Improvement of shelf life and nutrition values of fruits and vegetables using nanoencapsulated *trans*-resveratrol/chitosan edible coating

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Introduction

The waste of food is especially prominent in perishable fruits and vegetables due to the short shelf life of only a few days after reaching retailers, such as strawberries. We developed a biodegradable and biocompatible *trans*-resveratrol (R) encapsulated nanoparticle delivery system (RNPs) and embedded it into chitosan (CS) matrix to form a dip-coating solution. The RNPs-CS was performed on strawberries and formed a multifunctional edible coating that can diminish dehydration, prevent nutrient loss, inhibit microbe growth, increase nutraceutical value, preserve strawberry quality, and extend strawberries' shelf life.

Fabrication of RNPs: Improved aqueous solubility

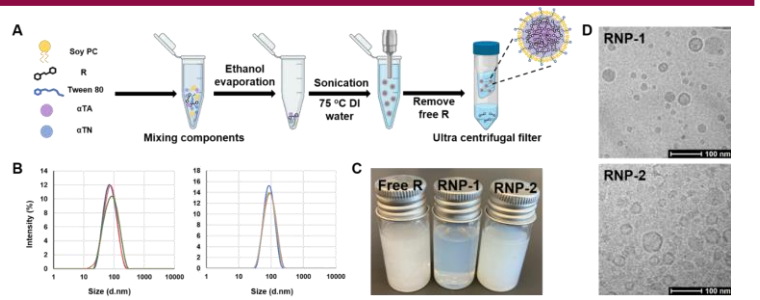


Fig. 1. Illustration of components and preparation of RNPs (A); Size characterization of RNP-1 and RNP-2 by dynamic light scattering (B); Free R, RNP-1, and RNP-2 suspended in DI water (C); Cryo-TEM of RNP-1 and RNP-2 (D).

Increase oral bioavailability

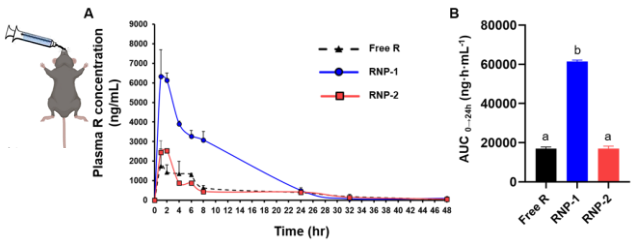


Fig. 2. Plasma R concentrations (A) and the AUC $_{0\rightarrow24h}$ value (B) after gavage of free R, RNP-1, and RNP-2.

Morphology of edible films

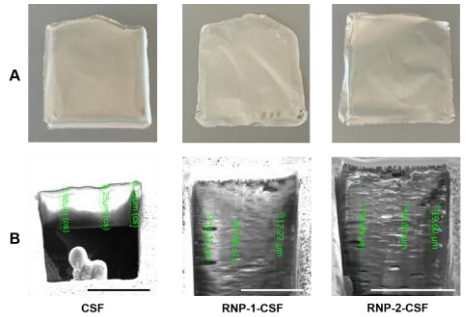
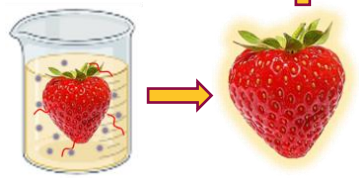


Fig. 3. Appearance of CS, RNP-1-CS, and RNP-2-CS (A) and their morphology observed using SEM (B).



Multifunctional RNPs-CS edible coating

Inhibit microbe growth

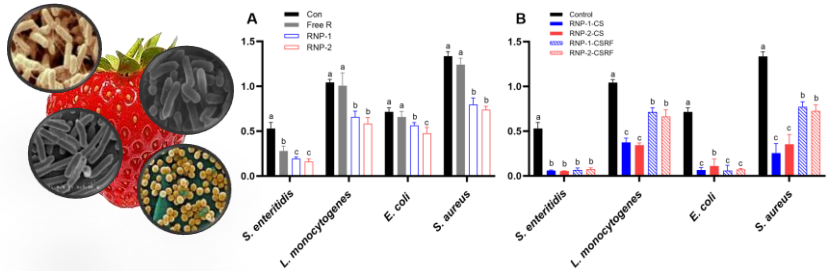


Fig. 4. Antimicrobial activity of free R, RNP-1, RNP-2 (A); RNP-1-CS, RNP-2-CS, RNP-1-CSRF, and RNP-2-CSRF (B) against *S. enteritidis*, *L. monocytogenes*, *E. coli* and *S. aureus*.

Prolong shelf life of strawberries

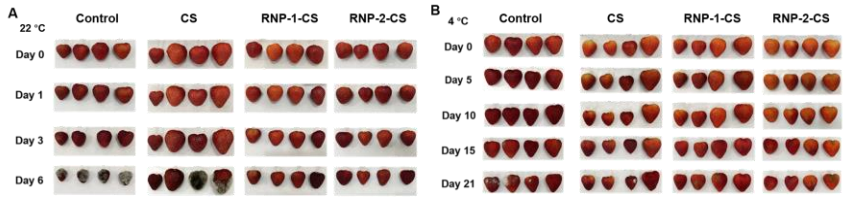


Fig. 5. Appearance of strawberries coated with CS, RNP-1-CS, and RNP-2-CS stored at 22°C (A) and 4°C (B).

Prevent nutrient loss

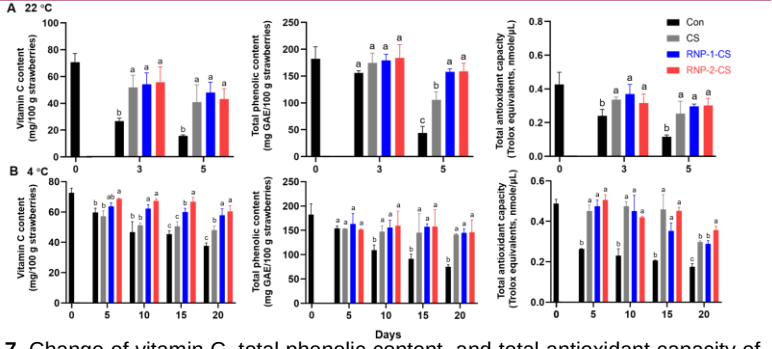


Fig. 7. Change of vitamin C, total phenolic content, and total antioxidant capacity of strawberries coated with CS, RNP-1-CS, and RNP-2-CS during storage at 22°C (A) and 4°C (B) at different time points.

Diminish dehydration

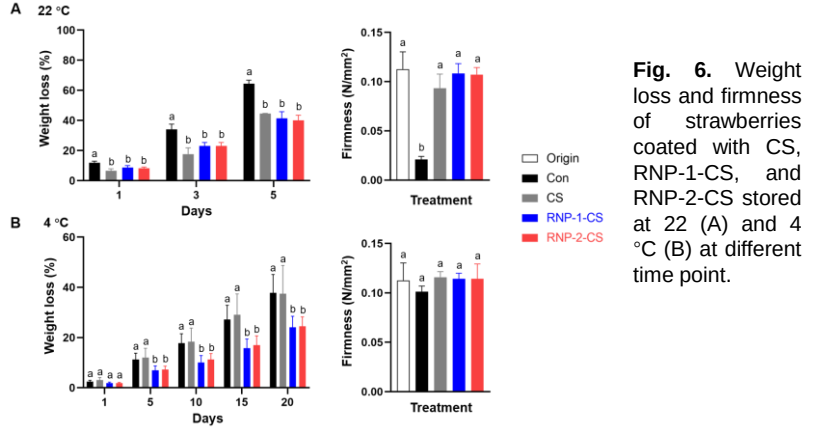


Fig. 6. Weight loss and firmness of strawberries coated with CS, RNP-1-CS, and RNP-2-CS stored at 22 (A) and 4 °C (B) at different time point.

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