鱼鳞胶原与羧甲基纤维素复合膜的制备及其在食品保鲜中的应用

Preparation of Fish Scale Collagen and Carboxymethyl Cellulose Composite Film and Its Application in Food Preservation

团队成员：王礼宁，张梦真　　　指导老师：朱杰

西北农林科技大学　　　园艺学院

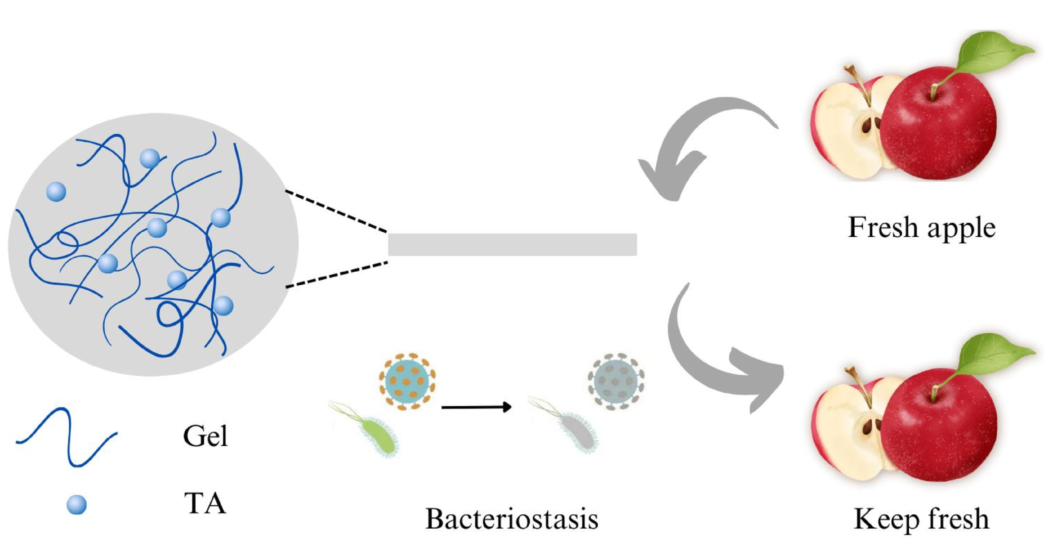
Introduction

With the increasing global environmental pollution problem, especially the pollution problem caused by "microplastics" has attracted widespread attention. Edible plastic wrap is prepared using natural macromolecular materials, among which collagen and polysaccharides play an important role in medicine, packaging and other fields due to their biocompatibility, antioxidant and degradability.

Gel is extracted from fish scales, aquatic waste, and has low price, good intermolecular cross-linking ability, low immunogenicity, and high antioxidant activity.CMC is a water-soluble cellulose ether with thickening, film-forming, emulsifying, and suspension properties. Neither of the two single components can meet the needs of actual production and life, but after mixing, they can form a complex with stable performance of polymeric electrolyte complex. TA has a large number of hydrophilic phenolic hydroxyl groups, which have good antioxidant and antibacterial properties, and it is speculated that blending with Gel can also improve the mechanical properties and barrier properties of gelatin-based films.

In this experiment, the composite film was applied to the preservation study, and the preservation effect of the composite film was judged according to the influence of the composite film on the water holding capacity, pH value, total number of colonies and color changes of the sample during storage, and the composite film was evaluated.

Materials and Methods



Basic properties	Application
Antioxidant and antibacterial	AFM analysis and Molecular docking simulation

Results and Discussion

Basic properties

Fig. 1 Preparation of gelatin-TA composite films. The TA addition were 0, 0.5%, 1.0%, and 2.0 % of gelatin weight, respectively.

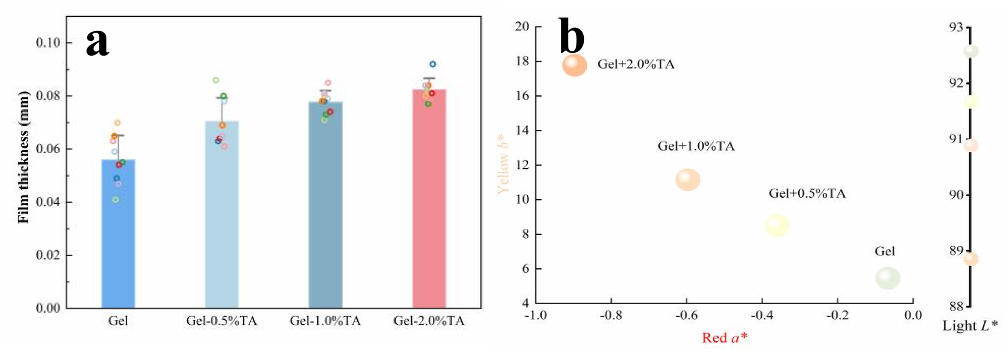


Fig. 2 Physical properties of gelatin films enriched with different amount of TA. (a) stands for the thickness of composite films, (b) is color parameters of gelatin-based films with different concentration of TA.

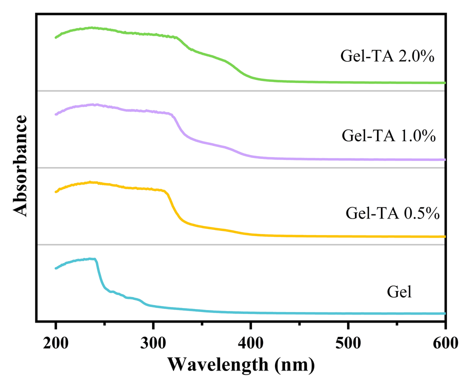


Fig. 3 Multi-spectroscopic analysis of the Gelatin-TA films. Effect of TA on the UV–Vis spectra of gelatin.

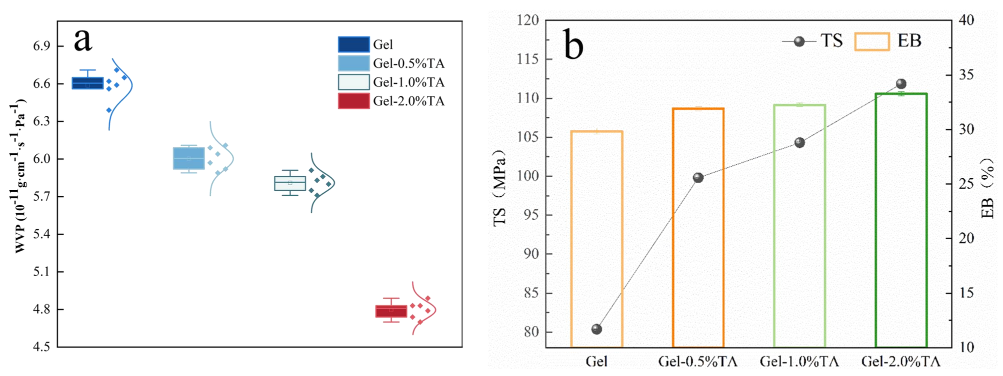


Fig. 4 Mechanical properties of gelatin films enriched with different amount of TA. (a) stands for the WVP value of edible films, (b) is the mechanical properties of films, including TS and EB.

AFM analysis and Molecular docking simulation

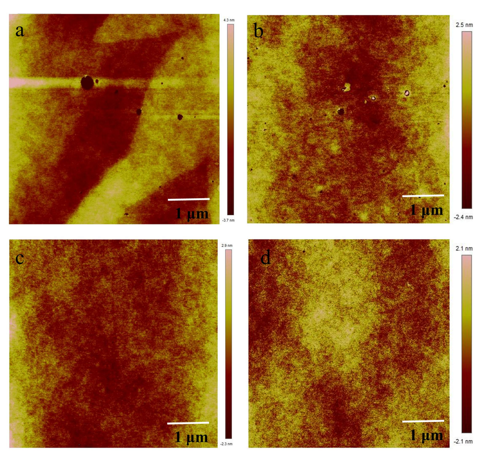


Fig. 5 AFM images of gelatin and gelatin-TA complex. a, b, c and d are gelatin, Gel-0.5%TA, Gel-1.0%TA, Gel-2.0%TA, respectively. Scale bar = 1 μm.

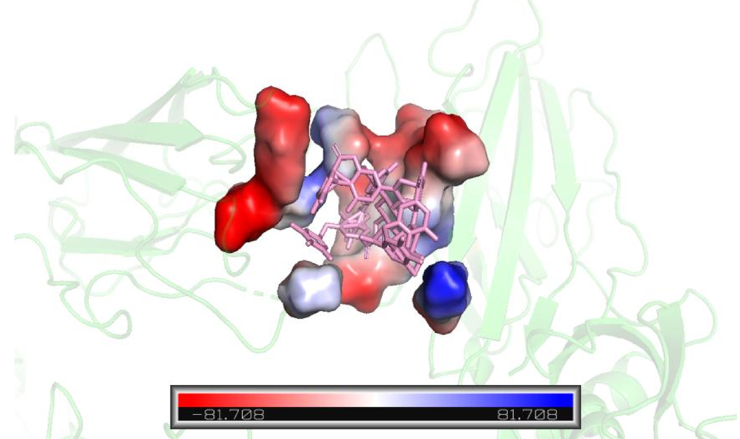


Fig. 6 Binding mode of gelatin-TA complex by molecular docking. The binding pockets were showed by PyMOL software. Coloring is from magenta (for strong H-bonds) to blue (for poor H-bonds).

Antioxidant and antibacterial

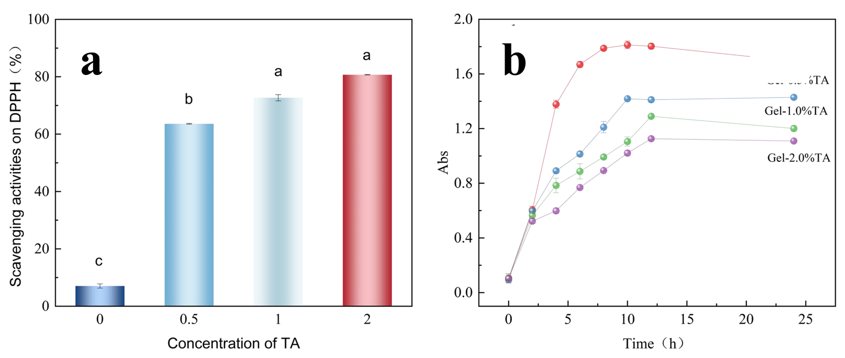


Fig. 7 Antioxidant and antibacterial behavior of gelatin films enriched with different amount of TA. (a) and (b) are antioxidant activities and antibacterial properties of the edible films, respectively.

Application

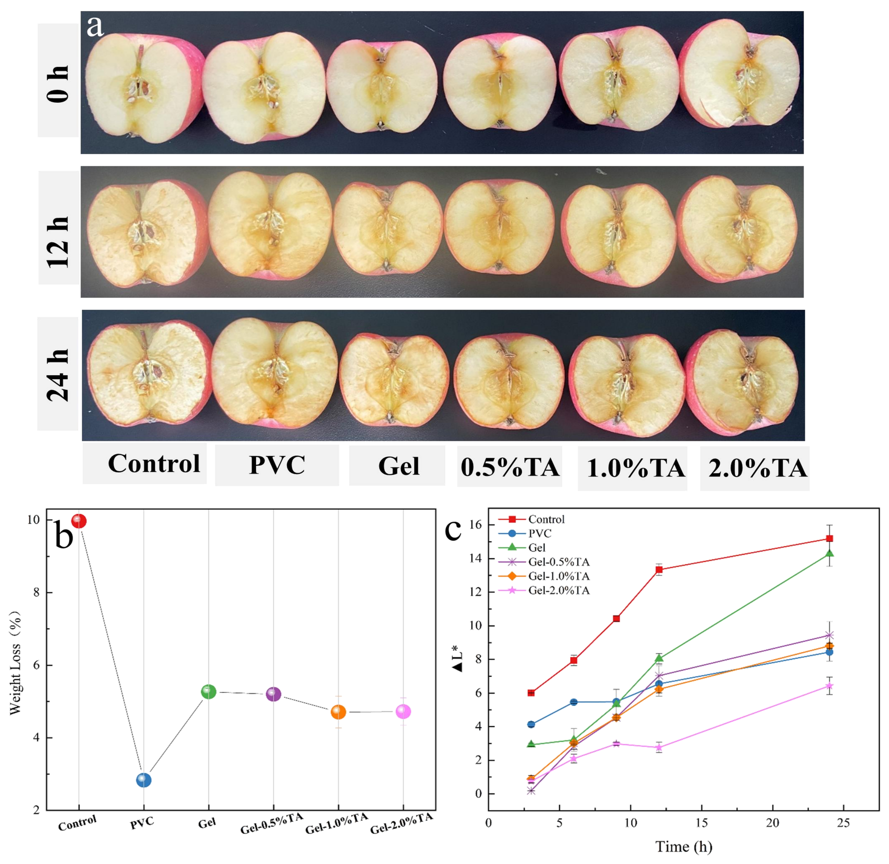
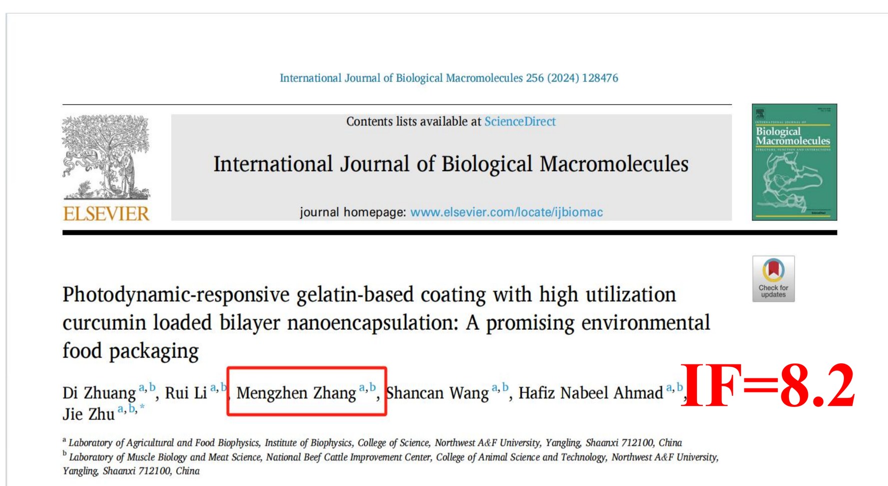


Fig. 8 Mechanical properties and antioxidant/ antibacterial behavior of gelatin films enriched with different amount of TA. (a) stands for images of the apple preservation test, (b) is the weight loss of apples covered by different films, (c) is the effect of cling wraps on cut apple slices, ΔL* value.

Conclusion

- Due to the presence of TA,the mechanical properties and barrier properties of films were improved.
- The multi-spectroscopy analysis and molecular docking showed that non-covalent bonds (the hydrogen bonding and electrostatic interaction) were formed between the gelatin and TA, which resulted in performance enhancements.
- The gelatin-TA edible films had high antioxidant biological activities，so the films wereapplied to the preservation of apples.

Achievements



International Journal of Biological Macromolecules 256 (2024) 128476

Contents lists available at ScienceDirect

International Journal of Biological Macromolecules

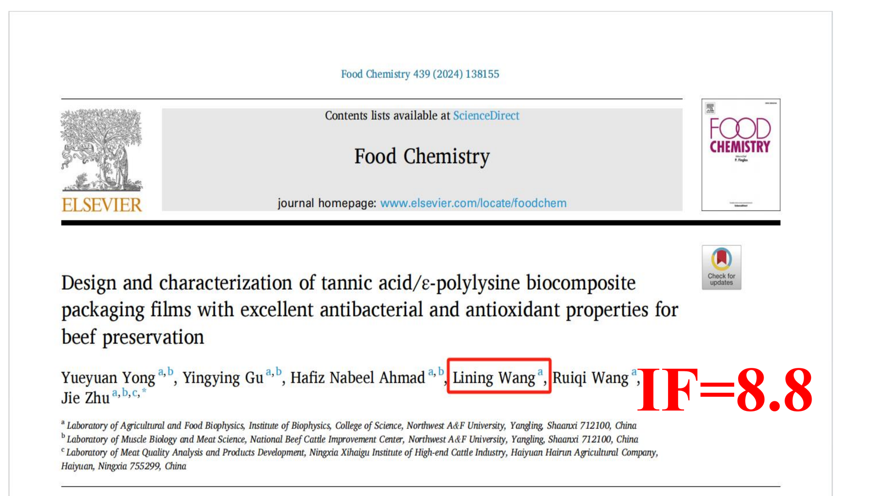
journal homepage: www.elsevier.com/locate/ijbiomac

Photodynamic-responsive gelatin-based coating with high utilization curcumin loaded bilayer nanoencapsulation: A promising environmental food packaging

Di Zhuang[a,b], Rui Li[a,b], Mengzhen Zhang[a,b], Shancan Wang[a,b], Hafiz Nabeel Ahmad[a,b], Jie Zhu[a,b,*]

[a] Laboratory of Agricultural and Food Biophysics, Institute of Biophysics, College of Science, Northwest A&F University, Yangling, Shaanxi 712100, China
[b] Laboratory of Muscle Biology and Meat Science, National Beef Cattle Improvement Center, College of Animal Science and Technology, Northwest A&F University, Yangling, Shaanxi 712100, China

IF=8.2



Food Chemistry 439 (2024) 138155

Contents lists available at ScienceDirect

Food Chemistry

journal homepage: www.elsevier.com/locate/foodchem

Design and characterization of tannic acid/ε-polylysine biocomposite packaging films with excellent antibacterial and antioxidant properties for beef preservation

Yueyuan Yong[a,b], Yingying Gu[a,b], Hafiz Nabeel Ahmad[a,b], Lining Wang[a], Ruiqi Wang[a], Jie Zhu[a,b,c,*]

[a] Laboratory of Agricultural and Food Biophysics, Institute of Biophysics, College of Science, Northwest A&F University, Yangling, Shaanxi 712100, China
[b] Laboratory of Muscle Biology and Meat Science, National Beef Cattle Improvement Center, Northwest A&F University, Yangling, Shaanxi 712100, China
[c] Laboratory of Meat Quality Analysis and Products Development, Ningxia Xihaigu Institute of High-end Cattle Industry, Haiyuan Hairun Agricultural Company, Haiyuan, Ningxia 755299, China

IF=8.8