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Preparation and quality aspect of traditional fish dried product (Shidhil) of Bangladesh

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Abstract
A study was conducted to assess the quality of newly prepared 'Shidhil'. Two fish species –punti and silver jew fish and a vegetable of taro were used in the present study. The study was carried out for a period of 05 months from October 2011 to February 2012 at the laboratory of Fisheries Technology Department and the roof top of the Dean Office of Faculty of Fisheries, Bangladesh Agricultural University (BAU), Mymensingh. Two experiments were designed where fish species are different but taro is constant. In 1st experiment, 60% taro and 40% punti fish powder, 80% taro and 20% punti fish powder, 90% taro and 10% punti fish powder are designated as S_1, S_2, and S_3. In other experiment, 60% taro and 40% silver jew fish powder, 80% taro and 20% silver jew fish powder, 90% taro and 10% silver jew fish powder were used which were designated as T_1, T_2, and T_3. The overall organoleptic qualities of 'Shidhil' products obtained from both type of fish were excellent. Protein and lipid content of 'Shidhil' produced from punti with taro were ranged from 31.3 to 51.32% and 5.81 to 6.71% with the lowest in S_3 and highest in S_1, respectively. Protein and lipid contents in 'Shidhil' produced from silver jew fish with taro was ranged from 30.54 to 49.4% and 5.03 to 6.45% with the lowest in T_3 and the highest in T_1. The TVB-N values of different 'Shidhil' products produced using punti and silver jew fish with taro were in the range of 2.61% to 3.54% and 2.64% to 3.71% with the lowest in S_3 & T_3 and highest in S_1 & T_1 respectively.

Keywords: quality aspect, traditional fish dried product, shidhil

1. Introduction
Fishery industries of Bangladesh are processing high value items such as frozen shrimp, fish and dried products. Traditional fish processing is an important livelihood activity for large number of poor people of Northern part of Bangladesh. Processed fish includes sun dried, salt dried and semi-fermented products. 'Shidhil' is a home processed dried food, prepared from a small sized fish. It is prepared by the traditional method of drying and it does not cost much or need not much technical knowledge. Therefore, it serves as a cheap source of protein. In Bangladesh, poor class people consume 'Shidhil' for its low cost and characteristic taste and flavor. Indigenous dried foods are native to a country or culture. This traditional fish product is very important to North-Bengal areas because they are important in nutritional aspects for the poor and economically deprived people as the low cost processing method. A large number of people of our country specially Rangpur, Dinajpur, Rajshahi, Gaibandha region are engaged in production of dried product using small sized fish, mostly discarded low cost freshwater fish and taro (*Colocasia esculenta*). Method of simple drying is being practiced to preserve small fishes specially punti (*Puntius* sp.) in Bangladesh. This product is similar to those prepared from marine fishes in other south-east Asian countries. For the preparation of simple dried products, normally underutilized species which are not preferred as such and whose catch is also considerable. In Bangladesh the catch of the fresh water fish (punti) is quite high and a sizeable quantity is preserved by drying method.
The physical and organoleptic qualities of most of the traditional sun dried products available in the market are not satisfactory for human consumption [1, 2, 3, 4]. There are frequent complaints from the consumers about the quality of the products available in the market. The dry fishes are often infested by blow fly (*Chrysomya* spp.) and their larvae (maggot) during drying phase, especially in the cloudy and rainy days; and by beetle (*Necrobia* sp.) and mites in the store causing considerable amount of weight loss of the finished product every year. Quality loss through spoilage and insect attack on dried fish has been estimated to 10-35% in the marine areas [5]. To protect the products from the infestation of insects, the processors, whole sellers and retailers often use various harmful insecticides and fungicides indiscriminately. To improve the quality of 'Shidhil' product it is necessary to improve the method of sun-drying in order to increase the shelf-life and quality of the product. The improved methods such as, solar drying and rotary drying might be useful. Solar dram drying is reported to be effective in controlling fly larvae infestation as well as in improving the overall quality. To produce good quality sun dried product it is necessary to maintain hygienic condition and prevention to bacterial growth and spoilage of fish during fish processing and storage. As a result it is expected that acceptability of sun dried fishery product to the people will be increased.
The ultimate goal of the proposed study is to produce high quality sun dried fishery products by using high quality raw materials and analysis of its nutritional quality and shelf-life at different conditions. The main objective of the study is to prepare 'Shidhil' at laboratory condition and to assess the nutritional qualities of improved 'Shidhil' product.

2. Materials and methods
2.1 Selection of study area
The experiment was conducted in the laboratory of Fisheries Technology Department and the roof top of the Dean Office of Faculty of Fisheries, Bangladesh Agricultural University (BAU), Mymensingh during October 2011 to February 2012.

2.2 Raw material collection

2.2.1 Selection of fish species

Punti (*Puntius ticto*) and silver jew fish (*Otolithes argentatus*) were selected for the preparation of 'Shidhil' because of these fishes are low cost and available throughout the year.

2.2.2 Selection of weed species

Taro (*Colocasia esculenta*) was selected for the production of 'Shidhil'. Because it is nutritious and available in everywhere throughout the country.

2.3 Collection of species

2.3.1 Collection of fish species

Punti (*Puntius ticto*) fish was purchased directly from Mechua Bazar, Mymensingh and silver jew fish (*Otolithes argentatus*) was purchased directly from the BFDC landing centre, Cox's Bazar and were transported to the Laboratory of Department of Fisheries Technology, Bangladesh Agricultural University, Mymensingh, in an insulated box with ice (1:1). Average length of ten randomly sample of punti (*Puntius ticto*) was 8.39 cm. and average length of the ten randomly sample of silver jew fish was 15.22 cm. Average weight of the ten randomly sample of punti (*Puntius ticto*) before and after gutting was 13.31 g and 11.20 g, respectively. Average weight of the ten randomly sample before and after gutting was 301.16 g and 182.20 g, respectively.

2.3.2 Collection of taro

Taro (*Colocasia esculenta*) was collected from a clean dry place behind the faculty of fisheries and brought to the Laboratory of Fisheries Technology. For the purpose of this experiment both leaves and stems of taro were collected.

2.4 Different steps involving to produce 'Shidhil' from fish and taro

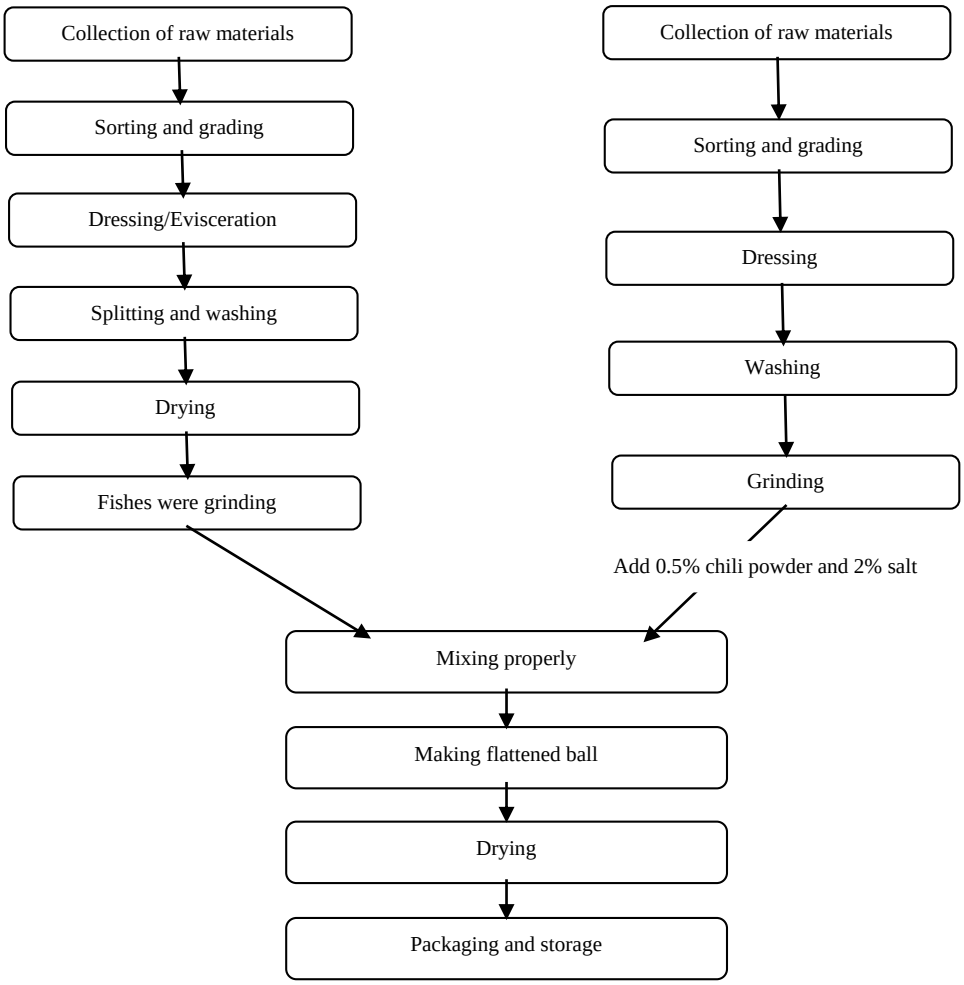

Fig 1: Preparation steps of 'Shidhil'

For this experiment, 3 types of 'Shidhil' were produced by using both punti (*Puntius ticto*) and silver jew fish (*Otolithes argentatus*) and taro (*Colocasia esculenta*). (Shown in Table 1 and 2)

Table 1: Types of 'Shidhil' produced using punti (*Puntius ticto*) and taro (*Colocasia esculenta*)

Product type	Treatment	Amount of fish powder (g)	Amount of Taro paste (g)
60% taro and 40% fish	S_1	200	300
80% taro and 20% fish	S_2	100	400
90% taro and 10% fish	S_3	50	450

Table 2: Types of 'Shidhil' produced using silver jew fish (*Otolithes argentatus*) and taro (*Colocasia esculenta*)

Product type	Treatment	Amount of fish powder (g)	Amount of Taro paste (g)
60% taro and 40% fish	T_1	200	300
80% taro and 20% fish	T_2	100	400
90% taro and 10% fish	T_3	50	450

2.5 Quality assessment of 'Shidhil'

In this section, the results of the improved technology for production of high quality 'Shidhil' products were described. Organoleptically the products obtained were high quality. To evaluate the superiority of the improved products, the proximate compositions were assessed. Quality assessment was done on the six samples of 'Shidhil'. These products were developed in the Department of Fisheries Technology, Faculty of Fisheries, Bangladesh Agricultural University, Mymensingh.

2.6 Organoleptic quality assessment

The organoleptic properties of traditional and improved sun dried fish products were determined according to the method described by Howgate [6]. Organoleptic quality assessment is an easy, quick and efficient method for getting idea about the quality of the product. This method is based on the response or tendency of sense organ for accepting the food products. A large number of schemes have been proposed for sensory evaluation for different types of product of 'Shidhil'. Sensory methods were used to assess the degree of freshness based on organoleptic characteristics such as color, odor and texture of 'Shidhil'. The evaluation methods used in this study were based on one that is currently in use in various institution of the world. Representative samples were taken on a tray to assess the characteristics such as color, odor and texture by organoleptic method.

These characteristics judged by four faculty members and the organoleptic characteristics of 'Shidhil' were assessed (shown in table 3 and 4)

Table 3: Grading of 'Shidhil'

Grade	Points	Comments
A	<2	Excellent/ Acceptable
B	2 to <5	Good/ Acceptable
C	5	Bad/ Rejected

Table 4: Determination of defect points of 'Shidhil'

Characteristics	Defect	Defect point	Grade
Color	a) Bright brown colour	1	Excellent
	b) Brown colour	2	Acceptable
	c) Blackish	3	Acceptable
	d) Whitish	5	Rejected
Odor	a) Strong dried fishy odor	1	Excellent
	b) Mild fishy odour	2	Acceptable
	c) Neutral odour	3	Acceptable
	d) Rancid off odour	5	Rejected
Texture	a) Hard texture	1	Excellent
	b) Fragile texture	2	Acceptable
	c) Less soft texture	3	Acceptable
	d) Soften and fragile texture	5	Rejected

2.7 Hedonic rating test

A panel of nine people of students, teachers and staffs of the Department of Fisheries Technology provided the sensory assessment of the products. Prior to testing, panelists were familiarized with the properties of cooked 'Shidhil' products and instructions relating to the scoring the sample. Pretests were undertaken with selected samples to familiarize the panelists with the measurement procedure. Three disc of cooked 'Shidhil' were supplied to each panelist to recognize every attribute. The quality was evaluated by the numerical scores up to 9, where 9 = Like extremely, 8 = Like very much, 7 = Like moderately, 6 = Like slightly, 5 = neither like nor dislike, 4 = Dislike slightly, 3 = Dislike moderately, 2 = Dislike very much and 1= Dislike extremely

2.8 Statistical Analysis

The whole data included the data obtained from the consumer taste were analyzed through Analysis of Variance (ANOVA) and Duncan's New Multiple Range Test (DMRT) by a statistical Package MSTAT-C

2.9 Proximate composition analysis

Proximate composition analysis of moisture, crude protein lipid and ash were carried out according to the methods given in AOAC (1990) [7] with certain modifications as described below:

2.9.1 Moisture

Moisture content was determined by placing an accurately weighed known amount of ground sample in a pre-weighed porcelain crucible in a thermostat oven (Gallenkamp, HOTBOX, Model OVB-306) at 105°C for 24 hours until constant weight was obtained. The loss of moisture was calculated as percent moisture.

The moisture content is estimated by using following formula:

$$\text{Moisture (\%)} = \frac{E}{C} \times 100$$

Where,

E = weight of moisture

C = weight of sample.

2.9.2 Crude protein

Total nitrogen content of each of the sample of the smoked fish should be determined by Kjeldahl apparatus. In this case, total nitrogen content is determined by digesting the samples with concentrated sulphuric acid (H_2SO_4) in presence of copper sulphate ($CuSO_4$) and selenium powder followed by distillation of ammonia liberated by alkali into boric acid. The total nitrogen value is then obtained by the following formula:

$$\text{Nitrogen (\%)} = \frac{\text{ml. acid titrated} \times 0.1\,\text{N acid titrated} \times \text{milliequivalent of N } (0.014)}{\text{Wt. of sample}} \times 100$$

The amount of crude protein is then calculated by multiplying the % total nitrogen with protein conversion factor (6.25)

2.9.3 Lipid

Lipid content was determined by a ground joint Soxhlet Apparatus. Accurately weight sample of 5g is taken in paper thimbles and these are placed on Soxhlet apparatus. The round bottom flask is placed in a distillation chamber at 70^0C. Lipid was extracted on acetone for 2-2.5 hours. The extracted lipid with acetone is then evaporated by placing in pre-weighted beaker at 60^0C in an electric oven. The following formula is used for lipid determination-

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

2.9.4 Ash

Ash content was determined by igniting the sample in a muffle furnace at a temperature of 550°C for 6 hours. The sample was then cooled in a desiccator. The average weight in percentage of each sample of the remaining material was taken as that of ash. For determination of ash content the following formula is used-

$$\text{Ash content (\%)} = \frac{E}{C} \times 100$$

Where,

E =Weight of ash

C=Weight of sample

2.9.5 Determination of Total Volatile Base Nitrogen (TVB-N)

Total Volatile Base Nitrogen (TVB-N) was determined according to the methods given in AOAC (1990) [7] with certain modifications.

The TVB-N value was calculated by using the following formula:

$$\text{Amount of TVB-N (mg/100g sample)} = \frac{\text{ml titrant} \times 0.01 \times 1 \times 100}{\text{Sample wt.}}$$

3. Results & Discussion

3.1 Quality Assessment of Shidhil

3.1.1 Organoleptic characteristics

The physical and organoleptic qualities of 'Shidhil' were evaluated on the basis of the color, odor, texture and overall other quality aspects and the results are presented in Table 5. The 'Shidhil' of bright brown color is considered best to the consumers. Strong dried fishy odor is considered best for 'Shidhil' and it is rejected when it shows rancid off odor. The hard texture of 'Shidhil' is preferred by the consumers and considered excellent. The color of 'Shidhil' of punti ranged from bright brown to whitish. The odor of the 'Shidhil' prepared from punti was mild fishy odor and it was considered as acceptable. The texture of the 'Shidhil' was partial soft texture to soft texture which showed the medium quality of the product. Among the three products of 'Shidhil' prepared from punti were S_1 showed better condition than S_2 and S_3. The average defect point of 'Shidhil' S_1, S_2 and S_3 was 1.0, 1.0, and 1.3 respectively. On the basis of organoleptic characteristics, all the samples were found acceptable condition. It has been reported that the traditional sun dried fish products showed objectionable color, odor and texture whereas the dried fish produced by solar tunnel drier gave comparatively better quality in all aspects [8]. It has also been reported that no discoloration was observed in the traditional and improved sun dried fish products but some sort of insect infestation was noticed in the traditional sun dried products during the study period [9].

On the other hand the organoleptic characteristics of 'Shidhil' produced from silver jew fish are presented in Table 6. Among the three products of 'Shidhil' prepared from silver jew fish were T_1 taro showed better condition than T_2 and T_3. The average defect point of 'Shidhil' T_1, T_2 and T_3 were 1.0, 1.33, and 2.0 respectively. On the basis of organoleptic characteristics, all the samples were found acceptable condition.

Table 5: Organoleptic characteristics of 'Shidhil' produced from punti (*Puntius ticto*) with taro *(Colocasia esculenta)*

Product type	Characteristics	Defect Characteristics	Defect points*	Average Defect points	Grade/ Comments
S_1	Color	Bright brown color	1	1.0	A (Acceptable)
	Odor	Strong dried fishy odor	1		
	Texture	Hard texture	1		
S_2	Color	Bright brown color	1	1.0	A (Acceptable)
	Odor	Strong dried fishy odor	1		
	Texture	Hard texture	1		
S_3	Color	Brown color	2	1.33	A (Acceptable)
	Odor	Strong dried fishy odor	1		
	Texture	Hard texture	1		

*Defect points of 1 to 5 point scale with according order of inferior quality.

Table 6: Organoleptic characteristics of 'Shidhil' produced from silver jew fish (*Otolithes argentatus*) with taro *(Colocasia esculenta)*

Product type	Characteristics	Defect Characteristics	Defect points	Average Defect Points	Grade/ Comments
T_1	Color	Bright brown color	1	1.0	**A (Acceptable)**
	Odor	Strong dried fishy odor	1		
	Texture	Hard texture	1		
T_2	Color	Brown color	2	1.33	**A (Acceptable)**
	Odor	Strong dried fishy odor	1		
	Texture	Hard texture	1		
T_3	Color	Brown color	2	2.0	**B (Acceptable)**
	Odor	Mild fishy odor	2		
	Texture	Partial soft texture	2		

*Defect points of 1 to 5 point scale with according order of inferior quality.

3.1.2 Hedonic Rating Test

A series of experiments were conducted on different compositions of 'Shidhil' to enrich the preparation. An attractive looking, very good textured, excellent colored, nice flavored 'Shidhil' were developed. Increasing contents of fish increasing the taste and protein and color and flavor were decreased in terms of fish powder.

Table 7: Mean sensory scores of 'Shidhil' (punti and taro)

Product Type	Color	Flavor	Taste	Overall acceptability
S_1	7.40^a	7.90^a	8.10^a	7.10^a
S_2	6.40^b	6.50^b	6.80^b	6.00^b
S_3	5.70^b	5.60^b	6.20^b	5.90^b
LSD (<0.05)	0.7677	0.9959	0.7931	0.7449

*Means with different superscripts within a column are significantly different at $p<0.05$.

Table 8: Mean sensory scores of 'Shidhil' (silver jew fish and taro)

Product Type	Color	Flavor	Taste	Overall acceptability
(T_1)	7.30^a	8.10^a	8.40^a	8.10^a
(T_2)	6.50^a	6.20^b	6.70^b	6.00^b
(T_3)	5.60^b	4.90^c	4.40^c	4.10^c
LSD (<0.05)	0.8470	0.6920	0.6344	0.7018

*Means with different superscripts within a column are significantly different at $p<0.05$.

3.2 Proximate Composition of fishes and taro

Proximate composition i.e. moisture, protein, lipid and ash contents of two dried fishes and taro has been presented in Table 9.

Table 9: Proximate composition of dried punti (*Puntius ticto*), silver jew fish (*Otolithes argentatus*) and raw taro *(Colocasia esculenta)*

Composition	Punti	Silver jew fish	Taro
Protein (%)	59.45	52.57	8.58
Lipid (%)	5.21	7.02	1.12
Ash (%)	11.15	16.15	13.54
Moisture (%)	22.34	23.64	73.15

3.3 Proximate Composition of Product

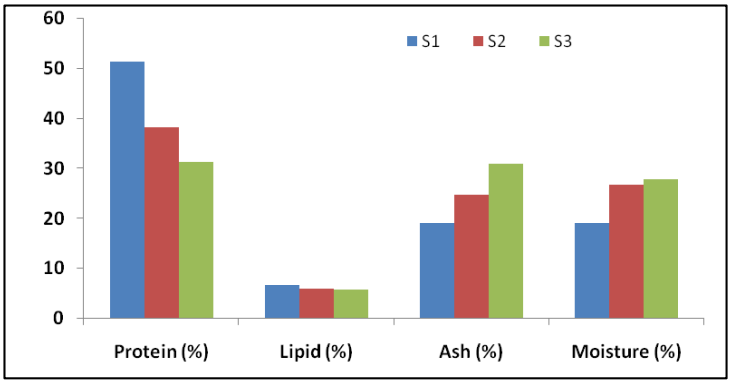

Fig 2: Proximate composition of 'Shidhil' produced from punti (Puntiusticto) with taro (Colocasia esculenta) in different treatments

Proximate composition i.e. moisture, protein, lipid and ash contents of 'Shidhil' products has been presented in Table 10 and 11. Protein content in 'Shidhil' produced from Punti with taro was ranged from 31.3 to 51.32% with the lowest and highest value found in S_3 and S_1, respectively. Lipid content ranged from 5.81 to 6.71% with the lowest and highest value found in S_3 and S_1, respectively. Ash contents ranged from 19.11% to 27.76% with the lowest and highest value found in S_1 and S_3, respectively. Moisture content was ranged from 19.03 to 30.92% with the highest in S_1 and lowest in S_3 (Fig. 2.).

On the other hand, Protein content in 'Shidhil' produced from silver jew fish with taro was ranged from 30.54 to 49.4% with the lowest and highest value found in T_3 and T_1, respectively. Lipid content ranged from 5.03 to 6.45% with the lowest and highest value found in T_3 and T_1, respectively. Ash contents ranged from 18.76% to 30.56% with the lowest and highest value found in T_1 and T_3, respectively. Moisture content was ranged from 21.77 to 31.34% with the highest in T_1 and lowest in T_3 (shown in Fig 3.). It is known that the dried fish products contain less amount of moisture which indicates the better quality of the products. It is known that dried fish with 15% or less moisture content is well enough to inhibit microbial growth [10]. It has been reported that the moisture content of four sun dried small indigenous fish products (control) were within the acceptable limit (<25%), whereas the moisture content of traditional sun dried products were comparatively higher than the recommended value [3]. Normally the sun-dried fishes contain 60 to 80% protein (Haque, 2004) [11]. Hussain *et al.* (1992) [12] reported that protein content varied widely from 17.2 to 78% in 23 different dried species. Faturoti (1985) [13] showed that the gutted dried fish samples of *C. nigrodigitus* had a range of crude protein as 55.02 to 63.05%. The lipid content was varied between of 3.21% and 14.03% with the highest lipid content found in *Amblypharyngodon mola* and the lowest in *Channa punctatus* [14]. On the other hand, some scientists obtained 3.7-17.8% fat in 23 sun-dried fish species [15], which is more or less similar to the present study. The ash content varied over a larger range of 1.4-21.6% in 23 different small indigenous fish species [15]. It has also been reported that a wide range of ash content from 5.08 to 12.14% found in fourteen dried fishes [16].

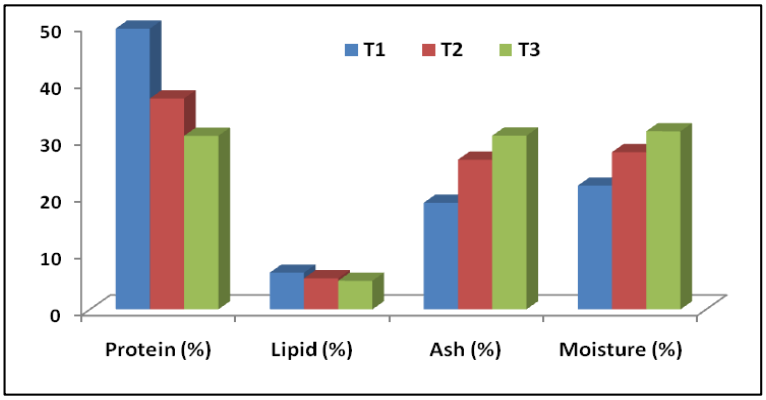

Fig 3: Proximate composition of 'Shidhil' produced from silver jew fish (Otolithes argentatus) with taro (Colocasia esculenta)

3.4 Food Quality Analysis

Food quality of 'Shidhil' products were analyzed by determining the biochemical aspect like Total Volatile Base Nitrogen (TVB-N).

3.4.1 TVB-N Value of different 'Shidhil' products

The TVB-N values of different 'Shidhil' products produced from punti (*Puntius ticto*) with taro were in the range of 2.61% to 3.54% with lowest value in S_3 and highest value in S_3 (shown in Fig. 04). The TVB-N values of all the samples were found lower than the recommended value (100 - 200mg/100g) for variety of salted and dried products [17].

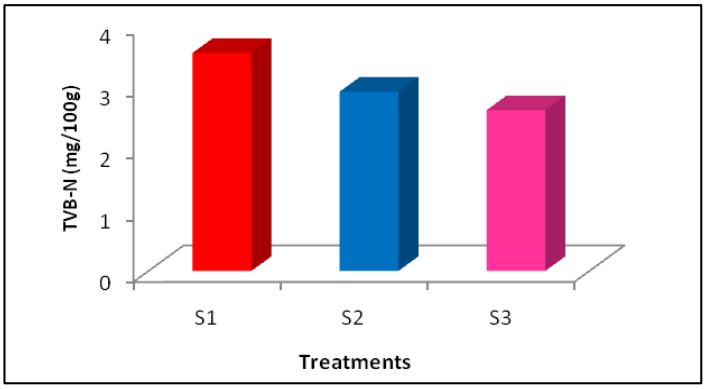

Fig 4: TVB-N Value of 'Shidhil' produced using punti (Puntius ticto) with taro (Colocasia esculenta) where (A) S_1 (B) S_2 and (C) S_3

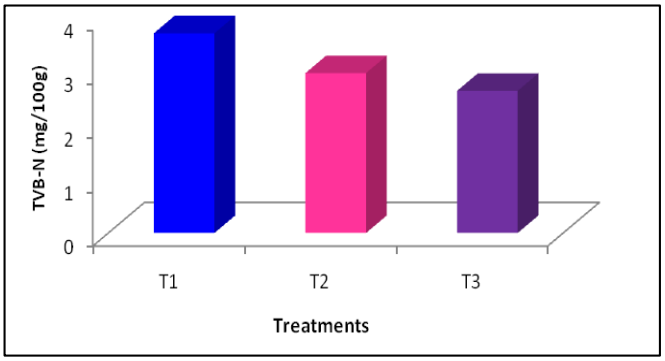

Fig 5: TVB-N Value of 'Shidhil' produced from silver jew fish (Otolithesargentatus) with taro (Colocasia esculenta) where (A) T^1 (B) T^2 and (C) T^3

The TVB-N values of different 'Shidhil' products produced using silver jew fish (*Otolithes argentatus*) with taro were in the range of 2.64% to 3.71% with lowest value in T_1 and highest value in T_2 (shown in Fig. 05). The TVB-N values of all the samples were found lower than the recommended value (100 - 200mg/100g) for variety of salted and dried products [17].

4. Conclusion

Organoleptic quality assessments of 'Shidhil' products were also conducted. The physical and organoleptic qualities of 'Shidhil' were evaluated on the basis of the color, odor, texture and overall other quality aspects. On the basis of organoleptic characteristics, all the samples were found acceptable condition. Studies were also conducted to find out the proximate composition of this product. All the parameters found within the satisfactory level. The food quality of this product is excellent.

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