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Formulation of a pectin-based food wrapper enriched with antioxidant and antibacterial properties

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Accumulation of non-degradable polyethylene on earth creates imbalance in environmental sustainability. Natural bio polymers like pectin can be used as a versatile, low-cost solution for this problem. Main objectives of this research were to develop a pectin-based film with antioxidant and antibacterial properties by highlighting the values of Sri Lankan natural oils and extracts, and then to find a healthy substitution for non-degradable polyethylene food wrappers while increasing the shelf life of foods. Sri Lankan cinnamon (*Cinnamomum zeylanicum*) leaf oil and curry leaf (*Murraya koenigii L*) extracts (methanol: water 1:1) were used as functional ingredients to introduce antibacterial and antioxidant properties to the pectin film. These ingredients were selected after considering their medicinal values, compatibility and accessibility. Pectin film formulations (50 mL) were prepared by mixing commercially available pectin (1.500 g) with glycerol (0.50 mL), curry leaf extract (5.00 mL), different cinnamon leaf oil concentrations (0.010, 0.020, 0.040, 0.060) mg/mL and water. Prepared solutions were poured in to sterilized petri dishes up to 2 mm thickness and dried for 5 hours at 40°C. Antibacterial activity of films and antioxidant activity of formulations were evaluated using Kirby-Bauer Disc Diffusion method and DPPH radical scavenging assay, respectively. A film prepared without both functional ingredients was used as the control. To compare the combine activity of the functional ingredients, two samples were tested individually with each functional ingredient. The film which showed the best antioxidant and antibacterial activities was analyzed for its tensile strength, solubility and suitability as a food wrapper. The pectin film (F3) with cinnamon oil concentration 0.040 mg/mL showed good antioxidant activity (95.89 ± 0.39), and antibacterial properties against *Escherichia coli* (8.60 ± 0.56 mm), *Streptococcus aureus* (13.0 ± 1.13 mm) and *Bacillus subtilis* (8.00 ± 1.13 mm). F3 showed a moderate tensile strength (1.40 ± 0.13) and it was completely soluble after 4 hr in water. F3 also increased the shelf life of grapes (refrigerator:21 days, room temperature; 18 days) compared to the control (refrigerator:17 days, room temperature: 13 days) and the unwrapped grapes (refrigerator:15 days, room temperature:10 days). Samples with both functional ingredients showed better antioxidant and antibacterial activities compared to samples with only one functional ingredient. Observed results demonstrated that Sri Lankan cinnamon leaf oil and curry leaf extract act as a good combination to obtain antibacterial and antioxidant properties of pectin films. Therefore, it can be concluded that these films could act as a healthy substitution for non-degradable polyethylene food wrappers.

Keywords: Anti-bacterial, anti-oxidant, bio polymer, food wrapper, pectin