Original Research Article

Sensory Quality of Organic Tilapia (*Oreochromis niloticus L.)* in the Philippines: Implications for Market Assistance and Preference

ABSTRACT

This study evaluates the sensory quality and proximate composition of steamed and fresh organic tilapia (*Oreochromis niloticus* L.) in the Philippines, addressing implications for market acceptance and consumer preferences. Using a sample of 100 fish, sensory analysis revealed that steamed tilapia significantly outperformed its fresh counterpart. Notably, steamed tilapia received an average odor rating of 8.0, indicating a strong consumer preference for this cooking method, while fresh tilapia scored lower due to less appealing visual attributes. Proximate analysis highlighted organic tilapia's nutritional benefits, revealing a crude protein content of 18.43%, a low fat content of 0.66%, and a moisture level of 78.87%. These findings suggest that organic tilapia not only meets health-conscious consumers' demands for high-protein, low-fat options but also aligns with the growing interest in sustainable aquaculture. Enhanced sensory attributes associated with organic farming practices further bolster its market potential, making organic tilapia a viable and appealing seafood choice for domestic and international markets. This study underscores the importance of sensory quality assessments alongside nutritional analysis in informing consumer choices and promoting organic fish products in the ever-evolving aquaculture landscape.

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Keywords: Organic Tilapia, Steamed Tilapia, Fresh Tilapia, Proximity, Aquaculture, Sensory Analysis, Nutritional

1. INTRODUCTION

Tilapia is one of the most important aquaculture species globally and plays a significant role in the Philippines' fish farming industry. As a tropical country with abundant water resources, the Philippines has become one of the top producers of tilapia, contributing significantly to food security and local livelihoods (Guerrero, 2002). With the growing global and domestic demand for healthier and more sustainable food products, organic aquaculture is emerging as a viable alternative to conventional fish farming in the Philippines. Organic fish farming practices emphasize the use of natural feeds and sustainable farming methods, avoiding the use of synthetic chemicals, which align with increasing consumer preferences for organic products (Boyd & Tucker, 2012).

In the context of the Philippines, tilapia farming is not only a crucial source of nutrition but also an economic driver for many rural communities. However, as consumers become more health-conscious, there is a rising demand for organic tilapia, which is seen as a healthier option due to its natural farming practices and lower use of synthetic inputs (Rivera &Dulnuan, 2018). Moreover, organic farming practices are believed to enhance the sensory attributes of fish, including taste, texture, and overall acceptability, making it more appealing to both local and international markets (Watanabe et al., 2002).

In evaluating organic tilapia, sensory acceptability is a key factor influencing consumer preferences. In the Philippines, where tilapia is a staple fish, it is important to assess how consumers perceive both the steamed and fresh forms of organic tilapia. Steaming, as a common cooking method, is known to enhance the natural flavors and tenderness of the fish, which may lead to higher sensory ratings compared to fresh, uncooked fish (Aquerreta et al., 2002). The visual and olfactory characteristics, such as the shininess of scales and the firmness of the flesh, are critical in determining consumer satisfaction, especially in a country like the Philippines, where fresh seafood is highly valued (Olivar et al., 2020).

Furthermore, the proximate analysis of organic tilapia is important for understanding its nutritional value. Proximate analysis, which includes measurements of crude protein, ash, crude fat, and moisture, provides insights into the health benefits of consuming organic tilapia (Gokoglu & Yerlikaya, 2015). The nutritional composition of tilapia is crucial, especially in the Philippines, where fish serves as a primary protein source for many households (Chavez et al., 2008). The relatively low-fat content and high protein levels of organic tilapia make it an attractive option for health-conscious consumers, aligning with the government's push toward promoting healthier diets and sustainable food systems.

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2. METHODOLOGY

2.1 Respondents of the Study

The respondents of the study was composed of 50 people, 25 male and 25 with age ranged from 15-60 years old and not trained for sensory analysis but regular consumers of tilapia.

2.2 Pond Preparation and Maintenance

Prior to stocking, pond preparation was done to ensure better pond productivity. Pond preparation involves weeding; total draining of pond water to remove unwanted species; pond bottom tilling and leveling to increase oxygen level and facilitate ease in seining during sampling and harvesting of stocks and pond drying to facilitate evaporation of toxic gases present in the pond. Water filling to a depth of 0.8m to 1.0m and fertilization were also done. Vermicast was used as organic fertilizer with basal application of 1,500 kg/hectare.

2.3 Source of Organic Tilapia Sample

The organic tilapia sample was obtained from the Bureau of Fisheries and Aquatic Resources – National Freshwater Fish Technology Center (BFAR-NFFTC) located inside the CLSU Compound, Science City of Muñoz, Nueva Ecija. Tilapia used was reared in a 1,200 m^2 pond with a stocking density of 2pcs/m^2.

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2.4 Experimental fish

The fish used in this study is Organic Improved GET ExCEL 2010 with an initial size of #24 (Average Body Weight of 0.025 and Average Standard Length of 2.57 cm) with four (4) months culture period and harvested an average weight of 60-100g.

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2.5 Feeding

Daily feed ration was computed based on the feeding guide used for organic and non-organic to determine the amount of feeds given per meal. The formulated diet use in the

study contains 34% crude protein content for fingerlings and 30% crude protein content for juvenile to adult size fish.

Incorporation of plant based and animal-based protein was administered to meet the desired crude protein requirement. The computed feed formulation for feed ingredients were weighed, combined, pelletized and dried. Below is the monthly computed feed given.

Table 1. Monthly feeding of organic tilapia

Month	Feed Ingredients	Crude Protein (%)	Inclusion (%)	Final Crude Protein (%)
First month	Fish Meal	63	30	18.90
	Vermi Meal	52	5	4.50
	Rice bran	11	32	3.52
	Duckweed meal	27	16	4.32
	Kangkong meal	22	11	2.42
	Cassava	0	5	0
	Fish oil	0	1	0
	Total		**100**	**33.66**
Second Month	Fish Meal	63	30	18.90
	Vermi Meal	52	5	4.50
	Rice bran	11	25	2.75
	Duckweed meal	27	24	6.48
	Kangkong meal	22	16	3.52
	Cassava	0	5	0
	Fish oil	0	1	0
	Total		**100**	**30.47**
Third Month	Fish Meal	63	30	18.90
	Vermi Meal	52	5	4.50
	Rice bran	11	32	3.52
	Duckweed meal	27	16	4.32
	Kangkong meal	22	11	2.42
	Cassava	0	5	0
	Fish oil	0	1	0
	Total		**100**	**33.66**
Fourth Month	Fish Meal	63	24	15.12
	Vermi Meal	52	5	2.60
	Rice bran	11	32	3.52
	Duckweed meal	27	16	4.32
	Kangkong meal	22	11	2.42
	Cassava	0	5	0
	Fish oil	0	1	0
	Total		**100**	**33.66**

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2.6 Preparation of tilapia for evaluation

100 pieces of organic tilapia were obtained from pond of BFAR-NFFTC Organic Aquaculture Farm located at CLSU compound Science City of Munoz, Nueva Ecija.The weight of fish harvested is in the range of 60-100 grams. The newly caught fish were washed thoroughly, stored separately at the ice box kept in insulated polystyrene boxes with ice: fish ratio of 2:1 to keep temperature at 0 - 4°C. The fish samples used for taste test were steamed prior for evaluation and transportation to Brgy. Abar 1st and Brgy. Caanawan, San Jose City, Nueva Ecija.

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2.7 Data gathering instruments

To determine the appearance of fish, the fish were washed thoroughly with cold water, placed in an ice box. In terms of sensory attributes, the fish were steamed in an oven (145˚F) for 20 minutes in a well packed foil then provide with an alpha-numerical code.

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2.8 Sensory analysis

The panel consisted of 50people; age 15- 60 years old. Each was given a survey form which is the consumer preference test and will do the sensory evaluation of the steamed and fresh organic tilapia in terms of shininess of scales, color of eyes, color of gills, odour and firmness.

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The panel performed the sensory evaluation without information about the experimental design. Acceptability of the two products in terms of taste, odor, texture, appearance was done using a Hedonic scale of 1-9 from dislike extremely to like extremely

2.9 Proximate analysis

Proximate analysis was done by sending at least 250g samples of chilled organic tilapia for laboratory extraction. Crude protein, ash, crude fat and moisture are the fractions determined during the analysis.

3. RESULTS AND DISCUSSION

3.1 Acceptability of Steamed and Fresh Tilapia

3.1.1 Mean acceptability of steamed organic tilapia

The high acceptability of steamed organic tilapia, particularly in terms of odor (mean score of 8.0, "Like Very Much"), reflects findings from previous research that emphasizes the importance of odor in consumer preferences for fish. According to Verbeke et al. (2007), odor is a crucial sensory factor that influences the overall perception of freshness and quality in seafood. Similarly, steaming as a method has been shown to enhance the natural flavors and aroma of fish, making it more appealing to consumers (Aquerreta et al., 2002). The moderate to high ratings for other attributes, such as shininess of scales and firmness, are consistent with research suggesting that the visual appearance of fish, particularly the condition of the scales and texture, plays a significant role in consumer decisions (Hempel & Hamm, 2016).

Table 2. Acceptability of steamed organic tilapia

Attributes	Mean	Description
Shininess of scales	7.8	Like Moderately
Color of Eyes	7.2	Like Moderately
Color of Gills	7.3	Like Moderately
Odour	8.0	Like Very Much
Firmness	7.6	Like Moderately

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3.1.2 Mean acceptability of fresh organic tilapia

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In contrast, fresh organic tilapia received lower scores for attributes such as shininess of scales (6.3) and color of eyes (5.3), indicating a lesser degree of acceptability. This result aligns with research by Korzen et al. (2011), which found that consumers often associate fresh fish with less appealing visual characteristics compared to cooked fish, where steaming or baking can improve the texture and visual appeal. Moreover, the relatively low score for the firmness of fresh tilapia (5.8) mirrors findings by Grigorakis (2007), who suggested that post-harvest handling and the method of display can affect the firmness and overall quality of fresh fish, thereby influencing consumer perception.

Despite these lower scores, the color of gills and odor of fresh tilapia were still moderately liked by the respondents, with scores of 7.5 and 7.1, respectively. This finding supports the argument by Fauziah et al. (2019), who noted that while the visual appearance of fresh fish might be less appealing, the natural odor and gill color are often indicators of freshness, which still influence acceptability positively.

Table 3. Acceptability of fresh organic tilapia

Attributes	Mean	Description
Shininess of scales	6.3	Like Slightly
Color of Eyes	5.3	Neither Like nor Dislike
Color of Gills	7.5	Like Moderately
Odour	7.1	Like Moderately
Firmness	5.8	Neither Like nor Dislike

3.2 Proximate Analysis

The crude protein content of the organic tilapia sample was found to be 18.43%, which is consistent with general findings in other studies on tilapia. According to Watanabe et al. (2002), tilapia species typically range between 15% and 20% crude protein content, depending on factors such as diet, water quality, and growth conditions. Protein is a vital component of fish that not only supports muscle growth but also contributes to the overall health benefits of consuming fish. High protein content, as found in organic tilapia, reflects the species' role as a valuable source of nutrition, particularly for consumers seeking high-protein, low-fat food options.The nutritional value of organic tilapia is in line with studies on organic farming that show how natural feed and sustainable farming practices can enhance protein content without the use of synthetic inputs (Pelillo et al., 2002). Organic fish farming practices tend to emphasize the natural development of fish, which can contribute to optimal protein levels that meet consumer health expectations.

The ash content in the organic tilapia sample was 1.12%, representing the mineral fraction of the fish. This falls within the typical range for freshwater fish species, which is generally between 1% and 2% (Huss, 1995). Ash content is an important measure as it reflects the presence of essential minerals such as calcium, potassium, and magnesium, which are critical for human health. Organic farming, which limits the use of chemical inputs, has been shown to support more natural mineral absorption in fish (Boyd & Tucker, 2012).Fish with a balanced ash content is often more appealing to health-conscious consumers, as minerals play a vital role in maintaining bone health and metabolic functions. The ash content reported here supports the notion that organic tilapia provides an adequate mineral profile.

The crude fat content of 0.66% in the organic tilapia sample suggests that the fish is lean, which is characteristic of tilapia species. Low-fat content is often seen as a positive trait, especially in light of consumer trends favoring leaner meats for health reasons (Ng & Chong, 2004). Crude fat in fish, however, is also a source of essential fatty acids such as omega-3 and omega-6, which are important for cardiovascular health (Simopoulos, 1991). The low-fat content also reflects the farming practices in organic aquaculture, where fish are allowed to grow in a more natural environment with a balanced diet, as opposed to conventional aquaculture where fat levels can be higher due to the use of high-energy feeds (Boyd & Tucker, 2012).

The moisture content of the organic tilapia sample was 78.87%, which is within the expected range for freshwater fish, typically between 70% and 80% (Nettleton & Exler, 1992). Moisture content in fish is inversely related to fat content, meaning that leaner fish, like tilapia, generally have higher moisture levels. This high moisture content reflects the fresh quality of the fish and contributes to its texture and palatability (Gokoglu & Yerlikaya, 2015). The relatively high moisture content also suggests that the fish is ideal for various cooking methods such as steaming or grilling, which preserve moisture and enhance flavor.
The high moisture level may be advantageous for consumers who prefer fish that remains tender after cooking. However, from a storage perspective, high moisture content can also

affect the shelf life of fish products, requiring careful handling and chilling to prevent spoilage (Chukwu & Shaba, 2009).

Table 4. Proximate analysis of organic tilapia

Test Parameters	Organic
Crude Protein	18.43%
Ash	1.12%
Crude Fat	0.66%
Moisture	78.87%

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4. CONCLUSION

The acceptability assessment demonstrates that steamed organic tilapia is preferred due to its high odor rating (mean score of 8.0), which aligns with consumer preferences emphasizing freshness and flavor. In contrast, fresh organic tilapia received lower scores for various attributes, highlighting that while overall acceptability is moderate, certain visual characteristics affect perceptions negatively.

From the proximate analysis, organic tilapia showcases valuable nutritional attributes, including a high protein content of 18.43% and a low fat content of 0.66%, making it an appealing choice for health-conscious consumers. Its adequate moisture and mineral content further support its role as a nutritious seafood option.

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Comment [A12]: Follow uniform style in writing. Indicate doi for all references

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