Antiurolithiatic Activity of Gokhsuradi Churan, an Ayurvedic Formulation By In Vitro Method

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Abstract

Purpose: Gokhsuradi churna is an ayurvedic formulation, was investigate for antiuroulethiatic activity. Methods: Calcium oxalate crystallization was induced by the addition of 0.01M sodium oxalate solutions in synthetic urine and nucleation method. Results: The effect of Gokhsuradi Churna exhibited a concentration dependent inhibition of calcium oxalate crystallization and nucleation. Conclusion: The present studies suggest that Gokhsuradi churna has a potential inhibition of calcium oxalate crystallization exhibited and nucleation. Gokhsuradi Churna showed potent antiurolethiatic activity.

Introduction

Gokshuradi Churna contains Gokshura (Tribulus terrestris Linn), Kokilaksha (Asteracantha longifolia Nees), Satavari (Asparagus racemosus Willd), Kapikachu (Mucuna pruriens Baker), Naagabala (Sida cordata) and Atibala (Abutilon indicum Linn). In Ayurvedic Gokhru is indicated for the treatment of urinary disorders, kidney diseases, diseases of the genito-urinary system and impotence. It is used for regulation of heart functions, reduction of inflammation, chronic cough and asthma also. The leaves of this medicinal plant of India are considered to possess stomachic properties, and a paste prepared from them is used in the treatment of bladder stones.¹

Asteracantha longifolia roots, leaves and seeds have been used in Indian systems of medicine as diuretics and also employed to cure jaundice, dropsy, rheumatism and diseases of the urinogenital tract. Root of A. racemosus has been referred as bitter-sweet, emollient, cooling, nervous tonic, constipating, galactogogue, aphrodisiac, diuretic, rejuvenating, carminative, stomachic, antiseptic² and as tonic. Beneficial effects of the root of Asparagus racemosus are suggested in nervous disorders, dyspepsia, diarrhoea, dysentery, tumors, inflammations, hyperdipsia, neuropathy, hepatopathy, cough, bronchitis, hyperacidity and certain infectious diseases.³ Sida cordata³ traditionally used for arthritis, leucorrhoea, urinary infection, asthma, cough, bronchitis, diarrhea, burning sensation, and general debility.⁴ Mucuna pruriens has a long history of being used in the Indian Ayurvedic medicine. It has been used for dysentery, stone in the bladder, diarrhea, snakebite, sexual debility, cough, tuberculosis, impotence, rheumatic disorders, muscular pain, sterility⁵, gout, menstrual disorders, diabetes, and cancer.⁶

Abution indicum Linn is used as a demulcent, aphrodisiac, laxative, diuretic, and sedative (leaves). The bark is astringent and diuretic; expectorant and demulcent (seeds); laxative and tonic, anti-inflammatory and anthelmintic (plant); analgesic (fixed oil); diuretic and for leprosy (roots). The leaves can also be used to treat ulcers, headaches, gonorrhoea and bladder infection.⁷

Materials and Methods

Preparation of Gokshuradi churna
Gokshuradi churna contains Gokshura, Kokilaksha, Satavari, Kapikachu, Naagabala and Atibala were made in to fine powder and passed through 100 No. sieve and mixed. Gokshuradi churna was extracted with water for antiurolethiatic study.

Experimental Protocol

The effect of extract on CaOx crystallization was examined through CaOx crystallization was induced by the addition of 0.01M sodium oxalate solutions in synthetic urine and nucleation method.

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turbidity changes due to the crystallization in artificial urine on addition of 0.01M sodium oxalate solution. The precipitation of calcium oxalate at 37 °C and pH 6.8 has been studied by the measurement of absorbance at 620 nm using UV/Visible spectrophotometer.

**Preparation of artificial urine**
The artificial urine (AU) was prepared according to the method Burns and Finlayson with slight modification and the following composition: sodium chloride 105.5 mM, sodium phosphate 32.3 mM, sodium citrate 3.21 mM, magnesium sulfate 8.55 mM, potassium chloride 4.05 mM, calcium chloride 4.5 mM, sodium oxalate 0.32 mM, ammonium hydroxide 17.9 mM, and ammonium chloride 0.0028 mM. The AU was prepared fresh each time and pH adjusted to 6.0.

**Study without inhibitor**
A volume of 1.0 ml of AU was transferred into the cell and 0.5 ml of distilled water added to it and blank reading was taken. The 0.5 ml of 0.01M sodium oxalate was added, to the previous volume, and the measurement is immediately started for a period of ten minutes.

**Study with inhibitor**
The aqueous extract of Gokshuradi churna was dissolved in distilled water, filtered through membrane filter and the concentration of 200, 400, 600, 800 and 1000 μg/ml was obtained. A mixture of 1 ml of AU and 0.5 ml of plant extract solution is versed in the cell. A blank reading was taken and then 0.5 ml of 0.01M sodium oxalate solution was added and immediately the absorbance was measured for a period of ten minutes at 620nm. The percentage of inhibition of calcium oxalate crystal formation was calculated using the following formula:

\[
\text{% inhibition} = \left( \frac{\text{Absorbance of Control} - \text{Absorbance of Test}}{\text{Absorbance of Control}} \right) \times 100
\]

Where; Ab Test: Absorbance in the presence of inhibitor (Extract), Ab Control: Absorbance of graph without inhibitor (Control).

**Results and Discussion**
Figure 1 showed the graph of percentage inhibition of the crystallization of calcium oxaloate (CaOx) with different concentrations of aqueous extract of Gokshuradi churna. It inhibited the crystallization in a concentration dependent pattern. The percent inhibition was calculated using the above mentioned formula.

Nephrolithiasis is common, affecting up to 10% of the population at some point during their lifetime. Calcium-containing stones are the most commonly occurring to an extent of 75-90% followed by magnesium ammonium phosphate (Struvite) to an extent of 10-15%, uric acid 3-10% and cystine 0.5-1%. Calcium oxalate stones are found in two different varieties, calcium oxalate monohydrate (COM) or Whewellite, and calcium oxalate dihydrate (COD) or
Weddelite. COM, the thermodynamically most stable form, is observed more frequently in clinical stones than COD and it has a greater affinity for renal tubular cells, thus responsible for the formation of stones in the kidney.\textsuperscript{12}\n\nIn the present study, the anticalcifying properties of Gokshuradi churna were explored by \textit{in vitro}. After nucleation, crystal growth is the next major step of stone formation. The driving force for crystallization is a reduction in the potential energy of the atoms or molecules when they form bonds to each other. The crystal growth process starts with the nucleation stage when several atoms or molecules in a supersaturated liquid start to form clusters.\textsuperscript{13} Nucleation is the formation of a solid crystal phase in a solution. It is an essential step in renal stone formation.\textsuperscript{14,15} The inhibitory potency of the Gokshuradi churna was tested on the nucleation and growth of the most commonly occurring kidney stones, calcium oxalate monohydrate. A concentration dependent inhibition was observed using Gokshuradi churna.

**Conclusion**

The present study provides scientific proof for traditional claim of Gokshuradi churna as antiurolithiatic. So further \textit{in vivo} studies are required to support the ethnomedicinal claim.

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**Conflict of Interest**

The authors report no conflicts of interest.

**References**