NATURAL ADDITIVES IN ICE CREAM: PERSPECTIVES ON APPLICABILITY

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Introduction

Natural additives in ice cream are substances obtained from plant, animal, or mineral sources, used to improve aspects such as flavor, color, and preservation of the product, without resorting to artificial ingredients [1]. In recent years, the demand for healthier products with a natural appeal has grown significantly, driven by consumers who are more aware of the effects of chemical additives on health. In this context, natural additives emerge as a healthier and more sustainable alternative, valued for their origin and for having less environmental impact [2].

The main natural additives used in ice cream production include colorants extracted from fruits and vegetables, such as beta-carotene from carrots or anthocyanin from grapes, stabilizers and thickeners from algae, such as agar and carrageenan, and natural flavorings derived from essential oils or plant extracts. These additives play a crucial role in enhancing the sensory experience of ice cream, ensuring its creaminess, vibrant color, and authentic flavor, while preserving its nutritional integrity. As a result, the ice cream industry has increasingly sought to incorporate these natural ingredients, aligning with the "clean label" trend, which prioritizes transparency and quality [3,4].

Therefore, this study aims to analyze the natural additives currently tested and used in ice cream production, with the goal of identifying more sustainable and appealing options for consumers.

Material and Methods

A narrative review of the literature was conducted by searching the PubMed, Scielo and ScienceDirect databases. The following descriptors were used in English: ice cream, natural additive, as well as the Boolean operators AND and OR. Eligible for inclusion in the review were original studies on the use of natural additives applied to ice cream, published in English in the last 5 years, and relating the impact of these additives on the overall quality of the product.
Consequently, studies that didn't address ice cream quality directly, literature reviews, that weren't published in English, that were more than 5 years old and that didn't relate the impact of the application of natural additives on product quality were excluded.
The first phase of the selection was characterized by an analysis of the titles, followed by an analysis of the abstracts. Finally, the studies were analyzed in their entirety to verify the eligibility criteria, considering their relevance and compliance with the topic in question. Furthermore, an evaluation was carried out regarding their beneficial potential, with regard to the applicability of the aforementioned compounds as additives in the formulation of ice creams.

Results and Discussion

After the application of inclusion and exclusion criteria, six articles were incorporated into this review, which investigated the use of natural compounds to assess their potential as natural additives. The technological application of natural additives in ice cream, while not yet widely explored in the literature, has shown significant benefits. These natural additives, such as oat β-glucan (0.5%), can be practically

applied in low-fat ice cream (2%) to reduce the recrystallization of free water by more effectively inhibiting the growth of ice crystals compared to Cremodan ® SI 320, a synthetic additive used as a control. Even after one month of storage at -18 ºC, ice
crystal sizes in the sample with β-oat glucan did not exceed 12.96 ± 1.92 μm, indicating a greater effect on cryoscopic temperature in the ice cream mix, ability to form a greater number of energy bonds due to specific interaction with milk proteins, suppresses the growth of ice crystals more effectively and gives the ice cream a creamy taste and
increases resistance to melting through an increase in overrun, which brings this type of frozen dessert closer to an integral analog to the control used with 10% fat [5].

Pectin, a heteropolysaccharide in the middle lamella of all plant cells, has also been evaluated for its emulsifying applications for its capacity to regulate rheology and texture due to its potent gelling and thickening abilities [6-8]. The application of watermelon (Citrullus lanatus (Thunb.) and pomegranate (Punica granatum Linn.) rind pectin as natural emulsifiers has been shown to have more viscosity in ice cream mixtures, a more complex texture and better dripping time when compared to the control with a commercial synthetic emulsifier. This demonstrates that pectin as an emulsifier is a healthy, sustainable, and economical alternative for the food industry.

Given their favorable hydrocolloid properties, another study utilized two tubers separately as stabilizers in ice creams. Purple sweet potato flour (Ipomoea batatas L.) and porang flour (Amorphophallus muelleri Blume) at a concentration of 1% demonstrated a highly significant effect (P < 0.01) on overrun and emulsion stability. The purple sweet potato showed better-overrun values and melting time than the control without adding the flour [9]. An additional study evaluated buttermilk, a byproduct of butter production, as a substitute for emulsifiers due to its remarkable emulsifying properties in food. When used as a natural additive, the authors demonstrated that this residue provided superior results in overrun, melting, and sensory attributes, resulting in higher acceptance of the ice cream and increased purchase intention. Thus, buttermilk can be recommended as a substitute for skim milk in ice cream production, promoting efficient utilization of this residue [10].

Conclusion

Finally, our analyses suggest that these applications, although still in the development stage for industrial use, should be more widely investigated to assess the feasibility of partially or entirely replacing synthetic additives. Additionally, it is essential to implement consumer testing approaches to evaluate the acceptance of products using natural additives. Such research is fundamental to promoting a strategy that aligns more closely with clean label principles.

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