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Development and Quality Assessment of Fish Flavored Potato Chips and Its Consumer Acceptance.

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ABSTRACT

Present study was conducted to develop fish flavored potato chips and finding out the effect of *Labeo rohita* fish powder on it. Fish was filtered and pressed using a hand extruder removed excess water from the steam cooked product and treated with ethanol at 70 - 80°C. Further the fish powder was dried and packed in LDPE pouches. Biochemical and mineral assessment of the edible fish powder found to be possessing excellent protein, lipid and essential mineral contents. The result of organoleptic test was adjudged to be the best by the panelists using 1-9 hedonic scale and ranked as "like very much" securing score 8.0 which containing fish power.

Keywords: fish flavoured, potato chips, *Labeo rohita.*

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INTRODUCTION

Fish is one of the main food components in our diet as it includes essential fatty acids, amino acids and some of the principal vitamins and minerals in required quantities [1]. Significance of fish doesn't come exactly from the presence of fascinating metabolites or bioactive compounds, but from its balanced proximate composition. Principal composition of fish is 66-81% water, 16-21% protein, 0.2-15% fat, 1.2-1.5% mineral and 0-0.5% carbohydrate [2, 3]. In addition to these, fish is also a rich source of vitamins A, D, E, and K [4, 5]. The composition, however, varies greatly from species to species [6]. Irrespective of the variations observed, fish is always a good source of healthy diet with desired quantity of protein, lipid, and carbohydrate that contribute to the total energy content of an organism while water and ash contribute mass. Based on the demand in the last fifty years, fish production in the world has increased from 23.50 million tones to 170.48 million tones. Correspondingly, the share of India in global fish production has grown gradually from about 2.66% to 4.7% at present, as the largest producer of fish in the world and higher enhancement levels as compared to world fish production levels. But unfortunately the current production rate is way high than the utilization or demand. So alternative ways are required to either store or convert the fishes into other products for enhancing the shelf life.

Currently developing and underdeveloped countries are facing a serious nutritional problem due to acute shortage of protein in the diet. On the other hand people have developed taste for junk food over their healthy, nutritious whole food counterparts. Eating junk food especially potato chips of different flavors regularly is linked to obesity and chronic health conditions such as high blood pressure, cancer, diabetes etc. By introducing moderate protein and required amounts of unsaturated fatty acids from natural source into these junk food items through scientific methods can solve both the problems.

Protein deficiency can be minimized by supplying sufficient amount of fish instead of low nutrient value foods. Instant fish powder can provide a certain amount protein in the diet. The muscle of Indian major carp (*Labeo rohita*) posses all the useful qualities to be used for the production of various value added products (7, 8 & 9). Among the value added fish products instant fish powder, which readily mix in curries, soups, rice and especially it can be added in junk food in order to make it healthy and testy. Present study was carried out with the objectives to formulate fish flavor potato chips as a complete instant food, examine the effect of fish powder for a period of three months, evaluate the nutrient specification and organoleptic analysis of the product.

MATERIALS AND METHODS

Labeo rohita were collected from Mangalagiri fish market and brought to the laboratory in clean polythene bags kept in ice box under hygienic condition.

Preparation of Edible Fish Powder

Edible fish powder was prepared as per method described [10] with some modifications. The fins, head and viscera were removed. The sample was washed thoroughly in running tap water and minced in a mincer. About 0.5% acetic acid was added to the meat. It was heated for 30 minutes and then filtered and pressed. The pressed cake was heated at 70-80°C in a water bath with ethanol (1:2) for 1 hour to remove fat and moisture from the meat. The solvent was drained and the extraction was repeated twice. The fish powder was dried properly and packed in 100 g in 200 gauge low-density polyethylene (LDPE) sachets and stored at room temperature. The powders were analyzed at monthly intervals for a period of five months.

Proximate Composition

The proximate composition such as moisture content, protein, lipid and ash were determined according to AOAC [11] standard method. The moisture content was determined by drying the samples in a hot air oven at 100 -105°C for 16 hours until a constant weight was obtained. Protein content was estimated by following Lowry's method [12]. Lipid content is determined by using gravimetric method of Folch et al. [13]. Total ash content was determined by combusting the samples in the furnace at 550°C until the white color of samples. Carbohydrate content was determined by the method of Hedge and Hofreiter [14] using anthron and hydrochloric acid.

Mineral Analysis

The samples were digested with concentrated nitric acid and perchloric acid (3:1, v/v) until a clear and transparent solution was obtained. The digested samples were filtered using Whatman no.1filter paper and diluted with double distilled water and made as 500 ml in a volumetric flask. After wet digestion, samples were analyzed for Calcium, Iron, Sodium and Potassium concentrations according to APHA [15] through Atomic Absorption Spectrometry (ELICO, SL 194 Model).

Microbial Changes

Pathogenic bacteria like *Escherichia coli* (MPN value); Salmonella and Vibrio (25 g) were enumerated by following the method of USFDA [16].

Sensory Quality Evaluation

Sensory quality such as intensity of fish flavor and taste of edible fish powder prepared from *Labeo rohita* was tested separately. Fresh edible fish powder and at monthly storage intervals 10% edible fish powder was added to boiling water continued boiling for 10 minutes, after which the panel members (n=5) were asked to judge the intensity of the fish flavor and taste. The assessment was given on a 5 point score (0 to 5) by the panel members with a score of 2 being the limit of acceptability, ingredients of the common foods items such as Ragi fish

Organoleptic Analysis

The organoleptic quality of potato chips with edible fish powder was served to a taste panel of 6 to 8 members and appearance, color, odor, taste texture and overall acceptability was determined by using hedonic scale of 1 to 9 [17] and the dishes were rated as 9 for excellent 6 for good and below 4 for poor or unacceptable.

RESULTS AND DISCUSSION

The prepared edible fish powder was colorless and odorless and almost contained 65% of protein. Most of the food items contain high percentage of carbohydrates and fat both of which are needed for energy production and source of calories. Other nutrients like vitamins, mineral and protein are relatively in small proportion. Edible fish powder had good protein and mineral content. Acetic acid was used by protecting the product for longer time. Filter and pressing using a hand extruder removed excess water from the steam cooked product. Then the press cake was treated with ethanol to remove the fat and moisture from meat using a water bath at 70 - 80°C. The protein concentrate was dried in a hot air oven at 50°C for five hours. The moisture content of the dried product was reduced below 6% level for microbial safety. The dried product was ground and packed in LDPE pouches.

Table 1: Proximate composition and mineral assessment of edible fish powder

Biological Parameters	Initial	1st Month
Moisture (%)	2.79	3.89
Protein (%)	65.4	60
Lipid (%)	0.2	0.04
Calcium (mg/100g)	12.0	11.6
Potassium (mg/100g)	5.9	5.2
Iron (mg/100g)	98	81
Sodium (mg/100g)	148	153
P^H	7.5	6
E. coli	4	absent
Salmonella	absent	absent
Vibrio	absent	absent

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Table 2: Organoleptic characters of edible fish powder

Storage period	Appearance	Color	Odor	Taste	Texture	Flavor	Overall acceptability
Initial	8.7	8.8	8.9	8.5	8.8	8.0	9
1 Month	8.65	8.7	8.5	8.6	8.9	8.1	9
2ND Month	8.5	8.4	8.4	8.25	8.4	8.4	9
3RD Month	8.1	8.5	8.8	8.2	8.0	8.0	8.9

Table 3: Organoleptic analysis of fish flavored chips

Organoleptic parameters	Initial	1st month	2nd month	3rd month
Appearance	9	8.1	8	8.5
Color	8	8.2	7.9	7.5
Odor	8	7.9	7	8
Taste	9	8	9	9
Texture	8	8	8	8
Flavor	9	8.1	9	9
Overall acceptability	9	8.1	9	8

Nutritional composition and quality of fresh and edible fish powder made out of rohu species is given in Table 1. Edible fish powder was rich in protein and minerals like calcium, potassium, sodium and iron. The calcium and phosphorus content of edible fish powder made from rohu was 12 mg/100g and 5.9 mg/100g respectively. Whereas iron and sodium content of the edible fish powder was 98 mg/100g and 148 mg/100g, respectively. The source of high mineral content of this product was mainly from bones of the fish, which were otherwise discarded. The proximate composition of fresh *Labeo rohita* value was similar to our previous reports [18]. The moisture content of the edible fish powder was 2.79 as tabulated (1). Moisture content below 10% was preferred for fish products to inhibit microbial growth [19].

The pH of the fishery products has an important influence on the quality of product because the value of pH has direct influences on bacterial growth. The lower pH of the sample slows the bacterial growth and increase in pH is directly proportional to the growth of bacteria [20]. In our study also, during the storage period the pH values decreased therefore total plate count also decreased throughout the storage period. Moreover, rohu species were steam cooked in the pre-preparation of edible fish powder which might have killed the pathogens such as *E. coli*, *Salmonella* and *Vibrio*. Moreover, low density polyethylene (LDPE) sachets were used to store the edible fish powder because dry foods are prone to the attacks of moulds and bacteria. Moreover upon exposed to moist air they start absorption of water, hence good packaging is essential to retain the original quality [10]. Readily available packaging material (LDPE pouch) preserved the quality of edible fish powder without any adverse effect up to 3 months.

Sensory scores of the edible fish powders and its storage at ambient temperature for three months were as tabulated (3). The storage has no significant changes in the product's texture, odor, taste, appearance and the acceptability. Fish powder was incorporated as a supplement to potato chips for human consumption and it was highly accepted by the healthy volunteers participated in the study. Sensory quality such as intensity of the fish flavor was tested periodically after every 30 days against potato chips and organoleptic quality these chips were presented in table (4). The color of fish flavored potato chips scored between 8 to 7.5 and taste had scored 9, this character is highly accepted by the volunteers.

CONCLUSION

In the present study edible fish powder was processed from *Labeo rohita*, which had excellent color, odor and required mineral content. Nutritional studies conformed that this edible fish powder can be added as food additive due to their rich in protein and low lipid and carbohydrate. Current results suggested that the product could be an alternative source of protein and mineral for consumers through food fortification of potato chips. However, further study is required to assess the commercial potential of the edible powder product.

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