

Development of canned products from Indian major carp, catla (*Catla catla*)

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Abstract

Pieces of catla fish (*Catla catla*, a major carp of Indian subcontinent) of length 10 to 11 cm and thickness 1.0 to 1.5cm were precooked by two methods; steam precooking and frying. The precooked pieces were packed in No.1 tall can (301x411) with various hot filling media like oil, brine, tomato sauce and curry. Cans were seamed by a hand seamer and retorted at 117.2^o C (12 psi) for 90 minutes. All the canned products had satisfactory cut-out, biochemical and organoleptic characteristics. Steam precooked canned products had moisture content of 65.6 to 74%, protein content of 20.8 to 22%, fat content of 1.1 to 6.6% and ash content of 2.1 to 2.5%; whereas fried canned products had moisture content of 65.4 to 68.2%, protein content of 21.3 to 22%, fat content of 7 to 10.2% and ash content of 2.1 to 2.7% on wet wt. basis. Salt content in steam precooked and fried canned products varied from 1.2 to 1.9% and 2.0 to 2.5% respectively. All the canned products were organoleptically good. However, degree of preference varied for different products. Canned fried catla in curry was the best product among all types of packs. Among the precooking methods, frying was more efficient than steam precooking in controlling the amount of exudate to a desirable limit in canned products. However, crispness, the characteristic quality for a fried fish, was lost during retorting. There was no change in quality characteristics during a storage period of 3 months at ambient temperature (32±2^oC).

Key words: Canned products, Biochemical characteristic, *Catla catl*.

Introduction

Fish is an important food in human nutrition since time immemorial. It is relatively cheap compared to other protein foods. Fish can be preserved by canning, freezing, curing, etc. Canned foods including fish after warming are ready to serve for the table and can be stored at ambient temperature safely for 2 years. Canned product developed from catla may find a ready market in the Eastern parts of India and Bangladesh where carps are considered to be a delicacy. Precooking for canning can be carried out

by steam, hot air, hot brine, scalding in hot oil or frying in oil. During precooking, fish flesh releases fat, moisture and water soluble vitamins (Zaitsev *et al.* 1969). These losses are directly proportional to the temperature and duration of cooking and inversely proportional to the fat content of flesh. Chand (1991) reported that during frying, the moisture content of mackerel decreased, but there was an apparent increase in other proximate parameters of fried products. In the absence of necessary technological information for canning of catla fish, the present work reports a study in the same.

Materials and methods

Fresh catla fish weighing 1.4 to 1.6 kg was used as raw material for the study. Fish were dressed by removing scales, fins, head, viscera, etc. and cut into small pieces of length 10 to 11 cm and thickness 1.0 to 1.5 cm. S-R lacquered No.1 tall cans (301×411) were used in the study. Pieces were brined in saturated common salt solution for 10 min and 1 min for steam precooked and fried product respectively. Brined fish was given a quick wash. For steam precooking, brined pieces were packed in cans and cooked at 108.4°C (5 psi) for 40 min. The precooked cans were drained for 10 min. For fried products, spices like chilli powder, 1% and turmeric powder, 0.1% were mixed with the brined pieces and fried at 160°C for 6 min by using sunflower oil. Fried pieces were cooled at ambient temperature and packed in cans. All cans were filled with hot liquid media (oil, brine, tomato sauce and curry at 80°C). Curry is a hot aqueous liquid with more or less thick consistency, made up of turmeric and other spices. Cans were then seamed by a hand-seamer and retorted at 117.2°C (12 psi) for 90 min (Bhat 1983, Chand 1991). After retorting cans were cooled under running water for 20 min and kept at ambient temperature for storage study. By following the above procedure, 8 types of canned products were prepared. The products were analysed for their quality characteristics after 7 days of production (0 month), 1 month and 3 months by 'cut-out test', biochemical tests and organoleptic quality. Biochemical tests were carried by AOAC (1995) method. Twenty members of experienced judges were involved in assessing the organoleptic quality of the products. Nine point hedonic scale developed by Peryam and Pilgrim (1957) was used for scoring purpose.

Results and discussion

The cut-out characteristics of steam precooked and fried canned products are represented in Table 1. The observed net weights of steam precooked products were (426-432g) slightly above the standard net weight of 425 g. In fried products the net weights were 420-430 g. The solid weights as the percentage of net weights were between 65-67% and 65-66%, for steam precooked and fried products respectively. As per Bureau of Indian standards specification (BIS 1963) the minimum drained weight of solids for mackerel is 65%. In fried samples, the exudate quantities were 0.5% which was less than the exudate quantities (1.1%) in steam precooked samples. Less than 5% of exudate has been recommended for tuna in round sanitary containers (BIS 1967). In the present

experiment, vacuum in all the can samples were around 10 cm Hg or slightly above. As per B.I.S. specifications (BIS 1963 and 1966), vacuum of 10 cm of Hg is given as minimum for canned fish products. Head space specified by B.I.S. (BIS 1968) for canned fishes is maximum of 10 mm. The head space of all the products were satisfactory as it varied from 8 to 10 mm. pH values of different products except sauce pack were in the range of 6.1 to 6.8. Low pH (5 and 5.2) of sauce was due to the presence of acetic acid in sauce. On an average, there were more broken pieces in steam precooked products than fried ones. More cooking under steam caused breakage of pieces in steam precooked products, but in fried products, the breakage of pieces was during packing. Adhesion of meat was found in all steam precooked products. But there was absolutely no adhesion in the fried product because of their oily nature. In brine packs, slight turbidity of brine was noticed in steam precooked products, whereas it was absent in fried products.

Table 1. Cut out characteristics of canned products

Cut-out characteristics	Steam precooked				Fried			
	Oil pack	Brine pack	Sauce pack	Curry pack	Oil pack	Brine pack	Sauce pack	Curry pack
Gross wt.(g)	440	438	436	442	436	430	440	438
Vacuum (cm Hg)	11	12	11	10	10	11	10	10
Head space (mm)	9.5	9	9	9	8	10	9	10
Net wt. (g)	430	428	426	432	426	420	430	428
Solid wt. (g)	285	288	280	286	280	274	281	280
Solid wt. (as % of net wt.)	66.28	67.29	65.73	66.20	65.72	65.24	65.35	65.42
Liquid wt. (g)	85	80	86	86	86	86	89	88
Liquid wt. (as % of net wt.)	19.78	18.7	20.2	20	20.19	20.48	20.70	20.56
Solid & can wt. (g)	345	348	340	346	340	334	341	340
Empty can wt. (g)	60	60	60	60	60	60	60	60
Liquid volume (ml)	93	77	79	84	94	83	82	85
Exudate vol. (ml)	1				0.5			
Exudate vol. (as % of liquid volume)	1.1				0.5			
Pack wt. (g)	432	430	428	434	428	422	432	430
Number of pieces	9	9	8	9	10	11	10	10
Broken pieces	Nil	1	Nil	1	Nil	1	Nil	Nil
pH of meat	6.8	6.8	5.2	6.1	6.8	6.8	5.0	6.1
Turbidity	-	+	-	-	-	-	-	-
Adhesion	+	+	+	+	-	-	-	-

Note: + sign indicates degree of adhesion/turbidity, where as - sign indicates its absence.

Results of analysis of biochemical characteristics of steam precooked and fried products are presented in Table 2. The moisture content was found higher in steam

precooked products than that of fried products. This is due to difference in the severity of heat treatment given during precooking. Within the packs, the moisture contents were highest in brine packs and lowest in oil packs. This might be due to the absorption of moisture from the filling brine. In all products, there was not much difference in protein contents among the packs. However, as compared to steam precooked products, the protein content in fried products was more. This might be due to less moisture content in these products leading to an apparent increase in protein content (wet wt. basis). Similar trend was also found in case of fat content. Irrespective of precooking treatments; the oil packs showed highest fat contents and the brine packs showed lowest fat contents. High ash and salt contents in brine packs might be due to the absorption of salt from the brine. Fried samples showed higher ash and salt contents compare to that of steam precooked products because by steam precooking some loss of salt content occurred. During storage, there were no remarkable changes in the proximate composition of canned products. Similar observations have also been reported by many workers (Suresh Kumar 1984, Jeyasekaran 1985 and Chand 1991).

Table 2. Biochemical characteristics of canned products

	Product	Period of storage (month)	Characteristic					
			Moisture (%)	Crude protein (%)	Crude fat (%)	Ash (%)	Salt (%)	
S t e a m P r e c o o k e d P r o d u c t	Oil pack	0	67.11	21.89	6.40	2.32	1.39	
		1	66.09	21.92	6.02	2.14	1.21	
		3	65.57	21.97	6.61	2.22	1.32	
	Brine pack	0	73.98	20.77	1.09	2.40	1.89	
		1	73.46	20.82	1.38	2.45	1.92	
		3	71.24	20.89	1.70	2.42	1.91	
	Sauce pack	0	68.48	21.76	1.07	2.35	1.85	
		1	67.41	21.83	1.24	2.32	1.81	
		3	66.98	21.90	1.65	2.38	1.88	
	Curry pack	0	71.19	20.91	2.59	2.10	1.61	
		1	71.68	20.88	2.89	2.12	1.58	
		3	69.17	21.00	4.16	2.36	1.76	
	F r i e d P r o d u c t	Oil pack	0	65.43	21.90	9.98	2.39	2.25
			1	65.42	21.93	10.06	2.43	2.24
			3	65.47	21.99	10.13	2.49	2.23
Brine pack		0	68.22	21.27	7.14	2.45	2.48	
		1	68.18	21.29	7.12	2.57	2.50	
		3	68.12	21.31	6.99	2.70	2.53	
Sauce pack		0	66.96	21.80	8.55	2.41	2.23	
		1	66.87	21.84	8.69	2.45	2.29	
		3	66.99	21.79	8.78	2.51	2.33	
Curry pack		0	67.11	21.71	8.58	2.11	2.06	
		1	67.19	21.68	8.67	2.14	2.09	
		3	68.07	21.39	8.77	2.39	2.13	

Note: All the values are on wet wt. basis.

The organoleptic results both mean panel scores are presented in Tables 3 and 4. At 0 month of storage all the products were organoleptically good as the mean panel scores ranged from 7 to 9 (irrespective of product type and attribute). This indicates that all products were liked by the panelists though the degree varied to a minor extent for different products. The glossy bright colour of the steam precooked products in case of oil pack may be the reason for the highest score in the attribute, appearance. Irrespective of precooking treatment and storage period, the average texture score was highest for curry packs. Products of sauce pack had low score for texture. This might be due to the action of acid present in tomato sauce which has a firming effect on fish meat. The average flavour score was high for fried products. This might be due to the distinct fried flavour in these products. Pack-wise, the flavour score was highest in curry pack. After 3 months of storage, mean panel scores slightly decreased in many packs and sauce pack developed slight bitter taste. This might be due to the bottled sauce used in the study which contained SO₂ as preservative. So, use of bottled sauce should be avoided and tomato sauce should be prepared by the canners. After 3 months storage, the average score for 'over all liking' was highest for the products of curry pack. So, it can be concluded that among different type of filling media, curry was liked most. Moreover, between steam precooked and fried canned products, the fried catla pieces in curry pack had more scores than others. This might be due to the reason that fried fish in curry is the traditional food item of the Bengali households. Crispness, the characteristic quality for fried fish, was lost during the retorting of canned fried pieces.

Table 3. Mean panel scores awarded to steam precooked canned products

Sl No.	Product	Period of storage (month)	Attribute			Overall liking
			Appearance	Texture	Flavour	
1.	Oil pack	0	8.7	7.9	7.2	7.9
		1	8.5	7.9	7.0	7.7
		3	8.5	7.8	6.8	7.7
		Average	8.6	7.9	7.0	7.8
2.	Brine pack	0	7.8	7.8	7.0	7.3
		1	7.4	7.7	6.8	7.2
		3	7.5	7.4	6.8	7.0
		Average	7.6	7.6	6.9	7.2
3	Sauce pack	0	8.3	7.7	8.4	8.3
		1	8.2	7.6	8.3	8.0
		3	8.1	7.3	6.6	7.1
		Average	8.2	7.5	7.8	7.8
4.	Curry pack	0	8.4	8.4	8.5	8.4
		1	8.3	8.2	8.3	8.3
		3	8.1	8.0	8.4	8.2
		Average	8.3	8.2	8.4	8.3

Table 4. Mean panel scores awarded to fried canned products

SI No.	Product	Period of storage (month)	Attribute			Overall liking
			Appearance	Texture	Flavour	
1.	Oil pack	0	8.3	8.0	7.4	7.8
		1	8.3	7.9	7.1	7.6
		3	8.0	7.7	7.0	7.5
		Average	8.2	7.9	7.1	7.6
2.	Brine pack	0	8.2	8.0	7.7	7.9
		1	8.2	7.8	7.6	7.7
		3	7.9	7.8	7.5	7.7
		Average	8.1	7.9	7.6	7.8
3	Sauce pack	0	8.4	7.7	8.5	8.4
		1	8.2	7.4	8.4	8.2
		3	8.0	7.1	6.9	7.0
		Average	8.2	7.4	7.9	7.9
4.	Curry pack	0	8.6	8.5	8.9	8.8
		1	8.5	8.4	8.7	8.6
		3	8.5	8.3	8.6	8.6
		Average	8.5	8.4	8.7	8.7

Above study indicates that catla can be very well used as a raw material for the production of quality canned products in various forms following the procedures standardized.

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