Popular science summary of Master's thesis report:

Lactic acid fermentation aided precipitation of alkaline extracted hemp proteins

Written by: Darius Baeckström

Hempseeds, a product of the *Cannabis Sativa* plant, are nutritious seeds with high contents of fat, fibre and protein. Hempseed protein contains all eight essential amino acids, and is therefore a suitable as an alternative for people looking top replace animal protein sources. Hempseeds are already utilized as a standalone food ingredient, but a large part of hempseeds in the food industry are used for pressing hempseed oil. The leftovers from the oil production, called hempseed press cake (HPC), constitute the fibre and protein fractions of the hempseeds. Due to the unpalatable nature of the HPC it is rarely used in foodstuffs, but rather used for animal feed or biogas production. In a market that is in the middle of a protein shift towards plant-based protein, being able to effectively the hempseed proteins in the HPC would incredibly useful, both to increase the sustainability of the current crop production and also to make hemp cultivation more viable moving forwards.

Previous research at Chalmers and Lund University has established that extraction of the hemp protein from HPC is possible through a relatively simple process utilizing pH shifts. Firstly, the HPC is mixed with water at alkaline conditions (high pH), at which the proteins have high water solubility. This results in a two-phase system: The proteins are found in the liquid phase, while the rest of the HPC (mainly insoluble fibres) are stuck in the solid phase. These are easily separated, resulting in a protein-rich liquid. In order to separate the protein from the rest of the liquid, the pH is lowered until the proteins are no longer soluble. This creates a curdling effect, similar to the one seen in cheese production, resulting in a another two-phase system, but this time the proteins are the sole macronutrient component of the solid phase. After separation of the liquid and solid phases, a protein precipitate (PP) is left, with a green colour and a texture similar to cream cheese. The PP has a protein content of about 75% (dw), and the process exhibits a protein yield (from HPC to PP) of about 60%.

In this particular study, lactic acid fermentation was utilized to lower the pH of the protein liquid. This allows for a reduced use of chemicals, but could have other effects as well. It was seen that the fermentation drastically reduced the presence of pathogens such as mould and Enterobacteriaceae in the end product, which is very likely to prolong the shelf life. The fermentation method showed comparable yields and PP protein contents to the non-fermented method, and with further optimization it is possible that the fermented process outperforms the non-fermented one even in these areas.