ABSTRACT

Many people suffer from problems resulting from urinary stones. Urinary stones have been found to contain calcium phosphate, calcium oxalate, uric acid and magnesium ammonium phosphate with apatite and struvites predominating. Calcium-containing stones are the most common variety of urinary stone, and it comprise about 75% of all urinary calculi, which are found in the form of pure calcium oxalate (50%), calcium phosphate (5%) or a mixture of both (45%). Urinary stones are characterized by its high recurrence rate, if patients are not treated appropriately. Among the treatments used are surgical removal, percutaneous techniques based on laproscopic and Extracorporeal Shock Wave Lithotripsy (ESWL) and drug treatment. Besides, these treatments cause undesirable side effects such as hemorrhage, hypertension, tubular necrosis and subsequent fibrosis of the kidney leading to cell injury and recurrence of renal stone formation. Patients affected with kidney-stone forming are prone to its recurrence even after its surgical removal. From the above facts it is clear that there is a need to study herbal plants for the treatment of urinary stones because of their efficacy, safety, lesser side effects and better compatibility with human body. Herbals presently available for the treatment of kidney stones are Tribulus terrestris, Tamarindus indica, Crataeva nurvala, Costus igneus and Grewia titiaefoliae. The present study is to investigate the composition and the type of kidney stones were surgically removed from patients in our population by Fourier Transform Infrared (FTIR) spectroscopy. A comparative study was carried out among the above stated medicinal plants like Tribulus terrestris, Tamarindus indica, Crataeva nurvala, Costus igneus and Grewia titiaefoliae on the three most common types of urinary stones [CHPD (Calcium Hydrogen Phosphate Dihydrate), COM (Calcium Oxalate Monohydrate) and Struvite crystals] under in vitro condition. Isolation, purification and characterization of one pentacyclic triterpenoid compound Lupeol and one steroid compound Stigmasterol from the stem of Costus igneus extract by HPTLC, HPLC, IR, $^1$H NMR, $^{13}$C NMR, TLC and Column chromatography technique separately.

To study the effects of aqueous extract of stems of Costus igneus which are used as additives to induce the nucleation and growth of COM crystals by single diffusion gel growth technique under in vitro condition. The assessment of inhibition effect of aqueous and ethanolic extract of stem of Costus igneus and isolated compound (Lupeol and Stigmasterol) using urolithiasis induced albino rats under in vivo condition. To examine the antibacterial activity of stem of Costus igneus and isolated constituents toward urinary tract infection causing pathogens using disc diffusion method. Pure calcium oxalate stones (28.9%) followed by a mixture of calcium oxalate dihydrate in combination with
magnesium ammonium phosphate and calcium phosphate (21%) are commonly found in patients of Tiruchirapalli and adjoining areas. The stems of *Costus igneus* extracts can promote the formation of hydroxyapatite crystals and COD crystals treat urinary stone by inhibiting the formation of CHPD and COM crystals, a major component of calcium urinary stone under *in vitro* conditions. TLC aluminum plates precoated with silica-gel 60F_{254} (20cm x 10cm) were used with a mobile phase of n-Hexane: Ethyl acetate (80:20v/v) for Lupeol, Toluene: Acetone: Acetic acid (8.9: 0.9: 0.2 v/v/v) for Stigmasterol. The linear regression data for the calibration plots showed a good linear relationship with $r=0.99794$ and $r=0.99291$ for Lupeol and Stigmasterol, respectively. The average recovery of Lupeol and Stigmasterol was 100.16 % and 99.94 %, respectively. From IR and $^{13}$C NMR spectral data, isolated compound was identified as Lupeol and Stigmasterol. The purity of the isolated compounds Lupeol and Stigmasterol were confirmed by HPLC technique. The aqueous and ethanolic stem extracts of *Costus igneus* having the isolated compounds Lupeol and Stigmasterol were found significantly reduced the elevated level of calcium oxalate ions in treated albino wistar rats. The histopathological findings also conformed the effect of the *Costus igneus* on animals treated with extract principally having Lupeol and Stigmasterol compounds. *Costus igneus* stems extract could inhibit the stone (CaOx crystals) formation induced by ethylene glycol in albino wistar rats. Lupeol from *Costus igneus* represented a significant activity against selected urinary tract infection pathogens as compared with Stigma sterol compound. This research provides a multidisciplinary approach in characterizing urinary stone CHPD and COM crystals grown *in vitro* and *in vivo* to help, formulate prevention or dissolution strategies in controlling calcium urinary stone growth. This research is also focused to find new alternative medicine *Costus igneus* for the treatment of calcium oxalate urinary stone. Therefore, the purpose of this research is to investigate the beneficial effects of *Costus igneus* at a different dose and single compound for the prevention of kidney stone formation.