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QUALITY EVALUATION OF CUTLET PREPARED FROM ROHU (*Labeo rohita*) AND *PANGASIUS* (*Pangasius pangasius*) AT DEEP FREEZE STORAGE

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Abstract: In the present study, quality evaluation of fish cutlets prepared from rohu (*Labeo rohita*) & pangasius (*Pangasius pangasius*) minced meat stored at -18^{o}c in deep freezer was done on the basis of biochemical, microbiological and organoleptic parameters. The biochemical and microbial value of cutlets prepared from rohu and pangasius meat showed in rising manner during storage. Fish cutlets prepared from rohu meat had scored higher value for it taste, flavor, color and overall acceptability than cutlet prepared from pangasius meat and it was showed in decreasing manner during storage of both the cutlets. Crispiness of cutlets prepared from rohu meat was stable during storage compared to cutlets prepared from pangasius meat. Fish cutlets prepared from rohu and pangasius meat was suitable for consumption upto 21 and 18 days respectively.

Keywords: Quality evaluation**,** cutlet, rohu and pangasius minced meat and deep freeze storage.

Introduction

The fisheries sector makes an important contribution to the national economy of a developing country like India. Apart from providing food and employment to thousands of rural people, it also helps us earn the much-needed foreign exchange. India has now emerged as one of the largest producers of fish in the world. Fish and fishery products are recorded highest increase in price in recent years, both in domestic and export markets, compared to any other food items, because of the changes that have been taken place in the dietary habits of the people all over the world and the fish products were considered as health food by the consumers. The conventional products are disappearing from the market and their places is being taken up by the hygienically prepared and attractively packed products in form of 'ready to cook' or 'ready to serve' convenience foods such as Fish cutlet, finger, patties, burger, pizza and momos.

Processing of carps and pangasius into value added fish products enhance their acceptability and market value as revealed by the sensory evaluation of the products. Adding value means employing processing methods, specialized ingredients or novel packaging to enhance the

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nutrition, sensory characteristics, shelf life and convenience of food products (Pagarkar et. al., 2011).

Nagpur and neighboring districts of vidarbha region possess vast recourses of freshwater fishes such as carps, murrells, catfishes, tilapia and pangasius etc. By utilizing locally available fresh water fishes more numbers of value-added products can be prepared. Hence, present study was undertaken to compare microbial, biochemical and organoleptic quality evaluation of cutlets prepared from rohu (*Labeo rohita*) & pangasius (*Pangasius pangasius*) and stored at -18^{o}c.

Material and Methods

Preparation of Minced Meat

Fresh rohu and pangasius fish, size ranges from 2 to 2.5 kg were purchased from local fish market and brought to the laboratory of Fish Processing Technology, College of Fishery Science, Nagpur in the iced condition. Further, it was weighed, dressed (deheaded, eviscerating, gutted) washed, and minced meat was obtained from by utilizing meat mincer.

Preparation of Fish Cutlets from minced meat (Rohu and Pangasius):

Fish Cutlets were prepared as per standardized recipe and method by CIFT, Cochin with very few changes. (Table No. 1).

Table 1. Recipe of fish cutlet from CIFT, Cochin

Sr. No.	Ingredient	Quantity
1	Cooked fish meat	1000 gm
2	Salts	25 gm
3	Oil	125 ml
4	Green chilli	15 g
5	Ginger	25g
6	Onion:	250 g
7	Potato (cooked)	500 g
8	Pepper (powder)	3 g (to taste)
9	Clove (powered)	3 g
10	Cinnamon (powered)	2g (to taste)
11	Turmeric	2 g
12	Eggs	4 Nos
13	Bread powder	200 g

Method of Fish cutlet preparation:

- Cook the fish mince in boiling water for 20 min.
- Drain off the water.
- Add salt and turmeric to the cooked meat and mix well.
- Fry chopped onions in oil till brown. Fry chilli and ginger mix well with the cooked meat.
- Add mashed potatoes and spices and mix well with the meat.
- Shape 40 g each of this in oval or round form, dip in beaten eggs, roll in bread crumb powder, par fried at 180^{o}c in oil for 30 sec and both (Rohu & Pangasius) cutlets were separately packed in HDPE pouch, sealed and stored at -18^{o}c in deep freezer.
- Finally fried at 180^{o}c in oil and use.

Samples (cutlets prepared from rohu and pangasius) were regularly drawn from deep freeze on three days interval for microbial, biochemical and organoleptic analysis.

Biochemical Analysis:

Proximate composition of fish cutlets (Rohu and Pangasius) was determined at beginning and end of storage by (AOAC, 2005). The pH was recorded using a pH meter (AOAC, 2005). A TVB-N content of fish cutlet was determined by the procedure giving by Beatty and Gibbons (1937). Peroxide Value and Free Fatty Acid of samples was analyzed and expressed as milli equivalent of O_2/ kg fat and mg/100 g respectively (AOAC, 2005).

Microbiological Analysis:

Cutlet samples were analyzed for total plate count (TPC) and pathogenic bacteria like *E. coli*, *Staphylococcus, Streptococcus, Vibrio* and *Salmonella* by method recommended by EIA (1995).

Organoleptic Analysis:

Cutlets prepared from rohu and pangasius were stored in deep freezer at -18^{o}c for 30 days was subjected to organoleptic evaluation. The cutlet prepared from rohu and pangasius was deep fried in rice bran oil until they were cooked before being presented to the panelist. Various sensory characteristics like colour, texture, odour, taste, appearance and overall acceptability were evaluated by a group of 10 panelists using a 10- point hedonic scale.

Result and Discussion:

1. Proximate composition of rohu fish meat and rohu fish cutlet:

The percentage of proximate composition like moisture, crude protein, lipids and ash content of rohu fish meat was 74.2, 14.86, 3.28 and 1.4, respectively. It was similar to the other fresh

water fishes (Vanitha, 2011 and Reddy et al., 2012). The slightly decreasing trade was observed in moisture and crude protein during initial and final storage of rohu meat cutlet. It was shown in Table 1.

Table 1: Proximate composition of rohu meat and cutlets on day of production and 24th day of spoilage

Parameter (%)	Rohu meat	Initial Storage (Cutlet)	Final Storage (Cutlet)
Moisture	74.2	57.62	54.46
Crude Protein	14.86	16.8	15.88
Fat	3.28	15.92	16.12
Ash	1.4	2.57	2.68

The same finding was observed by Sowmya et.al. (2017). The percentage of fat and ash content was increased during storage at -18°c. The increase in fat and reduction of moisture of fish cutlet is might be due to dehydration during storage (Ninan et. al. 2008).

2. Proximate composition of pangasius fish meat and pangasius fish cutlet:

The data shown in table 2 indicates the proximate composition of pangasius meat and changes occurred of cutlet prepared from pangasius meat during deep freeze storage at -18°c.

Table 2: Proximate composition of pangasius meat, cutlet on day of production and 21st day of spoilage

Parameter (%)	Pangasius meat	Initial Storage (Cutlet)	Final Storage (Cutlet)
Moisture	83.58	58.52	56.30
Crude Protein	13.32	16.16	15.82
Fat	6.8	22.28	23.58
Ash	1.11	2.60	3.06

The percentage of moisture, protein, fat and ash content of pangasius meat was 83.58, 13.32, 6.8 and 1.1 respectively. The percentage of moisture and protein was declined whereas percentage of fat and ash content was slightly increased. The same trend was found by Rathod and Pagarkar, (2013).

3. Bacterial counts of rohu and pangasius raw minced meat:

Total plate count of raw rohu and pangasius minced meat was found to be 2.4×10^5 and 3.6×10^5 cfu/gm respectively.

Table: 3 Initial Bacterial counts of rohu and pangasius mince meat

Storage in days	TPC (CFU/ gm sample) of rohu meat	TPC (CFU/ gm sample) of pangasius meat	Pathogenic bacteria (*E. coli, staphylococcus Streptococcus, salmonella and vibrio*) of rohu meat	Pathogenic bacteria (*E. coli, staphylococcus Streptococcus, salmonella and vibrio*) of pangasius meat
0	2.4×10^5	3.6×10^5	ND	ND

Pathogens namely E. *coli, staphylococcus Streptococcus, salmonella and vibrio* were absent in both raw minced meats. Whereas TPC of raw rohu minced meat was found to be 2.82 x 10^5 cfu/gm and pathogen absent was found by Joshi (2005).

4. Biochemical changes during storage at -18^{o}c

The biochemical values of rohu and pangasius fish cutlets are given in table 4. In present study the pH of fish cutlets prepared from rohu and pangasius minced meat was increased significantly during storage. It was increase between 6.8 to 7.92 in case of rohu mince cutlets and 6.2 to 7.12 in case of pangasius cutlets. It might be due to release of CO_2 by the microbial flora present on the fish product Kilinc (2007). Similar observation was found by the Sowmya et. al. 2017 during his studies on the quality of fish cutlets prepared from rohu during refrigeration storage. Rathod and Pagarkar (2013) also found same observation in case of cutlets made from pangasius and during storage of 1 to 18 days at -15 to -18^{o}c.

Free fatty acid (FFA) of rohu fish cutlets stored in deep freezer at -18^{o}c showed an increasing trend from 0.98 to 5.18 mg/100 g. whereas pangasius fish cutlets stored at deep freezer at -18^{o}c shown same increasing trend. It was increased from 1.28 to 5.02 in 18 days storage. FFA value is a result of enzymatic decomposition of fat during storage and it was increase due to lipase action (Gopakumar, 2002). FFA value of par fried cutlets and raw cutlets in range of 0.98 to 1.49 and 2.03 to 2.82 mg/100 g respectively at 4^{o}c by Joseph et al. 1984. Increasing value of FFA during storage was reported by (Sowmya et. al. 2017).

In the present study, a constant increase in PV during frozen storage was observed. PV increased from 2.32 to 4.48 and 2.34 to 4.04 meqO_2/ kg respectively during storage of cutlet prepared from rohu and pangasius. Similar increasing trend was reported by Rathod and Pagarkar (2013) during his study on cutlets made from pangasius and during display unit storage at -15 to -18^{o}c. Whereas Sowmya et al. 2017 reported that Peroxide value of fish cutlets during initial storage period increase from 8.86 to 21. 0 meqO_2 / kg of fat till the end of 5th day of storage and subsequently decreased to 11.6 meqO_2 / kg of fat at the end of 15 days storage period at refrigerated temperature. Coating with egg white and spices with

antioxidant properties may function as an oxygen barrier, thus prevent the fat oxidation (Joseph et. al., 1984).

Table: 4 Changes in biochemical composition of fish cutlets prepared from rohu and pangasius mince meat during storage at -18°c.

Duration in days	pH of rohu meat cutlet	pH of pangasius meat cutlet	FFA of rohu meat cutlet	FFA of pangasius meat cutlet	TVBN of rohu meat cutlet	TVBN of pangasius meat cutlet	PV of rohu meat, cutlet	PV of pangasius meat, cutlet
0	6.8	6.2	0.98	1.28	4.17	4.52	2.32	2.34
3	7.02	6.34	1.26	2.46	4.62	4.96	2.40	2.48
6	7..16	6.58	2.48	3.12	4.86	6.8	2.68	2.88
9	7.24	6.88	2.96	3.84	4.98	12.58	2.88	3.02
12	7.32	6.96	3.86	4.48	5.02	14.96	3.12	3.34
15	7.64	7.10	4.26	4.96	5.68	18.20	3.84	3.68
18	7.78	7.12	4.84	5.02	10.46	22.48	4.20	4.04
21	7.92	-	5.18	-	14.68	-	4.48	-

Total volatile bases nitrogen (TVB-N) refers to all volatile basic components and comprises mainly trimethylamine and ammonia. TVB-N is the most common index of quality universally used for deciding the state of freshness of fish (Balachandran, 2001). In present study, TVB-N value of rohu fish cutlets was in the range of 4.17 to 14.68 mg % and fish cutlet prepared from pangasius was in the range of 4.52 to 22.48 mg %. Increase of TVBN content during storage period might be due to bacterial spoilage, activity of endogenous enzymes and degradation of tissue proteins (Chomnawang et. al., 2007) or due to production of ammonia (Adebona, 1978). Rathod and Pagarkar (2013) and Sowmya et. al. (2017) found similar increasing value of TVB-N during frozen storage. While Ninan et. al., 2008 reported that TVB-N value was in the range of 12.4 to 20.2 mg % in tilapia fish cutlet.

5. Microbiological changes during storage at -18°c

The TPC is widely used to assess the bacterial quality of fish and a pathogenic bacterium indicates the inadequacy of hygiene and sanitation during processing, transport and storage (Sanjeev, 2000). The changes in the total plate count in the rohu and pangasius cutlets during storage were enumerated and the result is presented in the table 5.

Table: 5 Bacterial counts during frozen storage of cutlet prepared from rohu and pangasius minced meat at -18^{o}c.

Storage in days	TPC (CFU/ gm sample) of rohu meat, cutlet	TPC (CFU/ gm sample) of pangasius meat, cutlet	Pathogenic bacteria (*E. coli, staphylococcus Streptococcus, salmonella and vibrio)* of rohu meat, cutlet	Pathogenic bacteria (*E. coli, staphylococcus Streptococcus, salmonella and vibrio*) of pangasius meat, cutlet
0	1.56×10^{1}	1.86×10^{1}	ND	ND
3	2.2×10^{1}	2.4×10^{1}	ND	ND
6	4.8×10^{1}	4.9×10^{1}	ND	ND
12	8.9×10^{1}	9.2×10^{1}	ND	ND
15	2.1×10^{2}	2.8×10^{2}	ND	ND
18	8.6×10^{2}	8.8×10^{2}	ND	ND
21	9.2×10^{2}	-	-	-

The TPC value of rohu mince cutlets was steadily increase from 1.56×10^{1} to 9.2×10^{2} cfu/gm in 21 days storage whereas, TPC value of pangasius mince cutlets was increase from 1.86×10^{1} to 8.8×10^{2} cfu/gm in 18 days. The same increase of bacterial count was reported by Joseph et al, 1984 in fish cutlet during storage at 4^{0}c. Pathogens were not found in the minced meat samples as well as in the cutlet samples of both fishes during entire study. The reduction in TPC and absent of pathogens in both cutlets is might be due to par frying.

Organoleptic Evaluation

It is reported from Table 6 that sensory quality changes and overall acceptability of fish cutlet started decrease from 8. 4 to 4.5 in case of rohu mince cutlets whereas overall acceptability of pangasius mince cutlets was decrease from 8 to 4.

Table: 6 Organoleptic evaluations (Overall acceptability)

Storage days	Rohu meat cutlet	Pangasius meat cutlet
0	8.4	8.0
3	7.3	7.0
6	6.5	6.0
12	6.10	5.5
15	5.4	5.0
18	5.00	4.0
21	4.5	-

The cutlets prepared from rohu and pangasius mince were suitable for consumption upto 21 and 18 days respectively. Pangasius cutlets has less shelf life might be due to more water content in pangasius meat than rohu meat. In support to present study, Biswas et al (2004) reported that enrobed patties had a shelf life upto 28 days during chilled storage, whereas control patties were unacceptable after 21 days. The shelf life of various fish products in refrigerated condition were 9 to 11 days.

Conclusion

The cutlets prepared from rohu meat has good shelf life upto 21 days and having good crispiness whereas cutlets prepared from pangasius meat accepted up to 18 days and loss crispiness during deep freeze storage at -18^{o}c. The less shelf life and loss of crispiness in pangasius meat cutlet might be due to more moisture content than rohu meat. The above study will support the selection of fishes for preparation of various value-added minced meat base products and their storage.

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