

# Revolutionizing the Bakery Industry: Creating Low-Fat, Low-Salt, Puff Pastry While Preserving Sensory and Technological Excellence



Celeste



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## Introduction and Objective

Consumers' awareness regarding the health impact of dietary intake has increased significantly over the past years, revealing serious concerns regarding the nutritional value and health-related features of the food products comprising their everyday diet. In this sense, the distinct food industry sectors have searched for, and developed, products with increasingly balanced nutritional profiles, which include, among others, reduced- or low-fat products/formulations. One such industry is the bakery industry, which offers a vast array of distinct products, and in which efforts have been undertaken to reformulate the traditional recipes to manufacture healthier products. Since butter (fat) represents 34% of the total ingredients comprising the traditional formulation, the aim of the present work was to develop an innovative puff pastry with significantly reduced fat content, but with which the products manufactured therewith would maintain the sensorial and technological properties of those produced with the conventional recipe.

## Methodology

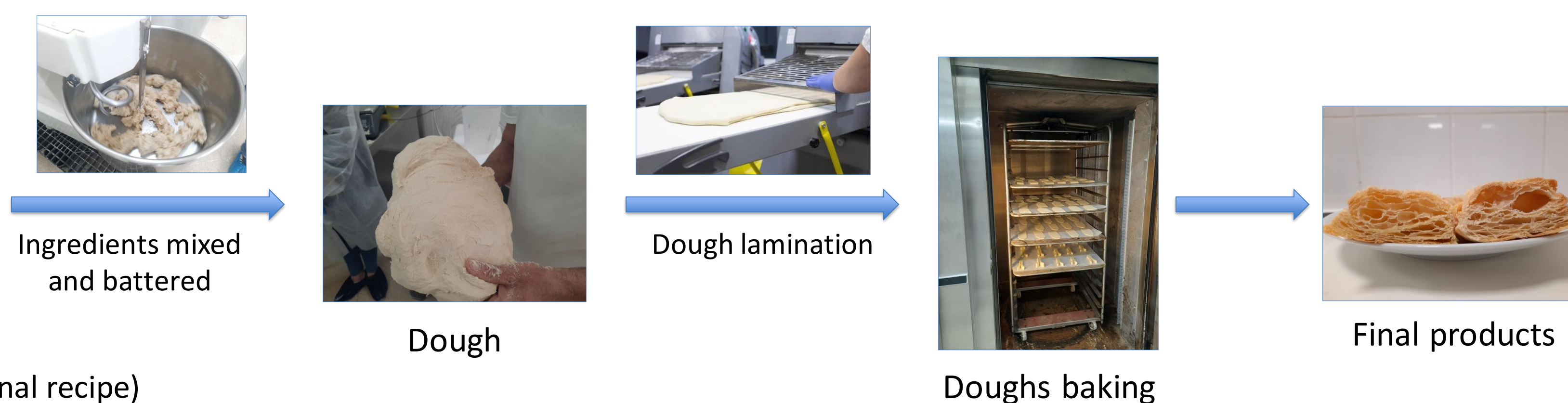
### Formulations

#### ❖ Conventional

- Flour
- Salt
- Butter
- Water

#### ❖ Alternative

- Flour
- Salt
- Butter (50% of conventional recipe)
- Acacia gum + wheat fiber
- Water



### Nutritional profiles

Fatty acids profiles (gas chromatography)

Firmness (texture analysis)

Color (CIELAB analysis)



## Results

**Table 1.** Nutritional composition of conventional and alternative baked puff pastry.

Parameter	Conventional	Alternative
Energy	2100 kJ 505 kcal	1793 kJ 429 kcal
Total fat (lipids) g/100g	34.8	22.2
Saturated FA g/100g	18.5	12.5
Monounsaturated FA g/100g	12.6	7.5
Polyunsaturated FA g/100g	3.7	2.2
Total carbohydrates	44.4	53.4
Digestible carbohydrates	39.8	47.7
Total sugars (ac. inv.)	2.0	2.4
Total fiber	4.6	5.7
Protein	5.8	6.8
Sodium / NaCl	0.89 / 2.23	0.46 / 1.15
Moisture (%)	12.4	16.2
Ashes (%)	2.59	1.41

**Table 2.** Fatty acids profiles (%distribution) of conventional and alternative baked puff pastry.

Fatty acid	Conventional	Alternative
C8	0.02	0.03
C10	0.02	0.02
C12	0.42	0.33
C14:0	0.96	0.93
C15:0	0.02	0.04
C16:0	45.70	48.87
C16:1	0.10	0.08
C17:0	0.08	0.06
C17:1	0.01	0.02
C18:0	5.48	5.45
C18:1n9trans	0.02	0.02
C18:1n9c	36.16	33.56
C18:2n6c	10.21	9.80
C20:0	0.35	0.35
C20:1	0.01	0.01
C18:3n3(ALA)	0.24	0.25
C22:0	0.09	0.09
C24:0	0.08	0.07
C22:6n3(DHA)	0.01	0.02
Total	100	100
ΣSaturated	53.23	56.23
ΣMonounsaturated	36.31	33.70
ΣPolyunsaturated	10.46	10.08
Total	100	100

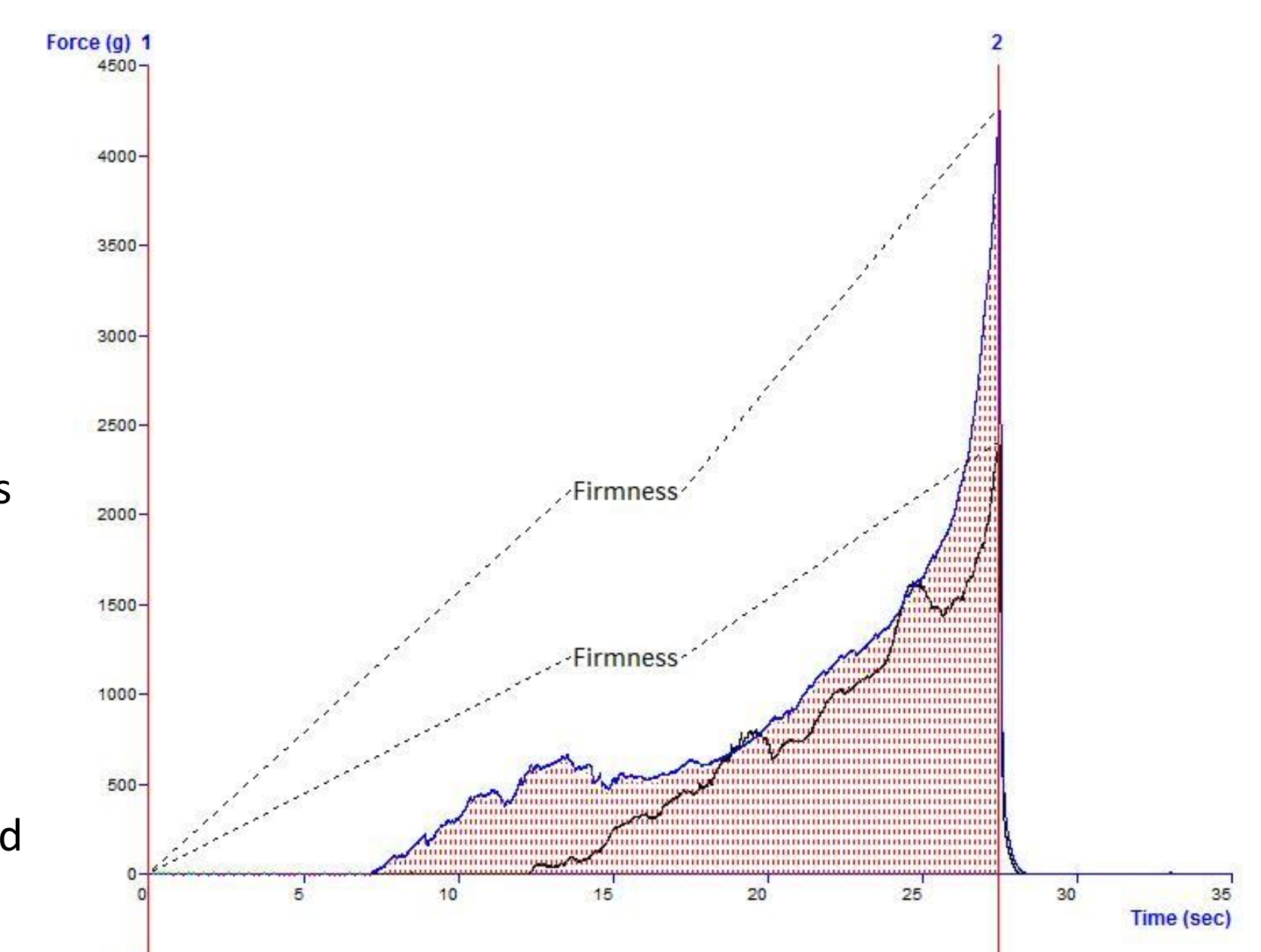
### Nutritional profile

- Improved (lower) caloric value;
- Decreased fat content (ca. 40% less);
- Reduction ca. 50% salt content (Table 1).

- Similar fatty acids qualitative profiles (Table 2; Fig. 1).

### Physical properties

- Similar firmness between both baked puff pastry.
- No significant color alterations.

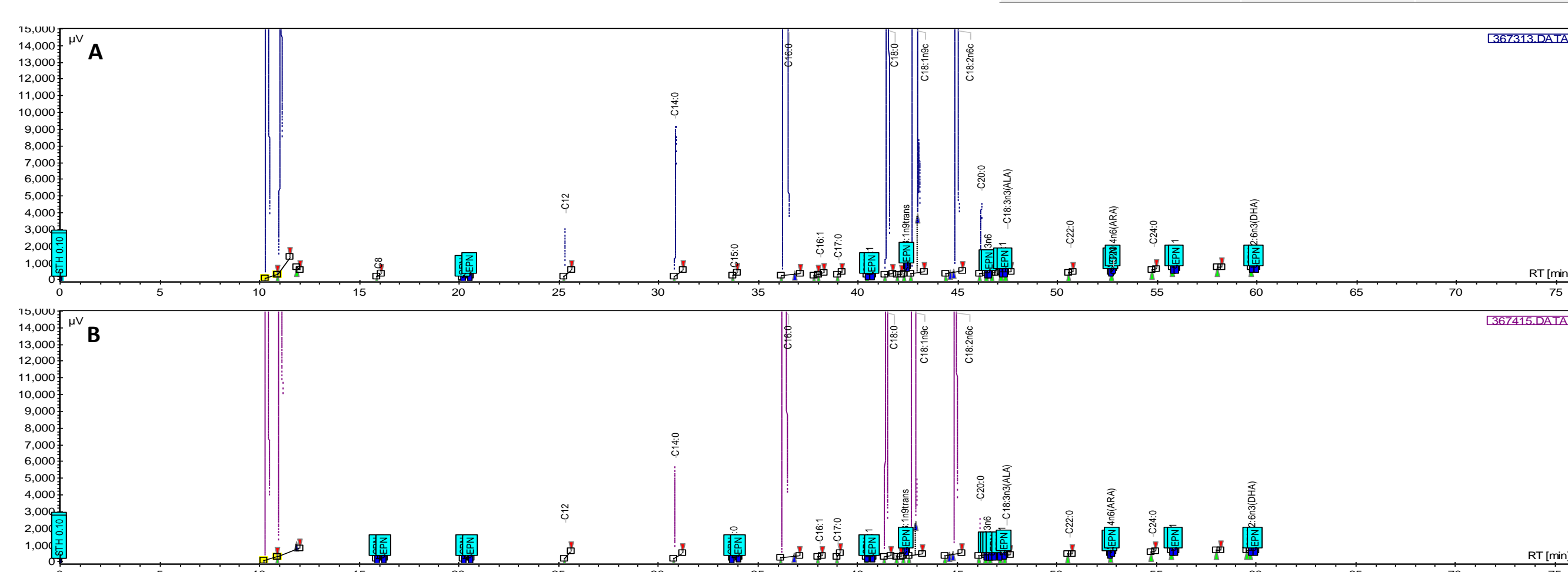


**Fig. 2** Texture analysis (firmness) of the baked puff pastry determined by cutting longitudinally. (blue – conventional; black – alternative)

**Table 3.** CIELAB color space coordinates of conventional and alternative baked puff pastry.

Part	Formulation	Coordinate				
		L	a	b	h	
External	Conventional	54.2 ± 6.4	8.2 ± 3.4	19.2 ± 1.3	21.0 ± 2.3	67.4 ± 7.6
	Alternative	52.7 ± 3.00	8.2 ± 1.2	20.7 ± 0.7	22.3 ± 0.8	68.4 ± 2.9
Internal	Conventional	53.1 ± 5.7	0.45 ± 0.31	11.9 ± 1.5	11.9 ± 1.5	87.8 ± 1.5
	Alternative	44.9 ± 4.5	0.97 ± 0.15	10.1 ± 0.7	10.1 ± 0.7	84.5 ± 0.8

L – lightness; a – red/green; b – yellow/blue; C – chroma ; h – hue angle



**Fig. 1** Fatty acids chromatograms of the baked puff pastry manufactured with the two formulations (A – conventional; B – alternative)

## Conclusions

- Substitution of the butter by the acacia gum/wheat fiber mixture resulted in an innovative product, with an improved nutritional profile.
- Texture and color of the baked puff pastry were not significantly impacted by the alternative lower fat formulation.
- Puff pastry with a healthier profile was achieved, presenting physical traits similar to those of the conventional formulation.