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## Development of a Functional Snack Food Product with *Cyprinus carpio* (Linnaeus, 1758)

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**Abstract** In this study, it was aimed to product of a functional snack food using Mirror carp (*Cyprinus carpio*, Linnaeus, 1758). Snack Food mixture with a ratio 14% minced fish, 10% flour, 20% oatmeal, 5% hazelnut, 5% almond, 2% salt, 40% cold water (4 °C) and 4% sunflower oil were added and stirred until a homogenous mixture was obtained. The mixture was compressed in an extractor and baked. Food composition (moisture, raw protein, raw oil, raw ash, carbohydrate) and sensorial quality of the samples. The general acceptability scores of snack foods A samples according to B samples received higher scores by the panelists.

**Keywords** Snack foods; *Cyprinus carpio*; Fish Snacks; crispy; food composition; sensory quality

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### Introduction

One of the recommended strategies to improve dietary quality in face of the current worldwide epidemics of chronic diseases and obesity is to increase the consumption of fish. In order to increase fish consumption, strategies are required to overcome or bypass certain limitations of commercialization and acceptability of fish. The biggest role to increase fish consumption is to provide processed and manufactured fish products preserving the high nutritional value of fish and meeting customer expectations [1]. Therefore, if snack foods are consumed frequently between meals this might result in excessive energy intake. It is considered that it would be worth to enrich these products with fish meat since they are consumed in large volumes today [2].

There exists an opportunity of incorporating local staple cereals, like flour in the fish mince and making dried products. Worldwide, several value-added mince fish products have been developed [3-5] and continue to be developed.

The present study aims to investigate the effect of fish meat on chemical composition, and sensorial characteristics of fish snacks in order to supply an alternative food, snack foods containing meat of *Cyprinus carpio* aquacultured in Turkey.

### Material and Methods

Within this study, *Cyprinus carpio* fishes with certain economic value were procured from fisheries in Pertek territory in the Keban Dam Lake. Fishes were transferred in insulated polyurethane carriage boxes with ice in them to the laboratory set in the Pertek Vocational College. Then, they were processed in the very same day. After fish fillets were prepared, they were rinsed with fresh water. Then, they were boiled in water for 20 minutes before grounding in blender.

### Formulation /Preparation of Fish Snacks (Fish Crisp)

The method used was based on Oduor-Odote and Kazungu (2008) [5], with some modifications. The rest of the ingredients were minced fish, flour, oatmeal, hazelnut, almond, salt, cold water (4 °C) and sunflower oil. The snack



food mixture was mixed using a TEFAL kitchen mixer until a homogenous mixture was obtained. The mixture was compressed as long rods with a 30 mm diameter extractor on a tray covered with oven paper. The tray was placed in an oven previously heated to  $170 \pm 2$  °C and baked for 30 minutes. The Fish Snacks were cooled to room temperature and packed in closed bags.

### Chemical Analyzes

Moisture content% was determined by drying the sample at 100 °C until constant weight was obtained. [6]. Crude Protein% was determined according to AOAC procedure with crude protein% analysis [7]. In analysis of crude fat% content, Soxhlet (Extraction) method was employed [8]. The percentage of crude ash% content was determined by means of crude ash% burning method [7]. Carbohydrate value was determined by subtracting total moisture, crude ash% , crude protein% and crude fat% amount percentages found during analysis from 100 [9].

### Sensory Analysis

Sensory analyses on samples were conducted by a group of panelist (n=40) aged 18-65. Each panelist sensorial examined snack foods samples in terms of their colour, odour, flavour appearance and general acceptability (5—Very Good to 1—Very Bad) [10].

**Table 1:** Sensory analysis scoring form [10]

Panelist name:		Date:			
Group	Colour	Odour	Flavour	Appearance	General acceptability
<b>Control</b>					
<b>Fish Snacks</b>					

### Results

Table 2 exhibits chemical compositions of prepared samples. According to the Table 2, average moisture, protein, fat, ash, carbohydrate contents of fish meat ingredient of fish snacks samples were determined as follows 75.50%, 15.33%, 5.85%, 1.01% and 2.31%, respectively. Table 2 exhibits moisture%, protein%, fat%, ash% and carbohydrate % amount of prepared sanck foods paste as they were containing fish meat in various proportions. Of considered samples, whereas the highest crude protein% amount was determined with the group B and paste (B), respectively; the lowest crude protein% amount was determined with group A at 11.51% (Table 2). Two groups displayed similarity in terms of fat amounts in snack foods samples, the highest crude protein% amount was determined at the group B and paste (B) (Table 2). Whereas the highest crude ash % percentage measured with snack foods enriched with fish meat was estimated with group B at 3.51%; the lowest percentage was estimated with group A at 3.33%. In terms of percentage of carbohydrate% content of prepared samples, it was estimated with group A and B at 62.40% and 59.25%, respectively. For paste samples, the same Carbohydrate% value was estimated with group A and B at 23.06% and 21.09%, respectively (Table 2).

**Table 2:** Food Composition of Fish Snacks Samples

	Moisture %	Crude Protein %	Crude Fat %	Crude Ash %	Carbohydrat %
<i>Mirror carp</i>	75.50	15.33	5.85	1.01	2.31
<i>A Paste</i>	50.10	13.34	10.95	2.55	23.06
<i>B Paste</i>	50.00	15.34	11.23	2.34	21.09
<i>A</i>	5.25	11.51	17.51	3.33	62.40
<i>B</i>	6.21	13.01	18.02	3.51	59.25

**A:** Control, **B:** Fish Snacks



Sample snack foods were also evaluated by participants in terms of color, odour, taste, appearance and general acceptability (Figure 1). According to Figure 1, when samples were evaluated by respondents in terms of general acceptability, it was seen that the highest score was given to group A; and the lowest score was given to group B.

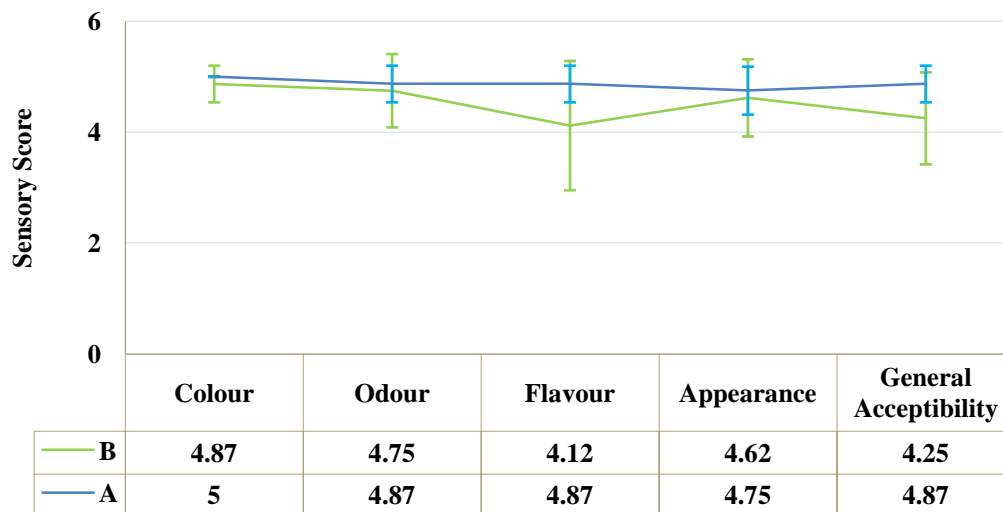


Figure 1: Sensory Change in Fish Snacks Samples

### Discussions

Table 2 exhibits chemical compositions of prepared samples. According to the Table 2, average moisture, protein, fat, ash, carbohydrate contents of fish meat ingredient of fish snacks samples were determined as follows 75.50%, 15.33%, 5.85%, 1.01% and 2.31%, respectively. In parallel to these findings, Duman and Dartay (2007) [11], reported in their study conducted on *Cyprinus carpio* fillet that moisture, protein, fat and ash percentages were  $78.49 \pm 0.23\%$ ,  $17.18 \pm 0.98\%$ ,  $2.16 \pm 0.41\%$  and  $0.86 \pm 0.13\%$ , respectively. Of considered samples, whereas the highest crude protein% amount was determined with the group B (13.01%) and paste (B) (15.34%), respectively; the lowest crude protein% amount was determined with group A at 11.51% (Table 2). Two groups displayed similarity in terms of fat amounts in snack foods samples, the highest crude protein% amount was determined at the group B and paste (B) (Table 2). Whereas the highest crude ash% percentage measured with snack foods enriched with fish meat was estimated with group B at 3.51%; the lowest percentage was estimated with group A at 3.33%. In terms of percentage of carbohydrate% content of prepared samples, it was estimated with group A and B at 62.40% and 59.25%, respectively. For paste samples, the same Carbohydrate % value was estimated with group A and B at 23.06% and 21.09%, respectively (Table 2). According to another study in the literature, amounts of constituents in per 100 g of substance were determined measured; and ash%, moisture%, protein%, fat% and carbohydrate% percentages were reported as 2.55, 10.00, 11.68, 6.74 and 69.08, respectively [12]. In another study on cake paste, moisture %, crude ash%, crude fat% and crude protein% content percentages of mixture were reported as  $58.32 \pm 0.70$ ,  $0.45 \pm 0.02$ ,  $2.58 \pm 0.37$  and  $4.23 \pm 0.50$ , respectively. These findings are similar to our findings. However, fat ,protein, ash amounts were found to be lower than the values found in our study [13]. This situation could be associated with the different proportions in paste mixture. In the same line, Yağmur et al. (2005)[14], In these products, average moisture, protein fat, carbohydrate and ash were determined as 5.54%, 6.48%, 18.49%, 68.43% and 1.08%, respectively. These findings displayed similarity with our findings. In the same line, Karaton Kuzgun (2017)[2], in these products, average moisture, protein, fat, carbohydrate and ash were determined as  $7.10 \pm 1.50\%$ ,  $15.00 \pm 1.00\%$ , %,  $32.50 \pm 0.50\%$ ,  $41.50 \pm 2.50\%$  and  $3.50 \pm 0.50\%$ , respectively. These findings displayed similarity with our findings.

Sample snack foods were also evaluated by participants in terms of color, odour, taste, appearance and general acceptability (Figure 1). Sample snack foods were scored the same in two groups (A,B) in terms of their color



(5.00±0.00-4.87±0.33) (Figure 1). When snack foods samples were evaluated by participants in terms of their odour, the highest score was given to samples from group A (4.87±0.33), the lowest score was given to the samples from group B (4.75±0.66) (Figure 1). As it was seen from Figure 1, in sensorial analysis of samples for their flavour, whereas group A samples were given 4.87±0.33 score, group B samples were given 4.12±1.16. According to Figure 1, when samples were evaluated by respondents in terms of general acceptability, it was seen that the highest score (4.87±0.33) was given to group A; and the lowest score (4.25±0.82) was given to group B. Karaton Kuzgun and Gürel İnanlı, (2017) [15], determined in their study conducted on cracker that general acceptability score of the cracker as 4.75±0.43-4.00±0.00. This value coincides with our findings.

### Conclusion

The development of sensory acceptability of fish snacks (made from fresh fish species) of high nutritional value can be a strategy to increase fish consumption and strategy to improve the quality of the diet of people by providing a low-fat, low-calorie food product (snack foods) that is accepted worldwide. Consumers can expand the product at home by deep frying and, besides, this might be the subject of a future study.

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