

INPLASY PROTOCOL

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Conflicts of interest:

None declared.

Edible insects as a source of bioactive peptides

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Review question / Objective: This systematic review aimed at performing an exhaustive bibliographic search of all research articles reporting sequenced bioactive peptides obtained from edible insects and the respective properties demonstrated by in silico, in vitro and/or in vivo approaches. This report intends to evaluate the existing weigh-of-evidence regarding each specific claimed bioactive property, thus representing a valuable contribution to the divulgation of the scientific basis on the health benefits associated to the consumption of insects.

Condition being studied: Insects are a good source of bioactive peptides (3-20 amino acids residues in length that promote beneficial effects for human health), including antihypertensive, antidiabetic, antioxidant, anti-obesity, immunomodulatory, anti-inflammatory, anti-microbial, antiviral, and antithrombotic properties, among others.

INPLASY registration number: This protocol was registered with the International Platform of Registered Systematic Review and Meta-Analysis Protocols (INPLASY) on 20 March 2023 and was last updated on 20 March 2023 (registration number INPLASY202330075).

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INTRODUCTION

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Rationale: According to the projections of the World Health Organization (WHO), the world's population is expected to grow from the current 8 billion in 2022 to nearly 9.7 billion in 2050 (<https://www.un.org/en/global-issues/population>), which will demand a dramatic intensification of food and feed production. Additionally, the decrease of cultivation areas resulting from the climate changes and industrial development, together with the effects of the temperature changes on the crop yields are serious challenges to overcome by the next generations. Currently, there is an increasing pursuit for sustainable solutions, which may rely on extending the ancient local food practices to a global scale, such as the case of entomophagy (practice of eating insects) that has been gaining relevance in the recent years.

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METHODS

Search strategy: This review was developed according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) methodology. The publications were retrieved from the PubMed, Web of Science, and SCOPUS databases and the keywords entered were: ((((((insect) OR (larva*)) AND (hydrol*)) OR (digest*)) AND (peptide*)) AND (en-zym*)) AND (bioact*) in PubMed. ((((((ALL=(insect)) OR ALL=(larva*)) AND ALL=(hydrol*)) OR ALL=(digest*)) AND ALL=(peptide)) AND ALL=(enzym*)) AND ALL=(bioact*) in Web of science. insect OR larva* AND hydrol* OR digest* AND peptide AND enzym* AND bioact* in SCOPUS.

Participant or population: Not applicable.

Intervention: Not applicable.

Comparator: Not applicable.

Study designs to be included: Only the studies focusing on edible insects and reporting the amino acid sequence of potentially bioactive peptides were selected for careful examination.

Eligibility criteria: The duplicates, the review articles, and all original studies focusing on other species rather than insects were excluded. Only the studies focusing on edible insects and reporting the amino acid sequence of potentially bioactive peptides were selected for careful examination. The studies describing the sequence of peptides obtained from insect sub-products (e.g., *Bombyx mori* cocoon) were excluded.

Information sources: The publications were retrieved from the PubMed, Web of Science, and SCOPUS data-bases on August 9th, 2022.

Main outcome(s): This systematic review identified 37 studies focused on the identification and/or characterization of bioactive peptides obtained from the hydrolysis of proteins from edible insects. Several peptides with antioxidant, antihypertensive, antidiabetic, anti-obesity, anti-inflammatory, hypocholesterolemic, anti-microbial, anti-SARS-CoV-2, antithrombotic, and immunomodulatory properties were reported. A total of 212 potentially bioactive peptides were identified, but only 62 were characterized individually through in vitro methodologies to evaluate their predicted bioactive properties. From the identified peptides, only 3 (YAN, AVF, and VF) were tested in vivo, all demonstrating effective antihypertensive properties in spontaneously hypertensive rats. This systematic review summarizes, for the first time, all the scientific evidence about the potential health benefits associated with the ingestion of insect proteins. The collected information suggests that the consumption of insects can play a key role in the prevention of some important pathologies.

Quality assessment / Risk of bias analysis:

All articles were independently reviewed by two authors and articles that met all eligibility criteria were carefully read and evaluated by the five authors.

Strategy of data synthesis: All the information considered relevant for this review, including: insect species, sample, sample treatment, type of study, type of gastrointestinal (GI) digestion, analytical methods for peptide identification, peptide sequence, bioactive property, en-zyme/cellular/organ/animal target, in vitro assays, in vitro outputs, in vivo assays, in vivo outputs, in silico assays (software/database), and bibliographic reference, was retrieved from each research article and collected in an excel spreadsheet.

Subgroup analysis: Not applicable.

Sensitivity analysis: Not applicable.

Language restriction: Only articles written in English were selected.

Country(ies) involved: Portugal.

Keywords: entomophagy; bioactive peptides; gastrointestinal digestion; health benefits; systematic review.

Dissemination plans: This review will be published in a peer-reviewed journal of the appropriate research area.

Contributions of each author:

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