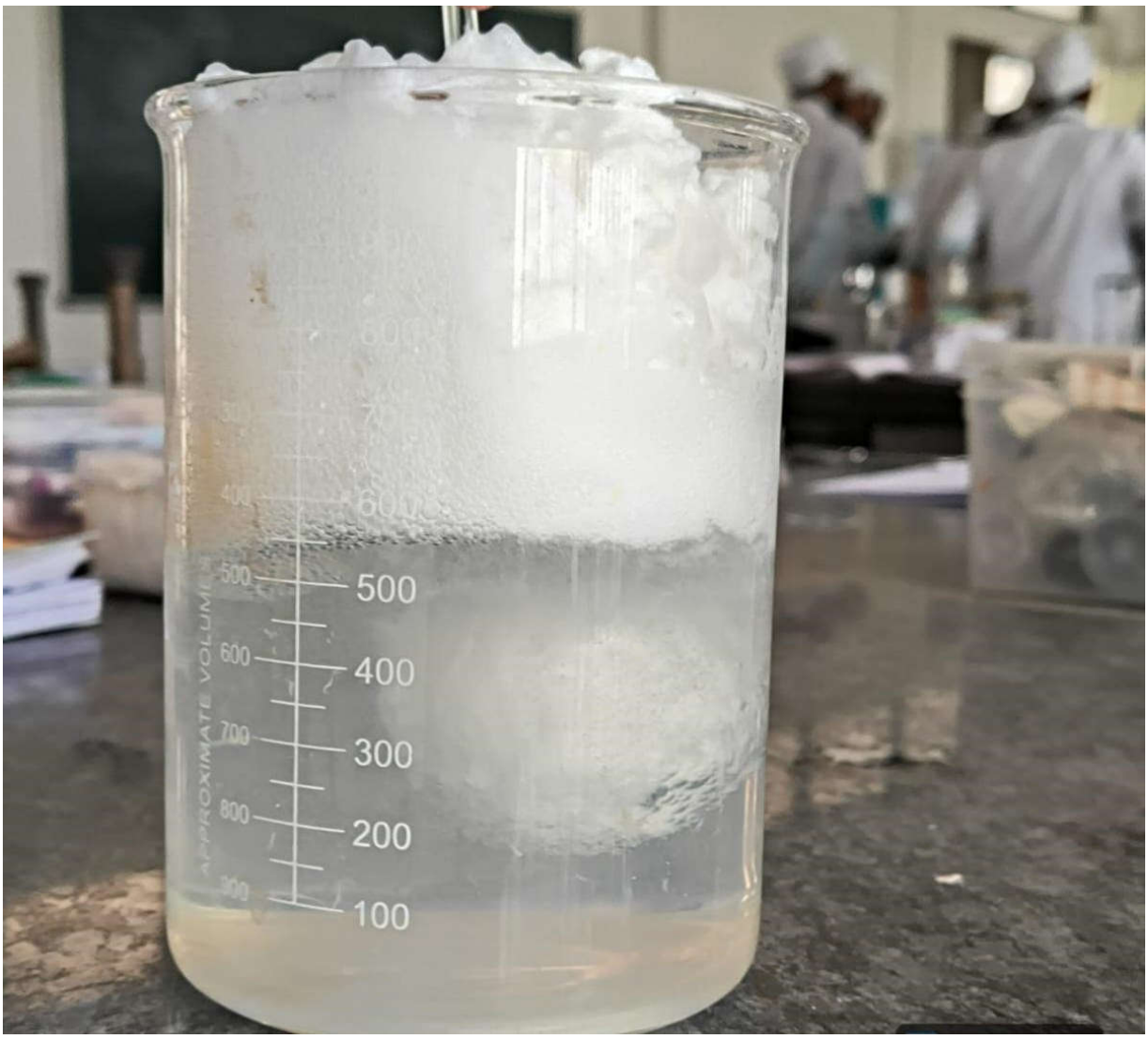


Figure 03 : *Isolation of Egg Semipermeable Membrane*

Step 3: Quantitative Estimation of Calcium Oxalate by Titration[20]

Exactly 1 mg of prepared calcium oxalate crystals was weighed and enclosed inside the egg membrane along with 10 mg of plant extract. For standard comparison, another membranepacketcontaining 10 mg of Cystone was prepared. A control pouch containing only mg calcium oxalate was also maintained.Each packet was suspended separately in a conical flask containing 100 mL of 0.1 M Tris buffer solution. The flasks were placed in an incubator maintained at 37°C for two hours. During incubation, dissolution of crystals occurred depending on activity of the sample.[21]

After incubation, the membrane contents were transferred into separate test tubes. To each tube,2 mL of 1 N sulphuric acid was added. The mixture was titrated against 0.9494 N potassium permanganate until a faint stable pink shade appeared as the endpoint.The quantity ofundissolvedcalcium oxalate was determined from the titre value. The dissolved amount was

calculated by subtracting the remaining quantity from the original weight taken initially. Greater dissolution indicated stronger antiurolithiatic potential of the tested extract .[22]

Observation Table

Samples	Burette Reading
Blank	00
Cystone	3.2
Ethanolic extract	4.5

Calculation [23]

$$\% \text{ Inhibition} = \frac{V_C - V_t}{V_C} \times 100$$

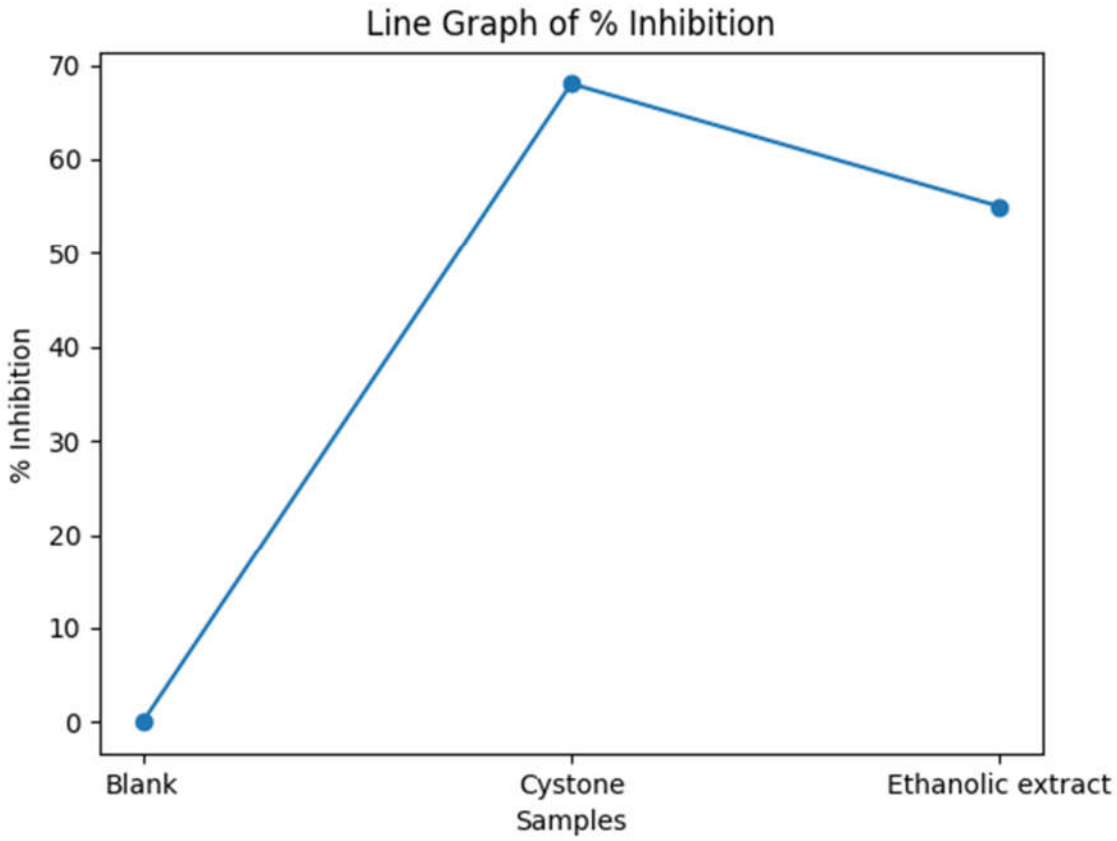
Where ,

V_C = Control reading

V_t = Test reading

Result

Sr No	Samples	% Inhibition
01	Blank	00
02	Cystone	68
03	Ethanolic extract	55



Discussion

The ethanolic leaf extract of Cinnamomum tamala exhibited noteworthy anti-urolithiaticpotential in the in vitro model, producing 55% inhibition of calcium oxalate crystal generation. Thereference formulation Cystone showed comparatively higher efficacy with 68% inhibition, indicating stronger litholytic performance under identical experimental conditions. Even though the herbal extract displayed lower activity than the standard, the response confirms meaningful preventive action against stone development.Preliminary phytochemical evaluation of Cinnamomum tamala revealed the occurrence of flavonoids, tannins, phenolic constituents, terpenoids, glycosides, alkaloids, and saponins. These bioactive substances may contribute to the observed response through several pathways such as antioxidant influence, reduction of crystal nucleation, suppression of aggregation, and facilitation of urinary flow. Polyphenolic compounds are recognized for minimizing oxidative injury to renal tissue, while tannin fractions may interfere with adhesion of crystals to epithelial surfaces.The moderate but significant activity of the extract suggests that Cinnamomum tamala can act as a natural source for managing urolithiasis. Although its efficacy remained below the marketed preparation, the plant sample demonstrated promising inhibitory capacity and may offer supportive benefits with fewer synthetic-associated limitations. Further animal experimentation, isolation of active molecules, dose optimization, and clinical validation are recommended to establish its therapeutic usefulness in stone disorders.

Conclusion

The present investigation confirms that the ethanolic leaf extract of Cinnamomum tamala possesses appreciable anti-urolithiatic activity, producing 55% inhibition of calcium oxalatecrystal formation under in vitro conditions. The standard formulation Cystone demonstrated superior efficacy with 68% inhibition, indicating stronger crystal suppressing potential. Thefindings suggest that Cinnamomum tamala may help in limiting kidney stone initiation, enlargement, and aggregation, possibly due to the presence of beneficial phytoconstituents such as flavonoids, tannins, phenolics, and other secondary metabolites. Although the response was lower than the marketed standard, the plant extract showed meaningful protective action and may serve as a natural supportive or alternative remedy for urolithiasis.

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