Application of Sericin based materials in food packaging

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Abstract

Sericin is a natural silk globular protein, which is usually discarded as a biological waste material after removing the fibroin for making silk products from the silk cocoon. In the current investigation, an attempt has been made to extract this usually wasted silk protein from the silk cocoon, purify it and study its potential applications in the food sector as a food packaging material. The sericin was extracted from the silk cocoon by the degumming method. The protein concentration of the extracted crude sericin sample was estimated by the standard Lowry's method using the bovine serum albumin as the reference standard. Linearity was obtained ($R^2 > 0.99$), and the protein concentration of the crude sericin was found out to be 3.60 % (W/V). The purification of the crude protein was carried out by dialysis using a cellulose tubing with a molecular weight cutoff of 12 kDa, followed by freeze-drying. The protein concentration of the purified sericin was found out to be 3.47 % (W/V). Following extraction, sericin can be used as the food packaging material.

Objectives

- Proteins are one of the most commonly used biomaterials in food technology especially in food packaging, coatings, and additives.
- Proteins especially sericin which is a byproduct, can provide a low-cost and naturally occurring raw material to be used as green formulation ingredients in the food industry as a food packaging material.

Methods

1. Extraction

Measure the absorbance of the concentration of Silk cocoon solution at 660nm. Finally, Estimate concentration of Silk cocoon solution using the BSA standard curve. $y = 0.0882x - 0.0688$ ($R^2 = 0.9933$)

Figure 1. The Silk Cocoon.

Figure 2. The Extraction of Sericin protein of Silk Cocoon.

2. Estimate the volume of Sericin A, B, C, D

Estimate the volume of Sericin A, B, C, D using BSA standard curve.

3. Dialysis

Dialysis the concentrated solution of Silk Cocoon to separate on the basis of their size for remaining the larger ones.

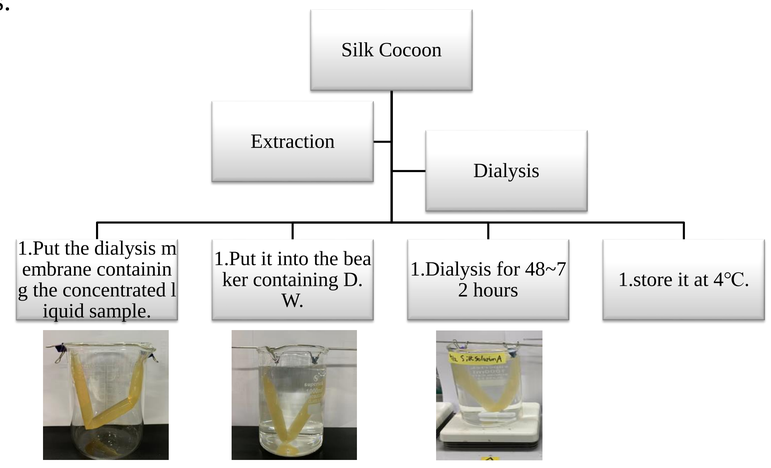

Figure 3. The Dialysis of condensed sericin solution of Silk Cocoon.

4. Lypilization

Freeze-drying the dialysised solution to make powder powder.

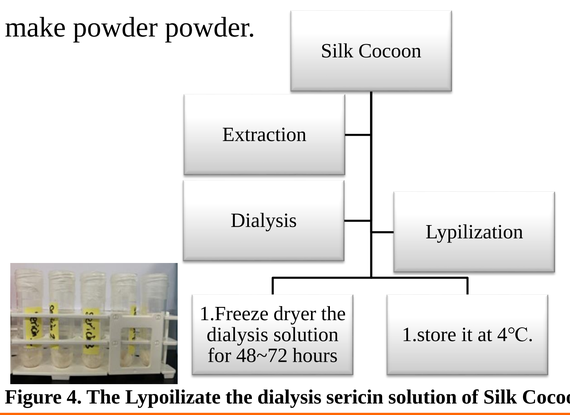

Figure 4. The Lypoilizate the dialysis sericin solution of Silk Cocoon.

Results

1. Extraction

Figure 5. The extracted sericin solution

3. Dialysis

Figure 6. The dialysised sericin solution

4. Lypilization

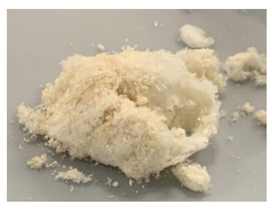

Figure 7. The Lypilizated Sericin samples

2. Estimate the concentration of Silk cocoon solution & the volume of Sericin A, B, C, D

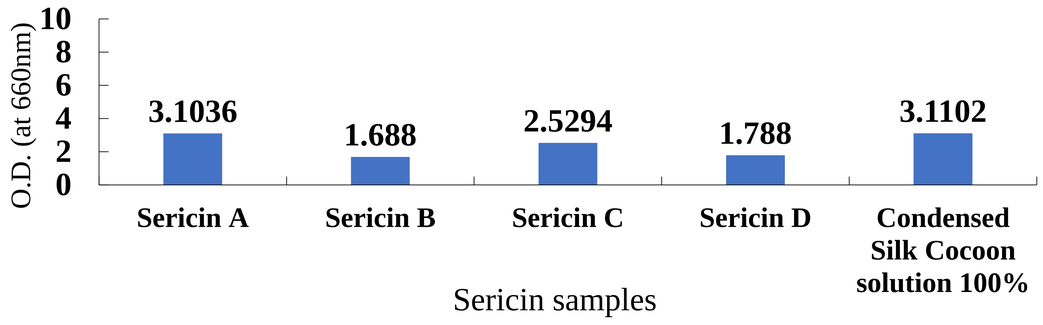

Figure 8. The absorbance of Sericin A, B, C, D and the condensed Silk Cocoon solution 100%

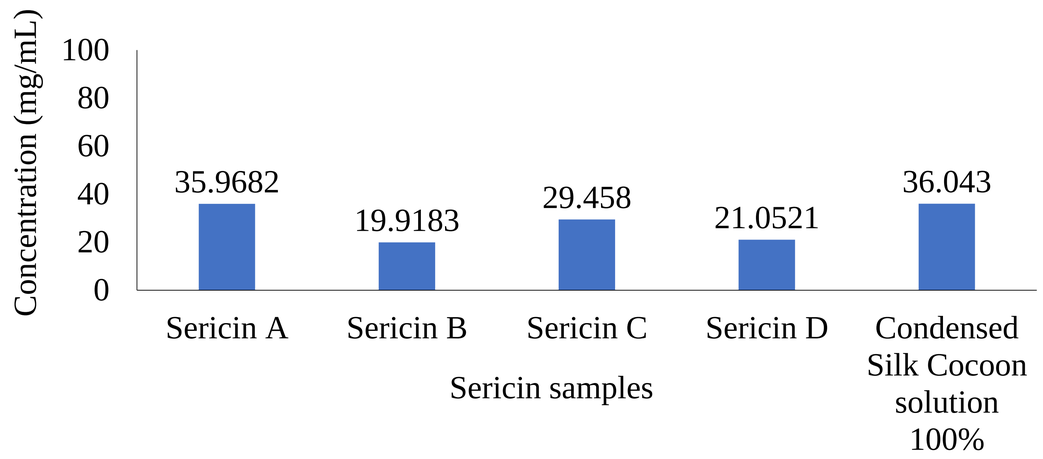

Figure 9. The concentration of Sericin A, B, C, D and the condensed Silk Cocoon solution 100%

Conclusion

- The sericin was extracted from the silk cocoon by the degumming method.
- The protein concentration of the extracted crude sericin sample was estimated by the standard Lowry's method using the bovine serum albumin as the reference standard.
- The protein concentration of the crude sericin was found out to be 3.60 % (W/V).
- The purification of the crude protein was carried out by dialysis using a cellulose tubing with a molecular weight cutoff of 12 kDa, followed by freeze-drying.
- The protein concentration of the purified sericin was found out to be 3.47 % (W/V).
- Following extraction, sericin can be used as the food packaging material.

Reference

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