In silico identification of bioactive proteins and peptides in insects for human consumption

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INTRODUCTION

Insect consumption has nowadays become a new research field in food science and nutrition. Insects have been proposed as a promising alternative to cover the growing demand for protein by the population.

This study aimed to evaluate the protein content and profile of six insects and peptide release during gastrointestinal digestion, assessing both proteins and peptides' physicochemical and biological properties.

METHODOLOGY

Protein concentrates from mealworm (*Tenebrio molitor*), beetle (*Phyllophaga rugosa*), caterpillar (*Nudaurelia melanops*), ant (*Oecophylla smaradigna*), locust (*Locusta migratoria*), and cricket (*Acheta domesticus*) flours were characterized by SDS-PAGE. Tentatively identified proteins were hydrolyzed (pepsin, trypsin, and chymotrypsin) *in silico* to obtain the potential peptides released. Physicochemical properties and biological activity were evaluated using computational tools.

RESULTS

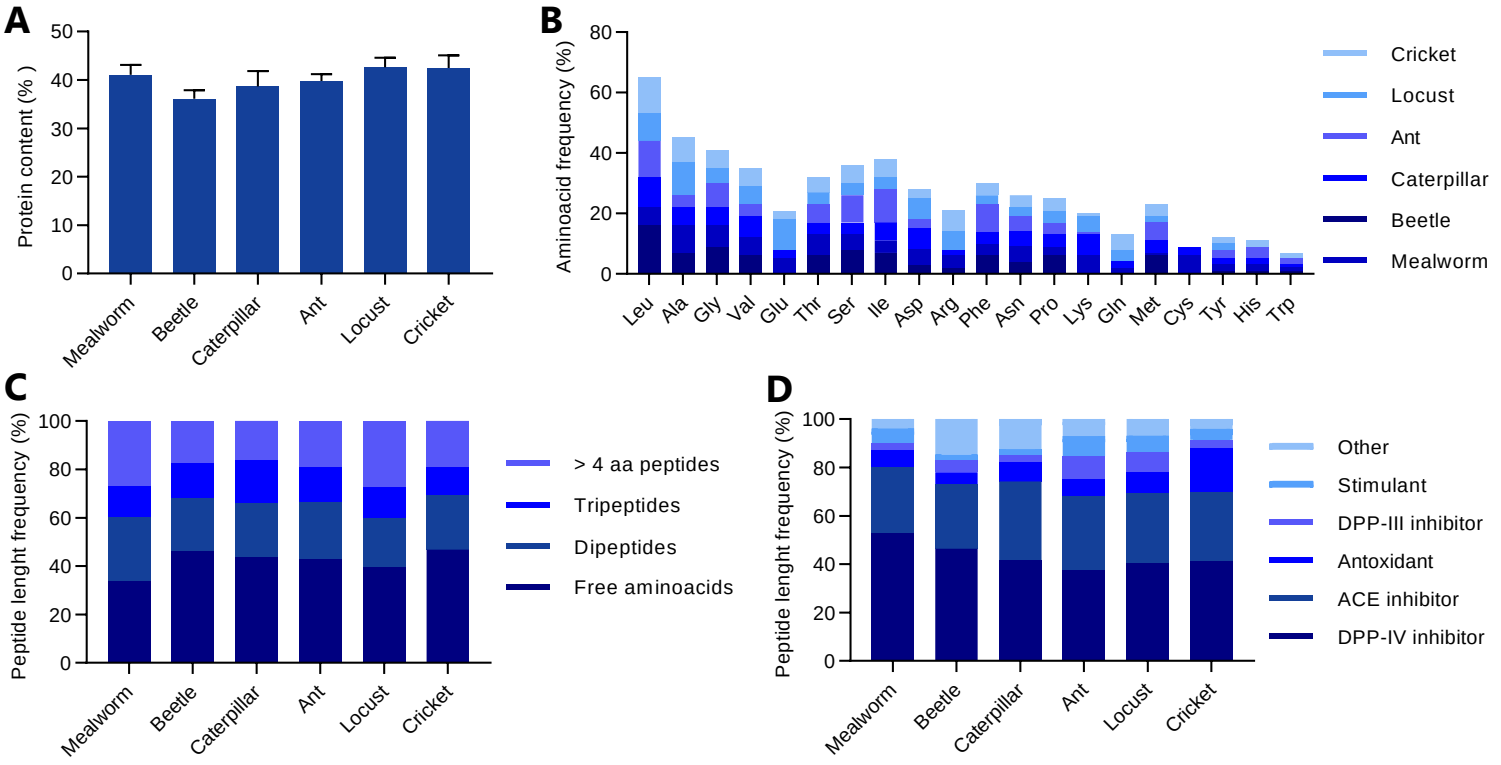

Figure 1. Protein content of the six edible insect species studied (**A**), mean frequency of each amino acid in the set of proteins identified for each insect (**B**), peptide mean length after *in silico* gastrointestinal digestion (**C**), and most frequent biological activities of the peptides released during digestion (**D**).

- Protein content varied from 36 to 42% (**Figure 1A**), and the main proteins identified among insects were cytochrome c oxidase subunit I, acyl-CoA Δ-9 desaturase, and α-amylase. Insect proteins were rich in Leu, Ala, Gly, and Ile and deficient in Cys and Trp (**Figure 1B**).
- Locust tropomyosin exhibited shared allergenic 22 epitopes with lobster tropomyosin.
- Gastrointestinal hydrolysis of each insect protein mainly released free amino acids (22–55%), di- and tri-peptides (17–31% and 7–7%, respectively), being peptides longer than four amino acids less frequent (13–42%) (**Figure 1C**). Peptides presented antioxidant and DPP-IV and ECA inhibitory potential (**Figure 1D**).

CONCLUSIONS

- Results revealed the feasibility of insect proteins as sources of bioactive peptides.
- Forthcoming studies are required to expand the knowledge on insects' proteins and peptides and validate their use by the food industry and gastronomy.

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