Title	Effect of 1% calcium chloride treatment prior to gamma irradiation on physicochemical and microbial properties of diced tomatoes
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Abstract

The shelf-life of diced tomatoes is limited by microbial spoilage. Low-dose irradiation is known to reduce microflora and hence increase shelf-life of various vegetables. However, irradiation causes pectic substance solubilization resulting in softening. Calcium treatment prior to irradiation can minimize the softening caused by irradiation. The objectives were to determine the effects of combined irradiation and 1% $CaCl_2$ treatments on enzyme activities polygalacturonase (PG) and pectinesterase (PE), respiration rate, ethylene production, texture, and microbial populations of diced tomatoes. Celebrity tomatoes were harvested at stage 6 from a local farm. Tomatoes were diced then dipped in 1% $CaCl_2$ for 1 min and irradiated at 1kGy using a gamma source. The control, $CaCl_2$ dipped, irradiated, and combination (1% $CaCl_2$ + 1kGy) samples were stored at 4 °C for the 13-d study and evaluated at regular intervals for changes in enzyme activities (PG and PE), respiration rate and ethylene (by gas chromatography), texture (Kramer Shear), and microbial populations (total aerobic count, yeast & mold, lactic acid bacteria, and psychrotrophs). Irradiation suppressed ethylene production as well as respiration rate, whereas 1% $CaCl_2$ stimulated ethylene production but suppressed respiration rate. The combination treatment was not different from the control on both respiration rate and ethylene production. While irradiation had no significant effect ($p>0.05$) on PG activity, calcium enhanced PG activity. Neither Ca nor irradiation had an effect on PE. Because the samples were fairly ripe, irradiation did not induce further loss of firmness. Dipping in 1% $CaCl_2$ increased firmness by 346% and the combination treatment increased firmness by 319%. As expected, all irradiated samples showed a decrease in microbial load but the calcium-dip sample did not reduce microbial counts as compared to the control. The results suggest that the combination treatment of irradiation and calcification mitigates the softening effect of irradiation while enhancing shelf-life of diced Celebrity tomatoes.