SJIF Impact Factor: 5.464

WORLD JOURNAL OF ADVANCE HEALTHCARE RESEARCH

ISSN: 2457-0400
Volume: 6.
Issue: 4
Page N. 47-55
Year: 2022

Original Article www.wjahr.com

COMPOSITION AND QUALITY OF INDIGENOUS FRESHWATER SCHILBEID CATFISH (*Pangasius pangsius*) OF BANGLADESH AND CONSUMERS' RESPONSE TO A NEW PRODUCT PREPARED FROM THIS SPECIES

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Received date: 08 January 2022 **Revised date:** 28 February 2022 **Accepted date:** 20 March 2022

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ABSTRACT

This research was conducted to study the composition, quality, heavy metal safety of freshwater schilbeid catfish (*Pangasius pangasius*) of Bangladesh; and to study consumers; response to 'Fish Ball' prepared from this species by different formulations. *Pangasius pangasius* used in this research contained 18% protein, 4.25% lipid, 4.23% ash, 73.01% moisture. The raw fishes were of excellent freshness (Grade A, SDP was 1.86). Quality in terms of TVB-N and TMA-N was excellent. TVB-N was 13 mg/100g fish and TMA-N was 2.9 mg/100g fish. Heavy metal safety was studied by the determination of Cd, Pb and Cu concentration. Cd concentration was 0.21 ppm, Pb was nil and Cu concentration was 0.22 ppm which were within the maximum allowable limit. New Product (Fish Ball) was prepared by using muscle of *Pangasius pangasius* by two different formulations, i.e. ingredient proportion. Deep fried products were prepared by using different frying time. Statistical Test was conducted to know the consumers' response. Triangle Test and Hedonic Test were conducted in this regard. Taste Panel Members liked all types of Fish Balls irrespective of formulation type. Taste Panel Members liked most the products prepared by Formulation – I with frying time 4 minutes.

KEYWORDS: Composition, Quality, heavy metal, *Pangasius pangasius*, Fish ball, Consumers' preference.

INTRODUCTION

In spite of long cultural heritage of fish consumption in Bangladesh, the recent trend in major cities of Bangladesh is the decreasing trend/pattern in fish consumption among the children and the juveniles/young. School and college students are seriously reluctant about fish consumption. Difficulty and less time in purchase and preparation (descaling, cutting, washing, etc.) before cooking is another cause of such decreasing pattern of fish consumption in major cities of Bangladesh. As a result children and young are deprived of delicious taste, nutrition of fish. Considering this fact, attempt was taken for product development which will be ready to eat (after microwave heating) or ready to cook in home. Fish Ball is an example of such product. For better information about acceptance of such products different formulations were attempted. In general these technologies are known as NPD (New Product Development). NPD are of two types: Value added Product; and Minced Fish Product (Coated Fish product), e.g. Fish Ball.

Connell (1980) mentioned that the growing sophistication and variety of products and of markets is leading to a greater complexity in the numbers and kinds of quality factors which have to be taken into consideration. Considering the pattern of consumers' choice it requires more careful attention in preparation and storage. Normally, the desired sensory quality of such New \ Fish Products influence consumers' preference/acceptance. Sensory quality of such new fish products depends on the Functional Properties of Fish

Muscle Protein (Hall and Ahmad, 1994). Functional properties of proteins are the function of their structure which can be described at four different levels. Knowledge of structure and its manipulation by enzymes can indicate the potential use of the protein. There are some commonly used terms for functional properties of protein e.g. solubility, emulsification, water/oil absorption and binding, foam formation, viscosity and gelation. Each property has its specific mode of action and utilized in the preparation of specific product. Functional properties may be defined as "the overall physico-chemical behavior of performance of protein in fish during processing, storage and consumption". They reflect complex interactions that are influenced by the protein composition, its structure and intermolecular associations with the other ingredients such as water, carbohydrate and lipid. These interactions are further influenced by the environment in which they take place, and the result is a series of characteristics that enhance the quality and organoleptic properties of the product (Hall and Ahmad, 1994). Practically these properties are seen as: Good Texture and mouth feel; Lack of drip or shrinkage due to loss of fat and water; and Binding of particulate product (Mansur, 2017).

Such NPD (New Product Development) is possible from indigenous fishes of Bangladesh. Due to heavy production of fish by the fish farms many freshwater fishes are now available with reasonable price. Such fish may be used for NPD. Once the quality and safety of such indigenous freshwater fishes are known then these fish species may be used for NPD. Pangas (*Pangasius pangasius*) may be used for this purpose as this fish species has got bumper production in Mymensingh district of Bangladesh, price of this species is now disappointing for the farmers. Product development and trade of such products by using this species (*Pangasius pangasius*) may overcome financial loss of the farmers. At the same time it will be easy to eat fish product by the children and the young who are usually reluctant to eat fish in a traditional manner. Fish products and processes based on fish mince are already in use worldwide. At the same time, new technologies are finding use in fish processing as a response to economic and environmental demands (Hall, 1994). Ockerman (1994) described surimi production from fish and reviewed its consumption in USA and export from USA. Attempt to produce fishery products for human consumption have been made by Chhaya et. al., (1985) and Bhuiyan et. al. (1989).

Objective of this research was the preparation of Fish Ball with different formulations from the indigenous fishes of Bangladesh; Study of composition, quality of raw fish; Study of consumers' preference to the products (Fish ball).

These objectives have relationship to the present state of knowledge in the field. It has already been mentioned that the consumers' preference of such fish products depends on the sensory quality of the products which is related to the functional properties of fish muscle protein. Functional properties have different characteristics which are expressed by different terms and they have specific nature and function in use. Moreover, several factors affect the performance of protein as functional agent. That means several factors influence the functional properties of protein. These include: the nature of the protein; methods of preparation (including enzymatic /acid/alkali hydrolysis); concentration; temperature; pH and ionic strength of solution.

Apart from the above influencing factors the functional properties of fish protein is species dependent. Some fishes are pelagic, some are demarsal, some are fatty fish, some are lean fish. Functional properties of protein is different among these groups of fish.

In Bangladesh present state of knowledge is inadequate. It has been observed from experience during preparation of Fish Ball that some species of fish is a good raw material for NPD with good texture and mouth feel, but muscle of some species of fish produce foam like texture (e.g. cake, meringues). In pelagic fish, oxidative rancidity is initiated by oxygen before processing and proceeds even in the absence of oxygen. Functional property is affected from pre-rigor to post-rigor and during freezing and frozen storage. Collection of boneless, non-minced flesh and trembling it with salt polyphosphate to extract the proteinous gluey material to coat the flesh surface has been attempted but product fall apart due to lipid material interrupting gel continuum; and become quickly rancid and unacceptable due to auto-oxidation. In Bangladesh we don't know which species is suitable for NPD and which will give best result. The present research will produce reliable data and information which will be a base for NPD in Bangladesh.

MATERIALS AND METHOD

Source of raw fish

Pangas (*Pangasius pangasius*) were purchased from the van of a retailer who supply fish in the Bangladesh Agricultural University campus at Mymensingh, Bangladesh. Fishes were in excellent condition during purchase. Fishes were kept in a polyethylene bag and transported to the laboratory of the Department of Fisheries Technology, Bangladesh Agricultural University, Mymensingh. On arrival to the laboratory the fishes were subjected to freshness test and biochemical analysis to estimate nutritional composition, quality and heavy metal concentration of the fishes. A part of the purchased fish was stored at deep freeze for further use.

Freshness test

At first the fishes were subjected to freshness test i.e. SDP estimation by organoleptic method according to Howgate et. al. (1992). In doing so the seven characters were studied, defect points were plotted and total defect points were divided by the number of characters (seven). Result is SDP. Fishes were graded for freshness on the

basis of this SDP value. Freshness test was conducted in the Laboratory of the Department of Fisheries Technology.

Biochemical analysis

Then the nutritional composition i.e. protein, lipid, ash and moisture was estimated by the methods of A. O. A. C. (1980). Quality of the raw fishes was studied by the methods of A. M. C. (1979).

Estimation of heavy metal concentration

Heavy metal concentration e.g Cr, Cd, Pb, Cu, Zn was estimated according to the methods of Eboh et. al. (2006) and Clesceri et. al. (1989). Heavy metal analysis was conducted in the laboratory of the Department of Fisheries Technology (sample preparation) and in Department of Aquaculture (sample digestion). Heavy metal concentration was estimated in the laboratory of the Bangladesh Institute of Nuclear Agriculture (BINA) in the Bangladesh Agricultural University campus, Mymensingh, Bangladesh. The method is described below:

Sample preparation: In case of fish only the muscle is taken by a sharp knife and finely homogenized by a grinder. Muscle is taken from the dorsal side of the fish. Accurately weighed 5g homogenized sample is taken in a crucible and dried at 105^0C for 24 hours in an electric oven. This dried sample is used for heavy metal analysis/estimation.

Sample digestion: Accurately weighed 0.5 – 1.0g oven dried sample is taken in a Microkjeldahl Flask. A volume of 10 ml Nitric Acid is added to this flask. After that 5 ml perchloric acid is added to this flask. The Microkjeldahl Flask containing the sample and acid mixture is placed in an Electrothermal heater and heated at 30^0C – 80^0C. Heating starts at 300C and gradually increased to 80^0C. During heating the colour of the liquid in flask (sample+acid) is turned into reddish colour, which is turned into white colour afterwards. Then the flask with the content is cooled. Then 6 ml 6N HCl is added to the flask. The Kjeldahl Flask with its content is placed in the Electrothermal heater and heated at 30^0C – 80^0C.Heating temperature gradually rises from 30^0C to 80^0C. This time the colour of the liquid (sample+acid) in flask is first yellow colour which is turned into white colour afterwards. Then the flask with its contents is cooled. The contents of the flask is taken in a 50 ml volumetric flask. The volume is made 50 ml with distilled water. This solution is filtered by ashless Whatman No. 1 filter paper.

Analysis by Atomic Absorption Spectrophotometer: The digested and diluted sample is then subjected to analysis by Atomic Absorption Spectrophotometer. That means the absorbance of colour of solutions is measured by Atomic Absorption Spectrophotometer at a specific wave length. The wave length for such measurement is for As, Cr and Cd is 193.7 nm, 127 nm and 217 nm respectively. The absorbance and corresponding concentration of heavy metal is observed or determined from a standard graph which is previously prepared by standard compound of heavy metal. Calculation is done by the following formula:

$$\text{Heavy metal (ppm)} = \frac{\text{Concentration observed (ppm)} \times \text{Final volume of sample (ml)}}{\text{Weight of sample in g}}$$

Consumers' preference test

Consumers' response to the product e.g. Fish Ball was conducted by the most widely used Sensory Test (Triangle Test) according to the methods described by Smith (1989), and acceptance (degree of liking or disliking) was studied by Hedonic Test according to the method of Watts et. al. (1989). Consumers' preference/acceptance test was conducted in the Department of Fisheries Technology.

Processing and preparation of New Product (Fish Ball)

Fish Ball: Fish Ball was prepared from boiled fish muscle. At first the fishes were filleted. Then muscle was taken out of the fillets by a sharp knife. The muscle was steamed in steam. Some ingredients were mixed with fish muscle. Among the ingredients egg, corn flour, boiled potato, salt, spices are main. Then this fish muscle was round shaped manually. Roundels (round shaped fish muscle) were dipped in a thick solution of egg. Then the roundels were deep fried for five minutes in hot edible oil and cooled to room temperature. This type of product is known as Fish Ball (Fig. 1). Fish ball was prepared from Pangas (*Pangasius pangasius*) with different formulations. In preparing Fish ball different formulations were followed to find out the best formulation preferred by the consumers. Ingredient content of each Formulation is stated in the tables. Pangas balls were prepared without breadcrumbs. Processing and preparation of New Product (Fish ball) by different formulations was conducted in a home kitchen in the BAU Residential Area.

RESULT AND DISCUSSION

Proximate composition and quality of *Pangasius pangasius* have been presented in the Table 1. Proximate composition of this species was found to be similar to other freshwater fish species. Protein was 18%, lipid 4.25%, ash 4.3% and moisture was 73%.

Quality of *Pangasius pangasius* used in this research have been presented in the Table 2. The freshness SDP value (sensory quality) of *Pangasius pangasius* was 1.86 (Grade A). Overall quality of *Pangasius pangasius* used in this research was excellent, TVB-N value was 13 and

TMAN value was 2.9. Heavy metal (Cadmium, Lead, Copper) concentration of *Pangasius pangasius* fish used for fish ball preparation has been presented in Table 3. It appears that the heavy metal concentration of raw fish was within acceptable limit i.e. safe to eat. Pb concentration was undetectable, Cu concentration (0.22 ppm) was within the MAL (Maximum Allowable Limit, 10 ppm) and Cd concentration (0.21 ppm) was nearly at the level of MAL (Maximum Allowable Limit, 0.20 ppm).

Composition of Fish Ball prepared by two formulations from *Pangasius pangasius* has been presented in Table 4. In formulation I the composition of Fish Ball was boiled fish muscle 82.50%, boiled potato 10%, corn flour 2.5%, other ingredients 5% (egg, salt, spices). In formulation II the composition of Fish Ball was boiled fish muscle 72.50%, boiled potato 20%, corn flour 2.5%, other ingredients 5% (egg, salt, spices).

Result of Triangle Test has been presented in Table 5 and Table 6. A panel of 18 members took part in the Triangle Test. Conclusion of the Triangle Test was that there was no detectable difference between two formulations of Fish Ball. Result of Hedonic Test has been presented in Table 7. Same panel members took part in the hedonic test to express degree of liking or disliking to the products developed by two formulations from *Pangasius pangasius*. A panel of 18 members expressed their opinion about degree of liking or disliking on a 9 point scale. Result of hedonic test was that the products were quite acceptable to them but Formulation I was better and more acceptable.

Table 1: Proximate composition of *Pangasius pangasius*.

Parameters	***Pangasius pangasius***
Protein (%)	**18.00**
Lipid (%)	**4.25**
Ash (%)	**4.3**
Moisture (%)	**73.01**

Table 2: Freshness and quality of *Pangasius pangasius*.

Parameters	***Pangasius pangasius***	**Maximum Allowable Limit**
SDP	**1.86**	**2***
TVB-N (mg/100g)	**13**	**30**
TMA-N (mg/100g)	**2.9**	**8 -10**

***Grade A**

Table 3: Heavy metal content of *Pangasius pangasius*.

Heavy Metal	***Pangasius pangasius* ppm**	**Maximum Allowable Limit ppm**
Cd	**0.21**	**1.00**
Pb	**NIL**	**2.00**
Cu	**0.22**	**10.0**

Table 4: Composition of fish balls prepared by two formulations from *Pangasius pangasius.*

Species	**Ingredients**	**Formulation I**	**Formulation II**
Pangasius pangasius	Boiled fish muscle	82.50%	72.5%
	Boiled potato	10%	20%
	Corn flour	2.5%	2.5%
	Egg, Salt, spices (turmeric powder, chili powder, ginger paste, garlic paste)	5%	5%
	Edible oil for frying	Deep frying	Deep frying
	Bread crumb	--	--

Consumers' response
Among the supplied samples which is odd sample*?.
Table 5: Panelists response to the products during Triangle test to determine whether or not there is a detectable difference between two formulations of fish balls prepared from *Pangasius pangasius*.

Panelist	Sample A	Sample B	Sample C
1		√	
2			√
3	√		
4	√		
5	√		
6	√		
7	√		
8	√		
9	----	----	----
10	----	----	----
11			√
12		√	
13		√	
14		√	
15			√
16	√		
17	√		
18	√		
19	√		
20	√		

*Sample B was prepared by formulation I (odd sample) and Sample A and C were prepared by formulation II.

Table 6: Result of Triangle test to determine whether or not there is a detectable difference between two formulations of fish balls prepared from *Pangasius pangasius*.

Parameter	Result
Panel size	18
Test statistic	4
Critical value	12
Significance level (%)	1
Conclusion	There is no detectable difference between two formulations of fish balls prepared from *Pangasius pangasius*.

Photograph of Products

Fig. 1: New product (Fish balls) prepared from *Pangasius pangasius* by two formulations.

Consumers' preference/acceptance test (degree of liking or disliking)

Table 7: Result of Hedonic test to express degree of liking or disliking to the products developed by two formulations from *Pangasius pangasius*.

9 Point Scale	Formulation I Sample B	Fprmulation II Sample A and C	
		Sample A	Sample C
Like Extremely	4 (22.22%)	NIL	4 (22.22%)
Like Very Much	9 (50%)	5 (27.77%)	8 (44.44%)
Like Moderately	4 (22.22%)	10 (55.55%)	5 (27.77%)
Like Slightly	1 (5.55%)	1 (5.55%)	1 (5.55%)
Neither Like Nor Dislike	NIL	1 (5.55%)	NIL
Dislike Slightly	NIL	NIL	NIL
Dislike Moderately	NIL	1 (5.55%)	NIL
Dislike Very Much	NIL	NIL	NIL
Dislike Extremely	NIL	NIL	NIL

Panel Size = 18

Hedonic Test

Table 8: Tabulated category scores for Hedonic Test for Fish Ball prepared from *Pangasius pangasius.*

Panelist	Sample A		Sample B		Sample C		Panelist Total	Panelist Mean	(Each Panelist Total^2)
	x	x^2	x	x^2	x	x^2			
1	7	43	8	64	8	64	23	7.66	529
2	8	64	7	49	6	36	21	7	441
3	7	49	8	64	9	81	24	8	576
4	8	64	8	64	8	64	24	8	576
5	5	25	8	64	7	49	20	6.66	400
6	7	49	8	64	8	64	23	7.66	529
7	3	9	8	64	9	81	20	6.66	400
8	7	49	8	64	9	81	24	8	576
11	8	64	7	49	7	49	22	7.33	484
12	7	49	6	36	7	49	20	6.66	400
13	7	49	7	49	7	49	21	7	441
14	8	64	9	81	8	64	25	8.33	625
15	8	64	9	81	7	49	24	8	576
16	7	49	9	81	8	64	24	8	576
17	7	49	8	64	8	64	23	7.66	529
18	6	36	7	49	8	64	21	7	441
19	7	49	9	81	8	64	24	8	576
20	7	49	8	64	9	81	24	8	576
Treatment Total	**ΣxA =124**	**$ΣxA^2$ =880**	**ΣxB =142**	**$ΣxB^2$= 1132**	**ΣxC =141**	**$ΣxC^2$= 1117**	**Σxp = 407**	**7.53**	**$Σxp^2$ = 9251**
Grand Total	**124 + 142 + 141 = 407**								
Treatment Mean	**6.888**		**7.888**		**7.833**				

Highest Score = 9 = Like Extremely; Lowest Score = 1 = Dislike Extremely

Calculation

Correction Factor

CF = (Grand Total^2) ÷ N = 4072 ÷ 54 = 165643 ÷ 54 = 3067.57

Total Sum of Squares

SS(T) = Σ (each individual response^2) – CF = 3129 – 3067.57 = 61.43

Treatment Sum of Squares

SS(Tr) = Σ{(each treatment total^2) ÷ number of responses per treatment} – CF = 11.37

Panelist Sum of Squares

SS(P) = Σ{(each panelist total^2) ÷ number of responses per panelist} – CF = 16.09

Total degrees of freedom df(T) = Total number of responses – 1 = 54 – 1 = 53

Total degrees of freedom df (Tr) = The number of treatment – 1 = 3 – 1= 2

Panelist degrees of freedom df (P) = The number of panelists – 1 = 18 – 1 = 17

Error degrees of freedom df (E) = df (T) – df (Tr) – df (P) = 53 – 2 – 17 =34

Treatment Mean Square, MS (Tr) = SS(Tr) ÷ df (Tr) = 11.37 ÷ 2 = 5.685

Panelist Mean Squares, MS(P) = SS(P) ÷ df(P) = 16.09 ÷ 17 = 0.946

Error Mean Squares MS(E) = SS(E) ÷ df(E) = 33.97 ÷ 34 = 0.999

ANOVA Table for Hedonic Test (Fish ball prepared from *Pangasius pangasius*

Source of Variation	df	SS	MS	F ratio Calculated	F ratio Tabular ($p \leq 0.05$)
Total (T)	53	61.43			
Treatment (Tr)	2	11.37	5.685	5.69	3.55
Panelist (P)	17	16.09	0.946	0.942	2.19 Σ 2.26
Error (E)	34	33.97	0.99		

Since the calculated treatment F ratio of 5.69 exceeded the tabulated F ratio of 3.55 it may be concluded that there was a significant ($p \leq 0.05$) difference among the mean hedonic scores for the three fish ball samples prepared from *Pangasius pangasius*.

The calculated panelist F ratio of 0.942 did not exceed the tabular F ratio of 2.19 2.26. Thus no significant panelist effect was present on the three fish ball samples prepared from *Pangasius pangasius.*

Duncan's New Multiple Range Test

This test compares the differences between all pairs of means to calculated range values for each pair. If the difference between pairs of means is larger than the calculated range value, the means are significantly different at the specified level of significance. Range values are computed based on the number of means that lie between the two means being tested, when the means are arranged in order of size.

To carry out the Duncan's Test, treatment means were arranged in order of magnitude as shown below:

Fish ball sample	B	C	A
Treatment means	7.88	7.83	6.88

To compare the 3 means in this experiment, range values for a range of 3, 2 means were calculated from the following equation:

$$\text{Range} = Q\sqrt{\frac{MS(E)}{t}}$$

MS(E) taken from ANOVA Table was 0.999.
T is the number of individual responses used to calculate each mean, here t = 18.

$$\text{Range} = Q\sqrt{\frac{0.999}{18}}$$

$$= Q\ (0.235)$$

Q values were obtained from statistical table at the same level of significance used in ANOVA,
$p \leq 0.05$. The df(E) or 34 df are also needed to determine Q values. From statistical table Q values for 34 df are:
Q value for 3 means = 3.006
Q value for 2 means = 2.858
Range value for 3 means = Q (0.235) = 3.006 x 0.235 = 0.706

Range value for 2 means = Q (0.235) 2.858 x 0.235 = 0.6716

The 3 mean range value was applied to the means with the greatest difference between them, 7.88 and 6.88, since these values covered the range over 3 means. The difference 1 is greater than 0.7064. These two means, therefore significantly different.

The next comparison was between the means 7.88 and 7.83, using the 2 mean range value (0.6716). Since the difference between the means (7.88 – 7.83 = 0.05) was less than 0.6716, these two means not significantly different.
The next highest mean was then compared with the lowest mean and the difference was compared to the range value for 3 means.
7.83 – 6.88 = 0.95 > 0.7064

The significant differences among the means are presented bt using letters. Means followed by different letters were significantly different at the 5% level of probability.

Fish ball samples	B	C	A
Treatment means	7.88a	7.83a	6.88b

Fish ball sample 'B' and 'C' were liked significantly more than the other sample 'A'. Sample B and C were equally liked.

In Triangle Test Panel members accepted the products prepared by Formulation - I and Formulation – II. There

was no detectable difference between two formulations of Fish ball. In Hedonic Test Panel members expressed their degree of liking to the products prepared by Formulation – I and Formulation – II. The Statistical analysis was continued to Duncan's New Multiple Range Test. Panel members liked most the sample "B". Sample "B" was prepared by Formulation – I with frying time 4 minutes. Panel members equally liked the sample "C". Sample "C" was prepared by Formulation – II with frying time 6-7 minutes. Panel members liked (least) the sample "A". Sample "A" was prepared by Formulation – II with frying time 4 minutes. In this experiment Formulation – I was better than Formulation – II according to the response of Panel members. Fish Ball prepared by Formulation – I with frying time 4 minutes had the following sensory characteristics:-

- Pleasant flavour
- Attractive colour
- Delicious Taste
- Good Texture and mouthfeel

Such sensory quality of a new product depends on the functional properties of fish protein. Functional properties reflect complex interactions that are influenced by the protein composition, its structural conformation, intermolecular associations with the food ingredients e.g. water, carbohydrates and lipid. These interactions are further influenced by the environment in which they take place, and the resultis a series of characteristics that enhance the sensory quality and organoleptic properties of the product. Use of ingredients particularly boiled potato or steamed potato reduce the fishy odour of the finished products which is an important attribute for consumers' preference. Elimination of fishy odour in the fished product or reduction of fishy odour in the fished product determine the acceptability in many Taste Panel Members. Also, cooking process particularly frying time determines the colour and taste of the finished product which is also important attribute for consumers' acceptance.

Succes of NPD depends on some factors such as Consumers' acceptance, Use of Technology, and Company's Policy. Also steps of NPD success process are Generation of idea, Triggers, Assessment of market potential, and Recording consumer dynamics (Horner, 1992). In the present research it is proved that NPD is possible from freshwater Schilbeid cat fish (*Pangasius pangasius*). One of such NPD is Fish Ball which is liked by Taste Panel Members. Such product is quite acceptable to the people of Bangladesh. From the result of the present research it may be concluded that preparation of new fishery product e.g. Fish Ball from indigenous freshwater fishes of Bangladesh is possible; nutritional composition, freshness, safety in terms of heavy metal concentration of indigenous freshwater schilbeid catfish *Pangasius pangasius* is excellent with a few exceptions of heavy metal concentration; consumers' preference is influenced by fish species, formulation i.e. ingredient proportion, cooking process i.e. frying time; usual fishy odour in conventional products can be reduced or completely removed by using some ingredients e.g. boiled potato, spices, wheat flour, corn flour etc,; Fish Ball prepared by different formulations from *Pangasius pangasius* were liked by the Taste Panel Members. All types of Fish Ball were accepted by the Panel members although the degree of liking varied among the products.

On the basis of the result of this research it may be concluded that, it is possible to prepare new fishery product e.g. Fish Ball from indigenous freshwater fishes of Bangladesh; nutritional composition, freshness, quality, safety in terms of heavy metal concentration of indigenous freshwater fish e.g. *Pangasius pangasius* is excellent; consumers' preference is influenced by formulation e.g. ingredient proportion, cooking process i.e. frying time; usual fishy odour in conventional products can be reduced by using some ingredients e.g. boiled potato, spices, wheat flour, cornflour; Fish Ball prepared by different formulations from Pangasius pangasius were liked by the Taste Panel Members. All types of Fish Ball were accepted by the Panel members although the degree of liking varied among the products.

ACKNOWLEDGEMENT

This research was conducted by the financial support of Ministry of Science and Technology, Govt. of the Peoples' Republic of Bangladesh, Project No. 78-BS (2019-20).

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