



AMINO ACID AND PROTEIN CHANGES IN TILAPIA AND SPANISH MACKEREL AFTER IRRADIATION AND STORAGE

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Abstract—Some amino acids in tilapia decreased while some others increased when subjected to doses up to 10.0 kGy. However, 10 kGy contributed to a significant reduction in all amino acids of Spanish mackerel. Variations in amino acid contents continued during post-irradiation storage with no consistent trend of increase or decrease. SDS-PAGE of protein from both fish showed 27 bands of subunits with MW < 14.0–94.0 KD. Isoelectric focusing patterns of sarcoplasmic protein of unirradiated and irradiated fish showed no change in the number of bands, while some changes were observed in the intensities of the anodic and cathodic bands depending on isoelectric points (pIs). © 1998 Elsevier Science Ltd. All rights reserved

INTRODUCTION

Tilapia (low-fat fish) and Spanish mackerel (high-fat fish) are an important food fish in several parts of the world and particularly in Saudi Arabia. Extension of shelf life of such products means maintaining availability and minimizing losses. Irradiation is gaining more attention as a possible method of preservation of food since minor effects upon the nutritional value of the macronutrients in foods are expected from the use of this technology because of the small amounts of energy involved. However, experimental investigation is necessary to determine the effects that actually occur and especially to check the response of different classes of nutrients (CAST, 1986).

The effects of irradiation on the amino acids of fish have been studied by several researchers (Brooke *et al.*, 1964, 1966; Kardashev *et al.*, 1970; Underdal *et al.*, 1973, 1976; Oku, 1983a,b). Other publications (Taub *et al.*, 1979; Zabielski *et al.*, 1984; Hassan, 1990) used sodium dodecyl sulfate polyacrylamide gel electrophoresis (SDS-PAGE) and/or isoelectric focusing (IEF) to detect the effect of irradiation on meat proteins. These studies indicated that when proteins were treated with ionizing energy, large protein molecules were cleaved into smaller ones that upon digestion yielded the same amino acids as the original proteins. Some of these studies demonstrated both fragmentation and aggregation. Moreover, minimal change was noticed

in total amino acid profiles as a result of treatment with irradiation, consequently no effects of major nutritional significance were found (Underdal *et al.*, 1973, 1976). However, Thayer (1990) described no essential change in amino acid content of chicken treated with a sterilizing dose of irradiation.

The objective of this study was to detect changes in amino acids and proteins of tilapia and Spanish mackerel caused by irradiation and post-irradiation storage at $2 \pm 2^\circ\text{C}$, for up to 20 days.

MATERIALS AND METHODS

Preparation and irradiation of fish

Tilapia samples (*Tilapia nilotica* \times *T. aurea*) were purchased from an aquatic farm in Al-Kharg (80 km south of Riyadh) and transported alive to the Meat Laboratory in the Food Science Department, King Saud University. The fish were then killed, gutted, and washed. The gutted fish were iced and placed in isolated boxes (Rubbermaid, Medina, OH; dimensions: 1 96.25 cm \times w 42.5 cm \times h 42.25 cm).

Approximately 160 kg Spanish mackerel (*Scomberomorus commerson*), were obtained from the Qatif fish market in the Eastern province of Saudi Arabia. This market is one of the main sources of fish in the kingdom. The fish had been caught off the fishing ground at the Eastern coast (Arabian Gulf) of Dammam and purchased 3 h after catching in the late evening. The fish were iced and arranged in plastic isolated boxes (25 kg ca-

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