

Innovation Substitution of Sucrose with Stevia and Chicory Root in Eclairs

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ABSTRACT

Introduction: The demand for lower-sugar baked goods without sacrificing sensory appeal has increased due to the development in non-communicable diseases like obesity, diabetes, and cardiovascular ailments worldwide. Sucrose plays a major role in the sweetness, structure, browning, and moisture retention of traditional confections like éclairs. Research on natural, low-calorie sweeteners and functional additives for food reformulation is being prompted by mounting evidence linking high sucrose intake to metabolic diseases. The high-intensity, calorie-free sweetener stevia (*Stevia rebaudiana* Bertoni) is well known for its stability, sweetness profile, and appropriateness in baked goods. Chicory root, on the other hand, is a rich natural source of inulin, a soluble dietary fiber with prebiotic potential, the ability to bind water, and a useful function as a sugar substitute. Inulin is particularly relevant for health-conscious baked goods since it can improve texture, lower calorie density, increase moisture retention, and maintain gut bacteria, according to scientific studies (Hughes, *et al.*, 2022). Building on these discoveries, the current project aims to create Golden Pods, a reinvented, health-conscious version of the traditional French éclair base, by replacing all of the sucrose with stevia and powdered chicory root.

Objectives:

1. To reduce calorie content and glycemic reaction, natural stevia will be used in place of refined sucrose in the éclair shell.
2. Using chicory root powder as an inulin source to improve textural stability, moisture retention, and dietary fiber content.
3. To compare the reformulated eclairs sensory, physicochemical, and functional qualities to those of conventional formulations.
4. To ascertain whether stevia and inulin-based formulations can satisfy customer demand for functional, clean-label, low-sugar baked goods.

Methodology: Stevia and powdered chicory root were used to reformulate the classic éclair shell for the study. The choux pastry dough was made by heating milk and water, adding stevia and vanilla essence, and then adding butter. To create a cohesive dough, all-purpose flour was progressively combined. The dough was then cooled before eggs were gradually added to get the right piping consistency. For functional evaluation, different amounts of chicory root powder (a source of inulin) were added (3–5%). Standard food science techniques were used for physicochemical evaluations, which moisture content, and structural stability. The sweetness profile, texture, and general appeal were the main emphasis of the sensory examination. The control sample, a conventional sucrose-based éclair, and the experimental samples made with stevia and powdered chicory root were compared. The results were analyzed in the context of recent research on the functional behavior of inulin in baked goods (Canale *et al.*, 2024; Tsatsaragkou *et al.*, 2021).

Key Findings: There were notable functional and nutritional gains in the reformulated eclairs. In line with other studies on the technical characteristics of inulin, inulin-enriched samples demonstrated increased moisture

retention, decreased staling, and improved softness. In order to maintain structural integrity and a pleasing mouthfeel, the moisture level stayed within the optimal range of 18–22%.

While chicory root enhanced sweetness balance, texture, and prebiotic content, stevia replaced sucrose without bitterness at ideal levels. Superior softness, reduced calories, and stability for 5 to 7 days under refrigeration were demonstrated by éclairs with 3-5% chicory root. Golden Pods successfully integrated clean-label, plant-based ingredients, sugar reduction, and functional enhancement to meet the demands of health-conscious consumers.

Conclusion: Stevia and chicory root powder are used in place of sucrose in éclairs, which is a creative and scientifically supported method of creating healthier confections. While chicory root inulin improves fiber content, moisture retention, and structural stability, stevia greatly lowers the calorie and glycemic impact. The reformulated éclairs are appropriate for diabetic-friendly product lines and health-conscious consumers since they provide increased nutritional content without sacrificing sensory excellence. This study supports further efforts to develop sustainable, practical, and customer-driven bakery solutions by highlighting the prospective role of natural sweeteners and prebiotic fibers in contemporary pastry innovation.

Keywords: Stevia, Inulin, Reduced-Sugar Eclair, Golden Pods, Chicory Root, Functional Bakery Product.

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