

Detection of Free Radicals in γ -Irradiated Soybean Paste by Electron Spin Resonance Spectroscopy

Cherl-Ho Lee, Eun-Joo Lee and Vitaly I. Volkov*

Graduate School of Biotechnology, Korea University Center of Science and High Technology,

**Karpov Institute of Physical Chemistry, Moscow, Russia*

Free radicals in γ -irradiated soybean paste were investigated by electron spin resonance(ESR) spectroscopy to determine the effect of temperature(77-296K) and moisture content(1-54%) of samples irradiated at high dose(1-40kGy). The samples were kept in liquid nitrogen(77K) during irradiation and subsequent ESR measurements. The line shape of ESR spectra altered according to different microwave powers, which meant the presence of different paramagnetic centers in the sample. In saturation curves, it was possible to select four types of spectra components, which were different in their relaxation times. According to the different irradiation doses, the change in free radical concentration showed a **curvilinearly** increasing relationship with irradiation dose in wet samples, whereas a proportional relationship was observed with dried samples. This might indicate that the indirect process of free radical formation was involved with the existence of free water radicals in the wet samples.

We have also investigated ESR spectra of fermented soybean paste irradiated at 77K and compared with those of model system which was composed of water, 10% NaCl solution, soluble and insoluble fraction of soybean paste, soybean protein isolate and soybean oil. The influences of irradiation dose, moisture content and heating after irradiation on the free radical concentration and species were examined. Four different carbon type free radicals, were identified as the product of amino acid decomposition. The radical OH was originated from water molecules, since it was not observed in dry sample. Sulfur radical was stable even at room temperature observed in both wet and dry systems. Aldehyde radical turned out to be from the chemical reactions of enzymatic **hydrolysates** of soybean.