Quantitative reconstruction of the nonvolatile sensometabolome of a red wine

The first comprehensive quantitative determination of 82 putative taste-active metabolites and mineral salts, the ranking of these compounds in their sensory impact based on dose-over-threshold (DoT) factors, followed by the confirmation of their sensory relevance by taste reconstruction and omission experiments enabled the decoding of the nonvolatile sensometabolome of a red wine. For the first time, the bitterness of the red wine could be demonstrated to be induced by subthreshold concentrations of phenolic acid ethyl esters and flavan-3-ols. Whereas the velvety astringent onset was imparted by three flavon-3-ol glucosides and dihydroflavon-3-ol rhamnosides, the puckering astringent offset was caused by a polymeric fraction exhibiting molecular masses above $5$ kDa and was found to be amplified by the organic acids. The perceived sourness was imparted by l-tartaric acid, d-galacturonic acid, acetic acid, succinic acid, l-malic acid, and l-lactic acid and was slightly suppressed by the chlorides of potassium, magnesium, and ammonium, respectively. In addition, d-fructose and glycerol as well as subthreshold concentrations of glucose, 1,2-propandiol, and myo-inositol were found to be responsible for the sweetness, whereas the mouthfulness and body of the red wine were induced only by glycerol, 1,2-propandiol, and myo-inositol.