



Survey on Serbian consumer acceptance of edible insects as alternative source of animal proteins

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ABSTRACT

This study aimed to evaluate the state of public perception of edible insects as an alternative source of animal proteins as part of the human diet in Serbia. Data were gathered via an online survey involving 1,845 participants who completed a Google Forms questionnaire shared via social media channels. The findings indicate that 37.8% of participants expressed a willingness to consume edible insects. In comparison, only 8.5% of respondents reported having previously consumed edible insects in some form (whole, processed as flour, or in dishes). Logistic regression analysis revealed that women were more open to the possibility of consuming edible insects as food compared to men. Additionally, 57.1% of participants selected grasshoppers as the most suitable edible insect for consumption. The majority of respondents preferred processed insects or dishes made from insects as the most favourable way to consume them, rather than whole insects. Regarding the age of the participants and willingness to consume edible insects, no statistical significance was determined between different age class types. In conclusion, this study revealed that the population in Serbia shows a low readiness to consume edible insects as an alternative source of animal proteins. Furthermore, this study demonstrated a higher acceptability of processed insects as food, which could be very useful for promoting specific market strategies in the future.

1. Introduction

Edible insects are a highly promising and sustainable alternative source of animal protein (Zhou *et al.*, 2022). The *Coleoptera* order represents the most widely consumed group of insects worldwide, accounting for 31% of total insect consumption. Additionally, the *Lepidoptera* order contributes significantly, representing 18% of global consumption (Tuhumury *et al.*, 2021). Entomophagy, the practice of consuming insects, is primarily associated with cultures in Asia, Africa, and Latin America (Sikora and Rzymiski, 2025). In recent years, this trend can

also be observed in European Union (EU) countries (Čobanović and Pajičić, 2024). According to several authors (Bbosa *et al.*, 2019; Mancini *et al.*, 2022; Tuhumury *et al.*, 2021; Zhou *et al.*, 2022), edible insects and their products are nutritionally valuable foods containing high levels of proteins, essential fatty acids, fats, polyunsaturated fatty acids, vitamins, and minerals (Čobanović and Pajičić, 2024). These nutrients offer various beneficial properties for the human body compared to conventional meat types (Zhou *et al.*, 2022). Compared to traditional livestock farming, insect farming offers several benefits: (i) lower greenhouse gas and ammonia emis-

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sions, (ii) less land use, (iii) minimal water requirements, and (iv) efficient, cost-effective nutrition (Čobanović and Pajičić, 2024; Mancini et al., 2022; Zhou et al., 2022).

The first studies to assess willingness to buy and eat edible insects were based on data gathered from Dutch (Lensvelt and Steenbekkers, 2014; Pascucci and de Magistris, 2013) and Belgian (Capparos Megido et al., 2014) consumers. In Serbia, there are no registered producers of edible insects, and the sector lacks specific legislation regulating it. Current legal acts, such as the Law on Food Safety (*Official Gazette*, 2019a) and the Law on Veterinary Matters (*Official Gazette*, 2019b), do not include reared insects within the category of farmed animals, nor do they recognize edible insects as acceptable food for consumers. However, as Serbia works towards EU membership, it will have to align its laws with those of the EU; thus, there will be a need to regulate the edible insect market and insect-based food. Therefore, this study aimed to assess the public perception of edible insects as an alternative source of animal protein in the human diet in Serbia.

2. Materials and methods

2.1 Data collection, survey and sample

Data for this study was collected via an online survey form. The survey was conducted between 2024 and 2025 via the Google Forms platform. Permission was obtained from the Ethics Committee (01-05/2024) for conducting the survey. The unique URL for the survey was shared across various social media channels, including Instagram, Facebook, WhatsApp, Reddit, and Discord. Participation in the survey was voluntary, with no financial compensation offered for completion. The survey was completed only by individuals older than 18 years of age who hold Serbian citizenship or who declared themselves as Serbian. The first section of the survey included questions designed to gather general information about respondents, such as their age and gender. The second section investigated opinions regarding the consumption of edible insects, intending to determine whether respondents would consume them and, if so, which edible insects they would prefer. In the third section, respondents could write their opinion in open form on whether edible insects can be a good alternative source of animal proteins. One thousand eight hundred forty-five individuals filled out the survey. Respondents who

answered “No” to the question “Would you consume insects?” did not fill in the rest of the questions. Instead, they were directed to the end section of the survey.

2.2 Data analysis

Participant responses to the survey, collected via Google Forms, were saved in Google Sheets. Afterward, the data were exported and analyzed using IBM SPSS Statistics Version 27 (Armonk, New York, USA). The participants’ answers to the questions in the first section of the survey are presented in the form of frequencies. A logistic regression analysis was conducted to determine whether willingness to consume edible insects was influenced by factors such as age and gender. Statistical significance was established at $P < 0.05$.

3. Results

General information about the participants, including their gender and age, is presented in Table 1. The study had a higher proportion of female participants and a younger population (<40 years of age). When asked about their lifetime consumption of edible insects, 156 participants (8.5%) reported having consumed them, whereas 1,689 participants (91.5%) reported no such experience. When asked about their knowledge of entomophagy, 860 participants (47.0%) responded affirmatively, while 971 participants (53.0%) reported being unfamiliar with the term.

Regarding their willingness to consume edible insects, 697 respondents (37.8%) indicated that they

Table 1. General information about participants.

Gender	
Male	780 (42.3%)
Female	1065 (57.7%)
Total	1845 (100%)
Age	
<30	828 (44.9%)
31 – 40	715 (38.8%)
41 – 50	167 (9.1%)
51 – 60	76 (4.1%)
>60	59 (3.2%)
Total	1845 (100%)

would consider doing so (Table 2). Among these, 398 participants (57.1%) selected grasshoppers as their preferred choice. Furthermore, they were also asked what they preferred more: products (processed insects) or whole insects, and 64.4% of participants chose products as their preferred choice. The results of the logistic regression analysis revealed a statistically significant difference concerning gender and the willingness to consume edible insects (Table 3). Male participants were 53% less likely to consume

edible insects in comparison to female participants. However, no statistically significant differences were observed regarding age ($P > 0.05$).

In Figure 1, the positive and negative attitudes of survey participants towards edible insects are summarized. In most cases, the main negative attitudes towards edible insects originated from religion or tradition, while positive attitudes resulted from their high nutritive value and reduced environmental pollution.

Table 2. Participants' answers to the questions "Have you ever consumed insects?" and "Would you consume insects?"

Have you ever consumed insects?			Would you consume insects		
Gender	Yes	No	Gender	Yes	No
Male	91 (11.7%)	689 (88.3%)	Male	375 (48.1%)	405 (51.9%)
Female	65 (6.1%)	1000 (93.9%)	Female	322 (30.2%)	743 (69.8%)
Total	156 (8.5%)	1689 (91.5%)	Total	697 (37.8%)	1148 (62.2%)

Table 3. Influence of gender and age on willingness to consume edible insects.

Variable	B	S.E.	Wald	OR	95% C.I. for EXP(B)		Sig.
					Lower	Upper	
Gender							
Female	0.000	0.000	0.000	1.000	-	-	< 0.001
Male	-0.759	.098	60.117	0.468	0.386	0.567	< 0.001
Age							
<30	0.000	0.000	0.000	1.000	-	-	0.447
31 – 40	-0.101	0.105	0.921	0.904	0.735	1.111	0.337
41 – 50	-0.264	0.172	2.338	0.768	0.548	1.077	0.126
51 – 60	-0.193	0.244	0.622	0.825	0.511	1.331	0.430
>60	0.179	0.288	0.387	1.196	0.680	2.103	0.534

4. Discussion

The findings of this research indicate that the population in Serbia is reluctant to accept entomophagy, as 62.2% of surveyed participants declared an unwillingness to consume edible insects. These observations align with the results of other studies conducted in European countries (Mandolesi et al., 2022; Ribeiro et al., 2022) and previous studies in Serbia regarding the willingness to purchase edible insects (Andric et al., 2023). In the present study, age was not a significant factor in determining willingness to consume edible insects, which was contrary to the findings reported by other authors (Andric et al., 2023; Cicatiello et al., 2016; Hartmann et al., 2015; Lammers et al., 2019).

However, in contrast to other research studies (Cicatiello et al., 2016; Hartmann et al., 2015; Laurerati et al., 2016; Tan et al., 2016; Verbeke, 2015; Videbaek and Grunert, 2020), female participants in this study showed a greater willingness to consume edible insects. This outcome could be attributed to more traditional attitudes among men in Serbia, including social norms and acceptability, as well as the larger sample size of surveyed male consumers. In agreement with earlier investigations regarding insects as food (Andric et al., 2023; Bartkovic and Babicz-Zielińska, 2020; Grasso et al., 2019; Orsi et al., 2019; Van Thielen et al., 2018; Tuccillo et al., 2020; Wilkinson et al., 2018), the majority of respondents willing to consume edible insects preferred processed insect products over whole insects,

likely due to the reduced visual impact, making them more acceptable from a sensory perspective. This discovery is consistent with the predominantly negative consumer perceptions of edible insects, which are frequently influenced by cultural or religious beliefs. Notably, the novelty and exoticism of edible insects significantly shape consumer attitudes, acting as both a catalyst for acceptance and a barrier to adoption. Although this study provides valuable insights into consumer perceptions of edible insects as an alternative source of animal protein and novel food, its limitations should also be acknowledged. Namely, this study was based on an online survey, which does not exclude volunteer bias, and it cannot be confirmed that declarations made about consuming edible insects will correlate with the actual choices of consumers in everyday life.

5. Conclusion

This study demonstrates that Serbian consumers exhibit a low willingness to accept edible insects as a part of their diet, with religion, culture, and concerns over safety and sensory properties as the primary barriers. Informing consumers about the advantages of edible insects as a food source could increase overall acceptability in Serbia. To further foster acceptance, it is crucial to promote insect-based foods, such as protein powder and flour, which mitigate disgust associated with whole insects as food while offering versatility in the application of edible insects as additives in regular food. Marketing strategies should focus on countering misconceptions while further emphasizing the nutritional and environmental benefits of edible insects and slowly normalizing them as part of a daily diet.



Figure 1. Consumer attitudes towards edible insects as food.

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