P-08-19

Feasibility of dry-cured ham pastiness evaluation using a rheometer (#362)

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Introduction

Defective textures in dry-cured ham can be instrumentally determined by stress relaxation tests. However, pastiness defect, a mouth sensation described as the feeling like a flour-water paste during the mastication process, can only be measured by sensory analysis. Flow changes in saliva occurring during the mastication of dry-cured ham measured by using a rheometer could be assossicated with pastiness feeling.

Thus, the aim of this study was to develop a new feasible methodology for dry-cured ham pastiness instrumental characterization based on rheology. For that, an initial experiment set up using samples with different pastiness intensities will be performed, followed by its application in commercial and high pressure treated samples.

Methods

Samples. Three *Biceps femoris* mucles with different pastiness levels (No, medium and high) were obtained, sliced and used for the rheological method set up and for the evaluation of the effect of High Pressure (HP) treatments at different temperatures (7ºC (HP7), 20ºC (HP20) and 35ºC (HP35)) on pastiness using the instrumental rheological method.

In order to develop a model to predict the pastiness perception using a rheometer, 50 sliced commercial packages of dry cured ham containing *Biceps femoris* muscle were selected and sensory evaluated. Afterwards, the same samples were analysed using a RheoStress controlled stress rheometer.

Rheological measurements. 15 gr of sample were cut into small pieces, homogenized with distilled water and centrifuged (4000 rpm 3 min at 15ºC). Rheological properties of the supernatant were measured with a parallel-plates sensor system (60 mm a gap of 0.5 mm) pre-heated at 25ºC or 37ºC. Flow curves were obtained from stepped shear stress ramp. Ranges of shear stresses, in logarithmic distribution, were used in order to obtain shear rates between 0.05 and 100 s^{-1}. Data from the flow curves were fitted to the Ostwald de Waele fit ($\sigma=K\gamma^n$), where K (Pa s) is the consistency index. All analysis were done at least in duplicate.

Statistical analysis. Correlations between the instrumental viscosity and sensory pastiness intensity of the commercial samples were performed by using Pearsons' correlation. Effect of temperature on the viscosity and differences between the control and HP treated samples at different temperatures were evaluated by using an analysis of variance.

Results

Temperature had a significant effect ($p<0.05$) on the viscosity measurement of dry-cured ham supernatants, showing higher viscosities at 25ºC in comparison to 37ºC (Table 1). At both temperatures, significant differences ($p<0.05$) were only found between the rheological viscosities of high defective samples and medium/non-defective ones.

Pastiness from commercial samples scored by trained assessors was significantly correlated k ($r=0.676$) and η_{10} ($r=0.653$) using the same rheometer at 37ºC. However, relationship between sensory pastiness perception and reological parameters is not linear.

Feasiability of the rheological methodology to differentiate different pastiness levels from the same sample after producing changes on the initial pastiness using high pressure processing is limited. Important changes on pastiness can be instrumentally detected (i.e. changes between non-treated and HP treated samples) for all the defective levels ($p<0.05$) (Table 2). However, a decrease of sensory pastiness, k and η (10) can be observed when using temperatures during HP processing but not significant differences were found ($p<0.05$).

Conclusion

This work shows, for the first time, how using a rheometer, dry-cured ham pastiness can be instrumentally measured. However, more work is need to precisely characterize sensory pastiness using a rheometer.

Acknowledgements

This work was partially supported by INIA (n. RTA2013-00030-CO3-01) and CERCA programme from Generalitat de Catalunya. Acknowledgements are extended to INIA for financing the doctorate studies of Elena Coll Brasas CPD2015-0054 (FPI2015-0023). Author Laura Laguna thanks the Spanish "Juan de la Cierva" program for her contract (Ref. IJCI-2016-27427). The authors would also acknowledge the contribution of Jeroni Durango, Cristina Canals, Quim Arbonés and Carles Ramírez.

Notes

	Non-defective			Medium defective			High defective		
Treatment	Sensory pastiness	*k*	η (10)	Sensory pastiness	*k*	η (10)	Sensory pastiness	*k*	η (10)
No HP-treated	0.0	0.049[a]	0.010[a]	2.833[a]	0.034[a]	0.010	6.833[a]	0.383[a]	0.062[a]
HP7	0.0	0.018[b]	0.005[b]	0.000[b]	0.016[b]	0.005	6.167[a]	0.018[b]	0.007[b]
HP20	0.0	0.013[b]	0.004[b]	0.000[b]	0.012[b]	0.004	5.750[a]	0.018[b]	0.006[b]
HP35	0.0	0.018[b]	0.004[b]	0.000[b]	0.009[b]	0.003	0.167[b]	0.027[b]	0.007[b]
p-value	0.000	0.000	<0.0001	<0.0001	<0.0001	0.490	0.000	<0.0001	<0.0001

[ab]different letters indicate significant differences (p<0.05) within each treatment.

Table 2.
LSMeans of sensory pastiness, *k* values and instrumental viscosity (η) at 10 s^{-1} of dry-cured hams with different defectives levels when using different HP treatments.

		Instrumental viscosity		
Temperature	Defective level	η (1)	η (10)	η (100)
25ºC	Non-Defective	0.054[a]	0.015[a]	0.006[a]
	Medium Defective	0.067[a]	0.012[a]	0.005[a]
	High Defective	0.590[c]	0.094[c]	0.023[c]
37ºC	Non-Defective	0.045[a]	0.010[a]	0.004[a]
	Medium Defective	0.029[a]	0.010[a]	0.004[a]
	High Defective	0.347[b]	0.062[b]	0.016[b]
	RMSE[A]	0.090	0.013	0.003
	p-value	0.000	0.002	0.011

[ab] Different letters indicate significant differences (p<0.05) within each defective level. [A] Root means square error of the linear model.

Table 1. LSMeans of instrumental viscosity (η) at 1 s^{-1}, 10 s^{-1} and 100 s^{-1} when using temperatures of 25ºC and 37ºC on dry-cured ham samples with different defective levels.

Notes