Protein concentrates from edible insect *Tenebrio molitor* – development of extraction methods and techno-functional characterization

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Aim

The goals of this work were to develop extraction techniques that allowed us to obtain protein concentrates from the edible insect *Tenebrio molitor* larvae, with high protein purity as well as good techno-functional characteristics.

Methods

Two different protein extraction methods were developed, based on isoelectric point precipitation or membrane ultrafiltration. For both methods, dried *T. molitor* larvae was defatted with the Soxhlet method with ethanol as a solvent. The defatted fraction was then homogenized in a NaOH solution with the homogenate being recovered and centrifuged.. The supernatant (S) and the pellet fractions were recovered.

For the isoelectric point precipitation method, the recovered supernatant pH was modified to 4.546 and the precipitate was centrifuged at 5000 rpm for 30 minutes at 4ºC. The pellet fraction was freeze-dried (IP).

For the membrane ultrafiltration, the supernatant was filtrated with a 50 kDa membrane with the retained (> 50 kDa) and filtered (< 50 kDa) being recovered and freeze-dried.

The fractions were characterized in respect protein recovery related to defatted sample, protein content, protein profile (SDS-PAGE and FPLC) and techno-functional properties (color, foaming properties, water/oil absorption capacities and emulsifying properties).

Results

Both the IP and the > 50 kDa fraction had protein contents above 80% while the <50 kDa fraction only had a protein content of 44.24% (± 1.61). Despite their high protein content, the IP and >50 kDa only attained a protein recovery rate of 31% and 32% respectively. Concerning the protein profiles, the >50 kDa fraction had a very similar profile to the supernatant, while the IP fraction was composed by protein with higher molecular weight.

The >50 kDa fraction had higher L* (lightness) and b* (yellowness) color than the IP fraction or the defatted or oven-dried samples. Additionally, the samples presented better techno-functional properties than the dried or defatted sample and the >50 kDa fraction had better properties than commercial protein concentrates (whey protein or pea protein).

Conclusion

Protein extraction method based on ultrafiltration led to a protein concentrate with high purity and acceptable techno-functional properties, and can function as an alternative to the more common method based on isoelectric point precipitation.

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