DIVERSIFICATION OF TRADITIONAL FISH MINCE-BASED PRODUCTS

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The present study investigated the quality and consumer acceptance of flavored fish cutlets prepared from Rainbow trout (Oncorhynchus mykiss) kept under frozen storage at a temperature of -20°C. Rainbow trout member of the family Salmonidae is a high-value coldwater species exclusively present in the hilly regions of the Northern Himalayas (Uttarakhand, Himachal Pradesh, and Jammu and Kashmir) and Northeastern state. It has a prominent role in the commerce of the hilly region as well as a consumer base present across India. Products made from fish mince have the potential to be highly palatable, nutrient-rich, ready-to-cook, or ready-to-fry foods. Both customers and manufacturers are growing more interest in the market for these products. Flavored fish cutlets were made from farmed Rainbow trout mince, which was kept in frozen storage at -20°C. Various aspects of sensory and organoleptic characteristics were investigated in the interval of 15 days up to 2 months. The entire study was based on feedback received by customers and the Testing panel to conclude the feasibility of Diversification of existing products.

INTRODUCTION

Huge post-harvest losses to merchants and farmers are noted during fish handling and processing; these losses can reach 100% and occur at different points and stages of the marketing chain (Joseph et al., 1992). The potential cornerstone of this program can be value addition and the application of processing technologies to diverse fish and fishery products, which include a wide range of perishable commodities. Fish farmers operating on a large scale often face problems related to post-harvest handling and storage; fish being a highly perishable commodity results in significant losses to these farmers (Akande and Diei-Ouadi, 2010). Fish must be handled carefully immediately after being caught and until it is kept for human consumption due to its high perishability (Duarte et al., 2020). The traditional technologies used to process fish help lower postharvest losses. The steps of washing, degutting, salting, fermentation, drying, and smoking are crucial in fish preparation (Dalin et al., 2013). These processes help the products' flavor, texture, and color develop and give them better storage qualities. Fish is traditionally processed using various salting methods, including brine and dry salting. Products made from fish mince have the potential to be highly palatable, nutrient-rich, ready-to-cook, or ready-to-fry foods (Dalin et al., 2013). Both customers and manufacturers are increasingly becoming more interested in the market...
for these products. The addition of synthetic chemicals, thaw drip, lipid oxidation during frozen storage, and biochemical, sensory, and organoleptic alterations play a significant role in the quality of these products and directly affect their shelf life (Abbas et al., 2009).

In the hilly region of the Northern Himalayas, the water temperature falls below 20°C; therefore, in such conditions, limited candidate species of fish can be cultured such as CMC, Trout, and Mahseer (Singh, 2015). Apart from this productivity of aquaculture systems in the hilly regions is very low as compared to the temperate region. In general, the absence of appropriate fish species, proper technology, poor fish growth, and inadequate infrastructures has significantly underutilized Coldwater fisheries resources. Most of the region’s tribal farmers are resource-poor and only have modest to medium-sized fish ponds for aquaculture. Some Coldwater high-value fishes like Brown Trout and Rainbow Trout are more profitable to culture because of their adaptation to shallow temperatures, reasonable return cost, and better growth results but farmers associated with Coldwater aquaculture practices found it very difficult to sell their produce due to the absence of proper consumer market and marketing channel present in the hilly regions. Fish farmers operating on a large scale have good market knowledge as they export their products to different states and countries. In contrast, traditional small farmers need to be more knowledgeable about dealing with this marketing problem. Hence, they restrict themselves to limited marketing options, such as selling their produce to a minor no. of customers and using it for their consumption (Sharma et al., 2012). The high nutritional value of fish mince-based products is well known. They are good animal protein sources, vitamins A, D, E, and K, and minerals, including calcium, phosphorus, and iron (Dalin et al., 2013). Compared to other meat-based goods, producing these fish mince-based products is economically viable. Additionally, due to the low price of fish mince, they sound like a more sensible option for value addition and are gaining popularity worldwide. Development, Branding, and Marketing of these products can be a potential solution to deal with the problems mentioned above faced by the hilly fisheries sector and native fish farmers.

MATERIAL AND METHODS

Keeping these things in mind, different flavored fish cutlets were produced at EFF, ICAR-DCFR, and Champawat. Under this study following flavors were developed as mentioned below:

1. Masala fish cutlet
2. Black pepper fish cutlet
3. Schezwan fish cutlet
4. Garlic fish cutlet

These fish cutlets produced from Rainbow trout mince were further subjected to frozen storage at -20°C, shelf life evaluation, and most importantly, their acceptance among consumers. After 20 minutes of steam pressure cooking with rainbow trout chopped flesh,
the cook drip was drained. According to the ratio of fish mince to potato and other ingredients, boiled and peeled potatoes were mashed correctly and blended with all other elements. A specific amount of the material above, 40 g, was taken, rolled into a ball, and flattened into a circle 1 cm thick. The breading material was battered by dipping it in egg white and then rolling it in bread crumbs powder until the surface had a homogeneous covering. After feeding these fish cutlets to the taste panel, the appropriate portion was selected for future storage at -20°C based on their input.

Table 1: The list of ingredients

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fish mince</td>
<td>1 kg</td>
</tr>
<tr>
<td>Potatoes</td>
<td>700 gm</td>
</tr>
<tr>
<td>Salt</td>
<td>5 gm</td>
</tr>
<tr>
<td>Garlic</td>
<td>20 gm</td>
</tr>
<tr>
<td>Monosodium Glutamate</td>
<td>5 gm</td>
</tr>
<tr>
<td>Ginger</td>
<td>35 gm</td>
</tr>
<tr>
<td>Chili powder</td>
<td>30 gm</td>
</tr>
<tr>
<td>Coriander leaves</td>
<td>40 gm</td>
</tr>
<tr>
<td>Garam masala</td>
<td>15 gm</td>
</tr>
<tr>
<td>Egg white</td>
<td>5</td>
</tr>
<tr>
<td>Bread</td>
<td>14 pcs</td>
</tr>
<tr>
<td>Mustard oil</td>
<td>750 ml</td>
</tr>
</tbody>
</table>

Sensory and Organoleptic characteristics

Sensory characteristics were evaluated for fish cutlets using a 10-point scale, whereas organoleptic properties were measured on a 9-point hedonic scale. Analysis was conducted on randomly selected samples immediately after the removal of frozen storage. The ranks from each model were evaluated for appearance, color, odor, taste, texture, and overall acceptability using a hedonic scale. The score for each attribute was presented. A score of 6 and above indicated good quality. The limit of acceptability was 4.
RESULT AND DISCUSSION

Sensory Evaluation

The tables and figures below include information on the sensory qualities of fish cutlets that have been diversified with flavor and kept in Frozen storage for two months. By the end of the 60-day storage period, the fish cutlets’ smell and general acceptability had significantly changed. However, flavor and color had not considerably changed. The sensory metrics of scent, color, taste-flavor, and public acceptability were altered, but overall acceptability was good. The results for paint, general acceptability, taste, and odor are shown in Table 2-6, respectively. These factors were crucial in determining the ultimate state of fish cutlet samples after storage.

Table 2: Comparative analysis to study the effect on overall acceptability of following fish cutlet samples at storage temperature -20°.

<table>
<thead>
<tr>
<th>Samples</th>
<th>On 15th day</th>
<th>On 30th day</th>
<th>On 45th day</th>
<th>On 60th day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Masala fish cutlet</td>
<td>9.50</td>
<td>8.75</td>
<td>8.25</td>
<td>7.75</td>
</tr>
<tr>
<td>Black pepper fish cutlet</td>
<td>9.50</td>
<td>9.00</td>
<td>8.50</td>
<td>8.00</td>
</tr>
<tr>
<td>Schezwan fish cutlet</td>
<td>9.50</td>
<td>9.00</td>
<td>8.75</td>
<td>8.25</td>
</tr>
<tr>
<td>Garlic fish cutlet</td>
<td>9.50</td>
<td>9.25</td>
<td>8.75</td>
<td>8.50</td>
</tr>
</tbody>
</table>

Table 3: Comparative analysis to study the effect on taste-flavor of following fish cutlet samples at storage temperature -20°.

<table>
<thead>
<tr>
<th>Samples</th>
<th>On 15th day</th>
<th>On 30th day</th>
<th>On 45th day</th>
<th>On 60th day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Masala fish cutlet</td>
<td>9.50</td>
<td>8.75</td>
<td>8.50</td>
<td>8.00</td>
</tr>
<tr>
<td>Black pepper fish cutlet</td>
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<td>9.00</td>
<td>8.50</td>
<td>8.00</td>
</tr>
<tr>
<td>Schezwan fish cutlet</td>
<td>9.50</td>
<td>9.00</td>
<td>8.75</td>
<td>8.25</td>
</tr>
<tr>
<td>Garlic fish cutlet</td>
<td>9.50</td>
<td>9.25</td>
<td>9.00</td>
<td>8.50</td>
</tr>
</tbody>
</table>
Table 4: Comparative analysis to study the effect on the odor of following fish cutlet samples at storage temperature -20°.

<table>
<thead>
<tr>
<th>Samples</th>
<th>On 15th day</th>
<th>On 30th day</th>
<th>On 45th day</th>
<th>On 60th day</th>
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<td>8.50</td>
<td>8.00</td>
</tr>
<tr>
<td>Schezwan fish cutlet</td>
<td>9.50</td>
<td>9.00</td>
<td>8.50</td>
<td>8.00</td>
</tr>
<tr>
<td>Garlic fish cutlet</td>
<td>9.50</td>
<td>9.25</td>
<td>8.75</td>
<td>8.25</td>
</tr>
</tbody>
</table>

Table 5: Comparative analysis to study the effect on the texture of following fish cutlet samples at storage temperature -20°.

<table>
<thead>
<tr>
<th>Samples</th>
<th>On 15th day</th>
<th>On 30th day</th>
<th>On 45th day</th>
<th>On 60th day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Masala fish cutlet</td>
<td>9.50</td>
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<td>8.75</td>
<td>8.50</td>
<td>8.00</td>
</tr>
<tr>
<td>Schezwan fish cutlet</td>
<td>9.50</td>
<td>9.00</td>
<td>8.50</td>
<td>8.25</td>
</tr>
<tr>
<td>Garlic fish cutlet</td>
<td>9.50</td>
<td>9.25</td>
<td>8.75</td>
<td>8.50</td>
</tr>
</tbody>
</table>

Table 6: Comparative analysis to study the effect on the colour of the following fish cutlet samples at storage temperature -20°.

<table>
<thead>
<tr>
<th>Samples</th>
<th>On 15th day</th>
<th>On 30th day</th>
<th>On 45th day</th>
<th>On 60th day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Masala fish cutlet</td>
<td>9.5</td>
<td>8</td>
<td>7</td>
<td>6</td>
</tr>
<tr>
<td>Black pepper fish cutlet</td>
<td>9.5</td>
<td>9</td>
<td>8</td>
<td>8</td>
</tr>
<tr>
<td>Schezwan fish cutlet</td>
<td>9.5</td>
<td>9</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>Garlic fish cutlet</td>
<td>9.5</td>
<td>9</td>
<td>8</td>
<td>8</td>
</tr>
</tbody>
</table>

Even after 60 days of frozen storage, these samples were in sound condition, which can be stored longer for further evaluation of Sensory characteristics.

CONCLUSION

Anything made from fish mince is so simple and convenient to prepare that anyone may set up a small production facility home using the proper storage techniques. Fish value-
added products are more profitable as compared to other meat-based items. Improved fundamental knowledge of the processes determining texture in new inventions will provide a suitable commercial outcome with a higher possibility of consumer acceptability. Due to their busy schedules and lengthy workdays, people today hardly ever have time to prepare meals, which fuels the demand for "ready to cook" or "ready to serve" food products. Fish that are already cooked or ready to serve, as well as products related to the fishing industry, are highly received by consumers worldwide and in India.

Due to the high value of rainbow trout, the post-harvest loss is not an option. Rainbow trout is limited to cold waters of the Northern Himalayas and North Eastern states, due to which high consumer demand is observed all over India. Making it available in sound condition to customers is challenging due to the need for suitable storage infrastructure and modes of transportation. Introducing fish processing technology and Value addition at root levels will be game-changing for the entire fisheries sector as it will reduce high dependence on agriculture by attracting farmers to the Fisheries sector. Establishing such small-scale production facilities will ultimately popularize the fisheries sector all over the country. It will also help in the socio-economic upliftment of many fish farmers by generating employment opportunities. Compared to other products in the market, products made with fish mince are less popular. This area of the fisheries sector still needs to catch up and requires special attention and fresh ideas to advance despite the ample amount of fish produced in our nation. It is impossible to underestimate the evolution and inventive improvisation in fish handling procedures that can be developed significantly when aquaculture growth is advancing quickly and gaining speed. Though many possible products can be prepared from Fish Mince, the current emphasis is to create a fish mince-based product that is affordable, easy to make, and well-liked by consumers. One such product that can be produced traditionally and matches our study is the fish cutlet. Diversification in the production of fish cutlets will change the product's marketing structure and will definitely boost consumer demand.

REFERENCES


