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RESEARCH PAPER

Comparison of Likings towards Fish Cutlet Made from *Pangasianodon hypophthalmus*

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Abstract

This study was performed to compare the likings of fish (Pangas) and chicken cutlet as well as to find the best preparations among three fish cutlets. Taking three groups- Teachers, staffs, and students as panelists, it was found that all the panelists preferred one fish cutlet equally with chicken cutlet. Teacher and staff group liked the cutlet incorporated with 40% fish muscle, whereas student group liked the cutlet made with less amount of fish muscle (30%). The attributes like – Odor, Color, Taste, Texture were studied and compared among each preparation of cutlets along with overall acceptability of the products. Proximate compositions were checked to reveal the nutritional containment at various stages. The biochemical qualities of the final cutlets were checked to ensure that no serious quality compromission has occurred during preparation and all parameters were found to be at a safe level.

Introduction

Fish has a major role in human food and nutrition. They are well known for being easily digestible and containing almost all the necessary amino acids (Haard 1995). Pangas is a very prominent fish in Bangladesh covering about 8.71% of the total fish production which is 4621228 MT (Department of Fisheries, 2020). This huge production can pave a way for fulfilling the country's demand and export abroad. Though wet fish is more popular still now in Bangladesh, different kinds of value-added products are getting attention day by day. To have the full advantage of this major inclusion in food habits, Pangas can be a good option to prepare a number of value-added products. Value added and ready to eat fish products are very popular and come in a variety of forms (Tomoszek 2002). Due to increasing awareness of the consumers on health issues, consumption of fish and fishery products are increasing now a days. On this basis, ready to eat fish minced products can bring immediate benefit to the existing fish processing industries of the country (Nowsad *et al*., 1994). Cutlet is a delicious fried item which has been prepared from chicken in most cases. To talk about the fish mice-based product, fish cutlet is a well- known item now a days. Though this item is made in the household occasionally but not on a large commercial level. With the heavy workload in the shoulder of modern human being, they can't give proper attention to food making or processing and working house groups are mostly dependent upon ready meals. Thinking from this ground, fish cutlet can make a great opportunity for

getting quick ready meal boxes. This study was done with an aim to make comparison of fish culet with chicken cutlet as it can give a distinct idea of the peoples' sentiment towards fish and pave a way to find out the feasibility of best-chosen cutlet to be popular among consumers.

Materials and Method

Experimental Design

Three preparations of fish cutlet from pangas fish (*Pangasianodon hypophthamus*) and one cutlet from chicken were made. The items were tasted by the panel members to choose the best preferred product to see whether the chicken cutlet or the fish cutlet gets the most preference and which percentage (among 30%, 40% and 50% fish mince) of fish cutlet is more favorable. After finding the best preferred product, some biochemical analyses were done.

Preparation of Cutlet

Fish Cutlet Mix

7 kg Fresh pangas fish was collected from KR market, Mymensingh, Bangladesh and brought carefully to the Fish processing and Quality Control Laboratory at Faculty of Fisheries, Bangladesh Agricultural University. Fish was gutted and filleted properly followed by washing until all the blood and debris got cleaned off. Washed fillets were then boiled for 5-8 mins and skin were removed from the muscle. Boiled muscles were homogenized using a blender to make a paste. The total yield of mice was about 41%. On the other hand, potatoes were boiled, peeled, and finely mashed. Three different composition of fish cutlet mix (30%, 40% and 50% fish muscle) were prepared following the recipe given for each 100g in Table 1. The dough was then shaped into round cutlet shape. The thickness of each cutlet was about 1 cm.

Chicken Cutlet Mix

3kg chicken was collected, gutted, and skinned from Seshmore market, Mymensingh, Bangladesh and brought carefully to the Fish processing and Quality Control Laboratory at Faculty of Fisheries, Bangladesh Agricultural University. Chicken was filleted followed by washing until all the blood and debris got cleaned off. Washed fillets were then boiled for 8-10 mins along with potatoes. Boiled chicken fillets were homogenized using a blender. Yield of chicken mince was about 47%. On the other hand, boiled potatoes were peeled and finely mashed. Cutlet mix was prepared using 50% chicken muscle following the recipe given for each 100g in table 1. The prepared mix was then shaped into round shape as cutlets. The thickness of the cutlet was measured 1 cm.

Battering, Breading and Frying

Prepared cutlets were dipped in whisked egg and then breaded with 1:1 bread crumb: rice flour to give it a crunchy texture. Soyabean oil was heated to about 80°c and fried until a nice brown color appeared. After that, oil was strained carefully to remove the excess oil.

Panel Test

Panel Formation

The panel was formed with three categories of panelists- Teachers, Students and Officers. The test was done on the University campus. They were given instructions properly and told to put unbiased marking of the samples.

Presenting the Sample

Samples were presented following the rules of multiple panel test. Each sample was given a coded name given in Table 2. In disposable plates, the code names were written, and the designated samples were put into the plates accordingly. Water was supplied with the samples to ensure the neutral sensory analysis of each sample.

Categories for Marking the Sample

The prepared samples were marked into two categories:

1. Attributes marking:

Samples were marked for color, odor, taste, texture in a 5-scale marking. Mean of all the attributes were taken as overall acceptability.

2. Hedonic scale:

Another overall acceptability of the sample was assessed in a structured 9- point hedonic scale.

Biochemical Analyses

Proximate composition, pH, TVBN, peroxide values of the cutlet samples were determined. Each sample was analysed in triplicate.

Proximate Composition

Proximate analyses of raw and boiled fish mince, raw and boiled chicken mince, 30%, 40%, 50% fish cutlet mix, 50% chicken cutlet mix, and the chosen final products were checked following the standard procedure (Association of Official Analytical Chemists, 1990). Wet weight (W/W) based analysis were done.

Moisture Content: Moisture content was determined using the following formula:

Table 1. List of ingredients for 100g cutlet mix

Ingredients	30% fish cutlet	40% fish cutlet	50% fish cutlet	50% chicken cutlet
Fish/ chicken muscle (g)	30	40	50	50
Mashed potato (g)	48	38	28	28
Onion (g)	15.5	15.5	15.5	15.5
Chili (g)	1.5	1.5	1.5	1.5
Fish spice (g)	1	1	1	1
Salt(g)	2	2	2	2
Rice flour (g)	2	2	2	2

Table 2. Code names for cutlets

Code	Cutlet
FC1	30% fish cutlet
FC2	40% fish cutlet
FC3	50% fish cutlet
CC1	50% chicken cutlet

$$\% \text{ Moisture} = \frac{\text{Wet sample weight} - \text{Dry sample weight (g)}}{\text{Wet sample weight (g)}} \times 100$$

Ash Content: Ash content was calculated using the following formula:

$$\% \text{ Ash} = \frac{\text{Weight of ash (g)}}{\text{Weight of sample (g)}} \times 100$$

***Determination of Protein*:** The protein estimating formula was:

$$\% \text{ Nitrogen (N)} = \frac{\text{Titrant use (ml)} \times \text{Strength of titrant} \times \text{Mili equivalent of N}}{\text{Weight of } sample} \times 100$$

$$\% \text{ of Crude protein} = \% \text{ of N} \times 6.25$$

***Determination of Lipid*:** Lipid content was measured using the following formula:

$$\% \text{ Lipid} = \frac{\text{Weight of the lipid (g)}}{\text{Weight of the sample (g)}} \times 100$$

Determination of Carbohydrate: As potato is used in the cutlet dough, carbohydrate content of fish and chicken dough as well as final products was determined. Moisture, lipid, protein, lipid content was summed up and subtracted from 100 to determine carbohydrate content (Food and Agricultural Organization, 2004).

TVBN

TVB-N was determined according to Analytical Methods Committee (1979) method with certain modification. The procedure is given below:

$$\text{TVBN (mg/100g)} = \frac{(\text{Titration value} \times 0.01 \times 14 \times 20)}{\text{Weight of sample}}$$

Peroxide Value

Peroxide value was determined according to the procedure by Japanese Association of Oil Chemists (1972) and Pearson (1976) with certain modification.

$$\text{PV (meq/1000g)} = \frac{\text{Titration volume} \times 10}{\text{Weight of fat (g)}}$$

Statistical Analysis

Statistical analysis was performed using Kruskal H test to compare the products' scores and likeliness, compositional and quality data of chosen final product at 0.05 significance level. All the tests were carried out by SPSS version 25. Tabulation and Graphical representation of the data was performed by MS Excel (version: 2110).

Results and Discussion

Panel Test

Four attributes of the cutlets, namely-odor color, taste and texture were compared according to the panelist to check if the prepared cutlets vary significantly ($P<0.05$) on the basis of their attributes. Significant ($P<0.05$) variation was found in odor, color, taste, and texture among the products on the basis of Teachers' opinion. FC2 varies significantly ($P<0.05$) from all the other cutlets on the basis of odor. In case of color, there is significant ($P<0.05$) difference only between FC1 and FC2. On the other hand, FC1 is significantly ($P<0.05$) different from FC2 and CC1; FC3 is significantly ($P<0.05$) different from FC2 and CC1 too on the basis of taste. Taking the score of texture quality, it was found that all the products were same except FC1 being significantly ($P<0.05$) different from CC1 (Table 3a).

In case of students, the culets varied significantly ($P<0.05$) on the basis of odor only, whereas there was no significant ($P>0.05$) variation among the other

attributes. Based on the score of likings, FC1 was proved to be significantly different from FC2 and FC3 (Table 3b).

There was no significant (P>0.05) variation in the texture among the cutlets on the basis of the staff's opinion whereas products varied significantly (P<0.05) based on the likings of color, odor and taste. FC2 and FC3 varied significantly (P<0.05) in case of odor, whereas FC1 was found to be different from FC3 and CC1 on the basis of color. Taste made FC2 and FC3 vary significantly (P<0.05) from each other (Table 3c).

Among the four compositions of cutlets, the most liked one was selected by the analysis of mean and standard deviation of the score given by the panelist of three categories. The cutlet which got the highest mean and the lowest standard deviation was taken as the most acceptable product as it showed the highest scoring done by the highest number of panelists.

Taking the mean score of all attributes as overall acceptability, significant (P<0.05) variation was found among the cutlet on the basis of teacher's marking. FC2 was significantly (P<0.05) different from FC1 and FC3; CC1 is not significantly different from FC1 but from FC2 and FC3.This clarifies that FC2 got the highest score and the lowest standard deviation value by the teachers. The likings for cutlet by the teacher was same for FC2 and CC1.

On the other hand, Student's preferences create significant (P<0.05) differences of FC1 from FC2 and FC3. Students were found to like FC1 the most among the fish cutlets. This may happen due to young generations' less likings to fishy odor. FC1 contains 30% of fish muscle that leads to less fish odor. Weichselbaum *et al*. (2013) suggested that youngs consume less amount of fish compared to adults. It was found that they liked 30% fish cutlet (FC1) and chicken cutlet (CC1) equally. FC1 here got the highest mean score and lowest SD value here.

According to staff's choice, data showed significant variation among the cutlet, where post hoc test confirms that FC1 is significantly (P<0.05) different that the other two fish cutlet, whereas they liked chicken cutlet in a equal manner (Table 4).

On the other hand, taking the hedonic scale score into account it was found that, cutlets varied significantly (P<0.05) upon the score given by teachers, students, and staffs. In every cases, choices show the exact same variation toward the cutlet that had been shown in overall acceptability (Table 5). On the basis of the highest score and the lowest standard deviation, result was found similar to previous findings- FC2 was most liked by both teachers and staffs whereas the staff liked FC1 the most judging by the hedonic scale score too. All the panelists liked chicken cutlet not differently from their chosen fish cutlet. This data represents linking toward fish which can be related to the early life fish consumption rate. In a hypothesis conducted by Altintzoglou et al. (2010) suggests that only frequent fish consumption as a child result in the same consumption habit as an adult. This is because consuming little fish as a child makes it difficult to become acquainted with fish. The findings of Thorsdottir et al. (2012) discovered that regular fish consumption in childhood can positively alter attitudes toward eating fish in young consumers

Table 3(a).Attributes score for teachers

Cutlets	Odor	Color	Taste	Texture
FC1	3.25 ± 0.04^{a}	3.25 ± 0.54^{a}	3.38 ± 0.23^{b}	3.50 ± 0.65^{a}
FC2	5.00 ± 0.13^{b}	4.63 ± 0.43^{bc}	4.75 ± 0.42^{a}	4.38 ± 0.33^{ac}
FC3	3.25 ± 0.15^{a}	3.88 ± 0.32^{ac}	2.75 ± 0.34^{b}	4.00 ± 0.23^{ac}
CC1	3.13 ± 0.14^{a}	4.25 ± 0.11^{ac}	4.75 ± 0.45^{a}	4.63 ± 0.06^{bc}

Table 3(b). Attributes score for students

Cutlets	Odor	Color	Taste	Texture
FC1	4.71 ± 0.45^{bc}	4.14 ± 0.65^{NS}	4.86 ± 0.34^{NS}	4.57 ± 0.32^{NS}
FC2	3.14 ± 0.76^{a}	3.71 ± 0.43^{NS}	4.43 ± 0.36^{NS}	4.29 ± 0.36^{NS}
FC3	2.71 ± 0.34^{a}	4.42 ± 0.30^{NS}	4.00 ± 0.23^{NS}	4.14 ± 0.65^{NS}
CC1	3.57 ± 0.23^{ac}	4.43 ± 0.22^{NS}	4.14 ± 0.32^{NS}	4.29 ± 0.42^{NS}

Table 3(c). Attributes score for staffs

Cutlets	Odor	Color	Taste	Texture
FC1	4.25 ± 0.55^{ac}	2.75 ± 0.44^{a}	4.00 ± 0.32^{ac}	4.00 ± 0.33^{NS}
FC2	4.75 ± 0.34^{bc}	4.50 ± 0.37^{bc}	4.75 ± 0.22^{bc}	4.50 ± 0.67^{NS}
FC3	3.00 ± 0.22^{a}	3.50 ± 0.45^{ac}	2.75 ± 0.65^{a}	3.75 ± 0.45^{NS}
CC1	3.75 ± 0.17^{ac}	4.50 ± 0.16^{bc}	4.50 ± 0.34^{ac}	3.75 ± 0.21^{NS}

aged 17-26 years and lead to higher fish consumption. Similar phenomena were seen in Norway, where high fish eating among 45–69-year-old women was associated with high fish consumption as a child (Trondsen et al., 2003).

Including a higher percentage of potato lowered the inclusion of fish muscle. In case of adult (teachers and staffs), the amount of potato in the liked fish cutlet was 38 g, whereas the students' preferred fish cutlet with more potato percentage (48%) the possible reason behind it could be that much potato mask the fishy odor of the cutlet. Fish cutlet prepared with 70:100 (w/w) ratio of potato to Catla meat was found to be superior by Pawar *et al*. (2012), as compared to the other ratios of potato and fish muscle used for preparation of cutlet.

Raw Fillet and Boiled Mince

The proximate composition of raw fillet and boiled mince of fish and chicken were analyzed (Figure 1). Hoque *et al*. (2021) found moisture of raw pangas fish 69.75±0.96%, protein 19.49±0.71%, lipid 8.84±0.20%, ash 1.71±0.38% strongly matched with the data found in this experiment. Another study conducted by Rathod and Pagarkar, (2013) revealed the moisture, protein, lipid, ash of raw pangas meat to be 76.62%, 14.37%, 6.76% and 2.25% respectively, which also more or less matched with the obtained data of raw pangas fillet. Boiling the fish fillets in this experiment dropped the moisture content to 68.65±1.02% whereas moisture, protein, lipid content raised a little to 20.88±0.65%, 8.67±0.67%, 1.8±0.78% respectively. Domiszewski *et al*. (2011) found that boiling fish slightly reduced moisture (81.57±0.57% to 80.75±0.48%) in pangas fish. On the other hand, Bassey *et al*. (2014) stated moisture to be fallen off 77.00±3.60% to 72.50±2.78% and ash, protein, fat to be slightly increased from 1.28±0.07% to 1.47±0.12%, 15.79±1.23% to 17.86±0.86%, 4.08±0.21% to 4.26±0.10% in *Polydactylus quadratifilis* fish species, respectively which supports the pattern found for the boiled pangas fish also.

Anandh (2019) found moisture, protein, lipid, ash of the raw chicken breast to be 73.8%, 22.1%, 0.55%, 1.12%, respectively. Besides, analysis of chicken by Moubasher *et al*. (2016) revealed that raw chicken meat contains 73.58% moisture, 23.17% protein, 2.21% lipid and 1.04% ash. Both the data support the findings on raw chicken fillet composition of this experiment.

Choi *et al*. (2016) found 64.21±0.34% moisture, 27.02±0.58% protein, 2.23±0.12% lipid, 1.42±0.13% ash in the marinated, boiled chicken which presents slight variation with the data found in this research which may have occurred due to marination and difference in boiling style.

Cutlet Dough

Data of cutlet dough has been presented in Figure 2. According to Fofandi *et al*. (2020), raw cutlet was found to contain 68.6±1.646% moisture, 17.463±0.7050% protein, 2.84±0.511% lipid and 2.70±0.364% ash. On another study conducted by Joseph et. al. (1984), moisture, protein, lipid and salt of raw cutlet was found to be containing 66.39%, 16.51%, 3.74% and 1.99 %, respectively Whereas moisture content varied from 55.88±0.56% to 58.67±0.67%, protein content from 16.21±0.76% to 19.52±0.89%, lipid from 15.81±0.98% to 17.98±0.45%, ash from 2.52±0.45% to 2.74±0.56%, carbohydrate from 3.98±0.65% to 6.79±0.76% in 30%,40% and 50% fish cutlet dough of this experiment. On the other hand, 50% chicken cutlet dough was found to contain 67.56±0.56 % moisture, 21.10±0.76 % protein, 5.88±0.56 % lipid, 1.7±0.45% ash and 3.76±0.56% carbohydrate in this experiment. Due to addition of other ingredients in the cutlet dough, moisture content had reduced comparing

Table 4. Mean score of Attributes

Panelists	Teachers		Students		Staffs	
	Mean	SD	Mean	SD	Mean	SD
FC1	3.34 ± 0.23^{a}	1.06	4.57 ± 0.54^{ac}	0.57	3.75 ± 0.54^{ac}	0.86
FC2	4.69 ± 0.33^{b}	0.75	3.89 ± 0.12^{b}	0.99	4.63 ± 0.65^{b}	0.62
FC3	3.47 ± 0.56^{ac}	0.91	3.82 ± 0.23^{b}	1.02	3.25 ± 0.43^{a}	0.68
CC1	4.19 ± 0.66^{b}	0.75	4.11 ± 0.76^{bc}	0.88	4.13 ± 0.34^{bc}	0.89

Results are mean ±SE

Different superscripts along the same column indicates significant variation ($P<0.05$)

Table 5. Mean score of hedonic scale

Panelists	Teachers		Students		Staffs	
	Mean	SD	Mean	SD	Mean	SD
FC1	6.75 ± 0.45^{a}	0.71	8.57 ± 0.04^{b}	0.53	5.50 ± 0.33^{a}	0.58
FC2	8.25 ± 0.23^{b}	0.71	6.86 ± 0.67^{a}	0.38	8.25 ± 0.45^{b}	0.50
FC3	6.38 ± 0.54^{a}	1.06	6.57 ± 0.64^{a}	0.53	5.25 ± 0.41^{a}	0.50
CC1	7.00 ± 0.56^{ab}	0.93	8.00 ± 0.23^{ab}	1.00	7.00 ± 0.23^{ab}	0.82

Results are mean ±SE

Different superscripts along the same column indicates significant variation ($P<0.05$)

to boiled fish mice, same goes for the chicken cutlet mix too. In case of fish cutlet mix, the more the fish percentage was added, the higher the protein, lipid and ash content had risen up. On the contrary, carbohydrate content dropped off as the percentage of mashed potato decreased with the increased fish mince.

Final Product

Rathod and Pagarkar (2013) found that there is 53.34% moisture, 18.43% protein, 21.02% lipid, 2.78% ash and 4.43% carbohydrate in flash fried cutlet made with 40% pangas muscle. Pawar *et al*. (2012) revealed 58.22% moisture, 16.41% protein, 17.28% lipid, 3.56% ash and 4.53% carbohydrate to be present in cutlet prepared from Catla meat. Arumugam (2017) found that flash fried catla cutlet contain 57.03±0.69% moisture, 21.74±0.04% protein, 7.61±0.94% fat and 3.42±0.01% ash. These results are comparable to the data found in this experiment presented in Table 6. Slight variation found may be due to variation in species or method of frying.

Ahlawat et al. (2012) found 55.28±1.06% moisture, 28.65±0.61% protein, 12.17±0.16%, fat, 2.10±0.06% ash and 1.80±0.05% carbohydrate content in chicken cutlet. On the other hand, Anandh (2019) stated that content of moisture, protein, lipid, ash in 50% emulsified chicken cutlet was 61.68±0.12%, 22.18±0.12%, 10.67±0.14% respectively which strongly support the findings of 50% chicken cutlet presented in table 6.

Moisture increased and fat increased in the final cutlet than the cutlet mixes, which may have occurred due to deep frying. This interpretation is also supported by Ninan et al. (2008).

From the statistical test it was found that FC2 and CC1 varied significantly ($P<0.05$) on the basis of moisture and lipid content, on the other hand, FC1 had protein and ash content significantly ($P<0.05$) different from CC1. In case of carbohydrate, FC1 showed significant ($P<0.05$) difference from FC2.

TVBN and PV value were studied to check if the whole process of cutlet preparation or any delay led to spoilage of fish or chicken. Both TVBN and PV values here were found far below than the minimum

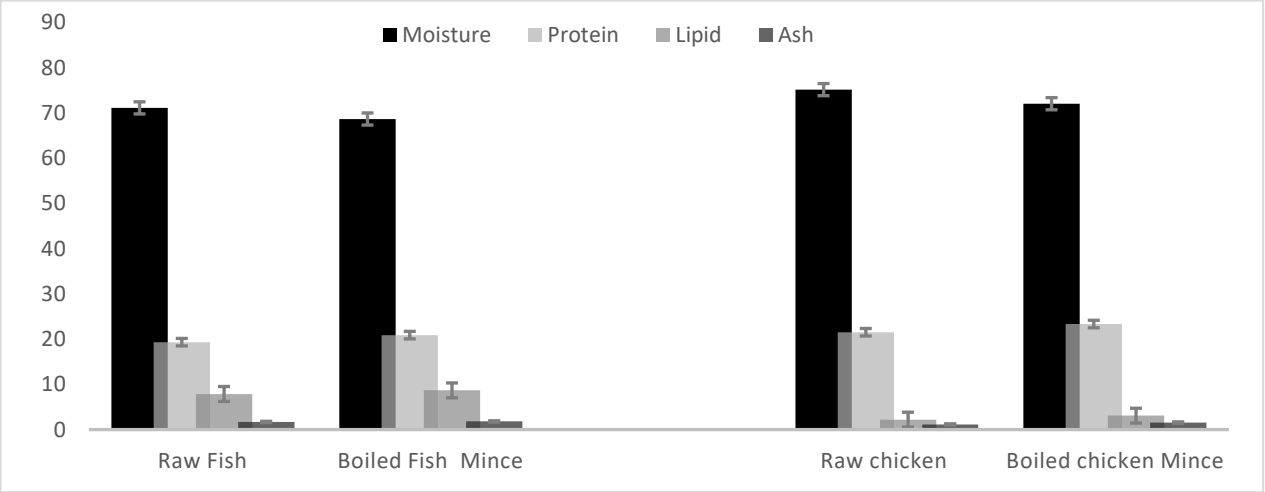

Figure 1. Proximate compositions of raw and boiled fish and chicken mince.

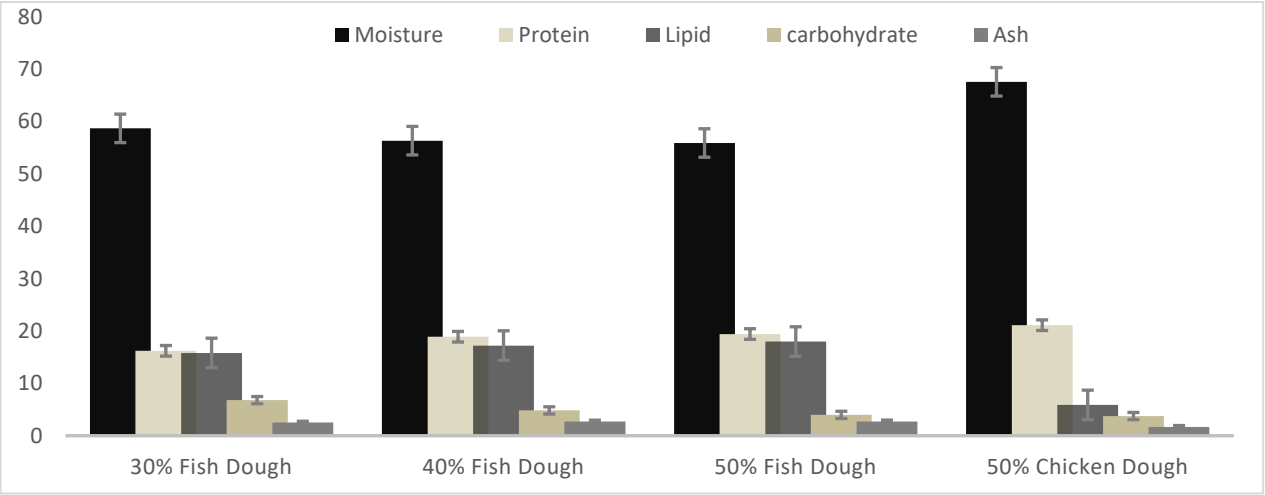

Figure 2. Proximate compositions of cutlet dough.

Table 6. Different parameters of final cutlets

Factors		Chicken (50%) (CC1)	Fish (30%) (FC1)	Fish Final (40%) (FC2)
Proximate composition	Moisture (%)	63.72± 0.03^{bc}	56.03±1.45^{ac}	52.97± 1.34^{a}
	Protein (%)	23.63± 0.34^{bc}	18.12± 0.23^{a}	20.81± 0.56^{ac}
	Lipid (%)	7.17±0.56^{a}	16.17±0.45^{ac}	19.11± 0.33^{bc}
	Ash (%)	1.8± 0.78^{b}	5.34±0.23^{ac}	3.05± 0.22^{bc}
	Carbohydrate (%)	3.68± 0.22^{ac}	4.56± 0.54^{bc}	3.14± 0.45^{a}
Quality parameters	TVBN (mg/100g)	2.43± 0.77^{NS}	2.22± 0.12^{NS}	2.91± 0.12^{NS}
	PV (meq/kg)	4.30± 0.34^{NS}	4.20± 0.11^{NS}	5.22± 0.23^{NS}

Results are mean ±SE
Different superscripts along the same row indicates significant variation (P<0.05)
NS= Not Significant

acceptable limit as the acceptable range of TVB-N and PV values for fishery products are 30–35 mg N/100 g (Gopakumar, 2002) and 10–20 meq. / kg of oil (Connell, 1975), respectively. Statistically, no significant difference was found among the product on the basis of both TVBN and PV content.

Conclusion

Fish provides excellent raw material to make ready to eat products like cutlet. This study clears the idea of likeness towards fish compared to chicken product while indicating the difference in fish likings between adults and Youngs. Proper facilities can pave a way to introduce fish cutlet in a large commercial scale which will be generating handsome profit while saving time.

Ethical Statement

Animal Welfare and Experimental Ethics Committee of Bangladesh Agricultural University provided the ethical statement for the approval of sensory analysis [AWEEC/BAU/2023/ (44). Date: 3/09/23]. All the participants were properly informed about the test and gave their consent. No complaints of any dispute were received.

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Author Contribution

Conception and design of the study, the acquisition of data, or the analysis and interpretation: Dr. Fatema Hoque Shikha, Nafis Tasneem Binti.

Drafted or provided critical revision of the article: Dr. Muhammad Mehedi Hasan, Dr. Md. Ismail Hossain, Nafis Tasneem Binti.

Provided final approval of the version to publish: Dr. Fatema Hoque Shikha, Dr. Muhammad Mehedi Hasan.

Agreed to be accountable for all aspects of the work: Dr. Muhammad Mehedi Hasan. Dr. Md. Ismail Hossain, Mst. Prianka Jahan.

Conflict of Interest

The authors report there is no competing interests to declare.

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