INFLUENCE OF ZOOTECHNICAL AND TECHNOLOGICAL PARAMETERS ON TYPE I COLLAGEN SOLUBILITY DURING THE HAM PROCESS.

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ABSTRACT

The influence of zootechnical and technological parameters on the ham process has been studied by analysing type I collagen solubilisation, which is an essential component of conjunctive tissue. The structural adaptations of collagen during cooking is well documented as an important function of collagen networks in the muscle.
The zootechnical factors were :
- Two genetics lines
  - (Large White (LW) x Pietrain(P)) x (LW x Landrace (LD)),
  - (P76 a composite line of Pen Ar Lan society) x (LW x LD),
- Two slaughter ages of 160 days and 190 days with identical weights.
- Two groups of pH 24, the lower parameter at 5.55 and the other upper at 5.7.
- Two muscles were studied the Biceps Femoris and the Semi Membranous.

The technological parameters were :
- Salt concentration (1.5 or 2.5 %)
- Two different gradients with variables of speed but the same final temperature (0.16 °C/min and the other 0.55 °C/min)
- Two pasteurisation values (Vp $^{10}_{70}$ 50 and Vp $^{10}_{70}$ 100).
- The abscence or presence of epymisium.

The variables, muscle, pH24, salt, pasteurisation value have an influence on type I collagen solubility ($p < 0.01$ %). An important correlation was found between technological output and soluble type I collagen ($r^2 = 0.58$; $p<0.01$%). Soluble collagen is a good index to predict the technological output.

Introduction

The ham process is complex and its process relies on several economic factors : breeder, carrier, slaughterhouse and meat product. These all influence the quality of the ham, by the effect on the composition of the white muscle as the ham is a fragile meat product. The meat quality used initially influence greatly the quality of the finish product. The pH of the semi membranous muscle is maintained 24 hours after slaughter. It has an effect of 50 % of the technological output.
The ham process became a point of high focus particually after the era of post-war when there was an increases in demand for pre-wrapped ham (G. Alviset et al., 1995; Weinberg H. et al., 1992). Therefore their is an important aspect to the meat industry to control the slice process. The quantity of conjunctive tissue and it's structure in meat is another important area for commercial research so that the evolution of the tissue in type I collagen whilst in the cooking process can be evaluated. A study of the relationship between collagen solubilisation and technological output was conducted. This was set with the parametres of several factors both zootechnological and technological.
The Zootechnical factors were : two genetics lines : (Large White (LW) x Pietrain(P)) x (LW x Landrace (LD)), (P76 a composite line of Pen Ar Lan society) x (LW x LD); two slaughter ages of 160 days and the other 190 days with similar weight; two groups of pH 24, one low at 5.55 and the other at 5.7; two muscles were study the Biceps Femoris and the Semi Membranous.
The Technological parameters were : salt concentration (1.5 or 2.5 %); two different gradients with variables of speed but the same final temperature (0.16 °C/min and the other 0.55 °C/min); two pasteurisation values (Vp $^{10}_{70}$ 50 and Vp $^{10}_{70}$ 100) ; abscence or presence of epymisium.
The object of this work is to see the influence of these factors on solubilisation of type I collagen evalueted with immunoassay technique (D.J. Hartmann, 1995) and to study the relation of this with technological output.

Materials and Methods

Influence of zootechnical characteristics

Three factors has been used to select the pigs : genetic line, age and pH24. These factors have no influence on weight carcase and percentage collagen in meat.

Ham process protocol

The muscles were cut into pieces of 80 g. A mixture of salt solution with water, nitrite salt, sugar, and sodium isoascorbate was added. Two nitrite salt concentration was realised (sodium nitrite salt , Compagnie des Salines du Midi et des Salines de l'Est, Varangeville, France) to obtain 1.5 or 2.5 % in the finished product. The salt solution concentration was 10 % of the original salt found in the meat. The duration of spinning was 10 hours with 20 min of spinning at 8 rt/min and 40 min with no rotation. The temperature whilst spinning was 8 °C. The spinning is carried out for one vacuum-packed meat which contains 1 kg of meat for 0.11 kg of salt solution. After spinning the meat is separated into two portions of 500 ± 10 g and cooked then vacuum-packed. During the

cooking, two gradients which increase in speed with only one final temperature (65.5 °C), followed by pasteurisation which is also noted. The study was conducted by a factorial plan with resolution IV and eight factors.

RESULTS AND DISCUSSION

The influence of the eight factors study is given table 1.

table 1 : Evolution of type I collagen solubility in fonction of height factors evaluate with mean ± standard error (NS : no significatively difference)

Several factors have in important influence on type I collagen solubility, muscle, pH, salt, and pasteurisation value. It is interesting to note that the same factors have an important influence on meat product also. The relationship between type I collagen solubitity and technological output is very strong as shown in figure I ($r2 = 0.58$; $p < 0.01$ %).

Figure I : Relation between technological output in percentage and µg of type I collagen solubilazed by gramme of meat.

The relation between type I collagen soluble and technological output is very interesting for the meat process. It is interesting to follow this solubilisation during the cooking for predict the technological output.

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		µg collagen/g meat	p
male genetic line	LW*P	607 ± 358	
	P76	682 ± 299	NS
age in day	160	646 ± 325	
	190	643 ± 340	NS
muscle	Biceps Femoris	759 ± 307	
	Semi		p<0.01 %
	Membranous	530 ± 315	
pH	< 5.55	786 ± 313	p<0.01 %
	> 5.7	503 ± 285	
salt	1.5 %	777 ± 322	p<0.01 %
	2.5 %	512 ± 285	
epimysium	with	692 ± 329	
	without	597 ± 328	NS
different gradient of speed temperature	slow	659 ± 365	NS
	quick	630 ± 296	
pasteurisation value	50	522 ± 253	p<0.01 %
	100	767 ± 355	

table 1

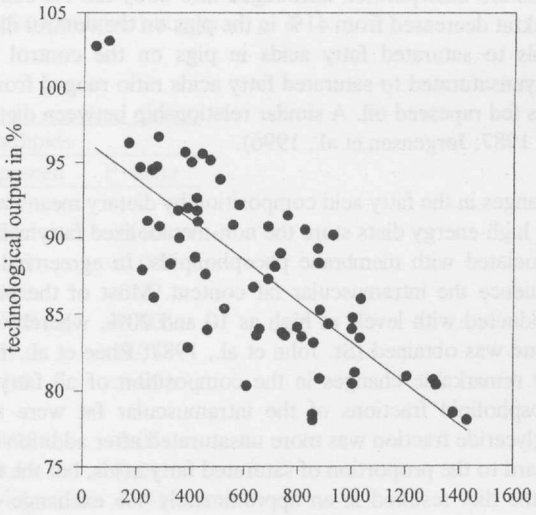

Figure I