

Fulvic acids in Fiuggi mineral water and their role in degrading kidney stones



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Introduction

Water is the key compound of human existence on Earth. Generally, water is available in abundance. However, the availability of safe water for drinking is a critical problem in many countries. Access to clean water will become one of the greatest challenges for humankind.

The ecosystem influences the composition of water which contains a number of dissolved molecules. Dissolved organic matters play a leading role in many soil processes. Humic substances (humic and fulvic acids) are principal constituents of soil [1].

Mineral water is water containing not less than 250 parts per million total dissolved solids. It has a constant level and relative proportions of mineral and trace elements at the point of emergence from the source.

The Fiuggi water seeps through the Anticolana Valley volcanic soil is enriched with humic substances and contains organic molecules belonging to the fulvic acids family and has no analogue anywhere in the world.

It doesn't possess diuretic action only but is also able to dissolve kidney stones. Urolithiasis is one of the most common diseases in the world [2].

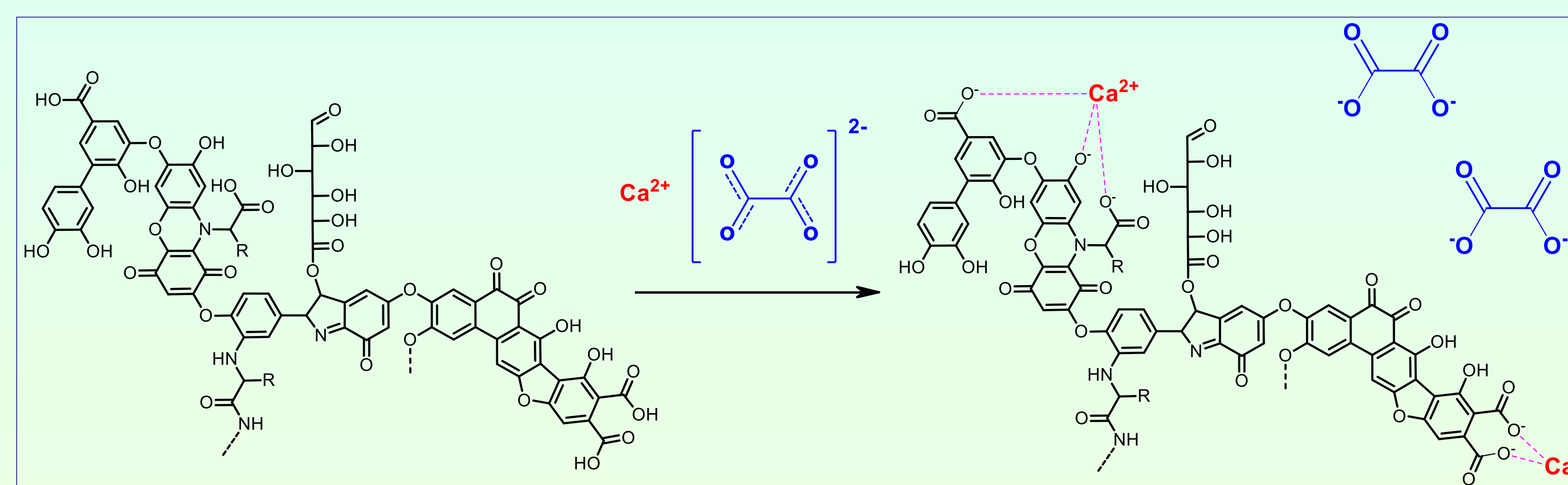
Water therapy is the most useful and efficient method for complex treatment and prevention of kidney stones.

Results and Discussion

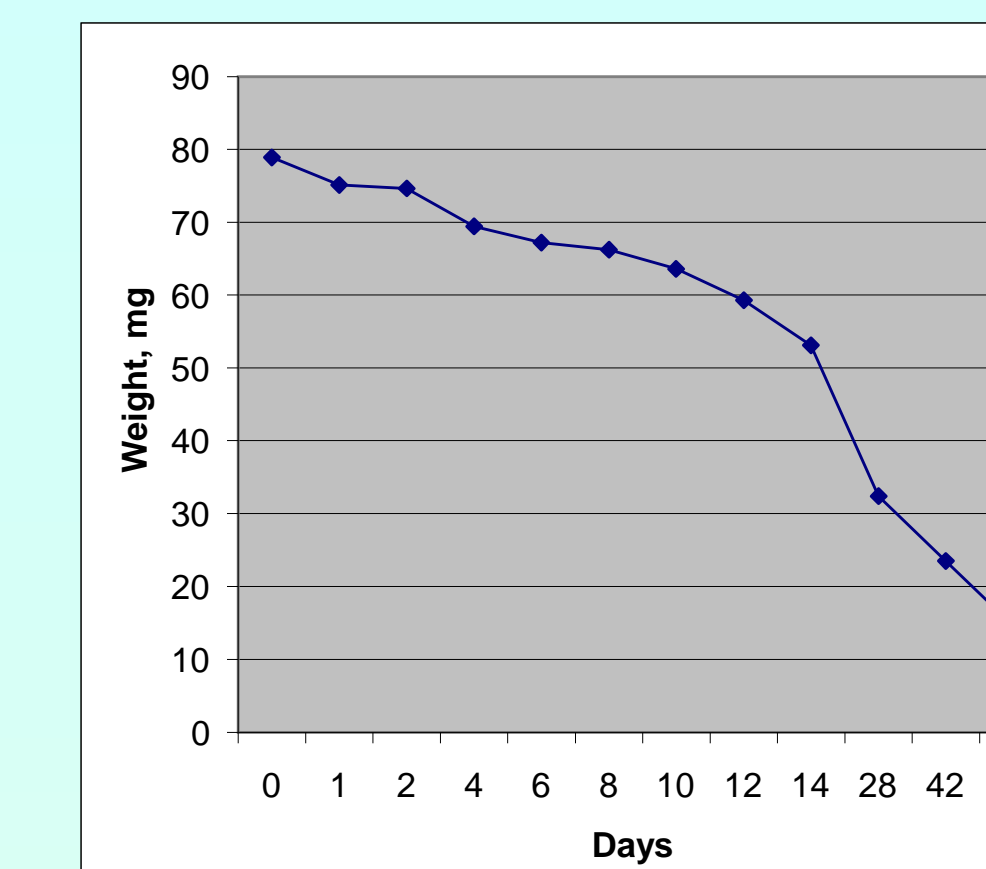
Here, we report the Fiuggi water medicinal effect in patients with urolithiasis and offer a probable model of interaction of fulvic acids with stone-forming metal ions (e.g., Ca^{2+}) in urine according to the Scheme described below.

The presence of fulvic acids in the Fiuggi water has been established and confirmed by chromatography and other analytical methods, nuclear magnetic resonance, and infrared spectroscopy [3-5].

Humic substances are natural polymers with complex and disordered molecular structures. One of the most important characteristics of humic substances is their ability to form water-soluble complexes with metal ions [6]. Fulvic acids in the Fiuggi water demolish the crystal lattice of the calcium salts (oxalates, phosphates, etc) in kidney stones and form soluble calcium complexes. As a result, the stones are dissolved and eliminated from the human body naturally.



Scheme of the interaction of a fulvic acid fragment with calcium oxalate [7].

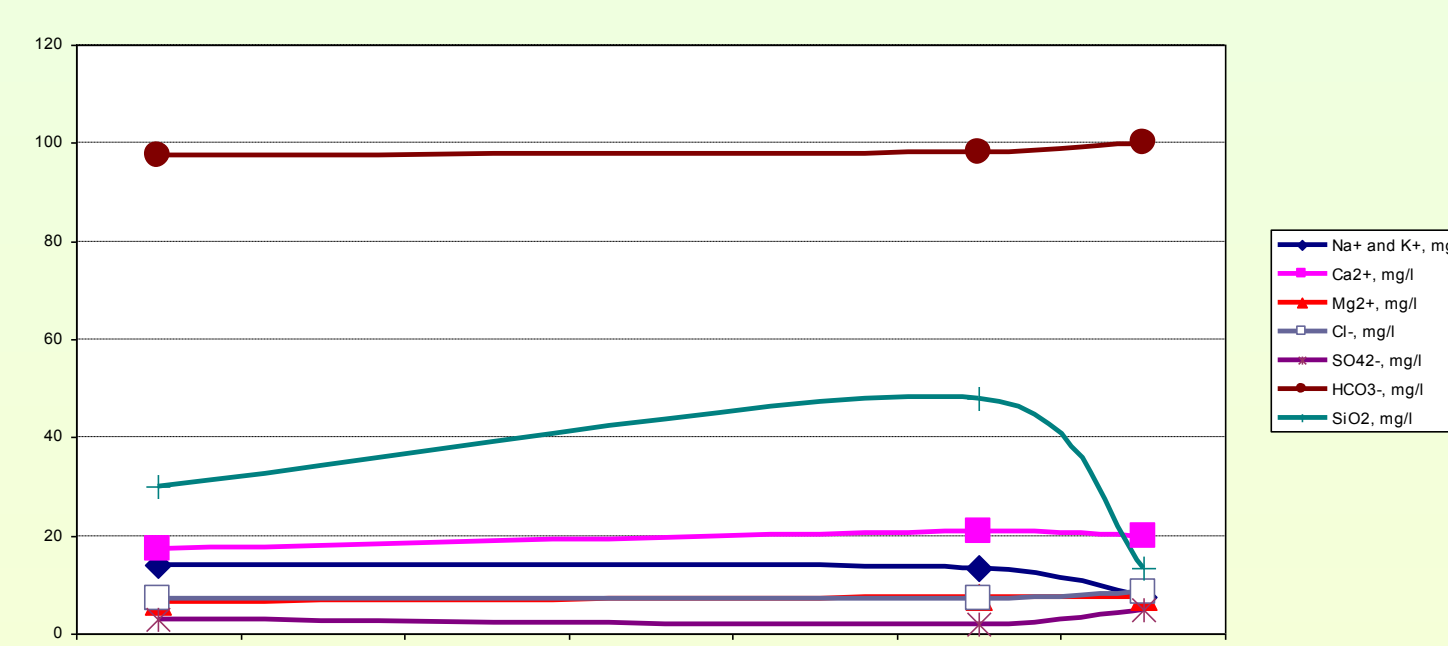


Dynamics of the oxalate calcium stone dissolution in the Fiuggi water over time (days) *in vitro* [7].

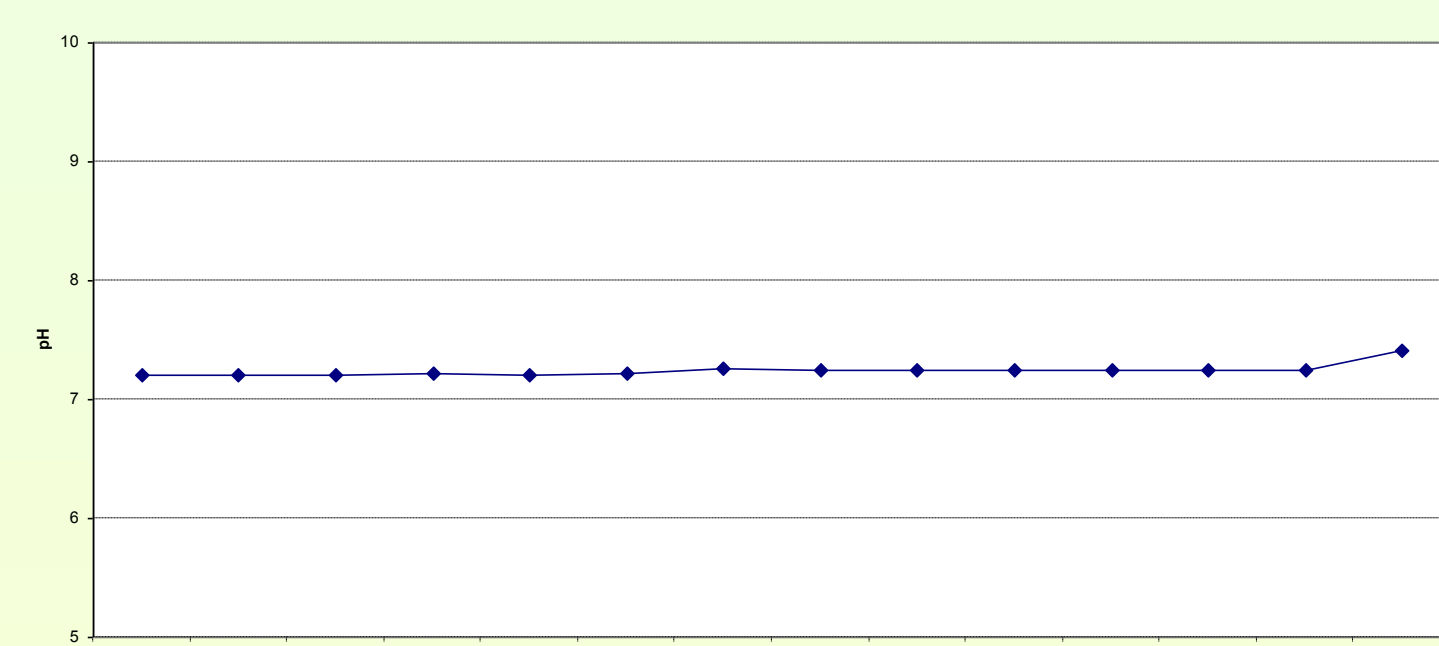
Indications for the Fiuggi water treatment

- Stones and sand in the kidneys.
- Acute and chronic cystitis, pyelonephritis, glomerulonephritis.
- Uratic arthritis.
- Prostatitis.
- Obesity, overweight.

The Fiuggi water has a constant level and relative proportions of mineral elements at the point of emergence from the source [7].



The variation in ionic composition of water



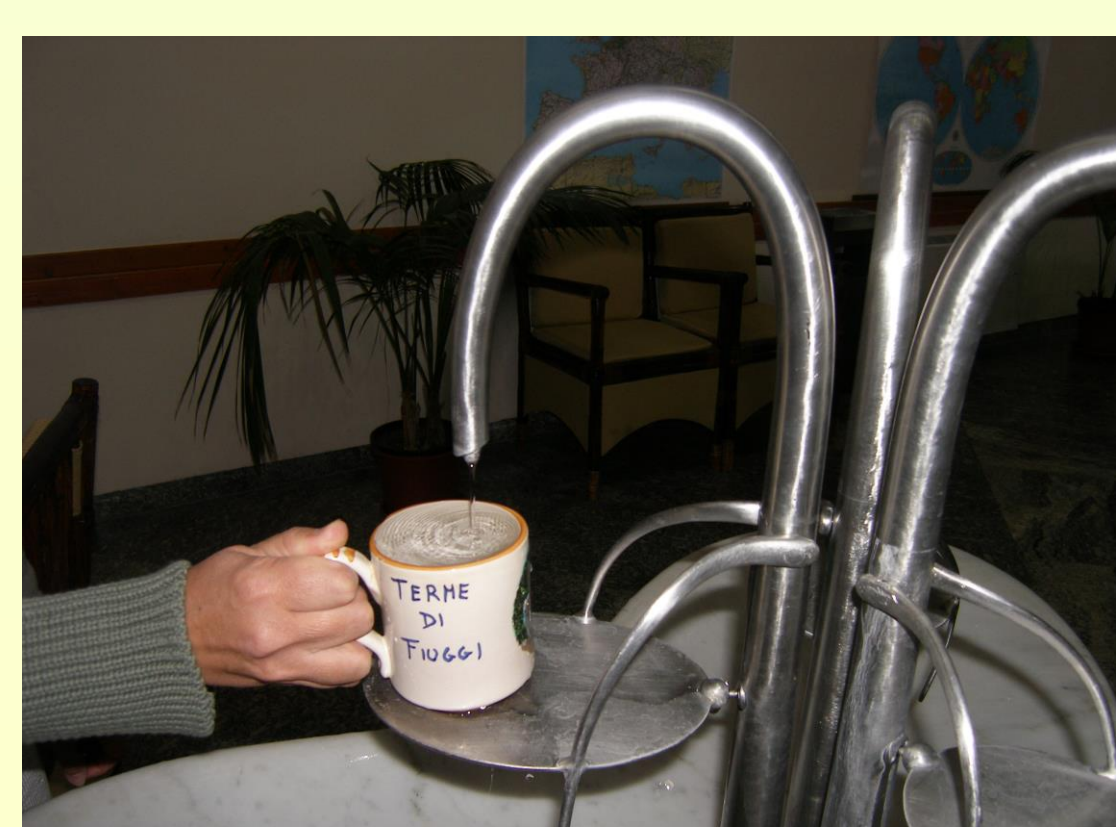
The seasonal variation in pH of water



Fiuggi bottled water

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View of Fiuggi and Thermae of Bonifacio VIII

Acknowledgement

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