

Title: Innovative, circular and sustainable production of insects and microalgae as Novel Food.

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Abstract

Today, concerns over food system sustainability are growing worldwide. In the near future, traditional animal-protein sources will no longer be sustainable due to their dependency on natural resources and their great impact on the environment. The current challenges of feeding the growing population in a fair and sustainable way, and addressing food insecurity, have led to an increasing interest towards sustainable novel food, such as edible insects and algae. The house cricket *Acheta domesticus* (AD), recently authorized by the European Commission for human consumption (EU 2022/188), contains high-quality proteins and essential nutrients. However, its notably high lipid presence, primarily characterized by a significant percentage of saturated fatty acids, presents health concerns. Marine algae biomass, considered a promising sustainable resource due to its high productivity and low environmental impact, is a rich source of nutrients, including carbohydrates, minerals, vitamins, high-quality proteins, and lipids, in particular the polyunsaturated fatty acids such as the healthy ω 3.

Our research focused on using marine algae as sustainable ingredients of the diet of AD, with the aim to obtain crickets with a low-fat content rich in high-quality fatty acids, that could be used as ingredients in the so-called “functional foods”. Moreover, based on the concept of circular economy, some species of microalgae rich in ω 3 were cultivated by adding in the culture medium the AD frass, a dry matrix of excrements, exoskeletons, and remnants of its diet. In turn, in a circular economy perspective, the microalgae grown on the frass were used as food supplements for the breeding of AD, in order to obtain an insect enriched with healthy fatty acids. The results of this research achieved the following objectives: 1) production of a healthy low-fat AD, rich in high-quality fatty acids, through the use of sustainable ingredients with a low environmental impact, 2) effective management and valorization of waste products; 3) reduction of microalgae production costs, and 4) creation of a circular and sustainable production chain.

Biography

Cristina Truzzi is an associate professor in Analytical Chemistry at the Department of Life and Environmental Science, Polytechnic University of Marche, Italy. She is author of 100 scientific publications on qualified international journals and of 3 book chapters. Her scientific interests are focussed principally on the field of analytical chemistry, with particular attention to the

determination of Potentially Toxic Elements and organic contaminants in food (such as honey, wine, fish, insects, algae) and environmental matrices (sea water, snow, aerosols), using Atomic Absorption Spectroscopy and separation techniques. In the last years, she is engaged in the study of nutritional properties and chemical risk assessment of Novel Food such as insects and algae, in an environmental sustainability and circular economy perspective. She also deals with chemometrics (multivariate statistical analysis) applied to her research.