

Title:

ESR for Food Irradiation Detection

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Introduction

Food irradiation is considered as a highly effective processing technology to improve and maintain food safety. As the absorption of the maximal allowed dose for food irradiation in Europe (10 kGy) leads only to an absorption of very few but effective energy, the radiolytic products that are formed remains predominantly not radiation specific. That's why, before 1990, the scientific community considered that food irradiation detection by the analysis of the food components was impossible. Now, ten official CEN protocols allow the control of the European trade by the official food control organizations. Three of these protocols are based on the ESR analysis of primary radiolytic products.

Methods

The Bruker ESR spectrometer, type ECS 106, was equipped with a TMH ECS 4108/9105 cylindrical resonator. The irradiated food samples were prepared according to the European protocols. The analysis of irradiated ingredients mixed in complex food samples were done accordingly to the protocol published by Marchioni et al. It consists in a smooth (55°C, pH8) extraction with an aqueous Alcalase-SDS enzymatic solution followed by a purification by density using a high density ($d=2$) aqueous solution of polytungstate.

Results

The spectra obtained thanks to the different protocols are presented and the performances of the analytical protocols are evaluated. Mechanically recovered poultry meat (MRM) is currently the food most frequently subjected to irradiation. This food is primarily used as ingredient by the food-processing industry. For its detection, an enzymatic hydrolysis has been developed for the extraction of the remaining bone fraction. When followed by a purification of the extracts by an aqueous solution of sodium polytungstate, this method made possible the detection of irradiated mechanically recovered poultry meat at very low inclusions (0.5%, wt/wt) in various meals (quenelles and precooked meals).