

RABBIT (*Oryctolagus cunicus*) NUGGETS

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Abstract

This study aimed to determine the acceptability of rabbit nuggets in three different formulations, as perceived by evaluators. The findings revealed that rabbit nuggets had a golden-brown appearance, a slightly rabbit meat aroma, a slightly meat flavor, and a moderately tender texture, which were generally well-liked by the evaluators. While there were no significant differences in appearance and texture across the three formulations, the study found significant differences in aroma and taste. Formulation A was the most preferred, followed by Formulation B and Formulation C. These results provide valuable insights for product development and optimization, suggesting that rabbit meat can be a sustainable alternative to traditional protein sources. The study also highlights the potential for incorporating rabbit meat into processed food products, such as nuggets, to diversify protein intake and promote food security. Recommendations include encouraging the use of alternative protein sources like rabbit meat in food technology education and product development, as well as further research on the nutritional and health benefits of rabbit meat.

Keywords: Alternative source of protein, Nuggets, Rabbit, Rabbit meat.

INTRODUCTION

Background of Study

The food industry is ever evolving, with an increasing emphasis on alternative protein sources due to concerns about sustainability, nutrition, and ethical considerations. One such alternative protein source gaining attention is rabbit meat, a lean and highly nutritious meat with a lower environmental impact compared to traditional livestock (Para *et al.*, 2015). The acceptability of rabbit meat as nuggets is a topic of growing interest, as evidenced by several research studies. The readiness of consumers to accept rabbit meat as an alternative protein source has been explored in various contexts, including in Malaysia and the Philippines. For instance, a study conducted in Malaysia aimed to assess the readiness of Malaysians to accept rabbit meat as an alternative protein source (Idris *et al.*, 2023), while a study in the Philippines specifically looked at the acceptability of rabbit meat as an alternative meat source in Cavite (Research Publish Journals, n.d.).

Additionally, a survey revealed that the greatest acceptance of rabbit meat occurred in the population of adult men with higher income and educational levels (de Cerqueira Magalhães *et al.*, 2022). Furthermore, a study on the consumer acceptability of empanadas stuffed with rabbit meat found that respondents liked rabbit meat and declared it to taste good and palatable (Espiritu *et al.*, 2022). These findings provide valuable insights into the acceptability of rabbit meat, which can be considered in the context of researching the acceptability of rabbit meat as nuggets.

Rabbit meat can be processed into various forms, including rabbit nuggets, which have the potential to become a popular and sustainable food product. However, the acceptance of rabbit nuggets may vary among different segments of the population. The preferences of students and teachers in this field are of significant interest, as they are likely to influence future culinary trends

and teaching practices. Understanding their willingness to incorporate rabbit nuggets into their coursework or future careers is essential for guiding and informing food industry practices.

Furthermore, limited research has been conducted on the preferences of students and teachers in food services management towards alternative protein sources, especially rabbit nuggets. This quantitative research aimed to address this gap by employing a structured survey to collect data from a sample of students and teachers (Clark & Davis, 2018). The use of a quantitative approach will enable the researchers to analyze the data objectively and draw statistically supported conclusions.

By gaining insights into the preferences of these teachers, students and cooks, this study can provide valuable information for educators and the food industry. This research will not only expand the understanding of the acceptance of alternative protein sources but also contribute to sustainable food practices in the field of food service management.

Statement of the Problem

This experimental research determined the acceptability of rabbit nuggets in three formulations. Specifically, the study sought to answer the following questions about the level of acceptability of rabbit nuggets as to appearance, aroma, taste, and texture and general acceptability in three formulations as perceived by the evaluators and Is there a significant difference in the acceptability of rabbit nuggets as to appearance, aroma, taste, and texture and general acceptability using the three formulations.

Significance of the Study

The findings of the study are significant to the following:

Teachers. This research could be significant for food and service teachers as it provides an alternative protein source. Exploring rabbit meat's nutritional value, culinary applications, and sustainability could broaden teaching opportunities, offering students a diverse understanding of protein options and culinary skills. It also introduces discussions on sustainable food sources, addressing environmental and health considerations in the culinary field.

Students. This research could provide students with a unique avenue to explore sustainable protein sources, animal husbandry, nutrition, and food science. It could also offer insights into alternative diets, ethical consumption, and the environmental impact of food production. Additionally, studying rabbit nuggets might encourage innovation in food technology and entrepreneurship among students.

Farmers. Rabbit farmer will encourage to engage more in raising rabbit. It can also help them generate more income.

Nutritionists. Understanding the nutritional content and benefits of rabbit nuggets could be valuable for a nutritionist. It could offer insights into protein content, fat composition, vitamins, and minerals, helping them advise on dietary choices and health recommendations.

Community. This study can have significant impacts on communities. It can provide alternative, potentially more sustainable sources of protein, offer economic opportunities for local farmers, and contribute to food security in regions where rabbit farming is viable. Additionally, understanding the nutritional value of rabbit meat can also benefit dietary diversity and health considerations within communities.

Manufacturers. This study could be significant for manufacturers as it might provide insights into consumer preferences, market demands, or production techniques related to rabbit-based

products. Understanding consumer interest in alternative protein sources like rabbit meat could guide manufacturers in creating new products that align with evolving dietary preferences or market trends.

Researchers. This study will make them apply all the knowledge they learned, and it will help them broaden it through experience.

Future Researchers. This study will serve as a basis for future development.

LITERATURE REVIEW

Theoretical Framework

This study was anchored Albert Bandura's Social Cognitive Theory, originally known as the Social Learning Theory (SLT), emphasizes the dynamic and reciprocal interaction of the person, environment, and behavior. It proposes that learning occurs in a social context and is not solely determined by classical and operant conditioning. The theory highlights the role of observational learning, imitation, and self-regulation in human behavior. In this study, Bandura's Social Cognitive Theory can be applied to understand how children's behavior and food preferences are influenced by observing others, such as parents, siblings, or peers, in a social environment. The theory can help explore how the observation of others consuming rabbit nuggets may impact children's attitudes and choices regarding this food item.

The Health Belief Model (HBM), developed by Hochbaum, Rosenstock, and Kegels is anchored in this study as a theoretical framework widely used to explain and predict health-related behaviors. The model contains several primary concepts that predict why people will take action to prevent, screen for, or control illness conditions. These concepts include the individual's perceptions of the severity of the threat, the benefits of avoiding the threat, and factors influencing the decision to act, such as barriers, cues to action, and self-efficacy. In this study, HBM can be applied to understand and predict the factors influencing individuals' perceptions and behaviors related to the consumption of rabbit nuggets. This could include assessing the perceived threat of health risks, the perceived benefits of consuming rabbit nuggets, the barriers to adopting or avoiding this behavior, and the cues to action that may influence individuals' decisions. By applying HBM, researchers can gain insights into the factors that drive individuals' decisions and behaviors related to consuming rabbit nuggets and develop strategies to promote healthy behaviors.

Further, Hofstede's cultural dimensions theory, a dominant concept in cross-cultural psychology and international management, identifies six key dimensions of national cultures: power distance, uncertainty avoidance, individualism-collectivism, masculinity-femininity, and long-term orientation. These dimensions have been widely used to understand cultural differences and their implications for various aspects of society, including business and communication. In this study, Hofstede's cultural dimensions are examined to understand how cultural factors may influence various aspects of the topic. For example, the cultural dimension of indulgence vs. restraint can be applied to understand how different cultures' attitudes toward enjoying life and having fun may impact the acceptance and consumption of "Rabbit Nuggets" as a food product. Similarly, the dimension of long-term vs. short-term orientation can be used to explore how different cultures' perspectives on the future and tradition may affect the adoption of "Rabbit Nuggets" in their diets. By incorporating Hofstede's cultural dimensions theory into the theoretical framework, the research on "Rabbit Nuggets" can gain valuable insights into the cultural factors that may shape consumer behaviors, food preferences, and the acceptance of new food products across different societies. This

framework will provide a solid foundation for the study and contribute to a deeper understanding of the cultural influences on food consumption and product acceptance.

Conceptual Framework

The conceptual framework of the study is illustrated in Figure 1 showing the input, throughout, and output.

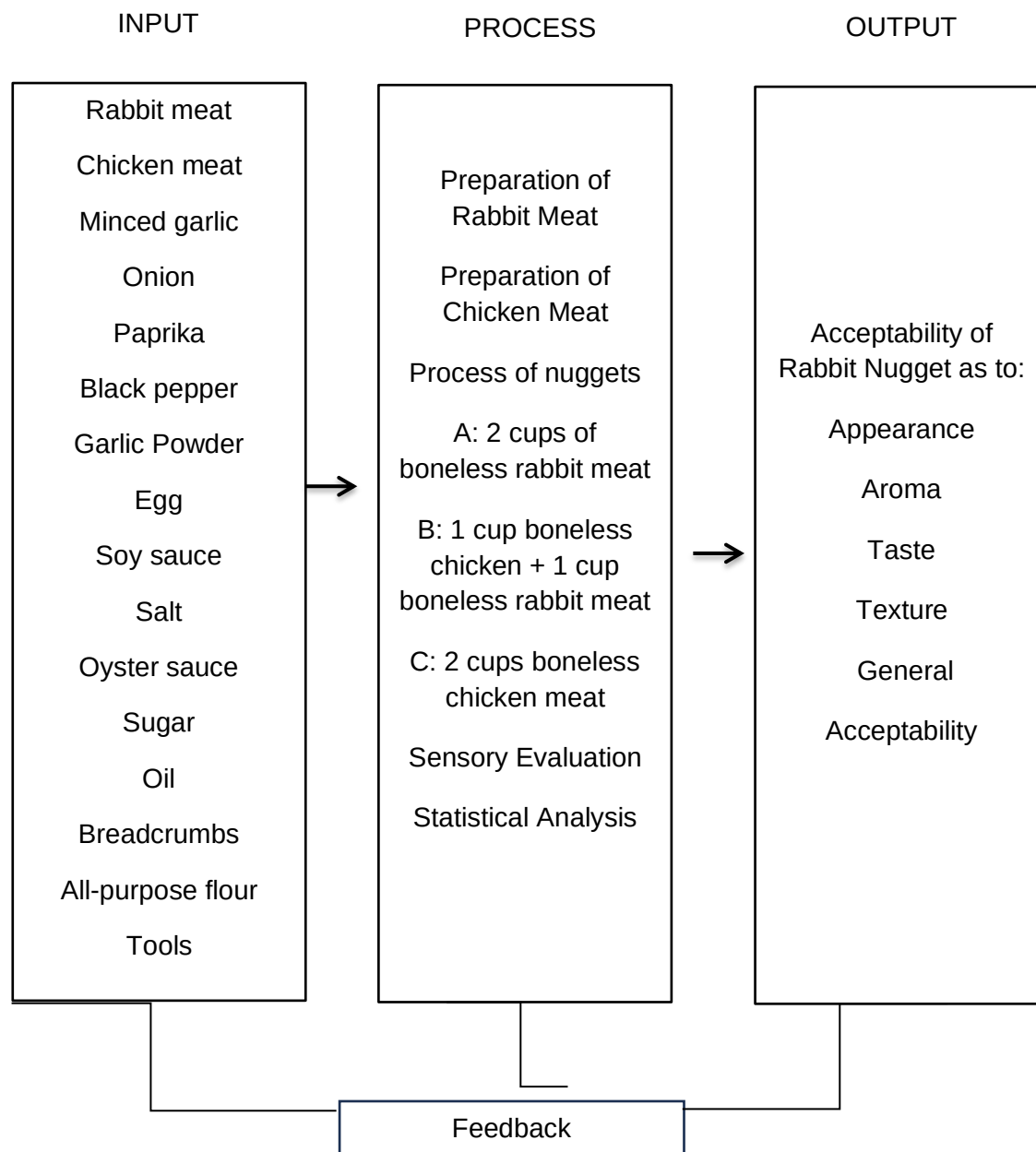


Figure 1. Conceptual Work

Figure 1. Shows the input which is the ingredients and tools and equipment in the rabbit nuggets.

The process was the preparation of rabbit and chicken, the process of nuggets and the measurement of the three formulations of nuggets, while output included the Acceptability of the Rabbit Nuggets as to appearance, aroma, taste, texture, and general acceptability.

RESEARCH METHOD

Research Design

The experimental method of research was used in this study. According to Burns and Grove (2003) define a research design as "a blueprint for conducting a study with maximum control over factors that may interfere with the validity of the findings". Experimental research involves gathering data that describes events and then organizes, depicts, and describes the data collection. It often uses visual aids such as graphs and charts to aid the reader in understanding the data distribution. This study focuses on Rabbit meat as an alternative source of protein, due to in demand products of meat. The research approach is experimental and quantitative. According to Creswell (2014), quantitative research involves the collection and analysis of numerical data to understand patterns, relationships, and trends. It employs statistical methods to draw objective conclusions and generalize findings to a larger population.

Respondents of the Study

This study covered by 30 respondents composed of 10 food service and management students, 10 expert food technology teachers and 10 cooks in the locality of Miagao. All the participants were purposefully selected.

Table 1. Evaluators profile

Evaluators	Frequency	Percentage
Cooks in Miagao	10	33.33%
Expert FoodTech Teachers	10	33.33%
BTVTED FSM Students	10	33.33%
Total	30	100%

Research Instruments

The research instrument used to gather data were sample items of rabbit nuggets and survey form. There are three types of items (1) rabbit meat nuggets (2) mixed rabbit and chicken meat nuggets and (3) chicken meat nuggets. The study utilized the sensory evaluation which was validated by experts and the panel of evaluators. This research instrument contained the title of the study, direction, and criteria on how to evaluate the finished product in terms of appearance, aroma, color, taste, texture, and general acceptability.

The sensory evaluation was used as an instrument in evaluating the sensory qualities and level of acceptability of the rabbit nuggets in terms of appearance, aroma, color, taste, texture, and general acceptability.

The study used the evaluation sheet employing the Nine-Point Hedonic Scale to determine the evaluator's general acceptability of the Rabbit Nuggets and Five-Point Likert Scale to determine the evaluator's perception of Rabbit Nuggets as to appearance, aroma, taste, texture.

Data Gathering Procedure

The data gathering procedure is composed of different phases:

Phase I- Preparation of ingredients and tools and equipment

Phase II- Processing of the chicken and rabbit meat and Preparation of nuggets

Phase- III- Evaluation of the product

Phase I -Preparation of Materials, Tools, and Equipment

The researchers prepared the necessary ingredients, tools, and equipment.

Phase II - Processing of the chicken and rabbit meat and Preparation of nuggets

Procedure:

1. Preparing the rabbit and chicken meat
2. Seasoning
3. Forming
4. Coating
5. Cooking

Phase III – Evaluation of the product

After the recipe is standardized, the finished product of the rabbit nuggets is prepared for evaluation. The 30 respondents were given the product and asked to evaluate using the sensory characteristics as to appearance, aroma, taste, texture, and general acceptability.

Analysis Procedure

After the evaluation of the finished product, responses of the evaluators are collected by the researchers. The data gathered are recorded, tallied, tabulated, and summarized and computed using the appropriate statistic tools. Then, the data are analyzed and interpreted.

Frequency count, Percentage, Mean, and Standard Deviation is used to determine the level of acceptability of the rabbit nuggets in terms of appearance, aroma, color, taste, texture, and general acceptability.

RESULTS AND DISCUSSION

Descriptive Analysis

The findings of the study revealed that the general acceptability of Rabbit Nuggets in Three Formulations. To describe the data, mean and standard deviation were used.

Inferential Data Analysis

Kruskal Wallis Test was used to determine if there are statistically significant difference between the three formulations.

Acceptability of Rabbit Nuggets

The general acceptability of the Rabbit Nuggets in terms of appearance, aroma, taste, and texture of the three formulations was determined using the Nine-Point Hedonic Scale and Five-Point Likert Scale.

The table above presents the Level of Acceptability of Rabbit Nuggets in terms of Appearance, Aroma, Taste, Texture and General Acceptability. In Appearance, it showed that the evaluator's perceptions of Formulations A (M= 4.00, SD=0.50), B (M= 3.77, SD=0.42), and C (M= 3.83, SD=0.45) was Golden-Brown, which is generally considered an acceptable and desirable color for fried or breaded meat products. In terms of Aroma, Formulation A was rated as having a Slightly Rabbit Meat Aroma (M= 4.07, SD=0.49), which is expected for a product containing rabbit meat.

Formulation B had a Balanced Chicken and Rabbit Aroma ($M= 3.40$, $SD=0.41$), and Formulation C was perceived as having Chicken Meat Aroma ($M= 2.50$, $SD=0.36$).

Variable	M(SD)	Description
Appearance		
Formulation A	4.00 (0.50)	Golden Brown
Formulation B	3.77 (0.42)	Golden Brown
Formulation C	3.83 (0.45)	Golden Brown
Aroma		
Formulation A	4.07 (0.49)	Slightly Rabbit Meat
Formulation B	3.40 (0.41)	Balance Chicken and Rabbit
Formulation C	2.50 (0.36)	Chicken Meat
Taste		
Formulation A	4.20 (0.39)	Slight Rabbit Meat Flavor
Formulation B	3.47 (0.55)	Slightly Rabbit Meat Flavor
Formulation C	2.40 (0.47)	Chicken Flavor
Texture		
Formulation A	3.53 (0.69)	Moderately Tender
Formulation B	3.53 (0.53)	Moderately Tender
Formulation C	3.67 (0.61)	Moderately Tender
General Acceptability		
Formulation A	7.53 (0.50)	Liked Very Much
Formulation B	7.23 (0.88)	Liked Very Much
Formulation C	7.77 (0.61)	Liked Very Much

Table 2 The level of acceptability of Rabbit Nuggets as to the appearance, aroma, taste and texture in the three formulations as perceived by evaluators.

Considering the Taste, Formulation A was rated as having a Slight Rabbit Meat Flavor ($M= 4.20$, $SD=0.39$), since it has 2 cups of pure rabbit meat. Formulation B had a Slightly Rabbit Meat Flavor ($M= 3.47$, $SD=0.55$), since it has 1 cup of pure rabbit meat and 1 cup pure chicken meat, while Formulation C was perceived as having a Chicken Flavor ($M= 2.40$, $SD=0.47$), since it has 2 cups of pure chicken meat. In terms of Texture, it showed that the evaluator's perceptions of Formulations A ($M= 3.53$, $SD=0.69$), B ($M= 3.53$, $SD=0.53$), and C ($M= 3.67$, $SD=0.61$) was Moderately Tender, which is a desirable texture for a nugget-style product. In General Acceptability, it showed that the evaluator's perceptions of Formulations A ($M= 7.53$, $SD=0.50$), B ($M= 7.23$, $SD=0.88$), and C ($M= 7.77$, $SD=0.61$) was Liked Very Much.

The findings of the study conform with the study of Espiritu et al, (2022) with regards to taste, which stated that rabbit meat taste good and palatable. It also conforms with study of Hongma and Zhiqi (2012), with regards to texture, which stated that rabbit meats are tender. Furthermore, the result of this study conforms with the study of Adique V. et al., (2009) with regards to acceptability, which stated that rabbit meat can be an alternative source of protein.

Table 3. Result of the Kruskal Wallis Test of significance between the perception of the evaluators as to appearance, aroma, taste, and texture in the three formulations of Rabbit Nuggets.

Factors		Sum of Squares	df	Mean Square	F	Sig.
Appearance	Between Groups	0.29	2	0.14	0.69	0.511
	Within Groups	5.63	27	0.21		
	Total	5.91	29			
Aroma	Between Groups	12.36	2	6.18	34.21	0.000
	Within Groups	4.88	27	0.18		
	Total	17.23	29			
Taste	Between Groups	16.42	2	8.21	36.64	0.000
	Within Groups	6.05	27	0.22		
	Total	22.48	29			
Texture	Between Groups	0.12	2	0.06	0.16	0.852
	Within Groups	10.06	27	0.37		
	Total	10.18	29			
General Acceptability	Between Groups	1.43	2	0.72	1.55	0.231
	Within Groups	12.50	27	0.46		
	Total	13.94	29			

*significant at $p < 0.01$

The Kruskal-Wallis's test was conducted to assess the significance of differences in evaluator perception across three formulations of Rabbit Nuggets in terms of appearance, aroma, taste, texture, and overall acceptability.

The Kruskal-Wallis test for appearance yielded a non-significant result ($\chi^2(2) = 0.69$, $p = 0.511$), indicating that there were no significant differences in perception of appearance between the three formulations of Rabbit Nuggets. For aroma, the Kruskal-Wallis test revealed a highly significant difference between formulations ($\chi^2(2) = 34.21$, $p < 0.001$). Post-hoc tests would be necessary to determine which specific formulations differ significantly. Similarly, the Kruskal-Wallis test for taste showed a highly significant difference ($\chi^2(2) = 36.64$, $p < 0.001$) between the formulations of Rabbit Nuggets. This suggests that evaluators perceived notable differences in taste across the different formulations. The Kruskal-Wallis test for texture indicated no significant difference between formulations ($\chi^2(2) = 0.16$, $p = 0.852$). Thus, perceptions of texture were similar across the three formulations of Rabbit Nuggets. In terms of overall acceptability, the Kruskal-Wallis test did not reveal a significant difference ($\chi^2(2) = 1.55$, $p = 0.231$) between formulations. This suggests that despite differences in aroma and taste, overall acceptability did not vary significantly among the Rabbit Nuggets formulations.

The results indicate that while there were significant differences in aroma and taste perceptions among the evaluators for the Rabbit Nuggets formulations, appearance, texture, and overall acceptability did not show significant variations. This suggests that aroma and taste attributes may be critical factors influencing perception and preference among evaluators, whereas appearance, texture, and overall acceptability may be less influential or more consistent across different formulations.

The findings of the study conform with the study of Esmail et al, (2022) rabbit meat is generally accepted as an alternative meat by consumers in terms of its healthiness, taste, and price. One-way ANOVA analysis found a significant difference in the acceptability of rabbit meat in terms of taste.

Furthermore, the result of this study conforms with the study "Quality and Consumer Acceptance of Meat from Rabbits Fed Diets in Different Production Systems" by Gasco et al. (2023), which showed that the sensory characteristics in the general acceptability of the meat did not show significant differences using an ANOVA test.

Table 4. The post hoc test was conducted to compare the mean differences between the different formulations of rabbit nuggets in terms of aroma and taste.

Variable	Formulation		Mean Difference	Std. Error	Sig.
Aroma	Formulation A	Formulation B	.66500*	.19004	.005
		Formulation C	1.56600*	.19004	.000
	Formulation B	Formulation A	-.66500*	.19004	.005
		Formulation C	.90100*	.19004	.000
	Formulation C	Formulation A	-1.56600*	.19004	.000
		Formulation B	-.90100*	.19004	.000
Taste	Formulation A	Formulation B	.73300*	.21173	.005
		Formulation C	1.80200*	.21173	.000
	Formulation B	Formulation A	-.73300*	.21173	.005
		Formulation C	1.06900*	.21173	.000
	Formulation C	Formulation A	-1.80200*	.21173	.000
		Formulation B	-1.06900*	.21173	.000

*The mean difference is significant at the 0.01 level.

To further explore the differences among the rabbit nugget formulations in terms of aroma and taste, post hoc tests were conducted. Significant mean differences were found between various formulations, as summarized in Table 4.

For aroma, significant differences were observed between Formulation A and Formulation B (Mean Difference = 0.665, SE = 0.190, $p = 0.005$), as well as between Formulation A and Formulation C (Mean Difference = 1.566, SE = 0.190, $p < 0.001$). Additionally, Formulation B and Formulation C differed significantly in aroma (Mean Difference = 0.901, SE = 0.190, $p < 0.001$).

Similarly, in terms of taste, significant differences were noted between Formulation A and Formulation B (Mean Difference = 0.733, SE = 0.212, $p = 0.005$), as well as between Formulation A and Formulation C (Mean Difference = 1.802, SE = 0.212, $p < 0.001$). Formulation B and Formulation C also exhibited significant differences in taste (Mean Difference = 1.069, SE = 0.212, $p < 0.001$).

The post hoc test results reveal significant differences in both aroma and taste among the three rabbit nugget formulations. Formulation A had the highest scores for both aroma and taste, followed by Formulation B, and Formulation C had the lowest scores. These findings provide valuable insights for product development and optimization, as they indicate that Formulation A is the most preferred in terms of aroma and taste.

CONCLUSION

Summary of the Problem

This experimental research determined the acceptability of rabbit nuggets in three formulations. Specifically, the sought to answer the following questions:

1. What is the level of acceptability of rabbit nuggets as to appearance, aroma, taste, and texture and general acceptability in three formulations as perceived by the evaluators?
2. Is there a significant difference in the acceptability of rabbit nuggets as to appearance, aroma, taste, and texture and general acceptability using the three formulations?

Formulations Overview

Formulation A: 2 cups of pure rabbit meat.

Formulation B: A blend of rabbit and chicken meat.

Formulation C: 2 cups of pure chicken meat.

Sensory Evaluation Results

Appearance: Evaluators rated Formulation A (M=4.00, SD=0.50) highest, followed by B (M=3.77, SD=0.42) and C (M=3.83, SD=0.45), with all considered acceptable.

Aroma: Formulation A had a slightly rabbit meat aroma (M=4.07, SD=0.49), while B had a balanced chicken and rabbit aroma (M=3.40, SD=0.41), and C was perceived as having a chicken meat aroma (M=2.50, SD=0.36).

Taste: Formulation A was rated for a slight rabbit flavor (M=4.20, SD=0.39), B had a slightly rabbit flavor (M=3.47, SD=0.55), and C was perceived as having a chicken flavor (M=2.40, SD=0.47).

Texture: All formulations were rated as moderately tender (A: M=3.53, SD=0.69; B: M=3.53, SD=0.53; C: M=3.67, SD=0.61).

General Acceptability: Formulation A scored highest (M=7.53, SD=0.50), followed by B (M=7.23, SD=0.88) and C (M=7.77, SD=0.61), indicating they were liked very much.

Statistical Analysis

The Kruskal-Wallis test results indicated:

Appearance: No significant differences ($\chi^2(2) = 0.69$, $p = 0.511$).

Aroma: Significant differences among formulations ($\chi^2(2) = 34.21$, $p < 0.001$).

Taste: Significant differences noted ($\chi^2(2) = 36.64$, $p < 0.001$).

Texture: No significant differences ($\chi^2(2) = 0.16$, $p = 0.852$).

General Acceptability: No significant differences found ($\chi^2(2) = 1.55$, $p = 0.231$).

The post hoc tests confirmed that Formulation A was preferred for both aroma and taste.

Summary of the Findings

The study found that:

Rabbit nuggets were perceived to have a golden-brown appearance (M=4.00, SD=0.50).

The aroma was rated as slightly rabbit meat-like (M=4.07, SD=0.49).

The taste was perceived as slightly rabbit flavored (M=4.20, SD=0.39).

The texture was described as moderately tender (M=3.53, SD=0.69).

General acceptability was rated as liked very much (M=7.53, SD=0.50).

The Kruskal-Wallis test results reinforced that while there were no significant differences in appearance and texture perceptions among the formulations, significant differences were observed in aroma and taste.

Conclusions

Based on the findings of the study, the following conclusions were drawn: Rabbit meat can be a sustainable alternative to traditional protein sources, offering an opportunity to diversify protein intake and promote food security. Rabbit nuggets, which can be marketed for their pleasing appearance and unique taste, provide a balanced flavor and good texture. Additionally, rabbit meat is a nutrient-dense, lean protein that is low in calories and cholesterol, while being high in essential vitamins, minerals, and healthy fats.

Recommendations

The following recommendations are hereby given:

Food Technology teachers should encourage students to use alternative sources of protein, such as rabbit meat, in making processed foods like nuggets. Additionally, they may attend training and seminars to stay updated on current food innovations. Students are recommended to use different protein sources, including rabbit meat, as ingredients in making processed foods like nuggets and other products. Rabbit farmers are encouraged to engage more in raising rabbits. Nutritionists can offer insights into the protein content, fat composition, vitamins, and minerals of rabbit meat, helping them advise on dietary choices and health recommendations. The community should consider alternative, potentially more sustainable sources of protein like rabbit meat. Manufacturers should innovate with alternative protein sources like rabbit meat in creating new products that align with evolving dietary preferences or market trends. Future researchers are encouraged to study other protein sources like rabbit meat to discover different food products.

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