

INFLUENCE OF NEW PRESERVATION TECHNIQUES ON SENSORY CHARACTERISTICS OF "MORCILLA DE BURGOS"

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Introduction

"Morcilla de Burgos" is a traditional cooked blood sausage produced in the Burgos region, in the north of Spain. This product is commercialised as a fresh product with a shelf-life of around 10 days. However, vacuum packaging of this product has increased in order to extend the shelf-life and to increase market impact. The product is typically consumed by deep frying in vegetable oils, roasted or boiled as part of other traditional dishes. Cooked meat products, including "Morcilla de Burgos", are liable to contamination during post-cooking handling, particularly during the chilling step, just before vacuum packaging. In order to extend the shelf-life and safety of the product high pressure treatments and addition of organic acids have been applied. The aim of this work was to study the sensory evolution of vacuum packaged "morcilla" during a 50 day period, following the application of different preservation methods (HPP and addition of organic acids).

Materials and Methods

Samples: Four batches of 50 samples were treated (C: control; A: 3% of a mixture of lactate-Na and lactate-K (Purasal LITE Purac.) (the Na content was adjusted in the product); H: 10 min at 600 MPa (these conditions were chosen due to previous studies with "morcilla" (Borek *et al.*, 2002; Díez *et al.*, 2005) which were shown to be optimal conditions), and AH: 3% lactate and 10 min at 600 MPa).

High Pressure equipment: comprised plant equipment with Wave 6000/120 with horizontal vessel of 300 mm diameter and 2400 mm of length, with a total capacity of 120 L developed by NC Hiperbaric (Nicolas Correa Group, Burgos, Spain).

Sensory analysis: two types of sensory analysis were conducted: a discriminative test and a sensory profile.

Difference test: a paired comparison between different treatments was done by untrained panellists. "Morcilla" was cooked in a microwave until the temperature reached 70-75°C in the core and served to the panellist in slices of 1 cm thickness. This test was completed for each batch including the control.

Sensory profile analysis: Quantitative descriptive analysis was carried out by a trained panel scoring over a five point scale, where 1 correspond to absence and 5 to maximum intensity of each parameter, (Santos *et al.*, 2005), in five sessions, on days 8, 15, 22, 29 and 36. The sensory profile consisted of 7 descriptors grouped in two blocks. The first block related to visual attributes including gas production, presence of spots, and presence of slime. The second block included the evaluation of texture and olfactory attributes including smell, flavour and taste. Samples were evaluated at room temperature for the first two blocks while for the texture and flavour evaluation, "morcillas" were cut in 1cm thick slices and were cooked in a domestic microwave to a core temperature of 70-75 °C.

Results and Discussion

Table 1 presents the results for the difference tests. No significant difference was found between treatment C (control) and A (lactate). However, for the rest of the comparisons, significant differences between treatments were found. Most of the differences perceived by the panellists were related to taste and texture of the products, although these differences were not always negative for the product, because the control was not always the preferred, as it is shown in table 1. Previous studies on "morcilla" (Díez *et al.*, 2005), showed similar results for high pressure treatment, and other authors (Mor-Mur and Yuste, 2003), obtained significant difference between control and HPP samples, while consumers illustrated a preference for samples that had been subjected to the highest pressure treatment.

Table 1: Results of paired comparison test analysis.

Pairs	Panellists	Correct replies	Significant difference	p	Panellist differentiate by:					Pref.	Pref. %
					A	C	O	T	S		
C vs. H	45	33	Yes	p<0,01	10	8	6	17	28	C	54.54
C vs. A	24	15	No	-	-	-	-	-	-	-	-
C vs. AH	22	16	Yes	p<0,05	4	4	5	8	15	AH	62.50
AH vs. H	44	29	Yes	p<0,05	6	5	12	20	21	AH	62.07
AH vs. A	44	30	Yes	p<0,05	4	9	4	17	20	AH	56.66

Control (C); lactate-Na and lactate-K (A); HPP (H); HPP+ lactate-Na and lactate-K (AH).

p: significance level; A: appearance; C: colour; O: smell; T: texture; S: taste; Pref.: preferred sample;

Pref. %: percentage of panellists that prefer the sample.

The treatments had significant effects ($P < 0.05$) on sensory properties. Scores on all sensory parameters dramatically increased for the control and to a lesser extent with the application of lactate (A) during storage (Table 2), while significant differences did not exist ($P < 0.05$) for the treatments H and AH during the same period. High pressures treatments were more effective than lactate to extend the sensory shelf-life of "morcilla" (Borek *et al.*, 2002; Diez *et al.*, 2005, Santos *et al.*, 2005). The same results were observed in previous studies in "morcilla" (Borek *et al.*, 2002; Diez *et al.*, 2005, Santos *et al.*, 2005). When the score was greater than 3, the product was considered unfit for consumption. Products treated with HPP (H and AH) never exceeded this level for the parameters studied. The lactate treatment was less effective than HPP and only extended shelf-life until day 29.

Table 2: Results of sensory profile analysis.

Treatment C							
Day	Spots	Slime	Gas	Texture modifications	Acid smells	Off-flavours	Off-tastes
8	^a 1,30 _A	^a 1,10 _A	^a 1,00 _A	^a 1,20 _A	^a 1,10 _A	^a 1,10 _A	^a 1,10 _A
15	^{ab} 1,90 _A	^{ab} 1,50 _A	^a 1,20 _A	^a 1,80 _A	^b 2,40 _B	^a 1,60 _A	^a 1,10 _A
22	^{abc} 2,14 _A	^{bc} 2,43 _A	^b 2,43 _B	^b 2,88 _A	^{bc} 3,57 _B	^{bc} 2,71 _A	^a 1,40 _A
29	^{bc} 2,88 _A	^{cd} 3,38 _B	^{bc} 3,25 _B	^b 3,00 _B	^c 4,38 _B	^{bc} 2,50 _A	^b 3,14 _A
36	^c 3,25 _B	^d 3,88 _C	^c 4,00 _B	^b 3,00 _B	^c 4,50 _C	^c 3,63 _A	^b 3,75 _B ^b 4,00 _B
Treatment A							
Day	Spots	Slime	Gas	Texture modifications	Acid smells	Off-flavours	Off-tastes
8	^a 1,20 _A	^a 1,00 _A	^a 1,00 _A	^a 1,30 _A	^a 1,10 _A	^a 1,20 _A	^a 1,10 _A
15	^a 1,20 _A	^a 1,20 _A	^a 1,20 _A	^a 1,10 _A	^a 1,20 _A	^a 1,20 _A	^a 1,10 _A
22	^{ab} 1,71 _A	^{ab} 1,71 _A	^{ab} 1,43 _{AB}	^a 1,72 _A	^a 2,14 _A	^a 1,57 _A	^a 1,40 _A
29	^{ab} 1,75 _A	^{ab} 1,75 _{AB}	^{ab} 1,38 _A	^{ab} 2,00 _A	^b 3,50 _{AB}	^{ab} 2,50 _A	^a 2,00 _A
36	^b 2,38 _{AB}	^b 2,38 _B	^b 2,12 _A	^b 3,00 _B	^b 3,38 _{BC}	^b 3,50 _A	^b 4,00 _B ^b 3,50 _B
Treatment H							
Day	Spots	Slime	Gas	Texture modifications	Acid smells	Off-flavours	Off-tastes
8	^a 1,00 _A	^a 1,00 _A	^a 1,10 _A	^a 1,30 _A	^a 1,20 _A	^a 1,10 _A	^a 1,10 _A
15	^a 1,30 _A	^a 1,30 _A	^a 1,20 _A	^a 1,40 _A	^a 1,30 _A	^a 1,20 _A	^a 1,10 _A
22	^a 1,43 _A	^a 1,43 _A	^a 1,43 _{AB}	^a 2,14 _A	^{ab} 2,58 _A	^{ab} 1,86 _A	^a 1,80 _A
29	^a 1,75 _A	^a 1,86 _{AB}	^a 1,63 _A	^a 2,13 _A	^{bc} 2,50 _A	^{ab} 1,88 _A	^a 2,00 _A
36	^a 2,00 _A	^a 2,00 _{AB}	^a 1,63 _A	^a 2,25 _{AB}	^c 2,75 _{AB}	^b 2,75 _A	^a 1,75 _A ^a 1,88 _A
Treatment AH							
Day	Spots	Slime	Gas	Texture modifications	Acid smells	Off-flavours	Off-tastes
8	^a 1,00 _A	^a 1,00 _A	^a 1,00 _A	^a 1,50 _A	^a 1,30 _A	^a 1,10 _A	^a 1,20 _A
15	^a 1,30 _A	^a 1,10 _A	^a 1,10 _A	^a 1,50 _A	^a 1,30 _A	^a 1,30 _A	^a 1,60 _A
22	^a 1,57 _A	^a 1,43 _A	^a 1,14 _A	^a 2,00 _A	^a 1,58 _A	^{ab} 1,43 _A	^a 2,00 _A
29	^a 1,38 _A	^a 1,38 _A	^a 1,25 _A	^a 1,75 _A	^a 2,00 _A	^{ab} 1,88 _A	^a 2,12 _A
36	^a 1,5 _A	^a 1,38 _A	^b 1,86 _A	^a 1,80 _A	^a 2,00 _A	^b 2,50 _A	^a 2,13 _A

Control (C); lactate-Na and lactate-K (A); HPP (H); HPP+ lactate-Na and lactate-K (AH). Not Detected (N.D.). a-f Averages with different letter in the same column are significantly different ($P < 0.05$), across time. A-C Averages with different letter in the same column are significantly different ($P < 0.05$), for each treatment.

Conclusions

"Morcilla" treated with HPP shows slight differences in taste and texture compared to the control. However, these differences did not affect the preferences of panellists. Furthermore, the treatment extended the sensory shelf-life of the product by at least 15 days more than the control. Lactate treatments also increased the shelf life of the "Morcilla" product by 7 days.

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