Effect of polysaccharide modification on the emulsifying properties of potato protein

賴姵璇(5129)

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Outline

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Abstract

Among natural emulsifiers, potato proteins showed to be good candidates for their functionality, low cost, and high availability. However, to better exploit potato proteins, a better understanding of the conditions which modulate their behavior as emulsifiers is necessary. The effect of pH and of the presence of the anionic polysaccharide k-carrageenan on the emulsifying properties of the potato proteins was here studied. Oil in Water (3:1) emulsions were prepared using potato proteins in the presence or absence of 0.2% k-carrageenan at different pH conditions (3.0, 7.0, and 4.8). The best emulsion stability was achieved combining potato proteins and k-carrageenan at pH 3.0. This being attributed to the onset of a gel-like viscoelastic structure as well as an electrostatic interaction between the positively charged potato proteins and the anionic polysaccharide. The interaction allowed the formation of a strong molecular network able to stabilize the system. In second study, the relations among the structure, interface adsorption and emulsifying properties of potato protein isolate (PPI) modified by chitosan (CS) were investigated. The results showed that the addition of CS led to an increase in the surface hydrophilicity of PPI, the reduction of the interfacial tension between oil-water and gas-water of PPI in the complex system. Moreover, the emulsion stabilized by the PPI/CS complex exhibited a smaller average particle size and a higher zeta - potential with a better emulsifying stability. In addition, the gel network structure of the emulsion stabilized by PPI/CS complex enhanced to promote the emulsion stability. These results will provide meaningful guidance for the application of CS modified PPI as a novel food emulsifier in the construction of stable emulsion system.

References

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多醣修飾對馬鈴薯蛋白乳化性能的影響

賴姵璇(5129)

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大綱

一、 前言

二、 不同 pH 條件下 k-鹿角菜膠存在對馬鈴薯蛋白乳化活性的影響

三、 幾丁聚醣修飾之馬鈴薯分離蛋白的結構、界面吸附及乳化特性

四、 結論

摘要

在天然乳化劑中，馬鈴薯蛋白因其功能性、低成本和高可用性而被證明是很好的選擇對象。然而，為了更好地利用馬鈴薯蛋白質，有必要更好地了解調節其作為乳化劑行為的條件。本研究討論 pH 值和陰離子多醣 k-鹿角菜膠的存在對馬鈴薯蛋白乳化特性的影響。不同 pH 條件(3.0、7.0 和 4.8)下，在存在或不存在 0.2% k-鹿角菜膠 (k-carrageenan) 的情況下，使用馬鈴薯蛋白製備水包油 (3:1) 乳化液。在 pH 3.0 下，結合馬鈴薯蛋白和 k-鹿角菜膠可獲得最佳乳化液穩定性，可觀察到均勻且小的油滴。乳化液顯示出最高黏度和最大 G' 值，這歸因於這些條件下凝膠狀黏彈性結構的產生，以及帶正電荷的馬鈴薯蛋白和陰離子多醣之間的靜電相互作用，形成能夠穩定系統的強大分子網狀結構；在本研究中，研究了幾丁聚醣(chitosan, CS)修飾馬鈴薯分離蛋白(potato protein isolate, PPI)的結構、界面吸附和乳化特性之間的關係。結果表明，CS 的加入導致複合物體系中 PPI 的表面親水性增加。同時，CS 的加入降低了油-水、氣-水界面張力。此外，由 PPI/CS 複合物穩定的乳化液表現出更小的平均粒徑和更高的 zeta 電位以及更好的乳化穩定性。此外，PPI/CS 複合物穩定乳化液的凝膠網狀結構增強，促進乳化液穩定性。這些結果將為 CS 修飾 PPI 作為新型食品乳化劑在構建穩定的皮克林乳化液 (Pickering emulsion) 系統中的應用提供有意義的指引。