A new embedding wall material prepared by silkworm pupa protein-polyphenol complex and its application

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Introduction

Functional structural lipids are rich in unsaturated fatty acids, which can provide nutrition and energy for people's growth and development. However, this structure makes structured lipids easily oxidized. The microencapsulation method can effectively prevent the oxidation of structural lipids rich in unsaturated fatty acids, and the key to the success of preparing structural lipid microcapsules is to select the appropriate embedded wall material. The amino acid composition of silkworm pupa glutenin is better than that recommended by WHO/FAO, and natural polyphenols have many important biological characteristics. They can bind to proteins through non-covalent and/or covalent interactions to change the structure of proteins.

Methods

In this paper, silkworm pupa glutelin and plant polyphenols such as caffeic acid and tannic acid were used to successfully prepare silkworm pupa glutelin-polyphenol complexes. Microfluidic droplet embedding technology was used to embed structural lipids with protein-polyphenol complex as wall material.

Results & Discussion

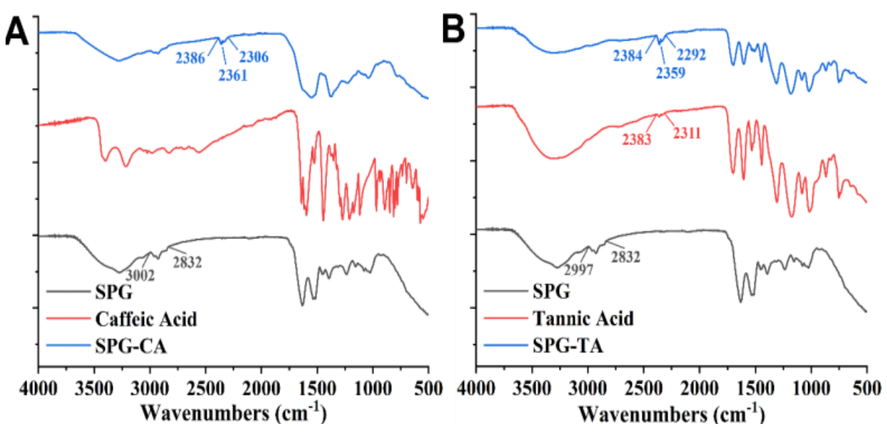


Fig.5.2 Fourier transform infrared spectroscopy of silkworm pupa glutenin-polyphenol complex (A) silkworm pupae glutenin-caffeic acid (SPG-CA); (B) silkworm pupae glutenin -tannic acid (SPGTA)

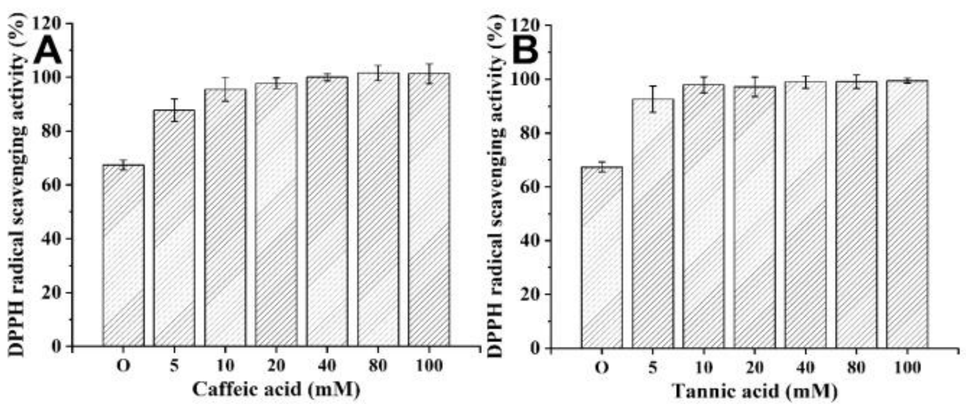
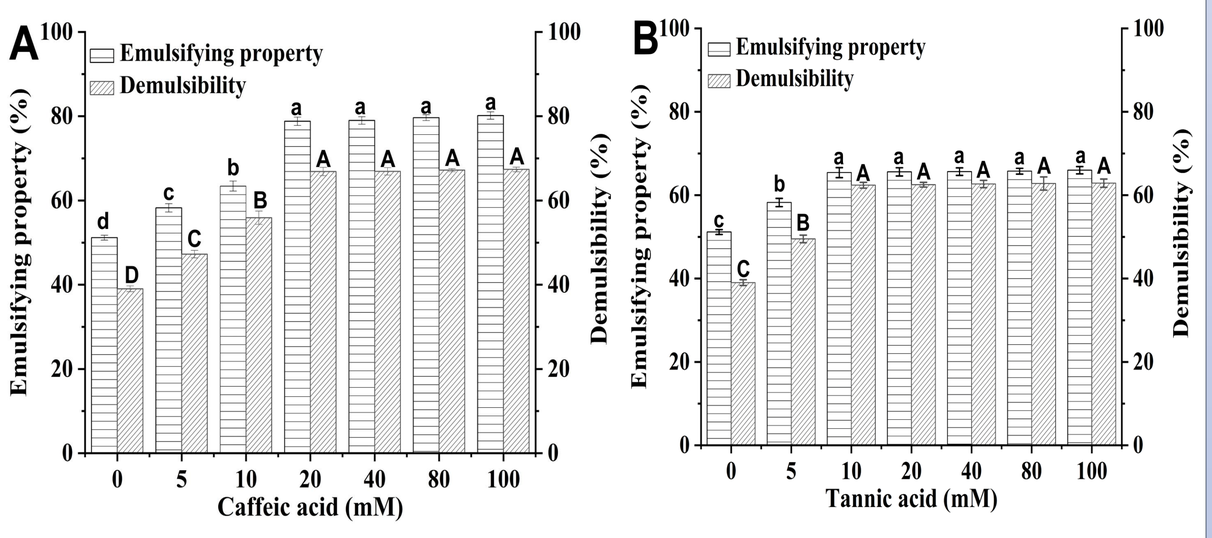


Figure.1 Antioxidant activity of two polyphenols-silkworm pupa protein complexes, (A) Caffeic acid-pupa protein complex; (B) Tannic acid-silkworm pupa protein complex.



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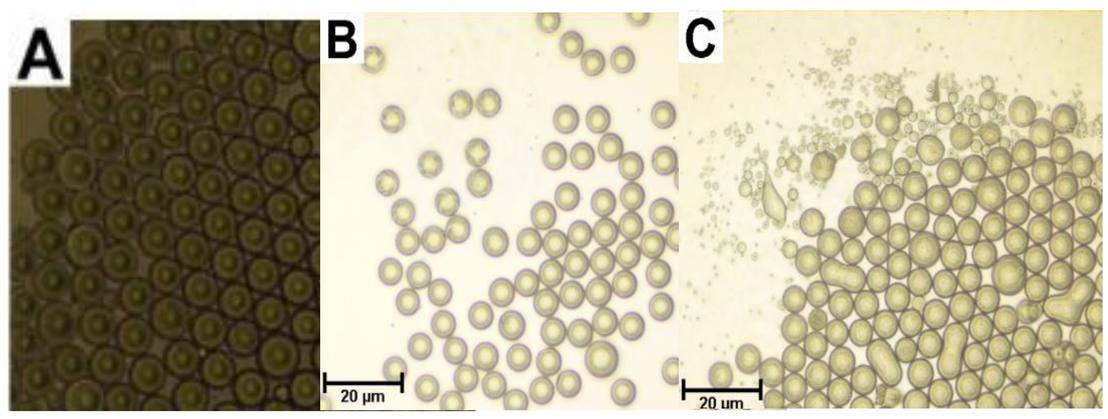

Figure.2 Two polyphenols-silkworm pupa protein complexes and silkworm pupa protein embedded structural lipid microcapsules, (A) silkworm pupa protein ; (B) Caffeic acid-pupa protein complex ; (C) Tannic acid-pupa protein complex

Conclusion

In summary, two protein-polyphenol complexes with good antioxidant and emulsifying properties were prepared. Microfluidic droplet technology was used to prepare structured lipid microcapsules with protein-polyphenol complex as the embedding wall material. The prepared structured lipid microcapsules had uniform size, good emulsification stability, and oxidation resistance. While preventing the oxidative damage of structural lipids, it can also supplement proteins and polyphenols, which are more conducive to human absorption and nutritional supplementation.

Acknowledgement

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