

# Microalgae, a potential source of protein and bioactive peptides



CATÓLICA  
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PORTO

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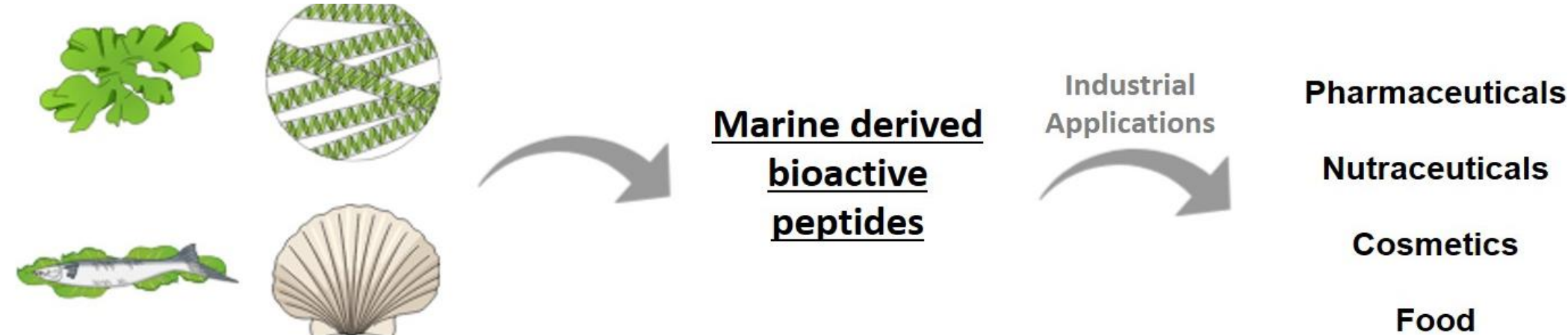
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## Introduction

Microalgae may be a source of several interesting compounds, as bioactive peptides with anticancer, antioxidant, anti-hypertensive activities. Algae peptides may be of great interest as active food or cosmetic ingredients, as preservatives for food or cosmetics, as pharmaceutical or nutraceutical to treat or prevent diseases.



## Objectives

Microalgae have a rigid and hard to break wall, thus microalgae protein hydrolysis could increase the bioavailability of proteins and the release of bioactive peptides, conveying new economic value for the industry. This work aimed to obtain soluble microalgae extracts 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

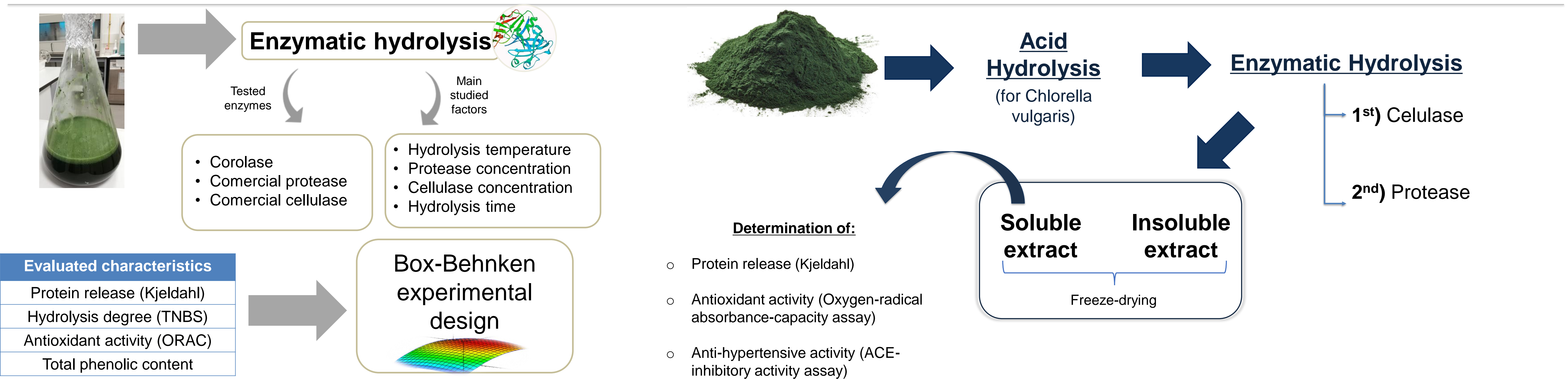


Figure 1: Peptide extraction tests from the microalgae *Nannochloropsis oceanica* and *Chlorella vulgaris*.

Figure 2: Optimized extraction method for *Chlorella vulgaris* and *Nannochloropsis oceanica*.

## Results

Table 1: Nutritional composition of the tested microalgae.

Nutrients (g/100g)	<i>Nannochloropsis oceanica</i>	<i>Chlorella vulgaris</i>
Proteins (g/100g)	33	52.2
Lipids (g/100g)	14.3	7.9
Mineral matter (g/100g)	12.7	11.1

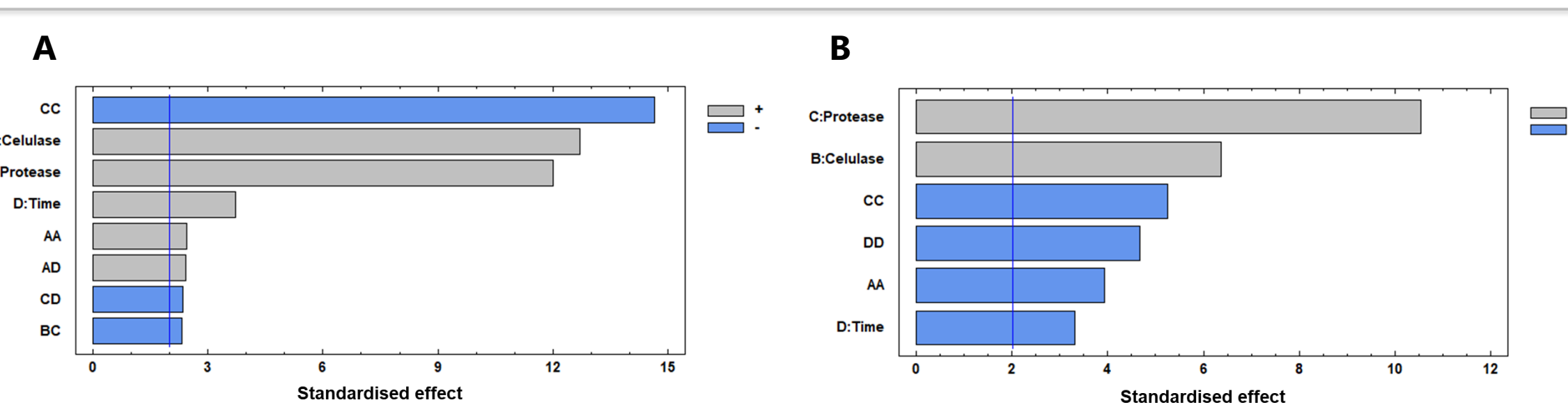


Figure 3: Pareto charts obtained for protein release (A) and antioxidant activity (B) in the experimental design, showing the most influential factors. A-Temperature of incubation with the protease. B-Cellulase concentration. C- Protease concentration.

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

Factors	<i>N. oceanica</i>	<i>C. vulgaris</i>
Temperature	53	40
% Cellulase (v/v)	5.0	5.0
% Protease (v/v)	1.7	3.9
Incubation time (hours)	5	2

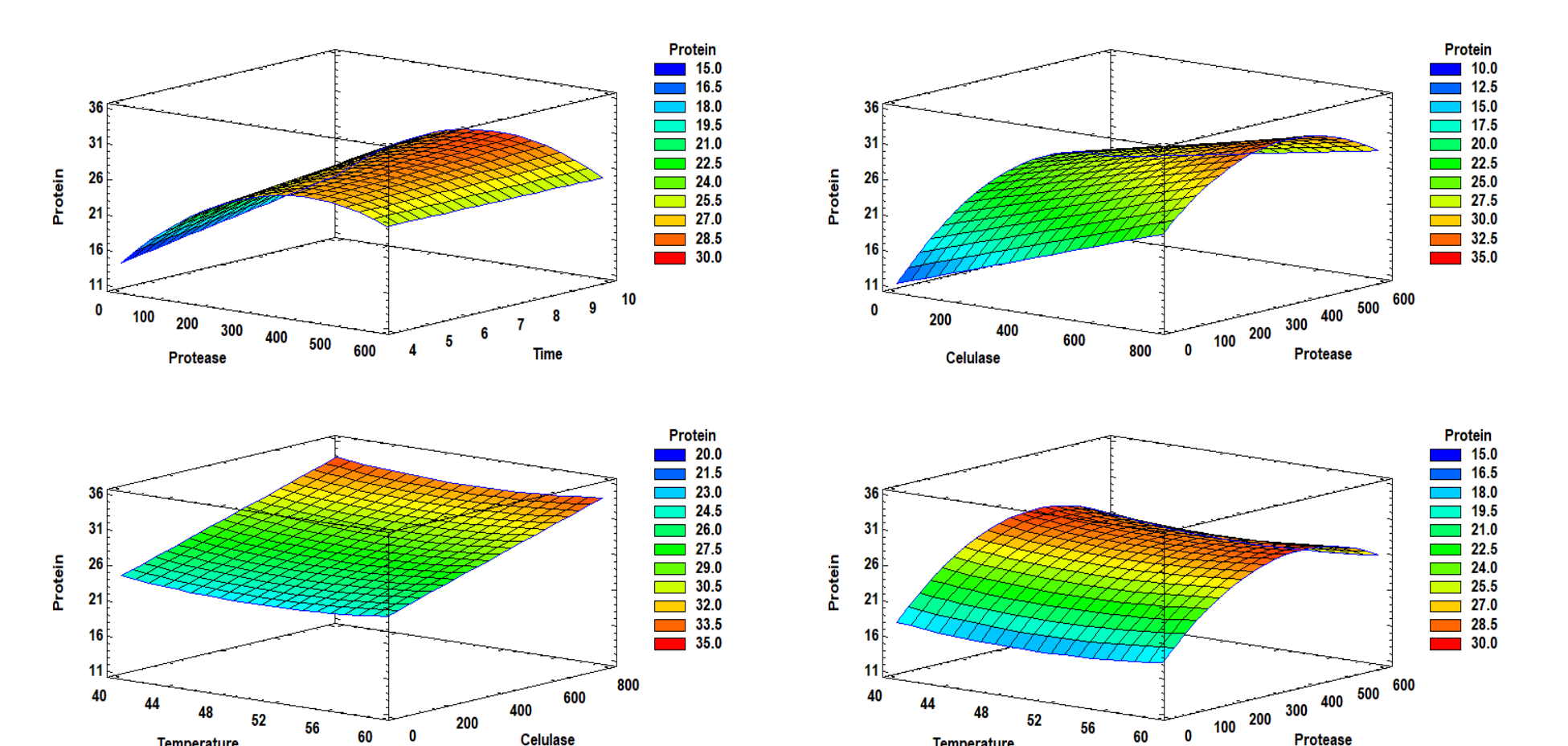


Figure 4: Obtained chart for protein release in the performed experimental design, showing the best factors combination that allows to achieve a higher protein release.

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

Evaluated characteristics	<i>N. oceanica</i>	<i>C. vulgaris</i>
% Protein / dry weight	35	64
Antioxidant activity (µmol TE/mL extract)	25.51	32.13
Anti-hypertensive activity (% of 10mg/ml)	66.27	51.80

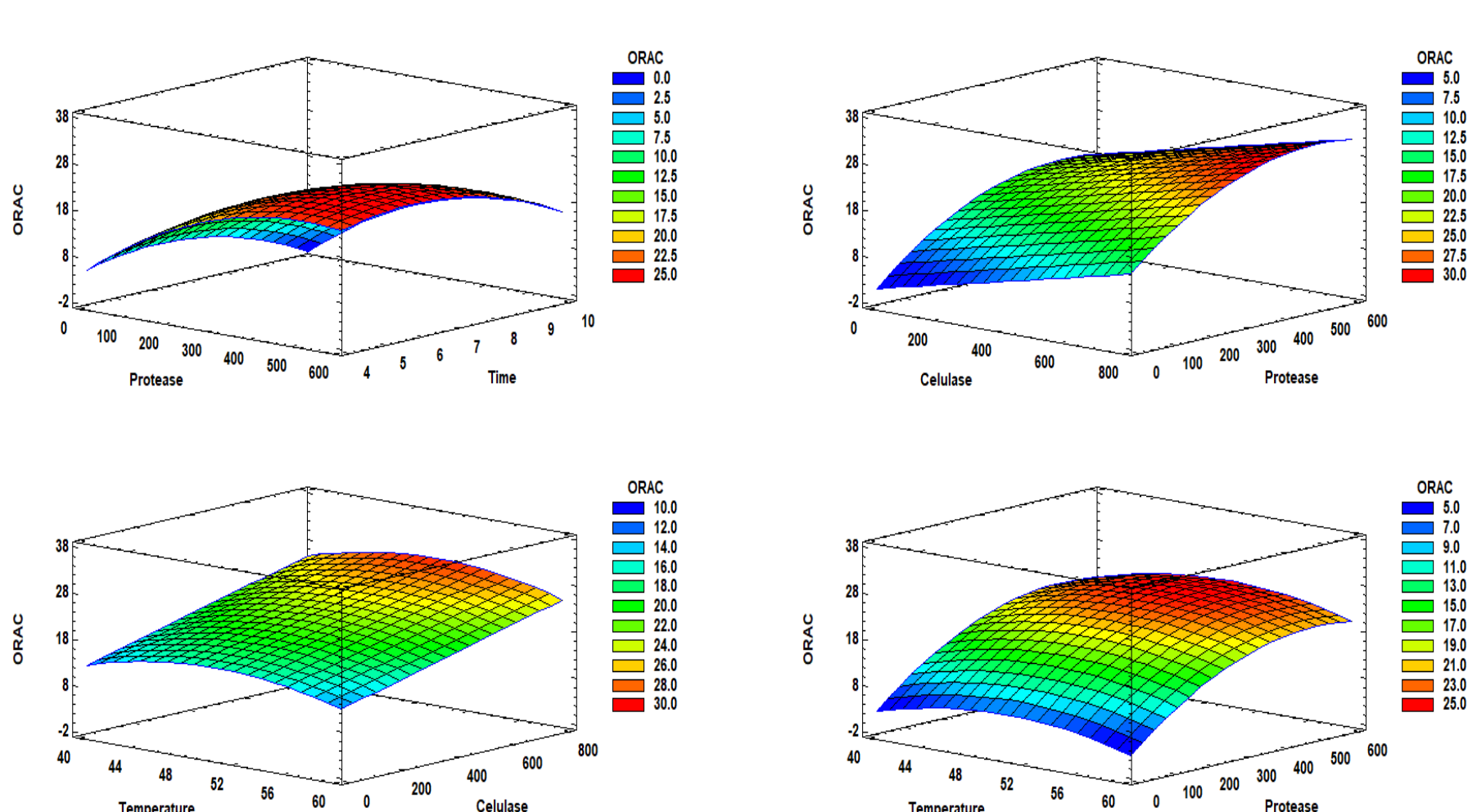


Figure 5: Obtained chart for antioxidant activity in the performed experimental design, showing the best factors combination that allows to achieve a higher bioactivity.

## Conclusions

For *Chlorella vulgaris* a combination of an acid and an enzymatic hydrolysis, with a cellulase and a protease, appeared to be the best method to achieve protein and peptide extraction. For *Nannochloropsis oceanica*, only the enzymatic hydrolysis, with a cellulase and a protease, showed relevant results, since the acid hydrolysis did not show significant differences. Factorial design allowed an evaluation of the effect of four factors (protease and cellulase concentration, temperature and hydrolysis time) on protein release and extracts bioactivities. 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. The resulting soluble and the insoluble extracts can be applied in food, cosmetic and animal feeding.

## Acknowledgements

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