

ASSESSING THE PHYSICOCHEMICAL AND ANTIOXIDANT PROPERTIES OF EXTRACTED YEAST CELL WALL CARRIERS FOR PROBIOTIC ENCAPSULATION

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Abstract

The interest in functional foods has driven the search for novel materials to protect probiotics during processing and digestion. Among microbial polymers, biopolymers derived from yeast cell walls, composed primarily of glucans and mannoproteins, represent a promising natural carrier due to their unique structural and bioactive properties. Given its wide range of commercial uses and metabolic capacities, yeast has long been acknowledged as a key microorganism in food biotechnology. This research seeks to characterize the physicochemical properties of the extracted carriers, including their morphology, particle size, and chemical composition, quantify the *in vitro* antioxidant activity, and evaluate their potential as probiotic carriers. The thermal stability of the yeast carrier will be assessed to determine its storage properties and processability. The yeast-derived carrier should exert antioxidant capacity capable of scavenging free radicals. Encapsulation of probiotics using yeast-derived carriers should be able to improve upon the Bioaccessibility and storage properties of probiotics been investigated. The findings will advance sustainable probiotic delivery for functional foods, addressing viability challenges while leveraging GRAS-status materials.

Keywords

Microencapsulation, β -glucan, Microbial carriers, polysaccharide, Probiotic.

ОЦЕНКА ФИЗИКО-ХИМИЧЕСКИХ И АНТИОКСИДАНТНЫХ СВОЙСТВ ЭКСТРАГИРОВАННЫХ НОСИТЕЛЕЙ КЛЕТОЧНОЙ СТЕНКИ ДРОЖЖЕЙ ДЛЯ ИНКАПСУЛЯЦИИ ПРОБИОТИКОВ

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Аннотация

Интерес к функциональным продуктам питания стимулировал поиск новых материалов для защиты пробиотиков в процессе обработки и переваривания. Среди микробных полимеров биополимеры, полученные из клеточных стенок дрожжей, состоящие в основном из глюканов и маннопротеинов, представляют собой перспективный природный носитель благодаря своим уникальным структурным и биоактивным свойствам. Учитывая широкий спектр коммерческого применения и метаболические возможности, дрожжи давно признаны ключевым микроорганизмом в пищевой биотехнологии. Данное исследование направлено на характеристику физико-химических свойств экстрагированных носителей, включая их морфологию, размер частиц и химический состав, количественную оценку антиоксидантной активности *in vitro* и оценку их потенциала в качестве носителей пробиотиков. Термическая стабильность дрожжевого носителя будет оценена для определения его свойств хранения и

технологичности. Дрожжевой носитель должен обладать антиоксидантной способностью, способной нейтрализовать свободные радикалы. Инкапсуляция пробиотиков с использованием дрожжевых носителей должна улучшить биодоступность и свойства хранения исследованных пробиотиков. Полученные результаты будут способствовать развитию устойчивой доставки пробиотиков в функциональные продукты питания, решая проблемы жизнеспособности и используя материалы, имеющие статус GRAS (общепризнанно безопасные).

Ключевые слова

Микрокапсулирование, β -глюкан, микробные носители, полисахарид, пробиотик.

The substantial loss of microbial viability that occurs during food manufacturing, storage, and gastrointestinal processes frequently limits the effectiveness of probiotic-based functional products [1]. Microencapsulation offers a promising approach to enhance probiotic survival. Microbial carriers especially, yeast-derived carriers, have emerged as biodegradable and biocompatible encapsulants due to their unique structures and resilience [2]. The yeast cell wall is a complex composite of polysaccharides, primarily β -glucans, mannoproteins and chitins offer natural, GRAS-status biopolymers for probiotic encapsulation, providing mechanical strength, thermal stability and protection against gastric conditions. According to new research, yeast cell wall polysaccharides have inherent immunomodulatory and antioxidant properties which could offer synergistic benefits by shielding probiotics from oxidative damage [3].

The primary objective of this work is to isolate and purify yeast cell wall carriers from *S. cerevisiae* biomass using established extraction protocols. This study aims to: (i) Characterize the physicochemical properties of the extracted carriers, (ii) Quantify the *in vitro* antioxidant activity of the extracted carriers, and (iii) Evaluate the potential of these carriers to encapsulate model probiotic bacteria, assessing encapsulation efficiency and the protective effect conferred by the carriers' antioxidant properties against oxidative stress.

Physicochemical analysis is anticipated to reveal a porous, hollow morphology conducive to high probiotic loading. Given the documented antioxidant nature of yeast polysaccharides, we expect the extracted carriers to demonstrate enhanced viability and effectiveness, as the carrier matrix may reduce cell leakage and maintain membrane integrity.

This research will provide a comprehensive assessment of yeast-derived cell walls as multifunctional encapsulants. The expected outcome is the development of a natural, probiotic delivery system with enhanced properties to combat oxidative stress, thereby improving the overall efficacy and stability of probiotic products for functional food and nutraceutical applications.

Literature

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