Pilot-Scale Protein Recovery from Cold-Pressed Rapeseed Press Cake

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The agricultural sector is responsible for about 30% of greenhouse gas emissions, and thus there is a need to develop new plant-based proteins with lower climate impact. Rapeseed press cake, a by-product from rapeseed oil production contains 30% high-quality protein. The purpose of this study was to upscale the recovery of rapeseed protein from cold-pressed rapeseed press cake to pilot scale and investigate the effect of recirculation of the spent solids fraction on protein recovery yield. Proteins were extracted from cold-pressed rapeseed press cake under alkaline conditions (pH 10.5) followed by precipitation with citric acid at pH 3.5. Separations were conducted in pilot scale with a continuous decanter at 20 L/h. The recirculation of the spent solids fraction was repeated three times and protein yields, proximate composition, amino acid profile, glucosinolate content, and phytate content were analyzed in the corresponding protein concentrates. The experiments showed that it was possible to increase the recovery of rapeseed protein on a pilot scale by recirculation of the spent solids fraction. Recirculating the spent solids fraction once increased the accumulated protein yield from 70% to 83%. The ef?ciency of the extraction process was signi?cantly higher in the ?rst and second cycles compared to the third and fourth cycles, where only an additional 2% was extracted. The amino acid composition showed high levels of essential amino acids and was not reduced throughout the recovery process. The glucosinolate content was successfully reduced in the protein concentrates after one cycle and was in the same range as commercial plant-based protein ingredients. The phytate content was reduced in the protein concentrate after one cycle, though additional process steps are needed to further reduce the phytate content and limit the negative effect on mineral uptake. It was possible to increase the protein recovery yield by the recirculation approach and the amino acid profile was not deteriorated. This opens possibilities to upscale a protein recovery process with a higher economic efficiency.