Abstract

C6-α-dicarbonyl compounds are formed as part of the *Maillard* Reaction during thermal treatment of sugar-containing food.

In this thesis, high-resolution NMR spectroscopy was used to elucidate the structures of equilibrating D-glucosone (GLUC) and 1-deoxyglucosone (1-DG) isomers in aqueous solution. GLUC formed four isomers, and their equilibrium is dependent on the pH value (due to NMR: pD) and temperature. 1-DG formed up to fifteen isomers and their equilibrium depends on pD values and temperature as well.

Additionally the antioxidant capacity of 1-DG and GLUC was investigated. Both compounds possess a reductone-like structure. Their reductive potential was measured with the trolox equivalent antioxidant capacity (TEAC) assay and the Folin–Ciocalteu reagent (FCR) assay. Their antioxidant capacity sets them apart from their precursors and other typical Maillard Reaction products. Using electron paramagnetic resonance (EPR) spectroscopy, the special radical scavenging behavior of 1-DG and GLUC could be measured. Both exhibited a slow, but constant scavenging ability over the course of several hours, even days. It was postulated that this characteristic behavior is caused by isomeric composition and transformation to the particular antioxidant form. Reaction mixtures of 1-DG showed a correlation between decrease of antioxidant properties and decomposition of 1-DG.

For the first time, combined model systems of α-dicarbonyl compounds were investigated to measure possible effects on each other. Numerous reaction products could be identified which were already described in the single compound model experiments. Only a lower concentration of the α-dicarbonyl compounds could be determined but no additive or suppressive effects.

Furthermore all model systems were examined concerning their colour formation, their antioxidant properties, and their formation of α-dicarbonylic and heterocyclic compounds. In some cases correlations between these different experimental sections were possible.