天然乳化劑的乳化特性及應用

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摘要

乳化劑能促進油水混合，提高食品穩定性，是食品工業的重要添加劑。然而，合成乳化劑時對環境有負面影響，如聚氧乙烯（Polyethylene glycol, PEG）乳化劑難以分解。因此，本研究目的為探討天然乳化劑的乳化特性、穩定性機制及加工應用。研究中使用了多醣體（關華豆膠 Guar gum, GG; 玉米糖膠 Xanthan gum, XG; 果膠 Pectin, Pec）、山藥黏液（*Dioscorea opposite* mucilage, DOM）和中鏈脂肪酸酯（Medium-chain triglycerides, MCT）作為水、油相，混合製備 DOM-多醣體乳液。此外，牡丹籽粕磷脂質（Peony seed phospholipids, PPLs）和大豆卵磷脂（Soy lecithin, DPLs）與玉米油-牡丹籽油混合製備 PSO 乳液，同時從發酵乳（*pendidam*）中分離六個 *Lactobacilli* 菌株（DM1B, DM1C, GM2B, GM2C, PM2B, DM2C）製備 BE/BS 乳液。此等乳液添加 DOM、DPLs 和 PPLs 使粒徑、乳化指數(Creaming Index, CI)、界面張力降低並 zeta 電位提升，隨著 PPLs 濃度升高效果更好。*Lactobacilli* 乳液提升乳化穩定指數（Emulsion Stability Index 24 , ESI 24）。乳液穩定性易受 NaCl 與溫度影響，pH 4～10 下界面活性穩定。加工應用上，添加 DOM 可提升濁度。*Lactobacilli* GM2B、GM2C 和 PM2B 可降低麵糰黏度和麵包屑硬度、PM2B 提高麵包屑均勻性。綜上所述，DOM-多醣體、PSO 和 *Lactobacilli* 乳液均可提供食品工業應用。

Emulsifying Properties and Applications of Natural Emulsifiers

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Outline

1. Introduction
2. Emulsifier extraction and characteristics
3. Applications
4. Conclusion

Abstract

Emulsifiers can promote the mixing of oil and water, improving the stability of food products, and are important additives in the food industry. However, synthetic emulsifiers have negative environmental impacts, such as the difficulty of degrading Polyethylene glycol (PEG) emulsifiers. Therefore, the aim of this study is to explore the emulsifying properties, stability mechanisms, and processing applications of natural emulsifiers. In this study, polysaccharides (Guar gum, GG; Xanthan gum, XG; Pectin, Pec), *Dioscorea opposite* mucilage (DOM), and medium-chain triglycerides (MCT) were used as water and oil phases to prepare DOM-polysaccharide emulsions. Additionally, Peony seed phospholipids (PPLs) and soy lecithin (DPLs) were mixed with corn oil and peony seed oil to prepare PSO emulsions. Six *Lactobacilli* strains (DM1B, DM1C, GM2B, GM2C, PM2B, DM2C) were isolated from fermented milk (*pendidam*) to prepare BE/BS emulsions. The addition of DOM, DPLs, and PPLs to these emulsions reduced particle size, creaming index (CI), and interfacial tension, while increasing the zeta potential, with better results as the concentration of PPLs increased. *Lactobacilli* emulsions improved the Emulsion Stability Index (ESI 24). Emulsion stability was affected by NaCl and temperature, and was stable in the pH range of 4~10. In processing applications, adding DOM increased turbidity. *Lactobacilli* strains GM2B, GM2C, and PM2B reduced dough viscosity and crumb hardness, while PM2B improved crumb uniformity. In conclusion, DOM-polysaccharide, PSO, and *Lactobacilli* emulsions have potential applications in the food industry.

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