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Quality aspects of some exportable dried fishery products of Bangladesh

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Abstract

A study was conducted to evaluate the quality aspects of eight exportable dried fishery products of Bangladesh. The products were evaluated by examining organoleptic properties, water reconstitution behaviour, microbiological and biochemical aspects. The water reconstitution rate was faster in ribbon fish and bombay duck, and slower in other fishes and air bladder and shark fin products. Organoleptic and physical characteristics in respect of colour, odour, texture, insect infestation and broken pieces of the products revealed that all of the products were either in excellent or acceptable condition. Total viable bacterial load ranged from 0.95 x 10^4 CFU/g to 1.8 x 10^4 CFU/g in dried products. Coliform bacteria was absent in all the dried fishery products. The results of moisture, crude protein, lipid and ash content of the products ranged from 16.20 to 23.51%, 58.37 to 82.86%, 0.17 to 14.44% and 0.58 to 9.23%, respectively. Non-protein nitrogen (NPN) contents were in the range of 0.104 to 2.372% and the pepsin digestibility values were of 88.41 to 94.23%. The results of the study suggested that the exportable dried products were of good quality and hygienically safe.

Key words : Quality aspect, Dried fishery products

Introduction

Fishery industry of Bangladesh is mainly involved with the processing of high value items such as frozen shrimps, dried and salted dehydrated fishery products. Bangladesh stepped into a new era of sophisticated industrial processing of fish. Dried processed fishery products have occupied a key position in the exportable fishery items in Bangladesh. However, the process of drying fish is mainly performed by the households of the artisanal fishermen who are mostly illiterate. There are frequent complaints from the consumers

about the quality of the products. Lack of proper amenities like proper handling during loading and unloading, time and exposure of the fish to the high environmental temperature and, besides, insufficient knowledge about scientific and hygienic methods of handling from time of catch until it is processed into finished products contribute significantly to the loss of quality. The major problems associated during the storage of dried and salted-dehydrated processed fishery products are infested by the fly and insect larvae during drying and storage which deteriorate the products before consumption (Ahmed *et al.* 1979).

Very little is known on the quality aspects of exportable dried fishery products of Bangladesh. In order to get sufficient information for expansion of export market, a study was undertaken to the quality aspects of eight exportable dried fishery products of Bangladesh. The products were selected on the basis of their economic significance and export potential.

Materials and methods

Eight different dried exportable fishery products were investigated, the products were processed from the marine fishes caught by the artisanal fishermen. The species were: chinese pomfret (*Stromateus chinensis*), silver jew fish (*Johnius argentatus*), bombay duck (*Harpodon nehereus*), white grunter (*Pomadasys hasta*), dog fish shark (*Scoliodon sorrakowah*), red snapper (*Lutianus johnii*), ribbon fish (*Trichiurus haumela*) and Indian salmon (*Polynemus indicus*). The products were obtained from processing industry of Cox's Bazar and brought to the Fisheries Technology Laboratory of Bangladesh Agricultural University, Mymensingh in air-tight polythene bag.

The characteristics such as colour, odour, texture, broken pieces and insect infestation of the products were evaluated organoleptically.

To study the water reconstitution behaviour, 5 g of fish flesh was kept soaked in 1 litre of water at 30°C for 150 minutes and in hot water at 80°C for 60 minutes with occasional stirring. Water was drained off through a fine mesh nylon sieve. All the flesh were transferred to the strainer and extraneous water was wiped off by a piece of blotting paper and the flesh was weighed again. By the given soaking time, flesh could reabsorb maximum amount of water. Results were expressed in terms of weight of water absorbed by 5 g of the sample.

Qualitative determination of bacterial flora of dried fishery products was done by dilution technique using nutrient agar (Seely and Vandemark 1972). Test of health hazard microorganism, such as coliform count was conducted by using Levine-EMB agar (DIFCO 1960).

Proximate composition of the samples were determined according to AOAC (1980). The total lipid was, however, determined by the modified method of Bligh and Dyer (Smith *et al.* 1964). Non-protein nitrogen (NPN) was

determined according to the method of Konosu *et al.* (1974). The pepsin digestibility test was done according to AOAC (1980).

Results

Organoleptic evaluation and bacteriological examination of the exportable dried fishery products are presented in Table 1. The dried fishery products had characteristic natural colour (reddish white, yellowish white, slightly transparent and blackish white). Air bladder was of attractive cream colour.

Table 1. Organoleptic observation of exportable dried fishery products

Name of the products	Colour	Odour	Texture	Insect infestation	Broken piece	Overall quality
Chinese pomfret	Characteristic natural colour (reddish white)	Characteristic natural odour	Tough & flexible	No visible sign	Nil	Very good
Bombay duck	Characteristic natural colour (Yellowish white)	Characteristic dried fishy smell	Firm & flexible	No visible sign	Nil	Very good
Indian salmon	Characteristic natural colour (whitish)	Characteristics favour	Tough & flexible	No visible sign	Nil	Excellent
Shark's fin	Blackish white	Characteristic natural flavour	Very tough	No visible sign	Nil	Excellent
Red snapper	Reddish white	Characteristic natural flavour	Firm	No visible	Nil	Good
Air bladder of white grunter	Cream colour & translucent	Characteristic odour	Very tough	No visible sign	Nil	Very good
Ribbon fish	Silvery white	Characteristic smell	Firm	No visiblesign	Nil	Excellent
Silver jewfish	Reddish	Characteristic flavour	Firm	No visible sign	Nil	Very good

The reconstitution behaviour of the dried fishery products soaked in water at 30°C for 120 minutes and in hot water (80°C) for 60 minutes are presented in the Table 2. The reconstitution rate was found higher in ribbon fish (81.8 % at 30°C and 74.9% at 80°C) and lower in shark's fin (19.8% at 30°C and 33.2% at 80°C).

Table 2. Reconstitution rate (%) of the dried fishery products soaked at 30°C for 150 minutes and at 80°C for 60 minutes

Name of the products	Reconstitution rate(%) at 30°C for 150 mins.	Reconstitution rate(%) at 80°C for 60 mins.
Chinese pomfret	55.5	69.8
Bombay duck	80.1	68.1
Indian salmon	64.1	70.4
Shark's fin	19.8	33.2
Red snapper	55.5	84.9
Air bladder of white grunter	45.1	72.6
Ribbon fish	81.8	74.9
Silver jewfish	32.8	43.3

The results of the total plate count and coliform count are shown in Table 3. Total viable bacterial count in the chinese pomfret, bombay duck, Indian salmon, shark's fin, red snapper and the air bladder of white grunter, ribbon fish and silver jewfish were found as 1.8×10^4, 1.3×10^4, 1.5×10^4, 1.1×10^4, 1.1×10^4, 1.0×10^4, 0.95×10^4 and 0.95×10^4, respectively. Coliform bacteria was not detected in any type of dried products.

Table 3. Standard plate count and coliform test of exportable dried fishery products

Name of the products	Standard plate count (CFU/g)	Coliform microorganism (CFU/g)
Chinese pomfret	1.8×10^4	Nil
Bombay duck	1.3×10^4	Nil
Indian salmon	1.5×10^4	Nil
Shark's fin	1.1×10^4	Nil
Red snapper	1.1×10^4	Nil
Air bladder of white grunter	1.0×10^4	Nil
Ribbon fish	0.95×10^4	Nil
Silver jewfish	0.95×10^4	Nil

The proximate composition of the dried products are shown in Table 4. The moisture, crude protein, lipid and ash content in different types of products

ranged between 16.20 to 23.51%, 58.37 to 82.86%, 0.17 to 14.44% and 0.58 to 9.23%, respectively.

Table 4. Proximate composition of exportable dried fishery products

Name of the products	Moisture %	Crude protein %	Net protein %	Lipid %	Ash %
Chinese pomfret	19.78	59.36	58.64	14.44	(5.87
		(74.00)	(73.10)	(18.00)	(7.32)
Bombay duck	20.95	66.86	64.65	5.61	(5.47
		(84.58)	(81.78)	(7.10)	(7.26)
Indian salmon	18.79	68.71	68.06	6.98	6.01
		(84.61)	(83.81)	(8.60)	(7.40)
Shark's fin	22.07	72.64	61.30	.0.74	3.98
		(93.21)	(78.66)	(0.94)	(5.11)
Red snapper	23.51	58.37	57.22	11.71	7.22
		(76.31)	(74.80)	(15.31)	(9.44)
Air bladder of white grunter	20.59	82.86	71.09	0.17	0.58
		(104.34)	(89.51)	(0.21)	(0.74)
Ribbon fish	16.20	70.90	69.77	4.67	9.23
		(84.61)	(83.26)	(5.57)	(11.01)
Silver jewfish	20.69	60.56	59.37	13.91	5.91
		(76.36)	(74.86)	(17.54)	(7.45)

** Values in parentheses are on moisture-free basis*

The NPN and pepsin digestibility values have been shown in Table 5. The values of these products were found to vary from 0.104 to 1.883% for NPN and 88.41 to 94.23% for pepsin digestibility.

Table 5. Non protein nitrogen content (NPN) and pepsin digestibility of exportable dried fishery products

Name of the products	NPN content %	Pepsin digestibility %
Chinese pomfret	0.1159	90.13
	(0.1445)	
Bombay duck	0.3541	89.75
	(0.4479)	
Indian salmon	0.1041	94.23
	(0.1282)	
Shark's fin	1.8147	89.75
	(2.3286)	
Red snapper	0.1845	92.71
	(0.2412)	
Air bladder of	1.8837	94.07
white grunter	(2.3721)	
Ribbon fish	0.1815	88.41
	(0.2166)	
Silver jewfish	0.1904	89.11
	(0.2401)	

** Values in parentheses are on moisture-free basis*

Discussion

During organoleptic evaluation, the exportable dried fishery products had characteristic natural colour (reddish white, yellowish white, silvery white, slightly transparent and blackish white). Air bladder was of attractive cream colour. Almost all of the products had no rancid smell and insect infestation. No broken pieces or powdery particles were observed during the study. Based on the observation on organoleptic qualities of dried products, three were found to be excellent, four were very good and one was simply good (Table 1).

The best way of reconstitution is to conserve a porous structure by a suitable method which absorbs and retains sufficient water by capillary. Compressed products absorbed slowly and less completely (Jason 1965). In the present study, the samples of ribbon fish and bombay duck exhibited a rapid initial rate of rehydration which was obviously due to the rapid absorption of water by sufficient porous structure (Jason 1965). According to Schewan *et al.* (1956) the most important requirements of a satisfactory dried fish products are (i) resemblance to fresh fish in flvour and texture, and free from ripened flavours

caused by prolonged bacterial, enzymatic, oxidative and chemical changes, (ii) compactness, (iii) ready and rapid reconstitution, and (iv) retention of good palatability. On the basis of reconstitution ability of these products, ribbon fish, bombay duck and chinese pomfret were better in quality than the rest of the products.

The results of bacteriological study showed that the total bacterial load of these products were comparatively low. The ranges were within the acceptable limit. Generally marine fish contains a high level of NPN and samples with high NPN content contain high bacterial load. But there is a positive relationship between moisture content and bacterial growth in fish. Sen *et al.* (1961) reported that when water content of the fish fell below 25% of the wet weight, bacterial action stopped and when the water content was further reduced to 15%, mold ceased to grow. The present study indicated that moisture content of about 20% in dried fishery products was quite unsuitable for the bacteria and both the moisture content and bacterial load were in acceptable condition. No coliform bacteria was found in the products. Therefore, the products were safe from microbial point of view.

The moisture content of the dried products were comparatively low which ranged, between 16.20 and 23.51%. For better evaluation of the nutritive value of the products, the crude protein contents were corrected for NPN to obtain net protein. As a result, range of net protein content stood at the ranges of 57.22 to 71.09%. It was observed that air bladder of white grunter (82.86%) and shark's fins (72.64%) had the higher amount of crude protein contents; the corrected net protein content stood at 71.09% and 61.30%, respectively. Elasmobranchs are characteristically known to contain higher amount of NPN in the form of urea and other nitrogenous bases and they may contain NPN up to 40% of the total nitrogen (Schewan 1950). But no such information was available for air bladder. This is largely due to the fact that urea retention, unlike in other animals, is a normal physiological process in elasmobranch. There were variations in lipid contents in the teleost fishes which, ranged from 0.17 to 14.44%. On the other hand, shark's fins contained only 0.74% lipid. In the air bladder lipid content was very low because of the presence of high amount of crude protein content. Shark's fin is known to contain very little amount of oil because most of the lipid is generally deposited in the liver (50-70%) (Rahman *et al.* 1978).

The crude protein, lipid and ash contents of dried fishery products on moisture-free basis ranged from 74.00 to 104.34%, 0.21 to 18.00% and 0.74 to 11.01%, respectively. Since the crude protein content was determined on the basis of total nitrogen content, an absurd value of 104.34% was obtained on dry matter basis for the air bladder of white grunter. Its corrected net protein content (excluding NPN) was only 82.86%. It was found that dried products of relatively high protein content had low lipid content and vice-versa. This is in agreement with the findings of Ahmed *et al.* (1979).

In this study it was observed that only the air bladder of white grunter and shark's fin contained higher amount of NPN than that of the other dried fishery products. The elasmobranchs are, however, known to contain a higher NPN than usual tissue mainly in the form of urea and trimethyl amine oxide (TMAO). The NPN content of the marine sharks and rays range from 36 to 50% of the total nitrogen (Kizevetter and Nasedkina 1975). The NPN contents of sharks fin obtained in this study falls within this range. NPN values vary considerably from species to species and even among the individuals of the same species due to various causes such as sex, age, season, feeding habit, spawning cycle etc. (Schewan 1950).

It was also observed that Indian Salmon and air bladder of white grunter showed higher pepsin digestibility. NPN was not considered during the determination of the digestibility. Therefore, the high pepsin digestibility value of the air bladder of white grunter (94.07%) and sharks fin (89.75%) does not represent the actual digestibility value of that products because those products contained considerable amount of NPN, mainly urea. Rahman *et al.* (1978) studied the digestibility of some marine fish meal and found a digestibility value of 82 to 92% with an average of 86%. Compared to the reported values, the pepsin digestibility of the products in the present study may be considered satisfactory.

The result of the present study indicates that the dried products that are exported from Bangladesh are of good quality and free from health hazard microorganisms.

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