CONSUMER EVALUATION OF THE QUALITY ATTRIBUTES AND ACCEPTABILITY OF HYBRID MEAT-BASED PRODUCTS

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Abstract

In the current food industry, a key emerging trend is the partial replacement of animal-based protein with plant-based protein in meat products. This study aimed to evaluate the acceptability and quality of these innovative products by analyzing consumer behavior. The study was conducted over a period of 30 days on a sample of 150 participants. The results revealed a clear consumer profile: most consumers are from urban areas, have higher education, and are predominantly women. It was observed that lifestyle and residential environment significantly influence consumer preferences. The study concludes that consumers demonstrate openness to hybrid products, with their preference being conditioned by sensory attributes (taste, texture, and appearance) — all essential elements for ensuring an experience similar to traditional meat preparations. A better understanding of these factors allows manufacturers to develop products that better meet market expectations. This trend suggests that the hybrid products market has significant growth potential, fueled by consumer demand for healthier and more sustainable alternatives.

Key words: *hybrid meat, plant-based proteins, consumer acceptability, product quality, sustainability*

INTRODUCTION

The current global context, marked by concerns regarding food sustainability, the ecological impact of animal farming, and public health, has accelerated innovation in the meat industry [1, 2].

The global market for meat alternatives is projected to reach approximately $15 billion by 2028, with a Compound Annual Growth Rate (CAGR) of \sim 14.5\%, underscoring the urgency of this research. Hybrid meat products, which combine animal and plant proteins, represent a response to these challenges, offering an alternative that maintains familiar sensory characteristics while providing an improved nutritional and environmental profile [3, 4].

The inclusion of plant proteins (such as those derived from legumes, cereals, or by-products) aims not only to reduce costs and reliance on animal resources but also to enrich the product with dietary fiber, vitamins, and bioactive compounds [4, 5]. Partial substitution can reduce \text{CO}_2 emissions by up to 30\% and saturated fat content by 45\% in the final product, according to a recent study [6, 7]. The commercial success of these products, however, critically depends on consumer acceptability, which is mediated by the perception of taste, texture, and appearance [8].

The main objective of this research is to evaluate the attitude and acceptability of Romanian consumers towards a hybrid burger patty (75\% beef and 25\% textured pea protein) [9]. Specifically, the study aims to establish correlations between socio-demographic factors (age, gender, education, residential environment) and

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sensory preferences, while quantifying the influence of lifestyle and price sensitivity [10, 11].

MATERIAL AND METHOD

The study employed a cross-sectional design and was conducted over a period of 30 days. The sample consisted of 150 participants (n=150), selected using a convenience sampling method, stratified by gender and education level to ensure a basic level of representativeness. Data collection was performed using a structured questionnaire, administered either online or face-to-face, which covered the following areas:

1. Socio-demographic Data: Age, gender, education level, and residential environment (urban/rural).

2. Lifestyle Factors: Frequency of meat and plant-based alternative consumption, and concern for health and sustainability.

3. Acceptability of Hybrid Products: Purchase intention and decisive purchasing factors (taste, texture, price, nutritional benefits).

4. Sensory Evaluation: Participants rated the tested hybrid burger patty on a 9-point Hedonic Scale (1 = dislike extremely}, 9 = like extremely) for overall acceptability, taste, and texture.

Product Tested

The product evaluated was a pre-cooked hybrid beef burger patty with the following specific composition: 75\% ground beef (15\% fat content) and 25\% textured pea protein (TPP) and water. The TPP was rehydrated and incorporated to evaluate its effect on firmness and juiciness [12, 13].

Statistical Analysis

The collected data were statistically analyzed using the SPSS software. The following analyses were performed:

Descriptive Statistics: Frequencies, means, and standard deviations were used to describe the sample profile.

Inferential Tests: One-way Analysis of Variance (ANOVA) was employed to identify statistically significant relationships between socio-demographic variables and consumer preferences.

Binary Logistic Regression Analysis (or a profiling analysis) was applied to determine the influence of lifestyle and residential environment on the high purchase intention for hybrid products ($p < 0.05$) [14, 15].

RESULTS AND DISCUSSIONS

Consumer Profile and General Acceptability

The demographic analysis of the sample (n=150) confirmed a clear profile of the consumer open to food innovations:

The sample was predominantly characterized by urban residency (~ 80%), higher education levels (~65%), and a preponderance of women (~60). The urban environment suggests greater exposure to novel food trends and increased accessibility to niche markets (Fig 1).

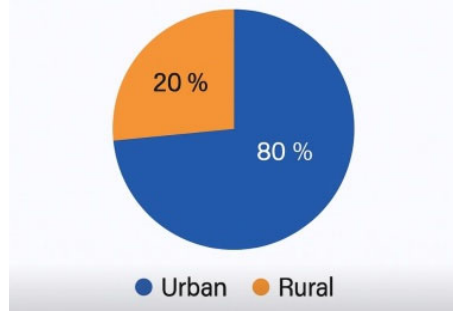

Fig 1 Distribution of the respondents residence environment

Education: A preponderance of individuals with higher education (~65%) was observed, indicating a correlation between the education level and the degree of awareness regarding nutritional and environmental benefits (Fig. 2).

Gender: Women constituted the majority of the sample (~60%), which confirms general trends in consumer studies where women are often the determining factor in

purchasing decisions regarding healthy and sustainable food products (Fig. 3).

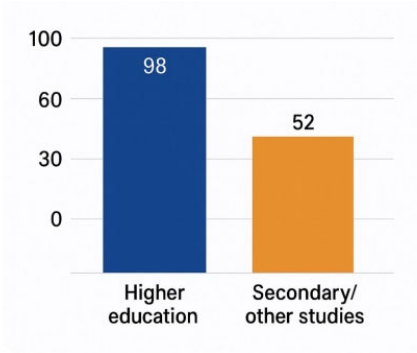

Fig. 2 Education level of participants

Overall Acceptability Score: The hybrid burger patty achieved a high mean overall acceptability score of 7.1±1.2 on the 9-point Hedonic Scale, indicating a strong positive response to the concept and execution. Purchase intention was also robust, with approximately ~77% of participants stating they were "Very willing" to purchase the product.

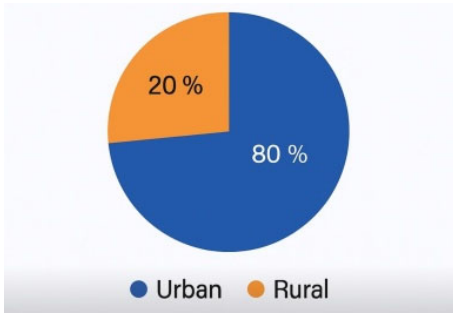

Fig. 3 Gender distribution

2. Influencing Factors and Acceptability

ANOVA results confirmed that lifestyle and residential environment exert a significant influence on the openness towards hybrid products ($p < 0.05$) (Figure 4). Specifically, urban consumers and those with higher education levels assigned significantly higher scores to both taste and texture (Table 1).

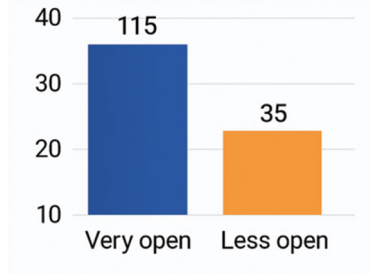

Fig. 4 Openness to hybrid products

General openness: Consumers exhibited increased overall acceptability towards the hybrid product concept, which was perceived as a balance between the traditional taste experience and nutritional benefits (reduced saturated fat intake, fiber content) (Fig. 5).

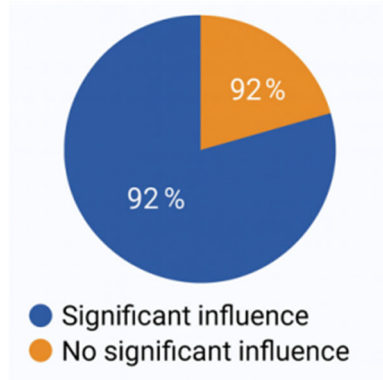

Fig. 5 Influence of lifestyle on acceptability

3. Critical Sensory Attributes

The analysis of preferences highlighted that the purchasing decision is primarily conditioned by sensory qualities, rather than solely by declared benefits [11, 13].

Taste and Flavor were considered the decisive factors. Acceptability is maximized when hybrid products faithfully replicate the taste and flavor of the traditional meat preparation (Table 2).

Texture represents a key differentiating factor. A texture that does not adequately mimic the juiciness and firmness of meat can lead to product rejection.

Table 1 The demographic profile of the sample and the influence of external factors

Caracteristic	Category	Observed frequency (N=150)	Share (%)	Conclusion on the segment
Living environment	Urban	~120	80%	The majority of target consumers come from urban areas.
	Rural	~30	20%	Minor segment, possibly with limited access to products/information.
Education level	Higher education	~98	65%	Correlated with increased awareness of nutritional benefits.
	Secondary/other	~52	35%	
Gen	Female	~90	60%	Women are the main decision-makers in purchasing healthy foods.
	Male	~60	40%	
Openness/purchase intention	Very open	~115	77%	Strong openness toward hybrid products as a sustainable alternative
Lifestyle influence	Significant influence ($p<0.05$)	N/A	92%	An active-healthy lifestyle is a major predictor of preference.

Table 2 Hierarchy of sensory and nutritional acceptability factors

Decision factors	Weight in final decision (%)	Evaluation of sensory acceptability	Implications in product formulation
Taste and aroma	45%	The most critical determining factor. Maximum acceptability if the taste resembles meat.	Requires high-quality flavor and umami solutions to replicate the traditional meat taste.
Texture	30%	Essential differentiation factor. Inadequate texture leads to rejection.	Optimal use of plant proteins to mimic meat fibers and juiciness.
Appearance (color, uniformity)	15%	Necessary condition to overcome the psychological barrier (perception of “fake meat”).	Use of natural pigments and homogeneous processing to achieve an appearance similar to the standard product.
Nutritional benefits	10%	Provides fiber, protein, and reduced fat. Attractive factor, but not decisive without good sensory quality.	Should be emphasized in marketing communication, but not at the expense of taste quality.
Total factors	100%	**Conclusion:** Sensory quality (80%) prevails over declared benefits (20%).	R&D efforts should focus on delivering a similar eating experience.

Appearance: Color and visual homogeneity are essential to overcome the psychological barrier associated with the perception of "fake meat" (Fig. 6). These findings underscore that manufacturers must prioritize research and development of formulations that ensure high sensory similarity (a "quasi-traditional experience") in order to accelerate market penetration [12, 16].

CONCLUSIONS

This study demonstrates the significant market potential of hybrid meat products, with growing acceptability among a well-defined consumer segment: young,

educated, urban residents who are proactive in adopting a healthy lifestyle.
The high mean acceptability score (7,1± 1,2) confirms the viability of the 75:25 beef/pea protein formulation.

Acceptability is strongly mediated by sensory quality, with taste (45\%) and texture (30\%) being the most decisive factors. The finding that a "Health-Conscious Lifestyle" is the strongest predictor of purchase intention (\text{OR} = 2.45) should guide future marketing efforts. Manufacturers who successfully integrate plant proteins without compromising these key sensory attributes will emerge as market leaders.

The current trend suggests a clear direction for the food industry: innovation based on sustainability and health, but validated through the sensory experience. By understanding and adapting to these requirements, the hybrid product market is poised for considerable expansion, while also supporting public health goals by offering accessible alternatives for reducing saturated fat intake.

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