

Kinetic investigations of the sulfite addition on flavanols

Sulfonated monomeric and dimeric flavan-3-ols are recently discovered in wine and proved to have great importance in understanding wine chemistry and quality [1, 2]. Since the mechanism of their formation is still unknown, the aim of this work was to investigate the behaviour of wine monomeric and oligomeric and polymeric flavanols in the presence of SO₂, through the evaluation of the kinetic parameters of the monomeric and dimeric flavanols sulfonation at the wine pH. The experimental design considered two different pH (3 and 4) and at five different temperature values (23, 30, 40, 50 and 60 °C), in order to study the reaction products obtained by SO₂ addition to both monomeric (epicatechin and catechin) and dimeric flavanols (procyanidin B2 and procyanidin B3). The quantitative measurements were carried out by using a UHPLC-QTOF-MS instrument. The results demonstrated that [3]: a) the major sulfonation route that leads quickly and in good yields to monomeric 4β-sulfonated derivatives passes through the acid-catalysed depolymerisation of proanthocyanidins; b) monomeric flavanols lead with a significantly slower process to the same 4β-sulfonated products; c) kinetic data in our hands, in particular the temperature dependence of the observed rates, suggest the involvement of two completely different reaction mechanisms for the SO₂ addition to dimeric and monomeric flavanol substrates; d) the direct sulfonation of epicatechin is slightly faster with respect to catechin. In conclusion, this new knowledge provides essential information in order to better understand tannin chemistry in food and predict or model the chemical/sensorial behaviour of wine or other food rich in proanthocyanidins.

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