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Comparative Study of Organoleptic, Microbiological and Biochemical Qualities of Four Selected Dried Fish in Summer and Winter

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Abstract: Organoleptic, microbiological and biochemical qualities of four dried fish samples (*Mugil cephalus, Scoliodonshorrakowah, Harpodon nehereus and Setipinna phasa)* were assessed in summer and winter season and their qualities were compared. The organoleptic score of the samples collected in winter were higher than summer season. The standard plate count (SPC) of different samples in summer and winter indicated an acceptable microbial load. Total Coliform (TC) counts of the samples in summer and winter were found to vary between <3 MPN g^{-1} to 4 MPN g^{-1} and had no differences except for *Mugil cephalus* (4 MPN g^{-1} in winter) and *Harpodon nehereus* (4 MPN g^{-1} in summer). Total Coliform (TC) counts of rest of the samples were <3 MPN g^{-1}. The faecal coliform counts of all the samples were also < 3 MPN g^{-1}. *Vibrio* and *Salmonella* were not detected in any of the four samples. A slight variation was observed in moisture, ash, protein and fat content of the samples in summer and winter. Moisture, ash, protein and fat content of Parshe were higher in summer. In case of *Mugil cephalus* and *Scoliodon shorrakowah*, TVB-N was higher in winter than summer. TMA-N content of the two species (*Mugil cephalus* and *Scoliodon shorrakowah*) showed a similar pattern to that of TVB-N. TVB-N and TMA-N content of the remaining two species i.e. *Harpodon nehereus* and *Setipinna phasa* showed a reverse pattern in comparison to *Mugil cephalus* and *Scoliodon shorrakowah*. *Mugil cephalus* and *Harpodon nehereus* showed higher pH in winter than summer while, the pH in *Scoliodon shorrakowah* and *Setipinna phasa* was higher in summer.

Key words: Winter season, summer season, dried fish, microbiological, biochemical and organoleptic assessment

INTRODUCTION

Fish accounts to 63% of the country's animal protein supply (DOF, 2001). During the year 1999-2000, Bangladesh exported 39,391 metric ton fish and fisheries products with an earning of 181.16 Million taka (EPB, 2001). Amongst total export volume and export earning, dried products (Dry fish, Salted and dehydrated fish and Shark fin and Fish Maws) accounted to 1286.00 MT with a value of 6.07 Million taka (3.35% of total) (DOF, 2001). Drying is regarded as a traditional and primitive method of preservation of fish. It is of vital importance in the developing countries of the world like Bangladesh. About 8 million tons of fish (25-30%) of the present world catch for human consumption are dried, salted, smoked, or treated by some combination of these processes each year (Kamruzzaman,1992). In Bangladesh the process of drying fish is mainly performed by the households of the artisanal fisherman who are mostly illiterate. There are frequent complaints from the consumers about the quality of the products. Organoleptic microbiological and biochemical quality assessment is necessary to ensure the food safety of any processed product. But less work has been done on the quality assessment of dried fish in different seasons. Thus, the present investigation was carried out to determine the variation in qualities of fourteen dried fishes between summer and winter in relation to organoleptic, biochemical and microbial parameters. However, this present study was done to assess the organoleptic and microbiological quality of fourteen dried fishes.

MATERIALS AND METHODS

Samples were collected from the local sutki(dried) market of Kuakata of Bangladesh both in summer and winter. All the collected samples packed in air tight polythene bag and were brought to the Quality Control Laboratory of Fisheries and Marine Resource Technology Discipline of Khulna University by road transportation for investigation. As soon as the samples were received in the laboratory, they were first evaluated organoleptically by a three-member taste panel. The samples were then stored at 4°C for microbiological and biochemical investigations.

The organoleptic assessment of the quality of the samples was carried out according to the procedure of Paryam and Pilgrim (1977). However, a slight modification was done in order to fit the characteristics of the samples investigated (Table 1). The organoleptic characteristics

Table 1: Modification of the organoleptic score sheet of Paryam and Pilgrim(1977)

Acceptability	Score (Paryam and Pilgrim, 1977)	Modified score (present investigation)
Like extremely (LE)	9	9-10.0
Like very much (LVM)	8	8-8.9
Like moderately (LM)	7	7-7.9
Like slightly (LS)	6	6-6.9
Like neither like nor dislike (LNLND)	5	5-5.9
Dislike slightly (DS)	4	4-4.9
Dislike moderately (DM)	3	3-3.9
Dislike very much (DVM)	2	2-2.9
Dislike extremely (DE)	1	1-.9

emphasised on odour, flavour, toughness, fibrousness and appearance.

Standard Plate Count (SPC) of the samples was carried out according to procedure and diagnostic scheme reported by Hobbs and Hodgkiss (1960), Lee and Pfeier (1975) and Cowan and Steel (1977). Plate Count Agar (PCA) was used to enumerate SPC. The spread plate method was applied by spreading aliquots (1ml) from the serial dilutions on triplicate Nutrient Agar (NA) plates and incubated at 35± 2°C for 48 h.

The most probable number (MPN) of total and faecal coliform was established according to Bacteriological Analytical Method (BAM, 1978).

For isolation and identification of *Vibrio cholerae* the method outlined in FDA Manual (FDA, 1978) was applied. Glucose Salt Teepol broth was used for enrichment, Thiosulphate Citrate Bile Salt (TCBS) agar for isolation and Triple Sugar Iron Agar for screening. For identification, biochemical tests described in the FDA Manual were carried out and MPN was used in enumeration.

Salmonella isolation and identification was based on the tests listed by Collins and Lyne (1976). In the detection of *Salmonella*, Lactose Broth (LB) was used as pre-enrichment and Tetrathionate Broth and Seletine Cystine Broth were used in enrichment. For *Salmonella* isolation, Xylose Lysine Deoxycholate (XLD) was used. Further biochemical tests were done for identification.

Proximate composition (the percentage of moisture, protein, fat and ash) of the samples were analysed according to AOAC (1988) methods.

Total volatile basic nitrogen and trimethyl amine nitrogen were assessed following the method of Conway (1977) micro-diffusion technique.

RESULTS AND DISCUSSION

The result of organoleptic assessment of the four common dried fish in summer and winter is shown in Fig. 1. Table 2 shows the results of microbiological parameters.

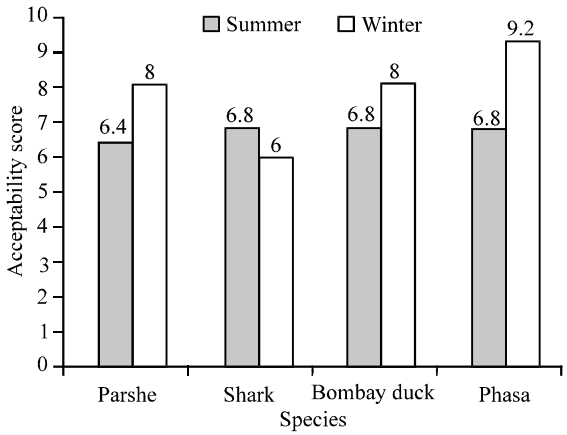

Fig. 1: Comparative study of the organoleptic assessment of four common dried fish in summer and winter

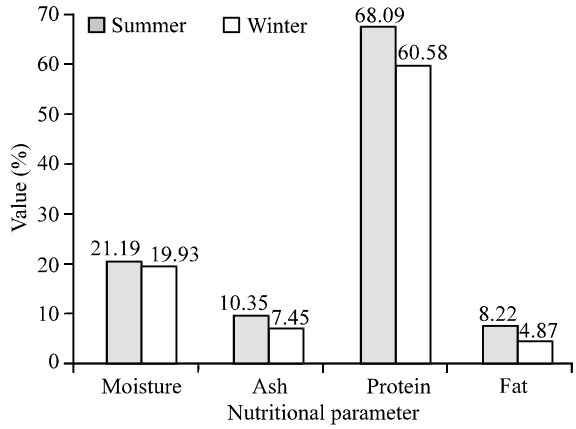

Fig. 2: Comparative study of the proximate composition of Parsha between summer and winter

Comparative study of proximate composition of four common dried fish between summer and winter is shown in Fig. 2, 3, 4 and 5. Comparative study of TVB-N, TMA-N and pH is shown in Fig. 6, 7 and 8.

The organoleptic evaluation of food products to any processing technology is very important in determining the consumer acceptability. The organoleptic parameters that are important include colour, texture, odour and taste. For simplicity of evaluation only overall acceptability was compared. The results showed that the organoleptic score of samples collected in winter were higher than summer season. All the winter samples had mean score of 8 and higher except for. While the summer sample had a score ranging between 6.4 to 6.8 with a remark of 'Like slightly' by the panellists. Winter samples were better as they were processed and brought immediately for assessment while summer samples were stored for a longer period before being processed.

Table 2: Comparative study of microbiological assessment of the four common dried fish between summer and winter

	Total count cfu g^{-1}		Total coliform MPN g^{-1}		Faecal Coliform MPN g^{-1}		Salmonella and *Vibrio*	
Species	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
Parshe	3.2×10^4	6.07×10^4	<3	4	<3	<3	ND	ND
Shark	4.8×10^4	7.7×10^4	<3	<3	<3	<3	ND	ND
Bombay duck	7.8×10^3	4.23×10^3	4	<3	<3	<3	ND	ND
Phasa	3.7×10^4	7.1×10^3	<3	<3	<3	<3	ND	ND

ND = Not Detected

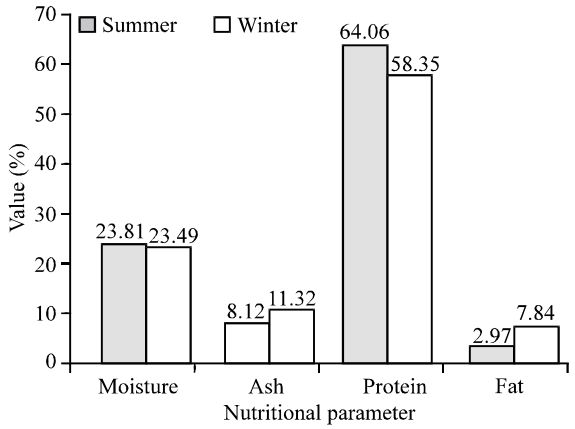

Fig. 3: Comparative study of the proximate composition of Shark between summer and winter

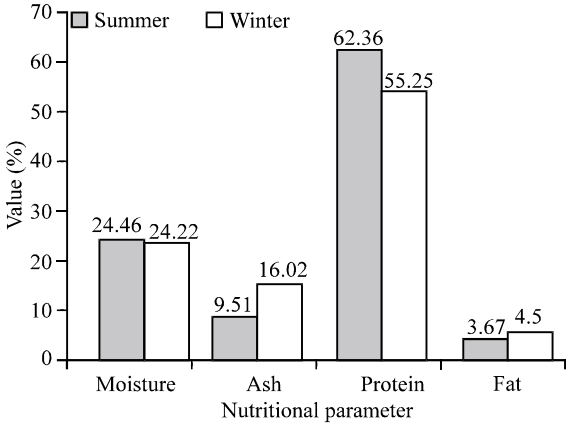

Fig. 5: Comparative study of the proximate composition of Phasa between summer and winter

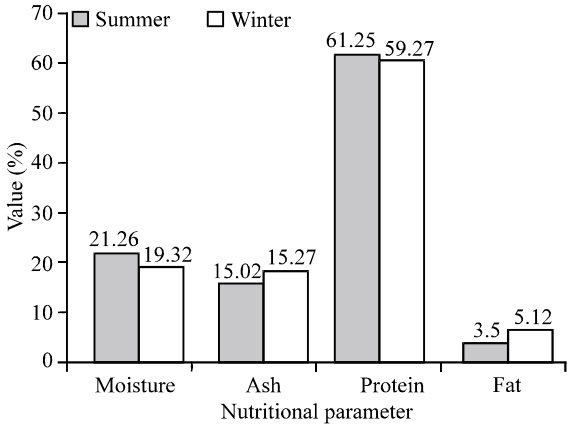

Fig. 4: Comparative study of the proximate composition of Bombay between summer and winter

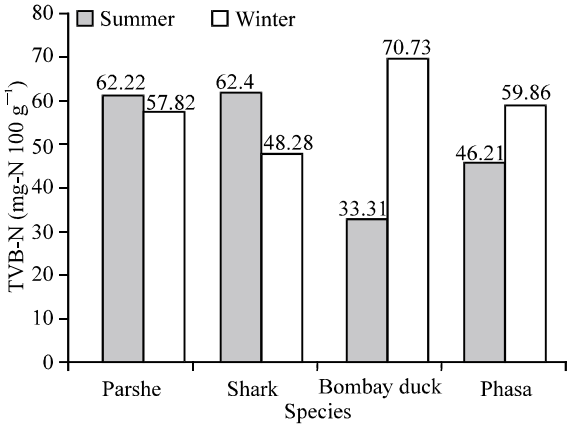

Fig. 6: Comparative study of TVB-N content of four common dried fish between summer and winter dried fish between summer and winter

The result shows that the standard plate count (SPC) of different samples in summer and winter indicated an acceptable microbial load (<10^5 cfu g^{-1}) (ICMSF 1988). For the sample collected in summer season, the SPC counts varied between a range of 3.2×10^4 cfu g^{-1} to 4.8×10^4 cfu g^{-1} while the SPC of the other sample, Bombay duck, was 7.8×10^3 cfu g^{-1} (Table 2). SPC of these three samples had little variation while Bombay duck showed one log cycle difference compared to the three samples. In winter, Parshe, Shark and Bombay duck indicated similar pattern.

Total Coliform counts of dried fish sample in summer and winter were in the acceptable limit (<100 MPN g^{-1}) and had no differences except for Parshe (4 in winter) and Bombay duck(4 in summer). Total Coliform (TC) counts of rest of the samples were <3 MPN g^{-1}. The faecal coliform counts of all the samples were also < 3 MPN g^{-1}.

Vibrio sp. and *Salmonella sp.* were not detected in any of the dried fish sample studied. It is evident that a slight variation was observed in moisture, ash, protein and fat content of four common dried fish in summer and

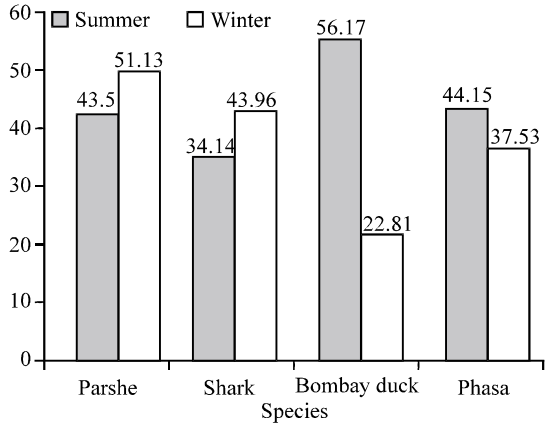

Fig. 7: Comparative study of TMA-N content of four common dried fish between summer and winter

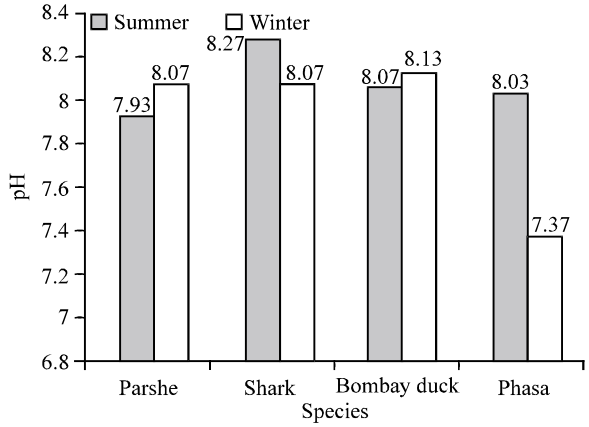

Fig. 8: Comparative study of pH of four common dried fish between summer and winter

winter. Moisture content of Parshe was higher in summer (21.19%) compared to winter (19.93%). It may be attributed to the fact that it was processed in winter and investigated immediately as winter was the season of processing while in summer fish were stored at ambient temperature and might have absorbed moisture from the atmosphere. Ash, protein and fat content of Parshe were also higher in summer. The values were 10.35, 60.58 and 8.22 (summer) and 7.45, 68.09 and 4.87% (winter), respectively (Fig. 2).

Proximate composition of Shark, Bombay duck and Phasa followed a similar pattern to that observed in Parshe between summer and winter (Fig. 2, 3 and 4).

TVB-N value was higher in winter than summer in case of Parshe and Shark,. The value of TVB-N of the two dried fish in winter were 62.23 ± 0.71 and 62.40 ± 0.52 mg-N $100\ g^{-1}$ which decreased in summer (57.82 ± 0.69 mg N $100\ g^{-1}$ and 48.28 ± 0.87) (Fig. 5).

TMA-N content of the two species (Parshe and Shark) showed a similar pattern to that of TVB-N (Fig. 6). TVB-N and TMA-N content of the remaining two species i.e. Bombay duck and Phasa showed a reverse pattern in comparison to Parshe and Shark. (Fig. 6 and 7).

Parshe and Bombay duck showed higher pH in winter (8.03 and 8.13) than summer (7.93 and 8.07) while, Shark and Phasa showed higher pH in summer. The values of this two-dried fish were 8.27 and 8.03 in summer and 8.07 and 7.37 in winter, respectively.

It is thus clearly observed that winter dried fish samples were of better quality than summer samples in relation to organoleptic, microbiological and biochemical parameters. However, all samples collected both in summer and winter were in acceptable state.

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