Asian Journal of Multidisciplinary Studies
Vol. 7, No. 1, (2024)
ISSN 2651-6691 (Print)
ISSN 2651-6705 (Online)

Utilization of Different Types of Artisanal Salt in Making Padas (*Siganus Species*) Bagoong

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Abstract - *This study aimed to develop a new variety of Padas (siganus species) Bagoong using Sugpo Salt from Dasol, Pangasinan, Asin sa Buy-o from Zambales, and Asin Tibuok from Bohol, and assess its sensory acceptability, microbial properties and return of expenditure. The Experimental Completely Randomized Research Design was utilized, employing a validated survey form to gather data from bagoong manufacturers, food technology experts, and food service management students. Mean, weighted means, and GLM-ANOVA were employed to analyze sensory acceptability. Treatment 2 of Padas Bagoong, containing 1 cup of Asin sa Buy O, and 3 cups of padas (siganus species) fish, received the highest overall mean and with very much liked adjectival rating. Microbial analysis demonstrated compliance with regulatory standards, with low microbial contamination levels. Padas Bagoong made with Asin sa Buy O salt exhibited the highest favorability in sensory acceptability. Microbial analysis indicated product safety, with low microbial counts. Despite variations in appearance and odor among salt types, taste consistency was observed. The study recommends further exploration of alternative salts and suggests assessing physicochemical properties and shelf life to enhance product quality control. Incorporating shelf-life assessment alongside microbial and physicochemical analyses can optimize production and bolster consumer confidence in Padas Bagoong as a safe, high-quality food product.*

Keywords – *Padas Bagoong, Artisanal Salt, Sensory Acceptability*

INTRODUCTION

Fermented foods are so frequently consumed and so well-liked by the public in many regions of the world, particularly Asia, that a person's regular diet would not be complete without them. Fermented foods are popular in developing nations like the Philippines, where they are well-known for their distinct flavor and the relative affordability of other processing techniques like canning and freezing.

The processing procedures were established in homes, and modifications were made based on practitioner observations. Fermentation methods are typically passed down from generation to generation. The role of microbes and the physical and chemical changes that occur in the products are of little interest. Changes in color, odor, and taste caused by process alterations or variations in components or conditions are recognized. Most processes are trial-and-error, with little quality control. Product quality is mostly determined by the processor's experience.

In the Philippines, fermented fishery products can be divided into two groups. The first group includes those containing high concentrations of salt—about 15 to 20 percent in the final product. This group consists of bagoong (fish paste) and patis (fish sauce). These products are generally used as condiments (Olympia, M. 1992)

Bagoong is the partially hydrolyzed residue of fish or shrimp. It smells salty and slightly cheese-like. The qualities of this product differ depending on where it is manufactured and eaten. The fish paste in Tagalog provinces is totally fermented and mashed, with or without adding pigment. In Batangas, Maranan, J.P. et. al. 2019 have come up with the process of producing powdered fermented fish (bagoong) where from the liquid fermented fish will be provided with hassle free travel, powdered

condiments, and gourmet foods. Moreover, in Marinduque, Villavicencio, W. 2021 have come up with the process of producing value added fish paste (bagoong) with ground and toasted coconut meat as extender where this product can be a good compliment as sauce to boiled vegetables, unripe mangoes, and many more.

This product as well can be used as a viand and appetizer. While these products are either partially or entirely fermented in the Ilocos region and Pangasinan provinces. The product is somewhat fermented without liquid in the Visayas and Mindanao; the fish is firm, and solid salt is. Sodium chloride (NaCl) or salt is a mineral component important for human and animal health and business. To distinguish it from a family of chemical compounds known as salts, the mineral form halite, or rock salt, is sometimes termed common salt (Hills et. al., 2023). Salt is a sodium chloride-based chemical molecule (electrolyte). It is the primary source of salt in our diet and is widely used to preserve and flavor foods. A modest quantity of sodium is necessary for optimal health because it aids in the maintenance of the proper volume of circulating blood and tissue fluids in the body.

With 64 million metric tons of salt produced as of 2022, China is the world leader in salt production. In 2022, the United States had 42 million metric tons of salt. The most significant single application for salt is as a raw material in manufacturing industrial chemicals. (Garside, 2023).

According to the report, the average adult salt intake equivalent in China was 10.9 grams per day, while adults in the United States consumed 9 grams in 2019 (Wunsch, 2020). In the Philippines, the salt capital is "PangASINan", which means the "land of salt". Salt is produced by the evaporation of sea water, the combination of sea water and the sun, thus, retaining trace minerals. Salt is produced during summer months under the sun's extreme heat. There are many uses of salt. One is salt is basic raw material to patis making. Patis and Bagoong are made by mixing fish and salt and fermenting it. (Tarriela, F. G. (2022).

According to Arquilliano 2019, the town of Lingayen bears a gulf in its name. This body of water is known for several fish harvests like, but not limited to, rabbit fish, anchovies, slipmouth, and round scad. With these fish catches, together with the presence of salt industries in the province of Pangasinan and the claims of salinity of air, the town naturally gets its recognition as a fermented fish center of the country. The municipality adopted fish paste as the official one town, one product and celebrated the bagoong festival based on the Municipal Ordinance No. 6, series of 2012 or the ordinance adopting bagoong of fish paste as the capital town's official one town, one product and making an annual town celebration of the bagoong festival. There were issues with fish catches as the production of fish paste relies on fish as the main ingredient. There were also reports on the banning of several illegal fishing techniques by the authorities that lessen the volume of fish caught that goes along with bagoong production.

In Filipino households, bagoong is not merely a condiment but a cultural emblem, embodying the essence of Filipino flavors. Its presence in local cuisine dates back generations, and its usage has become an integral part of Filipino cooking. Bagoong finds its way into an array of dishes, from the aromatic Pinakbet of the Ilocanos to the indulgent Kare-Kare of the Tagalogs. Its inclusion reflects the Filipino penchant for bold and flavorful culinary experiences, demonstrating the importance of preserving traditional methods of food preparation in the face of evolving tastes and global influences. Beyond its culinary significance, bagoong also fosters a sense of community and tradition. The process of making bagoong is often a communal activity, with families and communities coming together during the harvest season to prepare this beloved condiment. This shared effort reinforces the social fabric and cultural bonds that make bagoong more than just a seasoning—it's a symbol of Filipino identity, connecting people through the shared appreciation of a uniquely Filipino taste.

Despite their widespread availability, fermented foods receive little research and development. Most traditional food fermentation enterprises, particularly in the Philippines, are rural, seasonal, labor-intensive, informal, and capital poor. Fermented foods are typically sold and consumed in the places where they are produced. This study aimed to determine the utilization of the different types of artisanal salt in making padas bagoong.

OBJECTIVES OF THE STUDY

The study aims to determine the utilization of different types of artisanal salt in making Padas Bagoong. Specifically, it sought to answer the following questions:

1. What is the sensory acceptability of the Padas Bagoong made under the different types of artisanal salt in terms of:
    a. Appearance
    b. Odor
    c. Taste and
    d. Texture / Consistency?
2. What is the description of the Padas Bagoong using the different types of artisanal salt in terms of Microbiological Analysis?
3. Is there a significant difference in the characteristics of the different types of artisanal salt used?
4. What is the return of expenditure (ROE) of the Padas Bagoong using different types of artisanal salt?

MATERIALS AND METHOD

This study using a completely randomized design with three replications (R1, R2, R3). Three replicates of each treatment (e.g., T1R1, T1R2, etc.) were used: T0 (Rock Salt, control), T1 (Sugpo Asin of Pangasinan), T2 (Asin sa Buy-o of Zambales), and T3 (Asin Tibuok of Bohol). In each treatment, one cup of salt was mixed with three cups of fresh rabbitfish (Siganus species) at a 1:3 salt-to-fish ratio (by weight). For two to four weeks, the clay pots were fermented at 35°C while being stirred frequently to maintain uniformity.

The materials needed included three clay storage pots, nine cups of rabbitfish, and one cup of each of Sugpo Asin, Asin sa Buy-o, Asin Tibuok, and rock salt. After being cleaned in a 3–4% brine solution (1 tablespoon salt to 1 cup water), the fish were drained and thoroughly salted. Products were kept at ≤10°C after fermentation until they were evaluated. 30 respondents (5 bagoong manufacturers, 5 experts, and 20 food technology students) participated in the sensory evaluation. They evaluated appearance, odor, taste, texture, and overall acceptability using a 9-point Hedonic Scale (1 being extremely disliked and 9 being extremely liked). To reduce carryover effects, samples (1 tablespoon bagoong + steamed rice) were tested in a randomized order while mouthwashing was done in between treatments. The baseline for comparing T1–T3 was the control (T0). Three replications per treatment were followed during data collection.

Appearance Acceptability of the Padas Bagoong at Different Types of Artisanal Salt

Salt Type	Mean Value	Mean Description	SD	Lowest	Highest
Rock Salt (control)	7.93	Very Much Liked	1.53	4.00	9.00
Sugpo Salt	8.10	Very Much Liked	1.21	4.00	9.00
Asin sa Buy-o	7.80	Very Much Liked	1.30	4.00	9.00
Asin Tibuok	7.30	Moderately Liked	1.80	1.00	9.00

Legend:
2.50 - 3.49 Moderately Disliked (MD)
5.50 – 6.49 Slightly Liked (SL)
8.50 – 9.00 Extremely Liked (EL)
1.00 – 1.49 Extremely Disliked (ED)
3.50 – 4.49 Slightly Disliked (SD)
6.50 – 7.49 Moderately Liked (MD)
1.50 – 2.49 Very Much Disliked (VMD)
4.50 – 5.49 Never Liked or Disliked (NLD)
7.50 – 8.49 Very Much Liked (VML)

Odor Acceptability of the Padas Bagoong at Different Types of Artisanal Salt

Salt Type	Mean Value	Mean Description	SD	Lowest	Highest
Rock Salt (control)	7.97	Very Much Liked	.96	6.00	9.00
Sugpo Salt	7.03	Moderately Liked	1.59	1.00	9.00
Asin sa Buy-o	7.90	Very Much Liked	1.06	6.00	9.00
Asin Tibuok	7.40	Moderately Liked	1.81	1.00	9.00

Legend:
2.50 - 3.49 Moderately Disliked (MD)
5.50 – 6.49 Slightly Liked (SL)
8.50 – 9.00 Extremely Liked (EL)
1.00 – 1.49 Extremely Disliked (ED)
3.50 – 4.49 Slightly Disliked (SD)
6.50 – 7.49 Moderately Liked (MD)
1.50 – 2.49 Very Much Disliked (VMD)
4.50 – 5.49 Never Liked or Disliked (NLD)
7.50 – 8.49 Very Much Liked (VML)

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Taste Acceptability of the Padas Bagoong at Different Types of Artisanal Salt

Salt Type	Mean Value	Mean Description	SD	Lowest	Highest
Rock Salt (control)	8.10	Very Much Liked	1.12	5.00	9.00
Sugpo Salt	7.47	Moderately Liked	1.14	5.00	9.00
Asin sa Buy-o	8.10	Very Much Liked	.88	6.00	9.00
Asin Tibuok	7.70	Very Much Liked	1.49	3.00	9.00

Legend:
2.50 - 3.49 Moderately Disliked (MD)
5.50 – 6.49 Slightly Liked (SL)
8.50 – 9.00 Extremely Liked (EL)
1.00 – 1.49 Extremely Disliked (ED)
3.50 – 4.49 Slightly Disliked (SD)
6.50 – 7.49 Moderately Liked (MD)
1.50 – 2.49 Very Much Disliked (VMD)
4.50 – 5.49 Never Liked or Disliked (NLD)
7.50 – 8.49 Very Much Liked (VML)

Texture Acceptability of the Padas Bagoong at Different Types of Artisanal Salt

Salt Type	Mean Value	Mean Description	SD	Lowest	Highest
Rock salt (control)	8.00	Very Much Liked	.83	5.00	9.00
Sugpo salt	8.23	Very Much Liked	.77	7.00	9.00
Asin sa Buy-o	8.37	Very Much Liked	.67	7.00	9.00
Asin Tibuok	7.47	Moderately Liked	1.66	2.00	9.00

Legend:
2.50 - 3.49 Moderately Disliked (MD)
5.50 – 6.49 Slightly Liked (SL)
8.50 – 9.00 Extremely Liked (EL)
1.00 – 1.49 Extremely Disliked (ED)
3.50 – 4.49 Slightly Disliked (SD)
6.50 – 7.49 Moderately Liked (MD)
1.50 – 2.49 Very Much Disliked (VMD)
4.50 – 5.49 Never Liked or Disliked (NLD)
7.50 – 8.49 Very Much Liked (VML)

Sensory Acceptability of the Padas Bagoong at Different Types of Artisanal Salt

Salt Type	Appearance	Odor	Acceptability	Texture	Mean	Description
Rock Salt (control)	7.93	7.97	8.10	8.00	8.00	Very Much Liked
Sugpo salt	8.10	7.03	7.47	8.23	7.71	Very Much Liked
Asin sa Buy-o	7.80	7.90	8.10	8.37	8.04	Very Much Liked
Asin Tibuok	7.30	7.40	7.70	7.47	7.47	Moderately Liked

Legend:
2.50 - 3.49 Moderately Disliked (MD)
5.50 – 6.49 Slightly Liked (SL)
8.50 – 9.00 Extremely Liked (EL)
1.00 – 1.49 Extremely Disliked (ED)
3.50 – 4.49 Slightly Disliked (SD)
6.50 – 7.49 Moderately Liked (MD)
1.50 – 2.49 Very Much Disliked (VMD)
4.50 – 5.49 Never Liked or Disliked (NLD)
7.50 – 8.49 Very Much Liked (VML)

Test of Between Salt Type Effects on Appearance of the Padas Bagoong

Source	Sum of Squares	df	Mean Square	F	Sig.
Salt Type	10.700	3	3.567	2.989	0.035*
Panelist	149.867	29	5.168		
Error	103.800	87	1.193		
Total	264.367	119			

* - significant at the 5% alpha level

Post Hoc Comparison of Salt Types Effect on Padas Bagoong Appearance in Homogenous Subset

Salt types	Subset 1	Subset 2
Asin Tibuok	7.30	
Asin sa Buy-o	7.80	7.80
Rock Salt (control)	7.93	7.93
Sugpo Salt		8.10
Sig.	.12	.71

* - significant at the 5% alpha level using Tukey's HSD test

Test of Between Salt Type Effects on Odor of the Padas Bagoong

Source	Sum of Squares	df	Mean Square	F	Sig.
Salt Type	17.492	3	5.831	3.421	0.020*
Panelist	79.575	29	2.744		
Error	148.258	87	1.704		
Total	245.325	119			

* - significant at the 5% alpha level

Post Hoc Comparison of Salt Types Effect on Padas Bagoong Odor in Homogenous Subset

Salt types	Subset 1	Subset 2
Sugpo Salt	7.03	
Asin Tibuok	7.40	7.40
Asin sa Buy-o	7.90	7.90
Rock salt (control)		7.97
Sig.	0.06 ns	0.34 ns

ns – not significant at the 5% alpha level using Tukey's HSD test

Test of Between Salt Type Effects on Taste of the Padas Bagoong

Source	Sum of Squares	df	Mean Square	F	Sig.
Salt Type	8.825	3	2.942	1.955	0.127ns
Panelist	30.242	29	1.043		
Error	130.925	87	1.505		
Total	169.992	119			

ns - not significant at the 5% alpha level

Post Hoc Comparison of Salt Types Effect on Padas Bagoong Taste in Homogenous Subset

Salt types	Subset 1
Sugpo Salt	7.47
Asin Tibuok	7.70
Asin sa Buy-o	8.10
Rock Salt (control)	8.10
Sig.	0.20 ns

ns – not significant at the 5% alpha level using Tukey's HSD test

Test of Between Salt Type Effects on Texture/Consistency of the Padas Bagoong

Source	Sum of Squares	df	Mean Square	F	Sig.
Salt Type	14.167	3	4.722	4.355	0.007**
Panelist	35.467	29	1.223		
Error	94.333	87	1.084		
Total	143.967	119			

* *- highly significant at the 5% alpha level

Post Hoc Comparison of Salt Types Effect on Padas Bagoong Taste in Homogenous Subset

Salt types	Subset 1	Subset 2
Asin Tibuok	7.47	
Rock Salt (control)	8.00	8.00
Sugpo Salt		8.23
Asin sa Buy-o		8.37
Sig.	0.20	0.53

ns – not significant at the 5% alpha level using Tukey's HSD test

Test Result on the Microbial Analysis of the Padas Bagoong

Parameter	Result	Allowable Limit	Interpretation
Aerobic Plate Count	3,100 CFU/mL	10,000 CFU/mL	Passed
Staphylococcus Aureus	0 CFU/mL**	0 CFU/mL**	Passed
Total Coliform Count	<3.0 MPN/mL	10 MPN/mL	Passed
Escherichia coli Count	<3.0 MPN/mL	10 MPN/mL	Passed

Source: *FDA Circular No. 2022 012 Revised Guidelines for the Assessment of Microbiological Quality of Processed Foods

Return of Expenditure of Padas Bagoong

Production Cost (Php)	Total Yield	Mark-Up (Php)	Price per bottle (Php)	Gross Income (Php)	Net Income (Php)	ROE
Php 675.00	16 bottle @ 250 ml	Php 12.65	Php 55.00	Php 880.00	Php 205.00	30.37%

RESULTS AND DISCUSSION

In a sensory evaluation of Padas Bagoong, various artisanal salts were analyzed, with Asin sa Buy-o achieving the highest weighted mean score of 8.04, indicating a "very much liked" preference among respondents, which included manufacturers, experts, and students. The control group, Rock Salt, closely followed with a score of 8.00, while Sugpo Salt scored 7.71, both also falling into the "very much liked" category. Conversely, Asin Tibuok received a mean score of 7.47, categorizing it as "moderately liked," suggesting lower overall preference among consumers. Microbial analysis demonstrated the product's adherence to food safety standards, revealing an aerobic plate count of 3,100 CFU/mL with no detection of Staphylococcus aureus (0 CFU/mL). Additionally, both Escherichia coli and total coliform counts were below the regulatory threshold of 3.0 MPN/mL, confirming the microbiological safety and dietary suitability of Padas Bagoong.

On the economic side, the production costs amounted to Php 675.00, incorporating expenses for raw materials such as fish and Asin sa Buy-o, labor, and manufacturing costs. After applying a 30% mark-up, the retail price was set at Php 55.00 for a 250 mL container, resulting in a gross income of Php 880.00 and a net profit of Php 205.00, translating to a 30.37% return on expenses. This robust financial performance underscores the market potential of Padas Bagoong when leveraging Asin sa Buy-o, as it aligns sensory appeal with safety and economic viability.

CONCLUSION AND RECOMMENDATION

The study confirms that Asin sa Buy-o artisanal salt is a viable option for producing padas bagoong, with microbial analysis verifying compliance with FDA Circular 2022-012 (harmful bacteria absent or minimal) and sensory evaluations indicating consumers prioritize appearance, odor, and texture/consistency—factors that varied significantly among salts—over taste, which remained consistent. These results highlight the product's dual appeal as a safe, hygienic, and sensorially desirable fermented food with strong market potential. To further enhance quality and consumer trust, future research should explore alternative The This study confirms that Asin sa Buy-o artisanal salt is a viable option for producing padas bagoong, with microbial analysis verifying compliance with FDA Circular 2022-012 (harmful bacteria absent or minimal) and sensory evaluations indicating consumers prioritize appearance, odor, and texture/consistency—factors that varied significantly among salts—over taste, which remained consistent. These results highlight the product's dual appeal as a safe, hygienic, and sensorially desirable fermented food with strong market potential. To further enhance quality and consumer trust, future research

should explore alternative artisanal salts, integrate physicochemical assessments (e.g., pH, moisture, salinity) to understand fermentation dynamics, and investigate shelf-life under diverse storage conditions to optimize stability. Establishing a holistic framework that combines microbial, sensory, physicochemical, and shelf-life analyses will refine production protocols, ensure product freshness, and strengthen quality assurance, ultimately advancing padas bagoong as a culturally authentic yet globally competitive product that bridges traditional practices with modern food safety standard.

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