Molecular and sensory characterization of gamma-glutamyl peptides as key contributors to the kokumi taste of edible beans (Phaseolus vulgaris L.)

Addition of a nearly tasteless aqueous extract isolated from beans (Phaseolus vulgaris L.) to a model chicken broth enhanced its mouthfulness and complexity and induced a much more long-lasting savory taste sensation on the tongue. Gel permeation chromatography and hydrophilic interaction liquid chromatography/comparative taste dilution analysis (HILIC/cTDA), followed by LC-MS/MS and 1D/2D-NMR experiments, led to the identification of gamma-L-glutamyl-L-leucine, gamma-L-glutamyl-L-valine, and gamma-L-glutamyl-L-cysteinyl-beta-alanine as key molecules inducing this taste-modifying effect. Sensory analysis of aqueous solutions of these peptides showed threshold concentrations between 3.3 and 9.4 mmol/L for an unspecific, slightly astringent sensation. More interestingly, when added to a savory matrix such as sodium chloride and monosodium glutamate solutions or chicken broth, the detection thresholds of these gamma-glutamyl peptides decreased significantly and remarkably enhanced mouthfulness, complexity, and long-lastingness of the savory taste were observed; for example, the threshold of gamma-glutamyl-cysteinyl-beta-alanine decreased by a factor of 32 in a binary mixture of glutamic acid and sodium chloride. As tasteless molecules inducing mouthfulness,
thickness, and increasing continuity of savory foods were coined about 10 years ago as "kokumi" flavor compounds, the peptides identified in raw as well as thermally treated beans have to be considered as kokumi compounds.