

# Nannochloropsis oceanica: a source of bioactive peptides



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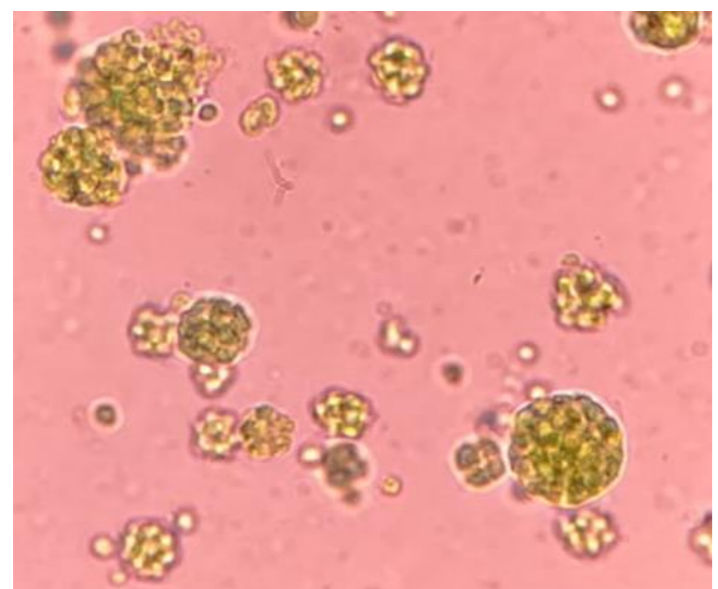
PORTO

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## Introduction



*Nannochloropsis oceanica*, a marine microalgae, represents a source of protein and important fatty acids, such as eicosapentaenoic acid (EPA), making it interesting for application in human food or animal feed.

Proteins hydrolysis of this microalgae can provide added value through the release of bioactive peptides with several potential biological properties, namely antioxidant, anti-hypertensive, anti-inflammatory and anticancer activities.

## Objectives

*Nannochloropsis oceanica* has a rigid and hard to break wall, thus hydrolysates could increase the bioavailability of proteins and the release of bioactive peptides and EPA, conveying new economic value for the industry. This work aimed to obtain a soluble microalgae extract rich in bioactive peptides, through an optimized enzymatic hydrolysis, instead of mechanical methods, as they may be more feasible and affordable for industrial applications.

## Methods

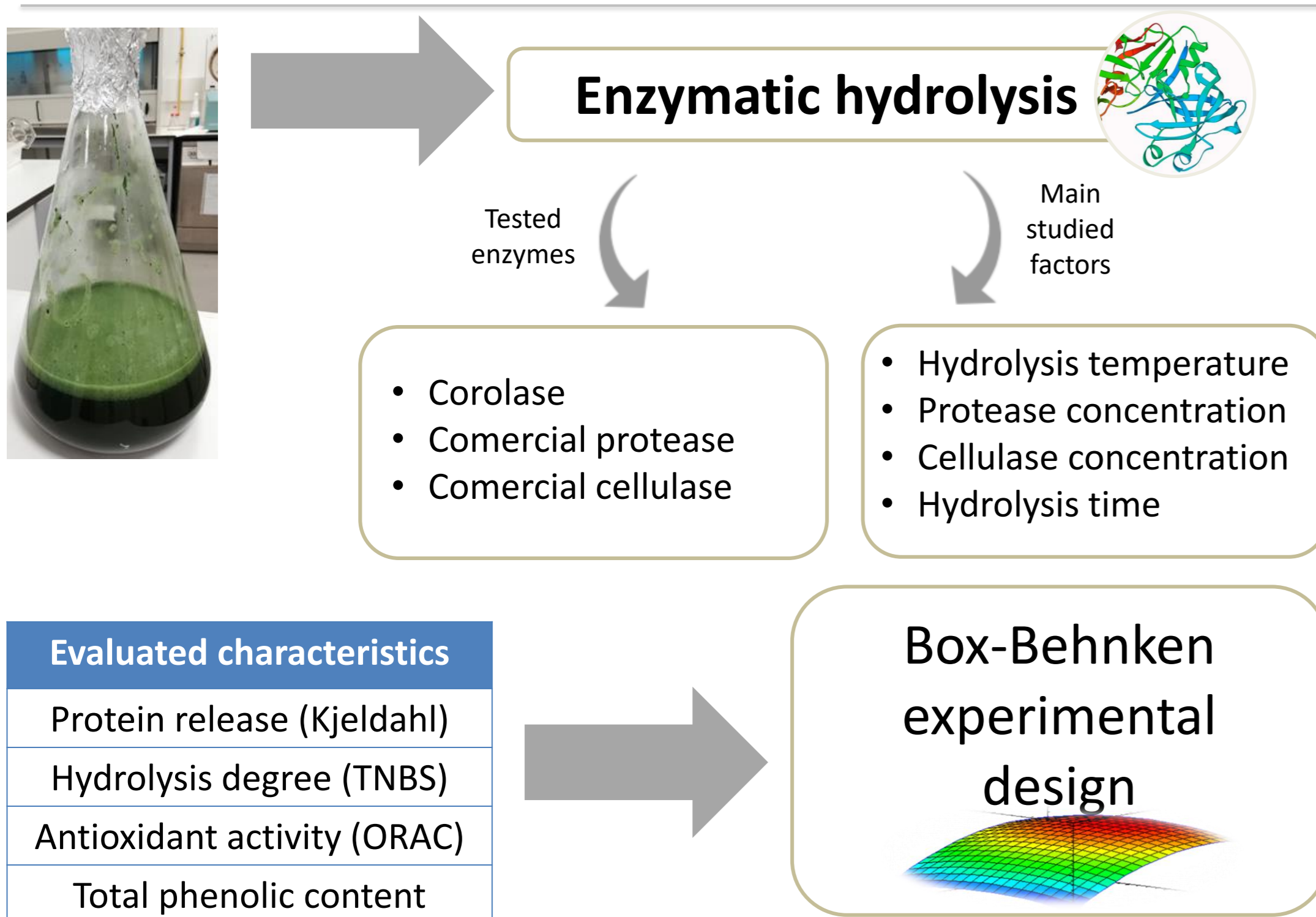


Figure 1: Peptide extraction tests from *Nannochloropsis oceanica*.

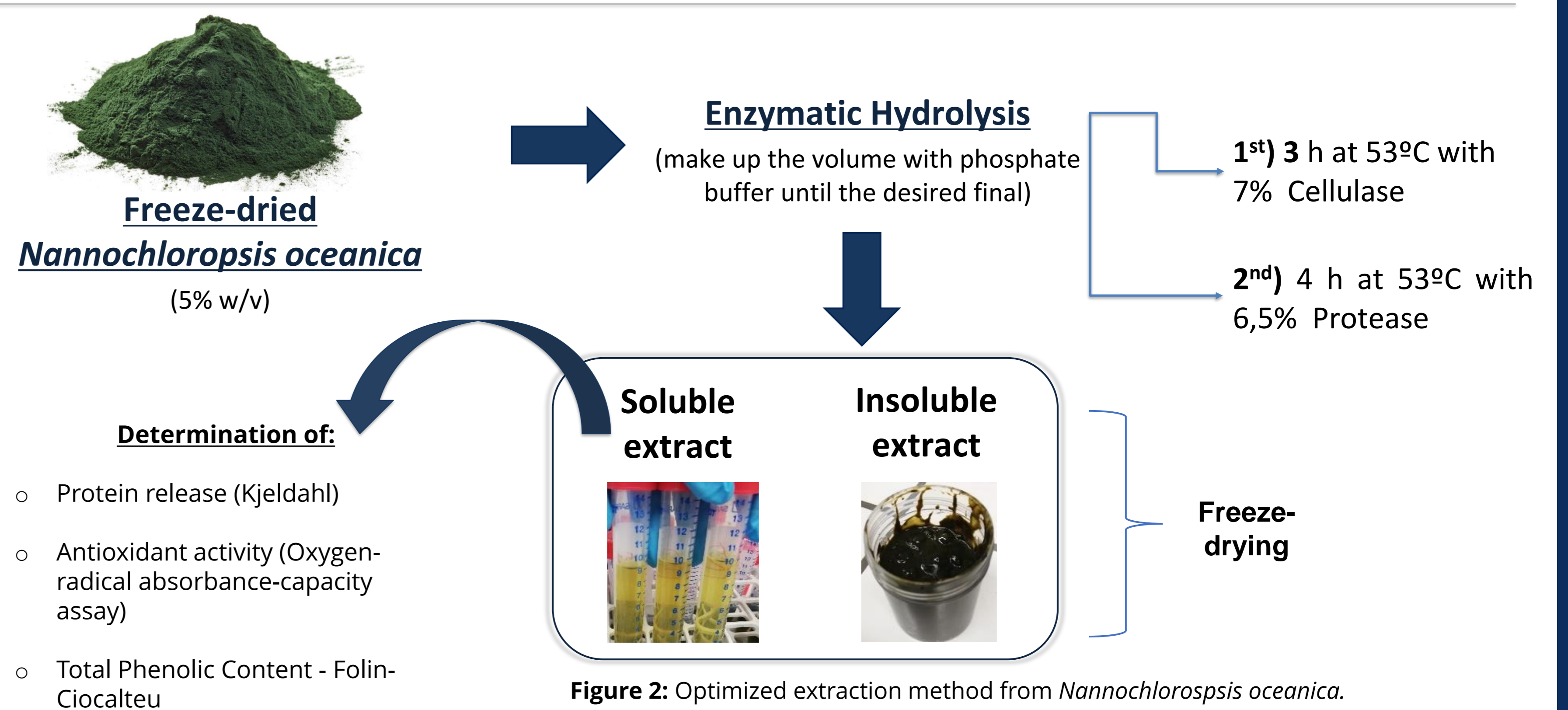


Figure 2: Optimized extraction method from *Nannochloropsis oceanica*.

## Results

Table 1: Nutritional composition of the tested microalgae.

Nutrients	Composition (g/100g)
Proteins	33
Lipids	14,3
Mineral matter	12,7

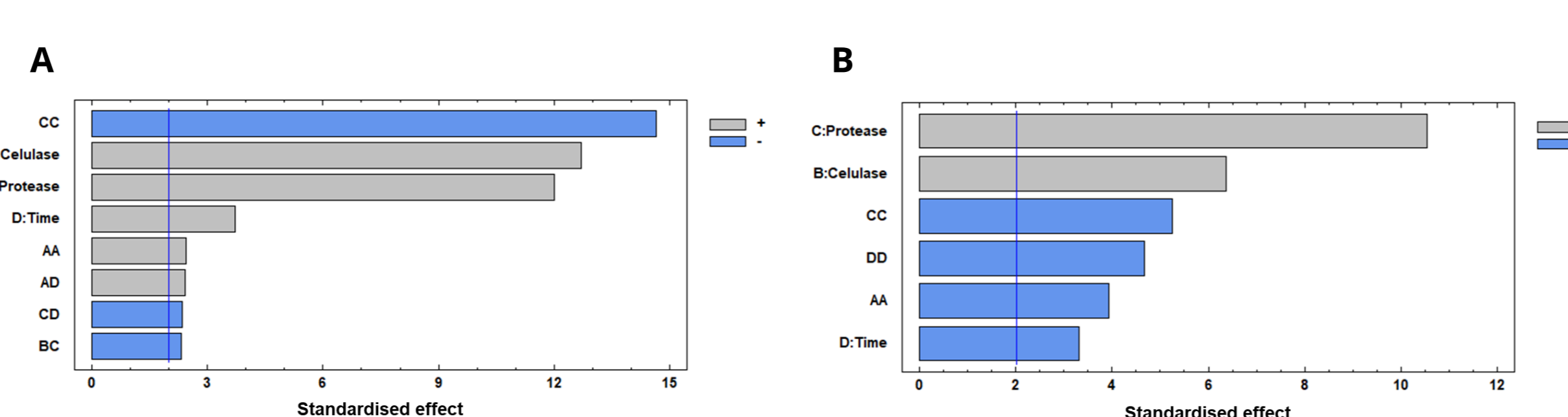


Figure 3: Pareto charts obtained for protein release (A) and antioxidant activity (B) in the experimental design, showing the most influent factors. A-Temperature of incubation with the protease. B-Cellulase concentration. C- Protease concentration.

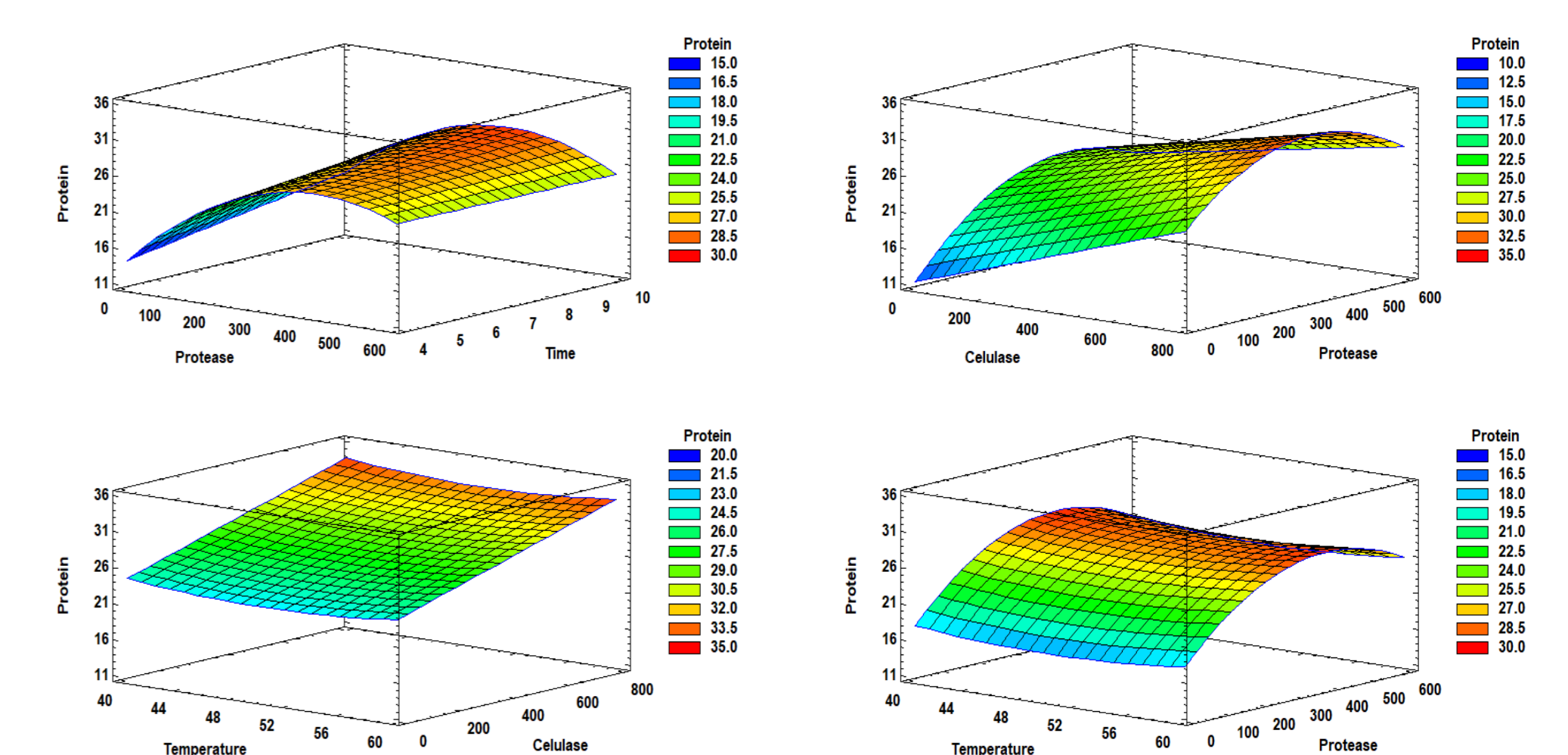


Figure 4: Obtained chart for protein release in the performed experimental design, showing the best factors combination that allows to achieve a higher protein release.

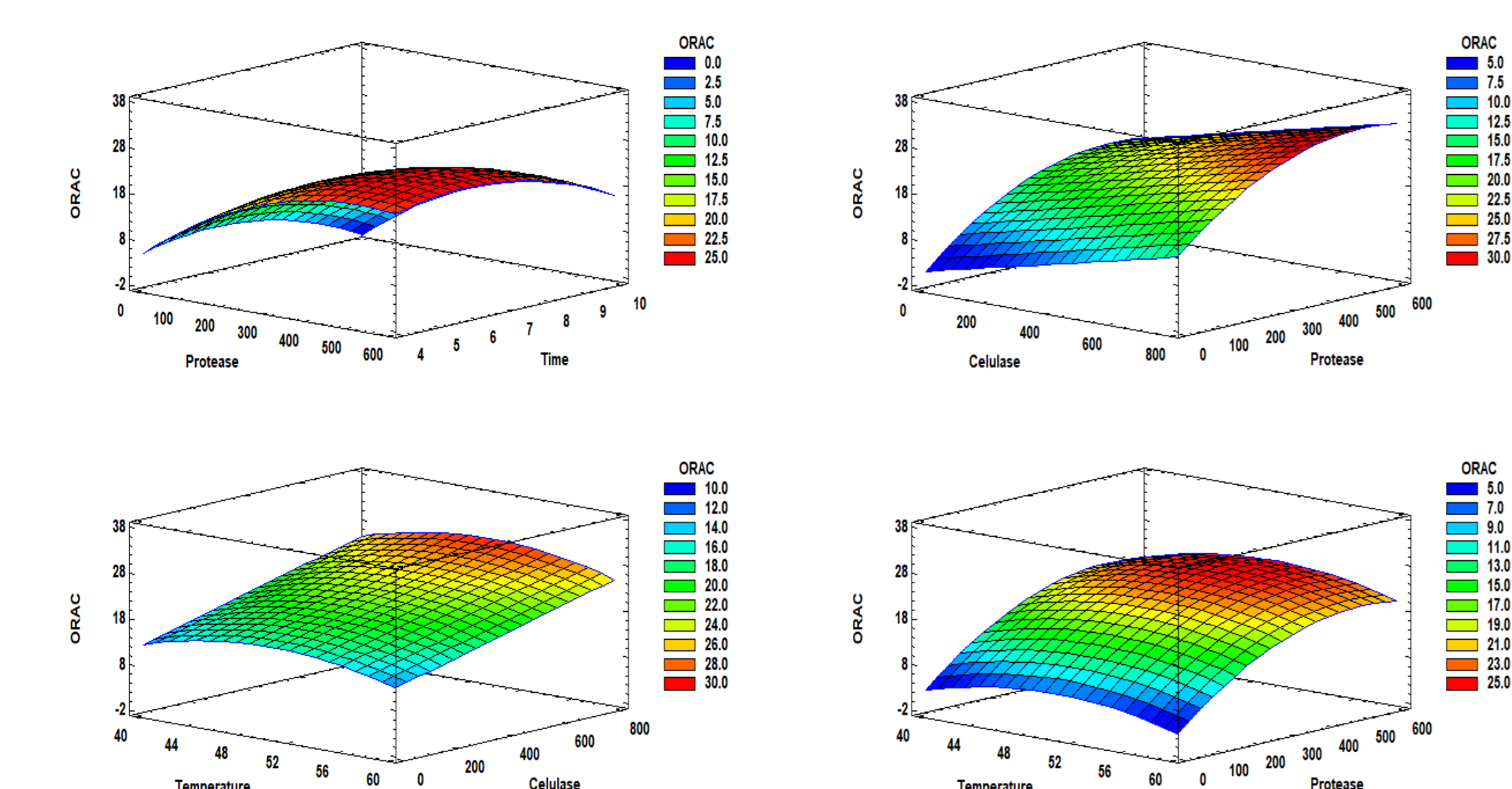


Figure 5: Obtained chart for antioxidant activity in the performed experimental design, showing the best factors combination that allows to achieve a higher bioactivity.

Table 2: Optimal conditions predicted by the experimental design to maximize protein release and antioxidant activity of the extracts.

Factors	Conditions to optimize protein release	Conditions to optimize antioxidant activity	Optimal conditions "Derringer desirability"
Temperature	59	55	53
% Cellulase (v/v)	6,7	7,0	7,0
% Protease (v/v)	3,3	6,0	4,5
Incubation time (hours)	10	5,5	6,5

Table 3: Obtained values in an extraction performed with the optimal conditions described in table 2.

Evaluated characteristics	Expected results
% Protein / dry weight	35,0
Antioxidant activity (µmol TE/mL extract)	36,26
Phenolic compounds (mg GAE/mL extract)	1,08

## Conclusions

A combination of a cellulase and a protease appeared to be the best method to achieve the highest protein and bioactive peptide extraction. The best extracts showed 35% of soluble protein/dry weight and an antioxidant activity of 36 µmol Trolox Equivalent/mL extract. The concentration of cellulase used was the major factor for protein release. Thus, the factorial design allowed to confirm the combination of experimental factors that leads to the most efficient extraction of antioxidant peptides, validating the studied extraction method.

The resulting soluble and the insoluble extracts can be applied in food, cosmetic and animal feeding.

### Acknowledgements

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### Cofinanciado por:

