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Effect of kaempferol on calcium oxalate crystallization under *in vitro*, *in vivo*, and *in silico* conditions

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Introduction: Urolithiasis is one of the prevalent disorders of the urinary system. The use of plant products has reduced recurrence rate of renal calculi having no side effects. However, till now few scientific studies were reported in respect to the anti-urolithiatic property of the phytochemicals. *Betula alba* is widely used in the traditional medicinal systems like Ayurveda and Unani. Earlier, this plant was used as herbal traditional medicine for the treatment of kidney stones.

Aim: In this study, we aim to investigate protective anti-urolithiatic activity of kaempferol, which is an important constituent of *Betula alba* against calcium oxalate induced urolithiasis.

Methods: Urolithiasis results in the production of ROS/free radicals. So, to determine the antioxidant activity, phytochemicals will also be tested for its free radical scavenging effect on 2, 2-diphenyl-1-picrylhydrazyl (DPPH), superoxide, hydrogen peroxide and nitric oxide radical etc. Urolithiasis or kidney stone formation occurs in three steps i.e., nucleation, crystallization, and aggregation. Phytochemicals having anti-urolithiatic activity can be screened by following assays: crystallization assay, nucleation assay and aggregation assay in normal urine.

Findings: The main findings of kaempferol were investigated for their anti-urolithiatic property *in vitro*, *in vivo* and *in silico* studies. For antioxidant activity, DPPH, TRC, NO and superoxide assays were done whereas for anti-urolithiatic activity growth and inhibition of CaOx crystals formation in urine was performed. *In silico* experiments were performed by using AutoDock 4.2 tool to find out affinity of kaempferol and L-ascorbate with the antioxidant enzyme that acts as bio-markers of kidney fibrosis or stone.

Notes: