Novel Spectrophotometric Determinations of Cu(II) and Cr(III) by Complexation with a Natural Polyphenolic Betanin and their Applications to Biological Fluid

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Abstract:

Betanin is a natural polyphenolic compound that has gained wide popularity recently due to its characteristics. Therefore, the study of the interaction between betanin with metals is receiving more attention. In this study, betanin was extracted from natural Beetroot and it was bounded with metals Cr(III) and Cu(II) to form binary complexes. These complexes were studied by using simple, rapid and accurate UV-Vis spectroscopic methods and applied to biological urine matrix. Acid-base equilibria of betanin were investigated. The reactions of betanin with Cr(III) and Cu(II) were optimized to produce highly absorbent complexes at 525 and 499 nm within 1 min at pH= 7 and 25 ºC, respectively. Linear concentration ranges from 1500 to 200 µg mL^{-1} and from 2000 to 270 µg mL^{-1} were achieved for Cr-betanin and Cu-betanin complexes with correlation coefficients more than 0.997, respectively. The stoichiometry of complexes was found to be 1:1 Metal:Betanin. The LOD and LOQ values were calculated and found to be (LOD=76.7& LOQ=232.5µgmL^{-1}) for Cr-Betanin complex and (LOD=98.5 & LOQ= 298.5 µg mL^{-1}) for Cu-Betanin complex. The current methods have high precision and accuracy with RSDs<1.0 and % recovery of 100±5%. The proposed methods were successfully applied to biological urine matrix**.**

Keywords:

Metal-polyphenolic complexes, Betanin, Cr(III), Cu(II), UV-Vis, Urine.