

Functional properties of whey protein concentrate texturized at acidic pH: effect of extrusion temperature

ABSTRACT

Reactive supercritical fluid extrusion (RSCFX) process at acidic condition (pH 3.0) was used to generate texturized whey protein concentrate (TWPC) and the impacts of process temperature on product's physicochemical properties were evaluated. TWPC extruded at 50 and 70 °C formed soft-textured aggregates with high solubility than that extruded at 90 °C that formed protein aggregates with low solubility. Total free sulfhydryl contents and solubility studies in selected buffers indicated that TWPC is primarily stabilized by non-covalent interactions. Proteins texturized at 90 °C showed an increased affinity for 1-anilino-naphthalene-8-sulfonate (ANS) and a decreased affinity for cis-parinaric acid (CPA), indicating changes in protein structure. Water dispersion of TWPC at room temperature showed thickening function with pseudoplastic behavior. Secondary gelation occurred in TWPC obtained at 50 and 70 °C by heating the cold-set gels to 95 °C. TWPC texturized at 90 °C produced cold-set gels with good thermal stability. Compared to control, TWPC formed stable oil-in-water emulsions. Factors such as degree of protein denaturation and the balance of surface hydrophobicity and solubility influenced the heat- and cold-gelation and emulsifying properties of the protein ingredients. TWPC generated by low and high temperature extrusions can thus be utilized for different products requiring targeted physicochemical functionalities.

Keyword: Whey protein; Supercritical fluid extrusion; Protein hydrophobicity; Cold-set gelation; Emulsifying properties