UNLOCKING THE NATURAL UMAMI OF BATAAN OYSTERS: A PRODUCT INNOVATION AND CONSUMER ACCEPTABILITY STUDY OF PURE FERMENTED OYSTER SAUCE

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ABSTRACT

Understanding electrical hazards and safety measures among Grade 12 students from Letran is crucial for enhancing safety and preventing accidents. This study investigates the levels of awareness regarding electrical hazards and safety measures among 92 Grade 12 students at Letran-Bataan, divided equally into 46 males and females, focusing on gender, academic tracks, and their implications for community and literacy development. Using a quantitative approach, a mixed-mode survey was conducted with a purposive sample of participants. The analysis included descriptive statistics, parametric, and non-parametric tests. Results indicate a high overall awareness level among Grade 12 students regarding electrical hazards and safety measures. While gender-based differences were observed, with males exhibiting higher awareness levels in safety measures, there was no significant difference in hazard awareness between genders, suggesting similar levels of hazard awareness among male and female students. Tailored educational interventions are recommended, especially across diverse tracks, to effectively enhance awareness. The study advocates institutional policies integrating safety education, contributing to community literacy development, and improving safety standards. These findings underscore the importance of targeted interventions for enhancing electrical safety awareness among Grade 12 students at Letran-Bataan, offering valuable insights for educational and community safety initiatives.

Keywords: *Electrical hazards, Safety measures, Grade 12 students, Awareness levels, Gender differences, Academic track, Technical- track, Community development, Literacy initiatives.*

INTRODUCTION

Existing studies have highlighted the nutritional and economic potential of oysters as valuable marine resources. Oysters are nutrient-dense, containing high levels of essential amino acids, omega-3 fatty acids, and trace minerals such as zinc, copper, and iodine (Moniruzzaman et al., 2021; Loaiza Iván et al., 2023). Furthermore, bioactive compounds found in oysters exhibit antioxidant, antimicrobial, and bone health–promoting properties, contributing to their growing reputation as a functional food (Molagoda et al., 2022; Selvakumari Ulagesan et al., 2022).

These characteristics suggest that oyster-based products can meet the increasing consumer demand for foods that are both nutritious and sustainable. From an environmental standpoint, farmed bivalves such as oysters and mussels provide high nutrient density with relatively low greenhouse gas emissions compared to many other protein sources (Bianchi et al., 2022).

However, despite the abundance of oysters and the rising demand for clean, minimally processed condiments, there remains a limited number of locally developed, innovative food products that make full use of Bataan's marine resources. This gap reflects the broader trend in which many local farms and fisheries produce high-quality raw materials but lack product innovation and value-adding initiatives. Additionally, the market lacks a clean-label, pure oyster-based condiment that highlights the natural oyster essence in a patis-like form—most available options remain commercialized oyster sauces mixed with soy and other additives.

This study sought to bridge that gap by developing and evaluating a pure oyster-based sauce that excludes soy, sugar, and artificial ingredients. Inspired by the recent innovation of a mussel-based patis developed by students and researchers from the University of the Philippines Visayas (Encarnacion & Encarnacion, 2025), the study aimed to create a product that highlights the authentic umami flavor of oysters while supporting the local oyster industry through better utilization of abundant marine resources.

Statement of the Problem

This study aimed to evaluate the sensory acceptability and perceived marketability of a pure oyster-based sauce developed through the natural fermentation of locally sourced talaba (oysters) from Bataan. Despite the province's abundance of oysters and its potential as a hub for sustainable aquaculture, their utilization in value-added and innovative food products remained limited. Most oyster sauces currently available in the market were mixed with soy sauce, sugar, starch, and artificial

flavorings, which often diminished the natural umami flavor and nutritional integrity of oysters. At the time of the study, there was no widely available pure, additive-free oyster sauce that highlighted the authentic flavor and health benefits of locally harvested oysters while catering to the growing demand for clean-label, minimally processed condiments.

The study addressed this gap by developing and assessing the consumer acceptability and market potential of a naturally fermented, pure oyster-based sauce as an innovative condiment alternative. Specifically, the study evaluated consumer perceptions through sensory testing and structured questionnaires, comparing the pure oyster-based sauce to commercial oyster sauce and traditional patis to determine differences in acceptability and market potential.

The study addressed the following research questions:

1. What was the demographic profile of the respondents in terms of:

a. Age

b. Monthly Income

c. Frequency of Condiment Use

d. Most Used Condiment

2. What was the level of acceptability of the three sauce samples—Sample A (experimental pure oyster-based sauce), Sample B (commercial oyster sauce), and Sample C (traditional patis)—in terms of:

a. Taste

b. Aroma

c. Color/Appearance

d. Saltiness

e. Texture

3. Was there a significant difference in the acceptability ratings between the pure oyster-based sauce, commercial oyster sauce, and traditional patis in terms of taste, aroma, color/appearance, saltiness, and texture?

4. What was the perceived marketability of the pure oyster-based sauce based on:

a. Purchase intent

b. Perceived uniqueness of the product

c. Willingness to recommend to others

d. Expected frequency of use

e. Price expectation

f. Perceived healthiness

By addressing these research questions, the study sought to determine whether a pure, naturally fermented oyster sauce could achieve consumer acceptability and competitive marketability as a clean-label alternative to conventional condiments. The findings were expected to provide insights that would support local product innovation, enhance sustainable aquaculture utilization, and promote community-based food entrepreneurship in Bataan.

Hypothesis

Null Hypothesis (H_0):

There is no significant difference in the level of sensory acceptability among the three sauce samples—Sample A (pure oyster-based sauce), Sample B (commercial oyster sauce), and Sample C (traditional patis)—in terms of taste, aroma, color/appearance, saltiness, and texture.

Alternative Hypothesis (H_1):

There is a significant difference in the level of sensory acceptability among the three sauce samples—Sample A (pure oyster-based sauce), Sample B (commercial oyster sauce), and Sample C (traditional patis)—in terms of taste, aroma, color/appearance, saltiness, and texture.

Objectives

Specifically, the study sought to:

1. Develop a pure, naturally fermented oyster-based sauce from locally sourced talaba as an innovative, value-added product utilizing underexploited marine resources;

2. Determine the demographic profile of respondents in terms of age and frequency of consuming condiments such as oyster sauce or patis;

3. Assess the level of acceptability of the pure oyster-based sauce in terms of taste, aroma, color/appearance, saltiness, and texture;

4. Compare the acceptability ratings of the pure oyster-based sauce with commercial oyster sauce and traditional patis, identifying any significant differences in sensory perceptions;

5. Evaluate the perceived marketability of the pure oyster-based sauce based on purchase intent, perceived uniqueness, willingness to recommend, expected frequency of use, price expectation, perceived quality, and perceived healthiness;

6. Identify potential improvements in the formulation or presentation of the pure oyster-based sauce based on consumer feedback; and

Significance of the Study

This study held significant value for multiple sectors involved in local food production, innovation, and community development. By transforming an abundant yet underutilized marine resource into a clean-label, naturally fermented condiment, the research contributed to sustainable food practices and inclusive local economic growth (Bianchi et al., 2022). It aligned with the growing movement toward health-conscious and environmentally friendly food consumption while highlighting the potential of local aquaculture products to serve both nutritional and livelihood goals.

Local Producers and Farmers. The study offered a value-adding opportunity for oyster farmers and small-scale producers in Bataan by demonstrating how raw talaba could be processed into a viable and marketable condiment. Through product innovation, oyster farmers diversified their income sources, reduced post-harvest losses, and established small-scale fermentation enterprises that promoted economic resilience within coastal communities (Rustia et al., 2025).

Consumers. The development of a pure oyster-based sauce provided a healthier, soy-free, and additive-free alternative to commercial oyster sauces. This aligned with the increasing consumer demand for clean-label and nutrient-rich condiments that supported healthier dietary choices. It also catered to individuals seeking minimally processed, locally sourced products that reflected authentic Filipino flavors (Loaiza Iván et al., 2023; Selvakumari Ulagesan et al., 2022; García-Salirrosas et al., 2024).

Researchers and Students. The study contributed to the growing body of literature on fermentation, sensory science, and sustainable product development. It served as a model for future studies exploring the utilization of regional resources and traditional processes in food innovation. The findings also supported academic programs focused on food science, entrepreneurship, and community-based product design (Molagoda et al., 2020; Molagoda et al., 2022).

Community. Beyond its academic and industrial implications, the research promoted collaboration with local oyster farmers, vendors, and small business owners in Bataan. By exploring the potential integration of the product into existing local markets, the study fostered community participation, entrepreneurship, and sustainable use of marine resources. It also contributed to local economic empowerment by transforming an abundant natural resource into a marketable and health-oriented product (Cpredo, 2023).

Scope and Limitations

This study focused on the development, sensory evaluation, and marketability assessment of a pure oyster-based sauce produced through the natural fermentation of talaba (oysters) from Bataan. The research was exploratory, aiming to provide preliminary insights into consumer acceptability and market potential rather than fully generalizable conclusions.

The scope included preparation of the sauce using a small-scale, salt-based fermentation method without additives. Sensory evaluation covered taste, aroma, color/appearance, saltiness, and texture, while marketability was assessed through purchase intent, perceived uniqueness, willingness to recommend, expected frequency of use, price expectation, perceived quality, and perceived healthiness. The study involved 50 to 100 purposively selected respondents from Bataan, including culinary students, food vendors, and local consumers. This sample size was sufficient to capture diverse perspectives for exploratory sensory and marketability testing.

The study was limited to sensory and consumer evaluation and did not include full nutritional profiling or shelf-life testing due to time and equipment constraints. These aspects were important for commercial production but were recommended for future research. Additionally, the small-scale fermentation setup and localized sample might not have fully

Definition of Terms

Amino Acids. The building blocks of proteins that contribute to taste and nutritional value. During fermentation, amino acids such as glutamic acid, glycine, and alanine enhance the umami and overall flavor of the oyster sauce (Molagoda et al., 2022).

Bataan Oysters. Locally harvested oysters from the province of Bataan, Philippines, known for their freshness and quality. They serve as the main raw material for the experimental sauce in this research.

Clean-Label. Food products made with simple, recognizable ingredients and free from artificial additives. In this study, it refers to the oyster sauce developed without preservatives, flavor enhancers, or synthetic components (Kovacs & Keresztes, 2022b).

Clean Production. A sustainable method of food processing that minimizes waste and avoids harmful chemicals. In this study, it refers to the natural and environmentally friendly preparation of the oyster sauce.

Commercial Oyster Sauce. A commonly available condiment made from oyster extract but often mixed with soy sauce, sugar, starch, and artificial additives to enhance taste and texture.

Condiment. A seasoning or sauce added to food to enhance flavor. Examples include oyster sauce, fish sauce, soy sauce, and

vinegar. The study focuses on developing an innovative condiment made purely from oysters.

Fermentation. A biological process involving microorganisms that convert organic compounds (such as proteins and carbohydrates) into simpler substances. In this study, fermentation is used to break down oyster meat and develop flavor compounds naturally (Han et al., 2023).

Microorganisms. Microscopic living organisms such as bacteria and yeast that play a vital role in the fermentation process by converting organic matter into flavorful compounds (Liu et al., 2024).

Natural Fermentation. A slow, unassisted fermentation process that relies on naturally occurring microorganisms and salt, rather than added enzymes or starters, to break down the food and develop flavor (Encarnacion & Encarnacion, 2025).

Oyster Extract. A liquid obtained after fermentation or cooking of oysters, containing concentrated umami flavor and nutrients. In this study, it refers to the natural liquid produced from fermented oysters used as the main base of the sauce.

Patis (Fish Sauce). A traditional Filipino condiment made through the fermentation of small fish with salt, known for its strong aroma and salty, umami-rich flavor. It is used as a point of comparison in this study.

Proteolysis. A biochemical process in which proteins are broken down into smaller peptides and amino acids by enzymes. This natural breakdown occurs during fermentation and is responsible for developing the savory taste of the oyster sauce (Hakimi et al., 2022).

Pure Oyster-Based Sauce. The experimental product developed in this research, made through natural fermentation of oysters without the addition of soy sauce, sugar, starch, preservatives, or artificial flavors. It aims to retain the natural umami of oysters while offering a healthier, clean-label alternative to conventional condiments.

Rice Koji. Steamed rice inoculated with the fermentation mold Aspergillus oryzae, which produces enzymes that break down proteins and other complex compounds during fermentation. In this study, rice koji is used as a natural fermentation starter to facilitate the breakdown of oyster proteins, enhancing the development of natural umami flavor in the pure fermented oyster sauce.

Sensory Attributes. The characteristics of food that can be perceived by the senses—taste, aroma, color/appearance, texture, and appearance. These are used to evaluate consumer acceptability of the product (Kovacs & Keresztes, 2022b).

Shelf Life. The period during which a food product remains safe to consume and retains its desired sensory, chemical, and physical qualities. Although not tested in this study, shelf life is an important factor in future product development.

Sustainable Aquaculture. The responsible cultivation of aquatic species such as oysters that minimizes environmental impact and supports long-term ecological balance (Bianchi et al., 2022).

Taste (Umami). One of the five basic tastes, often described as savory or meaty. It is produced by compounds such as glutamic acid found in protein-rich foods like oysters and contributes significantly to the flavor profile of fermented condiments (Molagoda et al., 2022).

Product Innovation. The process of creating or improving a product through new ideas, techniques, or ingredients. The development of a pure, naturally fermented oyster-based sauce is a form of food product innovation (Encarnacion & Encarnacion, 2025).

REVIEW OF RELATED LITERATURE

Understanding consumer familiarity with fermented condiments is essential in evaluating the potential acceptance of an innovative oyster-based product. In the Philippines, condiments such as patis, bagoong, and oyster sauce are integral to daily cooking and reflect both culinary heritage and regional identity. However, consumption frequency and preference are shaped by demographic factors such as age, exposure, and local culture. Coastal communities like Bataan, where oyster farming is a major livelihood, have consumers who are more aware of marine-based condiments and their variations (Cpredo, 2025).

The study by Sorio et al. (2020) on small rock oyster (Saccostrea spp.) sauce demonstrated that Filipino consumers are receptive to locally developed fermented seafood condiments. Their findings showed that products maintaining traditional flavor characteristics while offering cleaner, locally sourced ingredients received high sensory ratings in taste, aroma, and overall acceptability. This reflects how familiarity and cultural association influence consumers' openness to innovations such as a pure, naturally fermented oyster sauce.

Similarly, Encarnacion and Encarnacion (2025) documented the creation of a patis made from green mussels at the University of the Philippines Visayas. The product achieved favorable feedback for preserving indigenous flavor while offering a healthier alternative to traditional soy-based condiments. These innovations show that Filipino consumers appreciate sustainable,

Additionally, local initiatives such as the Shellfish Industry Roadmap (2021–2025) by the Department of Agriculture emphasize oysters as a high-potential raw material for value-added food products, citing increasing consumer awareness of sustainable seafood consumption (Cpredo, 2025). Such

developments underline how localized familiarity, coupled with sustainability awareness, shapes Filipino consumers' perceptions of product authenticity and acceptability.

Sensory Characteristics and Product Acceptability

The sensory qualities of fermented condiments—taste, aroma, color/appearance, and saltiness—are critical determinants of consumer preference. According to Hakimi et al. (2022), fermentation triggers enzymatic proteolysis, breaking down oyster proteins into amino acids such as glutamic acid, alanine, threonine, methionine, and histidine. These amino acids form the foundation of umami, the characteristic savory taste that drives acceptability in fermented seafood condiments. Han et al. (2023) confirmed that glutamic acid and related metabolites play central roles in flavor development across various types of fish sauces.

Liu et al. (2024) identified Saccharomyces cerevisiae, Kazachstania, and Lactobacillus pentosus as core microbial species responsible for the flavor and aroma of fermented oysters (Crassostrea gigas). These microbes produce volatile compounds that enhance depth and

Lu et al. (2022) provided a comprehensive review showing that the sensory outcomes of fermented shellfish condiments are influenced by raw material quality, microbial composition, and fermentation parameters such as temperature and salinity. The study emphasized that properly optimized fermentation conditions can elevate both product quality and consumer satisfaction. These findings directly relate to the current study's sensory evaluation, which measures acceptability in taste, aroma, color/appearance, and saltiness between the experimental pure oyster-based sauce, commercial oyster sauce, and patis.

Furthermore, Kovacs and Keresztes (2022b) observed that consumers tend to associate "clean-label" products—those free from synthetic flavorings and preservatives—with superior sensory authenticity and higher value. This underscores that the absence of soy, sugar, and artificial enhancers in the present oyster-based innovation could positively influence consumer perception of natural taste and aroma.

Comparative Insights from Traditional and Innovative Fermented Products

Fermented condiments vary in formulation, raw material, and sensory characteristics. Traditional patis and bagoong are made from fish or shrimp, while oyster sauces often combine oyster extract with soy sauce, starch, and caramel coloring. These variations contribute to distinct sensory profiles but also to the dilution of the original seafood flavor. Lu et al. (2022) emphasized that the sensory identity of fermented shellfish condiments is primarily shaped by microbial activity and substrate composition.

Similarly, Sorio et al. (2020)'s development of rock oyster sauce showed comparable microbial and sensory quality to imported condiments, establishing a scientific foundation for oyster-based product innovation in the Philippines. The findings reinforce that locally sourced, naturally fermented shellfish condiments can meet both safety and sensory standards while strengthening local industries.

The current research follows this trajectory by producing and evaluating a pure oyster-based sauce through natural fermentation. By comparing it with patis and commercial oyster sauce, the study seeks to determine whether the natural fermentation process can yield an authentic umami profile capable of competing with processed alternatives while promoting sustainable local resource use.

Market Potential and Consumer Perception

Kovacs and Keresztes (2022b) reinforced this perspective, reporting that consumers are willing to pay a 5–25% price premium for artisanal, preservative-free, and locally made products, driven by their perceived authenticity and sustainability. This is consistent with the findings of Cpredo (2025), which identified oysters as a promising sustainable raw material for innovative condiments due to their environmental efficiency and local availability.

Local studies, including Sorio et al. (2020) and Encarnacion and Encarnacion (2025), highlight that product innovations grounded in cultural familiarity and sustainable sourcing can succeed in the Philippine market. Their work supports the current study's emphasis on perceived marketability indicators—purchase intent, product uniqueness, willingness to recommend, expected frequency of use, and price expectation.

The Department of Agriculture's Shellfish Industry Roadmap (2021–2025) further supports these trends by outlining strategic directions for developing shellfish-derived food products that enhance local livelihoods and export potential (Cpredo, 2025). These findings collectively suggest that a Bataan-made pure oyster sauce has a favorable market outlook among Filipino consumers who prioritize both taste authenticity and sustainable food practices.

Nutritional Value as a Basis for Market and Health Appeal

Bioactive peptides derived from oysters exhibit antioxidant and antimicrobial activities that promote food safety and human health (Anusha, 2022; Selvakumari Ulagesan et al., 2022). Molagoda et al. (2020, 2022) demonstrated that fermented oyster extracts enhance bone formation and prevent prednisolone-induced bone loss through activation of osteoblasts and the IGF-1 signaling pathway. These findings establish a strong link between fermentation and increased functional bioactivity—factors that add value to oyster-based condiments.

From a sustainability perspective, Bianchi et al. (2022) highlighted that farmed bivalves such as oysters offer high nutrient output with minimal environmental footprint, making them ideal for sustainable food systems. Their research supports using oyster-derived ingredients for low-carbon, nutrient-dense condiments.

By integrating these nutritional and ecological benefits, the current study positions its product as both a healthy and sustainable innovation. It examines whether these perceived health and environmental attributes influence consumer acceptance and willingness to purchase a pure, naturally fermented oyster-based sauce compared to commercial and traditional alternatives.

Theoretical Framework

In addition, the study aimed to assess the product's acceptability through sensory evaluation, compare it with commercial oyster sauce and patis, and evaluate its perceived market potential. These objectives involved key elements such as flavor development, fermentation method, and consumer perception.

Proteolysis and Umami Generation Theory. This theory elucidated that during the fermentation process, enzymes present in oysters decomposed proteins into free amino acids, including glutamic acid, glycine, and alanine, which contributed to the inherent umami flavor (Lu et al., 2022). This transformation took place without the use of artificial additives, relying exclusively on salt and time to cultivate a deep, savory taste. In this research, the theory reinforced the idea that a pure, naturally fermented oyster sauce could attain an appealing flavor and acceptability due to these biochemical alterations.

Fermentation Strategy and Flavor Optimization Theory. This theory posited that various fermentation methods—natural, starter-based, or koji-assisted—could greatly influence the flavor, aroma, and amino acid composition of fermented seafood products (Zhou et al., 2023). Enhancing fermentation conditions resulted in better flavor quality and consistency. This study emphasized the possibility of further refining oyster sauce through regulated fermentation techniques to improve product performance.

Collectively, these theories provided a scientific foundation for the development of a naturally fermented, additive-free oyster-based sauce. They underscored the role of biochemical processes and fermentation strategies in enhancing flavor and sensory quality, thereby supporting the feasibility of developing a clean-label oyster-based condiment that aligned with consumer taste preferences, health values, and market trends.

METHODS AND DESIGN

Research Design

A descriptive–comparative approach was deemed appropriate because the study did not manipulate variables but instead analyzed differences in consumer responses using structured evaluation instruments and statistical analysis. This design allowed the researchers to measure quantifiable variations in taste, aroma, color/appearance, saltiness, and texture among the three products, as well as assess consumer perceptions related to purchase intent, perceived uniqueness, and overall acceptability. Sensory evaluation was conducted in a controlled, blind-testing setup with randomized sample presentation to minimize bias and ensure reliable results.

The study addressed a research gap in existing condiment innovation by exploring a pure, naturally fermented oyster sauce—a product not yet commercially available and rarely examined in Philippine food product development research. Unlike commercial oyster sauces, which were typically soy-based and contained artificial flavorings, this study focused on creating a clean-label, additive-free variant that highlighted the natural umami of oysters harvested from Bataan.

Sample and Setting

The target population for this study consisted of individuals in Bataan who possess relevant culinary experience or familiarity with condiments such as oyster sauce and patis. This group included culinary students, food vendors, home cooks, and regular consumers of fermented condiments. Selecting participants from this population ensured that responses were informed by practical culinary knowledge and reflective of local consumer preferences. Individuals with seafood allergies or known impairments in taste or smell perception were excluded to ensure participant safety and the reliability of sensory data.

A voluntary purposive sampling technique was employed to select respondents who could provide credible sensory and marketability evaluations. This method emphasized qualified and experience-based consumer insight rather than random selection, which is appropriate for exploratory sensory and marketability research (Kovacs & Keresztes, 2022b; Sorio et al., 2020).

Inclusion

Participants were selected according to the following inclusion parameters:

1. Residents of Bataan who are familiar with or regularly use condiments such as oyster sauce or patis in cooking or meal preparation.

2. Individuals with relevant culinary exposure—such as culinary students, home cooks, or food vendors—with prior experience in evaluating taste and aroma.

3. Participants willing to voluntarily participate in the sensory and marketability evaluation and sign the informed consent form.

Exclusion

To ensure safety and data validity, the following exclusion criteria were applied:

1. Individuals with known seafood or shellfish allergies.

2. Participants with impaired taste or olfactory functions that could affect sensory accuracy.

3. Individuals unable to provide informed consent.

4. Participants who failed to comply with sensory testing procedures or withdrew prior to completion.

Research Instrument

The research instrument used in this study was a structured questionnaire designed to gather both respondent profile information and sensory evaluation data. The questionnaire was divided into two sections to ensure the systematic collection of relevant information necessary for analyzing consumer perception and product acceptability.

The first section collected demographic information, including age, occupation, monthly income, frequency of condiment use, and most commonly used condiment. These variables were included to provide context regarding the respondents' consumption behavior and familiarity with condiments. Understanding these characteristics helped determine whether participants regularly consume products similar to the samples being evaluated, which could influence their perceptions and evaluations.

The second section focused on sensory evaluation, where respondents assessed the three sauce samples based on taste, aroma, color/appearance, saltiness, and texture using a 7-point hedonic

Part I: Demographic Profile

a. Age

b. Occupation

c. Monthly Income

d. Frequency of Condiment Use

e. Most Used Condiment

Part II: Sensory Evaluation

a. Taste

b. Aroma

c. Color/Appearance

d. Saltiness

e. Texture

Participants rated each attribute using a 7-point hedonic Likert-type scale to indicate their level of preference. The marketability assessment within the same instrument gathered consumer perceptions regarding:

a. Purchase intent

b. Perceived uniqueness of the product

c. Willingness to recommend to others

d. Expected price range

e. Perceived quality

f. Perceived healthiness

A pilot test was conducted with a small group of participants, separate from the main sample, to evaluate the clarity, reliability, and usability of the questionnaire. Necessary revisions were made based on the pilot test before full-scale data collection.

Conceptual Framework

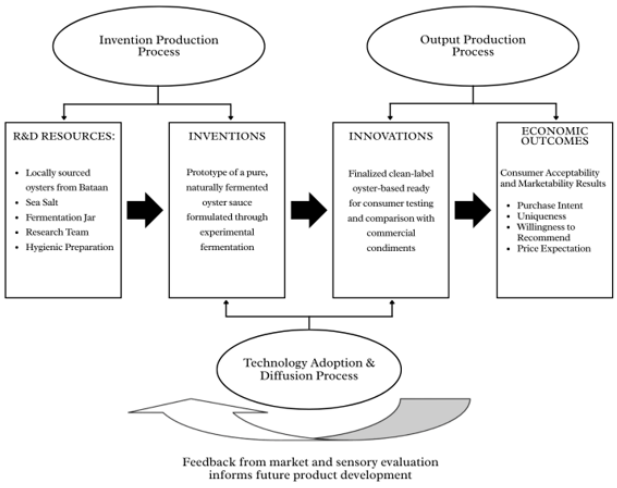
This study adopted the Conceptual Framework of Innovation developed by Geomina Turlea et al. (2010) under the Joint Research Centre–Institute for Prospective Technological Studies (JRC-IPTS) of the European Commission. The model described how research and development (R&D) activities led to inventions that progressed into innovations and eventually resulted in measurable economic outcomes through technology adoption and diffusion. It also emphasized the cyclical nature of innovation, wherein feedback from market and consumer

responses helped refine and strengthen future R&D activities.

For the purpose of this study, the framework was adapted to describe the process of developing and determining the marketability of a pure, naturally fermented oyster-based sauce made from locally sourced oysters in Bataan. Each component of the framework corresponded to a stage in the product's innovation cycle—from the use of raw materials and experimental formulation to consumer evaluation, market testing, and continuous improvement through feedback.

Figure 1

Conceptual Framework of the Innovation Process for the Development and Marketability of a Pure Oyster-Based Sauce



The conceptual framework showed how research inputs led to the creation, testing, and market introduction of an innovative food product. It presented the process by which locally available materials and fermentation techniques were utilized to produce a new formulation that underwent refinement and evaluation before reaching the market. The model also highlighted how consumer feedback and sensory evaluation results contributed to further enhancement of the product, ensuring that the innovation remained responsive to consumer needs and preferences.

Overall, the framework demonstrated how local resources could be transformed into a sustainable, value-added product through research, innovation, and consumer evaluation. It supported the study's objective of developing and assessing a pure, naturally fermented oyster-based sauce that promoted the use of local aquaculture resources while meeting the standards of quality and market competitiveness.

Data Gathering Procedure Product Making

The production of the pure fermented oyster sauce was conducted using freshly shucked oysters sourced from Bataan. Before processing, all materials and equipment were thoroughly cleaned and sterilized to maintain sanitary conditions and prevent contamination during fermentation. The equipment used in the procedure included a casserole, ladle, baking beaker, weighing scale, blender, bowls, fermentation jars, cheesecloth, and a stove. The ingredients utilized in the formulation were fresh talaba (oysters), non-iodized salt, and rice koji.

Raw Material Preparation

Formulation and Fermentation Setup

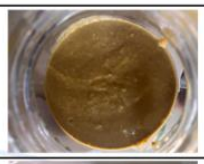
The cleaned oysters were placed in a casserole and cooked under low heat until fully cooked and until their natural brine was released. The cooked oysters were then transferred into a clean bowl. Non-iodized salt equivalent to 20% of the oyster weight was added to the cooked oysters. The mixture was blended using a blender until a uniform consistency was achieved.

After blending, the mixture was allowed to cool completely to room temperature. This step was necessary because excessive heat may inactivate the microorganisms present in rice koji that are essential for fermentation. Once cooled, rice koji—equal in amount to the previously measured salt—was added to the mixture. The ingredients were thoroughly mixed to ensure even distribution of the fermentation starter and then subjected to a final blending process to obtain a homogeneous mixture.

The prepared mixture was transferred into sterilized fermentation jars and covered with cheesecloth to allow airflow while preventing contamination from foreign particles. The mixture was then allowed to ferment for at least one month under controlled conditions. During fermentation, microorganisms present in rice koji, particularly Aspergillus oryzae, produce enzymes such as proteases and amylases that break down proteins and other complex compounds into amino acids and smaller molecules that contribute to flavor development and the formation of umami compounds (Liu et al., 2024; Wang et al., 2024).

Table 1

Formulation and Fermentation Process

STEP	FIGURE
Washing of oysters to remove shell fragments and foreign matter	
Cooking under low heat until fully cooked and natural brine is released	
Weighing oysters with brine	
Calculation of salt and rice koji based on 20% of total mixture weight	
Incorporation of salt into the oyster mixture	
Blending the salted mixture to achieve uniform consistency	
Cooling the mixture to prevent enzymatic inactivation of rice koji before incorporatinga	
Final blending to ensure homogeneous distribution	
Transfer of mixture into fermentation jar and covering with cheesecloth. Mixture has rich golden brown color	

Post-Fermentation Process

After the fermentation period, the fermented oyster mixture was filtered using cheesecloth to separate the liquid extract from the remaining solid residues. The extracted liquid served as the pure fermented oyster sauce produced in this study.

Following filtration, the sauce underwent pasteurization at 70–80 °C for approximately 10–15 minutes to reduce microbial activity, improve product safety, and stabilize the sauce by stopping further fermentation. Mild heat treatments within this temperature range are widely applied in food processing to control microorganisms while preserving the sensory quality of liquid food products (Samapundo et al., 2014). Recent research also highlights that pasteurization is commonly applied to sauces and similar food systems to extend shelf life while maintaining desirable flavor characteristics (Purohit et al., 2023).

Sensory Evaluation and Marketability Assessment

Controlled sensory evaluation sessions were conducted in a clean testing area. Each participant received three unmarked samples—Sample A (experimental pure oyster-based sauce), Sample B (commercial oyster sauce), and Sample C (traditional patis)—served in randomized order. Participants rated taste, aroma, color/appearance, saltiness, and texture using a 7-point hedonic Likert scale, and completed marketability items (purchase intent, perceived uniqueness, willingness to recommend, expected frequency of use, price expectation, perceived quality, and perceived healthiness). Participation was voluntary and preceded by a written informed consent form. The collected ratings were then summarized using descriptive statistics to determine the level of acceptability of each sample.

Participant Safety and Ethical Considerations

Individuals with seafood allergies or known sensory impairments were excluded. Product handling, evaluation protocols, and emergency procedures followed institutional ethical and

food-safety guidelines. The researchers assumed responsibility for participant welfare and covered any medical expenses resulting from unexpected adverse events.

Data Handling and Confidentiality

Data Analysis

The data collected from this study was analyzed using both quantitative and descriptive approaches to assess the sensory acceptability, marketability, and potential consumer preference for the pure oyster-based sauce.

For the sensory evaluation, results from the acceptability tests—including taste, aroma, color/appearance, saltiness, and texture—were recorded in tables and analyzed using descriptive statistics such as mean and standard deviation. Repeated measures ANOVA was conducted to determine if there were statistically significant differences in the ratings among the pure oyster-based sauce, commercial oyster sauce, and traditional patis. Post hoc comparisons, such as Bonferroni or Holm adjustments, were performed to identify where significant differences occurred between samples. These analyses highlighted which sensory attributes were most preferred by respondents and indicated the relative performance of the pure oyster-based sauce compared to existing condiments.

Open-ended responses, if any, were summarized to provide qualitative insights into consumer perceptions, highlighting suggestions, concerns, or notable observations regarding the product. By combining quantitative and descriptive analyses, the study provided a comprehensive evaluation of both the sensory qualities and market potential of the pure oyster-based sauce.

Ethical Considerations

This study strictly adhered to the ethical research standards of Colegio de San Juan de Letran–Bataan, ensuring the safety, rights, and well-being of all participants. Participants were selected through purposive sampling, focusing on individuals with relevant culinary experience, and their participation was entirely voluntary. Before participation, all individuals were fully informed of the study's objectives, procedures, and potential risks—particularly those related to consuming the fermented oyster-based condiments—and were provided an informed consent form to read and sign. Participants were explicitly informed of their right to withdraw at any stage without penalty.

All data collected were treated with strict confidentiality and anonymity. Digital data were stored in password-protected spreadsheets and backed up in secure cloud storage accessible only to the researchers. Data were used solely for academic purposes. Upon completion of the study, participants received a token of appreciation in recognition of their time and contribution.

RESULTS

Presentation of Data

This chapter presents the data gathered from the respondents regarding the acceptability and perceived marketability of the pure oyster-based sauce. The results are organized and analyzed according to the research questions of the study. Descriptive statistics such as frequency, percentage, mean, and standard deviation were used to describe the respondents' demographic profile and the level of acceptability of the sauce samples. In addition, Repeated Measures Analysis of Variance (ANOVA) was used to determine whether there were significant differences in the acceptability ratings among the sauces.

The data presentation is divided into four sections: (1) the demographic profile of the respondents, (2) the level of acceptability of the sauces in terms of sensory attributes, (3) the significant differences in acceptability ratings among the sauces, and (4) the perceived marketability of the pure oyster-based sauce.

Demographic Profile of the Respondents

This section presents the demographic profile of the respondents in terms of age, occupation, monthly income, frequency of condiment use, and most used condiment. A total of 67 respondents participated in the study. Their characteristics provide important context for interpreting their responses regarding condiment acceptability and marketability.

Age of Respondents

Table 2

Frequency Distribution of Respondents by Age

Age	Frequency	Percent	Valid Percent	Cumulative Percent
10 – 20	10	14.9	14.9	14.9
21 – 30	23	34.3	34.3	49.3
31 – 40	16	23.9	23.9	73.1
41 – 50	18	26.9	26.9	100.0
Total	67	100.0		

As shown in Table 2, the majority of respondents belonged to the 21–30 age group, accounting for 23 respondents (34.3%). This was followed by respondents aged 41–50 with 18 respondents (26.9%), and those aged 31–40 with 16 respondents (23.9%). Meanwhile, the 10–20 age group had the lowest representation with 10 respondents (14.9%).

The distribution indicates that most respondents fall within the

young to middle adult age range, which is a demographic group commonly involved in food preparation, purchasing, and consumption decisions. Their familiarity with condiments and cooking practices makes their evaluation relevant to the assessment of the oyster-based sauce.

Occupation of Respondents

Table 3

Frequency Distribution of Respondents by Occupation

Occupation	Frequency	Percent	Valid Percent	Cumulative Percent
Carinderia Owner	3	4.5	4.5	4.5
Consumer	16	23.9	23.9	28.4
Culinary Student	14	20.9	20.9	49.3
Food Vendor	9	13.4	13.4	62.7
Home Cook	21	31.3	31.3	94.0
Housewife	2	3.0	3.0	97.0
Restaurant Owner	2	3.0	3.0	100.0
Total	67	100.0		

As presented in Table 3, the largest proportion of respondents were home cooks, comprising 21 respondents (31.3%). This was followed by consumers with 16 respondents (23.9%) and culinary students with 14 respondents (20.9%). Other respondents included food vendors (13.4%), carinderia owners (4.5%), housewives (3.0%), and restaurant owners (3.0%).

The dominance of home cooks and individuals involved in food preparation suggests that the respondents are familiar with condiments and flavor evaluation, making their assessments valuable in determining the acceptability of the product.

Monthly Income of Respondents

Table 4

Frequency Distribution of Respondents by Monthly Income

Monthly Income	Frequency	Percent	Valid Percent	Cumulative Percent
₱<10,000	6	9.0	9.0	9.0
₱10,000–₱19,999	24	35.8	35.8	44.8
₱20,000–₱29,999	25	37.3	37.3	82.1
₱30,000–₱39,999	10	14.9	14.9	97.0
₱40,000+	2	3.0	3.0	100.0
Total	67	100.0		

Table 4 shows that most respondents belonged to the ₱20,000–₱29,999 income bracket, with 25 respondents (37.3%), followed closely by those earning ₱10,000–₱19,999 with 24 respondents (35.8%). Respondents earning ₱30,000–₱39,999 accounted for 10 respondents (14.9%), while 6 respondents (9.0%) reported earning below ₱10,000. Only 2 respondents (3.0%) indicated a monthly income of ₱40,000 and above.

This distribution indicates that the majority of the respondents belong to the low- to middle-income sector, which represents a significant portion of the consumer market for food condiments.

Frequency of Condiment Use

Table 5

Frequency Distribution of Condiment Use Among Respondentsto middle-income sector, which represents a significant portion of the consumer market for food condiments.

Freq of Condiment Use	Frequency	Percent	Valid Percent	Cumulative Percent
Daily	23	34.3	34.3	34.3
Occasionally	13	19.4	19.4	53.7
Several times a week	31	46.3	46.3	100.0
Total	67	100.0		

As shown in Table 5, nearly half of the respondents (46.3%) reported using condiments several times a week, while 34.3% indicated that they use condiments daily. Meanwhile, 19.4% of respondents reported using condiments occasionally.

These findings indicate that condiments are a regular component of daily meals, highlighting the importance of flavoring agents such as sauces in the respondents' food consumption habits.

Most Used Condiment

Table 6

Frequency of Most Used Condiments Among Respondents

Most Used Condiment	Frequency	Percent	Valid Percent	Cumulative Percent
Banana Ketchup	8	11.9	11.9	11.9
Calamansi with Soy Sauce	10	14.9	14.9	26.9
Chili Garlic Oil	6	9.0	9.0	35.8
Homemade Dipping Mix	2	3.0	3.0	38.8
Oyster Sauce	4	6.0	6.0	44.8
Patis (Fish Sauce)	15	22.4	22.4	67.2
Sukang Paombong (Vinegar)	6	9.0	9.0	76.1
Toyo (Soy Sauce)	16	23.9	23.9	100.0
Total	67	100.0		

Table 6 shows that toyo (soy sauce) was the most commonly used condiment among respondents, with 16 respondents (23.9%), followed closely by patis (fish sauce) with 15 respondents (22.4%). Other commonly used condiments included calamansi with soy sauce (14.9%) and banana ketchup (11.9%). Less frequently used condiments were chili garlic oil (9.0%), sukang Paombong (9.0%), oyster sauce (6.0%), and homemade dipping mixes (3.0%).

The prominence of traditional Filipino condiments suggests that respondents are familiar with fermented and umami-rich flavor profiles, which is relevant to evaluating the acceptability of the

pure oyster-based sauce.

Level of Acceptability of the Sauce Samples

The level of acceptability of the three sauce samples was evaluated in terms of taste, aroma, color/appearance, saltiness, and texture using mean scores and standard deviations.

Table 7

Sensory Evaluation of the Sauce Samples

Means for 3 Sauces in terms of Taste, Aroma, Color, Saltiness and Texture

	Samples	Valid	Mead	Std. Deviation	Verbal Interpretation
Level of Acceptability in Terms of Taste	pure oyster-based sauce	67	5.284	1.178	Like Slightly
	commercial oyster sauce	67	5.463	0.927	Like Slightly
	traditional patis	67	5.925	0.785	Like Moderately
Level of Acceptability in Terms of Aroma	pure oyster-based sauce	67	5.328	1.036	Like Slightly
	commercial oyster sauce	67	5.119	1.237	Like Slightly
	traditional patis	67	5.672	1.064	Like Moderately
Level of Acceptability in Terms of Color	pure oyster-based sauce	67	5.701	1.030	Like Moderately
	commercial oyster sauce	67	5.254	1.198	Like Slightly
	traditional patis	67	5.881	1.066	Like Moderately
Level of Acceptability in Terms of Saltiness	pure oyster-based sauce	67	5.269	1.388	Like Slightly
	commercial oyster sauce	67	4.716	1.165	Like Slightly
	traditional patis	67	5.194	1.090	Like Slightly
Level of Acceptability in Terms of Texture	pure oyster-based sauce	67	5.149	0.973	Like Slightly
	commercial oyster sauce	67	5.164	0.914	Like Slightly
	traditional patis	67	5.881	1.066	Like Moderately

** 1.00 – 1.49 – Dislike Very Much, 1.50 – 2.49 – Dislike Moderately, 2.50 – 3.49 – Dislike Slightly, 3.50 – 4.49 – Neither Like nor Dislike, 4.50 – 5.49 – Like Slightly, 5.50 – 6.49 – Like Moderately, 6.50 – 7.00 – Like Very Much*

The results show that Sample C (traditional patis) obtained the highest mean ratings across most sensory attributes. In terms of taste, Sample C received the highest mean score (M = 5.925), interpreted as Like Moderately, while both Sample A (pure oyster-based sauce) and Sample B (commercial oyster sauce) were interpreted as Like Slightly.

For aroma, Sample C again received the highest rating (M = 5.672), indicating that respondents preferred its aroma compared with the other samples. Meanwhile, Samples A and B also received acceptable ratings within the Like Slightly range.

In terms of color/appearance, both Sample A (M = 5.701) and Sample C (M = 5.881) were interpreted as Like Moderately, while Sample B received a slightly lower rating interpreted as Like Slightly.

Regarding saltiness, all three samples fell within the Like Slightly category, suggesting that respondents generally found the saltiness level of the sauces acceptable.

Lastly, for texture, Sample C obtained the highest mean rating (M = 5.881), interpreted as Like Moderately, while Samples A and B received similar ratings within the Like Slightly category.

Overall, the results indicate that the pure oyster-based sauce demonstrated acceptable sensory characteristics and performed comparably with existing commercial condiments, although traditional patis received slightly higher ratings in several attributes.

Significant Difference in Acceptability Ratings

A Repeated Measures ANOVA was conducted to determine whether there was a significant difference in acceptability ratings among the three sauce samples in terms of taste, aroma, color/appearance, saltiness, and texture.

Table 8

Comparison of Acceptability Ratings of the Three Sauce Samples

Cases	Sphericity Correction	Sum of Squares	df	Mean Square	F	p	ω^2
Sauce	Greenhouse-Geisser	14.70	1.823	8.063	7.240	.002	0.062
Residuals	Greenhouse-Geisser	133.97	120.305	1.114			

The analysis revealed a statistically significant difference in taste ratings among the three samples, F = 7.240, p = .002. Post hoc comparisons indicated that traditional patis was rated significantly higher in taste than both the pure oyster-based sauce and the commercial oyster sauce, while no significant difference was found between the pure oyster-based sauce and the commercial oyster sauce.

Similar analyses were conducted for the other sensory attributes.

Table 9

Difference in Acceptability Ratings in Terms of Aroma

Difference in Acceptability Ratings in Terms of Aroma

Repeated Measures ANOVA – Within Subjects Effects

Cases	Sum of Squares	df	Mean Square	F	p	ω^2
Sauce	10.42	2	5.209	3.843	.024	0.030
Residuals	178.92	132	1.355			

Table 10

Difference in Acceptability Ratings in Terms of Color/Appearance

Difference in Acceptability Ratings in Terms of Color/Appearance

Repeated Measures ANOVA – Within Subjects Effects

Cases	Sum of Squares	df	Mean Square	F	p	ω^2
Sauces	13.97	2	6.985	6.146	.003	0.046
Residuals	150.03	132	1.137			

Table 11

Difference in Acceptability Ratings in Terms of Saltiness

Difference in Acceptability Ratings in Terms of Saltiness

Repeated Measures ANOVA – Within Subjects Effects

Cases	Sum of Squares	df	Mean Square	F	p	ω^2
Sauces	12.03	2	6.015	4.347	.015	0.030
Residuals	182.64	132	1.384			

Table 12

Difference in Acceptability Ratings in Terms of Texture

Repeated Measures ANOVA – Within Subjects Effects

Cases	Sum of Squares	df	Mean Square	F	p	ω^2
Sauces	23.41	2	11.706	10.74	< .001	0.098
Residuals	143.92	132	1.090			

The results showed that significant differences were observed across all five sensory attributes ($p < .05$). Among the attributes, texture exhibited the strongest effect, indicating that respondents perceived the greatest difference among the sauces in terms of texture.

Traditional patis consistently obtained the highest ratings across several attributes, while the pure oyster-based sauce showed comparable ratings in some aspects, suggesting that it has potential as an alternative condiment.

Perceived Marketability of the Pure Oyster-Based Sauce

The perceived marketability of the pure oyster-based sauce was evaluated in terms of purchase intent, perceived uniqueness, willingness to recommend, expected frequency of use, price expectation, perceived quality, and perceived healthiness.

Table 13

Descriptive Statistics of Marketability Indicators

	Valid	Mean	Std. Deviation	Verbal Interpretation
Purchase Intent	67	3.776	0.623	Likely
Perceived Uniqueness	67	3.597	1.169	Likely
Willingness to Recommend	67	3.716	0.775	Likely

** 1.00 – 1.80 – Very Unlikely, 1.81 – 2.60 – Unlikely, 2.61 – 3.40 – Neutral, 3.41 – 4.20 – Likely, 4.21 – 5.00 – Very Likely*

Table 14

Descriptive Statistics of Consumers' Expected Frequency of Use

	Valid	Mean	Std. Deviation	Verbal Interpretation
Expected Frequency of Use	67	3.576	1.118	Several times a week

** 1.00 – 1.80 – Never, 1.81 – 2.60 – Rarely, 2.61 – 3.40 – Occasionally, 3.41 – 4.20 – Several times a week, 4.21 – 5.00 – Daily*

Results indicated that respondents were likely to purchase the product, with a mean score of 3.776. Similarly, the product was perceived as unique (M = 3.597) and respondents expressed a willingness to recommend it to others (M = 3.716).

In terms of expected frequency of use, respondents indicated that they would likely use the product several times a week (M = 3.576), suggesting potential regular consumption.

Additionally, respondents agreed that the product has good quality (M = 4.015) and perceived it as healthy (M = 3.866).

Table 15

Frequencies for Price Expectation

Price Expectation	Frequency	Percent	Valid Percent	Cumulative Percent
> Php 80.00	12	0.1	17.9	17.9
Php 80.00 – Php 99.00	12	0.1	17.9	35.8
Php 100.00 – Php 119.00	13	0.1	19.4	55.2
Php 120.00 – Php 139.00	21	0.1	31.3	86.6
Php 140.00 and above	9	0.1	13.4	100.0

Regarding price expectation, the largest proportion of respondents (31.3%) preferred a price range of ₱120–₱139, followed by ₱100–₱119 (19.4%), indicating that consumers are willing to pay a moderate price for a naturally fermented oyster-based product.

Overall, the findings suggest that the pure oyster-based sauce demonstrates positive marketability potential, supported by favorable consumer perceptions in terms of purchase intent, product uniqueness, quality, and pricing.

DISCUSSION

This study aimed to evaluate the sensory acceptability and perceived marketability of a pure fermented oyster-based sauce developed from locally harvested oysters in Bataan. The product was created as a clean-label alternative to conventional oyster sauces that often contain additives such as soy sauce, sugar, and artificial flavor enhancers. Through a controlled sensory evaluation, respondents assessed the experimental sauce alongside commercial oyster sauce and traditional patis based on taste, aroma, color/appearance, saltiness, and texture, as well as indicators of marketability including purchase intent, perceived uniqueness, and willingness to recommend.

The findings revealed that the pure fermented oyster-based sauce received moderate to favorable ratings across the evaluated sensory attributes, indicating that respondents generally found the product acceptable. Among the attributes evaluated, aroma and texture were rated comparably to the established commercial condiments, suggesting that the natural fermentation process was effective in developing desirable sensory characteristics associated with umami-rich sauces. Fermentation is widely recognized for enhancing flavor complexity and aroma in seafood-based condiments, which may explain why the product performed well in these attributes.

In terms of taste and saltiness, the experimental sauce also received acceptable ratings from respondents. However, slight variations in flavor perception may be attributed to the product's formulation, which intentionally excludes additives such as soy sauce, sugar, and

artificial enhancers. Unlike conventional oyster sauces that rely on these ingredients to intensify flavor, the developed sauce highlights the natural umami profile derived solely from fermented oysters. This difference may have produced a taste profile that is more natural and less processed, which some respondents perceived as distinctive compared to familiar commercial products.

The color and overall appearance of the sauce were likewise considered acceptable by the respondents, suggesting that the fermentation and preparation processes were sufficient in producing a visually appealing condiment. Appearance plays a significant role in food evaluation because consumers often associate color and consistency with flavor quality and freshness. The acceptable ratings in these attributes indicate that the developed sauce meets general expectations for seafood-based condiments.

Beyond sensory attributes, the study also examined the perceived marketability of the product. The results indicated that respondents generally expressed positive purchase intent, perceived the product as unique, and showed willingness to recommend it to others. These findings suggest that the pure oyster-based sauce has potential as an innovative condiment in the local market. Respondents also indicated a reasonable willingness to purchase the product within the ₱100–₱139 price range, suggesting that consumers recognize the product's value as a locally sourced and naturally fermented food innovation.

The perceived uniqueness of the product may be attributed to its clean-label formulation, which emphasizes minimal processing and the use of a single primary ingredient. As consumers increasingly seek natural and locally sourced food products, innovations that highlight regional ingredients and traditional fermentation methods may attract growing interest. In this context, the use of Bataan oysters not only contributes to product authenticity but also supports local aquaculture and promotes value-added utilization of marine resources.

Overall, the results indicate that the developed pure fermented oyster-based sauce demonstrated a level of sensory acceptability comparable to existing condiments. Statistical analysis revealed significant differences in the acceptability ratings among the three sauce samples across several sensory attributes. These findings therefore lead to the rejection of the null hypothesis, indicating that the level of sensory acceptability differed significantly among the evaluated condiments. Despite these differences, the experimental sauce obtained favorable consumer responses and showed comparable acceptability to traditional patis and commercial oyster sauce. This suggests that the simplified, additive-free formulation of the pure fermented oyster-based sauce can still provide a desirable sensory profile and has potential as an alternative fermented condiment derived from locally sourced oysters.

Taken together, the findings highlight the potential of Bataan oysters as a viable raw material for developing innovative food products. The acceptable sensory qualities, positive consumer perception, and promising marketability indicators suggest that the pure fermented oyster-based sauce may serve as a sustainable and locally inspired condiment that aligns with the growing demand for natural and clean-label foods.

CONCLUSION

Based on the findings of the study, the following conclusions were drawn:

1. The demographic profile of the respondents revealed that the majority belonged to the 21–30 age group, with most identifying as home cooks, consumers, and culinary students. Most respondents also fell within the ₱10,000–₱29,999 monthly income range, indicating representation from the low- to middle-income sector. In addition, the respondents reported frequent condiment use, with many using condiments several times a week or daily. The most commonly used condiments were toyo (soy sauce) and patis (fish sauce), indicating that respondents are familiar with fermented and umami-rich flavor profiles.

2. The results showed that the pure oyster-based sauce demonstrated an acceptable level of sensory quality in terms of taste, aroma, color/appearance, saltiness, and texture. The ratings for the pure oyster-based sauce were generally interpreted as "Like Slightly," indicating that respondents found the product acceptable as a condiment. In some attributes, particularly color/appearance, the pure oyster-based sauce obtained ratings comparable to traditional condiments.

3. The statistical analysis revealed that there were significant differences in the acceptability ratings among the three sauces in terms of taste, aroma, color/appearance, saltiness, and texture. Among the samples, traditional patis consistently obtained the highest acceptability ratings, particularly in taste and texture. However, the pure oyster-based sauce obtained ratings comparable to the commercial oyster sauce in several attributes, suggesting that it can compete with existing products in the market.

4. The findings also indicated that the pure oyster-based sauce has favorable marketability potential. Respondents expressed a positive purchase intent, perceived the product as unique, and indicated a willingness to recommend it to others. They also agreed that the product is of good quality and relatively healthy. Furthermore, most respondents preferred a price range of ₱120.00–₱139.00, suggesting that consumers are willing to pay a moderate price for a naturally fermented oyster-based condiment.

Overall, the results of the study indicate that the pure oyster-based sauce is an acceptable condiment with promising market potential, although traditional condiments such as patis still received higher preference in certain sensory attributes.

RECOMMENDATIONS

Improvement of Product Formulation. Future studies may improve the formulation and fermentation process of the pure oyster-based sauce in order to further enhance its taste and texture. Adjustments in ingredient proportions and fermentation duration may help increase the overall sensory acceptability of the product.

Utilization of Locally Produced Koji. Instead of relying on imported rice koji commonly sourced from Japan, future researchers may explore the use of locally produced koji made from locally grown rice. This may promote the utilization of abundant local agricultural resources, support local farmers and producers, and reduce dependence on imported fermentation starters.

Expanded Sensory Evaluation. Future research may involve a larger and more diverse group of respondents, including chefs, food technologists, restaurant owners, and consumers, in order to obtain broader evaluations of the product's sensory qualities and potential culinary applications.

Shelf Life and Safety Analysis. Further studies may examine the shelf life, nutritional composition, and microbiological safety of the pure oyster-based sauce to ensure product stability, quality, and safety for potential commercialization.

Market Feasibility Assessment. Future researchers may conduct market feasibility studies that include pricing analysis, packaging development, and branding strategies to determine the product's potential for commercialization and wider market acceptance.

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