



Original article

The Influence of Mg(II) and Ca(II) Ions on Rutin Autoxidation in Weakly Alkaline Aqueous Solutions

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SUMMARY

Rutin (quercetin-3-O-rutinoside) is one of the most abundant bioflavonoids with various biological and pharmacological activities. Considering the ubiquitous presence of Mg(II) and Ca(II) ions in biological systems we decided to investigate their influence on the autoxidation of rutin in weakly alkaline aqueous solutions. Changes in UV-Vis spectra recorded during the rutin autoxidation in aqueous solution at pH 8.4 revealed that this process was very slow in the absence of metal ions. The presence of Mg(II) and, especially Ca(II) ion, increased the transformation rate of rutin. UV-Vis spectra recorded after prolonged autoxidation indicated the formation of humic acid-like products in the presence of Mg(II) and Ca(II) ions. Four new compounds formed during the initial stage of rutin autoxidation in the presence of Mg(II) and Ca(II) ions were detected by HPLC-DAD. Based on the analysis of their DAD UV-Vis spectra and comparison of their retention times with the retention time value for rutin, we concluded that the initial rutin transformation products were formed by the water addition on double bond in ring C and hydroxylation of ring B. A very small decrease of the initial rutin concentration (4%) was observed by HPLC-DAD in the absence of metal ions for the period of 90 minutes. However, rutin concentration decrease was much larger in the presence of Mg(II) and Ca(II) ions (14% and 24%, respectively). The more pronounced effect of Ca(II) ion on the rutin autoxidation may be explained by the stronger binding of Mg(II) ion to rutin and thus greater stabilizing effect on reaction intermediates caused by its higher ionic potential (charge/ionic radius ratio) in comparison to Ca(II) ion. The results of this study may contribute to the better understanding of interactions of Mg(II) and Ca(II) ions with natural phenolic antioxidants which are important for their various biological activities.

Key words: rutin, autoxidation, magnesium, calcium

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