

**Project Title :**

Determination of radiosensitivity and features of the radiolytic intermediates produced after the irradiation of some food additives using Electron Spin Resonance spectroscopy

**Abstract**

High energy radiation is widely used in recent years at food industry to improve the quality and to prolong shelf life of the products. Shelf lives of the foods can be prolonged by irradiating them with  $\gamma$ -radiations to kill the microorganisms and to delay the germination. Also, certain food additives can be used to improving the quality and prolonging the shelf life of the foods. Although, radiation can help kill microorganisms that cause degradation it also cause negative effects on the functions of the food additives by creating changes in the molecular structures. In determining the rate of benefit and harm, it is important to investigate and reveal the properties of the radiolytic intermediates produced after the irradiation of the food additives. Electron Spin Resonance (ESR) spectroscopy is commonly used in determining structural and kinetic features of radiation induced radicals and determining dosimetric features of the materials exposed to the radiations. There are many published work in this subject in our country and in the world. In the present work structural and kinetic features of the produced radicals and radiosensitivity of the food additives that used in food industry will be determined using ESR spectroscopy. Furthermore, it will be determined usefulness as standard dosimeter and/or accidental dosimeter by determining its dosimetric features.

In the first step; the single crystal of the materials will be obtained, and the l-alanine standard materials will be pressed in pellets. In second step; ESR spectra of the powder samples which are not exposed to any treatment will be taken to determine if they give any background signal. Then, single dose ( $\sim 5$  kGy) irradiation will be performed using  $^{60}\text{Co}$ - $\gamma$  source at the Sarayköy Nuclear Research Center (SANEM) of Turkish Atomic Energy Agency (TAEK) in Ankara to determine the spectrometer conditions (microwave power, modulation amplitude, receiver gain etc.) at room and low temperatures which the ESR measurements will carried out for each samples. In the third step; the powder and crystal samples will be irradiated in the dose range of 0.5 – 25 kGy at room temperature using a  $^{60}\text{Co}$ - $\gamma$  source at SANEM, TAEK, than the spectra will be taken using the ESR spectrometer at Department of Physics Engineering, HÜ. The dosimetric features of each sample will be determined using dose-response curves constructed by a set of samples irradiated to doses 0.5, 1, 3, 5, 7, 10, 15, 20 and 25 kGy. Samples irradiated to a dose of 10 kGy were used to investigate low and high temperature stability and kinetic features of the radiation-induced radicals. Furthermore, radical decay kinetics at room temperature will be investigated by room temperature decay of the radicals. In the fourth step, the obtained data will be analyzed and necessary spectrum simulations will be performed to determine the spectroscopic, dosimetric, kinetic and structural features of the radicals.

**Keywords:** Electron spin resonance, irradiation, radical, radiation dose, radiosterilization, kinetics