Chapter N 128

Food safety and insect food: a preliminary consumers’ indication

**Abstract.** Food safety is a topic of central importance in the European context. Since the 1960s, the European Union has established numerous rules to guarantee the hygienic and sanitary protection of food products and therefore the health of consumers. In this sense, EU legislation has introduced an integrated approach to food safety, including information on food products and animal welfare, regulating the stages of the food chain and offering consumers several information. Over the past few years, however, the European legislator has regulated the breeding of insects for the production of food for human consumption. In this context, the present paper aims to investigate the perception and behavior of consumers on food safety issues also in light of the introduction of insects as food for human consumption. A preliminary survey on a sample of consumers was conducted and the results show that food safety is an important feature in the process of purchasing food products. Moreover, some differences emerge in terms of insect food confidence related to food safety perception.

**Keywords.** Food quality, Food safety, Insect food, consumers’ perception, survey

# Introduction

The quality of food can be defined in relation to three main aspects, namely the characteristics of the food, psychosocial use, and service. The first aspect can be divided into four sub-categories of quality, i.e. agronomic quality, hygienic-sanitary quality, nutritional quality, and sensorial quality (Peri, 2006). These different kinds of quality are essential to ensure the success of a food product on the market and, specifically, food safety is fundamental as a necessary condition and therefore as a prerequisite of quality (Peira et al., 2014). Food safety has always been at the center of international debates; indeed, it identifies food hygiene and safety and the commitment to prevent contamination by pathogens. Since the 1960s, the European Union (EU) has established numerous rules to guarantee the hygienic and sanitary protection of food products and therefore the health of consumers. In this sense, European legislation has introduced an integrated approach to food safety, including information on food products and animal welfare, regulating the stages of the food chain and offering consumers a wealth of information on the food chain.

Over the past few years, however, the European legislator has regulated the breeding of insects for the production of food for human consumption and, therefore, this issue has been combined with the legalization of insect food, a type of food widespread in Asia but, up to now, not considered as a food alternative in Europe.

In this context, this manuscript aims to identify the consumer approach to food safety related to the consumption of insects for human food use. In particular, the study investigates the insect food confidence of younger consumers related to the perception of several food safety aspects.

# Review of the literature

The EU guarantees high safety standards of food products that are placed on the market by EU members, through the definition of specific production requirements. In this context, the main element of the European Policy is the protection of public health, which is closely related to the economy and the environment. Moreover, the EU is the largest producer of food and drink products in the world, and therefore the environmental and health conditions can have important repercussions on the food chain.

In the last forty years, there have been cases of fraud and, more generally, food scandals that have undermined the safety of European and international consumers (e.g. methanol wine, "mad cow" disease, foods with dioxin). Therefore, the EU has developed some rules and control systems to guarantee safety in the food sector in line with the needs of the consumer i.e. the integrated food safety policy. Recorded food diseases and infections have increased over the past decade despite the use of modern manufacturing technologies and good manufacturing practices (Peira et al., 2014).

At the same time, the EU enlarges the competencies of the EU regulations and a few years ago has started to consider insects as food.

Entomology is a common food habit in many parts of the Asia Pacific region (Yen, 2015), and in these countries insects are a highly appreciate food (Orsi et al., 2019). Despite there is anecdotal evidence of insects consumed as food in the past (European Commission, 2022), no EU Member State has confirmed, in accordance with Regulation (EU) 2015/2283 that human consumption to a significant degree prior to 15 May 1997 for any insect species.

It is for that reason that the above-mentioned regulation states that whole insects and their preparation have to be considered novel food (European Parliament and Council, 2015). Therefore, to be commercialized for human consumption, they must be authorized in accordance with this regulation which, among other things, implies that insects should be safe for consumers, properly labeled (so as not to mislead buyers) and, to be marketed within the Eu, they have to be included in an authorized novel food Union list (International Platform of Insects for Food and Feed, 2021). The first decision granting authorization of an insect as novel food was adopted on 1 June 2021 (European Commission, 2021). Even if the topic is quite recent, many scholars have analyzed and studied it as insects represent by one hand a sustainable protein supplier and on the other, they may meet some obstacles in western consumers’ minds also with reference to safety reasons.

The literature has been recently revised by Kröger et al. (2021) who assume that consumer acceptance of insect as food is related to a variety of factors such as: i) sociodemographic factors (gender; age; education; place of residence and traditional food culture; nationality; ethnicity and travel experience; religion, income and occupation); ii) personality factors (sensation seeking, storytelling, mindfulness, attitude; sustainability consciousness/awareness and new ecological paradigm; perceived behavioral control and behavioral intention; purchase activism and trust; familiarity; “food neophilia”; neophobia; sensation seeking); iii) personality factors (emotions; disgust); iv) social influences (subjective norms; source of social influence; trend and perceived normality; social and financial acceptability); v) diet (dietary preferences; meat consumption and liking; previous insect consumption; seafood and sushi consumption; green dietary behavior; food fussiness); vi) product characteristics (preparer dish; characteristics of insect-based products; sensory expectation and ratings; degree of visibility of insects and amount of insect substitute; insect species and life stage; food appropriateness; carrier product characteristics; perceived benefits; perceived risks); vii) food choice motives; viii) information (information settings: package design).

Insects have nowadays to be accepted as regular food by Eu consumers and practitioners need valuable information to proact and give consumers proper information to dissipate perplexities and barriers.

# Material and methods

## Sample and questionnaire definition

The sample was defined on the basis of international literature and related gaps evidenced. Especially, the younger generations were selected in the light, on the one hand, of their sensitivity to sustainable issues, on the other, of their approach to novelties like insect food.

At the same time, the questionnaire was designed on the basis of international literature and EU legislation. In particular, the main aspects related to food safety and insect food were collected to understand more in-depth the state of art on this topic. After the collected data, a three-steps questionnaire definition was followed. In the first step, a version of the questionnaire was carried out after a focus group activity (6 young male and female consumers). The second step provided a second version of the questionnaire structured in several closed-ended questions after a second focus group activity (3 university scholars and 3 food professionals). The third step was a pre-test i.e. the second version of the questionnaire was tested by 30 young consumers and, consequently, the final version was defined. The questionnaire was administered by MOODLE platform to younger consumers.

After the collection of questionnaires, the sample was made up of 5,177 individuals, of which 25.81% were males and 74.19% were females. 53.13% of the sample is included in the range ≤ 22 years old, 37.24% belong to the age group 23-27, and the remainder is in the range ≥ 30 years of age. Therefore, the females show a greater propensity to respond, and are generally more interested in issues related to nutrition.

## Findings

The study focuses mainly on the trust that consumers place in food derived from insects. The sample results show a relatively small difference between those who trust the food safety of these products (52.87%) and those who do not trust (47.13%) since the EU allowed the marketing of these products. insects as food.

Table 1 Relationship between confidence and gender of the sample examined

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Gender** | **I trust** | **I do not trust** | **Total** |  |  |  |  |
| Male | 907 | 429 | 1336 |  |  | Chi-squared test = | 163.05 |
| Female | 1830 | 2011 | 3841 |  |  | P.value = | 2.44E-37 |
| Total | 2737 | 2440 | 5177 |  |  | Cramer's V = | 0.18 |

# The male gender is more willing to trust: the relationship is significant (p.value <0.05), but quite weak (Cramer's V = 0.18 on a scale between 0 and 1).

Table 2 Relationship between confidence and age of the sample examined

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Age** | **I trust** | **I do not trust** | **Total** |  |  |  |  |
| ≤ 22 | 1394 | 1366 | 2760 |  |  | Chi-squared test = | 53.69 |
| 23-29 | 1134 | 794 | 1928 |  |  | P.value = | 2.35E-13 |
| ≥ 30 | 209 | 280 | 489 |  |  | Cramer's V = | 0.10 |
|  | 2737 | 2440 | 5177 |  |  |  |  |

The 23-29 age cluster is more willing to trust: the relationship between trust and age groups is significant (p.value <0.05), but rather weak (Cramer's V = 0.10 on a scale between 0 and 1).

Table 3 Confidence in some items towards insect food

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Questions expressed on the Likert scale****(from 1 very little to 5 very much)** | **I trust** | **I don’t trust** | **Percentage Difference** | **P.value** |  | **All** | **Diff/average****All** |
| I trust the safety of the food I buy | 3.60 | 3.31 | 0.28 | 4.8E-19 |  | 3.46 | 0.0816 |
| I trust the information on the labels of the foods I buy | 3.60 | 3.33 | 0.27 | 2.27E-08 |  | 3.47 | 0.0774 |
| Food safety control bodies are effective  | 3.56 | 3.41 | 0.15 | 1.79E-08 |  | 3.49 | 0.0430 |
| Buying sensitivity for ethical brands (i.e. Fairtrade) | 2.88 | 2.78 | 0.10 | 1.46E-05 |  | 2.83 | 0.0350 |
| Sensitivity to purchase for products sold without packaging | 3.20 | 3.13 | 0.06 | 5.58E-06 |  | 3.17 | 0.0202 |
| Concern about the environmental impact of food (i.e. deforestation, waste of water resources, CO2 emissions) | 3.71 | 3.64 | 0.07 | 2.24E-06 |  | 3.68 | 0.0189 |
| Concern about the presence of harmful substances that could lead to food poisoning (i.e. Salmonella, Listeria, etc.) | 3.99 | 4.31 | -0.32 | 0.002173 |  | 4.14 | -0.0762 |
| Concern about counterfeit food (i.e. actual ingredients are not as stated on the label) | 3.77 | 4.09 | -0.32 | 0.001078 |  | 3.92 | -0.0821 |
| Sensitivity to purchase by the origin of the Italian and non-imported product  | 3.69 | 4.03 | -0.34 | 0.003757 |  | 3.85 | -0.0894 |
| Concern about chemical contamination  | 3.43 | 3.78 | -0.35 | 1.51E-11 |  | 3.59 | -0.0987 |
| Concerns about lack of sanitation checks during the production process | 3.79 | 4.23 | -0.44 | 1.99E-07 |  | 3.99 | -0.1097 |
| Concerns about deliberate contamination of the product (i.e. by workers or external people) | 3.32 | 3.84 | -0.52 | 2.68E-07 |  | 3.57 | -0.1462 |
| Concerns about viruses and food-related diseases (i.e. mad cow disease, avian and swine flu) | 3.42 | 3.96 | -0.54 | 4.8E-09 |  | 3.67 | -0.1466 |
| Sensitivity to purchase due to the absence of GMOs | 2.86 | 3.31 | -0.46 | 9.37E-17 |  | 3.07 | -0.1484 |

Table 3 considers a series of items expressed on a Likert scale, reporting, for each of them, both the mean of those who say they trust food from insects and that of those who do not; the difference between these two averages (and its significance) is then presented. Subsequently, this difference is again divided by the overall mean (i.e. of the whole sample: those who trust and those who do not trust) for the item in question, to generate an index indicating the importance of this difference. The items in the table are ordered according to this index.

All the differences between the averages considered are significant (the values in the p.value column are always less than 0.05).

Starting from the top, one finds the questions in which the average of those who trust is higher than that of those who do not trust, progressively decreasing to a tie (i.e. the same average for those who trust and those who do not trust) and then again to an increasingly higher inversion (i.e. a higher average for those who do not trust).

Starting again from the top of the table, those who trust insect food the most, appear those who also trust regulations, controls and certifications the most; then, moving downwards, we find those who are concerned about environmental and social sustainability issues; finally, moving downwards again, near the bottom of the table, where those who trust insect food the least appear, are those who are most concerned about food contamination and genetic modification.

* 1. **Conclusion**

The findings seem to underline that the respondents with more confidence in regulations and related applications are more inclined to accept the insect-like food. At the same time, the part of the sample that has less confidence in the application of the food rules and related control seems oriented to avoid the consumption of insect food.

The decision of the European Commission on the commercialization of insects is part of the "Farm to Fork" strategy which plans to transform the European food system in the direction of greater sustainability in several aspects. Insects are among the "future foods" that could support this "food" transition, carving out a role in the European food market and the results seem to show that at least a part of feasible consumers has the trust in insect food consumption.

This preliminary consumer study is intended to contribute to the perception of Italian consumers, even if it will be necessary to conduct studies on larger samples of the population to evaluate the main factors that can range from the consumption of this food to disgust and “food phobia”.

**1.6 References**

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