Optimization of antifungal edible pregelatinized potato starch-based coating formulations by response surface methodology to extend postharvest life of 'Orri' mandarins

Lourdes Soto-Muñoz, Lluís Palou, Maricruz Argente-Sanchis, Miguel Angel Ramos-López and María B. Pérez-Gago

Scientia Horticulturae 288: 110394. (2021)

Abstract

Antifungal composite edible coatings (ECs) formulated with pregelatinized potato starch (PPS, 1.0–2.0% w/w) as biopolymer, glyceryl monostearate (GMS, 0.5–1.5%, w/w) as hydrophobe, glycerol (Gly, 0.5–1.5%, w/w) as plasticizer, and sodium benzoate (SB, 2%, w/w) as antifungal agent were optimized using the Box–Behnken response surface methodology to extend the postharvest life of 'Orri' mandarins. The second order polynomial models satisfactorily fitted the experimental data, with high values of the coefficient of determination for the different variables (R^2>0.91). The individual linear effect of GMS concentration was significant in all the responses evaluated, whereas PPS only affected emulsion viscosity, fruit tacking, and weight loss of coated mandarins. Gly only affected acetaldehyde content in the juice of coated mandarins when interacted with PPS and in the quadratic effect. The optimum concentrations of PPS, GMS, and Gly based on maximum fruit quality and required emulsion properties were predicted to be 2.0, 0.5, and 1.0% (w/w), respectively. The optimized EC reduced weight loss of mandarins and created a modified atmosphere within the fruit without negatively affecting the overall acceptability of the fruit. On the other hand, the optimized EC significantly reduced postharvest green and blue molds and sour rot on mandarins artificially inoculated with the pathogens *Penicillium digitatum, Penicillium italicum*, and *Geotrichum citri-aurantii*, respectively. Therefore, the optimized antifungal EC containing SB showed potential to control the main postharvest diseases and maintain the overall quality of 'Orri' mandarins and could be a suitable alternative to commercial citrus waxes formulated with conventional chemical fungicides.