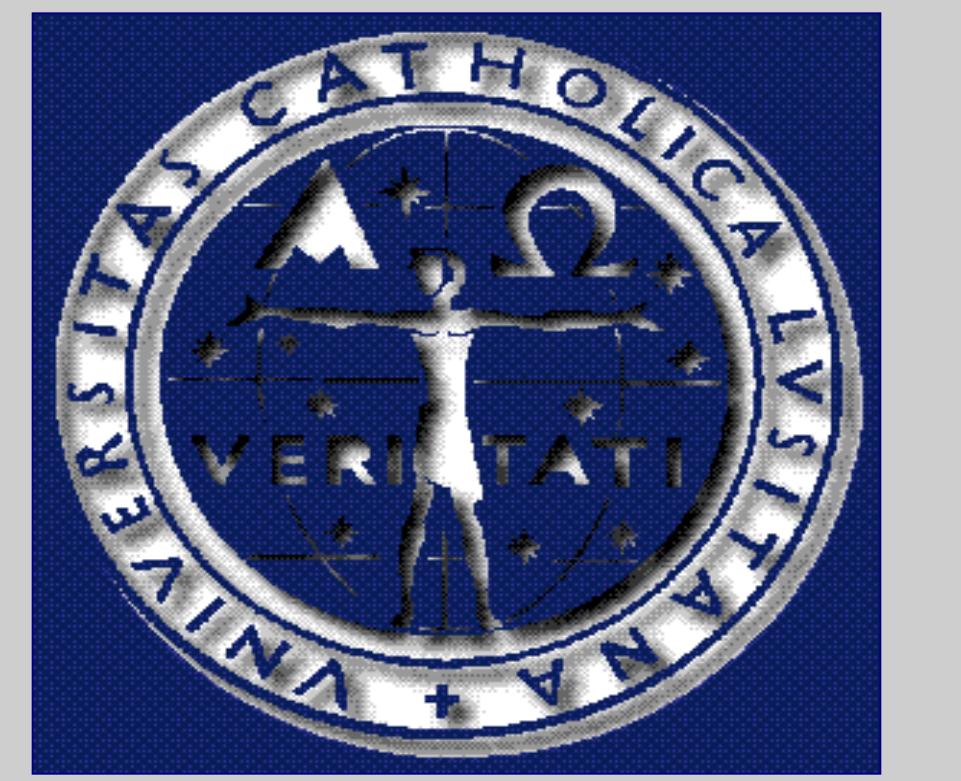


# ATTEMPTS TO CORRELATE SENSORY PROPERTIES OF BROA, A PORTUGUESE TRADITIONAL SOURDOUGH BREAD, WITH BAKING TECHNOLOGICAL PARAMETERS



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## OBJECTIVES

The goal of the present work was to evaluate the effect of given variables that play a role during the baking process of *broa* (a traditional type of sourdough bread) upon consumer acceptability and, at the same time, to try to correlate those sensory aspects with chemical parameters measured in a previous work (pertaining to samples from the same batch).

For that purpose, different breads (*broas*) were produced resorting to all possible combinations of 4 types of maize flours, mixed with one type of rye flour at 2 different proportions, and coupled with 2 kinds of starter culture, thus giving rise to 18 distinct combinations. Five (replicate) breads were produced per combination, and one standard *broa* (used as control) was also produced in each batch.

The samples obtained after baking were submitted to sensory scoring by a trained sensory panel; all panellists were experienced in sensory assessment, and particularly in evaluation of baked products.

This study has shown that changes in the baking process of *broa* can be perceived by, and optimized toward consumer sensory analysis, although the information on sensory perception and chemical testing may be different in both kind and magnitude.

## EXPERIMENTAL METHODS & ABBREVIATIONS

### BAKING TESTS:

Baking tests were carried out with all possible combinations of:

➤ 4 different types of maize flour:

- Portuguese regional maize flour, **MR**
- Dentated hybrid maize flour, **MHD**
- White hybrid maize flour, **MHF**
- Flint maize flour type 175, **F175**

➤ Grinding in 2 different types of mill:

- electric flour-mill, **ME**
- watermill, **MA**

➤ One type of rye flour at 2 different relative proportions:

- 15%
- 50%

➤ 2 kinds of starter culture:

- bakers' yeast, **Yeast**
- sourdough, **isco**

Five (replicate) breads were produced per combination, and one standard *broa* (used as control), manufactured with 50% maize flour F175 (one of the most common industrial flours used for baking) and with bakers' yeast, was produced in each batch as well. Those gave rise to 18 distinct combinations, as shown below.

**Table I - Correspondence between baking tests and nomenclature used**

Standard	1	MHDxMA, 15%rye, Yeast	11	MHFxMA, 50%rye, Yeast	21
MRxMA, 15%rye, Isco	2	MHDxMA, 50%rye, Isco	12	MHDxME, 15%rye, Isco	22
MRxMA, 15%rye, Yeast	3	MHDxMA, 50%rye, Yeast	13	MHDxME, 15%rye, Yeast	23
MRxMA, 50%rye, Isco	4	MHDxME, 15%rye, Isco	14	MHFxME, 50%rye, Isco	24
MRxMA, 50%rye, Yeast	5	MHDxME, 15%rye, Yeast	15	MHFxME, 50%rye, Yeast	25
MRxME, 15%rye, Isco	6	MHDxME, 50%rye, Isco	16	F175, 15%rye, Isco	26
MRxME, 15%rye, Yeast	7	MHDxME, 50%rye, Yeast	17	F175, 15%rye, Yeast	27
MRxME, 50%rye, Isco	8	MHFxMA, 15%rye, Isco	18	F175, 50%rye, Isco	28
MRxME, 50%rye, Yeast	9	MHFxMA, 15%rye, Yeast	19	F175, 50%rye, Yeast	29
MHDxMA, 15%rye, Isco	10	MHFxMA, 50%rye, Isco	20		

### SENSORY TESTS:

The samples obtained after baking were submitted to sensory scoring by a trained sensory panel; all panellists were experienced in sensory assessment, and in particular in evaluation of baked products. The properties evaluated were:

1. Crumb appearance

- 1.1 Bran in crumb appearance:
  - 1.1.1 Colour, **A1**
  - 1.1.2 Amount, **A2**
  - 1.1.3 Size, **A3**

- 1.2 Porosity in crumb appearance
  - 1.2.1 Amount, **B1**
  - 1.2.2 Size, **B2**

2. Crumb texture to tact

- 2.1 Elasticity, **C1**
- 2.2 Adhesiveness or gumminess character, **C2**
- 2.3 Hardness, **C3**
- 2.4 Friability, **C4**

3. Odour

- 3.1 Global, **D1**
- 3.2 Acidic, **D2**
- 3.3 Maize/rye, **D3**

4. Crumb taste

- 4.1 Global, **E1**
- 4.2 Sweetness, **E2**
- 4.3 Acidic, **E3**
- 4.4 Bitter, **E4**
- 4.5 Salt, **E5**

5. Texture on mouthfeeling/mastication

- 5.1 Friability, **F1**
- 5.2 Adhesiveness or gumminess, **F2**
- 5.3 Moistness, **F3**
- 5.4 Particles/graininess, **F4**

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## RESULTS

**Table II - Sensory scores of the samples of bread (*broa*) manufactured under different baking conditions**

Colour	Crumb appearance		Crumb texture to the tact		Odour		Crumb taste		Texture on mouthfeeling/mastication		Texture on the mouthfeeling/Mastication							
	Amount	Size	Amount	Size	Glob	Acidic	Maize/rye	Glob	Sweetness	Acidic	Bitterness	Salt	Friability	Adhesiveness/Gumminess	Moistness	Particles/Graininess		
A1	A2		C1	C2	C3	C4	D1	D2	D3	E1	E2	E3	E4	F1	F2	F3	F4	
1	4.01	2.79	2.8	3.50	2.96	2.46	2.27	3.01	3.20	1.82	3.51	3.01	1.74	1.61	2.45	1.50	2.18	2.59
MRxMA, 15%rye, Isco	2	2.00	2.00	2.50	2.90	2.38	1.98	3.00	3.25	2.25	3.30	3.11	2.53	2.50	2.50	2.50	2.50	2.50
MRxMA, 15%rye, Yeast	3	2.00	2.75	1.50	1.75	1.63	1.00	3.63	2.75	1.00	2.57	2.63	1.50	1.88	2.43	2.13	1.88	2.50
MRxMA, 50%rye, Isco	4	3.88	2.63	3.63	3.00	2.63	2.50	3.13	1.50	3.00	1.63	2.75	2.13	2.00	2.88	3.00	2.88	2.88
MRxMA, 50%rye, Yeast	5	3.50	2.38	1.63	2.25	2.63	2.13	3.00	1.13	2.75	1.38	3.13	2.13	1.63	1.50	2.63	2.88	2.88
MHDxMA, 15%rye, Isco	6	1.88	2.00	2.38	1.60	3.13	1.25	2.63	2.88	1.63	2.75	2.13	1.63	1.50	2.39	2.14	2.14	1.57
MHDxMA, 15%rye, Yeast	7	1.20	2.50	2.00	2.13	1.71	1.00	3.00	1.88	2.43	2.50	2.50	2.00	1.50	1.50	2.00	2.00	2.00
MHDxMA, 50%rye, Isco	8	1.88	2.00	2.00	2.50	2.00	1.50	3.00	2.23	1.50	2.50	2.13	1.50	1.50	2.39	2.13	2.13	1.57
MHDxMA, 50%rye, Yeast	9	4.25	2.00	2.00	2.88	2.38	1.00	3.00	1.88	2.13	2.50	2.13	1.50	1.50	2.00	2.13	2.13	2.13
MHDxMA, 15%rye, Isco	10	1.29	1.43	2.00	2.57	2.57	1.00	3.00	2.86	1.86	2.14	3.43	2.00	1.43	2.29	1.29	1.29	1.29
MHDxMA, 15%rye, Yeast	11	1.50	2.00	1.50	2.60	2.00	0.50	4.00	0.56	4.56	3.22	1.89	3.30	1.50	2.20	3.50	1.00	3.10
MHDxME, 15%rye, Isco	12	4.00	2.71	1.86	4.14	3.57	1.00	3.00	2.11	3.00	2.00	3.86	3.00	1.45	0.83	1.24	2.43	2.43
MHDxME, 15%rye, Yeast	13	1.20	2.00	1.50	2.80	2.00	0.50	3.00	2.00	3.00	2.00	3.70	3.00	1.50	1.50	2.00	2.00	2.00
MHDxME, 50%rye, Isco	14	2.29	1.64	1.71	2.29	2.29	0.50	3.00	0.57	3.00	2.00	3.86	3.00	1.57	2.14	1.43	2.00	2.00
MHDxME, 50%rye, Yeast	15	1.60	2.10	1.60	2.60	2.10	0.50	3.60	0.70	3.50	2.70	2.20	1.70	1.50	1.60	3.80	0.60	2.00
MHDxME, 15%rye, Isco	16	2.00	2.14	2.00	3.43	3.29	0.50	3.00	1.84	3.43	2.14	3.86	3.29	0.84	2.14	1.71	2.14	1.43
MHDxME, 15%rye, Yeast	17	2.15	2.38	2.14	3.00	2.63	0.50	3.71	0.75	3.75	3.25	3.00	3.13	1.88	2.38	2.29	1.63	2.00
F175, 15%rye, Isco	18																	