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In-Vitro Demineralization activity of Medicinal Plants extract against kidney stone forming minerals

Singh dinesh[1] and Garg gopal[2]

[1]*Institute of Pharmaceutical science and research center, Bhagwant University, Ajmer, Rajasthan, India.*
[1]*Millennium College of Pharmacy, Nathu-Barkheda road, Neelbud, Bhopal, Madhya Pradesh, India.*
[2]*VNS institute of Pharmacy, Nathu-Barkheda road, Neelbud, Bhopal, Madhya Pradesh, India.*

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ABSTRACT

The demineralization activity of medicinal plants extracts i.e. Brassica Rapa, Melia Azederach, Moringa Oleifera, Rubia Cardifolia, Zizyphus Jujuba against kidney stone forming minerals viz. calcium phosphate, oxalate or carbonate. The inhibition efficiency has been studied in different experimental models.

Keywords: *Kidney stone, Urolithiasis, Demineralization, and Plant extract.*

INTRODUCTION

Urinary calculogenesis is a result of Mineralization of insoluble calcium and magnesium salts or uric acid or cysteine over a suitable nidus in the urinary tract. Stone forming disease, called urolithiasis, exists in endemic proportion in some parts of our country [1-4]. Kidney stone formation or urolithiasis is a complex process that results from a succession of several physiochemical events including super saturation, nucleation, growth, aggregation, and retention within renal tubules [5]. Epidemiological data collected during several decades showed that the majority of stones up to 80% are composed mainly of calcium oxalate [6].

A number of people suffer from urinary stones (calculi). Areas of high incidence of urinary calculi include the British Isles, Scandinavian countries, Northern Australia, Central Europe, Northern India, Pakistan and Mediterranean countries. Saurashtra region, Gujarat has higher prevalence of urinary stones. According to an estimate, every year 6 lacs Americans suffer from urinary stones. In India, 12% of the population is expected to have urinary stones, out of which 50% may end up with loss of kidneys or renal damage. Also, nearly 15% of the population of northern India suffers from kidney stones [7].

Stone disease is two to three times more common in males than in females. It is occurs more than often in adults than in elderly persons, and more often in elderly persons than in children. In addition, urolithiasis occurs more frequently in hot arid areas than in temperature regions.

Decreased fluid intake and consequent urine concentration are the most important factors influencing stone formation. Certain medication, such as triamtererne, indinavir and acetazolamide are associated with urolithiasis. Dietary oxalate is another possible cause, but the role of dietary calcium is less clear, and calcium restriction is no longer universally recommended [8].

Plants and shrubs of medicinal value, used as folk medicine, might contain inhibitors of mineralization of insoluble stone forming compounds

In the present work we have estimated the inhibition efficiency of medicinal plant *i.e.* Brassica Rapa, Melia Azederach, Moringa Oleifera, Rubia Cardifolia, Zizyphus Jujuba against kidney stone forming minerals viz. calcium phosphate, oxalate or carbonate.

MATERIAL AND METHOD

All the chemicals used were of AR grade. Crystalloid forming solutions, *viz*., solution of calcium acetate, disodium oxalate, sodium carbonate were prepared in distilled water. Plant material for the present work was collected locally and was identified botanically. Leaves were carefully removed from the plants and allowed to dry in the sun light. The dried leaves were made into a powder and extracted with 95% ethanol. The extract was concentrated. The residue was suspended in water. Seed extract was prepared by the following procedure. Juice of the fruits was extracted with help of an ordinary fruit juicer. The thick juice obtained, were passed through a mesh and then suction filtered through ordinary filter paper. All the juice was used diluted to a known concentration. Four experimental models namely 'simultaneous flow static model' (S.S.M.), 'simultaneous flow dynamic model' (S.D.M.), 'reservoir static model' (R.S.M.) and 'reservoir dynamic model' (R.D.M.) were designed [9]. The medicinal plant was collected from hills area and botanically identified. The experiments were carried out in the laboratory. Simultaneous blank experiments were also carried out for evaluating the inhibition efficiency of inhibitor. All the experiments were conducted at room temperature. Percentage efficiency of inhibitor was calculated [10].

RESULT AND DISCUSSION

In the present study the dried powder of rubia cardifolia, moringa oleifera, melia azedarach, zizyphus jujube, brassica rapa were extracted with alcohol and the extracts was formed by soxhelet extraction method then this extracts was used for the preliminary phytochemical investigation.

In phytochemical investigation we have performed the various chemical tests for the presence of phytoconstituents. Phytochemical investigation of different extracts showed the presence of alkaloids, glycosides, tannins and proteins, vitamins etc. in ethanolic extracts and then we have studied the demineralization activity of rubia cardifolia, moringa oleifera, melia azedarach, zizyphus jujube, brassica rapa in vitro model like SSM, SDM, RSM, RDM and percent of inhibitors efficiency were calculated for these plants extract.

***Corresponding author:**
Singh dinesh
Institute of Pharmaceutical science and research center,
Bhagwant University, Ajmer, Rajasthan, India.
**E-Mail: singh.dinesh10@gmail.com*

Table No. 1: Inhibition of Calcium Phosphate Mineralization by Plants Extracts

Salt forming solutions: 0.01M$CaCl_2$
Inhibitors concentration: 10%w/v

S. No.	Inhibitors (Plant extracts)	Inhibition efficiency (%)			
		SSM	SDM	RSM	RDM
1.	Moringa oleifera	65	67	70	**71**
2.	Zizyphus jujba	72	70	60	**70**
3.	Melia Azederach	70	69	71	**68**
4.	Rubia cardifolia	68	71	69	**68**
5.	**Brassica rapa**	**65**	**63**	**64**	**67**

Table No. 2: Inhibition of Calcium Oxalate Mineralization by Plants Extracts

Salt forming solutions: 0.01M $CaCl_2$ and 0.01M $Na_2C_2O_4$
Inhibitors concentration: 10%w/v

S. No.	Inhibitors (Plant extracts)	Inhibition efficiency (%)			
		SSM	SDM	RSM	RDM
1.	**Moringa oleifera**	80	82	85	**88**
2.	**Zizyphus jujba**	70	65	67	**66**
3.	**Melia Azederach**	80	75	72	**70**
4.	**Rubia cardifolia**	75	70	64	**63**
5.	**Brassica rapa**	**68**	**62**	**58**	**60**

Table No. 3: Inhibition of Calcium Carbonate Mineralisation by Plants Extracts

Salt forming solutions: 0.01M $CaCl_2$ and 0.01M Na_2CO_3
Inhibitors concentration: 10%w/v

S. No.	Inhibitors (Plant extracts)	Inhibition efficiency (%)			
		SSM	SDM	RSM	RDM
1.	**Moringa oleifera**	79	81	85	84
2.	**Zizyphus jujba**	68	70	72	60
3.	**Melia Azederach**	65	71	68	62
4.	**Rubia cardifolia**	60	73	58	61
5.	**Brassica rapa**	**63**	**68**	**55**	**63**

CONCLUSION

The present investigation showed that the seed extract of the different plants markedly prevents the formation of urolithiasis. This activity may be due to diuretic effect. Diuresis reduces the risk of stone formation by reducing the saturation product of calcium oxalate and this drug also having excellent safety profile, low side effect. This confirms the seeds of this plant in folk medicine against urolithiasis. Further studies are needed to prove stone dissolving mechanism and active constituents responsible for this activity

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