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Nutritional, microbial and sensory quality evaluation of fermented *Setipinna phasa,* Hamilton 1822, (*Phassya Shidal*), marketed in North-east India

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Abstract: Fermented *Setipinna phasa* (*Phassya Shidal*) is a traditional fish product, popular in the north eastern states of India, because of its typical flavor and aroma. The proximate composition, biochemical, microbiological and sensory qualities of *Phassya Shidal* available in markets were studied. The results of the analysis showed that the market samples of *Phassya Shidal* were a good source of protein (27.20%). The pH and moisture content were 6.2 and 37.52%, respectively. Both *Phassya Shidal* and fresh *Setipinna phasa* (raw material) were rich in lysine, leucine, valine, aspartic acid, alanine and glutamic acid. The effect of fermentation on the amino acids content of the sample was not significant except in histidine (P<0.05). An increase in the contents of fatty acids and amino acids composition was observed in the *Phassya Shidal* during fermentation. Significant variations (P<0.05) in the proportions of some unsaturated fatty acids were noticed between product and fresh fish. The major saturated fatty acids were C16:0 and C18:0. The Oleic acid was the prominent monounsaturated fatty acid. The dominant polyunsaturated fatty acids (PUFA) were of the n-3 series. The major PUFA found chiefly in linoleic acid and linolenic acid in both the samples. The physicochemical analysis revealed that the product was of acceptable quality. The bacterial flora of *Phaasya Shidal* comprised of *Staphylococcus aureus, Streptococcus* spp. and *Escherichia coli* indicating unhygienic handling practices during preparation and storage. Though the product had acceptable sensory quality, strict hygienic measures should be adopted during processing to safeguard the health of the consumers.

Keywords: Fermentation, *Phassya Shidal,* Quality evaluation, *Setipinna phasa,* Traditional fish product

INTRODUCTION

Fermentation is one of the popular and most economical methods for producing and preserving food in northeastern part of India. Fermented foods are encountered worldwide and their origin is due to their prolonged shelf life, reduced volume, shorter cooking times and superior nutritive value as compared to non-fermented ingredients (Das and Deka, 2012).It has wide scope on nutritional possibilities in future and considered as a superior food in terms of protein value, minerals and vitamins and fermented fish in general have favourable amino acid composition which can be compared well with other meat products (Sarojnalini and Suchitra, 2009).

Fermented fish product *Shidal* is popular in the north eastern part of India, because of its typical falvour and aroma, which is prepared exclusively from soft fin swamp barb, *Puntius sophore* (Hamilton, 1822). But recently, it is also prepared from one estuarine dried fish product prepared from the Gangetic hairfin anchovy, *Setipinna phasa* (Hamilton, 1822), and become popular in the region, because of comparatively less price without compromising its typical flavor and taste. Fermented *Setipinna phasa* is locally known as *Phassya Shidal/Telas maach /Sepa /Hidol etc.,* which is available in the markets of the region (Majumdar, 2007).

Phassya Shidal is mostly produced in the household/ small-scale factory with limited process control to ensure product quality and safety. In addition, the environment, materials or utensils used, in which the product is processed may not be hygienic, paving the way for possible microbial contamination. Formal quality control systems are entirely lacking in the artisanal fish processing industry in the region. The procedures used for processing of *Phassya Shidal* do not include steps such as cooking or pasteurization that destroy pathogens, and the products are often stored and marketed at an ambient temperature in poor packaging conditions, until consumption. Besides, the product is prepared without salt during fermentation process which may leads to high microbiological risk (Kakati and Goswami, 2013a).

The medicinal properties (Sarojnalini and Singh, 1988), biochemical, microbiological and sensory quality of different fermented fish products of the region have been studied and documented (Majumdar *et*

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al., 2005; Majumdar and Basu, 2010; Kakati and Goswami, (2012, 2013a, 2013b); Muzaddadi and Basu, 2012; Ahmed *et al.,* 2013). There are few reports on the quality of traditional fish products available in the markets of India. But, the quality of fermented *Setipinna phasa,* available in the markets of the region has not yet been studied, which has major consumer's health concern. The present study has been carried out to assess the proximate composition, biochemical, microbiological and sensory qualities of fermented *Setipinna phasa,* during marketing and storage.

MATERIALS AND METHODS

Preparation of *Phassya Shidal*: For traditional *Phassya Shidal* preparation (Fig.1), the dried *Setipinna phasa* were collected from market and further allowed to sun-dry for 2-3 days and filled in to the specially designed airtight earthen pot (locally called *Koloh*), with the dry fish after soaking for 5-10 minutes. Soaking of raw materials is very important in the preparation of *Shidal* and crucial for obtaining the best quality product. By repeated smearing of oil (fish oil extracted from the entrails of low cost fresh water fishes, through an indigenous crude method or vegetable oil for smearing) and subsequent drying in the sun, the *Koloh* (round bottomed and narrow necked earthen vats, the capacity of which ranges from 10-40 kg) were saturated with oil before filled with dried raw fishes. Unlike the other fermented fish products, salt was never added during preparation of *shidal*. The filled earthen pot was then sealed air tight, thus providing an anaerobic condition inside and stored at room temperature (30±2^{o}C) for 3-4 months for fermentation.

Collection of samples: *Phassya shidal* and dried *S. phasa* (raw material used for *Shidal* preparation) were collected from the *Jagiroad* dry fish market of Assam (One of the largest dry fish market in Asia) and brought to the laboratory in aseptic condition, packed in low density polyethylene pouches (thickness:200gauge) and stored under ambient conditions (30±2^{o}C). *Phassya shidal* was collected from the retailers after two days of opening the airtight sealed fermenting containers. The retailers kept the product in plastic containers or in earthen pots before sale. The samples were analyzed for different quality parameters, and the analyses were done in triplicate in the case of both the samples.

Biochemical analysis: Moisture, crude protein, crude fat, ash and non protein nitrogen (NPN) content of the fish products were determined by AOAC (2000) methods, standard methods were used for the determination of salt soluble nitrogen (SSN) (Dyer *et al.*, 1950), total

Table 1. Biochemical quality of dried *S. phasa* and *Phassya Shidal* available in the markets.

Parameters (N=3)	Dried *Stipinna phasa*	*Phassya Shidal*	*P* value
Moisture, %	22.53 ± 1.34	37.52 ± 0.36	0.002
Crude protein, %	58.32 ± 0.66	27.2 ± 1.43	0.001
Crude fat, %	7.33± 0.85	24.1 ± 0.55	0.001
Ash, %	10.08± 0.35	10.2 ± 0.95	0.006
pH	6.40 ± 0.02	6.2 ± 0.02	0.009
Salt soluble nitrogen, (% of total N)	62.50 ± 1.23	45.6 ± 0.86	0.003
Non protein nitrogen, %	1.81 ± 0.21	2.2 ± 0.34	0.263
Total volatile base N_2, mg%	52.2 3± 0.75	108.24 ± 1.11	0.001
Peroxide value (meq O_2/kg of fat)	36.72 ± 1.20	51.96 ± 1.34	0.008
Free fatty acids (% as oleic acid)	59.90 ± 1.82	74.6 ± 0.35	0.011

Table 2. Amino acids composition (g amino acid per 100g of protein) of fresh *Setipinna phasa* and *Phassya Shidal*.

Amino acids (g 100 g^{-1}) N=5	Fresh *S. phasa*	*Phassya Shidal*	*P* value
Essential amino acids			
Arginine	5.0±0.9	5.4±0.5	0.815
Histidine	1.5±0.2	2.4±0.3	0.004
Isoleucine	4.0±0.3	4.6±0.5	0.288
Leucine	7.5±0.6	8.1±1.1	0.482
Lysine	12.5±1.3	13.6±0.8	0.391
Methionine	3.5±0.4	3.8±0.6	0.463
Phenyl analine	3.9±0.3	4.4±0.8	0.368
Threonine	4.6±0.5	4.9±0.4	0.389
Valine	6.0±0.7	6.5±0.8	0.482
Tryptophan	2.0±0.2	2.5±0.5	0.183
Non-essential amino acids			
Aspartic acid	8.5±1.2	9.0±1.0	0.656
Aspergine	4.1±0.5	4.5±0.2	0.183
Alanine	5.1±0.2	5.6±0.5	0.183
Cystein	0.8±0.1	0.8±0.2	1.000
Glutamic acid	19.0±1.8	20.1±1.3	0.696
Glycine	4.0±1.0	4.4±0.3	0.499
Proline	4.5±0.5	4.1±0.7	0.288

Table 3. Fatty acids composition of fresh *Setipinna phasa* and *Phassya Shidal.*

Fatty acids composition (mole %), N=5	Fresh *S. phasa*	*Phassya Shidal*	*P* value
Saturated fatty acids (SFA)			
C12:0	ND	ND	--
C14:0	1.6±0.2	2.0±0.4	0.176
C15:0	1.5±0.3	1.8±0.2	0.183
C16:0	19.4±1.2	19.7±1.3	0.650
C17:0	0.5±0.02	1.0±0.03	0.018
C18:0	15.0±1.5	15.2±0.6	0.628
C19:0	ND	ND	--
Monounsaturated fatty acids (MUFA)			
C16:1 n-7	10.4±1.5	11.0±1.8	0.781
C18:1 n-3	19.6±1.2	20.1±2.1	0.819
C20: 1	1.4±0.3	1.6±0.2	1.000
C22:1	1.0±0.04	1.5±0.2	0.125
Polyunsaturated fatty acids (PUFA)			
C18:2n-6	8.0±0.5	8.6±1.1	0.591
C18:3n-3	5.6±1.0	5.9±1.5	0.656
C18:4n-3	2.1±0.2	2.3±0.3	1.000
C20:4n-6	ND	ND	--
C20:5n-3	1.9±0.1	2.2±0.2	0.021
C22:5n-3	1.1±0.04	1.4±0.3	0.074
C22:6n-3	1.3±0.3	1.5±0.2	1.000
Unidentified	3.5±0.4	3.7±0.2	0.223
Total SFA (%)	38.00	39.70	
Total MUFA (%)	32.40	34.20	
Total PUFA (%)	20.00	21.90	

Fatty acids are represented in the following manner: the first number indicates the number of carbons, while the second represents the number of double bonds. ND: not detectable.

volatile base nitrogen (TVB-N) content according to the Conway's micro-diffusion method (Conway, 1947), peroxide value (PV) as per Jacobs (1958), free fatty acids (FFA) value following Olley and Loveren (1960). pH was determined using a pH meter (Sartorius Make), after homogenizing 5g of fish sample with 45ml distilled water.

Amino acid compositions of fresh *Setipinna phasa* and *Phassya Shidal* were determined by the methods of Chang *et al.,* (1991) and Sastry and Tummuru (1985). The fatty acid compositions were determined by fatty acid methyl ester (FAME)/gas chromatography using acetyl chloride as a reagent for transesterification according to the method of Christie (1993). Fresh *Setipinna phasa* was collected from the local market. The fish species studied were caught from natural resources. The fresh fish was iced (1:1 ice: fish) and brought to the laboratory using insulated containers. In the laboratory, the fishes were washed thoroughly with chilled water and were used for the study.

Microbiological and sensory analysis: An amount of 10g of muscle from different parts of the sample was collected aseptically and macerated with 90 ml sterile saline. The microbial quality of the samples was determined after making serial dilution in the same diluents. The microbial quality of *Phassya Shidal* was determined by the methods of APHA (2001) and USFDA (2001). Sensory evaluation of the sample was carried out using the 9- point hedonic scale by a trained taste panel consisting of 10 members. The sensory quality of *Phassya Shidal* sample was judged for appearance, colour, texture, flavour intensity and overall acceptability. The colour was recorded, based on visual observation and texture by applying pressure by the finger tips (Lilabati *et al.,* 1999).

Statistical analysis: Statistical analysis was done by performing one way ANOVA to compare the means at 5% level using SPSS 16.0 software (SPSS for Windows. Release 11.5. Chicago: IL: SPSS Inc, 2000).

RESULTS AND DISCUSSION

The mean value of moisture, crude protein, crude fat and ash of dried *Setipinna phasa* (raw material) and *Phassya Shidal* are presented in Table 1. Proximate composition of *Shidal* and dried *S. Phasa* showed significant differences ($P<0.05$) for all the parameters. This may be due to the effect of processing and microbial breakdown of the product (Mahanta and Muzaddadi, 2012). The moisture content of dried *S. Phasa* and *Phassya Shidal* was 22.53% and 37.52%, respectively. The increased moisture content in *Phassya Shidal* may be due to the water-soaking step during preparation and possible absorption of moisture from the environment during storage, since in most places *Shidal* was stored in earthen pots or in plastic bottles during marketing. The higher moisture content of the product may affect many vital parameters such as microbial growth, enzymatic activity and texture. The higher moisture content in ranges from 39.62 to 46.89% was reported in *Chepa Shutki,* a semi ferment-

Table 4. Microbiological quality of dried *S. phasa* and *Phassya Shidal* available in the markets.

Parameters (N=3) (log cfu/g)	*Dried S. phasa*	*Phassya Shidal*	*P* value
Total plate count	3.7±0.85	5.1±0.24	0.588
Yeast and mould	1.0±0.21	1.2±0.06	0.017
Staphylococcus aureus	1.4±0.12	1.8±0.33	0.042
Escherichia coli	<1	<1	--
Streptococcus spp.	1.1±0.21	1.0±0.12	0.514
Salmonella spp.	Absent	Absent	--

Table 5. Sensory quality of *Phassya Shidal* available in the markets.

Quality attributes	Characteristics of the product	Sensory score *
Appearance	Bright, moist with soft surface, sticky on touch	7.0 ± 0.67
Colour	Golden yellow colour	7.1 ± 0.76
Texture	Soft and spongy texture	6.8 ± 0.97
Flavour intensity	Characteristics *Shidal* smell with slight off sour odour	6.6 ± 1.06
Overall acceptability		6.9± 1.12

*9 point Hedonic scale given by 10 judges.

ed fishery product prepared from *Puntius* spp. collected from the markets of Bangladesh (Nayeem *et al.,* 2010). Products with high moisture content (above 35%) are susceptible to attack by blowflies, especially if the salt level in the product is low. This results in the development of maggots in some fermented fishery products during storage. The present study revealed that the moisture content was within the range of the BIS standard, which prescribes a range of 10-35% for smaller fish and 40-45% for bigger ones (Gopakumar and Devadasan, 1982).

Good quality raw material is essential to produce quality end product. *S. Phasa* collected during the winter period (October- December) was considered to be the best raw material to obtain quality *Phassya Shidal.* This may be attributed to the fact that this period coincides with the time of the maximum fat content of the fish (Majumdar, 2007). The results presented in the Table 1 exhibit the raw material used for the *Shidal* preparation was of good quality.

The pH value of *Phassya Shidal* samples was 6.2. The mean value of moisture and pH of samples indicates that the *Shidal* was a stable product. The protein content was 27.2% for *Phassya Shidal* (Table 1). The protein content of semi fermented fish products (*Chepa Shutki)* of Bangladesh, collected from retailer, wholesaler and producer was reported as 61.71%, 58.26% and 65.75% (on dry weight basis), respectively (Azam *et al.,* 2003). *Tungtap*-a traditional fermented fish product of Meghalaya prepared from *Danio* spp. was also a good source of protein (40.6g/100g) (Agrahar- Murugkar and Subbulakshmi, 2006).

The content of SSN (45.6% of total N), NPN (2.2%) and TVB-N (108.24 mg%) of the samples indicates the degradation of tissue protein that may be responsible for the generation of the typical flavor and aroma of the fermented *Shidal* (Table 1). The high value of NPN and TVB-N might be attributed to the subsequent microbiological and biochemical changes in the fish muscle during the drying and fermentation process. The value of NPN and TVB-N of salt fermented *Lona ilish* were reported as 540mg% and 48mg%, respectively (Majumdar *et al.,* 2005).

Amino acid composition of a fish product contributes significantly to its taste and also decides the quality of the protein. The amino acid composition of both *Phassya Shidal* and fresh *S. phasa* is presented in Table 2. Each amino acid content was increased during fermentation, except cystein and proline. During the fermentation process, the content of cystein remained unchanged, whereas the content of proline was decreased. But, the fermentation effect on amino acids composition was not significant (P>0.05) except histidine. The increase in the level of each free amino acid during fermentation seemed to be attributable to the results of dynamic balance between the production and breakdown of free amino acids by autolysis and microbial action and the degradation of some muscle proteins into peptides and amino acids. Chang *et al.,* (1994) reported that the contents of free amino acid, especially glutamic acid, alanine, valine and leucine increased during fermentation of *Hatahata-zushi* - a Japanese fermented product of sand-fish and boiled rice.

Phassya Shidal and raw fish used were rich in lysine, leucine, valine, aspartic acid, alanine and glutamic acid. Lysine was the most abundant among the essential amino acids, whereas glutamic acid was found to be higher in the non-essential amino acids group. Rabie *et al.* (2009) observed that the predominant free amino acids were leucine, glutamic acid, lysine, alanine, valine, aspartic acid, isoleucine and citrulline in an Egyptian salted-fermented fish product (*Feseekh*) during ripening. Dincer *et al.,* (2010) also reported the high amounts of glutamic acid, alanine, lysine, leucine and aspartic acid in fish sauce, produced by incubating mixtures of sardine (*Sardina pilchardus*) at 6 different concentrations of sodium chloride and glucose at 37°C for 57 days.

Lipid is an important constituent, determining both functionality and sensory properties of processed meat products. Depending on the content, composition and

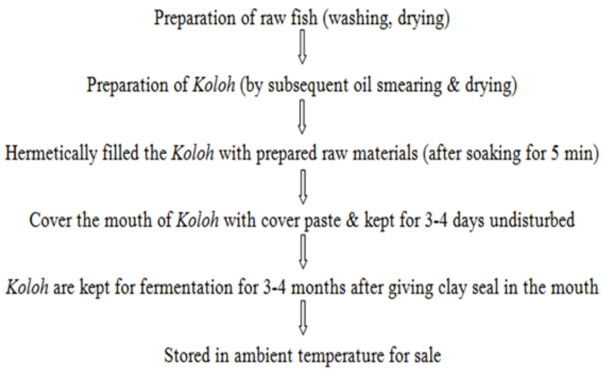

Fig.1. *Preparation of Shidal by traditional method.*

properties, lipids as well as their fatty acids, contribute to a wide range of quality attributes. The changes in lipid during processing, such as lipolysis and lipid oxidation, have a major impact, both desirable and deleterious for the final product quality of meat products (Visessanguan *et al.,* 2006). The fat content was 24.10% for *Phassya Shidal* (Table 1). The high amount of fat may be due to the fatty raw materials i.e. *Setipinna* spp. and additional fish oil or vegetable oil, which is normally used for smearing the earthen pot during processing.

The PV and FFA of *Phassya Shidal* were found to be 51.96 meq O_2/kg of fat and 74.6% of oleic acid, respectively (Table 1). The PV is a measure of the first stage of oxidative rancidity and fish lipid being highly unsaturated, is highly liable for both autolytic as well as oxidative rancidity (Balachandran, 2001). Though the *Shidal* fermentation is an anaerobic/micro aerophilic process, higher values of PV of the market samples might be attributed to direct exposure to air during retailing, resulting in the lipid oxidation of the product. A similar PV (41.3 meq O_2/kg fat) and FFA (31.84% oleic acid) has been reported in salted anchovy after 9 weeks of fermentation (Hernandaz-Herrero *et al.,* 1999). The PV and FFA value for *Lona ilish,* a traditional salt fermented fish product of northeast India, was also recorded as 40.0 meq O_2/ kg of fat and 18.22 % oleic acid, respectively (Majumdar and Basu, 2010).

The fish oils of fresh *Setipinna phasa* and *Phassya Shidal* were unique in the variety of fatty acids, of which they were composed and their degree of unsaturation (Table 3). The nature, proportion and degree of unsaturation of the fatty acids in the lipids are all closely related to the oxidation of the oils (Ugoala *et al.,* 2008). The fatty acids profiles of *Phassya Shidal* and raw fish (Table 3) included minor amounts of odd-number and even-number fatty acids. The mole percent of each fatty acid seems to vary. An increase in the contents of the fatty acids composition was observed in *Shidal* during fermentation, but the fermentation effect on the composition of fatty acids of both the samples was almost negligible. The changes observed in the lipid composition may be attributed to the lipolysis of both triacylglycerol and phospholipid during fermentation. The lipolytic activity during fermentation might be due to lipases of both the muscular tissue and microbial origin (Toldra and Flores, 1998). Visessanguan *et al.* (2006) also reported that fatty acids contents in both total and non polar lipid fractions was increased during fermentation, in the case of *Nham,* a Thai fermented pork sausage.

The saturated fatty acids (SFA), monounsaturated fatty acids (MUFA) and polyunsaturated fatty acids (PUFA) of fresh *S. phasa* and *Phassya Shidal* was 38.0%, 32.4%, 20.0% and 39.7%, 34.2%, 21.9%, respectively. In the present study, the high value of SFA recorded in the case of both the samples were palmitic acid (C16:0) and stearic acid (C18:0). Narayan *et al.* (2012) reported that palmitic acid was the most prevalent in all species with mean values of 8.5% (Catfish), 31.9% (Tilapia), 36.2% (Hilsa), 37.5% (Bonga fish) and 9.94% (Mudskipper). The higher amount of palmitic acid in tuna meat has been also reported by Nimish *et al.* (2010).

Oleic acid (C18:1) was the prominent monounsaturated fatty acid observed in all the samples studied (Table 3). In the samples analyzed, the dominant PUFA were of the n-3 series in fresh *Setipinna phasa* and *Phassya Shidal.* The major PUFA found chiefly in C18:2 (Linoleic acid) fatty acids in both *shidal* and raw fish. Due to high susceptibility to chemical and enzymatic oxidation, polyunsaturated fatty acids possibly act as pre-cursors for flavor development during fermentation (Josephson, 1991). Samples studied, contain all the essential fatty acids, although they vary in composition. The major n-3 polyunsaturated fatty acids observed in total lipids and their classes were eicosapetanoic acid (20:5n-3) and docosahexanoic acid (22:6n-3) in lower concentration and linolenic acid (18:3n-3) in higher concentration in both the product and the raw fish. Among n-6 fatty acids, linoleic acid (18:2n-6) was dominant one. Docosahexanoic acid (DHA) has well-documented health benefits as it is known to reduce the risk of cardiovascular disease,

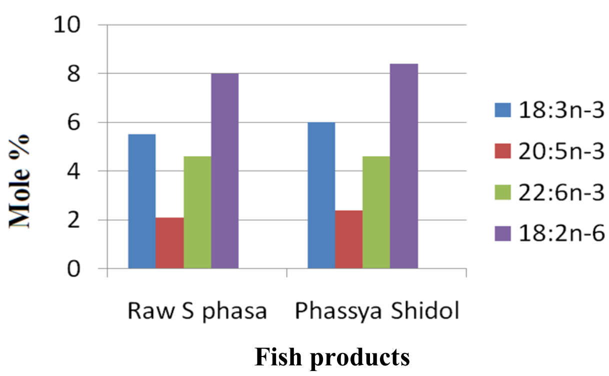

Fig. 2. *Essential fatty acids of fresh S.phasa and Phassya Shidal.*

hypertension, autoimmune and inflammatory diseases (Rustad, 2003; Kim and Mendis, 2006; Bhaskar *et al*., 2006).

Oxidation of lipids is of economic and nutritional significance to the food industry as well as to consumers. It may result in sensory changes (flavour and aroma) and loss of nutritional value (Essential fatty acids, fat-soluble vitamins: A, D, E, K), production of primary and secondary oxidation products (hydro peroxides, free radicals, epoxides, etc). These products, like most common oxidation products of cholesterol, could cause atherosclerotic injury, potent inhibitors of sterol biosynthesis or be carcinogenic (Fontana *et al*., 1993).

The samples were analyzed for pathogenic contamination. Determination of standard plate count, the faecal coliform count and *Staphylococcus* count are the widely accepted parameters in inspection of fish food (Anon, 1964). Pathogenic contaminants like *Staphylococcus aureus, Streptococcus* spp. and *Escherichia coli* were detected in dried *S. phasa* and *Shidal* sample. The count of *S. aureus* and *Streptococcous* spp. were 1.4 - 1.8 log cfu/g and 1.0 -1.1 log cfu/g, respectively, whereas the number of *E. coli* was less than 1.0 log cfu/g. *Salmonella* spp. was not detected in both the samples (Table 4). The presence of *S. aureus, Streptococcus* spp. and *E. coli* in fermented fish product might be attributed to poor handling practices and faecal contamination during processing and storage (Hazen, 1988; ICMSF, 1996). *Staphylococcus aureus* was regarded as a poor competitor and its growth in fermented food is generally associated with a failure of the normal micro flora (Nychas and Arkoudelos, 1990). The growth of *Staphylococcus* in food presents a potential health hazard since many strains produce enterotoxins, which cause food poisoning, if ingested. Rieman and Bryan (1979) reported that certain strains of *E. coli* cause enteric disease in man. 10^6-10^8 cells of this organism in human system cause symptoms of food poisoning as reported in infantile diarrhea.

The total plate count of dried *S. phasa* and *Phassya Shidal* was 3.7 log cfu/g and 5.1 log cfu/g, respectively. There was no visible fungal colony on the products. However, when grown on agar medium, a few yeast and mould colonies (1.0- 1.2 log cfu/g) were observed. Yeast such as *Candida* and *Saccharomycopsis* were reported in *Hentak, Nagri* and *Tungtap - a* few traditional fish products of northeast India. Similar results were also reported from *Nam-pla* and *Kapi* (Watanaputi *et al.,* 1983).

The sensory attributes evaluated for *Phassya Shidal* revealed that the product had a good sensory quality and overall acceptability (Table 5). Though the product was found to have satisfactory appearance (7.0), colour (7.1) and texture (6.8), yet the overall acceptability of the product depends mainly on the intensity of the flavor and aroma (i.e. 6.6) of *Shidal.* The complex interaction of enzymatic activity and oxidation during the fermentation, along with the bacterial production of volatile fatty acids may be responsible for the characteristic flavor and aroma of fermented fish products (Beddows *et al.,* 1980). A significant role of bacteria and muscle bacterial proteases in the process of fermentation, flavor and aroma producing process was recorded (Thongthai and Siriwongpairat, 1990). *Phayssa Shidal* had bright and shining appearance, golden yellow in colour, *Shidal* smell with slightly sour odour and with a soft and spongy texture. The overall acceptability (6.9) of the market sample was graded as acceptable for human consumption.

Conclusion

The present study reveals that the traditional salt-free fermented fish product, *Phassya Shidal* available in the markets of the north eastern states of India had a high nutritive value, as the protein, fat and ash content was observed to be high. The physicochemical quality of *Phassya Shidal* was found to be within the acceptable limit. *Shidal* in the markets of the north eastern region of India could serve as a significant source of essential amino acids; the sulphur-containing essential amino acids and lysine and could supplement the corresponding deficiency in plant proteins. The overall significance of this study is the revelation that *Phassya Shidal* was good source of polyunsaturated fatty acids, particularly n-3 series of essential fatty acids (EPA and DHA). The present findings suggest that the market sample of *Shidal* was contaminated with several pathogens like *Staphylococcus aureus, Streptococcus* spp. and *Escherichia coli*, which are generally associated with public health hazards. Though the absence of *Salmonella* spp. was a good sign for consumers, yet the aspect of the importance of public health of the above findings cannot be ignored. Therefore, it is stressed that strict hygienic measures should be adopted right from the preparation of raw materials, use of utensils, handling practices, processing methods and during storage, in order to safeguard the health of the consumers.

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