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马氏珠母贝肌肉提取蛋白热变性动力学

Kinetics of heat denaturation of proteins extracted from Pinctada martensii meat

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中文摘要:

为进一步了解水产蛋白的受热影响规律，更好利用它们的机能特性，该文研究热处理过程中马氏珠母贝肌肉提取蛋白（水溶性蛋白和盐溶性蛋白）的变性动力学，水溶性蛋白和盐溶性蛋白可分别用反应级数为1.1和1.3的方程较好地描述。研究结果表明，在60、70、80、90和100℃条件下水溶性蛋白变性的D值（90%蛋白变性所需时间）为33 333、12 500、3 333、1 667和769 s，而盐溶性蛋白热变性D值为50 000、12 500、5 000、2 000和1 250 s；水溶性蛋白和盐溶性蛋白的Z值（D值降低90%的温度变化）分别为24.1 和 25.0℃， 变性活化能分别为101.83 和112.78 kJ/mol，盐溶性蛋白比水溶性蛋白更为耐热。研究结果为进一步开发利用马氏珠母贝肌肉蛋白提供参考。

英文摘要:

South China Sea pearls are well known worldwide, and the pearl oyster Pinctada martensii is cultured for pearl production in China. Following the development of the pearl ind Pinctada martensii is now cultured at very large scale specifically for pearl production, with the oyster meat left aside as a typically unused byproduct of the pearl industry. Howev Pearl oyster meat is a good source of shellfish protein (74.9% protein/dry basis) at a low cost.Recently, the influence of food protein processing, storage and heat treatment is an a of growing interest. In particular, some thermal processing has a significant impact on animal muscle protein structure, enzymatic properties etc. Proteins are the most important ingredients in the food. They are not only important in nutrition, but also affect the texture and flavor of the food. Muscle proteins are generally classified into sarcoplasmic protei myofibrillar proteins (myosin, actin and actomyosin) and connective tissue or stromal proteins (collagen).This paper studied the kinetics of thermal denaturation of proteins (wate soluble and salt-soluble protein) extracted from Pinctada martensii meat in order to understand the thermal denaturation discipline of aquatic protein and make better use of their functional properties. Due to differences in the structure and composition, the two protein fractions denaturation was best described by assuming an apparent reaction order of 1. 1.3, respectively. D values, the time required to reduce the protein by 90%, were 33 333、12 500、3 333、1 667 and 769 s for the water-soluble protein fraction and 50 000、12 500、 000、2 000 and 1250s for the salt-soluble protein fraction at 60, 70, 80, 90, 100℃ respectively. There was significant difference of the two proteins for D value except at 70℃. This r be due to an easier to form gel for the salt-soluble protein under the condition of 65-70℃. The results showed that the thermal denaturation rate of two proteins continued to accel in the range of heating temperatures and the salt-soluble protein fraction was more heat-resistant than the water-soluble protein fraction. Protein denaturing reaction is very complicated, and many reactions occur as the temperature changes. The different heat treatment conditions have different effects on the expansion of the peptide chain and prote aggregation in the process of protein denaturation. Similarly, Z values, the degrees necessary to reduce the D value in one logarithmic cycle, were estimated to be 24.1℃ for water soluble protein fraction and 25.0℃ for the salt-soluble protein fraction. The denature reactions' activation energy of the water-soluble protein fraction and salt-soluble protein fraction were 101.83 and 112.78 kJ/mol respectively. The entropy value of protein thermal denaturation is a smaller process, and our results are consistent with it. The entropy cha of the system is negative. Therefore, these results will provide the theoretical basis for the data for Pinctada martensii meat protein high value utilization. In addition, it is of great practical significance for further development of new high-quality food use of their functional properties.

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