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GAMMA RADIATION INDUCED MODIFICATIONS OF TAPIOCA STARCH

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Abstract

The effect of gamma radiation (3, 5, 10, 20, 35 and 50 kGy) on the morphological, structural, physicochemical, pasting and thermal properties of tapioca starch was studied. Microphotographs of scanning electron microscopy and polarized light microscopy revealed the absence of morphological changes induced by gamma radiation. The X-ray diffraction spectra showed that irradiation treatment did not influence the shape and intensity of X-ray diffraction peaks. The presence of free radicals in the irradiated tapioca starch was confirmed by electron spin resonance spectrometry. Fourier transform infrared spectroscopy showed that the irradiated starch displayed a significant decrease in the intensity of the O–H and C–H stretches, bending modes of water and glycosidic linkages. Irradiation improved the water solubility index of starch granules and depressed the apparent amylose content. An increase in the swelling power was observed after irradiation treatment until 20 kGy, followed by a decrease at higher doses. Brabender viscoamylograph test showed that the maximal consistency of the starch paste decreased significantly with increasing irradiation dose. There was no significant difference in the gelatinization temperatures, as well as the corresponding transition enthalpies among native and irradiated tapioca starch samples, as shown in the differential scanning calorimetry thermograms.

Key Words: Tapioca starch; gamma radiation; granule morphology; structure-function relationships.

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