Title Effect or gamma irradiation on the physicochemical properties of orange pectinesterase

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Abstract

Pectinesterase (PE), responsible for the hydrolysis of the pectin, is widely distributed in plants. Loss of cloudiness due to the enzymatic reactions of PE is one of the main problems in the citrus juice industry. Various methods such as thermal processing and pH control have been attempted to inactivate PE. However, thermal processing causes quality loss and undesirable sensory value in citrus juices. The objective of this study was to elucidate the inactivation mechanism of orange PE by γ-irradiation as a means of non-thermal processing techniques. Commercial orange peel PE was purified using an ion exchange column chromatography and its homogenicity was confirmed on a SDS-PAGE. The purified enzyme was irradiated at 0, 1, 3, 5, 10 kGy using ^{60}Co ã-irradiator and its molecular properties were examined. Orange PE was purified using a cation exchange column equilibrated with 10 mM sodium phosphate buffer (pH 7.0). Five major fractions were obtained and fraction F1 had the highest specific activity. SDS-PAGE results showed that F1 is the purified PE with a major molecular weight of 32 kDa. ã-irradiation at 1 kGy decreased PE activity by 75%, whereas no further decrease was observed above 3 kGy, an indication that low-dose radiation is sufficient to inactivate the enzyme. Fluorescence emission intensities of the PE were affected by γ-irradiation. Emission intensity was the highest at 352 nm at 0 kGy, and its relative intensity decreased from 824 to 140 at 10 kGy. This indicates that increase of irradiation quenched the emission intensity of the enzyme. These results clearly showed that γ-irradiation at a low dose could inactivate PE and be used as a non-thermal treatment of citrus-based juice. Exposure of PE to ionizing radiation can extend the shelf-life and maintain the quality of citrus fruits.