

Tuber Discoloration Intensity as Detection Method of Irradiated Potatoes

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Abstract

The study was to distinguish between irradiated and unirradiated potatoes, using two different colorimetric methods; (1) color measurement on potato slices by the Color Difference Meter (L, a, b values) and (2) Spectrophotometric measurement at 440 nm of the potato extract. Two potato varieties (c.v. Spunta-as table potatoes and Hurmeze – as processing potatoes) were irradiated with 0.1, 0.2, 0.3, 0.5 and 1.0 kGy. Intensity of discoloration of the tubers was measured immediately after irradiation or after 3 and 6 months of storage at room temperature (22 – 25 °C). No difference in L-values was found between irradiated and unirradiated Hurmeze tubers until the last 3 months of storage when values sharply increased at all doses. Such changes were much less in Spunta. Irradiation seemed not to have an effect on L-values for both varieties. In Hurmeze, the a-values increased with increasing dose immediately after irradiation treatment and during the first 3 months of storage. However, such values diminished for all samples by the end of storage time. The increase in a-values in Spunta was immediately after the treatment, followed by sharp decrease during the storage. The a-values were more likely to correctly classify irradiated and unirradiated potatoes than were the L-values. However, the increase in a-values and the decrease in b-values were effective to detect irradiated tubers of both varieties only immediately after irradiation treatment. Irradiation decreased b-values in both varieties immediately after treatment and in case of Hurmeze, values remained low with slight increase or decrease during storage, whereas in Spunta higher values were found only in tubers irradiated at 0.3 kGy or more only during the first 3 months of storage, then dropped again to where they were before storage. In spite of the slight decrease in absorbance of extract of irradiated tubers at 0.2 and 0.3 kGy for both varieties, the spectrophotometric method did not seem to correlate with the fact that irradiation increases discoloration of potatoes.

Keywords: Irradiation, Hunter, Color, Gamma, Spunta and Hurmeze

1. Introduction

Irradiation treatment is used by many countries all over the world to inhibit sprouting in potatoes (Thomas, 1984). Sprouting is the most obvious manifestation of deterioration of potatoes. It increases susceptibility to bruise and decrease the marketability and the processing characteristics of potatoes. However, irradiation induced discoloration in potatoes. The incidence of enzymatic darkening known as "blackspot" in potatoes increased by irradiation (Sawyer and Dallyn, 1955). Doses of 10, 20 and 50 krad caused considerable darkening in cortex tissue of irradiated potatoes after slicing as compared to unirradiated controls (Ogawa and Uritani, 1970). Irradiated potatoes were also found to be more susceptible to after-cooking darkening than nonirradiated ones (Sawyer and Dallyn, 1961; Thomas, 1981; Hampson et al., 1986).