

Impact of electron-beam irradiation combined with shellac coating on the suppression of chlorophyll degradation and water loss of lime fruit during storage

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Postharvest Biology and Technology, Volume 172, February 2021, 111364

Abstract

The change in the color of the lime peel from green to yellow is the main postharvest-period problem that is unacceptable to consumers. The purpose of this research was to study the effect of electron-beam (E-beam) irradiation and shellac coating on chlorophyll degradation and qualities in lime fruit. Lime fruit cv. Paan were treated with E-beam irradiation at dosages of 0 (control), 0.5 and 1 kGy and stored at 13 °C for 30 d. E-beam treatment at 1 kGy delayed the change in peel color (b^* and ΔE values), total chlorophyll content and the increase of chlorophyllase activity more compared to the 0.5 kGy E-beam and control treatments. However, 1 kGy E-beam irradiation increased the respiration rate, resulting in high weight loss. Therefore, shellac coating at 10 % (w/v) applied prior to irradiation with 1 kGy E-beam could minimize the respiration rate and water loss. In addition, shellac coating combined with E-beam irradiation delayed the color change of lime peel (L^* , a^* , b^* and ΔE values), maintained the total chlorophyll content and suppressed the activity of chlorophyll degrading enzymes (chlorophyllase, Mg-dechelataase and pheophytinase) compared to non-treated fruit. However, the combined treatments affected the reduction of titratable acidity and enhanced the accumulation of total ascorbic acid and the hydrogen peroxide (H_2O_2) content. The results imply that shellac coating combined with E-beam irradiation is an alternative approach to delay chlorophyll degradation and maintain the quality of lime fruit.