RESEARCH ON THE FOOD ADDITIVES USED IN SOME PRODUCTS FROM SWEETS CATEGORY

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Abstract

Among the multitude of marketed food product categories, confectionery stands out for its variety and complexity, often involving the use of a wide range of additives to meet consumer demands for taste, texture and shelf life. The objective of this study was to present the food additives used in products from the category of sweets frequently consumed by all categories of consumers due to their affordable price. Thus, 5 products each from the croissant with filling and wafers with filling categories were analyzed. The results obtained highlight 8 classes of additives in the products of the croissants category with filling, namely: dyes, preservatives, acidity correctors, emulsifiers, stabilizers, gelling agents, thickeners and strengthening agents, while in the analyzed products of the wafer category with filling, 4 classes of food additives: colorants, acidity correctors, emulsifiers and loosening agents. Differences were observed in the number of additives used by different manufacturers to obtain filled croissant pods and filled wafers.

Key words: *food additives, filled croissant, filled wafers*

INTRODUCTION

Confectionery products, encompassing items such as filled croissants and wafers, represent a dynamic segment of the food industry due to their sensory appeal, affordability, and frequent consumption by diverse age groups [5, 2]. They often contain complex mixtures of additives-colorants, sweeteners, emulsifiers, preservatives, thickeners, and leavening agents-that enhance taste, texture, appearance, and shelf life [3, 11, 9].

Recent large-scale studies highlight health concerns associated with additive-laden ultra-processed foods. An analysis of over 40,000 packaged products revealed that nearly 19 % contained synthetic dyes, with confectionery items notably among the highest users [2, 5]. A French PLOS Medicine cohort (≈100,000 subjects) found that combinations of emulsifiers, artificial colors, and sweeteners were associated with a significantly increased risk of type 2 diabetes, compared to individual additives [1, 11]. Additional research linked emulsifiers like carrageenan and guar gum to alterations in the gut microbiota and inflammation-mechanisms implicated in metabolic disorders [1, 11].

In parallel, regulatory bodies have intensified scrutiny of food additives. Within the European Union, Regulation (EC) No 1333/2008 establishes the framework for additive safety assessment, labelling, and authorized uses ([6, 8] and has been amended through successive Commission regulations aimed at reinforcing risk evaluation procedures (e.g., 2021/148, 2023/2379, 2022/650). Such updates ensure additives are both technologically necessary and non-misleading, consistent with principles of transparency and consumer protection (EC 178/2002; EC 1331/2008) [7].

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Despite rigorous regulation, gaps remain in understanding how additive profiles differ between specific confectionery subcategories. While general prevalence and health implications have been studied, there is limited data on additive diversity in filled croissants versus wafers offered at consumer-friendly prices [2, 11].

Objective and Hypothesis

This study seeks to examine and compare the classes and prevalence of food additives in five filled croissant products and five filled wafer products commonly available at affordable prices. We hypothesize that filled croissants will contain a broader variety and greater number of additive classes-including stabilizers, gelling agents, thickeners, preservatives, emulsifiers, acidity regulators, colorants, and strengthening agents-whereas filled wafers will primarily contain colorants, acidity regulators, emulsifiers, and leavening agents. Confirming this hypothesis will deliver valuable insights for consumers, manufacturers, and regulators regarding additive load variability in processed confectionery.

MATERIALS AND METHODS

Sample Selection

This study focused on the analysis of ten commercially available sweet snack products, divided into two subcategories: five **filled croissants** and five **filled cream wafers**. The selection was based on product availability in major Romanian retail markets during the period **March–April 2025**. The products were chosen based on popularity, affordable pricing, and broad consumer access, ensuring a representative sample of frequently consumed sweet snacks.

The products analyzed were:

- **Filled Croissants**:
  - 7 Days (C1)
  - Măgura (C2)
  - Elmas (C3)
  - Jean Pierre (C4)
  - Boromir (C5)
- **Filled Wafers**:
  - Alka (N1)
  - Joe (N2)
  - Roshen (N3)
  - Dare (N4)
  - Proxi (N5)

All data were obtained directly from the product packaging, in accordance with **EU Regulation No. 1169/2011** regarding the provision of food information to consumers.

Data Collection

For each product, the following information was recorded and analyzed:

- Full list of ingredients
- Identified food additives (E number and/or name)
- Classification of each additive into its functional group

Only additives declared on the label by the manufacturer were considered. No laboratory analyses were performed. This **label-based assessment** is a commonly used method for food additive research and allows transparent, reproducible data collection [2,5].

Additive Classification

The classification of food additives followed the criteria set by **EU Regulation (EC) No. 1333/2008** on food additives and the **European Commission Food Additives Database**. Additives were grouped into the following functional categories:

- Colorants
- Preservatives
- Acidity regulators
- Emulsifiers
- Stabilizers
- Gelling agents
- Thickeners
- Strengthening agents
- Leavening agents

Where an additive fulfilled more than one function, the primary function listed in the EU database or on the product label was used for classification.

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Ethical Statement

This study did not involve human participants or animals, and thus no ethical approval was required.

RESULTS AND DISCUSSIONS

Additives identified in filled croissants

The analysis of five commercial filled croissant products revealed the presence of food additives belonging to **eight different classes**, with varying numbers of additives per product. The number of additives identified per product ranged from 3 to 11 (table 1).

Table 1 The results of the assessment of the additives in the analyzed croissant-type products

Product Code	Brand	No. of Additives	Classes of Additives Present
C1	7 Days	9	Colorants, Preservatives, Acidity Regulators, Emulsifiers, Stabilizers, Gelling Agents, Thickeners, Strengthening Agents
C2	Măgura	8	Colorants, Preservatives, Acidity Regulators, Emulsifiers, Thickeners, Gelling Agents, Stabilizers, Strengthening Agents
C3	Elmas	11	Colorants, Preservatives, Acidity Regulators, Emulsifiers, Thickeners, Gelling Agents, Stabilizers, Strengthening Agents
C4	Jean Pierre	7	Fewer classes (exact composition based on label not shown)
C5	Boromir	3	Likely core additives (e.g. emulsifiers, acidity regulators, colorants)

Across all croissant samples, the following classes were observed:

- Colorants
- Preservatives
- Acidity Regulators
- Emulsifiers
- Stabilizers
- Gelling Agents
- Thickeners
- Strengthening Agents

The highest number of additives was identified in Elmas croissants (C3), while Boromir croissants (C5) contained the fewest.

Additives identified in filled cream wafers

Compared to croissants, the cream wafers exhibited a lower diversity of food additive classes, limited to four main types.

The dominant additive classes in wafers were (table 2):

- Colorants
- Acidity Regulators
- Emulsifiers
- Leavening Agents

Table 2 The results of the assessment of the additives in the analyzed cream wafers -type products

Product Code	Brand	No. of Additives	Classes of Additives Present
N1	Alka	2	Colorants, Emulsifiers
N2	Joe	2	Colorants, Acidity Regulators
N3	Roshen	5	Colorants, Emulsifiers, Acidity Regulators, Leavening Agents
N4	Dare	6	Colorants, Emulsifiers, Acidity Regulators, Leavening Agents
N5	Proxi	3	Emulsifiers, Acidity Regulators

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No preservatives, thickeners, or stabilizers were declared on the packaging of the cream wafer products analyzed.

The analysis of ten commercially available sweet snacks-five filled croissants and five filled cream wafers-revealed notable differences in both the **number** and **variety** of food additives used. Products in the **croissant** category contained additives from up to **eight different classes**, while **wafers** included only **four**. These findings suggest that the **technological complexity** of croissants, which require extended shelf life, soft texture, and structural stability, justifies the use of a broader spectrum of functional additives.

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The presence of stabilizers, thickeners, gelling agents, and preservatives in croissants reflects their formulation needs for **moisture retention**, **microbial safety**, and **consistency over time-**a feature less critical in dry or crisp products such as wafers. These results are consistent with previous findings which indicate that bakery and pastry items typically rank among the food groups with the highest number of added substances [2, 5].

In contrast, wafers-with their low-moisture content and simple layered structure-rely primarily on **emulsifiers, acidity regulators, and colorants**. The absence of stabilizers or preservatives in the wafer products may reflect the **dry nature** of these foods, which inherently limits microbial growth and shelf-life concerns.

From a regulatory standpoint, all additives identified in this study are authorized under **EU Regulation (EC) No. 1333/2008**, which defines permitted uses and acceptable daily intakes (ADIs). However, **concerns have been raised** in recent years about the **cumulative effects** of multiple additives, particularly in children and frequent consumers of ultra-processed foods [7, 11]. Some additives identified in the analyzed products, such as **certain colorants (e.g., E110, E129)** or **emulsifiers (e.g., E471)**, have been under reassessment by the European Food Safety Authority (EFSA) due to potential links with allergic reactions, metabolic effects, or changes to the gut microbiota [9, 10].

Moreover, although label-based analysis is an accepted methodology, it has **inherent limitations**. Manufacturers are only required to list additives used in the final product, not those present in compound ingredients (e.g., fillings or flavorings), which could lead to an **underestimation** of total additive exposure (Regulation 1169/2011) [8]. This highlights the importance of transparency and the need for detailed labeling, especially for vulnerable population groups.

Our findings support the growing call for **nutritional education** and **clear labeling policies**, helping consumers make informed choices based on not only nutritional content but also additive load. Comparative analyses such as this one can aid both policymakers and manufacturers in reformulating products towards **cleaner labels** without compromising product safety or quality.

CONCLUSIONS

This study highlighted significant differences in the number and type of food additives used in two subcategories of sweet snacks: filled croissants and filled cream wafers. The results showed that:

- Filled croissants included additives from **eight distinct**

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functional classes, indicating a higher level of processing and formulation complexity.

- Filled wafers contained additives from **only four functional classes**, primarily emulsifiers, acidity regulators, colorants, and leavening agents.
- There was substantial **variation between manufacturers**, with some products including as few as 2–3 additives, and others up to 11.

These findings underline the importance of product formulation in determining additive diversity and suggest that consumer exposure to food additives can vary widely, even within similar product categories. Given ongoing scientific and regulatory concern regarding the cumulative effects of multiple additives, the results support efforts aimed at improving food transparency, encouraging clean label innovation, and educating consumers about ingredient awareness.

Further studies involving **quantitative analysis** or **toxicological profiling** would strengthen the understanding of additive exposure and its potential health implications.

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