

Development of resveratrol/cyclodextrin inclusion complex nanofibrous webs for fast-dissolving dietary supplement

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The encapsulation of food/dietary supplements into electrospun cyclodextrin (CD) inclusion complex nanofibers paves the way for developing novel carrying and delivery substance along with orally fast-dissolving property. Here, the large surface area and highly porous structure of nanofibers ensure readily dissolving or disintegrating of nanofibrous webs upon contact with saliva. On the other hand, cyclodextrins (CDs) classified as cyclic oligosaccharides enhance the water solubility and stability of the poorly soluble bioactive agents by inclusion complexation with their doughnut-shaped cavity. In our study, CD inclusion complex nanofibers of resveratrol were fabricated from the aqueous systems by using the electrospinning technique. Resveratrol is a well-known bioactive agent with its high antioxidant potential and it is commonly used in the formulation of dietary supplements. However, the poor water solubility of resveratrol is a drawback that creates challenges during its practices. Here, the hydroxypropylated (HP) CD derivatives of HP β CD and HP γ CD were used for both encapsulation of resveratrol and the electrospinning of free-standing nanofibrous webs. The amorphous distribution of resveratrol in the nanofibrous webs by inclusion complexation and the unique properties of nanofibers have ensured the fast-disintegration and fast-dissolution of nanofibrous webs in the saliva simulation and in an aqueous medium. The enhanced solubility of resveratrol in the case of resveratrol/CD nanofibrous webs has also ensured an improved antioxidant property for resveratrol. The polymeric resveratrol/pullulan nanofibrous webs have been also formed as a control sample in which resveratrol compounds are found in the crystal state. Both CD nanofibrous webs have shown faster dissolution, disintegration, and release profile and higher antioxidant potential compared to resveratrol/pullulan based samples.

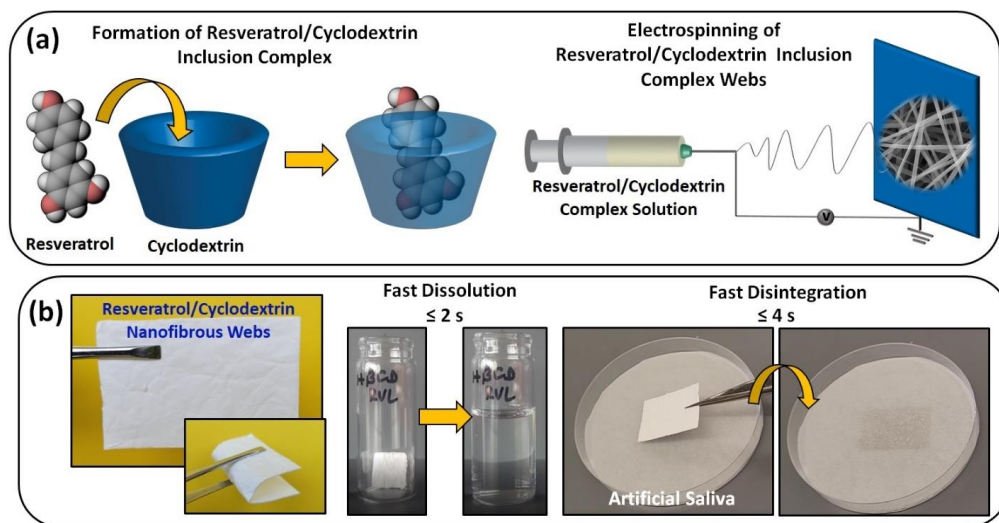


Figure 1. (a) Schematic view of the resveratrol/cyclodextrin inclusion complex formation and electrospinning of resveratrol/cyclodextrin inclusion complex nanofibers. (b) The photographs of fast-dissolution and fast-disintegration performance.