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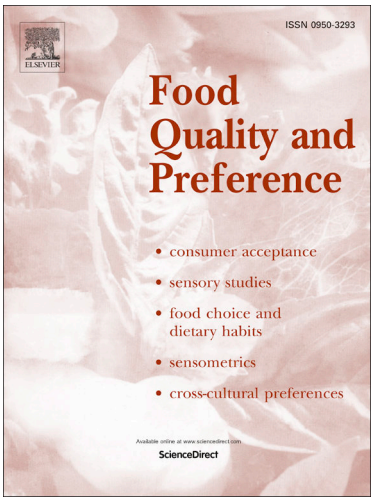

Short Communication

Acceptance of alternative meats among different dietarian styles: An explorative analysis in Italy

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Acceptance of alternative meats among different dietarian styles: an explorative analysis in Italy

1. Introduction

Because of the increased world population, global meat consumption soared to 330 million tons in 2021 (Shahbandeh, 2022). Researchers and policymakers are concerned with this trend because of the environmental impact of livestock farming, the public attention towards animal welfare, and health-related issues; thus, many stakeholders support the reduction of meat consumption (Kwasny et al., 2022). Nonetheless, previous research demonstrates that meat eaters are hardly willing to change their food choices (Milfont et al., 2021). In fact, many omnivorous consumers think that eating meat is healthier and more natural than excluding it from their diets (Piazza et al, 2015), they often show negative prejudices against vegetarian and vegan diets (Demartini et al., 2022), or are not disposed to abandon meat consumption simply because they enjoy its taste (Hoek et al., 2011).

Considering these factors, it seems reasonable to expect that few consumers would be inclined to transition from their usual omnivorous diet to a vegetarian or vegan diet. Therefore, over the past decade, researchers have suggested the idea of replacing at least a portion of animal proteins in omnivorous diets with proteins from more sustainable sources as a practical strategy to reduce meat consumption (Onwezen et al., 2020). While many alternative proteins, such as algae- and fungi-based foods, are available in the market, recent research highlights the three leading innovative protein sources for meat substitution: plant-based meat alternatives, insect-based flours, and cultured meat (Bryant & Barnett, 2018; Onwezen et al., 2020). Despite some limitations, these products present interesting characteristics. As an illustration, while plant-based meat alternatives have faced scrutiny regarding their nutritional value (Tso et al., 2021), they exhibit superior sensory attributes compared to traditional veggie surrogates such as seitan or tempeh (Fiorentini et al., 2020). Nevertheless, it's important to note that they still fall short of matching the taste of authentic meat, as highlighted by Giacalone et al. (2022). Insect-based foods might elicit a sense of disgust in most of consumers (Sogari et al., 2017; La Barbera et al., 2018), nevertheless, studies reported that they represent the best environmental source of protein of high quality on the market (Halloran et al., 2016). Finally, cultured meat appears to be the most promising solution to address both the nutritional concerns and unappealing aspects associated with other meat alternatives, and in fact recent research confirm that consumers prefer this option over other alternative proteins (Van Loo et al., 2020). Nevertheless, it remains a largely futuristic concept, as only a limited number of products have entered the market to date (Bryant & Barnett, 2018).

Considering such premises, the present research aimed at exploring the differences in the evaluations of meat alternatives among consumers with different diets. In fact, despite meat alternatives represent an interesting option for fostering meat consumption reduction, there is still the need to understand their acceptance among omnivorous, flexitarian (i.e., consumers that abstains from eating meat occasionally without totally abandoning it, according to Dagevos, 2021), and vegetarian and vegan consumers. Many studies were published on consumers' perception of meat alternatives in the last decade (see Onwezen et al., 2020 for a review), however, only a few of them presented a direct comparison between the three categories and, as far as we are aware, none of them explicitly scrutinized the different attitudes that omnivorous, flexitarians or veg*an consumers show towards them.

In this regard, a recent study conducted in the Netherlands and Finland by van Dijk et al. (2023) revealed that flexitarians held a more favourable attitude toward alternative meat options compared to omnivores. Additionally, among omnivores, hybrid meat products were the favored choice. These results imply that different dietarian habits relate to individual preferences for meat substitutes. It's important to note that the study did not include veg*an consumers, as the authors specified that their focus was solely on individuals aiming to reduce their meat consumption. Furthermore, Possidónio et al. (2021) conducted two experiments in Portugal and compared consumers' perception of tofu and seitan, with insects and cultured meat. Interestingly, 18% and 40% of the sample was composed of veg*an or flexitarian consumers in the first and second experiment respectively. Despite the analysis did not focus on the differences between this type of consumers, according to the findings most of the sample preferred lab-grown meat over plant-based proteins and insects. Next, a second group of omnivores was concerned about the possible negative outcomes due to cultured meat consumption. Finally, the smallest cluster, composed mainly of veg*ns, showed positive attitudes toward plant-based proteins and rejected insects and lab-grown meat. Similarly, Lundén et al. (2020) conducted two surveys on Finnish consumers' perception of different raw ingredients including plants, insects, and cultured meat. The authors found that flexitarians were more positively inclined towards plants, cultured meat, and insects as raw ingredients in novel foods, however they could not include the veg*an group in their analysis, as they were only 5% of the sample. Finally, a cross-cultural conducted by Gómez-Luciano et al. (2019) found that plant-based meat alternative was the most preferred option, followed by cultured meat and insects. Despite the relevant contribution of the research, also in this case the dietarians' habit had not been considered in the analysis.

To fill this gap, this research presents an explorative analysis of the different preferences and perceptions of alternative meats among the most representative dietarian styles in the modern world. Specifically, a sample of Italian omnivorous, flexitarian, vegetarian, and vegan consumers participated in an online survey and stated their willingness to buy plant-based meat, insect-based flours, and cultured meat and their perceived fungibility as replacement for conventional meats. Given the design of the empirical study, a description of the potential of these types of products can be derived from the data collected that are useful for both marketers involved in the industry of sustainable alternative meats and policymakers interested in fostering meat consumption reduction.

2. Materials and methods

2.1. Recruitment and sample size

An online data collection on Italian consumers' dietarian habits was conducted between December 2019 and January 2020 through a questionnaire distributed by Qualtrics. A total sample of 728 consumers completed the survey, however, 50 (6.87%) individuals were excluded from the analysis based on individual allergies that might cause dietarian choices and low response quality (Rosenfeld and Burrow, 2017). Thus, the final sample was composed of 678 respondents (Female= 57.8%; M_{Age}= 41.7, SD_{Age}= 12.8). Most of the sample was composed of omnivorous (398, 58.70%) and flexitarian (147, 21.68%) consumers, while vegetarian (84, 12.39%) and vegan consumers (49, 7.23%) represented a smaller quota of respondents. Despite the heterogenous dimension of consumers groups might represent a major flaw of our research, it must be emphasized that veg*ns represent no more than 8% of Italian consumers (Eurispes, 2021), which means that in our sample they were overrepresented compared to the national population (133; 19.62%). Other characteristics of the participants are shown in Table 1.

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Table 1. Sociodemographic characteristics of the sample (n= 678)

	n.	*%*		*n.*	*%*
Age			**Household income (€ per month)**		
18–24	86	12.70	< 1.000	117	17.3
25–34	121	17.80	1.000-2.000	309	45.6
35–44	158	23.30	2.001-4.000	181	26.7
45–54	174	25.70	4.001-6.000	44	6.5
55–65	139	20.50	> 6.001	27	4
Sex			**Household components**		
Male	286	42.20	1	65	9.60
Female	392	57.80	2	152	22.40
Education			3	221	32.60
First and secondary school	75	11.06	4	185	27.30
High school	374	55.16	5+	55	8.10
Bachelor degree	87	12.83	**Presence of children (<13 years)**		
Master Degree or higher	142	20.94	0	488	72.00
Area or residence			1	132	19.50
Coastal	179	26.40	2+	58	8.50
Inland flat	354	52.21	**Presence of young adults (13-18 years)**		

Inland hilly/mountainous	145	21.39	0	390	57.52
Region of residence			1	175	25.81
Northern-West Italy	218	32.15	2+	113	16.67
Northern-East Italy	103	15.19	**Responsible for food purchase**		
Central Italy	133	19.62	Yes	630	92.92
Southern Italy and Islands	224	33.04	No	48	7.08

2.2. Questionnaire and measures

A questionnaire was first designed to explore the relationship between Italian food choices and some psychological constructs. Most of the data collected was in fact used to validate the Italian version of the Dietarian Identity Questionnaire (DIQ-I) previously published by Amato et al. (2022). Furthermore, a specific section was introduced at the end of the original survey with the aim of exploring the preferences for plant-based, insect-based flours, and cultured meat among consumers with different dietarian habits. Only the results of this part of the questionnaire are reported in the present paper.

Two questions were used to determine the dietary choice of each subject. Firstly, the respondents were asked whether they excluded any of the following food from their daily meals: red meat, poultry, fish, eggs, or dairy products. A second question related to food allergies allowed us to form an analysis of those consumers whose dietary choices could be subject to medical conditions. Hence, according to the current definitions of diets (Amato et al., 2022), we classified the respondents as follows:

- Omnivores, if none of the foods were excluded from the diet;
- Flexitarians, if they excluded at least one meat among red meat, poultry, or fish from their diet, but they declared to eat at least one of them;
- Vegetarians, if they excluded all types of meat; or,
- Vegans, if they avoid all types of meat, eggs and dairy products.

To explore consumers' attitudes towards novel substitutes for meat, a set of questions was presented about plant-based meat, insect-based flours and cultured meat. For each of these products, respondents were asked to state their agreement on a 7-point Likert scale ranging from "1=Completely disagree" to "7=Completely agree" (with "4= Neither disagree, or agree") on the two items "*I would buy it*" and "*It's a good substitute for meat*".

2.3. Statistical analysis

An explorative inferential analysis was applied to test whether omnivorous, flexitarians and veg*an had different preferences and/or showed different perceptions for the three meat alternatives considered. Specifically, the one-way ANOVA, the Levene test for the equality of variances and the LSD or the Dunnett's T3 post hoc comparison of means were performed on SPSS 21.0 (IBM, 2012).

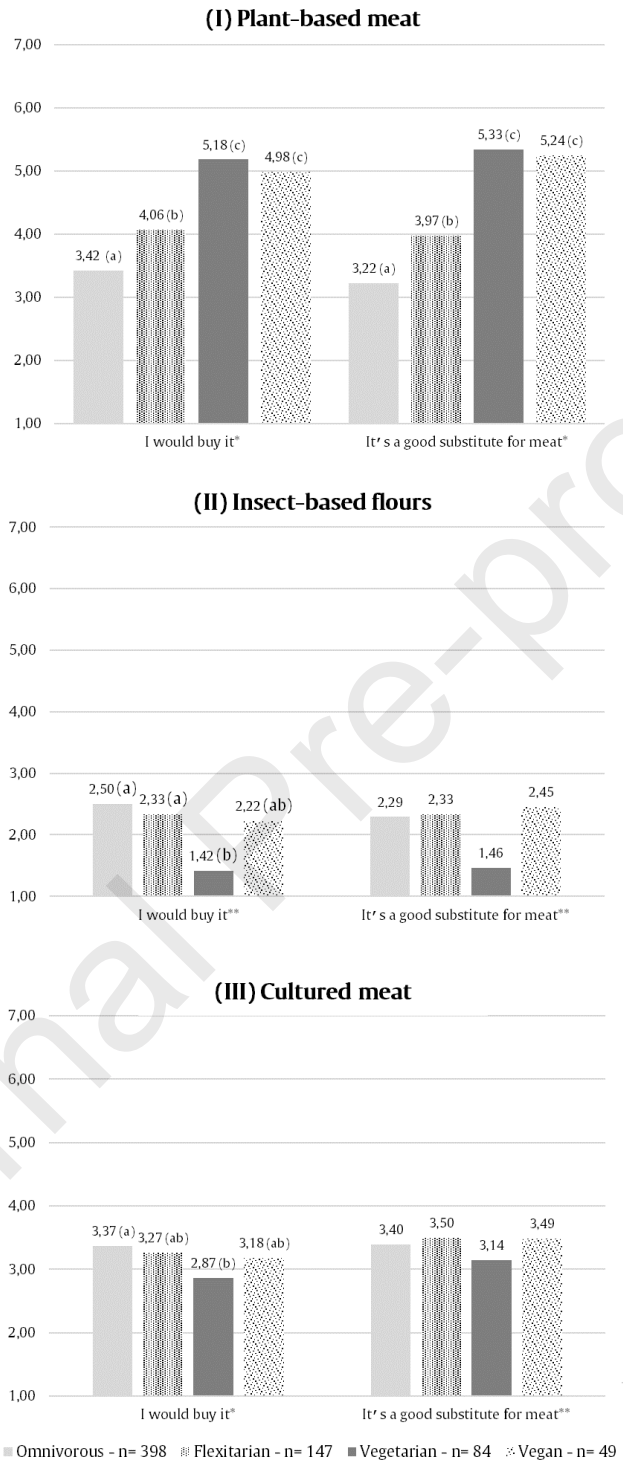
3. Results

The results of questions related to preferences and perceptions towards the three different meat alternatives for each dietarian style are presented in Figure 1. According to the estimations, statistically significant differences were found among the different consumers about their evaluation of plant-based meat and insect-based flours (all *p*s<0.001). With reference to consumers' preference and perception towards plant-based meat (Figure 1-I), omnivorous show the lowest willingness to buy (*Mean*= 3.42, *St.Dev.*= 2.00) and perception towards this meat alternative (*Mean*= 3.22; *St.Dev.*= 1.97), indicating that for this group of consumers plant-based meat is not a substitute for meat. Results related to the flexitarian group are significantly higher compared to those of the omnivore group in term of willingness to buy (*Mean*= 4.06; *St.Dev.*= 2.11) and perception (*Mean*= 3.97, *St.Dev.*= 2.13) towards plant-based meat. Finally, the results show that vegetarians and vegans consumers present similar attitudes and that they have the highest preferences (Vegetarian *Mean*= 5.18; *St.Dev.*= 2.00; Vegan *Mean*= 4.98, *St.Dev.*= 2.03) and better perception towards plant-based meat within the sample, considering it a good substitute for meat (Vegetarian *Mean*= 5.33, *St.Dev.*= 1.92; Vegan *Mean*= 5.24, *St.Dev.*= 1.92).

Overall, the analysis of the results related to insect-based flours shows that all type of consumers has negative attitudes towards this meat alternative (Figure 1-II). In contrast to what was observed in the case of plant-based meat, omnivorous, flexitarians and vegans show similar willingness to buy insect-based flours, with mean values of 2.50 (*St.Dev.*= 1.84), 2.33 (*St.Dev.*= 1.88) and 2.22 (*St.Dev.*= 1.98) respectively, and similar perceptions (Omnivorous *Mean*= =2.29, *St.Dev.*= 1.71; Flexitarians *Mean*= 2.33, *St.Dev.*= 1.80; Vegans *Mean*= 2.45, *St.Dev.*= 2.19). On the contrary, vegetarian consumers seem to be completely unwilling to purchase this meat alternative (*Mean*= 1.42; (*St.Dev.*= 1.02) compared to omnivorous and flexitarian. Similar values are found also regarding perceptions, with vegetarians reporting a statistically significance lower perception towards insect-based flour compared to other consumers (*Mean*= 1.46, *St.Dev.*= 1.06).

Finally, preferences and perceptions of cultured meat are considered (Figure 1-III). No statistically significant differences were found among respondents. Overall, the participants of the survey seem not willing to buy this meat alternatives - with mean values ranging from 2.87 for the vegetarian group, to 3.37 for the omnivorous group -, nor willing to consider it a good substitute for meat - with mean value of ranging from 3.14 for the vegetarian group, to 3.50 for the omnivorous group).

Figure 1. Preferences and perception among different dietarian styles for plant-based meat (I), insect-based flour (II) and cultured meat (III)



Note: The consumers' agreement with the statements has been measured on a 7-point Likert scale ranging from "1=Completely disagree" to "7=Completely agree" (with "4= Neither disagree, or agree"). *a, b, c indicate significantly different means using one-way ANOVA and LSD multiple comparison test (equal variances assumed) "**a, b, c indicate significantly different means using one-way ANOVA and Dunnet T3 multiple comparison test (equal variances not assumed) in both statements."

4. Discussion

The rise in alternative meats has led to substantial consumer science research. However, most studies have focused on specific products, neglecting the possible link between individual dietary choices and preferences. Our explorative survey reveals intriguing insights among Italian consumers, showcasing diverse preferences for three alternative meat types across various dietary styles: omnivores, flexitarians, vegetarians, and vegans.

Our findings suggest that plant-based meat is a viable substitute for traditional meat, indicating potential significant market success, especially among non-omnivorous consumers. However, Italian consumers show a negative inclination toward cultured meat and insect-based flours, which may require focused studies and communication efforts to find a profitable market. Furthermore, as insect-based flours are clearly less appreciated than cultured meat, the results suggest that selling insect as a protein source will be particularly challenging in the Italian market.

Given our results, it is evident that individuals following vegetarian and vegan diets are more inclined to embrace plant-based meat alternatives. These dietary groups, which decided at a certain point in their lives to avoid animal-derived products, often seek alternatives that provide similar sensory experiences and nutritional profiles to meat. Consequently, plant-based meat alternatives have garnered substantial interest and support from these groups. In this respect, studies have shown that vegetarians and vegans appreciate the variety of options available to them, as it allows for greater culinary diversity while adhering to their dietary choices (Circus & Robinson, 2019). On the other hand, omnivores tend to exhibit a lower level of intention to buy and consume plant-based meat alternatives (Onwezen et al., 2020). This observation is likely influenced by several factors. Firstly, it might be argued that omnivores often prefer the taste and texture of real meat, which may deter their enthusiasm for plant-based alternatives that aim to mimic these characteristics (Hoek et al., 2011). Moreover, the perceived novelty and unfamiliarity of plant-based meats may lead to hesitancy among omnivores to adopt these products, particularly if they are satisfied with their current dietary choices. However, the lack of interest from omnivores does not suggest a universal rejection of plant-based meat alternatives. Motivations and preferences vary within this group, with, some individuals that may be open-towards incorporating these alternatives into their diet. Additionally, the concept of flexitarianism, which involves a reduction in meat consumption, presents an interesting perspective on plant-based meat alternatives. Flexitarians may be more receptive to these products compared to omnivores due to their existing inclination towards plant-based options. For flexitarians, these alternatives can serve as a bridge between their desire to reduce meat consumption and maintaining familiar flavours and textures.

Furthermore, our study shows widespread hesitancy across diverse dietary backgrounds to purchase and consume insect-based flour products, aligning with previous studies (La Barbera et al., 2018) that identify a general reluctance to incorporate insects as a protein source into the diet. The notable distinction in the intention to buy insect-based flour products is evident among vegetarians, who consume dairy but avoid meat, showing a significantly lower inclination compared to other dietary groups. The difference may stem from concerns about how insect-based flour products could disrupt vegetarian diets, especially those heavily dependent on dairy for protein. Since vegetarian diets often prioritize animal-derived products, introducing insect flour as an alternative protein might be seen as a threat, challenging the reliance on dairy-based proteins and necessitating a significant shift in dietary habits. Nonetheless, considering the Italian sample that participated to this research, other factors such as cultural norms, lack of familiarity, and perceived aversion to consuming insects are probable drivers to this general hesitancy (La Barbera et al., 2018). Additionally, limited exposure and

education about the benefits and safety of insect flour products may lead to the perception of them being less desirable or unappealing across all four dietary groups.

Despite previous suggestions that vegetarians and vegans might be more receptive to cultured meat as a sustainable and cruelty-free alternative (Bryant and Barnett, 2018), our study challenges this assumption. Even within these groups, there is a notable lack of enthusiasm towards this product, questioning the expectation that individuals who already eschew animal products would readily embrace lab-grown meat. One possible explanation for the unfavourable intentions towards cultured meat among vegetarians and vegans could be attributed to concerns about the production process (Siegrist et al., 2018). Despite being animal-free, cultured meat is created through the cultivation of animal cells, which some individuals may perceive as unnatural or disconnected from their principles. Additionally, the perceived artificiality and unfamiliarity of cultured meat may contribute to the hesitancy among vegetarians and vegans, who often prioritize whole, minimally processed foods in their diet. Interestingly, our study also indicates that omnivores exhibit similarly unfavourable intentions towards cultured meat. Such finding contradicts previous research suggesting that omnivores may be more open to adopting alternative protein sources (Wilks & Phillips, 2017).

The skepticism among omnivores regarding cultured meat may arise from multiple factors. Some may view it as an inadequate replacement for traditional meat, perceiving differences in taste, texture, or nutritional value. Others might feel uneasy about consuming meat produced in a laboratory setting. Additionally, our study reveals that flexitarians also exhibit reservations toward cultured meat, indicating that their preferences differ from both vegetarians and omnivores. Recognizing these distinct concerns and preferences within different dietary groups is crucial for devising strategies to enhance acceptance of alternative meat products in the future.

5. Conclusions

In terms of academic implications, our research contributes to the existing literature by highlighting the relationships between dietary styles and preferences for meat alternatives and underscore the importance of considering individual dietarian habits in future studies. Failing to consider dietary styles may oversimplify the complex nuances underlying individual preferences. For instance, vegetarians may abstain from meat but often include whole, minimally processed foods in their diets. Conversely, omnivores who enjoy meat may have reservations about the artificial production of cultured meat.

Our findings also offer practical insights for the food industry. They underline the need for food companies to consider the diverse concerns and preferences of different dietary groups in product development and marketing. This newfound awareness can guide the development of tailored products that resonate with emerging market segments. In addition, building trust in the production process, especially among omnivorous, is crucial for companies' market expansion. In this sense, in the specific context of our Italian case study, where the livestock sector significantly impacts the national GDP, our findings stress factors maintaining animal protein as consumers' preferred choice. The sector should prioritize these factors in new business models, emphasising natural, minimally processed, and traditional products. These insights can shape innovative business models, meeting evolving consumer demands and contribute to the ongoing transformation of the Western food industry.

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Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

- Willingness to buy meat alternatives are explored among dietary groups in Italy
- Omnivorous, flexitarian, vegetarian, and vegan consumers are surveyed
- Plant-based meat is favoured as a meat substitute among non-omnivorous consumers
- Insect-based flours represents the worst option across all dietary groups
- Omnivores and flexitarians showed negative attitudes toward cultured meat