CORRELATIONS BETWEEN DIFFERENT DEVICES (WBSF, SSF, BMORS) AND SENSORY PROPERTIES IN VARIOUS PORK MEATS

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INTRODUCTION

The feasibility of developing models to predict meat texture from instrumental analysis is a topic of great interest because Descriptive Sensory Analysis, which has traditionally been used for sensory analysis, is time consuming and expensive (requires the recruitment, selection, training and qualification of assessors). Of the available shear methods, the most widely used has been Warner-Bratzler Shear Force, although Slice Shear Force (SSF) is currently the method recommended by the National Cattlemen's Beef Association (NCBA). Another option is the Meullenet-Owens Razor Shear (BMORS) blunt test which is claimed to be the fastest, most accurate and simplest tool for measuring poultry tenderness. However, this method has not been used for pork loins. Furthermore, although several studies have been conducted on the correlation between sensory and instrumental measurements, the relationships appear to be food specific.

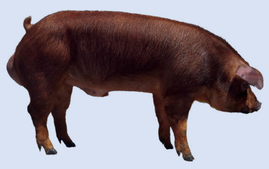
OBJECTIVE

To study the feasibility of using the BMORS device for pork texture evaluation and to establish which device is the most suitable by calculating the correlations between the parameters obtained with the different devices and the texture parameters determined by a trained sensory panel

MATERIALS

100% Iberian

50% Iberian



Landrace x Large White

100 left loins

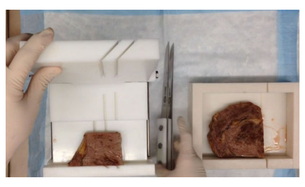
4 slices 3.5 cm for texture

2 slices 2 cm for sensory

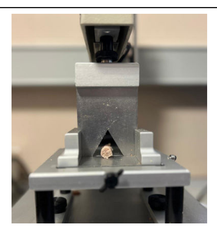
TEXTURE ANALYSIS

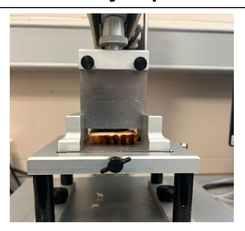
Cold samples	Hot samples
Cut into 3.5 cm thick slices (T9-T11) Heat in water bath at 76ºC to 72ºC centre piece (individual thermocouple) Cool in ice bath for 10 minutes Keep in refrigerator 6 hours at 4ºC.	Cut into 3.5 cm thick slices (T9-T11) Heat double-plate grill at 180ºC to an internal temperature of 70ºC

Warner-Bratzler	Slice Shear Force	Blunt Mullenet-Owens Razor
Load cell: 30 kg Cross speed: 2 mm/sec Penetration : 30 mm Repetitions: 6	Load cell: 30 kg Cross speed: 2 mm/sec Penetration : 30 mm Repetitions: 2 x 2 slices	Load cell: 5 kg Cross speed: 10 mm/sec Penetration : 20 mm Repetitions: 6
Sample preparation		
1.27 cm diameter cores removed parallel to the longitudinal orientation of muscle fibre	Using two parallel blades 1.0 cm apart, cut through the length of the 5.0 cm long steak portion at a 45°angle to the long axis of the loin and parallel with the muscle fibers	No preparation needed

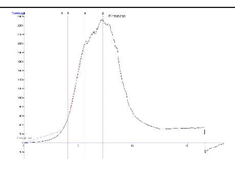


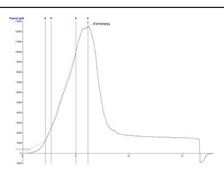
Probes and Analysis performance

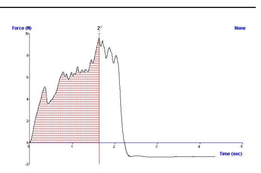




Parameters: maximun force and area under the curve until max force







SENSORY ANALYSIS

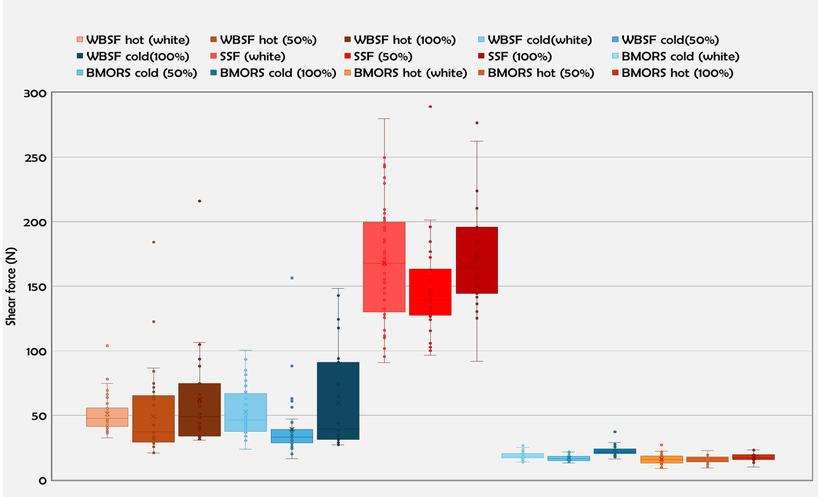
8 members panel trained and experienced in QDA analysis. The accuracy of the panel was assessed by studying its reproducibility and repeatability.
Structured scale from 1 (low intensity) to 9 (high intensity of the attributes).

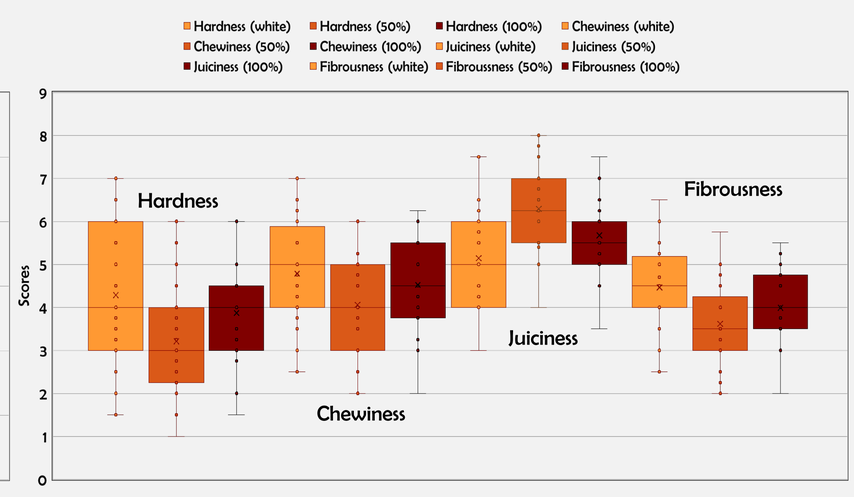
- Hardness: Firmness perception at first bite
- Fibrousness: Perception of fibers during chewing
- Chewiness: number of bites before the samples is swallowed
- Juiciness: impression of juiciness (liquid expelled) during chewing

Samples grilled until 70ºC internal temperature. 10 samples assessed per session.

RESULTS

VARIABILITY





DIFFERENCES BETWEEN BREEDS

	Hardness	Chewiness	Juiciness	Fibrousness
White	4.29 b	4.79 b	5.14 a	4.46 b
50% Iberian	3.21 a	4.06 a	6.29 b	3.61 a
100% Iberian	3.87 a,b	4.52 a,b	5.67 a	3.99 a,b

a,b means statistically significant differences at p<0.05.

Probe	WBSF	WBSF	WBSF	WBSF	SSF	SSF	BMORS	BMORS	BMORS	BMORS
Parameter	Force (N)	Work (N·mm)	Force	Work (N·mm)	Force	Work (N·mm)	Force	Work (N·mm)	Force	Work (N·mm)
Sample type	Cold	Cold	Hot	Hot	Hot	Hot	Cold	Cold	Hot	Hot
White	51.19 a	175.61 b	52.66 a,b	166.96 b	168.13 a,b	613.38 a	18.81 b	177.27 b	16.01 a	134.25 a
50% Iberian	49.21 a	130.39 a	39.32 a	120.77 a	146.23 a	519.33 a	16.85 a	137.47 a	15.87 a	126.41 a
100% Iberian	62.35 a	171.89 b	60.03 b	158.46 b	172.31 b	608.02 a	22.49 c	183.38 b	17.41 a	134.13 a

a,b,c means statistically significant differences at p<0.05.

CORRELATION COEFFICIENTS MATRIX

Probe	WBSF	WBSF	WBSF	WBSF	SSF	SSF	BMORS	BMORS	BMORS	BMORS
Parameter	Force	Work	Force	Work	Force	Work	Force	Work	Force	Work
Sample type	Cold	Cold	Hot	Hot	Hot	Hot	Cold	Cold	Hot	Hot
Hardness	-0.059	0.155	0.198*	0.304**	0.383**	0.378**	0.210*	0.369**	0.051	0.099
Chewiness	-0.039	0.189	0.196	0.295**	0.390**	0.366**	0.182	0.360**	0.110	0.073
Juiciness	0.013	-0.223*	-0.182	-0.263**	-0.412**	-0.415**	-0.246*	-0.454**	-0.085	-0.064
Fibrousness	-0.009	0.196	0.199*	0.324**	0.342**	0.347**	0.158	0.355**	-0.034	0.070

* Significant correlation at p<0.05; ** Significant correlation at p<0.001

CONCLUSIONS

The results revealed that texture parameters obtained after performing the SSF test, force and shear work, were highly correlated with all sensory parameters analyzed in this work. Furthermore, when the BMORS test was carried out on cold samples and WBSF test was applied to hot samples, shear work showed highly significant correlations with all sensory parameters. It is noteworthy that in the case of BMORS the correlations were as high as for the SSF test hence, as it is very easy to perform, these results point out to the suitability of BMORS work for predicting textural sensory parameters. Moreover, BMORS force (cold samples) was very useful to discriminate breeds. On the other hand, when WBSF test was carried out on cold samples or BMORS was applied to hot samples scarce or not significant correlations were found.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under funding agreement no. 101000344