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### Optimization of the autolysis of rainbow trout viscera for amino acid release using response surface methodology

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#### Exponential growth of aquaculture



Rise of fish by-products

51,000-96,000 tonnes of fish viscera produced every year in the EU



#### Exponential growth of aquaculture



#### Rise of fish by-products

Fishmeal and fish oil

High water content

#### Fish protein hydrolysates

Small peptides and free amino acids (FAAs) Bioactive properties

> Nutraceuticals Aromatic compounds Biostimulants for plants



#### **Biostimulants**

They improve the use of nutrients  $\rightarrow$  improvement of the efficiency of fertilizers

The use of biostimulants reduce the use of mineral fertilizers

Amino acids are used as plant biostimulants







Obtention of fish protein hydrolysates

#### **Enzymatic hydrolysis**

Addition of commercial enzymes 🖓 Acidic/alkaline pH Need for heat 🖓 Short time (hours) 🖒

#### Silage / Acid autolysis

Only endogenous enzymes 🖒 Acidic pH Room temperature 🖒 Long time (days) 🖓

#### Objective of the work

Acceleration of the silage from rainbow trout viscera under optimum experimental conditions





Raw material



Rainbow trout Oncorhynchus mykiss



Viscera

Mincing



Defattening by decantation



after







#### **Hydrolysis**

7 hours No addition of commercial enzymes

## Box-Behnken experimental design for optimization

Independent variables	Factor levels		
	-1	0	+1
pH	6	7	8
Temperature (°C)	40	50	60
% water added to the sample	0	25	50



#### Hydrolysis

7 hours No addition of commercial enzymes

## Box-Behnken experimental design for optimization

Independent variables	Factor levels		
	-1	0	+1
pН	6	7	8
Temperature (°C)	40	50	60
% water added to the sample	0	25	50

#### Response surface methodology (RSM)



Degree of hydrolysis (FAAs/protein)

Yield of FAAs from viscera

Yield of FAAs from total protein



Results

SEACLAND

#### Optimization





#### Results

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Results

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#### Comparison: optimized autolysis vs control autolysis







#### Comparison: optimized autolysis vs traditional silage (from previous experiments)







1) pH is the most important factor during autolysis alongside water added to the sample.

2) Optimization of the autolysis improved the yield of FAAs comparing to the first control.

3) Autolysis was not as effective as traditional silage, but it is useful to obtain protein hydrolysates in a shorter time.

4) A kinetics study is needed to determine if a longer autolysis is needed (ongoing experiment).



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