

From Waste to Wonder: Unleashing the potential of milk processing by-products

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The dairy industry plays a pivotal role in the global food sector, providing a wide array of essential products that form an integral part of people's diets worldwide. From milk and cheese to butter and yogurt, dairy products are rich sources of vital nutrients, contributing significantly to human nutrition and health. But apart from production of these primary products, dairy industries are known for the generation wastes in food sector. In this article, we will explore the importance of the dairy products in the food sector and unveiling the potential of milk processing by products/wastes to utilizing them as edible nutritious food.

Dairy products being the nutritional powerhouse, provides an excellent source of calcium, protein, vitamin D, and other essential minerals and vitamins. These nutrients are crucial for the development and maintenance of healthy bones, teeth, and muscles. The dairy industry's offering forms an essential component of a balanced diet, especially for growing children, pregnant women, and older adults. It provides versatility in culinary applications. Dairy products add depth, flavor, and richness to a wide variety of dishes, making them an indispensable part of culinary traditions across the globe. For example, cheese enhances the taste of pizzas, pasta, and sandwiches, while yogurt is used in sauces, dressings, and smoothies. Butter is a staple in baking, contributing to the texture and taste of cakes, cookies, and pastries. The dairy industry has a profound impact on the global economy too. It provides livelihoods for millions of farmers, dairy processors, and distributors around the world. In rural areas, dairy farming is a crucial source of income and employment, supporting local economies and contributing to poverty reduction. Moreover, the dairy industry is a significant

contributor to the GDP of many countries, fostering economic growth and stability. The dairy industry's importance in the food sector cannot be overstated. Its nutritional value, versatility, economic impact, and contribution to sustainable agriculture make it an essential pillar of the global food supply chain.

The dairy industry, while being a vital component of the food sector generates a variety of waste or by-products during the processing of milk as well as other dairy products. These by-products are secondary products that are obtained alongside the main dairy product manufacturing process. While the primary focus of the dairy industry is to produce milk, cheese, yogurt, butter, and other dairy staples, the by-products that emerge present additional economic opportunities and contribute to sustainability efforts. From the initial stages of milk collection and processing to the production of dairy products, waste is inevitable. Moreover, dairy processing generates other organic waste, such as trimmings, peels, and scraps from the production of dairy products like butter and cheese. The disposal of such organic waste can create environmental issues if not handled properly. Additionally, cleaning and sanitizing processes in dairy plants result in wastewater containing chemicals and detergents, adding to the waste generated by the industry.

One common dairy by-product is whey, a liquid remaining after milk coagulation during cheese or yogurt production. Among the various waste products generated by the dairy industry, whey stands out as a significant concern due to its potential adverse effects on the environment and human health (Chandra et al., 2018). Whey is rich in protein, lactose, vitamins, and minerals, making it a valuable resource for various applications. Despite of

being considered as dairy waste, it has been utilized in the production of protein supplements, infant formula, and as an ingredient in the baking and confectionery industries. Another essential dairy by-product is buttermilk, obtained during butter production. Buttermilk contains residual fats, proteins, and water-soluble vitamins, and it is widely used in the bakery industry to enhance the texture and taste of baked goods. It is also used as a base for various beverages, dressings, and marinades. Dairy industry by-products also include cream, which is separated during milk processing, and it is widely used in the production of ice cream, whipped cream, and various desserts. Moreover, dairy by-products like casein and lactose are used in pharmaceuticals, food additives, and industrial applications.

Dairy wastewater contains high amount of dissolved organic components, (lactose, casein, inorganic salts, and N, P, K, fat and whey protein), that is commonly characterized by is normally characterized by high amounts of biological oxygen demand (BOD) and chemical oxygen demand (Ahmad et al., 2019). The main by-product of dairy industry is whey, which is produced during cheese and casein manufacturing. Milk whey contains lipids, carbohydrates, soluble vitamin, minerals as well as protein. The proper utilization of dairy industry by-products is of utmost importance, not only for economic reasons but also from a sustainability perspective. By optimizing the use of these by-products, the dairy industry can reduce waste and its environmental footprint while maximizing the value obtained from the milk processed. The waste water generated cannot be directly expelled into the river water, but must undergo some treatments.

Advancements in technology have opened up vast opportunities for the creation of novel channels to utilize the by-products generated during dairy processing. Dairy waste and related by-products can be purified and used in other industries by development of some technologies such as reverse osmosis (RO), drying, hydrolysis, ion exchange, nano filtration (NF), ultrafiltration (UF) and electrodialysis (Ryan and Walsh, 2016), which can then safely be disposed into water streams. Thus, a number of by-products of great value from milk processing can be obtained and further utilized for human consumption. Therefore, milk processing by-products are essentially products of commercial value that arises as a by-product during the production of the main products.

References

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