



# NUTRITIONAL AND SENSORY QUALITY OF VALUE ADDED FOOD PRODUCTS FROM INDIAN MACKEREL, *RASTRELLIGER KANAGURTA*

Feona. K. Tom and \*Dr.G.Chitra

\*Assistant Professor in Zoology, Nirmala College for Women, Coimbatore – 641018, Tamilnadu, India

## ABSTRACT

An attempt was undertaken to evaluate the nutritional and sensory quality of the value added food products such as fish cutlet, fish sauce, fish finger and fish chutney powder prepared from Indian mackerel (*Rastrelliger kanagurta*). The shelf life quality of the prepared fish products was also studied. From the nutritional analysis, the protein content of fish cutlet (121 mg) and fish chutney powder (120mg) was found to be higher than the other fish products analysed; the other products used for the analysis were fish finger (110mg) and fish sauce (80 mg) respectively. The higher content of carbohydrate was observed in fish cutlet (0.92 mg) similar as in protein content, followed by fish sauce (0.71 mg), fish finger (0.57mg) and the lowest content of carbohydrate was shown in fish chutney powder (0.43 mg). The lipid content showed a decreasing trend of having 80 mg for fish chutney powder, 40 mg for fish finger, 30 mg for fish sauce and the lowest lipid content of 20 mg was observed in fish cutlet. The ash content of fish cutlet and fish chutney powder was assessed as 40 % and in fish finger and fish sauce the recorded ash content was 30%. The analysis of moisture content showed slight variations. Higher content (60%) of moisture was seen in fish finger and fish sauce followed by fish chutney powder and fish cutlet having value 40%. The sensory evaluation of fish products provided excellent results in colour, flavour, taste, texture and overall acceptability. The ideal shelf life for storing the fish products was found as 10 days in refrigerated condition. Thus the nutritional and sensory analysis revealed that the value added food products are healthy for human consumption and *R. kanagurta* is suitable for the preparation of the value added products.

**Keywords:** Nutritional quality, *Rastrelliger kanagurta*, Sensory analysis, Value added products.

## 1. INTRODUCTION

Fish has been recognized as an excellent food source for human beings and is preferred as a perfect diet not only due to its excellent taste and high digestibility but also because of having higher proportions of unsaturated fatty acids (Abelti, 2016). However, fish is one of the most perishable of all staple commodities, and in the tropical climates of most developing countries, it will become unfit for human consumption within about one day of capture unless it is subjected to some form of processing. Fish can act not only as a source of protein to human being, but also provide foreign exchange earning too many people when the harvesting, handling and processing methods done in the right way and time. The Indian mackerel, *Rastrelliger kanagurta* is one of the important pelagic, shoaling marine fish that is widely distributed in the Indo West Pacific region. India contributes 90% of the world mackerel production, out of which 77% is from west coast and 23% is from east coast of India (Das *et al.*, 2016).

There is a great scope to increase the fish consumption in India by developing value added products there is a growing demand for ready-to-eat and ready-to-cook convenience products due to social and cultural changes in recent years. Fish and fishery products contain high quality protein and other necessary, nutrients; they are low in saturated fatty acids and contain high content of unsaturated fatty acids (Pagarkar *et al.*, 2007). Battered and breaded product is

convenience food valued greatly by the consumers all over the world. The process of coating with batter and bread crumbs increases the bulk of the product, thereby reducing the content of costly fish, enhances the appearance, colour, texture and taste of food products and also the nutritional value of the product (Rathod *et al.*, 2012).

Value addition means employing processing methods, specialized ingredients or novel packaging to enhance the nutrition, sensory characteristics, shelf life and convenience of food products. Currently consumer's particularly urban ones are showing more and more interest in food products which are available in ready-to-eat or ready-to-cook form such as fish fillet, finger, cutlet, patties, burger, sausages and fish balls. Present trends of marketing reflect a rapidly growing demand for such processed foods that are more convenient to handle, store and prepare. Factors responsible for such a situation are increasing number of working women; reasonably increase in income, education, awareness and consciousness towards quality, freshness, nutrition, hygiene and health. This has led to the development of several fishery products varied in taste, texture and appearance (Pagarkar *et al.*, 2011)

The present study has been designed to prepare the value added products from commercially important marine fish, Indian mackerel, *R.kanagurta* and to test the biochemical composition and shelf life qualities of prepared valued added products.

## 2. MATERIALS AND METHODS

### 2.1. SAMPLE PREPARATION

The fresh fishes (Indian mackerel, *Rastrelliger kanagurta*) were collected from the local whole sale fish market at Palakkad, Kerala, India and brought to the laboratory in an ice cold box for the preparation of fish products. The fish used for the sample preparation was cleaned and the edible parts were taken and the value added products such as fish cutlet, fish sauce, fish finger and fish chutney powder were prepared.

#### 2.1.1. Preparation of Fish Cutlet

##### Ingredients

- 1 cup boiled and mashed potato.
- 250 grams fish fillet- steamed and shredded.
- 2 teaspoon vegetable oil.
- 1 teaspoon minced ginger.
- 1 onion chopped.
- 1 green chilli minced.
- 1 teaspoon salt.
- Finely chopped mint leaves.
- Finely chopped coriander leaves
- For the patty outer covering: 1 egg beaten : 1 cup bread crumbs
- For frying: 500 ml coconut oil.

##### Method of Preparation

The pan was heated and minced ginger was added, fried for a minute. Onion and green chillies were taken, onions were fried till soft and salt was added. Mashed potatoes with shredded fish, mint leaves and coriander leaves were mixed well and saute for a while and removed from heat. For the patty outer covering, 2 tablespoon fish mixture made into small patties, 2 bowls were taken, one with beaten egg and the other with bread crumbs. Patties were mixed in the egg and rolled in the bread. Oil was heated until hot; the patties were placed in hot oil and were fried till gold.

### 2.1.2. Preparation of Fish Sauce

#### Ingredients

- 6 cloves garlic
- Coarsely chopped zest from 1 small lemon
- 3 tablespoon sea salt
- 6 coriander leaves
- 2-3 teaspoon whole black pepper corns
- 200 gm of fish fillet
- 1 teaspoon sea salt

#### Method of Preparation

Garlic and lemon were muddled together with the salt. Rinsed fish was cut into half pieces. The fish pieces were tossed in the salt mixture and completely coated. The peppercorns and coriander leaves were added, and the mixture was packed into a clean jar, pressing down the pieces. The juice was released. The salt was poured into the jar, and then as much as water was poured into the jar nearly till the fish was submerged completely. The jar was covered tightly and leaved at room temperature for 2-3 days, then moved to the refrigerator and the mixture was double strained through a cloth and the solids were discarded. It was stored in glass bottles in the refrigerator.

### 2.1.3. Preparation of Fish Finger

#### Ingredients

- 300 gm fish fillets.
- 1\2 teaspoon salt
- 2 table spoon lemon juice
- 1\2 teaspoon turmeric powder
- 1\2 teaspoon red chilli flakes
- 1\2 teaspoon crushed black pepper
- 2 tablespoon maida (all purpose flour)
- 1 teaspoon rice flour
- 2 egg
- 1\4 tablespoon baking soda
- Coconut oil for frying

#### Method of preparation

Fish fingers were taken in a bowl and salt, lemon juice, turmeric powder, red chilli flakes, crushed black pepper and ginger paste were added. It was mixed well and kept aside for 10 minutes. Maida, rice flour, corn flour, egg and baking soda were mixed in another bowl. The marinated fish was added in this mixture and kept aside for another 10 minutes. The fish fingers were coated with bread crumbs. Oil in a pan was heated and the fish fingers were deep fried until golden brown on medium heat.

### 2.1.4. Preparation of Fish Chutney Powder

#### Ingredients

- 250 gm fish fillets (preferably boneless)
- Grated coconut - 1\2 cup
- Onions - 8 to 10
- Dry red chillies - 10 to 12
- Ginger - 1
- Peppercorns -10

- Tamarind - walnut sized
- Turmeric powder - 1\4 teaspoon
- Curry leaves 5- 6 sprigs
- Coconut oil - to fry the fish

## Method of Preparation

Fish was soaked at least for 1 hour in water and pat dried and marinated with turmeric powder for about 15 minutes. The fish was shallow fried. In another pan, the grated coconut was heated for few minutes and then the chopped onion and ginger were added. When the coconut turned light brown, the dry red chillies and curry leaves were added. The mixture was stirred until the coconut turns reddish brown. The fried fish was added to this and mixed well.

## 2.2. Biochemical Analysis

Biochemical compositions such as protein (Bradford Method), carbohydrate (Anthrone Method), lipid content (Chloroform-Carbinol mixture 3:1), moisture and ash contents (AOAC, 2005) were estimated in the four different fish products prepared from Indian mackerel, *R. Kanagurta* using standard procedures.

## 2.3. Sensory Analysis

Various sensory characteristics such as appearance, colour, flavour, taste, texture and the overall acceptability were evaluated by a group of 10 panellists (5 male and 5 female) using a nine (9) point hedonic scale. The average score of 5 was considered to be the borderline of acceptability (9- like extremely; 8- like very much; 7- like moderately; 6- like slightly; < 5 bad) (Peryan and Pilgrim, 1957).

## 2.4. Shelf life Quality

Shelf life quality of all the prepared products was recorded in refrigerated storage condition.

## 2.5. RESULTS AND DISCUSSION

### 2.5.1. Nutritional quality of Value added fish products

Biochemical composition such as protein, lipid, carbohydrate, ash and moisture contents were estimated in prepared value added products. Protein is a macronutrient essential for the metabolism and growth of human body. All essential amino acids are abundant in fish protein. In the present investigation, the values of protein in fish cutlet were observed to be higher ( $121\pm 0.02$  mg) than the other fish products. Followed by the protein value of chutney powder ( $120\pm 0.14$  mg), a decreasing trend of protein values was observed in fish finger ( $110\pm 0.06$ mg) as well as fish sauce ( $80\pm 0.10$ mg). The higher protein content in fish cutlets is attributed to the moisture loss during frying. Similar results were observed in the quality evaluation and shelf life assessment of raw and value added fish product of *Wallago attu* during frozen storage conditions by Gupta *et al.*, (2015). Jayasinghe *et al.*, (2012) observed that the addition of legume flours increased protein percentage of the nuggets significantly compared to the sample which did not include legume flour. Saritha and Patterson (2015) estimated that the protein value of seafood rice cracker was higher than that of sago cracker and protein content of raw meat.

Carbohydrate is the essential nutrient which helps in the functioning of the body and the metabolism. As observed in the case of protein content, the value of carbohydrate was estimated to be  $0.92\pm 0.56$ mg which was found to be higher in fish cutlet than the other products.  $0.71\pm 0.28$  mg of carbohydrate content was observed in fish sauce followed by fish finger ( $0.57\pm 0.10$ mg) and fish chutney powder ( $0.43\pm 0.02$ mg). The present results are correlated with the findings of Kolekar and Pagarkar (2013) in their study, the carbohydrate content showed variations (4.22 to 4.09%) in the product. Rathod and Pagarkar (2013) assessed that the carbohydrate content of the fish cutlet showed a variation from 4.43% to 4.09%.

When compared to the other products the chutney powder had the higher lipid content ( $80\pm 0.68$ mg) than the other products, followed by a decreasing trend of lipid values, fish finger ( $40\pm 1.00$ mg), fish sauce ( $30\pm 0.40$ mg). The least concentration of lipid content was observed in fish cutlet ( $20\pm 0.13$ mg). Saritha and Patterson (2015) estimated that the lipid content of the prawn meat (4.37%) was higher while that of seafood rice and sago crackers, it was 4 and 3.9% respectively. Gupta *et al.*, (2015) reported a decreasing trend of lipid content in raw muscles and fish cutlets. Ejaz *et al.*, (2009) observed the similar results in fish burger prepared from pangus catfish (*Pangasius sutchi*).

Ash content of fish cutlet and fish chutney powder was  $40\pm 0.25$  and  $40\pm 0.10$  % .The higher content of ash content could be due to the addition of salts and moisture loss. The other products fish finger and fish sauce showed a decreasing nature the lipid content to be  $30\pm 0.41$  and  $30\pm 0.63\%$ . In parallel, Ihm *et al.*, (1992) determined that the ash content of the sardine burgers increased upon analysis. Similarly Azad (2001) assessed the ash content of the fish cutlets to be varying and also found that the ash content of the fish products had increased than the raw fishes.

Fish finger and fish sauce had the highest moisture content of  $60\pm 0.62$  and  $60\pm 0.34\%$ . The estimated values of the other two products, fish cutlet and fish chutney powder was  $40\pm 0.14$  and  $40\pm 0.21\%$ . Ojagh *et al.*, (2013) stated that the amount of moisture after pre-frying the battered and breaded is affected by the water holding capacity. Rathod *et al.*, (2012) evaluated the higher moisture content of fish products (53.34%) in the analysed samples. Similar results were observed by Merline and Chitra (2015) in the moisture content of the fish cutlet and fish nuggets.

### 2.5.2. Sensory and shelf life Quality of Value added fish products

Organoleptic methods are considered as the most useful and dependable criteria for the freshness and acceptability of fishes. The sensory parameters taken into account are colour, flavour, taste, texture, and overall acceptability. In the present study, fish chutney powder prepared from *R. kanagurta* had best colour ( $08\pm 0.10$ ), flavour ( $7.7\pm 0.26$ ), taste ( $8.3\pm 0.40$ ), texture ( $08\pm 0.23$ ) and overall acceptability ( $8.7\pm 0.41$ ) followed by fish cutlet having colour ( $7.7\pm 0.11$ ), flavour ( $7.6\pm 0.64$ ), taste ( $8.3\pm 0.58$ ), texture ( $08\pm 0.22$ ) and overall acceptability ( $8.3\pm 0.13$ ). Fish sauce and fish cutlet had also good organoleptic qualities and the recorded overall acceptability was  $07\pm 0.72$  and  $8.3\pm 0.13$  respectively. Similarly Pawar *et al.*, (2012) evaluated the value added battered and breaded product 'fish cutlet' developed from fresh water fish *Catla catla*. Cutlet prepared using standardised recipe was excellent in taste, texture, odour, colour, and have good overall acceptance. Saritha and Patterson (2015) analysed the nutritive and organoleptic qualities using the innovative value added product of prawn meat sago and rice crackers. The results indicated that the nutritional quality of the prawn crackers was higher than the prawn meat and the microbial and organoleptic characters were good. Praneetha *et al.*, (2017) observed the good overall acceptability of fish cutlet prepared from rohu (*Labeo rohita*) during refrigerated storage.

The shelf life quality of fish culet from *R. kanagurta* was analysed and found to be ideal for storage in refrigerated condition for almost 10 days. The shelf life quality of fish chutney powder was 28 days and fish sauce and fish fingers were 41 days and 8 days respectively in refrigerated storage.

TABLE 1: Biochemical composition of value added products prepared from

*R. kanagurta*

Sl.No	Value added products	Protein content (mg)	Carbohydrate Content (mg)	Lipid Content (mg)	Ash Content (%)	Moisture Content (%)
1.	Fish cutlet	$121\pm 0.02$	$0.92\pm 0.56$	$20\pm 0.13$	$40\pm 0.25$	$40\pm 0.14$
2.	Fish sauce	$80\pm 0.10$	$0.71\pm 0.28$	$30\pm 0.40$	$30\pm 0.41$	$60\pm 0.34$
3.	Fish finger	$110\pm 0.06$	$0.57\pm 0.10$	$40\pm 1.00$	$30\pm 0.63$	$60\pm 0.62$
4.	Fish chutney powder	$120\pm 0.14$	$0.43\pm 0.02$	$80\pm 0.68$	$40\pm 0.10$	$40\pm 0.21$



TABLE 2: Sensory evaluation of value added products prepared from *R. kanagurta*

Sl. No.	Products	Colour	Flavour	Taste	Texture	Overall acceptability
1.	Fish cutlet	7.7±0.11	7.6±0.64	8.3±0.58	08±0.22	8.3±0.13
2.	Fish sauce	7.1±0.22	6.5±0.36	07±1.00	6.8±1.00	07±0.72
3.	Fish finger	6.5±0.20	6.8±0.10	8.1±0.56	6.8±0.71	08±0.30
4.	Fish chutney powder	08±.10	7.7±0.26	8.3±0.40	08±0.23	8.7±0.41

### 3. CONCLUSION

With the increasing population and industrialization of cities there is a growing trend of consuming ready to eat meat products. Among the ready to eat meat products, fish meat products have a special place due to its nutritional value. Considering this nutritional study of value added products prepared from Indian mackerel have been carried out. Value added products (fish cutlet, fish sauce, fish fingers and fish chutney powder) were prepared from Indian mackerel using standardised recipe. The organoleptic and sensory analysis carried out to evaluate the quality of the value added products prepared from *R. kanagurta*. From the results obtained, it was concluded that *R. kanagurta* can be used for the selected value added products which were rich in nutritional quality and also safe for human consumption. The procedure can be recommended for small scale fish farmers and self-help groups as well.

#### 4. REFERENCES

- 1) Abelti, A. L. 2016. Postharvest and nutritional loss assessment of fish at different handling stage from Genale River, South-eastern Oromia. *International Journal of Fisheries and Aquatic Studies*, 4(6): 263-266.
- 2) A.O.A.C. 2005. Official methods of analysis. 8 Edn, Association of Analytical Chemists, Gaithersburg, MD.
- 3) Azad, A. K. 2001. Formulation and development of fish burger and fish stick from silver carp and their quality evaluation. M. S. Thesis, Department of Fisheries Technology, Bangladesh Agricultural University, Mymensingh, Bangladesh.
- 4) Bradford, M. M. 1976. A rapid and sensitive for the quantitation of microgram quantities of protein utilizing the principle of protein- dye binding. *Analytical Biochemistry*, 72: 248-254.
- 5) Das, I., Hazra, S., Bhattacharya, S.B., Das, S. and Giri, S. 2016. A study on seasonal changes in feeding habit, health status and reproductive biology of Indian Mackerel (*Rastrelliger kanagurta*, Cuvier) in coastal water of West Bengal. *Indian Journal of Geo-marine Sciences*, 45(2): 254-260.
- 6) Ejaz, M. A., Shikha, F. H. and Hossain, M. I. 2009. Preparation of fish burger from pangus catfish (*Pangasius sutchi*) and evaluation of quality and shelf life during different storage conditions. *Progressive Agriculture*, 20(1 & 2): 153-162.
- 7) Gupta, V., Gandotra, R., Koul, M., Gupta, S. and Parihar, D.S. 2015. Quality evaluation and shelf life assessment of raw and value added fish product (fish cutlet) of *Wallago attu* during frozen storage conditions (-12 °C). *International journal of fisheries and aquatic studies*, 2(6): 243-247
- 8) Ihm, C. W., Kim, J. S., Joo, D. S. and Lee, H. E. 1992. Processing and quality stability of precooked frozen fish foods: processing of sardine burger. *Journal of the Korean Agricultural Chemical Society*, 34 (4): 254-259.
- 9) Jayasinghe, C. V. L., Silva, S. S. G. and Jayasinghe, J. M. J. K. 2012. Quality improvement of tilapia fish nuggets by addition of legume flour as extenders. *Journal of Food and Agriculture*, 6(1-2): 32-44.
- 10) Kolekar, A. D., and Pagarkar, A. U. 2013. Quality evaluation of ready-to-eat fish ball in curry. *SAARC Journal of Agriculture*, 11(1): 35-43.
- 11) Merline, X. and \* Dr. Chitra, G. 2020. Nutritional, microbial and sensory qualities of cutlets, nuggets and fingers prepared from *Scomberomorus guttatus*. *International Journal of Current Advanced Research*, 9(05A); 22077-22081.
- 12) Ojagh, S., Shabanpour, B. and Jamshidi, A. 2013. The effect of different pre-fried temperatures on physical and chemical characteristics of silver carp fish (*Hypophthalmichthys molitrix*) nuggets. *World Journal of Fish and Marine Sciences*, 5 (4): 414- 420.
- 13) Pagarkar, A. U., Basu, S. and Mitra, A. 2007. Extruder- A novel technology for development of value added fish products. *Beverage and Food World Journal*, 34 (1): 72-75.

- 14) Pagarkar, A. U., Joshi, V. R., Baug, T. E. and Kedar, J. G. 2011. Value addition is need of seafood industries. *Fish Coops*, 23(4): 8-17.
- 15) Pawar, P. P., Pagarkar, A. U., Rathod, N. B., Baug, T. E. and Rather, M. A. 2012. Standardisation of recipe for fish cutlet product from fresh water fish catla (*Catla catla*). *European Journal of Experimental Biology*, 2 (6):2043-2048.
- 16) Peryam, D.R. and Pilgrim, F.J. 1957 Hedonic scale method of measuring food preference. *Food Technology*, 11: 9 - 14.
- 17) Praneetha, S. S., Dhanapal, K., Reddy, G. V. S., Balasubramanian, A. and Kumar, G. P. 2017. Studies on the quality of fish cutlet prepared from rohu (*Labeo rohita*) during refrigerated storage. *International Journal of Current Microbiology and Applied Sciences*, 6 (12): 3262-3271.
- 18) Rathod, B. N., Pagarkar, A. U., Pujari, H., Gokhale, N. B. and Joshi, V. R. 2012. Standardisation of recipe for fish cutlet product from *Pangasianodon hypophthalmus*. *Ecology, Environment and Conservation*, 18(4): 981-986.
- 19) Rathod, N. and Pagarkar, A. (2013). Biochemical and sensory quality changes of fish cutlets, made from pangasius fish (*pangasianodon hypophthalmus*), during storage in refrigerated display unit at -15 to -18°C. *International Journal of Food, Agriculture and Veterinary Sciences*, 3(1): 1-8.
- 20) Sabat, S., Sharma, A. and Salim, S. S. (2008). Consumption pattern and consumer preference for value-added fish and fish products in north zone of India. *Journal Indian Fish Association*, 35: 19-27.
- 21) Saritha, K. and Patterson, J. 2015. Processing of innovative ready to fry crackers from *Penaeus japonicas*. *World Journal of Dairy and Food Sciences*, 7 (1): 66-73.