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Identification of Irradiated Foods with Electron Spin Resonance (ESR) Spectroscopy

Food irradiation uses electromagnetic radiation and is controlled by many identification methods according to the contents in foods. Currently there are ten methods used to identify the irradiated foods and electron spin resonance (ESR) spectroscopy is one of these methods to identify the irradiated food containing bone, cellulose and crystalline sugar. The present work was to detect the un-irradiated and irradiated wheat, rice and chickpea powder, study the ESR intensity with respect to the absorbed dose, and fading of ESR signal with time. As the radiation source, industrial type 5 MeV, 15 kW electron beam accelerator was applied and three grain flour was irradiated with the dose; 1, 1.5, 2.1, 2.6 and 3.2 kGy. The optical absorbance of B3 Windose film dosimeters was measured at 552 nm with GEX (Spectronic Genesys-20) spectrophotometer for absorbed dose measurement. ESR measurements were carried out using an ESR spectrometer (magnettech, MS 400). Free radicals generated by irradiation gave typical signal in the ESR spectrum for irradiation identification. In present study, irradiated samples showed strong ESR signals centered at g = 2.006, where un-irradiated samples had weak signals. And ESR intensity increased linearly with absorbed dose in most of the cases. The fading of ESR intensity of the samples stored at room temperature was studied over storage period of 4 weeks. Following one week after irradiation, ESR intensity decreased significantly with storage time.

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