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Determination of Amino Acid Profile of Sea Bass Cooked in Microwave Oven

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Abstract

It is evident that fish and fish products constitute a significant dietary source of animal origin for humans, playing a crucial role in the human nutrition. These products are of esential importance in ensuring adequate and balanced nutrition. The nutritional value of fish is subject to variation depending on the species; however, it is widely considered to be an excellent source of protein. In addition, fish products contain significant levels of omega-3 and other fatty acids necessary for our body. The present research aimed to determine the amino acid profile and some quality parameters of sea bass cooked using microwave. While the average pH value of the sea bass fish used in the study was 6.39, their moisture content was determined as 73.58%. Additionally, fifteen different amino acids were examined in the study. The amino acid content of the sea bass samples was found to vary between 1.97 and 178.22 µg/g. Major amino acids were determined as lysine, glycine, glutamate, alanine, proline and phenylalanine.

Key Words: *Fish, microwave, sea bass, cooking, amino acid profile*

Introduction

It is an irrefutable fact that foods of animal origin (such as red meat, chicken and fish) are indispensable products of human nutrition. Notably, fish constitutes a significant protein and nutrient source, essential for maintaining a healthy diet (Savaş et al., 2021; Savaş et al., 2023; Borrull et al., 2025). The nutritional composition of fish and its products is subject to variation due to a number of factors, including species, genus, age and geographical location. As is well documented, fish products boast a highly sophisticated composition in terms of both macro and micro components. Notably, fish proteins are distinguished by their complete amino acid profile, which is indispensable for the protection and development of body tissues (Turan et al., 2006).

Türkiye has the potential to become a significant producer of fish products. The region's strategic positioning, encompassed by seas and boasting approximately 25 million hectares of arable land conducive to aquaculture, confers a series of substantial benefits. Sea bass (Dicentrarchus labrax), a highly regarded fish product, is one of the fish species produced and consumed in Turkey and the Mediterranean countries (Alpaslan and Baygar, 2009; Karahan, 2009).

The consumption of meat products is typically followed by a process of cooking. While the cooking process provides both flavour and aroma to meat and meat products, it also contributes to the production of a microbially consumable product. However, in addition to the loss of nutrients due to inadequate cooking conditions, there is also the formation of mutagenic and/or carcinogenic compounds (Savaş et al., 2021; Savaş et al., 2023).

A substantial number of epidemiological studies have been published which demonstrate the significant role that nutrients and dietary habits play in certain diseases to which the societies is exposed. Consequently, there is an increasing awareness of the necessity to adopt a more conscious approach to eating. In this context, the number of studies on fish with a high nutritional composition continues to increase. In the present study, the analysis of sea bass fish was conducted in accordance with a range of quality parameters and amino acid profiles, utilising a microwave oven as the primary analytical instrument.

Materials and Methods

The sea bass (Dicentrarchus labrax) used as raw material in the research were obtained from the fish market in Giresun province. Special care was taken to ensure that the weight and size of the purchased fish were similar.

Cooking process

Samples of fish were transferred to the laboratory in a refrigerated environment and then subjected to a meticulous cleaning process to remove any internal organs. The fish samples were divided into two parts and cooked in a

microwave oven (MD 211DG, Arçelik, Turkey) with skin for a duration of 14 minutes. No oil and spices were used during the cooking process.

Water content ve pH analysis

Water content and pH values of the samples were determined according to the methods of Gokalp et al. (2010).

Free Amino Acid Screening with LC-MS/MS

The extraction of free amino acids from the samples was conducted as follows: 0.5 g of each sample was homogenised with 40 ml of 0.1 M HCl solution. The homogenate was then stored at 4°C for a period of 12 hours. Subsequently, the samples were subjected to centrifugation (MR 23i, Thermo Fisher Scientific) at 10000 g for 50 minutes at 4°C. Following extraction, the samples were filtered through a PTFE filter (Isolab 0.45 um) and transferred to a capped vial (Antoine et al., 1999; Oz, 2018).

Analyses were performed using a combined system of liquid chromatography (Spark Holland) and tandem mass spectroscopy (AB SCIEX 4000 QTRAP). The conditions for chromatographic analysis were; a C18 type column (Inertsil ODS-3V 250 mm x 4.6 mm, 5 µm), injection volume 10 µL, flow rate 0.700 mL/min and column oven temperature 30°C.

Statistical analysis

The present study was conducted using a completely randomised design with three replicates. All the data were presented as the mean ± standard deviation of the mean.

Results and Discussion

The water and pH values of the sea bass (Dicentrarchus labrax) used as raw material in the research were determined as %73.58±0.79 and 6.39 ± 0.03, respectively. Indeed, a preponderance of studies conducted hitherto have yielded analogous results (Türkkan et al., 2008; Sumi et al., 2025).

The amino acid profile of sea bass samples subjected to microwave-based cooking techniques in the present study is outlined in Table 1. In the present study, the amino acid composition of sea bass samples was analysed. The amino acid content of the samples exhibited a range from 1.97 to 178.22 µg/g. Subsequent analysis of the results yielded the determination that the predominant amino acids were lysine, glycine, alanine, glutamate, methionine, leucine, isoleucine and phenylalanine. Similar studies have been conducted in the literature (Baki et al., 2015). Sumi et al. (2025) determined seventeen different amino acids in their study on cultured and wild sea bass and reported that the amino acid contents of the samples varied between 17.11 mg/g and 116.03 mg/g.

Table 1. Amino acid profile of sea bass fish samples

Amino acid profile	Sea bass (µg/g)
Lysine	29.93±0.96
Histidine	1.99±0.10
Glycine	178.22±4.92
Serine	2.07±0.18
Alanine	137.29±3.72
Glutamic acid	72.44±1.55
Cysteine	6.83±0.14
Aspartic acid	18.94±1.13
Proline	16.96±0.77
Methionine	91.06±1.90
Leucine	29.93±0.88
Isoleucine	18.68±0.12
Tyrosine	5.29±0.17
Phenylalanine	57.85±1.03
Tryptophan	1.97±0.06

Conclusion

It is evident that fish and fish products constitute a significant component of the human diet, representing a vital source of animal protein. As is well documented, fish products exhibit a rich fatty acid profile and constitute a significant protein source. Furthermore, it is a rich source of essential and non-essential amino acids. The present study investigates the amino acid profile of sea bass fish. In this study, the amino acid profile of sea bass was examined after cooking it using microwave and fifteen different amino acids were determined. The effect of cooking on the nutritional composition of meat and meat products is significant. Consequently, there is a necessity for further research to ascertain the most suitable cooking methods.

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