

Electron Spin Resonance Analysis of γ -induced Free Radicals in Riceberry Rice Grain

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Gamma irradiation has long been serving as one alternative preservation method for food and agriculture products. Initial physical interactions of gamma with biomaterials lead through radical formation, depolymerization, and molecular changes to eventual sterilization, decontamination and preservation. An effective penetration of gamma radiation homogenize the effects throughout the materials. Riceberry rice composes mainly of starch, which has α -D glucopyranose ($C_6H_{12}O_6$ or glucose) as a building block in its polysaccharide network. Follow irradiating rice with Co-60 gammas of a few kilograys, the polysaccharide chains have undergone several changes in their molecular structure, which lead to generation of free radicals. Electron spin resonance (ESR) analysis has shown that quite a few free radicals were formed with different strengths. Their respective Lande's g -values were in the range of 1.9900 – 2.0180. Mechanisms such as hydrogen abstraction on C6 position, an internal hydrogen bonding between the C4 and C6 hydroxyl groups, or formation of primary hydroxyalkyl between C1 and C2 are presumably accounted for the formation of these free radicals.

Keywords: Gamma-ray irradiation, ESR, SEM, riceberry rice, depolymerization, crosslinking

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