Edible composite coatings formulated with antifungal GRAS compounds: a novel approach for postharvest preservation of fresh citrus fruit

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Abstract

New hydroxypropyl methylcellulose (HPMC)-lipid edible composite coatings containing food additives or GRAS ('generally regarded as safe') compounds with antifungal properties were developed for postharvest preservation of fresh citrus fruit. Stable emulsions were selected among a large number of formulations prepared with different solid concentrations (6-12% wet basis, wb), total lipid (beeswax and shellac) contents (up to 60% dry basis), and concentrations of the antifungal ingredients (0.05-4.5% wb). Disk diameter tests were used for in vitro selection of the most effective stand-alone films against the pathogens, *Penicillium digitatum* and *Penicillium italicum*. Selected coatings were tested in vivo against green and blue molds on 'Valencia' oranges and 'Ortanique' and 'Clemenules' mandarins, incubated at 20°C for 7 days or stored at 5°C for up to 60 days. Coatings containing sodium benzoate or potassium sorbate, alone or mixed with sodium propionate, were the most effective in reducing the incidence and severity of both molds on fruit coated 24 h after fungal inoculation (curative activity). The antifungal activity of the coatings was fungistatic rather than fungicidal and was dependent on varietal susceptibility to *Penicillium* decay (higher activity on oranges than on mandarins, and on 'Ortanique' than on 'Clemenules'). In general, green mold was more effectively controlled than blue mold on cold-stored fruit. Selected coatings significantly reduced fruit weight loss and maintained firmness during cold storage. Although the coatings modified the internal gas composition, they did not affect the overall sensory quality of oranges and mandarins.