

Effects of hydration, lipids, and temperature on the binding of the volatile aroma terpenes by β -lactoglobulin powders

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Abstract

The binding properties of dry proteins are relatively poorly known. Many proteins are present in emulsions and suspensions and also in dry forms. This is particularly true of dairy proteins, which are often stored and sold in powdered form. In the present work, the binding of three terpenes (α -terpinene, γ -terpinene, and terpinolene), which belong to the basic aroma components, and of decane by powdered β -lactoglobulin (BLG) was studied at different hydration levels (0.05-0.40 g of H₂O/g of protein) and temperatures (298 and 309.5 K), in the presence or absence of lipids and small concentrations of ethanol. Vapor sorption isotherms were determined for these systems by a static method of headspace gas chromatographic analysis. A cooperative effect of hydrophobic hydration was observed for the binding of aroma terpenes and decane by the solid BLG. The temperature increase from 298 to 309.5 K reduced the observed hydration threshold of BLG by 0.05-0.08 g of H₂O/g of protein. Lipids (1.2% w/w) in hydrated BLG gave at least a 2-fold increase in its binding affinity for the hydrocarbons studied, and synergic effects of the hydration and lipid on this affinity were observed.

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Keywords

Aroma binding, Hydration threshold, Hydrophobic hydration, Static headspace gas chromatography, Vapor sorption isotherms