THE IMPORTANCE OF OLEOGELS AS FAT REPLACER IN FOOD TECHNOLOGY

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Introduction

Lipids are directly linked to the physical and chemical properties of foods, which can influence the quality of products during processing and storage. In addition, they influence their sensory characteristics [1]. However, excessive fat intake is well-known for increasing the risk of chronic disorder development such as diabetes mellitus, coronary heart disease, and obesity [2]. To modify the composition of lipids in foods, it is essential to understand their chemical and physical properties, ensuring quality maintenance.

Food industries have used methods such as hydrogenation, interesterification, blending and fractionation to convert liquid vegetable oils into solid fats, which are more affordable alternatives to conventional fats [3,4]. Besides, several approaches to fat replacement, the so-called fat replacers, have been developed. These substitutes are designed to mimic the physicochemical and sensory properties of fats, allowing for a significant reduction in fat and calories in foods [5], which, beyond that, can ensure technological quality, and add health benefits to consumers. The objective of this work was to present a literature review on the relevance of oleogels as fat substitutes in foods.

Material and Methods

A literature review covering the last 10 years (2014-2024) was conducted between January and October 2024 using the electronic databases ScienceDirect, Google Scholar, and PubMed. The keywords "fat substitute," "fat replacer," and "oleogel" were used for searches in these databases.

Results and Discussion

A total of 145 results were found in the ScienceDirect database, 36 in Google Scholar, and 2 in PubMed based on the combination of descriptors. The thirteen most recent and relevant publications on the topic of oleogel as a fat replacer, as highlighted by each data platform, were selected. Additionally, bibliographical references that were not related to the main topic and were not associated with food science were excluded.

Fat replacers are conceptually classified into two categories: fat substitutes or fat mimetics [6]. In short, the term "fat substitutes" has been used as a generalized indication for ingredients that have the function of minimizing the proportion of fat in foods, but without providing extra calories, being used in place of fat in a 1:1 ratio. Ingredients that do not have total functional equivalence to fats and are not replaced in the same proportions are called fat mimetics, and are used to imitate the effects of fat in food formulations [6,7].

In this context, fat replacers are generally classified into three groups based on their compositions: carbohydrate-based, protein-based and lipid-based [8]. There is therefore a wide variety, including fat replacers derived from carbohydrates (such as starches and gums), fat replacers derived from proteins (such as egg whites, milk and whey) and fat replacers derived from lipids (such as emulsifiers and medium-chain triacylglycerols) [8,7]. However, these systems have limitations in terms of taste, texture and processing performance.

Oleogel, in this sense, have received great attention as a substitute for solid fat in foods, proving capable of overcoming the limitations of other alternatives, while providing texture and sensory attributes of solid fat [9]. Innovations with oleogels are strategies capable of reducing the amount of saturated fats and trans fatty acids of industrial origin in food products. This systems are capable to structure a liquid oil in the presence of structuring/gelling agents into a three-dimensional network that can behaving like a solid fat, without causing significant changes in the chemical composition or in the structure of triglycerides [10]. In addition, they also can add mono- and/or polyunsaturated fatty acids to foods from their oily phase, which can bring health benefits with their consumption [11,12, 13].

Conclusion

Fat replacers emerge as promising technological alternatives for reducing the fat and calorie content of foods, without compromising their sensory and technological qualities. Although these new systems have some limitations, oleogels stand out as an innovative solution, offering a structure similar to that of solid fats, while reducing the presence of saturated fats and trans fatty acids of industrial origin and increasing the content of mono- and polyunsaturated fatty acids, which can bring potential health benefits. Thus, the continuous development and implementation of solid fat substitutes such as oleogels can significantly contribute to the production of healthier foods that are more widely accepted by consumers, responding to the growing demand for products that combine healthiness and sensory quality.

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