PE4.118 Impact of salt reduction in Bayonna dry cured ham on processing yields and slicing ability
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Abstract: The aim of this work is to analyse the effect of reducing salt content in Bayonna dry cured hams on processing yield and slicing ability. From 60 pigs, one leg was submitted to normal processing (group 1: salting of 11-13 days) while the opposite leg was salted 2.5 days less (group 2) corresponding to expected 20% less salt. Green hams traits (pH, colour, fat cover and weight) were evaluated before processing. Processing yields were monitored after salting, resting and ripening periods**.** Slicing ability and total amount of prepacked slices of Bayonna ham were determined. Moisture, protein and lipid content, non protein nitrogen and NaCl were measured on *Biceps femoris* muscle. Paired t tests were performed. Green hams traits did not differ for both legs of each pig. Reducing the time of salting reduced the sodium chloride content by 20% on average and increased moisture, protein content, proteolysis index. Salting reduction influenced the rate of weight losses : less important during the period of salting and resting but a tendancy was noticed at the end of ripening. Moreover the total quantity of ham and the slicing yield were higher. Our results clarly demonstrated that it is possible to reduce salt by at least 15% without deleterious effects on processing quality. Further investigations will be provide to evaluate the sensorial and consumer impact of salt reduction.

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***Index Terms*—dry cured ham, processing yield, salt, slicing ability,**

I. INTRODUCTION

Bayonna ham enjoys EU Protected Geographical Indication (PGI) status. This certification requires professional processors to comply with a set of specifications that provide the consumer with a finished product of optimal quality, in particular as regards texture. Nowadays we assist to an increase demand for low salt food. In dry cured ham production, it is admitted that salt counteract the negative effects of high proteolysis on the sensory (texture, flavour) and processing (slicing ability) quality of ham. Controlling texture in the finished product is important for both organoleptic and technical quality. Defective texture generates considerable losses when the ham is sliced therefore impacting its economical value. Many studies have been conducted on the texture of dry-cured ham, and the role of proteolysis during curing has been demonstrated [1-4]. The major muscles in leg (*Semi membranosus and Biceps femoris*) differed in localisation and therefore present different water and salt dynamics, key factors in proteolysis [5].

Physical (temperature, hygrometry) and chemical conditions, such as water and salt content, which change in time, and the action of enzymes, are involved in this relation between proteolysis and texture [6]. Reducing drastically salt content may impair the overall quality of the product. Indeed, [7] reported that a drastic reduction of salt by 50% in dry cured ham was perceived by panellists as expected less salty and less

dry but with unacceptable aroma. According to [7] rancidity would been enhanced in the product when salt content is reduced. [8] reported similar results on Corsican dry cured ham. In this experiment we aimed to evaluate the effect of $1/5^{th}$ reduction of salt on processing parameters. Our experimental design was elaborated to avoid the bias of pH by using for each pig one leg as a control (normal salt) and the opposite leg as the treated (low salt).

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II. MATERIALS AND METHODS

Origin of hams and sampling. The study was based on a total of 60 pigs that had been fed a cereal-based diet (60-80%), slaughtered at the Lahontan abattoir, and selected to meet the processing specifications of PGI Bayonna ham for both legs. The processing of Bayonne hams was carried out at the Pyragena experimental station using the following steps : salting, settling, air drying, grease covering and ripening for a total duration of 12 months. In order to control raw ham heterogeneity, from the selected 60 carcass, one leg was submitted to normal processing (group 1: salting of 11-13 days) while the opposite leg was salted 2.5 days less (group 2) corresponding to expected 20% less salt. Green hams traits (weight, fat cover, semimembranosus pH and colour) were determined according to [9]. Compositional analysis were conducted on *Biceps femoris* : moisture, NaCl (NF V04-401), protein content (NF V04-407), non protein nitrogen or proteolysis index (Kjeldahl), and lipid content (NF V04-403). Processing yields were monitored after salting, resting and ripening periods**.** Slicing ability and total amount of prepacked slices of Bayonna ham were determined. Moisture, protein and lipid content, non protein nitrogen and NaCl were measured on *Biceps femoris* muscle. One way anova was realized with salt as fixed effect. Mean differences was evaluated by paired t tests.

III. RESULTS AND DISCUSSION

Green hams traits did not differ for both legs of each pig (Table 1). Reducing the time of salting diminished the sodium chloride content by 20% on average. In Corsican dry cured ham, [8] reduced drastically salt content by shortening salting time. An increased moisture, protein content, proteolysis index were found in low salt group (Table 2). [10] highlighted on Iberian dry cured ham significant non-protein nitrogen production. [6] reported similar results on italian ham with lower salt content. NPN was increased but also they noted defective appareance (the presence of surface white film) and the panellists highlighted an increase % of mushy mouthfeel. One the contrary [8] did not noticed significant effect on the dry cured ham appareance but a more pronounced aroma notes related to rancid, fatty and buttery. This could be related to the higher proportion of polysaturated fatty acids of the phospholipids in the low salt content dry cure ham. Figures 1, 2 and 3 showed the salting, resting and ripening losses in dry cured hams with normal and low salt content. Salting reduction influenced the rate of weight losses: in low salt group less important loss occured during the period of salting and resting and a tendancy ($p<0.06$) was noticed at the end of ripening. Most studies showed that pH plays a major role in dry cured ham processing yield [11]. Indeed salt penetrates more slowly into low pH meat because water diffuses more slowly to the surface in the salting stage than in normal pH meat. This is reason why we considered on the two legs of each pig. Moreover the total quantity of ham (not shown) and the slicing yield were higher (figure 4). The higher weight of ham can be due to the higher moisture in ham which did not lead to defective cohesiveness in the product. Industrial slicing occur at high speed but at cold temperature (under zero degree). Our results clarly demonstrated that it is possible to reduce salt by at least 20% without deleterious effects on processing quality. Further investigations will be provide to evaluate the sensorial and consumer impact of salt reduction.

IV. CONCLUSION

The salt content of dry-cured ham needs be reduced to adapt the product to the taste of the consumer and to human health recommendations. Our results clarly demonstrated that it is possible to reduce salt by at least 20% without deleterious effects on processing quality. Further investigations will be provide to evaluate the sensorial and consumer impact of salt reduction.

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	Salt level			
	Normal		Low	
	mean	SD	mean	SD
Green ham weight	10.2	0.4	10.5	0.5
fat cover	13.8	3.4	13.2	3.2
pH	5.7	0.1	5.7	0.1
Colour	3.4	0.6	3.5	0.6

Table 1 : green ham traits of the two groups of hams (normal and low salt)

	Salt level				
	Low		Normal		
	mean	SD	mean	SD	p
Humidity	60.7	1.2	59.6	1.5	***
Lipid	3.1	1.5	3.3	1.5	NS
Protein	29.1	1,00	29.5	1.5	*
proteolysis index	29.5	2.9	28.2	2.5	***
Chloride	5.3	0.6	6.1	0.8	***

Table 2 : Means values of chemical data from normal (group 1) and low (group 2) salt content

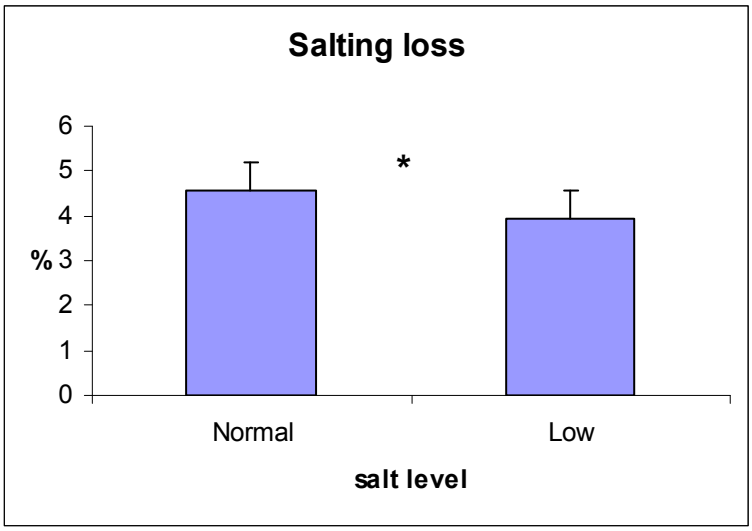

Figure 1 : salting loss in Bayonna dry cured ham of normal and low salt groups

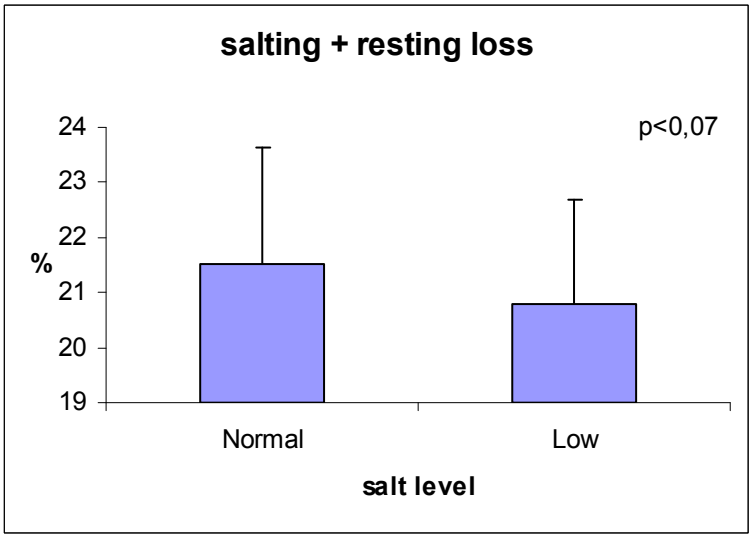

Figure 2 : salting + resting loss in Bayonna dry cured ham of normal and low salt groups

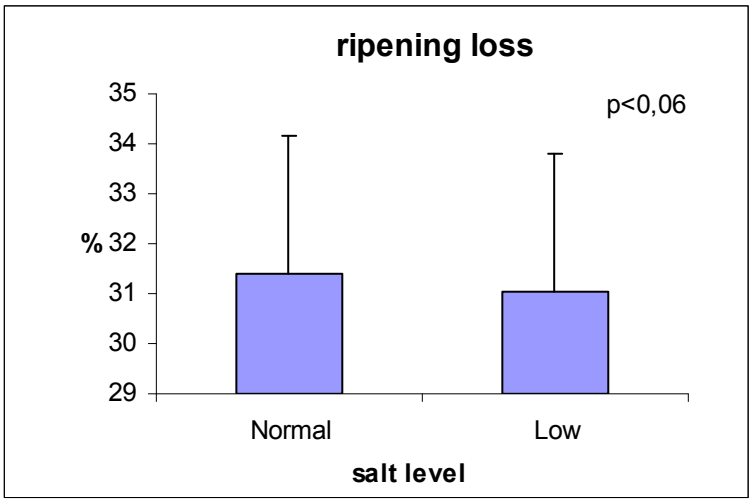

Figure 3 : ripening loss in Bayonna dry cured ham of normal and low salt groups

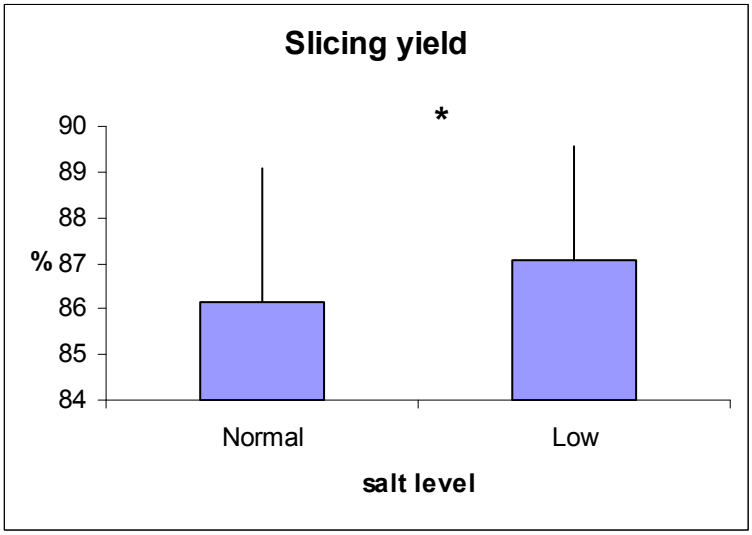

Figure 4 : slicing yield in Bayonna dry cured ham of normal and low salt groups