Protein enrichment of plant meals and side-streams by dry triboelectric separation

<u>WOCKENFUL. (1)</u> , HEINZ V. (1), LAMMERS V. (1), PI P. (2), LILLE M. (2), SER N. (2)
1 DIL Deutsches Institut fr Lebensmitteltechnik e.V., Quakenbrck, Germany
2 VTT Technical Research Centre of Finland, Espoo, Finland

The aim of the present study was to produce protein concentrates from deoiled lupine flakes (DLF), rapeseed press cake (RPC) and sunflower press cake (SPC) using triboelectric separation. The focus was on the raw material pre-treatment and optimisation of the process parameters to maximize protein enrichment and yield.
DLF, RPC and SPC with different oil contents were pin- milled to different particle sizes and subsequently fractionated using a triboelectric belt separator, resulting in a protein-rich (E2) and protein-depleted fraction (E1). The protein content of the raw material and the fractions produced were analysed using the Dumas method and the mass yield, protein enrichment and protein separation efficiency were calculated. Furthermore, the particle size distribution (PSD), proximate composition and colour were analysed. To determine the cellular components in both fractions, scanning electron microscopic (SEM) images were taken. The optimal process parameters were determined by multiple linear regression. Finally, the raw materials were tested in high-moisture extrusion.
Dry fractionation of the selected raw materials resulted in absolute protein enrichment of 6% for RPC, 20% for DLF, 6% for SPF and 9% for de-oiled SPF. The mass yield for each material tested was between 40 and 50%. Separation of the SPC with 20, 15 and 0% oil (dm) showed the highest protein enrichment for the de-oiled SPC. Smaller particle size of the raw material resulted in higher protein enrichment, as finer grinding, released more protein bodies from the cell matrix, which was confirmed by the PSD and SEM images of the separated fractions. The E2 fractions had a smaller particle size and protein bodies were visible on the SEM images, whereas the E1 fractions had a larger particle size and both hulls and cellular material were detectable on the SEM images.
Triboelectric separation proved to be a promising technology for dry fractionation of plant-based materials. Protein enrichment was best for the de-oiled raw materials with the smallest particle size, as de-oiling avoided agglomeration and fine grinding released the protein bodies sufficiently from the cellular matrix to be separated from the other components.