

Suitability of reef cod (*Epinephelus diacanthus*) minced meat for the preparation of ready to serve product

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ABSTRACT

Suitability of stuffed and cooked cutlet blend was evaluated for the preparation of battered and breaded products. Minced meat was prepared from the reef cod biochemical and microbiological and sensory analyses are carried out for fried cutlet. Based on the sensory score and biochemical values cutlet blend mixed with meat was found to be suitable. In the present study the reef cod fish (*Epinephelus diacanthus*) was used for the preparation of fish cutlet. The product was prepared and was observed for the proximate composition, biochemical, sensory and microbiological quality of different samples like fresh fish, fish paste, cutlet blend before frying and cutlet after frying. Yield of meat was also calculated.

Key words: Microbiology, Biochemical, Sensory evaluation, Fish cutlet, *Epinephelus diacanthus*.

INTRODUCTION

The current situation in Seafood industry demands a need to introduce new products based on fish mince which are stable, acceptable and nutritious. Addition of fish in the diet not only improves the nutritional quality but also results in increased consumption of meal. Therefore fish products as a condiment in 'ready to cook' or 'ready to eat' form appear to have a good potential. In India, a few speciality products such as soup powders, fish flakes, wafers, sausages, pickles and other ready to eat products have been developed, but commercial production and large scale production has not been materialized except a few [1, 2]. A fish mince is the skeletal muscle portion or flesh which has been separated from head, viscera, fins, skin, scales and major bones [2]. Some of the important fishes used for minced products are Crocker, lizard fish, cat fish, thread fin bream and ribbon fish [3]. Fish mince is used for the preparation of various products such as fish fingers, cutlets, sausages, cakes, analog products and certain canned products.

The present work reveals the development and standardization of ready to fry cutlet blend from minced meat of reef cod. As freshly prepared cutlet blend and the frozen blend were difficult to mould in to the desired shape and the process was time consuming. Hence the blend was stuffed into casing and boiled to get the desired characteristics. The product in the casing could be easily sliced to desired thickness using knife and further breaded prior to frying.

MATERIALS AND METHODS

Freshly landed reef cod (*Epinephelus diacanthus*) was obtained from fish landing center and immediately the fish was washed thoroughly with potable water to remove dirt and slime. The dressed and washed fish were fed in to meat picking machine to separate the meat later was mixed. The Meat was then transferred to a silent cutter, where salt was added and ground properly for the extraction of myofibrillar proteins. Then additives such as sugar, starch and spices were mixed to prepare the fish paste (Table 1). For the preparation of cutlet blend all other ingredients required such as rice powder, cooked and peeled and mashed potato, onion, ginger, green chillies, coriander leaves, garlic, curry leaves, turmeric powder, salt and egg were mixed separately in a fry pan and a blend was prepared (Table 1) by heating on a low flame and the blend that is obtained was cooled to room temperature. The cooled blend was then mixed with fish paste in 1:1 proportion and mixed thoroughly in the Silent cutter. The resultant cutlet blend was stuffed into synthetic casing sealed by ringing, processed in hot water at $88^{\circ}\text{C}+2$ for 60 min and finally cooled to room temperature (Figure 1). As and when cutlets are required, casing is removed by peeling off the casing and cutlet blend in the shape of sausage was sliced using a sharp knife. The slices were covered with bread crumbs and then shallow fried using double refined oil in a non stick pan. The procedure used for the preparation of minced meat which in turn used for the preparation of ready to fry cutlet blend as shown in the Flow chart.

The composition of ingredients based on sensory evaluation was standardized by using a panel of six experienced Faculty of College of Fisheries on the basis of ten point scale on each sampling. Sensory characteristics included general appearance (inclusive of color), texture and flavour of the final product. The fish cutlets were presented to taste panel after frying in refined sunflower oil for 3 min to a golden brown color (Table 2).

The yield percentage of dressed fish and picked meat were recorded, the average weight of fish cutlets before breading, after breading and after frying were also recorded. Samples were also taken for the determination of biochemical and microbiological parameters.

Chemical analysis

The proximate composition i.e. moisture, protein, fat and ash was determined by the method recommended by AOAC [4]. The biochemical analysis like Tri-methyl amine nitrogen (TMA-N) and Total volatile base nitrogen (TVB-N) were estimated according to Beatty and Gibbons [5]. The lipids were extracted according to the procedure of Bligh and Dyer [6] and peroxide value (PV) was determined by the method described by Jacobs (1958), Free fatty acids (FFA) were determined by titrating against standard alkali [7]. For microbiological analysis the samples were analyzed for total plate count by standard method recommended by APHA [8]. Sensory evaluation was done by panel of trained judges described by Huss [9].

RESULTS AND DISCUSSION

The ingredients used for the preparation of ready to fry cutlet blend from minced meat are shown in Table (1). In the present study an attempt was made to know the gel forming ability of the fish meat and hold cutlet blend together, the freshly prepared fish paste was mixed with freshly prepared cutlet blend at the ratio of 1:1. The cutlet blend was cooled prior to mixing with the fishpaste. The ability of fish paste to form the gel and to hold the ingredients of cutlet blend was evaluated by analyzing the homogeneity of slices, made after processing at $88^{\circ}\text{C}+2$ for 60 min in the hot water.

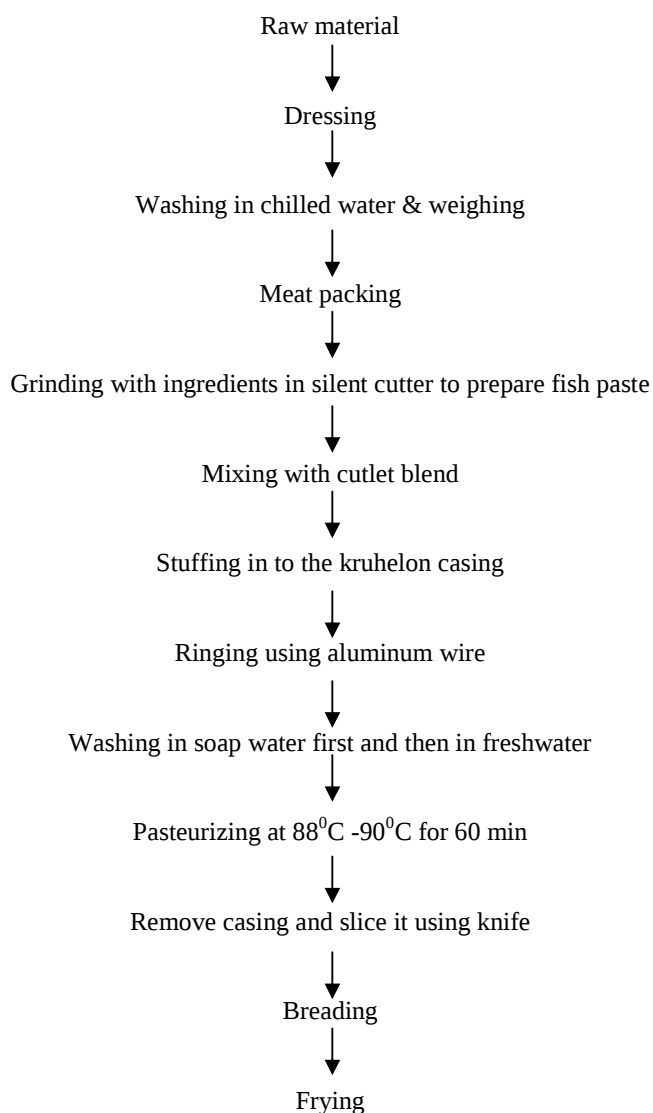
The yield of picked meat was 24.52% from fresh fish and the size of cutlet was 1cm thickness and 3.1cm dia. The average weight of each cutlet was about 8.6 g and pickup of bread crumbs was found to be 1.10g each. Weight of cutlet after shallow frying was 8.87g. It was found that there was decrease in weight of about 0.95g in each cutlet during frying. The decrease in weight was due to evaporation of moisture present in it. It was also observed that shallow frying of cutlet, for 3min was found to generate desirable sensory characteristics. The results are presented in Table (2).

The proximate compositions of fresh fish meat, paste, cutlet blend before frying, and cutlet after frying are presented in Table (3). By referring results the fish may be classified as lean variety since the fat content is less than 5% [10]. The lower moisture content in cutlet blend was due to addition of rice powder to the blend and starch to the fish paste. The higher values obtained for lipid and ash contents in the paste, and cutlet blend before frying and cutlet

after frying was due to the added fat and salt respectively. Reddy *et al.* [11] have reported the proximate composition of fish fingers at different stages of processing.

The biochemical characteristics like TMAO, TVBN, PV and FFA were analyzed to assess the quality of the fish meat, paste, and cutlet blend before frying and cutlet after frying and the results are presented in Table (4). The TMAO, TVBN values obtained for fresh fish meat indicate that the raw material was fresh. Jyothi [12] has reported a value of 0.73mg and 5.5mg/100g in minced meat of reef cod. During different processes in preparation of cutlet the TMAO, TVBN values increased slightly which may be due to enzymatic activity during preparation. Similar results have also been reported by Reddy *et al.* [11] and Sajuthomas [13].

FLOWCHART



The PV is an index of oxidative rancidity [14] which gradually increases during different stages of product preparation. The FFA content in the lipid of a fish is an indication of lipid hydrolysis. As the freshness quality of fish gets reduced, the FFA content in the lipids of fish increases due to the action of lipases. In the present study the FFA content increases. In the present study there was a gradual increase in PV, FFA values during processing Table (4). Many workers have reported an increase in PV and FFA contents in fish and fishery products. From the Table (4) we can observe that there was an increase in bacterial load in minced meat, paste and cutlet blend before frying.

This might be due to addition of various ingredients as they carry a high load of bacteria. The results of panel studies are given in Table (5) and it is observed that the cutlets were acceptable with mean scores above 8.

Table 1: Recipe used for preparation of ready to fry cutlet blend

Fish paste	
Ingredients	Weight (gm)
Fish mince	700
Starch	100
Salt	20
Sugar	15
Coriander paste	4
Green chilly paste	4
Chilled water	80-90 ml
Cutlet blend	
Ingredient	Weight(gm)
Rice powder	20
Cooked and peeled potato	300
Onion	150
Ginger	100
Lime	4no
Green chilly	80
Coriander leaves	50
Garlic	20
Curry leaves	6
Turmicpowder	3
Salt	30
Egg	4 no
Oil	30-50 ml

Table 2: Yield of fish meat, average weights of cutlet at different stages of processing

Stages	Yield (%)
Yield of dressed fish (%)	56.6
Yield of picked meat (%)	24.5
Average weights of cutlets before breeding(g)	8.6
Average weights of cutlets after breeding(g)	9.7
Average weights of cutlets after frying(g)	8.7

Table 3: Proximate composition of semi prepared and prepared products during different stages of processing

Sample	Moisture (%)	Protein (%)	Fat (%)	Ash (%)
Fish meat	79.80±0.84	17.55±0.27	1.41±.12	2.45±0.26
Fish Paste	71.41±0.31	14.29±0.11	1.75±0.04	2.85±0.10
Cutlet blend before frying	68.47±0.26	11.54±0.11	1.80±0.06	3.22±0.15
Cutlet after frying	56.50±0.5	13.58±0.20	6.68±0.24	3.61±0.16

Table 4: Biochemical and microbiological characteristics of semi prepared and prepared products

Sample	TMAN (mg %)	TVBN (mg %)	PV (milli equivalents of O ₂ /kg of fat)	FFA (% of oleic acid)	TPC (cfu/gm of sample)
Fresh fish	1.23±0.05	3.53±0.057	8.63±0.05	0.55±0.05	2.68x10 ⁵
Fish Paste	1.25±0.05	4.5±0.1	9.80±0.045	0.96±0.015	3.65x10 ⁵
Cutlet blend before frying	1.36±0.05	5.23±0.05	10.67±0.02	1.01±0.01	3.5x10 ⁵
Cutlet after frying	1.81±0.12	1.18±0.104	6.57±0.081	1.73±0.07	1.1 x10 ⁵

Table 5: Mean panel scores for cutlets prepared from minced meat of reef cod

Parameters	Scores
Appearance	8.4
colour	7.6
Taste	8.1
Texture	8.5
Flavour	7.8
Over all acceptability	8.08

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