

“ECONÓMICOS” CAKES STRENGTHENED WITH CHESTNUT: EFFECTS ON TEXTURE AND COLOR

Mariana C. Pedrosa,^{1#} Jonata M. Ueda,^{1#} Filipa A. Fernandes,¹ Elisabete Ferreira,² Sandrina Heleno,¹ Márcio Carochó,^{1,*} Lillian Barros,¹ Isabel C.F.R. Ferreira¹

¹Centro de Investigação de Montanha (CIMO), Instituto Politécnico de Bragança, Campus de Santa Apolónia, 5300-253, Bragança, Portugal;

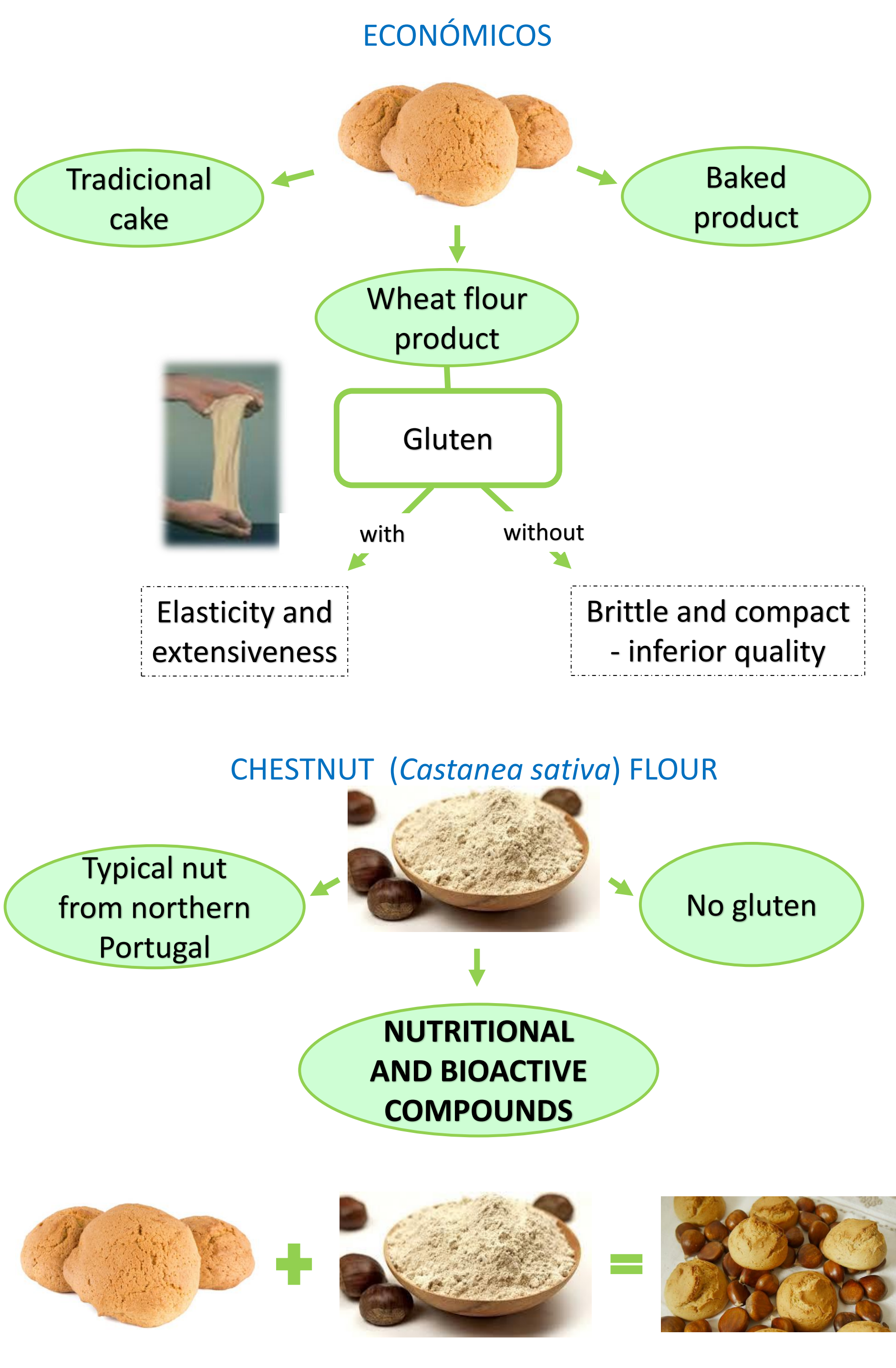
²M. Ferreira & Filhas, LDA, Av. Do Sabor, nº 2, Gimonde, 5300-553 Bragança, Portugal

These authors contributed equally to this work. *mcarochó@ipb.pt

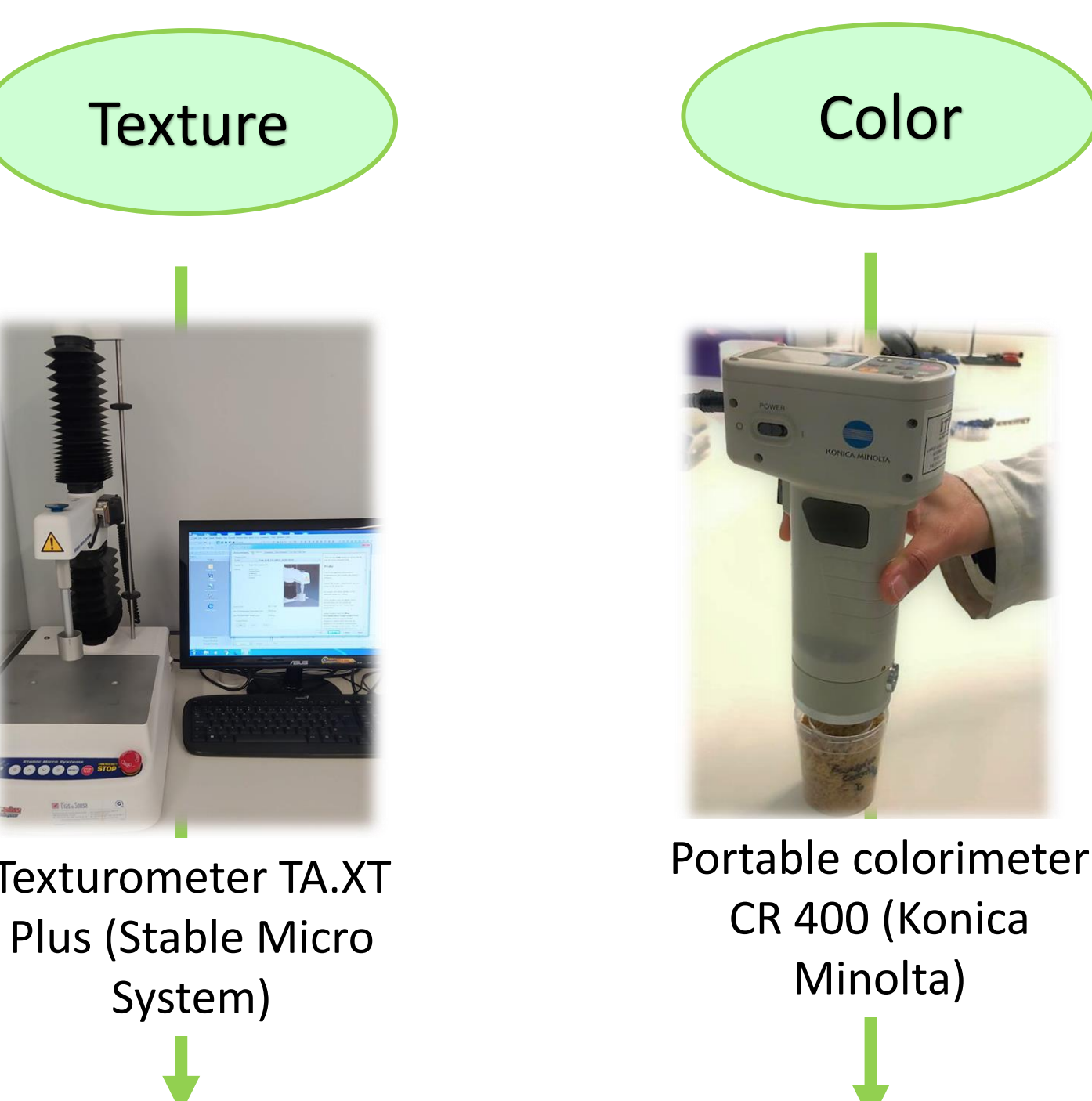
ABSTRACT

Cereals grains are one of the main sources of nutrients and energy contributors to the human diet. The “económicos” are traditional cakes from Portugal, made with wheat flour and quite appreciated by consumers, because of the good taste. Different sources of flour can be used in pastry products, however, the gluten present in wheat flour, along with starch maintain the union between the ingredients and provide the structure of the baked product. Therefore, with the use of other sources of flour, the presence of gluten becomes minimal and the cake tends to be of inferior quality compared to foods which contain it, namely at the level of low nutritional value, weak coloration, higher tendency to crumble and, mainly, low volume. Thus, the main objectives of this work were to analyse the texture and color of “económicos” incorporated with chestnut (*Castanea sativa* Mill.) flour, thus strengthening the económicos nutritional value and not fully reducing gluten. The analysis were carried out over the course of 25 days. Overall, significant interaction was sought for all analysis of color and storage time showed, as expected, a higher influence on the texture profile.

INTRODUCTION



METHODS



Texture profile analysis:

- Hardness;
- Adhesiveness;
- Resilience;
- Cohesiveness;
- Springiness;
- Gosity;
- Chewiness;
- Firmness.

L*, a* and b* coordinates:

- Outside and inside of the “Económicos”.

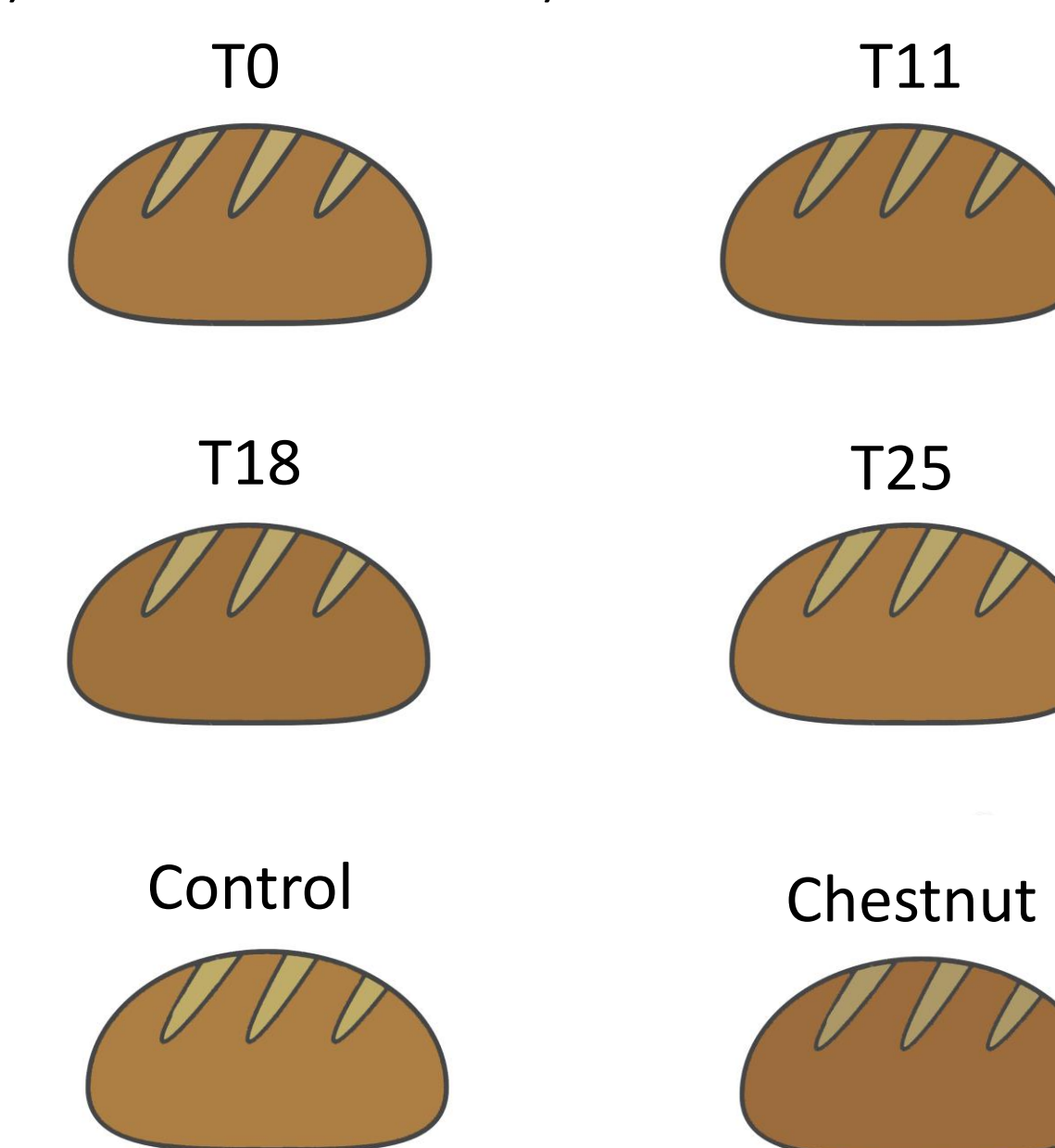
RESULTS

- Significant interaction for all analysis of color, except for red-green (a*) outside of the “Económicos” and for lightness (L*) inside, being the chestnut samples significantly darker than the control ones (Table 1 and Figure 1)

Table 1 - Colorimetric coordinates profile (L*, a*, b*) of outside and inside of the “Económicos” over 25 days with different flours.

		Outside			Inside		
		L*	a*	b*	L*	a*	b*
Storage Time (ST)	0 Days	55±5	15±1	37±3	70±5	2±2	33±3
	11 Days	53±4	15±1	37±2	65±5	3±2	33±5
	18 Days	52±3	14.5±0.9	36±2	69±4	2±2	33±5
	25 Days	55±3	15±2	37±3	68±3	1.5±1.5	33±5
p-value (n=3)	Tukey test	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Type of Flour (TF)	Control	57±3	14±1	39±1	71±3*	0.07±0.75	37±2
	Chestnut	50±2	15.7±0.7	34±1	64±3	3±1	29±1
p-value (n=9)	Tukey test	0.001	0.143	0.005	<0.001	<0.001	0.115
ST×TF (n=27)	p-value	<0.007	0.213	0.038	0.051	0.007	<0.001

Figure 1 – Illustrative representation of the resultant of the colorimetric coordinates of outside and inside of the “Económicos” for a) different times and b) different flours



- Storage time - higher influence on the texture profile (hardness, cohesiveness, springiness, gomosity and chewiness) with statistical differences found from the first to the 11th day (Table 2).
- The chestnut flour only influenced the springiness, making thus reducing this dimension (Table 2).

Table 2 -Texture profile of the “Económicos” over 25 days with different flours.

		Hardness	Adhesiveness	Resilience	Cohesiveness	Springiness	Gomosity	Chewiness	Firmness
		0 Days	8380±712a	-0.3±0.1	0.21±0.03	0.59±0.05a	0.85±0.02a	4895±293a	4183±314
Storage Time (ST)	11 Days	16961±2328b	-1±1	0.21±0.02	0.56±0.04a	0.79±0.02b	9558±1146b	7518±799	10515±3264
	18 Days	15222±391b	-0.7±0.3	0.21±0.01	0.58±0.03a	0.79±0.01b	8847±380b	7032±295	9842±2136
	25 Days	15822±2787b	-0.4±0.3	0.21±0.02	0.59±0.03a	0.79±0.03b	9286±1606b	7345±1385	11173±4274
p-value (n=3)	Tukey test	<0.001	0.050	0.115	<0.001	<0.001	0.002	0.932	0.971
Type of Flour (TF)	Control	11319±3555	-0.9±0.8	0.22±0.01	0.61±0.02	0.85±0.02*	8127±2084	6604±1540	10775±2745
	Chestnut	14873±4117	-0.5±0.4	0.20±0.01	0.55±0.02	0.79±0.03	8166±2314	6435±1701	10729±3013
p-value (n=9)	Tukey test	<0.001	0.010	0.559	0.194	<0.001	<0.001	<0.001	0.808
ST×TF (n=27)	p-value	0.789	0.263	0.021	0.247	0.670	0.963	0.991	0.654

CONCLUSION

- The chestnut flour only influenced the springiness.
- Overall, the chestnut samples were significantly darker than the control ones.
- Chestnut flour can be useful to fortify these cheap snacks, although analysis on the chemical, nutritional and microbial analyses are being processed.

ACKNOWLEDGEMENTS

The authors are grateful to the Foundation for Science and Technology (FCT, Portugal) for financial support through national funds FCT/MCTES to CIMO (UIDB/00690/2020). L. Barros thanks FCT through the institutional scientific employment program-contract for her contract, while M. Carochó and S. Heleno thank FCT through the individual scientific employment program-contracts (CEECIND/00831/2018 and CEECIND/03040/2017); to FEDER-Interreg España-Portugal program for financial support through the project TRANSCoLAB 0612_TRANS_CO_LAB_2_P, to ERDF, through the Incentive System to Research and Technological development, within the Portugal2020 Competitiveness and Internationalization Operational Program for the financial support to BIOMA(POCI_01_0247_FEDER_046112); ERDF through the Regional Operational Program North 2020, within the scope of Project GreenHealth (Norte-01-0145-FEDER-000042).