

LETTER

The microbial safety of edible insects: a matter of processing

Dear Editor,

the world population is constantly increasing, and it is widely accepted that, by 2050, the world will host 9 billion people [1]. Feeding this growing population with more demanding consumers will necessarily require an increase in food production. This will inevitably put more pressure on the planet's already limited resources.

Several studies suggest that the consumption of edible insects (entomophagy) may be a viable alternative or supplement to conventional protein sources [2-6]. However, insects, like many food products, are rich in nutrients and moisture, providing a favorable environment for microbial survival and growth, as already highlighted by several studies [2, 7-11].

Since, as of January 2018, arthropods are considered Novel Food in the European Union (Regulation (EU) 2015/2283), more research data about edible insects are necessary, waiting for a future market.

For this reason, samples of edible arthropods, already marketed as souvenir, were purchased online from an Italian insect-rearing agricultural holding and analyzed to verify their microbial safety.

Since at present there are no specific microbiological reference criteria for insects, results (Table 1, available online as Supplementary Material) were compared with those reported in the literature both for fresh and processed edible insects.

The total viable aerobic counts and the *Enterobacteriaceae* counts found in our study were generally lower than those reported for fresh edible insects, while the spore-forming bacteria counts were similar. On the other hand, comparing the results with literature data on processed edible insects, they were higher except for spore-forming bacteria, probably highlighting an inadequate processing or storage.

The bacterial flora found in the analyzed edible insects consists of known food contaminants, with different risks for human health according to the species and probably the method of insect production [9]. The main aspect in food perspective is not so much the microflora composition of live animals, as the possibility to safely store and preserve derived products. Prevention, detection, identification, and reduction of microbial contaminants are crucial for a successful and safe insect production. In order to respond to these control needs, the Food and Agricultural Organization (FAO) proposed the adoption, throughout the insect supply chain, of the Hazard Analysis Critical Control Points (HACCP) system [12]. Indeed, HACCP is recognized worldwide as a system for quality assurance, identifying, evaluating and controlling physical, chemical and biological hazards throughout the production process.

In conclusion, edible insects represent a new and sustainable protein source for humans and have huge potential to meet the challenge of food security in the near future, while limiting the environmental impact of human activities related to food production. In this context, however, scientific data on potential foodborne hazards in edible insects are lacking; literature reveals weakness of evidence and scarcity of data. Although our study is set as an exploratory study based exclusively on a single agricultural holding's samples, with all the limits of representativeness that derive from it, it confirms that insects can represent a compatible environment with the growth/survival of bacteria if inadequate processing measures are taken. To avoid these issues, insect use for food production should consider existing data derived from countries where insect consumption is usual. Assuming demand for edible insects as human food will increase, then new approaches for smart breeding, sustainable rearing, harvest and post-harvest processing

Key words

- entomophagy
- edible insects
- food safety
- microbial community
- insect processing

will be crucial. Finally, it is inevitable that existing legislation will need to be significantly modified by adopting sanitary regulations and quality standards on nutritional compositions and on contaminants as well as a new approach to products' labelling will be mandatory; the renewed European Novel Food Regulation is only the beginning.

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