Maximizing protein yield during pH-shift processing of herring co-products combined with antioxidant-rich materials

Introduction

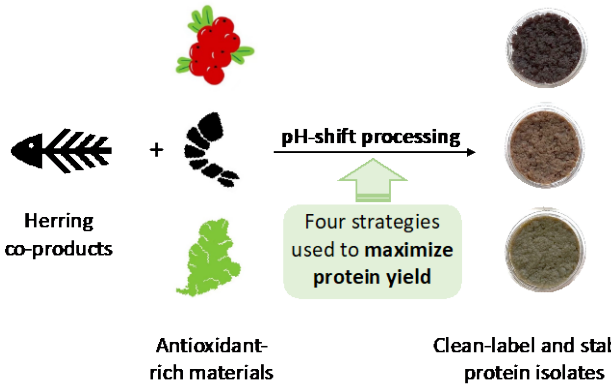
The pH-shift process is a promising tool to **recover functional proteins** from fish co-products, but lipid oxidation is a problem.

We have developed a **clean label** processing concept, "**Cross-processing**", which combines fish co-products with antioxidant-rich materials during the pH-shift processing to produce **stable protein isolates**. However, protein yield was reduced.

The present study was aimed to counteract this yield-reduction during the cross-processing of herring co-products with lingonberry press-cake, shrimp shells and green seaweed by four strategies.

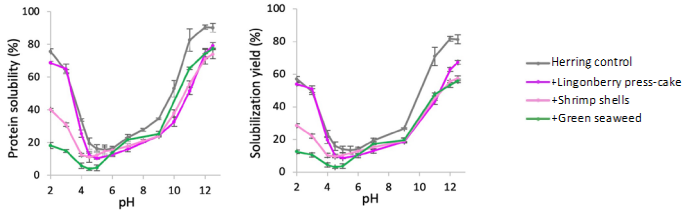
Cross-processing papers:

Materials and Methods



Results

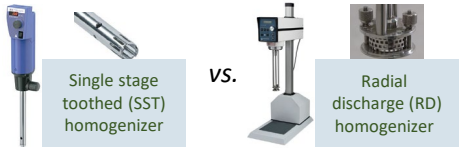
Optimization of solubilization and precipitation pH



For all three helpers, the solubilization pH should be increased from the previously used 11.5 to 12, while the precipitation pH should be decreased from previously used 5.5 to 5.0/4.5 during alkali-aided solubilization to compensate for the loss of protein solubility and yield caused by the helpers.

↑water addition: increased total protein yield for all three helpers.

High shear mechanical homogenization (HSMH): replace SST-HSMH by RD-HSMH



Single stage toothed (SST) homogenizer

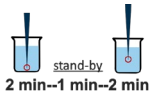
vs.

Radial discharge (RD) homogenizer

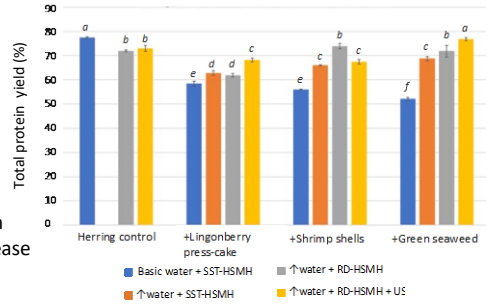
For +Shrimp, +Green seaweed: total protein yield was improved to the same levels as for herring controls.

Ultrasonication (US)

- with US probe.
- stand **on ice**.



For +Lingonberry , +Green seaweed: significant increase of total protein yield.



Conclusions

- This study confirmed earlier findings that cross-processing hampered protein solubility and solubilization yields.
- With shrimp shells and green seaweeds, reductions in solubilization yield were larger for acid- than alkaline solubilization, therefore using the former principle, shrimp shells or green seaweed cannot be recommended as helpers.
- It is possible to compensate for the loss in protein yield induced by cross-processing if optimizing the solubilization and precipitation pH's, slightly increasing the ratio of water to raw material, and by using RD-HSMH +/- US.
- Besides the effects on protein yield, the impacts of the process conditions on the structural and functional properties of the recovered protein isolates will be also investigated.

Reference

Zhang J., Ström A., Bordes R., Alminger M., Undeland I. & Abdollahi M. (2022). High shear homogenization and ultrasound assisted cross-processing of herring co-products for maximum protein yield and functionality. *Submitted.*

Acknowledgements

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