

EVALUATION OF STONE INHIBITING EFFICIENCY OF LEMON JUICE A BIOCHEMICAL REVIEW

DR. A.H.ANSARI

Professor Department of Chemistry
Govt. P.G. College Damoh, Madhya Pradesh, India

ABSTRACT

Naturally occurring acids like malic, tartaric and citric acids may be used as a good source to check the deposition of calcium oxalate and phosphates in kidney, urinary tract or in gall bladder. As they release citrate and tartrate ions which in turn easily react with present calcium ions in the body to give calcium citrate or tartrate which easily passes out through the kidney. Thus prevents the formation of stone.

Keywords: citrus, Rutaceae, Calcium Oxalate, Citric acid, Oxaloacetic acid

INTRODUCTION

Lemon ^[12](Citrus Limon) belongs to family rutaceae found throughout India and natives of south-eastern Asia is a small tree with short spines, large white purple flowers. It contains 5% Citric acid, sugar, vitamin-C carotene. Thiamene and used as flavoring the materials and bleaching agent. It is also used to prevent scurvy.

Stone formation process: - Calcium the major and essential element of the body has significant role in bone formation. Normally its concentration is controlled by proper functioning of parathyroid gland ^[34], but excess amount of calcium ions present many clinical problems viz-renal calculus, kidney or gall bladder stone.

Formation process of the stone in various parts of the body is still uncertain, however it is acceptable that high

intake of calcium, oxalates and phosphate rich foods create such a severe problem. Some other major factors are also responsible for the crystallization of calcium oxalate and phosphate ^[5]

1. Abnormal secretion of parathyroid gland.
2. Decalcification of the bones which increases calcium ion concentration in the blood.
3. Less capability of reabsorption of calcium ions by nephrones.
4. Less permeability of glomerular capillaries.

Chemical and physiological aspects

Chemically it can be generalized that when ionic product becomes more than solubility product compound precipitates out. Therefore when ionic product of calcium and oxalate ions becomes more than solubility product it easily precipi-

tates out.

It is also notable that metabolism of carbohydrates proceeds via try acids cycle formation i.e. citric, oxalo acetic and succinic acid. Therefore it is also possible that oxalo-acetic acid may release oxalate ions facilitates the reaction of calcium to give calciumoxalate. During the Crebs cycle it is assumed that due to incomplete oxidation of oxalo-acetic acid it may convert into malic acid causing fatigue. Oxalate ions mayalso travel to blood plasma and at the stage of super filtration of selective absorption in nephrones may get deposited as calcium oxalate by reacting with calcium ions at higher PH value.

EXPERIMENTAL

PH plays an important role in precipitation. It is observed that calcium easily combines at higher PH to form oxalates. If we decrease the PH value its capability of forming calcium oxalate is diminished. I have carried out series of experiments in RS (reservoir static) model, observations are as below.

1. I took 10 ml oxalic acid solution in a beaker having oxalate ions and made it acidic by adding dil. HCL, then added calcium acetate solution no fair amount of ppt. comes out, even though oxalic acid easily gives cal. oxalate ppt. on addition of calcium containing ions.
2. Now using RS model I took a beaker filled with 10 ml lemon juice in which drop wise drop simultaneous addition of .1M solution of ammonium oxalate and calcium acetate was made. Precipitate obtained was diminished perhaps due to chelation between calcium and citrate ions provided by lemon juice. Along with this, a blank was also carried out in which simply 10ml of each ammonium oxalate and calcium acetate solution was mixed ,a thick ppt. was obtained
3. In similar manner experiment was carried out with diluted lemon juice giving again a poor precipitation.

RESULT AND DISCUSSION

Percentage efficiency of inhibition of natural acid (citric) was calculated in following way^[6]

$$\% \text{ of inhibition} = \frac{\text{wt. of ppt. in blank set} - \text{wt. of ppt. in sample.}}{\text{Wt. of ppt. in blankset}} \cdot 100$$

Table

Salt solution. -0.1M calcium acetate and amm. oxalate

Inhibitor acid	State	Inhibition efficiency %
Citric acid	pure lemon juice	20
Citric acid	Diluted solution	30

From the above observation it is clear that lemon juice causes the suppression of oxalate ions by providing hydrogen ions and it is supposed that calcium and

citrate ions may react to form cal. citrate decreasing the cal. Oxalate precipitation. Therefore, if we may become successful to introduce hydrogen ions in the body by giving acidic contents in natural way

resulting the lowering of PH of body fluid; stone formation can be prohibited.

Above experiments also reveal that regular use of lemon juice is an effective remedy against deposition cal. oxalate crystals but diluted form is somewhat more effective, as it may provide sufficient citrate ions for chelation.

Secondly it is also notable that PH of kidney surrounding, remains somewhat higher due to presence of nitrogenous compounds like urea where combination of cal. and oxalate takes place easily if it may be changed slightly to acidic we can achieve success to prevent cal. Oxalate deposition to some extent. Thirdly if we take oxygen abundantly it is very-much possible to cure stone formation as on complete oxidation oxalo acetic acid is disintegrated into CO₂ and water or in presence of acetyl co- Enzymes A. It is converted into citric acid.

CONCLUSION

From the observation it may be concluded that natural hydroxy acids are the good stone inhibitors of cal. oxalate, cal. carbonate and cal. Phosphate minerals in our body organs. Intake of citrus fruits (citric acid) and grapes (tartaric acid) can be the curative sources for the prevention of kidney stone in a natural way.

REFERENCES

1. Albert F Hill Economic Botany; T.M.H. 2 Edition pp.411-12 (1979)
2. S.L.Coacher, Economic Botany in Tropics, Macmillan India Ltd. Pp.187-188.(1981)
3. Rao Rangnath, A Text Book of Biochemistry. 2 Edition Prentice Hall India, pp 410,(1980)
4. Hurkat, P C and Mathur, P.N., A Text Book of Animal Physiology, pp 341,(1976).
5. Rao Rangnath, A Text Book of Bio Chemistry, 2 Edition Prentice Hall India, pp327 (1980).
6. Rao T.V.R.K and Bano Sofia, Inhibition of Mineralization of urinary Stone forming Minerals by Naturally Occurring Acids, Asian Journal of chemistry Vol. 12, No. 2. April-June 2000

CORRESPONDING AUTHOR

Dr. A.H. Ansari

Professor Department of Chemistry

Govt. P.G. College Damoh,

Madhya Pradesh, India

Email: ahorgchem@gmail.com

Source of Support: Nil

Conflict of Interest: None Declared