

Studies on the Storage Behaviour of Frozen Fish Fingers from Croaker and Perches

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The frozen storage behaviour of breaded and battered "fish fingers" prepared from Croaker (*Sciaenid* spp.) and perches (*Nemipterus japonicus*) was studied for 22 weeks at -20°C. The products were acceptable even at the end of the storage period. Fish fingers prepared from pink perch was better than those from croaker meat organoleptically. The TVBN, TBA and PV values increased during the storage period, but the values were within the acceptable limits.

There is vast scope for increasing fish consumption in the country by the development of 'convenience foods' or 'ready to cook' and 'ready to eat' products. Fish and fish products in frozen form can be marketed to urban centres, where these convenience foods would be welcomed. The need for diverting the low value fish for human consumption and the necessity for diversification of fish and fishery products needs no emphasis. In this paper storage behaviour and the acceptability of frozen fish fingers prepared from Croaker (*Sciaenid* spp.) and perches (*Nemipterus japonicus*) and stored at -20°C have been presented.

Materials and Methods

The battered and breaded fish fingers from croaker and pink perch meat were prepared by the method of Reddy *et al.* (1990) and stored at -20°C.

Total volatile base nitrogen (TVBN) was estimated by the Conway micro diffusion method (Beatty & Gibbons, 1937). Peroxide Value (PV) of the extracted oil was determined according to the method given by Hills & Thiel (1946). 2-Thiobarbituric acid value was determined by the method of Koning & Silk (1963). Free fatty acids (FFA) were determined by titration with standard alkali (Olley & Lovern, 1960).

The samples were analysed for aerobic plate count, mesophilic spore forming

aerobes and for the presence of enteropathogenic *E. coli*, *Salmonella*, *Vibrio* and *Staphylococcus aureus* according to the standard methods recommended by APHA (Speck, 1976).

The organoleptic qualities were assessed by a taste panel of 8 members using a nine point hedonic scale. The fish fingers were presented to the taste panel after frying in refined ground nut oil (180-200°C) for 2 min to golden brown colour.

Consumer evaluation of the product was done, covering about 150 consumers, for assessing its acceptability.

Results and Discussion

The proximate composition of the meat, paste, raw and fried fish fingers prepared from croaker and pink perch is given in Table 1.

There was a gradual increase in TVBN in both the samples (Fig.1) during storage. However the values were within the limits.

The PV increased rapidly in the first 2 weeks in both the samples and then decreased (Fig.2). The maximum PV noticed for the products from perch and croaker were 11.35 and 10.23 m. moles O₂/kg fat respectively. Generally production of peroxides reaches a peak and then tapers off as the lipid oxidation proceeds

Table 1. Proximate composition of fish fingers from croaker and pink perch at different stages of processing

Sample	Moisture (%)	Protein (%)	Fat (%)	Ash (%)
<i>Croaker</i>				
Meat	78.9	17.3	2.1	1.4
Paste	71.6	13.1	5.8	3.4
Fingers (before storage)	70.8	13.0	5.6	3.3
Fingers (at the end of storage period)	70.1	12.9	6.0	3.4
Fingers (after frying)	52.4	20.3	18.4	3.9
<i>Pink perch</i>				
Meat	77.6	18.1	1.9	1.6
Paste	72.5	12.2	5.9	3.5
Fingers (before storage)	72.0	11.9	5.5	3.4
Fingers (at the end of storage period)	71.6	12.1	5.6	3.4
Fingers (after frying)	51.4	22.4	16.7	3.9

(Labuza, 1971). A gradual increase in TBA upto 14 weeks and a decrease thereafter were noted in both the products (Fig.3). The rate of increase in TBA values in fingers prepared from pink perch was much higher than that from croaker throughout the

storage period. The pattern of changes of TBA numbers similar to the present study has been noticed by Babbitt *et al.* (1976) in the minced flesh of Rock fish (*Sebastes melanops*). The decrease in TBA number during storage may be due to the retarda-

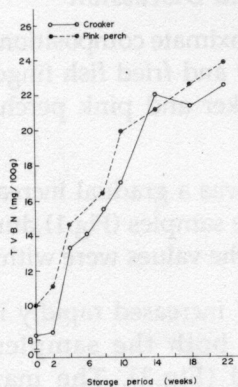


Fig. 1. Changes in total volatile base nitrogen (mg / 100g) of fish fingers from croaker and perch during storage at -20°C

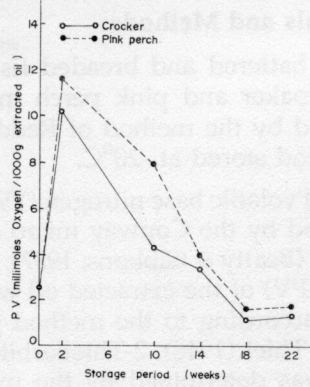


Fig.2. Changes in peroxide value (millimoles oxygen per 100 g extracted oil) of fish fingers from croaker and perch during storage at -20°C

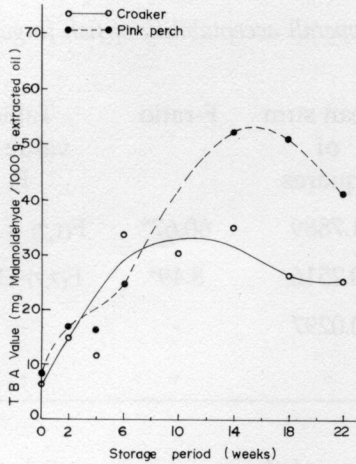


Fig. 3. Changes in 2-thiobarbituric acid value of fish fingers from croaker and perch during storage at -20°C

tion of lipid oxidation by the lipid hydrolysis products (Castell *et al.*, 1966) and the interaction of malonaldehyde/aldehydes with proteins.

The free fatty acids in the fish fingers prepared from croaker and pink perch increased upto 6th week and 10th week respectively, then decreased slightly upto 14th week and remained almost constant thereafter (Fig.4).

There was a decrease in bacterial counts in both the fish fingers throughout the

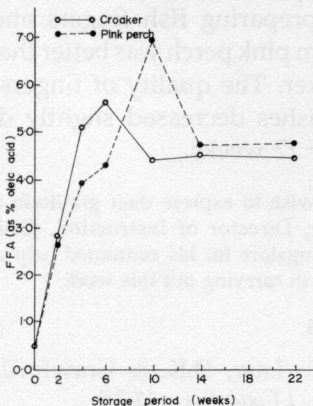


Fig. 4. Changes in free fatty acids of fish fingers from croaker and perch during storage at -20°C

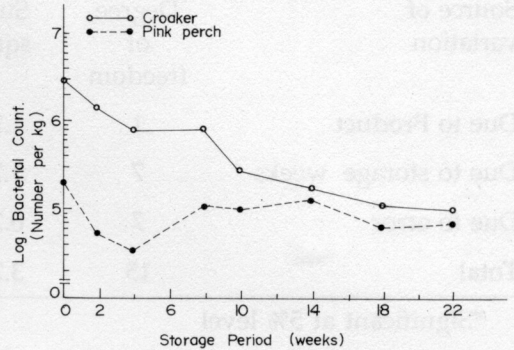


Fig. 5. Changes in log. bacterial count of fish fingers from croaker and perch during storage at -20°C

storage (Fig.5). Food poisoning organisms were not found in any of the samples. Several workers have reported decrease in bacterial counts during frozen storage (Racah and Baker, 1978; Sarvadeva, 1979). Liston (1980) opines that the effect of freezing on bacterial population of fish is erratic and difficult to predict, and generally reduction in counts is noticed, and the number will continue, in most cases, to fall during frozen storage.

The taste panel scores decreased only slightly in both the samples during the

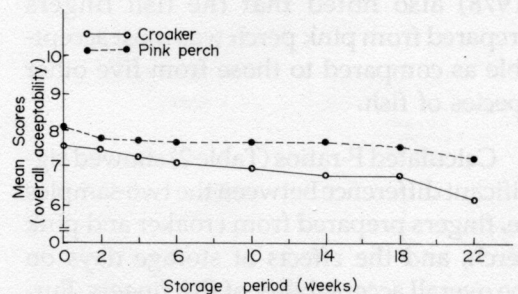


Fig. 6. Changes in organoleptic scores of fish fingers from croaker and perch during storage at -20°C

Table 2. *Analysis of variance of average panel scores for overall acceptability of fish fingers during storage at -20°C*

Source of variation	Degree of freedom	Sum of squares	Mean sum of squares	F-ratio	Table value of F
Due to Product	1	1.7989	1.7889	60.67*	F _(1,7) = 5.59
Due to storage weeks	7	1.7612	0.2516	8.49*	F _(7,7) = 3.79
Due to error	7	0.2076	0.0297	-	-
Total	15	3.7677	-	-	-

*Significant at 5% level

period of storage (Fig.6). The panelists preferred the fish fingers prepared from pink perch than those from croaker (Table 2) though both were quite acceptable to

response of the consumers to fish fingers prepared from croaker indicated that majority of the people liked the product (Table 3). The present study indicated that

Table 3. *Summary of consumer response (Figures indicate percentage of consumers)*

	Appearance	Taste	Texture	Flavour	Overall acceptability
Like definitely	70.92	64.55	62.04	69.73	68.23
Like mildly	22.73	30.91	31.48	21.10	25.23
Neither like nor dislike	4.55	2.72	4.63	5.50	6.54
Dislike mildly	0.90	1.82	1.85	3.67	0.00
Dislike definitely	0.90	0.00	0.00	0.00	0.00

them. This is most probably due to the better appearance and texture of fish fingers prepared from pink perch. Bremner & Snell (1978) also noted that the fish fingers prepared from pink perch was most acceptable as compared to those from five other species of fish.

Calculated F-ratios (Table 2) showed significant difference between the two samples i.e. fingers prepared from croaker and pink perch, and the effects of storage days on the overall acceptability of fish fingers. Further, the mean sum of squares due to storage weeks implied that the variety of fish fingers had more effect than storage time on the overall acceptability of the products. The

both pink perch and croaker meat were good for preparing fish fingers and fish fingers from pink perch was better than that from croaker. The quality of fingers from both the fishes decreased slightly during storage for 22 weeks.

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