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Processes for obtaining and recovering whey in the food industry

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Abstract

In the context of the circular economy, the capitalization of some by-products from the food industry is an important component of technological production. In the dairy industry, whey is a by-product with important nutritional properties that is not used to its true potential in other industries.

This review aims to analyze the possibilities of capitalizing the whey resulting as a by-product in the dairy industry, in different constituent forms (protein isolate, protein concentrate and hydrolyzed), as functional supplements.

Introduction

Whey, the liquid fraction remaining after milk coagulation during cheese or casein production, has traditionally been regarded as a low-value by-product. Due to its high organic load, improper disposal of whey has posed significant environmental risks, particularly through elevated biochemical oxygen demand (BOD) and chemical oxygen demand (COD). However, advances in food science, biotechnology, and environmental engineering have repositioned whey as a valuable raw material in the circular bioeconomy. Whey contains approximately 55% of the nutrients originally present in milk, including lactose (4.5–5%), whey proteins (0.6–0.8%), minerals (0.5–0.6%), and small amounts of fat and vitamins. Its complex composition makes it an attractive substrate for the production of functional ingredients and bio-based products. From a technological standpoint, the valorization of whey follows several strategic routes (figure 2).





Figure 1. Whey valorisation

Figure 2. Procedures used for whey valorisation



whey concentrate

Conclusion:

The comprehensive valorization of whey not only mitigates its environmental impact but also contributes to the economic resilience of the dairy sector. By integrating whey valorization into dairy processing chains, manufacturers can transition from waste management paradigms to sustainable resource utilization, aligning with circular economy principles. In summary, whey valorization stands as a multidimensional strategy that combines sustainability, technological innovation, and economic viability. Ongoing

Protein isolate is a purified form of whey protein, obtained through an advanced filtration process. It has the highest protein content (90%) but also the lowest fat, mineral and lactose content and is most commonly found in dietary supplements. It is obtained from whey concentrate, which is filtered to remove lactose, thus making it easily digestible.

Protein concentrate is a product obtained by ultrafiltration. Semipermeable membranes with pores are used that allow small molecules to pass through and at the same time retain serum proteins. The result is a concentrated protein solution with a protein concentration that can vary between 35% and 80%. It is used in food supplements, in low-protein diets, in athletes' nutrition, in various formulas for infants and children, it can be added to culinary recipes.

Protein hydrolysate - is a form of whey protein that has been processed through a hydrolysis process, which involves breaking down proteins into smaller peptides. This process improves the digestibility and absorption of protein in the body. Whey is treated with enzymes or acids that break down amino acid chains into smaller peptides. It is found in protein supplements, protein bars and shakes, and is popular among those who need a quick and effective protein intake. It can be used in formulas for people with digestive sensitivity or who need an easy-to-absorb protein supplement.

research into novel processing methods and microbial consortia is expected to further

expand the potential of whey as a feedstock for the bioeconomy.