

Innovated Product on Fish Tilapia (*Oreochromis niloticus*) Dumplings

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Abstract: This study determined the level of acceptability of “Innovated Product on Fish Tilapia (*Oreochromis niloticus*) Dumplings and its Cost Analysis.” This study sought to answer for the level of acceptability of the Tilapia Dumplings on appearance, color, aroma, flavor, and taste according to the three cooking methods: deep-frying, steaming, and baking. Moreover, the significant difference in the level of acceptability on appearance, color, aroma, flavor, and taste when grouped according to the cooking method, the one which has the highest level of acceptability is also considered, and the cost-analysis of the innovated product. This study made use of the experimental method of research, including the sampling scheme, sensory evaluation, acceptability of the products by the consumers according to varied cooking methods and its potential for copreneurship with stakeholders. The study showed that the respondents rated the Tilapia Dumplings “like moderately” based on the food attributes in the three cooking methods; The data showed that there is a significant difference in aroma, and a highly significant difference in terms of appearance and flavor. The result further showed that steaming had a higher mean score than frying. Deep frying the dumpling also resulted to difference in color as compared to steaming. In terms of appearance, the dumpling in deep frying gained higher mean score. This is because the dumpling that is deep-fried is intact and properly wrapped. While in steamed dumpling has the tendency to swag. Considering the previous results, the difference is not significant. Based on the results, it shows that the tilapia cooked in different cooking method is acceptable to the evaluators and consumers. It can be sold as deep fried, while it can also be sold in steamed. Based on the results of the study, it is further recommended that food innovators use the Tilapia in Dumplings as an alternative to other fishes and that local Food Producers & Entrepreneurs may consider the Tilapia Dumplings as a good source of income since the fish is abundant in the local market.

Keywords: Dumpling, Tilapia, Deep Frying, Steaming, Baking.

I. INTRODUCTION

Chinese meat dumplings are usually made from wheat flour dough sheeted to a thickness of 1.5 - 2.0 mm. This sheet forms a skin, which is used to wrap a variety of delicious fillings. The fillings usually consist of mincemeat, vegetables, seafood or a mixture [1]. Food retail industries that serve dumplings include hand-to-mouth stalls or simply a take-out kiosk that give customers easy access to food they want to eat. Collectively referred as “siomai” to Filipinos, dumplings are often made out of ground pork, beef, shrimps and tuna among others combined with extenders such as egg. The ingredients are then wrapped in wonton wrappers or in a molo wrapper. It is either steamed or fried resulting to a crispy texture. One of the most important cultured fish in the country is the fresh water tilapia. Tilapia or *Oreochromis niloticus* contains 66-84 %

moisture 0-2.9 % carbohydrates, 15-20 % proteins, 0.1-20 % lipids, 0.8-2 % ash content of marine fish [2]. Comparing this value with the results obtained in the present study, it is observed that in freshwater fish the carbohydrate content is higher while the protein, lipids and ash contents are low than those of marine fish [3]. Tilapia is also rich in n-3 Polyunsaturated Fatty Acids (PUFAs). Farmed tilapia, with enriched n-3 PUFA content may present some significant health benefits [4]. Human diet includes these important unsaturated n-3 PUFA in order to reduce risks and the “prevention of number of diseases, such as coronary heart diseases, inflammation, hypertriglyceridemic effect, allergies, hypertension, arthritis, autoimmune disorders, and cancer” [5]. Hossain added that modified diets of farmed tilapia according to their feeds can have better nutritional composition, as compared to the wild tilapia. Nile tilapias that were supplemented with chia bran can “raise the nutritional quality of Nile tilapia fillets” [6]. Common ways to cook tilapia fillet include frying, paksiw or vinegar based, baked, and even grilled. There is, however, no particular innovation to preparing tilapia as dumpling. Surprisingly, meat and shrimps are the usual main ingredients of dumplings when tilapia can become a much affordable alternative. Thus, this paper aims towards proposing a food innovation that should allow consumers and even small food business owners to discover how this famous fish in the country can be a main ingredient to fried, baked, or steamed dumpling.

II. METHODS

This research study used experimental method design which included sampling scheme, sensory evaluation and acceptability of the Tilapia Dumplings by the consumers which was done by pre-treatment process using pineapple juice, milk and anisado wine. Quantitative data was used in this descriptive research. Descriptive research is an approach which the inquirer often makes knowledge claims based primarily on constructivist perspectives which are developed as intent of participatory perspectives in quantitative perspective and data analysis [7]. This study also considered qualitative data analysis of the pre-treatment process and cost analysis of the innovated product in terms of production cost and operational cost. The study conducted had 85 students from the USTP-Cagayan de Oro, Lapasan, Cagayan de Oro City who served as respondents to determine the level of acceptability while 10 food processing faculty experts and five (5) industry experts from Cagayan de Oro City, Misamis Oriental were chosen to stabilize the result. The researcher utilized the nine-point hedonic scale instrument [8] on the level of acceptability of the Tilapia Dumplings in terms of appearance, color, aroma, flavor, and taste.

III. RESULTS

Problem 1. What is the accepted pre-treatment process of Tilapia dumplings?

Pre-treatment process is intended for eliminating the fishy odor of the Tilapia Dumpling. For this research, the marination process was done using three marinades. These included pineapple juice, milk, and anisado wine. The juice used for the marination was the canned 100% unsweetened pineapple juice. The milk was the canned evaporated milk while a bottled anisado wine was also utilized. Each of the marinades had one kilo tilapia meat used for marination. The tilapia meat was marinated for one hour in each marinade. There were three faculty food experts and three faculty members of the university who evaluated the final products from the three marinades. The majority of the evaluators preferred the pineapple juice pre-treatment among the three marinades. The food testers stated that the fishy odor of the tilapia was no longer present. They also stated that the taste of the Tilapia Dumplings with pineapple juice marinade had improved as compared to the dumplings marinated with milk and anisado wine. The pineapple juice marinade was the usual preference for marinating meats, including fish meats. The acid and enzymes found in pineapple juices can help in tenderizing the meat and even reduce its odor. A United States patent author stated “fruit acids, aldehydes and fruit related products in the juice do not react with the phenols and related smoke products to give off offensive odors or taste.” [9] Thus, pineapple juice marinades can generate better taste and smell due to their better acid composition as compared to those found in the milk and anisado wine.

Problem 2. What is the level of acceptability of the 100% tilapia dumplings with regards to taste, aroma, color, flavor and appearance when grouped according to different cooking methods:

- 2.1. deep-frying;
- 2.2. steaming; and,
- 2.3. baking?

Table 1. Distribution of statistics Frequency, percentage distribution, mean and standard deviation of level of acceptability of the tilapia dumplings taste, aroma, color, flavor and appearance in Deep-frying method.

Response	Range	Frequency	Percentage Distribution
Like Extremely	8.5 - 9.0	11	11.00%
Like Very Much	7.5 - 8.4	37	37.00%
Like Moderately	6.5 - 7.4	36	36.00%
Like Slightly	5.5 - 6.4	14	14.00%
Neither Like or Dislike	4.5 - 5.4	2	2.00%
Dislike Slightly	3.5 - 4.4	0	0.00%
Dislike Much'	2.5 - 3.4	0	0.00%
Dislike Very Much	2.5 - 2.4	0	0.00%
Dislike Extremely	1.0 - 1.4	0	0.00%
Total		100	100%

Mean 7.41 (like moderately)

Standard Deviation 0.88

The data showed the over-all level of acceptability of the Tilapia Dumplings' appearance, color, aroma, flavor, and taste in deep-frying method. The average of the food attributes in terms of appearance, color, aroma, flavor, and taste, was calculated to have a general perspective of the Tilapia Dumplings. The data showed that majority of the respondents rated the Tilapia Dumplings' appearance, color, aroma, flavor, and taste in Deep-frying method as "Like Very Much" (mean=7.41). However, the standard deviation of 0.88 indicates that their responses varied a lot from each other. In terms of appearance, most of the respondents evaluated the appearance of the deep-fried Tilapia Dumplings as 'like moderately,' this is because of the appetizing appearance of the product. The deep-fried Tilapia Dumpling was wrapped in a triangular shape which was somehow new to the eyes of the respondent-evaluators that made the appearance of the dumpling attractive and appetizing. The size of the Tilapia Dumplings also affected its acceptability based on the answers provided by the respondent-evaluators. Majority of them agreed that it would be more acceptable for the deep-fried Tilapia Dumpling to be bigger than the samples provided. Consequently, bite-size is among the physical structure characteristic of the food that determined the perception and acceptability of the food products [10]. In terms of color, the deep-fried Tilapia Dumplings varied in its saturation as some dumplings have deep brown color while others have lighter brown color. This variation affected the way the respondent-evaluators responded to the acceptability of the deep-fried Tilapia Dumplings' color. The color in food products can be connected to the ways consumers determine the quality [11]. When it comes to the acceptability of the Aroma of the deep-fried Tilapia Dumplings, it is highly dependent on how the potent fishy odor of the tilapia meat is eliminated. As observed from the respondent-evaluators, they reported that they liked the smell and even did not notice the tilapia fish aroma at all. Consequently, the deep-frying method contributes to this acceptability as the sense of smell is a "volatile component of the frying process" [12]. This means that deep-frying allows the response of the smelling senses based on how the cooking process is performed. As for the flavor, majority of the respondents "like extremely" the flavor of the deep-fried tilapia dumplings. This is because of the distinct ingredients added that gives flavor to the dumpling. Aside from the ways that food physically changed when deep-fried, the preservation of the flavor could also be achieved through this cooking method. "Simultaneous mass and heat transfer by hot oil modifies the food surface, forming a crust that preserves flavors and retains part of the juiciness of the food while it is cooked, making chewing and digestion easier." [13]. Lastly, about the taste majority of the respondent-evaluators responded 'like very much.' This implies that the taste of the deep-fried Tilapia Dumplings is highly acceptable to the palate of the consumers. The crispiness of the deep-fried Tilapia Dumplings added value to its taste as commented by many of the respondents. Respondent-evaluators added; however, that the taste could be improved if spices and chili were part of the ingredients. This goes along with the findings found in the study that stated how better taste could be achieved if the fish-based dumplings were added with more spices [14].

Table 2. Distribution of statistics Frequency, percentage distribution, mean and standard deviation of level of acceptability of the tilapia dumplings taste, aroma, color, flavor and appearance in steaming method.

Response	Range	Frequency	Percentage Distribution
Like Extremely	8.5 - 9.0	8	8.00%
Like Very Much	7.5 - 8.4	31	31.00%
Like Moderately	6.5 - 7.4	40	40.00%
Like Slightly	5.5 - 6.4	16	16.00%
Neither Like or Dislike	4.5 - 5.4	3	3.00%
Dislike Slightly	3.5 - 4.4	1	1.00%
Dislike Much'	2.5 - 3.4	1	1.00%
Dislike Very Much	2.5 - 2.4	0	0.00%
Dislike Extremely	1.0 - 1.4	0	0.00%
Total		100	100%

Mean 7.18 (like moderately)

Standard Deviation 0.97

The data showed the over-all level of acceptability of the Tilapia Dumplings' appearance, color, aroma, flavor, and taste in terms steaming method. The average of the food attributes in terms of appearance, color, aroma, flavor, and taste, was calculated to have a general perspective of the Tilapia Dumplings. the data showed that majority of the respondents rated the Tilapia Dumplings on appearance, color, aroma, flavor and taste in steaming method as "Like Moderately" (mean=7.18). However, the standard deviation of 0.87 indicated that their responses varied a lot from each other. Most of the respondents have higher acceptability to the deep-fried Tilapia Dumplings' appearance as compared to steamed Tilapia Dumplings. This is because the respondents are accustomed to the usual size and shape of the dumplings that are sold in the local market. The color of the steamed Tilapia Dumplings was same as to the usual dumplings at the local market. Same with the appearance, the respondent-evaluators were accustomed to the usual color of the existing dumplings of the market. The acceptability of the aroma of the steamed Tilapia Dumplings is highly dependable on how the potent fishy odor of the tilapia meat is eliminated. There were some issues with the aroma of the steamed Tilapia Dumplings, this is because steaming method could retain the original flavor of the food. One respondent said that the aroma is "too soury" because of the sauce added to the dumplings. However, respondent-evaluators rated the aroma of the steamed Tilapia Dumplings as to 'like very much'. As for the flavor, both dumplings had the same ingredients; however, the cooking method affected the flavor of the dumplings. The fat and the crispiness of the deep-fried Tilapia Dumplings added flavor to the dumplings which is why respondents favored deep-fried more than the steamed Tilapia Dumplings in terms of its flavor. The taste of the steamed Tilapia Dumplings was also widely accepted to the taste-buds of the respondents. The sauce prepared for the Tilapia Dumplings blended well to each other as reported by the respondents. Though deep-fried Tilapia Dumplings has the higher acceptability in terms of taste compared to steamed Tilapia Dumplings, still majority of the respondents accepted the taste of the steamed Tilapia Dumplings.

Table 3. Distribution of statistics Frequency, percentage distribution, mean and standard deviation of level of acceptability of the tilapia dumplings taste, aroma, color, flavor and appearance in baking method.

Response	Range	Frequency	Percentage Distribution
Like Extremely	8.5 - 9.0	14	14.00%
Like Very Much	7.5 - 8.4	24	24.00%
Like Moderately	6.5 - 7.4	34	34.00%
Like Slightly	5.5 - 6.4	17	17.00%
Neither Like or Dislike	4.5 - 5.4	8	8.00%
Dislike Slightly	3.5 - 4.4	1	1.00%
Dislike Much'	2.5 - 3.4	1	1.00%
Dislike Very Much	2.5 - 2.4	1	1.00%
Dislike Extremely	1.0 - 1.4	0	0.00%
Total		100	100%

Mean 7.08 (like moderately)

Standard Deviation 1.32

The data showed the over-all level of acceptability of the Tilapia Dumplings' appearance, color, aroma, flavor, and taste in baking method. The average of the food attributes in terms of appearance, color, aroma, flavor, and taste was calculated to have a general perspective of the Tilapia Dumplings. The data showed that majority of the respondents rated the baked Tilapia Dumplings' appearance, color, aroma, flavor, and taste in baking method as "Like Moderately" (mean=7.08). However, the standard deviation of 1.32 indicated that their responses varied a lot from each other. Baked products are generally attractive as they allow the appearance of "crispy, lightly browned crust." This gives an appeal to the Tilapia Dumplings as it implies good quality of the product. The slightly brown color that baking allows make the Tilapia Dumplings more attractive. Despite the uninviting smell, there are respondents that liked the flavor of the baked Tilapia Dumplings. The taste of the baked Tilapia Dumplings did not seem to have much difference with that of the steamed Tilapia Dumplings. Respondents added that it was tasty and delicious. Despite the lingering smell, the combination of the ingredients in the dumpling through heat transfer allowed the taste's acceptability among respondents.

Problem 3. Is there a significant difference in the level of acceptability on the appearance, color, aroma, flavor, and taste?

Table 4. Distribution of statistics Analysis of Variance (ANOVA) on level of acceptability of the Tilapia Dumplings on appearance, color, aroma, flavor, and taste when grouped according to cooking method.

Parameter	Deep Frying	Steaming	Baking	F-Value	P-Value
Color	7.17	7.44	7.19	1.272788	0.281573NS
Appearance	7.61	7.05	7.15	4.858406	0.008391**
Aroma	7.49	7.15	6.97	3.471181	0.032347*
Taste	7.04	7.12	7.06	0.094279	0.910056NS
Flavor	7.74	7.14	7.04	8.296305	0.000312**
Acceptability	7.41	7.18	7.08	2.450924	0.087956NS

The table showed the distribution of statistics Analysis of Variance (ANOVA) on level of acceptability of the Tilapia Dumplings on its appearance, color, aroma, flavor and taste when grouped according to cooking method. There were three groups being compared: Deep Frying, Steaming, and Baking method. The null hypothesis, there is no significant difference on the level of Acceptability of Tilapia Dumplings when grouped according to cooking method is ACCEPTED in Color (F= 1.272788NS), taste (F=0.094279NS) and Over-all acceptability (F=2.450924NS). However, the data showed that there was a significant difference in aroma (F=3.471181*). The data further showed that there was a highly significant difference in terms of appearance (F=4.858406**) and flavor (F=8.296305**).

Problem 4. What is the cost analysis of the study in terms of production cost and operation cost?

The total production cost of the product is P345.75. The cost per piece of the raw Tilapia Dumplings is P13. 83. This will be sold per pack with 25 pieces of raw Tilapia Dumplings. The price of the Tilapia Dumplings is lesser as compared to the price of the existing commercial dumplings sold in the local market. The operational expenses which included the list of supplies and materials costing P63.00 plus the list of tools and equipment needed for the production of Tilapia Dumplings. It is important to have acquired these materials in order to produce quality Tilapia Dumplings. The total operating expenses is P3,769.00 for the cost of tool and equipment needed.

IV. CONCLUSION

Based on the results, it showed that the tilapia cooked in different cooking methods were acceptable to the evaluators and consumers. Tilapia can be used as an alternative meat in dumplings. It can be sold as deep fried, while it can also be sold in steamed method. Because preference of consumers can vary, it is important that this variety be supplied to the consumer. But fundamentally the innovated product, tilapia, used in the dumplings is acceptable. However, some would prefer Deep-fried, while others would prefer dumplings that are steamed. Nonetheless, both are acceptable.

V. RECOMMENDATION

On the basis of the findings the following recommendations are presented. Food innovators to use the Tilapia Dumplings as an innovated idea that came from the usual Chinese Dumplings. This can also serve as a signature dish not only for the Asian market, but specifically to the Filipino market as well. Home Economics & Food Production Management Teachers can make use of the innovated product as alternatives in cooking Dumplings which is healthier, cheaper, and abundant in supply and for instructional purposes. Local Food Producers & Entrepreneurs can consider the innovated product as a good source of income and could double their marketability since the raw material is abundant in supply. Consumers can enjoy the innovated product as an alternative dumpling that is beneficial to the health of the individual for tilapia is also low in total and saturated fats and high in protein an exceptional nutrition combination. Investors can gain knowledge on what business to venture particularly to food retail industry and develop innovations of food particularly meals and snacks utilizing tilapia as a dish. Future researchers may find the results of the study useful in the future as future reference in pursuing further studies in utilizing tilapia as a dish.

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