Preparation and Storage of Cutlet from Low-priced Fish

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Cutlets have been prepared from the minces of lizard fish *(Saurida tumbil)*, threadfin bream *(Nemipterus japonicus)*, jew fish *(Johnius dussumieri)* and miscellaneous fish. The storage characteristics of cutlet (both raw and flash fried) at 4°C, -8°C and -20°C were studied. Cutlets prepared from the minced lizard fish showed the highest acceptability. Flash fried cutlets were found to be superior in quality compared to raw cutlets. The raw cutlet had storage life of 6 days, 11 weeks and 19 weeks at 4°C,–8°C and –20°C respectively and flash fried cutlets had a shelf life of 22 weeks at–20°C.

As regards fish products, a number of recipe and formulations are available which can be modified to turn out popular products from minced fish. One such product, namely, fish-cutlet was developed from minced fish and its acceptability and storage characteristics with respect to chemical, microbiological and organoleptic qualities are reported.

Materials and Methods

Freshly landed threadfin bream (*Nemipterus japonicus*), lizard fish (*Saurida tumbil*), jew fish (*Johnius dussumieri*) and miscellaneous (comprising of mainly soles, caranx, jew fish, threadfin bream, glassy perch) fish from shrimp trawlers were collected from the fisheries harbour, Cochin. They were washed thoroughly to remove dirt and slime. Part of the miscellaneous fish and other fishes were gutted, headed and washed thoroughly. Minces were prepared from all these separately by passing the fish through a Baader deboner equipped with a drum having 5 mm perforations. Mince was also prepared from ungutted miscellaneous fish.

The minced raw fish was cooked under 0.35 kg/cm^2 steam pressure for 30 min and the cook-drip was drained out. The boiled and peeled potatoes were made into a paste and mixed with cooked mince along with salt and turmeric powder. Onion, ginger and chilly were chopped into small size and fried in double refined groundnut oil until brown in colour. To this was added the mixture containing cooked fish and potato and heated for 3 min with proper mixing. The powdered spices were added to this and mixed thoroughly. Approximately 40 g of the material was shaped into balls and flattened to 2cm thickness. This was dipped in beaten egg-white and rolled in bread crumbs. Half of the cutlets were flash fried in refined groundnut oil at 160-170°C for 5 seconds. Both raw cutlet and flash fried (FF) cutlet were kept at 4°C, –8°C and –20°C in duplex cartons lined inside with polyethylene sheet for storage studies.

The stored cutlets were thawed and fried (5 to 6 min) in refined groundnut oil at 160-180°C till the surface attained uniform brown colour for organoleptic studies. Both samples kept at respective temperature were analysed for paired comparison by a trained taste panel consisting of 10 members and the overall acceptability was rated in a scale ranging from 9 to 1, 9–extremely linking, 4- acceptability limit and 1-extreme dislike. The results were statistically analysed.

The weight loss on cooking was determined by weighing the sample before and after cooking. The moisture, protein, salt and fat of the cutlet were determined by the method of AOAC (1975), peroxide value (PV) and free fatty acids (FFA) by the methods of Lea (1952) and AOCS (1946) respectively.

The samples were analysed for total bacterial number, *Escherichia coli*, total coliforms, faecal streptococci and coagulase-positive staphylococci. The total aerobic plate count (TPC) was determined by pour plate method using tryptone glucose agar media. Plates were incubated at 29 ± 1°C for 48 h and counts taken. Total coliforms were

estimated using desoxycholate agar, *Escherichia coli* using tergitol-7 agar (T_7), faecal streptococci using KF media, and coagulase positive staphylococci using Baird Parker agar employing the ISI method (IS: 2237-1971).

Results and Discussion

The ingredients used for the preparation of cutlet are shown in Table 1. About 65% of the ingredients used was minced fish and this was cooked to remove excess water and to get a firm and fibrous texture. The weight loss on cooking was substantial and the mince from whole miscellaneous fish showed the highest value (Table 2). The inherent characteristics of the minced flesh are important in determining the quality of cutlet. A good cutlet is firm, crisp and savory. The acceptability of cutlet prepared from different species and mixed species is given in Table 3. Cutlet prepared from the minced lizard fish showed the highest acceptability. The mince from miscellaneous catch was not suitable for cutlet preparation because the product showed bitter taste, soft and pasty texture. The bitter taste might be due to the mixing of the gall bladder contents with the mince. Significant texture degradation might be due to the gut proteases and the catheptic enzymes of the muscle tissue which are dispersed when mincing the whole fish causing hydrolytic changes in the muscle resulting in soft texture for the finished product. The cutlets from gutted, mixed catch had a lower acceptability than those from individual species, due to poor texture and less intense characteristic flavour. Since the majority of fish in the mixed catch was small in size, it was difficult to remove the gut contents completely. Grantham (1982) reported that even low levels of contamination by visceral materials from gutted fish can cause extensive proteolysis of the mince. Good quality cutlet with high sensory ratings was obtained from the mince of gutted individual species.

The chemical composition of FF and raw cutlets prepared from lizard fish is given in Table 4. The changes in PV, FFA,

Table 1. *Ingredients for the preparation of fish-cutlet*

Minced meat (raw)	1000 g
Cooked and peeled potato	300 g
Peeled onion	150 ,,
Salt	30 ,,
Ginger	15 ,,
Green chilly	10 ,,
Pepper	2 ,,
Cloves	2 ,,
Turmeric powder	1 ,,
Oil (double refined)	100 ml

Table 2. *Weight loss during cooking in steam at a pressure of* 0.35 *kg/cm²* *for* 30 *min.*

Fish mince	Percentage weight loss
Whole miscellaneous fish	39
Gutted miscellaneous fish	34
Threadfin bream	35
Lizard fish	33
Jew fish	36

Table 3. *Acceptability of cutlet prepared from minces of different species of fish*

Fish mince	Score	Remarks
Whole miscellaneous	3.00±0.42	Bitter taste and soft texture
Gutted miscellaneous fish	5.00±0.85	Fair taste and slightly soft texture
Jew fish	7.30±0.92	Very good taste, firm and fibrous texture
Threadfin bream	7.50∓0.95	,,
Lizard fish	8.0±0.55	,,

Table 4. *Composition of cutlet from lizard fish*

	Flash fried cutlet	Raw cutlet
Moisture, %	62.65	66.39
Crude protein, %	15.41	16.51
Fat, %	5.92	3.74
Salt, %	1.88	1.99

moisture and bacteriological quality of the cutlets during storage at 4°C are shown in Table 5. The peroxide values showed a decrease while the changes in FFA values are insignificant during storage. Since the oxidation is a surface effect (Grantham, 1982) the coating with egg-white may function as an oxygen barrier, thus preventing the fat from oxidation. Cutlets are highly spiced and the anti-oxidant properties of spices (Zain, 1979) might have further reduced the possibility of peroxide formation. The peroxides being unstable undergo decomposition and many of the decomposition products formed interact with proteins. This might have resulted in a reduction of PV. Cooking of the mince deactivates lipolytic enzymes (Lall *et al.*, 1975) protecting the cutlet against FFA formation. The characteristic taste of cutlet was significantly reduced by 7-8 days storage at 4°C and afterwards developed an off-taste which may be due to the bacterial growth (Table 5).

As seen from Fig. 1, FF and raw cutlet had a practical storage life of 6 days and the FF cutlets were superior in organoleptic quality compared to raw cutlet during the early stages of storage. At the end of the storage both had almost the same rating. The better acceptability of FF samples may be due to the production of some flavour producing components on flash frying.

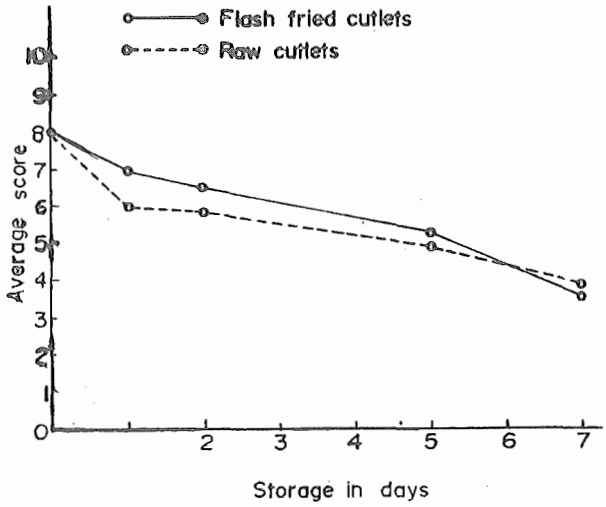

Fig. 1. Changes in organoleptic scores of cutlets stored at 4°C

The changes in PV and F F A of F. F. and raw cutlet stored at- 8°C are shown in Table 6 and the sensory changes in Fig. 2.

Table 5. *Changes in moisture, PV, FFA and TPC of cutlets stored at* 4°C

Days	Moisture		PV		FFA		TPC/g*	
	FF	Raw	milli eq./kg		% oleic acid		FF	Raw
			FF	Raw	FF	Raw		
0	62.65	66.39	8.16	9.5	0.98	2.03	6.4×10^3	2.1×10^4
2	63.48	66.42	9.58	7.84	0.63	1.x7	2.8×10^3	8.4×10^3
5	62.74	65.33	4.76	8.33	1.538	2.76	—	—
7	63.98	65.74	5.81	6.23	1.49	2.82	6.1×10^5	4.7×10^5
12	—	—	—		—	—	6.7×10^9	4.4×10^9

*The samples were free from *Escherichia coli*, total coliforms, faecal streptococci and coagulase positive staphylococcus

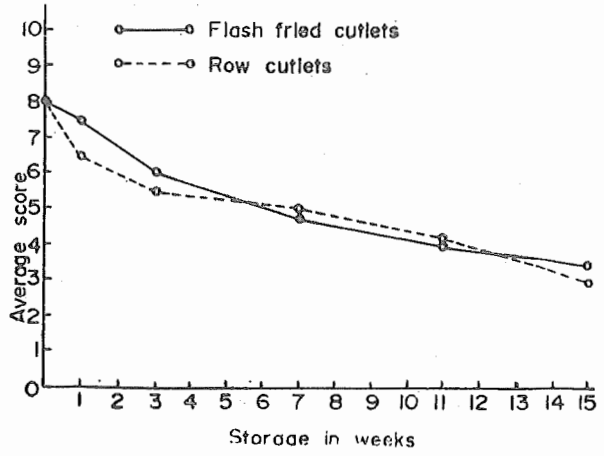

Fig. 2. Changes in organoleptic scores of cutlets stored at –8° C

Table 6. *Changes in PV and FFA during storage at -8°C*

Days	PV milli eq./kg		FFA % oleic acid	
	FF	Raw	FF	Raw
0	8.16	9.50	0.98	2.03
3	6.82	7.78	0.81	1.23
6	2.80	6.85	0.564	1.08
12	1.59	3.98	0.655	1.92

Both the PV and FFA showed the same trend as in the case of samples stored at 4°C. The shelf-life of both FF and raw cutlet did not show much difference on storage at –8°C and both had storage life of 11 weeks. The sensory changes were rapid during the early stages of storage and slowed afterwards. It was mainly due to the changes in flavour.

The changes in PV and FFA and sensory qualities of the samples stored at -20°C are presented in Table 7 and Fig. 3 respectively.

Table 7. *Changes in PV and FFA during storage at -20°C*

Days	PV millieq./kg		FFA % oleic acid	
	FF	Raw	FF	Raw
0	8.16	9.55	0.98	2.03
7	7.8	8.2	1.21	1.56
11	5.0	7.66	0.51	1.094
16	2.56	3.58	0.56	1.05
22	4.50	6.22	1.52	2-32

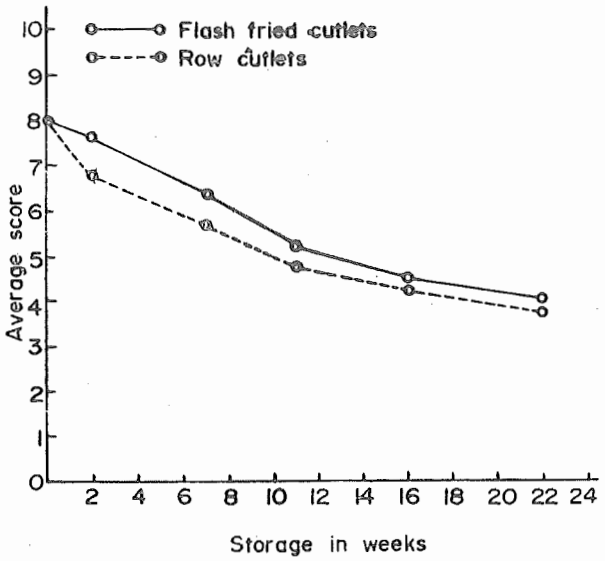

Fig. 3. Changes in organoleptic scores of cutlets stored at -20° C

The PV reduced slowly during storage and the changes in FFA were negligible. The F F and raw cutlet had storage life of 22 and 19 weeks respectively. The flavour change was the limiting factor in determining the storage life.

The production of cutlets from the mince of shrimp by-catch and other less utilized species may be a viable technology for their economic utilization. The product has a satisfactory storage life at -20°C. For shorter duration of storage higher temperature say –8°C can be used. To store cutlet above the freezing temperatures is not advisable because the storage life is very short. Flash frying the cutlet before storage enhances its flavour and acceptability and destroy the surface contamination if any. Cutlets prepared from individual species have better acceptability than those from mixed species. If mixed species are to be used a careful screening of the species is necessary based on the intrinsic characteristics of the minces from these species.

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