

Taste-neutral proteins from mackerel (SMELL)

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The project “Taste-neutral proteins from mackerel (SMELL)” focuses on increasing the utilization of pelagic fish species for human consumption, with special emphasis on mackerel filleting residual material.

One can expect sensory challenges in the protein/peptide rich products after processing of mackerel, due to the presence of oxidized unsaturated fats and endogenous pro-

teases, speeding up the formation of odorous secondary metabolites and trimethylamine.

The core of SMELL is production of a peptide fraction with acceptable sensory quality. The sensory and chemical analysis will guide processing parameters to achieve the best possible product.

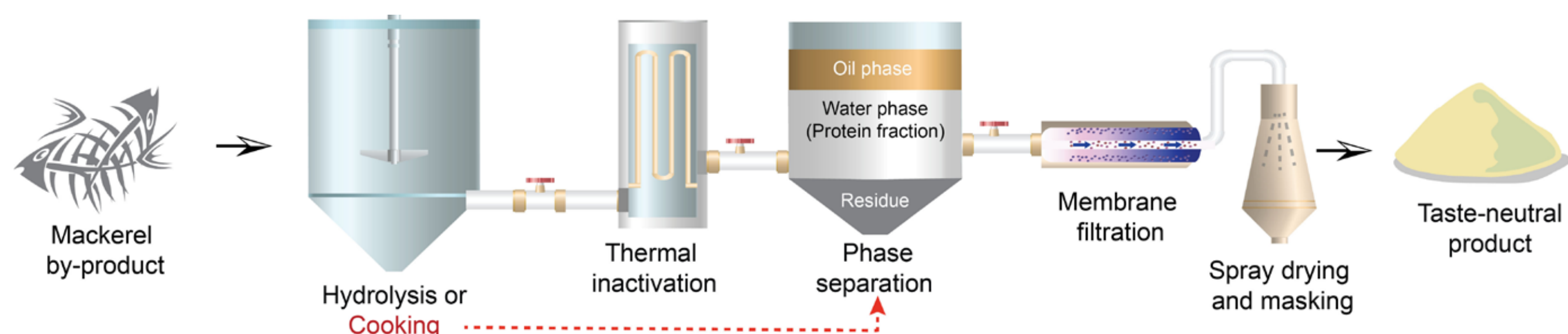


Illustration modified from Wubshet et al., 2018 (Wubshet, S.G. et al. Food Bioprocess Technol (2018) 11:2032)

Materials and methods

Optimization of enzymatic hydrolysis of mackerel backbones with ten different enzymes was performed.

All enzymatic hydrolysis were performed for 1 hour on 500 grams of raw material added water and 0.5 % enzym v/w. Optimal temperature was adjusted to suit the individual enzymes.

A projective technique named projective mapping® (Risvik et al., 1994) was used to evaluate the 10

different hydrolysates on two sensory modalities, flavour and mouthfeel. The whole sample set was coded and presented at a time to a trained sensory panel. The assessors tasted and evaluated each sample on similarities and differences within the two sensory modalities. The data were analyzed using MFA to obtain a two dimensional plot.

SEC was performed using 20 mg/mL solutions of rehydrated hydrolysate samples. The injection vo-

lume was 10 µL and separation was performed at 25°C using a BioSep-SEC-s2000 column. Isocratic elution was carried out using a flow rate of 0.9 mL/min for 20 minutes using 30 % CH₃CN + 0.05 % TFA as a mobile phase. Average molecular weight (Mw) was calculated using molecular weight calibration standards.

Results

The proximate composition of the raw material showed that the water content was 59.4 % with relatively high content of fat (18.3 %) and protein (18.6 %) and low content of ash (1.8 %) and carbohydrates (1.9 %).

Table 1. The results showed that the hydrolysate yield varied from 15.2–27.3 %, while the protein recovery varied from 26–52 % depending on type of enzyme used.

Enzyme	Yield hydrolysate (dw hyd/dw raw mat)	Protein recovery
Alcalase	23.6 %	44 %
Bromelain	27.3 %	52 %
Corolase 8000	20.1 %	37 %
Endocut 01	17.1 %	30 %
Flavourpro 766	18.7 %	33 %
Flavourpro 839	21.1 %	37 %
Foodpro PNL	15.2 %	27 %
Foodpro 51 FP	16.4 %	29 %
P950L	17.5 %	32 %
Alcalase 30 min + Fl.zyme	15.2 %	26 %

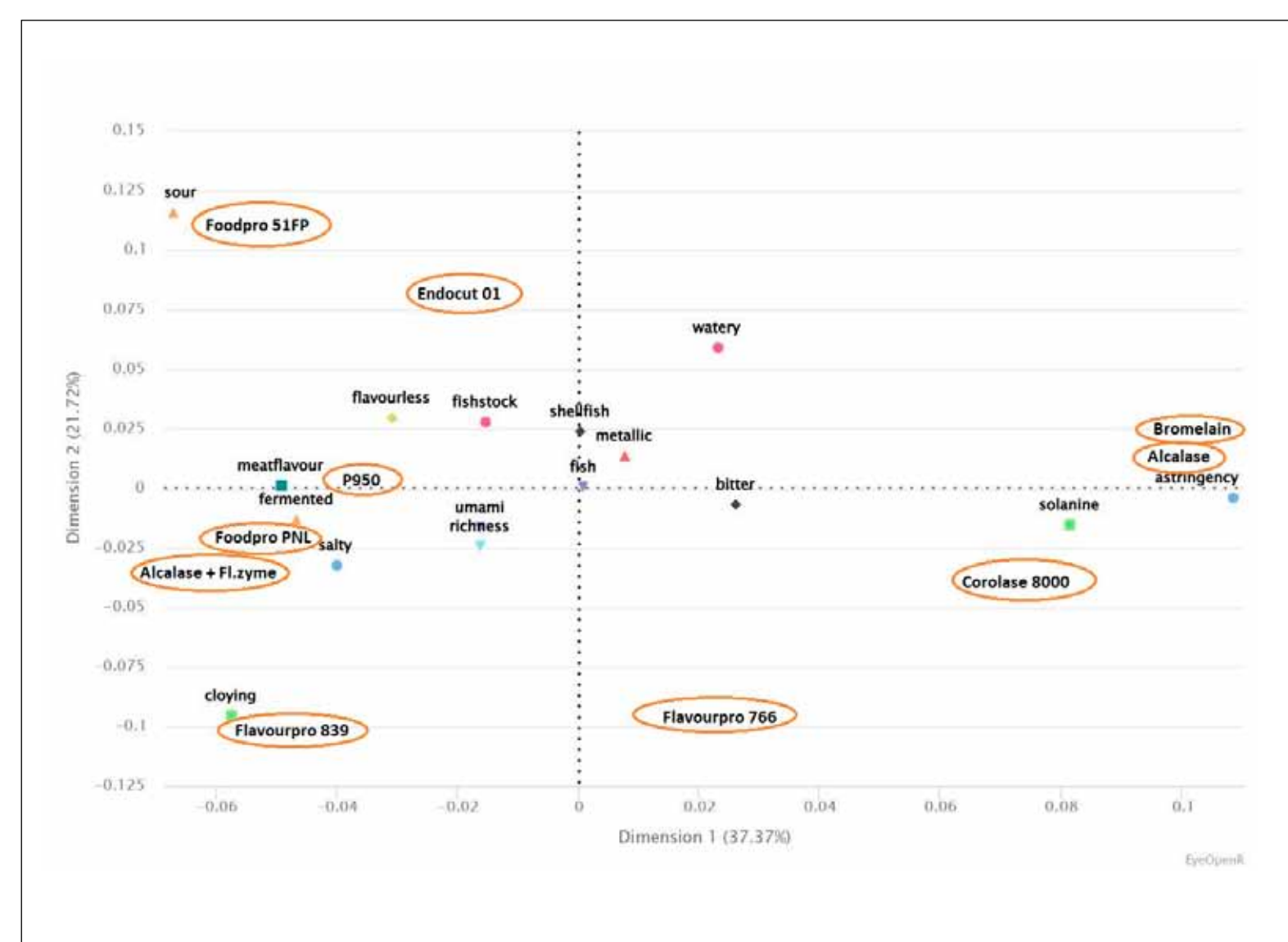


Figure 1. The results showed that the 10 hydrolysates, as expected, differed in both flavour and mouthfeel. Samples hydrolyzed with either Bromelain, Alcalase or Corolase were described as astringent, burned and with shrimp taste. They were also the most bitter samples. On the other end of dimension 1, samples hydrolyzed with FoodProPNL, Alcalase+Flavourzyme and P950 were located. They were described by the sensory attributes salty, fermented and meat flavour. While the most neutral samples were FoodPro 51FP and Endocut 01 described as sour and flavourless.

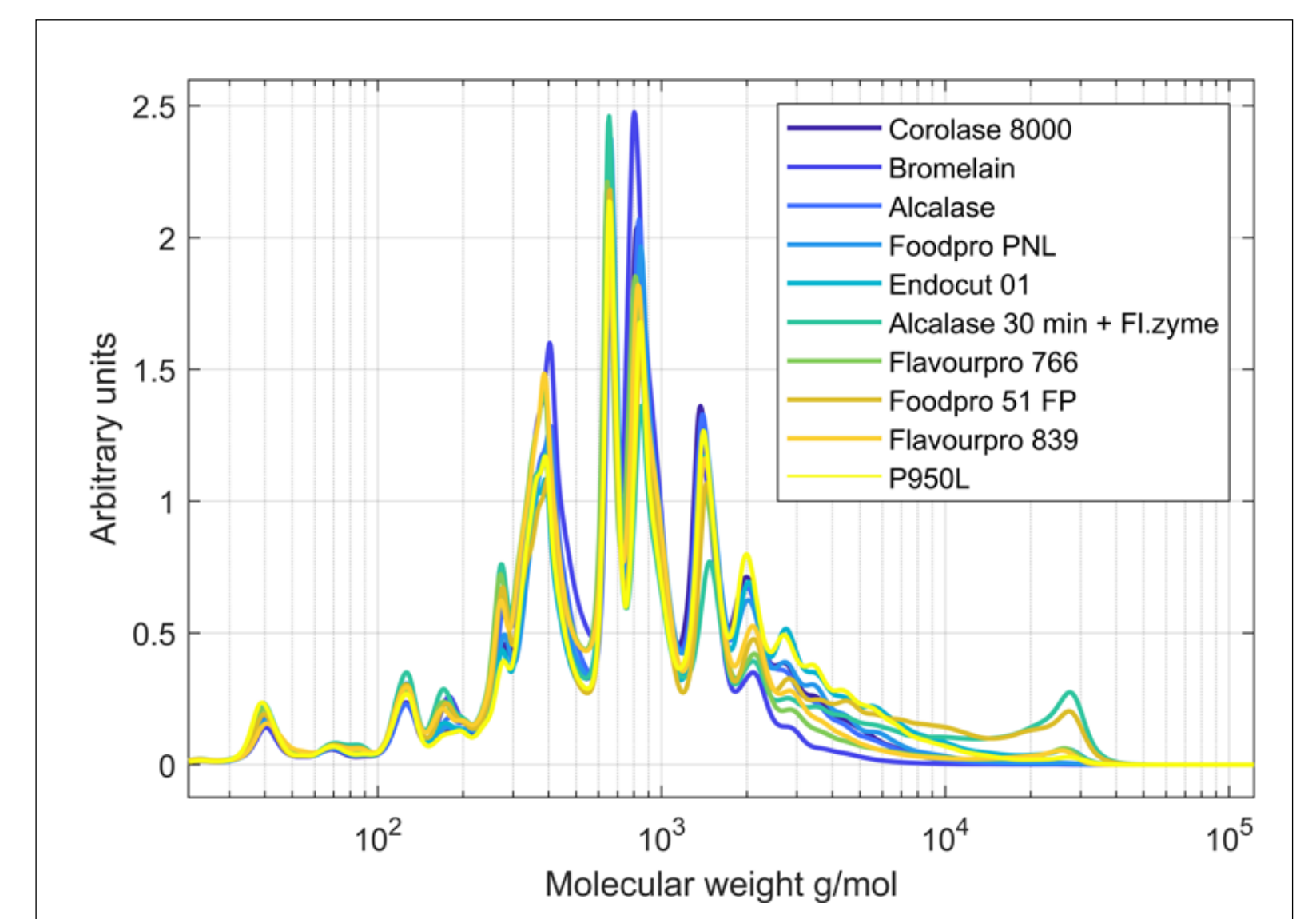


Figure 2. Treatments with different proteases resulted in different molecular weight distribution profiles. The average molecular weight of the 10 different hydrolysates were found to be in the range of 844 g/mol (Bromelain) to 2780 g/mol (Alcalase 30 min + Fl.zyme).

Concluding remarks

- Further investigation is underway to identify the constituents eliciting the distinct sensory attributes (e.g. bitterness) of mackerel backbone hydrolysates
- Hydrolysates that were associated with astringency and bitterness generally showed a higher share of lower molecular weight peptides