

Bioactive peptides produced from the mussel *Mytilus galloprovincialis* by enzymatic hydrolysis with corolase



CATÓLICA
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PORTO

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Introduction

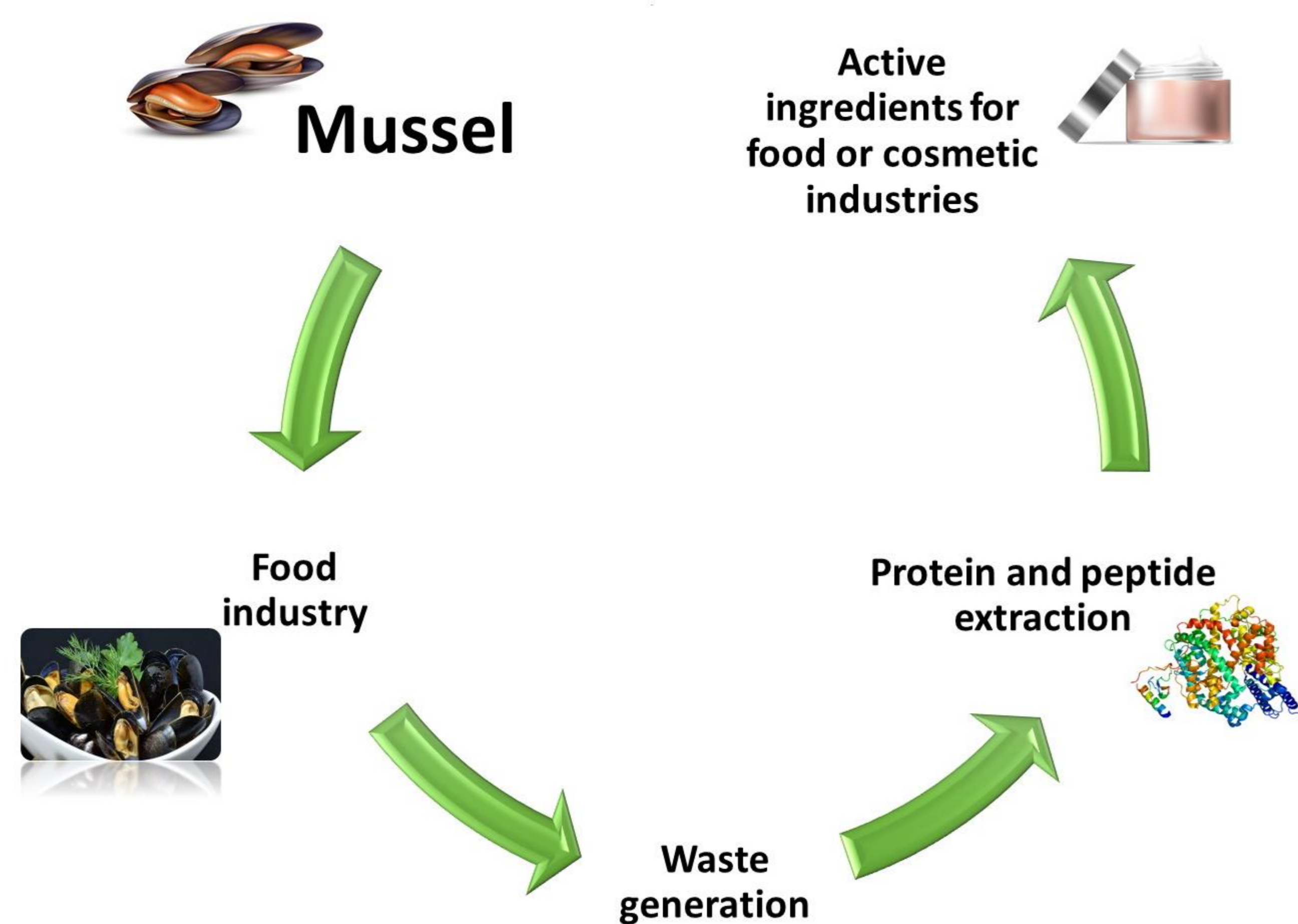


Figure 1: Scheme of the mussel *Mytilus galloprovincialis* normal processing and the sustainable approach studied.

Methodology

Enzymatic hydrolysis with corolase

Box-Behnken experimental design

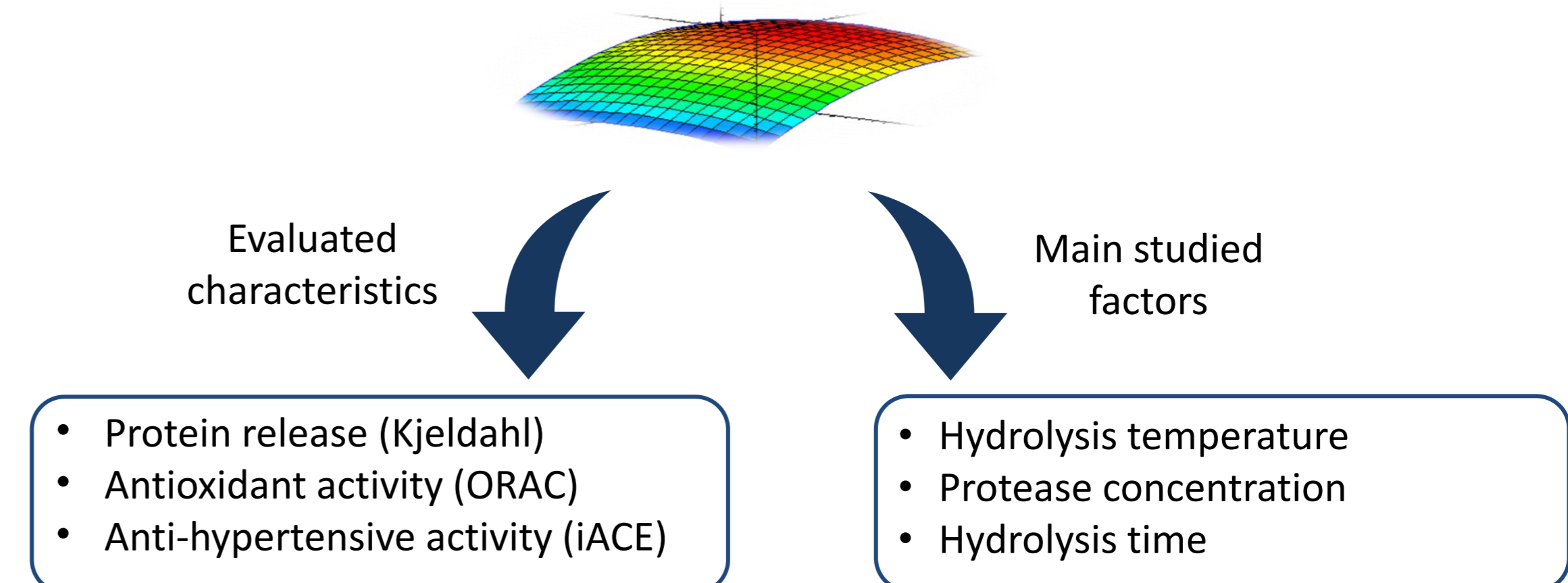
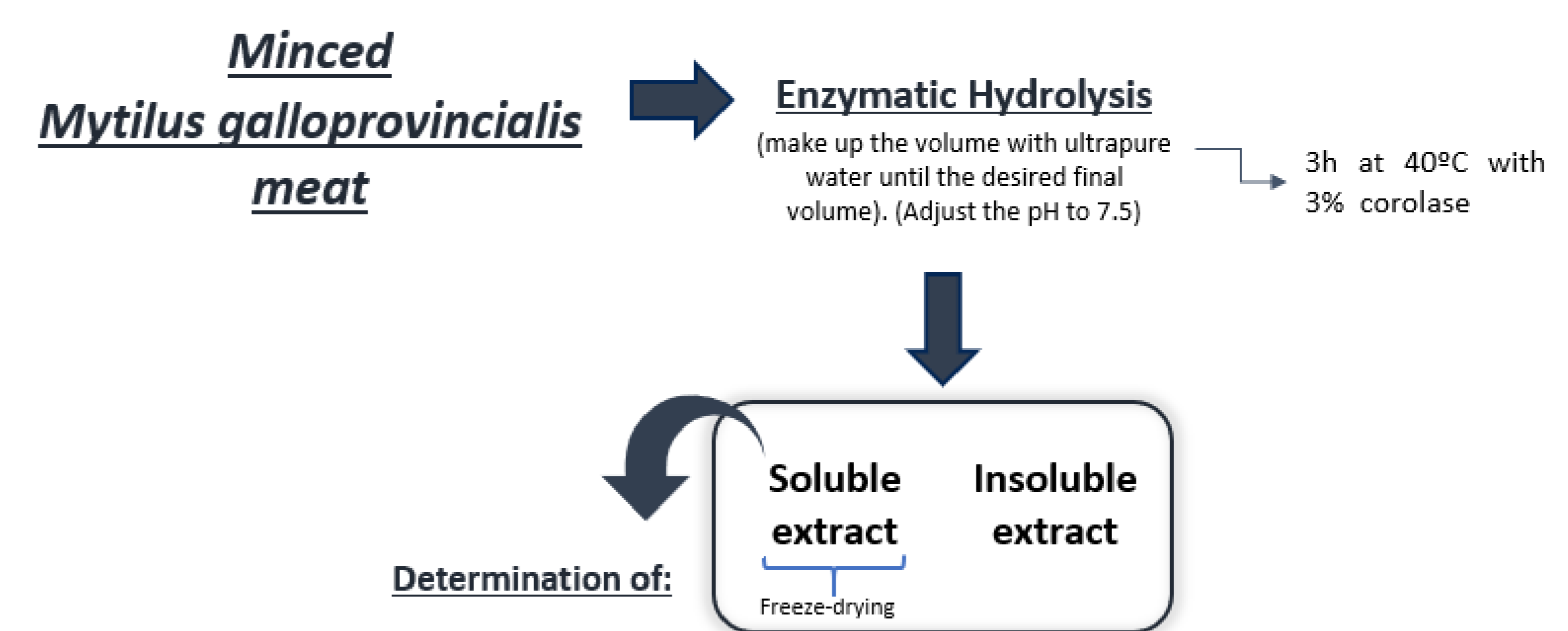


Figure 2: Scheme of the experimental design done to optimize the extraction of bioactive extracts from mussel using the enzyme corolase.



- Determination of:
- Protein release (Kjeldahl)
 - Antioxidant activity (Oxygen-radical absorbance-capacity assay)
 - Anti-hypertensive activity (Inhibition method of Angiotensin-I converting enzyme)

Figure 3: Optimized extraction method of bioactive extracts from *Mytilus galloprovincialis* using the enzyme corolase.

Objectives

Mussel commercialization generates waste, since the small or broken mussels are discarded. Thus, in this work discarded mussels were used with the goal of producing water soluble extracts rich in proteins and bioactive peptides.

Results

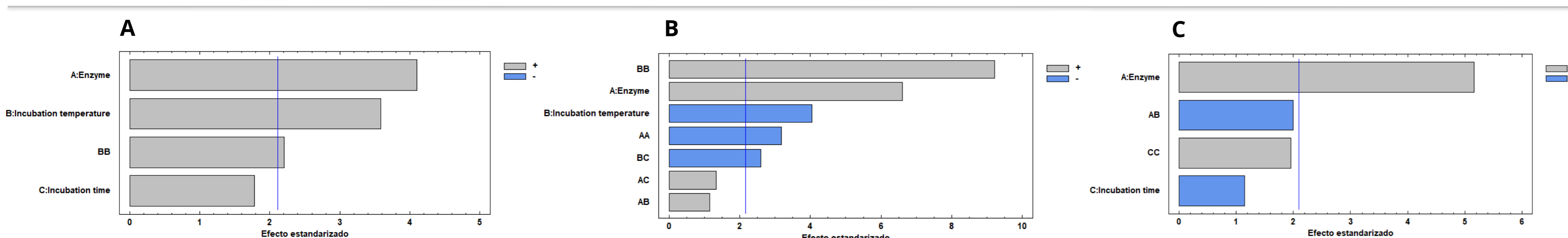


Figure 4: Pareto charts obtained for protein release (A), antioxidant activity (B) and anti-hypertensive (C) in the experimental design, showing the most influential factors.

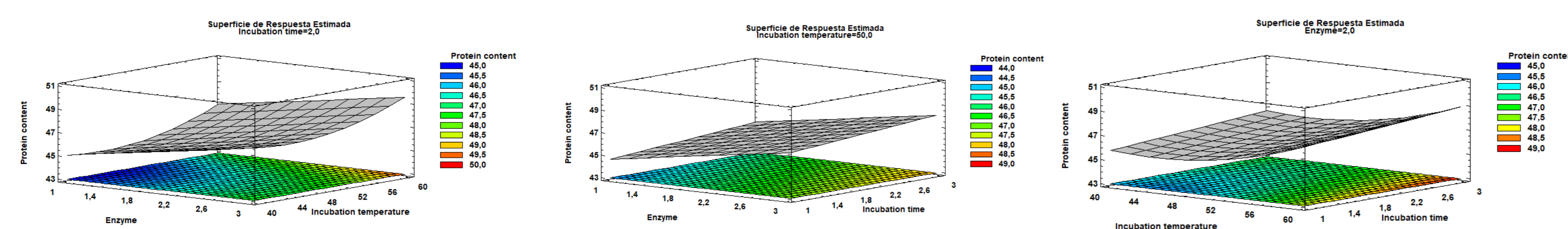


Figure 5: Graphs representing the protein release of the experimental design, showing the best factors combination that allows to achieve a higher protein release.

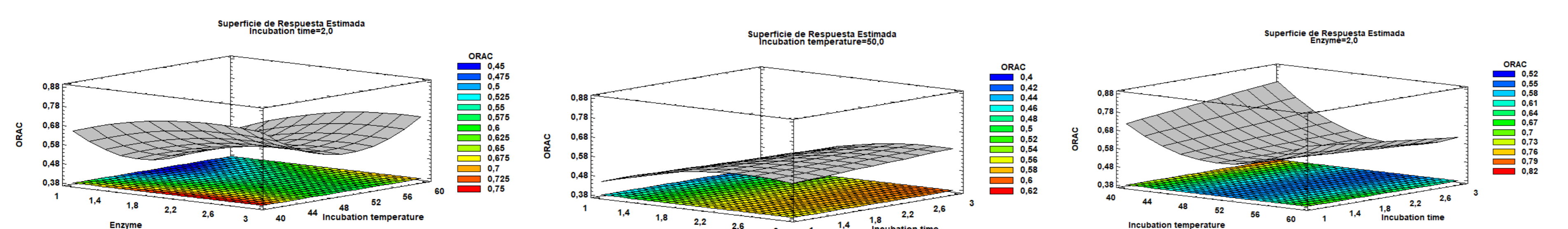


Figure 6: Graphs representing the antioxidant activity of experimental design, showing the best factors combination that allows to achieve a higher bioactivity.

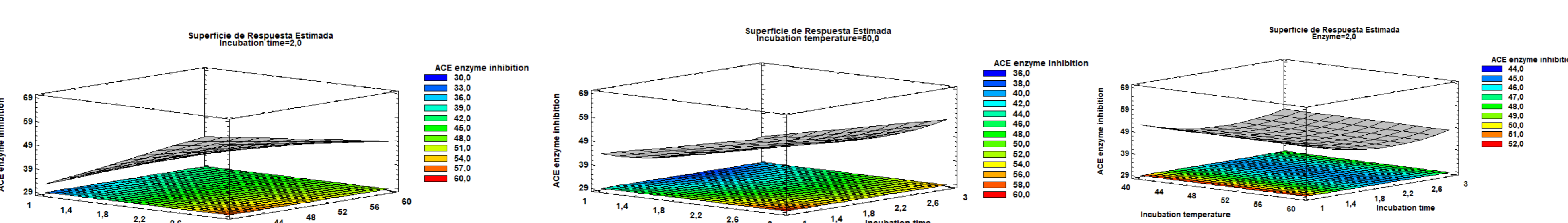


Figure 7: Graphs representing the anti-hypertensive activity of experimental design, showing the best factors combination that allows to achieve a higher bioactivity.

Table 1: Optimal conditions predicted by the experimental design to maximize protein release and antioxidant activity of the extracts.

Factors	Optimal conditions
Temperature	40
% Protease	3
Incubation time (hours)	3

Table 2: Obtained values in an extraction performed with the optimal conditions described in table 1.

Evaluated characteristics	Obtained results
% Protein / dry weight	48,0
Antioxidant activity ($\mu\text{mol TE/g}$ extract)	821
Anti-hypertensive activity (10 mg / mL)	61%

Conclusion

The incubation of the minced mussel meat with 3% of enzyme, at 40 °C for 3 hours, appears to be the best conditions to obtain the best results of protein extraction, and antioxidant and anti-hypertensive properties. The obtained extracts showed 48% of protein content, an antioxidant activity of 821 $\mu\text{mol TE/g}$ of extract, and an ability to inhibiting the activity of ACE of 61% (using a concentration of 10 mg / mL).

Thus, the factorial design allowed to confirm the combination of experimental factors that leads to the most efficient extraction of antioxidant and anti-hypertensive peptides of the mussel *Mytilus galloprovincialis*. In conclusion, the use of discarded mussels to produce functional ingredients for food, cosmetic and pharmaceutical industries contribute to valorise world waste in a circular economy context.