Development of Edible Active Coating From Agro-Waste for Produce Preservation

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After harvest, fruits and vegetables continue to undergo biological activities, including ripening, respiration, and fermentation, which shorten shelf-life. Furthermore, agro-waste in landfills becomes detrimental to human and environmental health. In this work, an edible coating was developed from orange peels through an environmentally-friendly hydrolysis process using 0.1 mol/L of citric acid, pomegranate peel extract (PPE), and green tea extract (GTE). It was hypothesized that natural ingredients from orange peels, such as pectin and flavonoids, could be extracted under a citric acid treatment. Furthermore, functional bio-actives could be introduced through the addition of PPE or GTE to create a coating solution for fresh produce. Applying a thin layer of the coating solution to produce is expected to reduce oxidation and prevent bacteria growth, therefore slowing the spoilage and prolonging shelf-life. The pectin content, molecular weight, and flavonoids extracted from orange peel were maximized through different process conditions, including temperature and duration. 39.2% pectin conversion rate and 47.1% antioxidant activity were achieved at 70oC/12hr. The final coating solution, using either 0.1 wt% PPE or 0.1 wt% GTE, resulted in over 93% antioxidant activity and good antimicrobial activity, with 24-hr log kills greater than 3.5 for S. aureus and nearly 3 for E. coli. When applied onto bananas, the coating solution slowed down the peel color change and pulp softening process. The time for freckles to appear was extended from uncoated 2.5 days to 4.7- 4.9 days with coating. The ripening process was delayed and the banana shelf-life was prolonged by 4 days.

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