

Sahakan Monthonwattana 2010: Detection of Irradiated Rice Noodles by Electron Spin Resonance (ESR). Master of Science (Applied Radiation and Isotopes), Major Field: Applied Radiation and Isotopes, Department of Applied Radiation and Isotopes. Thesis Advisor: Assistant Professor Wanwisa Sudprasert, Ph.D. 85 pages.

Electron spin resonance (ESR) spectroscopy is one of the physical methods for identification of irradiation on the wide variety of foods. This technique is based on the detection of free radicals induced in food composition by irradiation. In this study, ESR was applied to identify the irradiated rice noodle. Detailed ESR investigation on irradiated noodle was carried out in the dose range of 0.5 - 3 kGy using Bruker EMX spectrometer. The stability of that radiation-induced ESR signal intensity at cold (-18°C) and room (25°C) temperatures was studied over a storage period of 24 weeks. It was shown that operating conditions of the ESR spectrometer were as follows : microwave frequency 9.826 GHz, microwave power 1.0 mW, center field 3510 G, sweep width 100 G, modulation frequency 100 kHz, modulation amplitude 10 G, receiver gain  $2 \times 10^3$  G, time constant 163.84 ms and sweep time 51.2 s. Irradiated rice noodle samples exhibited a strong, symmetric doublet ESR signal centered at  $g = 2.0001$  whereas unirradiated noodle exhibited a very weak signal. A linear relationship between the ESR signal intensity and the absorbed dose was obtained for doses up to 3 kGy. The dose-response equation was  $y = 10^6 x + 4290$ , where  $x$  and  $y$  were absorbed dose (kGy) and ESR signal intensity (a.u.), respectively, and the correlation coefficient ( $R^2$ ) was 0.9981. Storage temperature and time strongly influenced on the fading of ESR signal intensity. Keeping the samples at -18°C and 25°C for 24 weeks caused decreases of 50 % and 90 % in ESR signal intensities, respectively. Furthermore, the shape of the ESR spectra was influenced by storage temperature and time. However, long-term decay data at room temperature indicate that ESR technique can be used to identify irradiated rice noodles during 24 weeks of room temperature storage after the irradiation process.

---

Student's signature

---

Thesis Advisor's signature