

Pão Transmontano: the use of physicochemical characterization and chemometrics in order to achieve the PGI certification

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I. INTRODUCTION AND OBJECTIVES

“Pão do Nordeste Transmontano” is a typical bread of the Northeast region of Portugal (Figure 1) with distinguished characteristics, very valorised in this region and used in the production of typical meat products, namely, fermented meat sausages. This bread is produced in the two areas that constitute the *Nordeste Transmontano* region of Portugal, namely, *Terra Fria* and *Terra Quente*, formed by twelve municipalities. Thus, the purpose of the present work was to perform the physicochemical and microbiological characterization of this bread and to use chemometrics towards its PGI certification application.

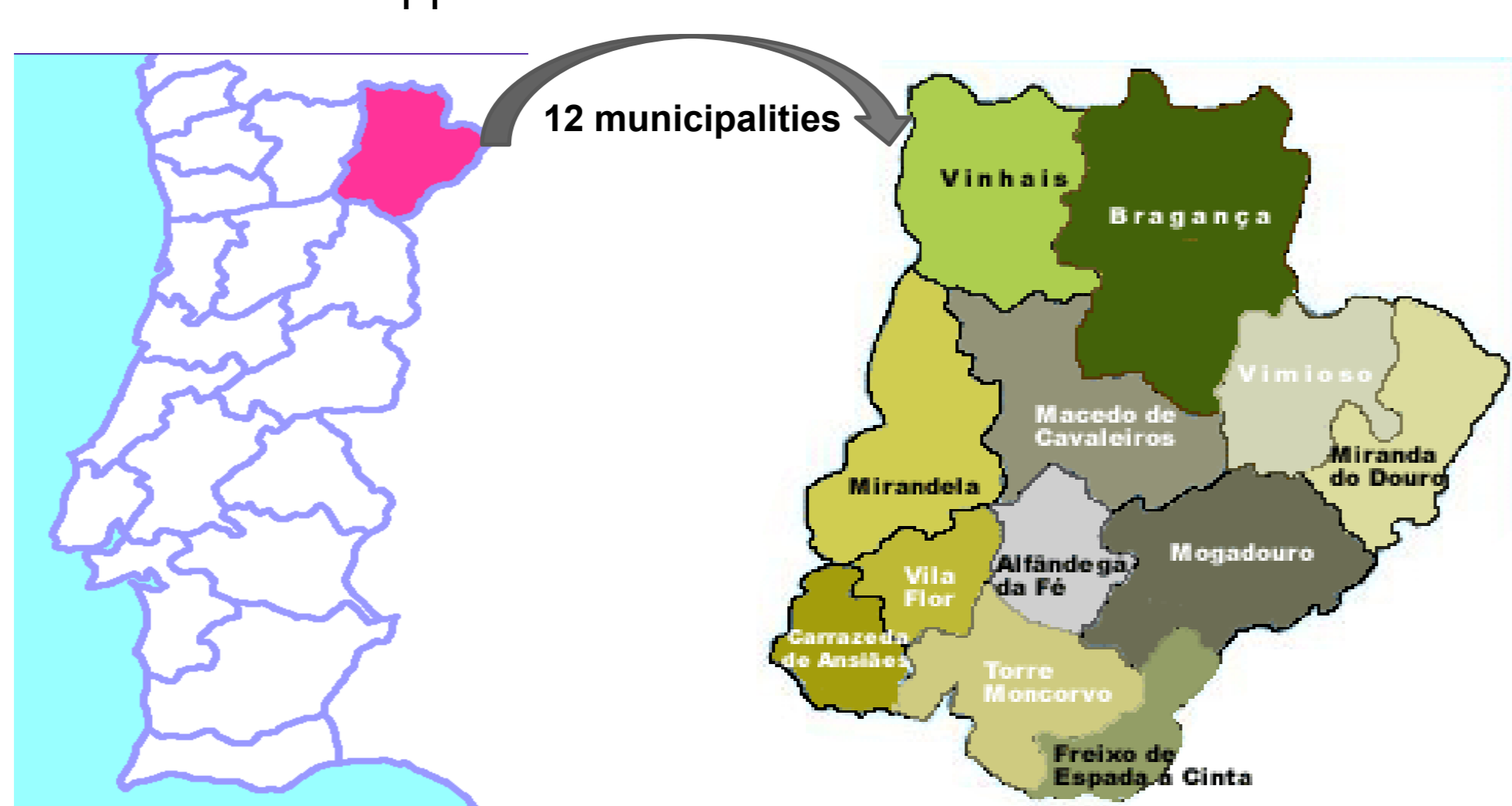


Figure 1. Geographic situation of the Northeast region of Portugal where the “Pão do Nordeste Transmontano” is produced.

II. MATERIAL AND METHODS

Twenty-four samples were randomly collected in the twelve municipalities that constitute the *Nordeste Transmontano* region of Portugal. One survey was carried out per bakery to collect operational information on the production and marketing.

Physicochemical determinations: dimensions, water activity, pH, moisture, ash, protein, fat, salt and total dietary fiber contents, following AOAC methods.

Microbiological determinations: Total mesophylls (ISO 4833:2003), yeasts and molds (ISO 7954:1998).

All determinations were made in triplicate. The results are presented on dry weight, except the moisture content.

III. RESULTS AND DISCUSSION

III. 1. Process description

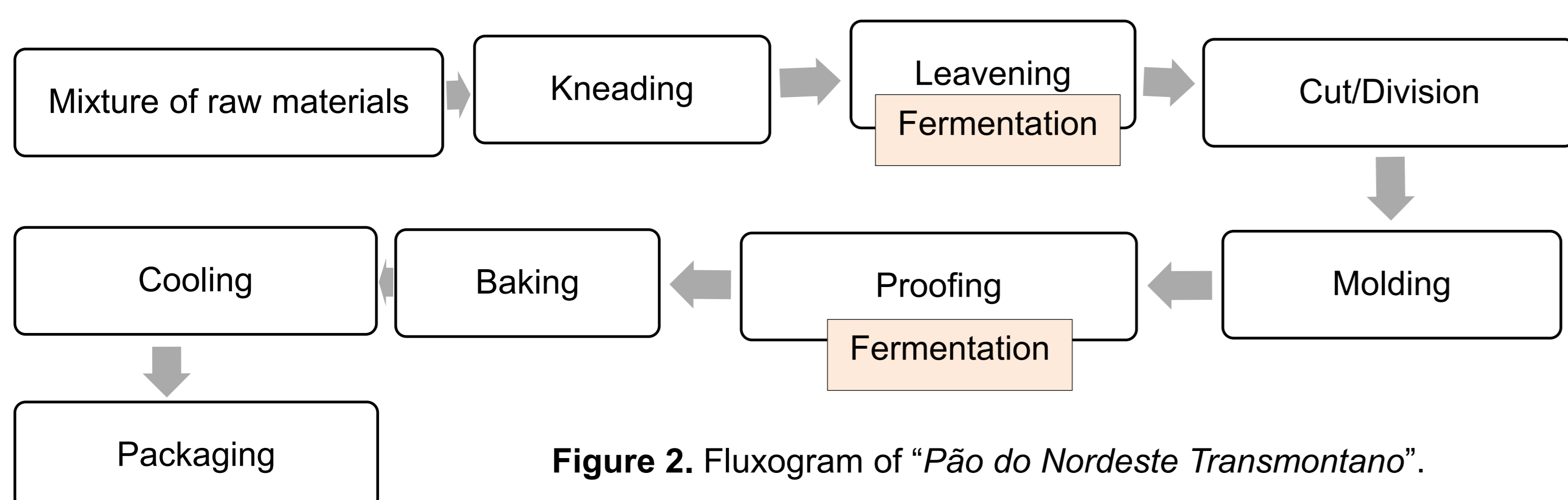


Figure 2. Fluxogram of “Pão do Nordeste Transmontano”.

Table 1. Characterization of the production process of “Pão do Nordeste Transmontano”

PARAMETER	VALUE
Flour type	65 and 55
Water/100 kg flour	50-70 L
Salt/100kg flour	1.2-1.4 kg
Kneading	15-20 min
Leavening	60-90 min
Baking time	50-60 min
Baking temperature	220-250 °C
Marketing	Weights between 0.5 and 2 Kg and unpackaged or packaged, sliced or whole.

More than 50% of the bakeries!



Figure 3. “Pão do Nordeste Transmontano”.

III. 2. Physical properties

Table 2. Dimensions range of “Pão do Nordeste Transmontano”.

PARAMETER	RANGE	
Weight (g)	500	2400
Height (cm)	7	12
Diameter (cm)	20	30

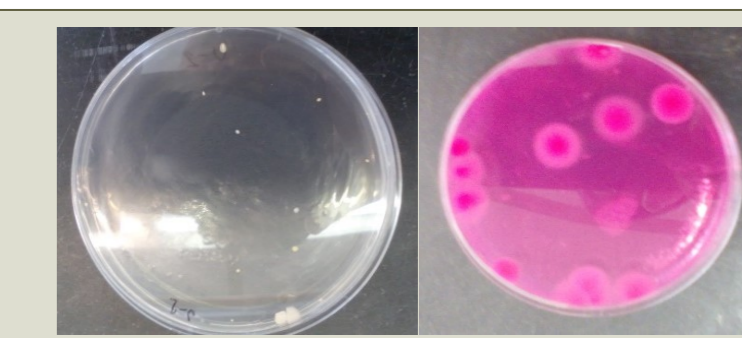


III. 3. Chemical and Microbiological properties

Table 3. Some chemical parameters range of “Pão do Nordeste Transmontano”.

PARAMETER	RANGE	
pH	5.0	6.0
Moisture (%)	30.0	40.0
Ash (% d.w.)	1.7	2.5
Fat (% d.w.)	2.3	3.1
Protein (% d.w.)	14.5	15.4
Fibre (% d.w.)	3.2	4.7
Salt (% d.w.)	0.7	1.0

Regarding microbiological analysis, all samples were satisfactory and acceptable in terms of total mesophylls, and yeasts and molds



When grouping the values obtained by the two areas that characterize the *Nordeste Transmontano* region, *Terra Fria* and *Terra Quente*:

Table 4. Comparison of the loaves produced in *Terra Quente* and *Terra Fria* areas.

Parameter	<i>Terra Quente</i>	<i>Terra Fria</i>
Dimensions	Weight (g)	1082±400 ^a
	Diameter (cm)	24.6±1.59 ^a
	Height (cm)	8.64±1.25 ^a
pH	5.72±0.24 ^a	5.57±0.41 ^b
Moisture (%)	35.51±2.50 ^a	35.06±2.52 ^a
Ash (% d.w.)	2.17±0.36 ^b	1.96±0.27 ^a
Fat (% d.w.)	2.76±0.39 ^a	2.70±0.51 ^a
Protein (% d.w.)	14.85±0.37 ^a	14.82±0.40 ^a
Fibre (% d.w.)	3.68±0.41 ^a	4.38±0.31 ^b
Salt (% d.w.)	0.93±0.22 ^a	0.89±0.18 ^a

No significant differences were observed in almost all parameters of the breads produced in both areas, not being possible to differentiate them and allowing its PGI certification.

IV. CONCLUSION

Even though some differences were detected among *Pão do Nordeste Transmontano* production processes followed by the 24 bakeries analyzed in the present work, more than 50% of them performed similar tasks and used identical amounts of raw materials. Furthermore, as no significant differences on physical and chemical properties were detected between the breads produced in the two areas that constitute *Nordeste Transmontano* region, *Terra Fria* and *Terra Quente*, it will be possible in the future to submit the PGI certification process for this product.

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