Process development for the valorization of the residual stream of sunflower oil press cake

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Sunflower oil press cake is a plant protein rich matrix that is usually utilized as animal feed. Since this residual stream is exceedingly high in value, it is desirable to make it available for direct human use on a larger scale. For this purpose, sustainable processes characterized by minimal use of environmental resources should be employed. Therefore, the suitability of solid state fermentation and membrane filtration for functional improvement, extraction, and purification of the plant proteins was investigated. The extracted proteins could be used as valuable ingredients in food and natural body care products.
Protein modification was carried out by solid state fermentation using *Aspergillus niger* as the microorganism. Concentration and fractionation of the proteins was realized by diafiltration using membrane microfiltration and nanofiltration.
The product composition was analyzed in all process steps regarding its nutrient components and selected phytochemicals and toxins. The growing microorganisms of the solid state fermentations were cultured on agar plates to check the progress of the fermentation and to detect contaminating microorganisms. The distribution of the molecular weight of the proteins was determined by gel electrophoresis after the different process steps. Chemical and physical analyses of the product were performed to determine various functional properties. These include foam formation, foam stability, solubility, water binding capacity, emulsification behavior and gel formation.
The results show that protein size distribution and functional properties can be modified by solid state fermentation with *Aspergillus niger*. Furthermore, fermentation of sunflower oil press cake is possible without being disturbed by other microorganisms. Membrane filtration processes were successfully applied to fractionate and purify proteins. In addition, polyphenol content in the final product was reduced. This is crucial for a neutral color in subsequent further processing in food and natural personal care products. From these results, it can be concluded that protein quality and molecular size distribution can be selectively adjusted by the process parameters of solid state fermentation and microfiltration. The combination of these processes therefore exhibits a promising sustainable possibility to produce valuable plant proteins for the usage in food and natural personal care.