

# Development of an innovative laminated dough with half-fat content



Sérgio Sousa<sup>1</sup>, Marta Coelho, Kritika Adlakha<sup>1</sup>, Ana Martins<sup>2</sup>, Marta Correia<sup>1</sup>, Ana Pimenta<sup>1</sup>, Maria João Monteiro<sup>1</sup>, Paula Teixeira<sup>1</sup>, Ana Gomes<sup>1</sup>, Manuela Pintado<sup>1,\*</sup>

1. Universidade Católica Portuguesa, CBQF - Centro de Biotecnologia e Química Fina – Laboratório Associado, Escola Superior de Biotecnologia, Rua Diogo Botelho 1327, 169-005 Porto, Portugal

2. CELESTE ATUAL S.A., Rua dos Estoleiros, Polvoreira, 4835-163 Guimarães, Portugal

\*corresponding author: [mpintado@ucp.pt](mailto:mpintado@ucp.pt)



XXII Congress, European Food Chemistry  
Belgrade, Serbia, June 14-16, 2023

## 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 laminated dough with significantly reduced fat and salt contents, but with which the products manufactured therewith would maintain the sensorial and technological properties of those produced with the conventional dough.

## Methodology

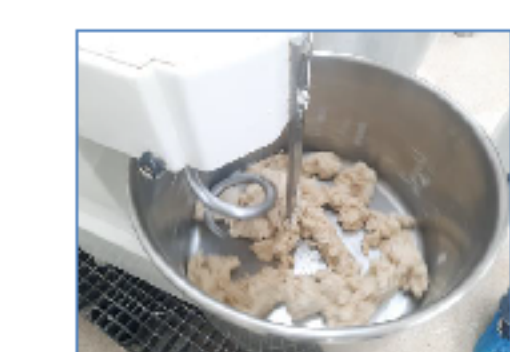
### Formulations

#### ❖ Conventional

- Flour
- Salt
- Butter
- Water

#### ❖ Alternative

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



Ingredients mixed and battered



Dough



Dough lamination



Doughs baking



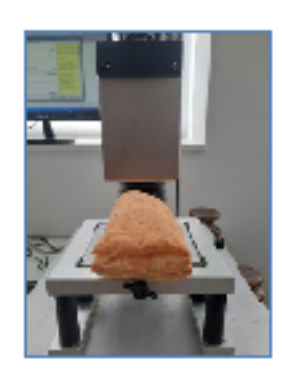
Final products

Nutritional profiles

Fatty acids profiles  
(gas chromatography)

Firmness  
(texture analysis)

Color  
(CIELAB analysis)



## Results

**Table 1.** Nutritional composition of conventional and alternative baked laminated doughs.

Parameter	Conventional		Alternative	
	kJ	2100	1793	
Energy	kcal	505	429	
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 (g/100g)		44.4	53.4	
Digestible carbohydrates (g/100g)		39.8	47.7	
Total sugars (inv. sugars)		2.0	2.4	
Total fiber (g/100)		4.6	5.7	
Protein (g/100g)		5.8	6.8	
Sodium / NaCl (g/100g)		0.89 / 2.23	0.46 / 1.15	
Moisture (%)		12.4	16.2	
Ash (%)		2.59	1.41	

FA – fatty acids

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

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

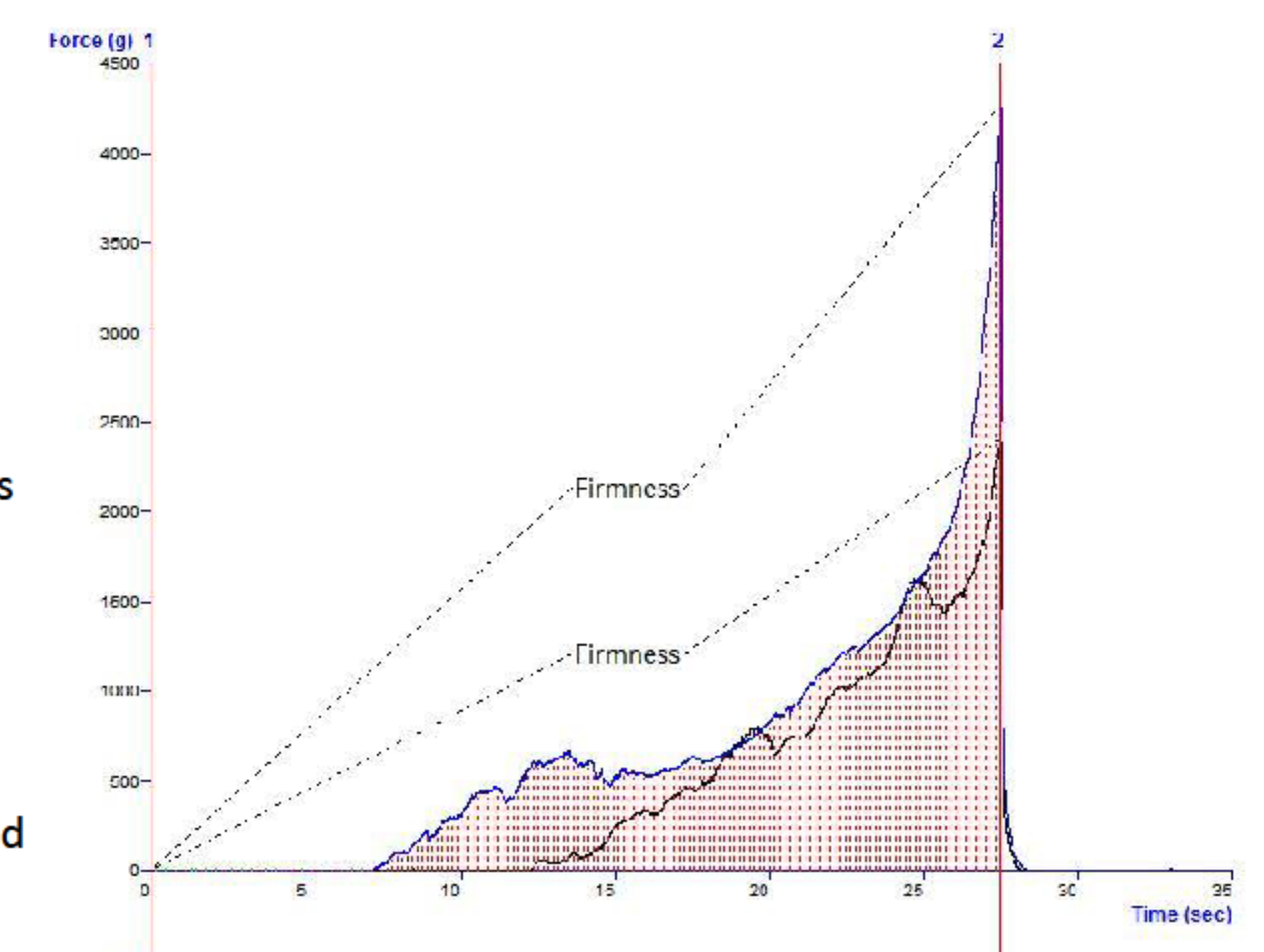
### Nutritional profile

- 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 doughs.
- No significant color alterations.

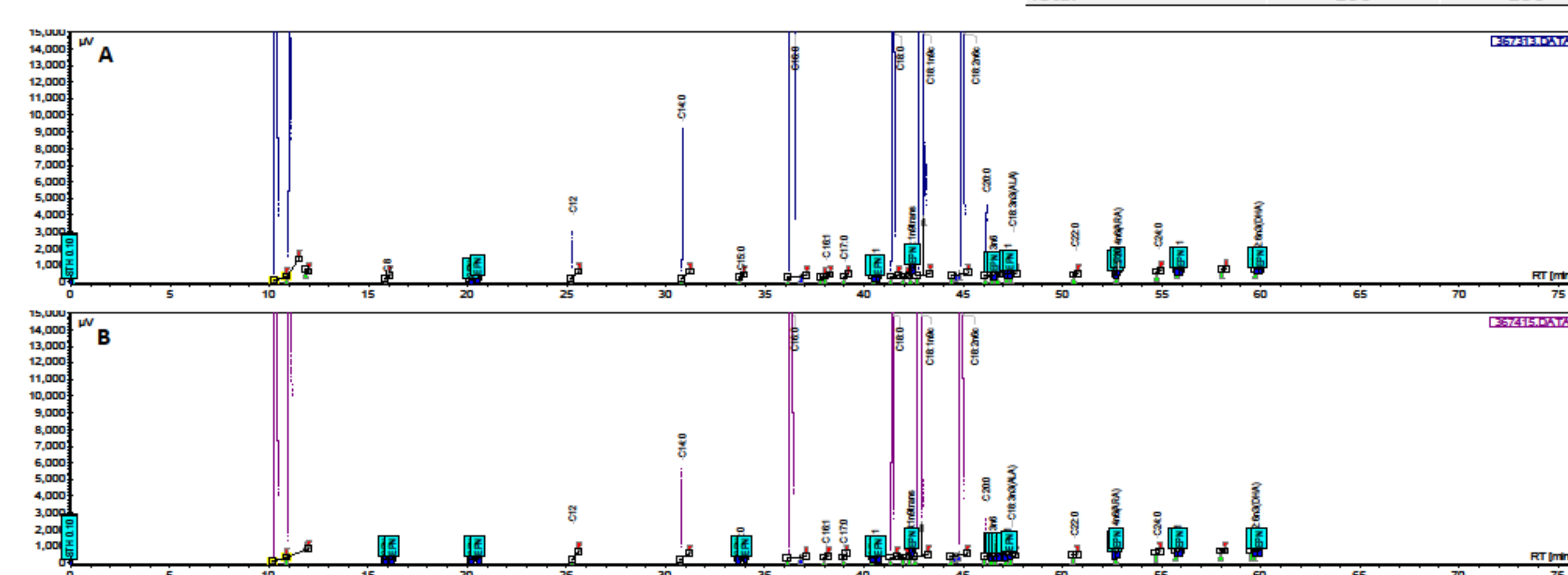


**Fig. 2** Texture analysis (firmness) of the baked laminated doughs determined by cutting transversely. (blue – conventional; black – alternative)

**Table 3.** CIELAB color space coordinates of conventional and alternative baked laminated doughs.

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 laminated doughs 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 dough were not significantly impacted by the alternative lower fat formulation.
- A laminated dough with a healthier profile was achieved, presenting physical traits similar to those of the conventional formulation.