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Proteomic approaches to identify antioxidant peptides from the microalga Tetraselmis chuii after its simulated orogastric digestion

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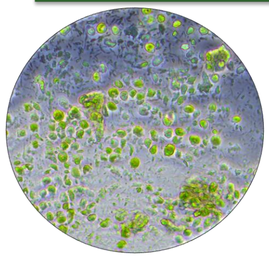
INTRODUCTION & AIM



MICROALGAE

Sustainable source of nutritional and bioactive compounds

★ Protein profile composition
★ Essential amino acids

Tetraselmis chuii

EUROPEAN FOOD SAFETY AUTHORITY

Gastric digestion Enzymatic cleavage of amino acids

Tyr – Ser – Gly – Ser

Digestion

Pepsin

✓ Fast, affordable and safe methods. No ethical limitations

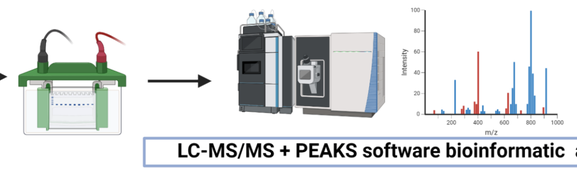
STRATEGY FOR EVALUATING BIOACTIVE PEPTIDES FROM MICROALGAE

METHOD

T. chuii biomass → *In vitro* orogastric digestion (INFOGEST)

Antioxidant activity

Trypsin digestion in gel



LC-MS/MS + PEAKS software bioinformatic analysis

Protein identification

UniProt database
13477 proteins entries

Rapid Peptides Generator

Function analysis
Methodology BLAST 2GO
- Molecular function
- Cellular component
- Biological process

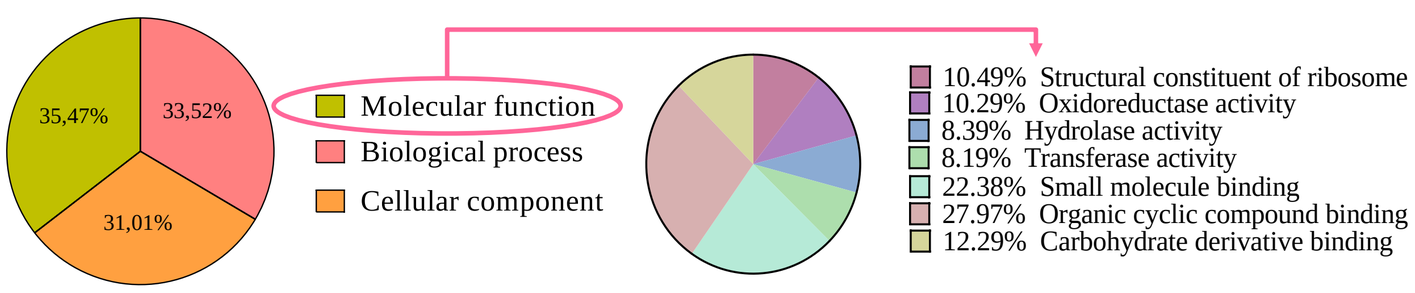
Web Server AnOxPP — Antioxidant activity

PreAIP — Anti-inflammatory activity

CAMPR4 Collection of Anti-Microbial Peptides — Anti-microbial activity

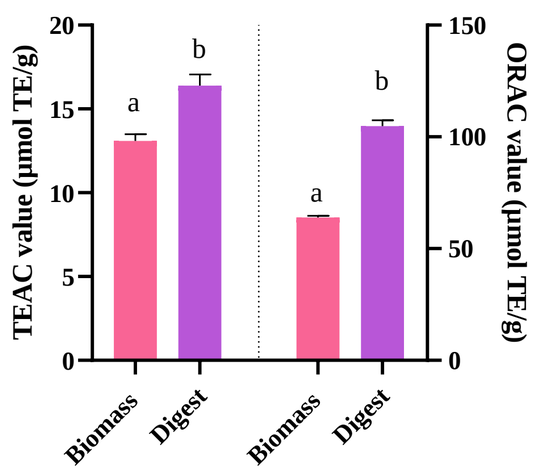
RESULTS & DISCUSSION

Functional analysis

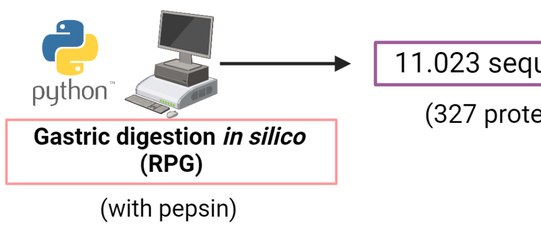


- **287** protein sequences were identified
- **Homogeneous distribution** of the identified proteins
- 35% of the sequences have a **molecular function** (most of them showed binding function)

Antioxidant activity *in vitro*



✓ **Higher ORAC and TEAC** values in the **digest** than in the intact biomass



Gastric digestion *in silico* (RPG)
(with pepsin)

11.023 sequences
(327 proteins)

Generate ≥75 sequences

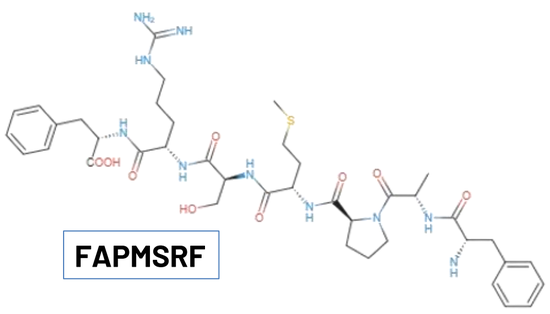
21 proteins (2083 peptides)

PeptideRanker (≥0.8)

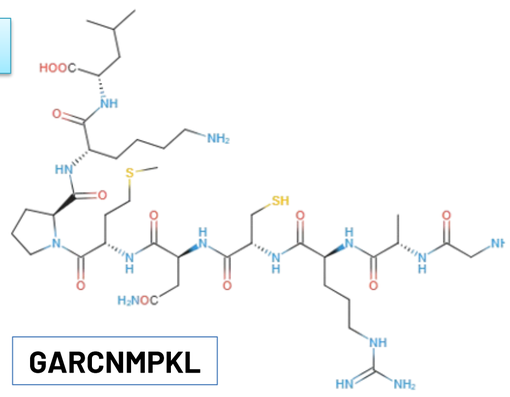
77 peptides

Activity	Peptides
Antioxidant activity	57
Antimicrobial activity	23
Anti-inflammatory activity	21
Antioxidant, antimicrobial and anti-inflammatory activity	**4**

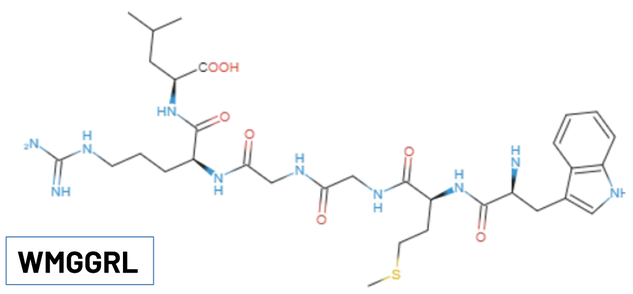
Potential multifunctional peptides



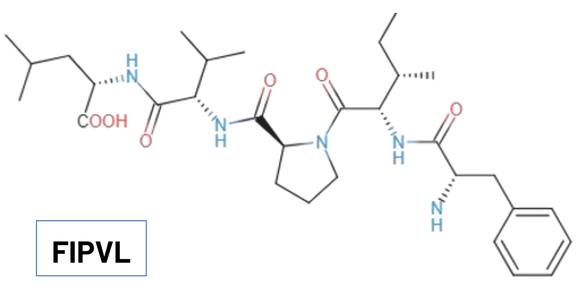
FAPMSRF



GARCNMPKL



WMGGRL



FIPVL

CONCLUSION

- The proteomic analysis of *T. chuii* allows the identification of proteins with biological functions differentiated into three main groups: biological process, cellular component and molecular function.
- Orogastric *in vitro* digestion increases the antioxidant activity of *T. chuii* microalgae.
- *In silico* gastric digestion of *T. chuii* yields bioactive peptides, such as FAPMSRF, WMGGRL, GARCNMPKL, FIPVL with multifunctional (antioxidant, anti-inflammatory and antimicrobial) properties.

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