Whey protein hydrolysis with trypsin immobilized on spent grains

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Whey proteins are well known for their versatile functional properties as well as for being an important source of bioactive peptides. Hydrolysis with trypsin can improve functional properties and/or release the bioactive peptides. This can be exploited in the manufacture of foods with enhanced functional and nutritional properties. Enzyme immobilization allows for a better overall system performance and spent grains, a by-product of the brewing industry rich in cellulose, may be an adequate support for enzyme immobilization. The hydrolysis of whey protein isolate (WPI) with trypsin immobilized on spent grains was studied. Monitoring was carried out during 3 hours by measuring the degree of hydrolysis with the pH-stat and TNBS methods. Further analysis was made by reversed phase HPLC/UV: peptides were separated according to their polarity and degradation of α-lactalbumin and beta-lactoglobulin was evaluated; RP-HPLC/MS assessment of the similarities between the peptide profile of free and immobilized enzyme treated WPI was made. The kinetic analysis, using the Michaelis-Menten model, showed that the immobilized trypsin apparent K_m was about two times lower than that found for the soluble enzyme. The v_max of the immobilised enzyme was 15 % of the v_max of the free enzyme. The optimal temperature for 180 min of hydrolysis time was 50 °C, slightly higher than for the free enzyme (45 °C). The main peptides produced with the immobilized and the free enzyme were the same.

Change of potato starch amorphicity and enzymatic hydrolysability caused by pressure treatments

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In the last 10–15 years the use of high pressure to preserve and modify foods has gained increased interest, existing already several commercial successful applications1. Pressure can also be used to change macromolecules properties, due to its effects on non-covalent bonds, like hydrogen, ionic and hydrophobic bonds and also due to rearrangements of solvent molecules, resulting in changes of solvation volume2. Starch is one of the most naturally abundant macromolecules and is used for a wide range of applications. In the food industry, starch-derived products are broadly used as thickening and gelifying agents and as sweeteners (glucose and fructose syrups)3. To obtain these products, starch is hydrolysed by different enzymes, requiring in some cases (as for amylases) the use of high temperatures to gelatinize the starch, rendering it accessible and hydrolysable. The use of milder temperatures would be an advantage on these processes. In this work, the effect of pressure treatments (1000 atm) of 5, 10, 20, 30, 45, and 60 min, on subsequent enzymatic hydrolysability of potato starch at atmospheric pressure by α-amylase was studied. It was found that the hydrolysis velocity decreased, while maximum product formation increased by more than 3-fold. Starch analysis by FTIR revealed that the amorphous character of starch correlated linearly with pressurization duration and with maximum product formation (up to 30 min pressurization time).