



Estimation of protein and lipid concentration in *Labeo rohita* (rohu) during iced and salt preservation

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Abstract

The present study was undertaken to investigate the total lipid and protein concentration comparatively in *Labeo rohita* during ice and salt storage. Among Indian major carps, *Labeo rohita* is highly preferred fish having good commercial value, taste, good looking and white colour of the meat. Icing and salting methods are extensively used in India due to lower cost. During preservation, protein and lipid concentration in fish are changed. On this view, it is noted that the mean concentration of protein and lipid were 60 ± 78.1 , 120 ± 10.06 , 94.07 ± 55.96 and 130 ± 0.76 , 110 ± 34.77 , 70 ± 0.07 in fresh, chilled and salted fish respectively. The observations were found that protein and lipid concentrations were decreased as preservation time increased. The total protein and lipid concentrations were higher in iced storage fish. Therefore, icing method is comparatively better than salting.

Keywords: Icing, *Labeo rohita*, lipid, protein, salting

Introduction

Although, India is a developing country, also known as agricultural land. Agriculture is one of the prime leading sector for Indian economy. Most of the population rely on agriculture for their livelihood. Agriculture provides the foods (cereals, vegetables, pulses, fruits, meats, fish milk and dairy products) that balance our basic diets for energy, protein, vitamins and minerals (FAO, 2012). Indian population reported as 1.42 billion which is noted to be highest across the world. Agriculture sector is not sufficient to fulfil the food demand of the population. Therefore, fisheries and aquaculture play a vital role in cope up with this food demand. Farmers are taking different approaches for increasing aquatic species including fish. Indian fishery contributes 1.1% to national GDP and 5.15% to agricultural GDP of the country (Sajeev M. V. 2021). Fish is one of the fastest growing sectors as well as highly perishable commodities that need to prevent micro-organisms contamination which spoil its flavour, texture and food value. Therefore, many processing technologies i.e., smoking, drying, canning, salting, icing, frying, salting, brining (wet salting) are used to prevent its deterioration. During processing of fish many biochemical parameters (Lipid, Protein, Carbohydrates, Glucose) are changed. Preservation of fish in salt and ice are the most cheapest and efficient methods applying by farmers to retarding spoilage. Salting and freezing mostly inhibit the survival of bacteria, fungi and other potential pathogenic organisms. Salting creates osmotic pressure that causes inactivation of pathogens. The extracted water products means a decrease of water activity (wa). Usually, wa for fish is close to 1 and after salting it can be decrease from 0.8 to 0.7. Although, some halophilic bacteria can also survive at wa 0.75 that led to spoilage of salted fish (Oliveira *et al.*, 2012). Whereas, psychrotolerant Gram negative bacteria (*Pseudomonas* spp. and *Shewanella* spp.) can spoil chilled fish (Gram and Huss, 2000). Freezing is applied for short term preservation. As Idachaba 2001 ice work in two ways;

1) it reduces the growth of bacteria, 2) it washes bacteria and slime as it melts. However excessive culture of fresh water fishes, led to poor market channel, results loss of profit to aqua farmers. Further, in India, the most cultured fishes are Grass carp (*Ctenopharyngodon idella*), Common carp (*Cyprinus carpio*), Rohu (*Labeo rohita*), Catla (*Catla catla*), Silver carp (*Hypophthalmichthys molitrix*) and Mrigal (*Cirrhinus mrigal*) that contribute more than 90% of share market, also known as Indian major carps. These carps have immense sources of lipid, proteins and fatty acids and n-3, n-6 polyunsaturated fatty acids that enhance its nutritional value for human beings (Yashodhara *et al.* 2009). According to Adebawale *et al.*, 2008 water, protein and fat are the major content of fishes. *Cirrhinus mrigal*, *Catla catla* and *Labeo rohita* contributes 87% fresh water production (Khillare YK 2012). These carps are highly preferred farmed fish not only in India, but also all over the world, due to potential growth rate and greater acceptability to consumers (Memon and Sadhu 2020). Among Indian major carps, only *Labeo rohita* (Rohu) contributes 80% major carps culture of India and also highly preferred species due to its high commercial value, taste, good looking and white colour of the meat (Dhanapal *et al.*, 2013). However, biochemical parameters in *Labeo rohita* in iced storage have been done by many authors (Dhanapal *et al.*, 2013, Gandotra *et al.*, 2012, Mohan *et al.*, 2006, Sadhu *et al.*, 2020, Gandotra *et al.* 2020), but salting method not much studied. Keeping in view, the storage of *Labeo rohita* (rohu) fish's muscle in these two preservation method (icing and salting) were undertaken comparatively to determine the proteins and lipid contents.

Materials and methods

a) Collection of samples: Live and healthy fish (*Labeo rohita*) were purchased from Naveen Machhali Mandi in Dubagga, Lucknow, placed safely in a bucket of water and immediately transported to Zoology lab at Babasaheb Bhimrao Ambedkar University (BBAU), Lucknow.

b) Preservation of fish

Six fishes were kept in the crushed ice, while six fishes were kept in salt powder. The whole preservation was applied for 7 days. Fish were beheaded, gutted and viscera was taken off. Salt and ice were placed in ventrally split area for better penetration. Fish and crushed ice was put in alternative layer. On contrary, salt is added to the fish in a ratio of 1:3, now fish and salt were also put same as icing. This preservation method was applied for 7 days at room temperature.

c) Sample preparation and analyses

The muscles tissue was dissected out from either sides of the dorsal body surface above the lateral line with the help of scissors and forceps. Subsequently, the tissues were blot dried and were kept at 4 degree Celsius till further processing. 2gm tissues were taken for protein as well as lipid determination. Protein estimation was done by Lowry *et al.*, (1951) while lipid estimation was done by Floch *et al.*, (1957) method.

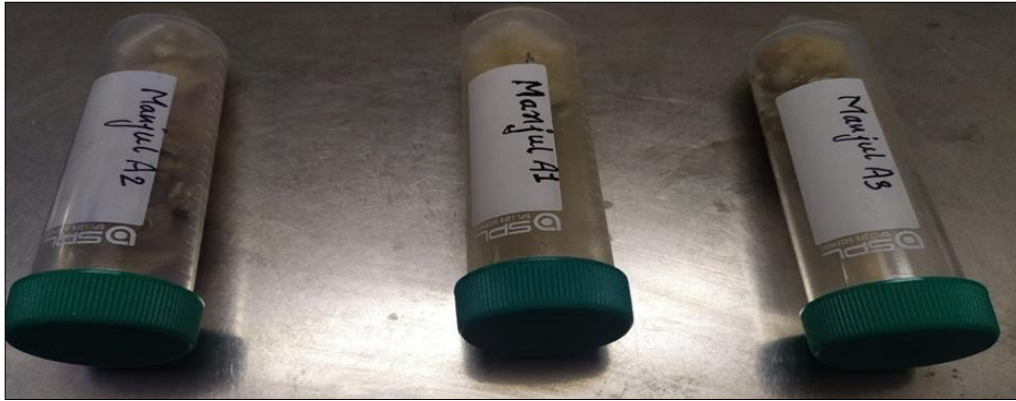


Fig 1: Blending of tissue in chloroform and methanol in 2:1 ratio

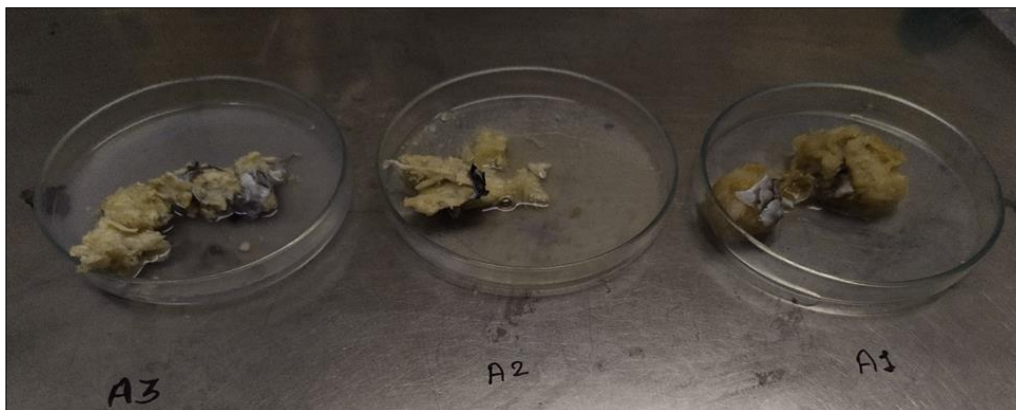


Fig 2: Homogenization of the sample inside laminar air flow.

Result and Discussion

Present study indicates that total protein and lipid concentration are affected by chilling and salting method in muscle tissue of the fish *Labeo rohita*. The total protein and lipid concentration of fresh fish muscle was comparatively higher than chilling and salting method. The total protein mean concentration (mg/g) were determined 60±20, 120±20

and 94.07±55.96 in fresh, chilled and salted fish respectively. On contrast, the total lipid concentration (mg/g) were measured as 130±0.76, 110±34.77 and 70±0.07 in fresh, chilled and salted fish. It is noticed that during chilling and salting, the total protein concentration was change as 10.00 (%) and 19.98 (%) while lipid concentration was change as 15.38 (%) and 46.15 (%).

Table 1: Concentration of total protein and percentage change (%)

Tissue type	Condition	Total protein content (mg/g of tissue)	Change in protein content (mg/g of tissue)	% change in protein
Muscle tissue	Fresh	60±20	00	00 %
	Chilled	120±20	15.02	10.00%
	Salted	94.07±55.96	30.01	19.98%

Table 2: Concentration of total lipid and percentage change (%)

Tissue type	Condition	Total lipid content (mg/gm of muscle tissue)	Change In lipid content (mg/gm of muscle tissue)	% change in lipid
Muscle tissue	Fresh	130±0.76	00	00
	Chilled	110±34.77	20	15.38%
	Salted	70±0.07	60	46.15%

As in present study, the protein and lipid content were decreased during preservation whether in ice or salt. Similarly, Vaini Gupta *et al.*, (2019), reported that during preservation in low temperature and brine (high concentrated solution of salt), the protein content was decreased due to change in proportion of chemical composition and protein breakdown in *Labeo rohita*. Gandotra *et al.*, (2013) also noticed that degradation of protein leads to increase leaching effect of amino acid and hence decrease protein content in common carp (*Cyprinus carpio*) and decrease in lipid content due to lipid hydrolysis and oxidation process in *Wallago attu*. Eight days Ice-stored *Labeo rohita* fish meat showed significant difference in total proteins and total lipid concentration K. Dhanpal *et al.*, (2013). As Meenakshi *et al.*, (2010), Lipid breakdown might be causative for such variations in the lipid content of the ice-stored in *Cyprinus carpio*. Protein content decreased at the end of the storage period. Decreased in true protein content during the storage might be due to leaching out the water soluble protein component and dilution effect caused by water uptake. It is further implicit that, proteolytic enzymes might have caused such effect by splitting the peptide bonds. Mehta *et al.*, (2011) determined that the effect of ice-storage on the functional properties of proteins from few species of fresh water fish (Indian major carps) with special emphasis on gel forming ability. Among the three species the gel strength of the obtained from *Catla catla* and *Cirrhinus mrigala* has higher than the gel obtained from *Labeo rohita* in fresh condition. Further, Gandotra *et al.*, (2017), investigated that the total protein and total lipid contents were while increasing storage period viz., -12°C and -20°C muscle tissue of *Labeo rohita*. According to the rapid penetration in the initial stage of salting and slow penetration at the latter stages indicated that exchange of water is largely responsible for the movement of salt in addition to osmosis. In dry salting, though the fish were covered by salt they could not take more salt because water exchange was practically absent. Result showed that processing and preservation methods had significant effects on the quality of *Labeo rohita* fish. It also indicates that the processing and preservation methods efficient in the post harvest management of fishery products. Chilling is the short term preservation and applied globally and salting is the traditional preservation methods.

Conclusion

Present study indicates that the chilling is the more acceptable than salting. But chilling is the short term preservation method, if fish kept under long period of time in chilled condition then the quality of fish will be declined. In addition, salting preservation method is good for long preservation of the fish but moisture, lipid and protein content will be decreased in the period of time.

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