Exploration on the Controlling of Molecular Weight Distribution of Collagen Hydrolysates from Cattle Hide

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Abstract

The solubility and the molecular weight distribution of cattle hide collagen dissolved by alkaline and protease were investigated. The molecular weight distribution was analyzed by high performance liquid chromatography.

- **Alkali hydrolysis**
- **Enzyme hydrolysis**
- **Distribution of molecular weight**

Material and Methods

Weigh 20.0 g of deliming cattle hide pieces as a sample in the experiment, add 80.0 mL of NaOH solution with concentrations of 0-1.0 mol/L respectively, and vibrate in water bath at 30 ℃ and 50 ℃ for 1, 3 and 5 hours. After the reaction, it was centrifuged with 9500×g at 4°C for 20min. Then filter with constant weight filter paper, collect the filtrate, analyze solubility according to the weight of residues. The pH of filter liquor was adjusted to 6-7 and freeze-dried for measurement of molecular weight.

Weigh 1.000g precisely deliming cattle hide powers as a sample, add 25.0mL of enzyme with enzyme activity of 1000U and adjust pH and temperature to optimum. Then vibrate in water bath 50 ℃ for 5 hours, inactivate for 10min at 90 ℃. Finally, filter and analyze total protein content and hydroxyproline content in the filtrate.

Introduction

In the biomedical field, collagen products requires certain mechanical properties and low degradation rate. Therefore, the molecular weight of collagen used in the medical field is required to be as large as possible.

In food field, in order to maintain a certain strength of the collagen membrane, collagen hydrolysates with a larger molecular weight are also required for food packaging materials. However, Health products demands collagen hydrolysates with lower molecular weight for great human absorption.

In the field of cosmetics, collagen polypeptide with high molecular weight is required to be added in oily cosmetics to enhance hydrophobicity, oil absorption and emulsification; Moisturizing cosmetics require that the molecular weight of collagen polypeptide is small for good water absorption and water retention.

Different fields have different requirements for the molecular weight of collagen hydrolysates. Therefore, it is very important to control the molecular weight of collagen hydrolysates. Moreover, the source of collagen, solvent medium and action conditions are the main factors that affect the collagen hydrolysis process and molecular weight.

Results and Discussion

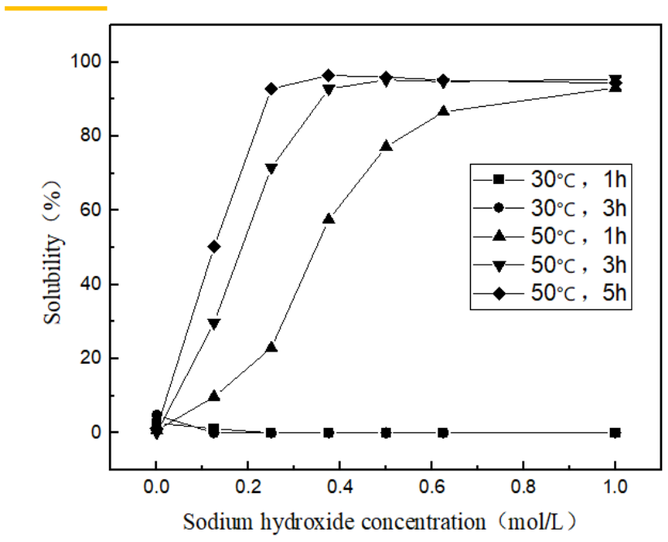

Fig. 1 Effect of sodium hydroxide concentration on the solubility of cowhide collagen

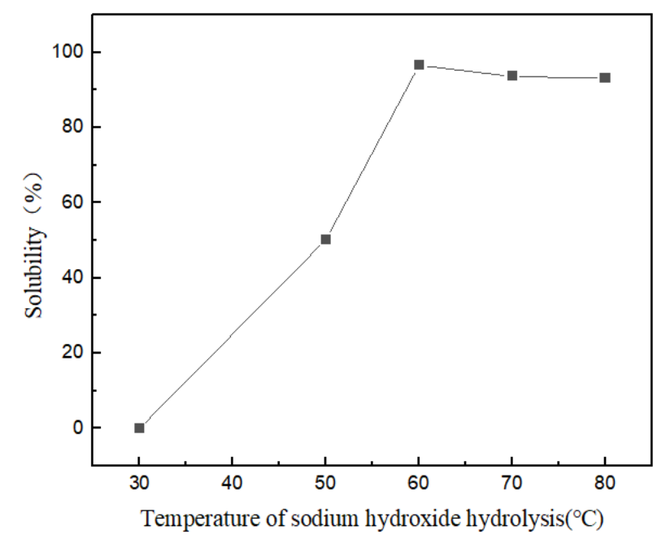

Fig. 2 Effect of sodium hydroxide hydrolysis temperature on the solubility of bovine collagen

Tab. 1 Effect of sodium hydroxide concentration on the molecular weight of cowhide collagen hydrolysates (50℃, 5h)

Sodium hydroxide concentration（mol/L）	Mn	Mw	Mw/Mn
0.13	6529	25545	3.91
0.25	4289	12026	2.80
0.38	3201	7279	2.27
0.50	2283	5022	2.20
0.63	1967	4146	2.11
1.0	1527	2859	1.87

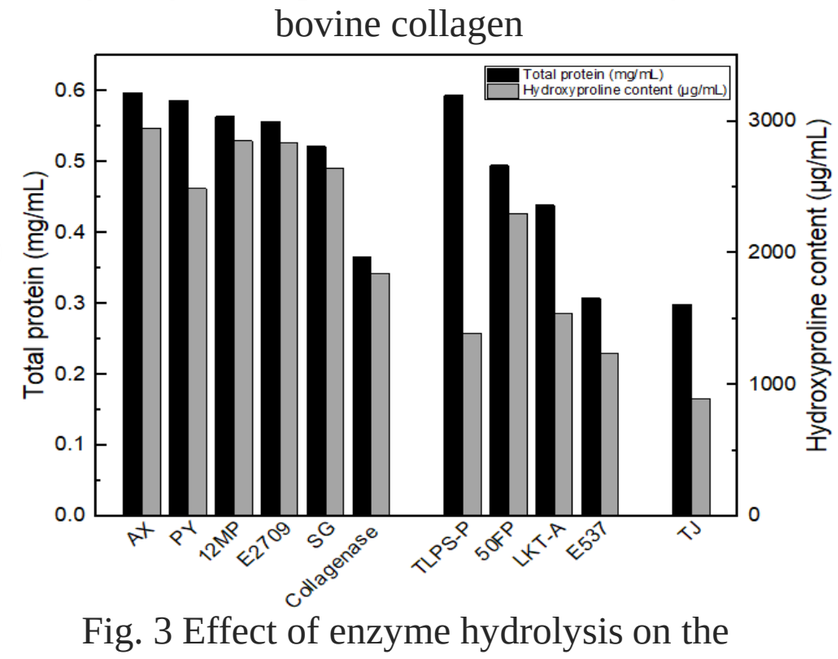

Fig. 3 Effect of enzyme hydrolysis on the solubility of bovine collagen

Conclusion

- The cattle hide would not be dissolved below 50 °C though the concentrations of sodium hydroxide have been increased to 1.0 mol/L.
- By raise temperature to 60 °C, the dissolution rate of cattle hide could be effectively increased to more than 95% with 0.1 mol/L sodium hydroxide.
- More than 90% cattle hide would be dissolved in 3-5 h when the concentration was raised to 0.25 mol/L.
- The molecular weight would be decreased to 5 KD (Mw) below and the distribution width was 2.0 around when the concentration was up to 0.5 mol/L.
- The dissolving of cattle hide would be promoted effectively by most of protease at 50 °C below.

Reference

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Acknowledgement

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