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Characteristics of "Toscano" cured ham of Cinta Senese and Large White x Cinta Senese pigs

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SUMMARY – Technological yields of *Toscano* cured ham from two genetic types – Cinta Senese (CS) and Large White x Cinta Senese (LWxCS) – were recorded from trimmed and cured ham. A sample slice was taken from cured hams of castrated males and meat quality traits were determined on *Biceps femoris (Bf)* and *Semimembranosus (Sm)* muscles. LWxCS produced more compact and better shaped fresh hams. No difference between genotypes was found regarding the technological yields apart of trimming losses, probably due to a greater adiposity of the CS which presented a higher incidence of subcutaneous fat. Dry-cured hams from LWxCS crosses are heavier, with better compactness and conformation indexes and with higher values for total lean of the slice than Cinta Senese purebred. CS hams were characterised by greater adiposity, which could negatively affect consumer acceptability.

Keywords: Dry-cured ham, Cinta Senese breed, crossbreed, meat quality, autochthonous pig.

RESUME – *"Caractéristiques du jambon sec "Toscano" issu de porcins Cinta Senese et Large White x Cinta Senese". Dans le présent essai, nous avons recherché l'influence de deux génotypes – Cinta Senese (CS) et Large White x Cinta Senese (LWxCS) – sur les caractéristiques technologiques du jambon sec Toscano. Sur un échantillon de jambon de mâles castrés, on a mesuré les paramètres physico-chimiques classiques dans le Biceps femoris (Bf) et le Semimembranosus (Sm). Après le séchage, les LWxCS ont présenté des jambons plus compacts et de meilleure conformation. Au regard des caractéristiques technologiques, on n'a pas trouvé de différences significatives entre les deux génotypes excepté pour les pertes au parage qui ont été plus élevées dans les CS à cause d'une teneur supérieure en graisse sous-cutanée. Les jambons secs de LWxCS ont présenté un poids supérieur, de meilleures compacité et conformation, et un pourcentage de tissu musculaire plus élevé. Les jambons secs de CS ont été caractérisés par un pourcentage supérieur de graisse, caractéristique qui pourrait influencer d'une façon négative les consommateurs.*

Mots-clés : *Jambon sec, race Cinta Senese, croisement, qualité de la viande, race locale.*

Introduction

Pig production in Italy is based on Large White and Landrace breeds and other breeds are traditionally employed for crossbreeding, thus "hybrid pigs" represent the most used genotype (Sabbioni *et al.*, 2004). Many studies have shown differences on dry-cured ham characteristics among traditional breeds (Bittante *et al*., 1991; Čandek-Potokar *et al.*, 2002; Gallo *et al*., 1994; Gou *et al*., 1995; Sabbioni *et al*., 2002) whereas there are few studies where comparison between autochthonous breeds and their crossbreeds with improved genotypes are studied (Antequera Rojas *et al.*, 1993; Antequera *et al.*, 1994; Franci *et al*., 1997).

Toscano cured ham is a typical meat product from the centre of Italy very appreciated by consumers, which has obtained the Denomination of Protected Origin (DOP). Cinta Senese breed is one of the breeds allowed to produce *Toscano* cured ham but among the breeders of Cinta Senese it's still debated its use as purebred or crossed with the improved breeds of the modern swine industry. The aim of this study was to assess the technological yields and the meat quality traits of the *Toscano* cured ham, obtained from Cinta Senese as purebred or crossbred.

Materials and methods

Fifty five cured hams of castrated male and female pigs were employed. Pigs belonged to Cinta Senese (CS n=27) and Large White x Cinta Senese (LWxCS n=28) breeds and were reared outdoors

with the same feeding system. The day after slaughter all right hams were processed in a commercial plant. After trimming, salting, and resting operations and at the end of seasoning period hams were weighed. Weight losses at different stages of processing were expressed as percentage of the ham weight at previous stage. Hams were cured according to the transformation rules of *Prosciutto Toscano D.O.P.* On trimmed and cured ham measures of length, width and thickness were recorded. On cured hams of the sole castrated males (12 CS and 14 LWxCS) a sample slice was taken. The main tissues and muscles were separated and weighed and samples of *Biceps femoris* and *Semimembranosus* were taken for determination of total lipid, moisture, total nitrogen, ash and Warner Bratzler shear force.

Data were analysed using the GLM procedure of SAS (2003). The following statistical model was used:

$$y_{ijk} = \mu + B_i + S_j + b(X_{ijk}) + \varepsilon_{ijk}$$

where: B_i = fixed effect of the i^{th} breed; S_j = fixed effect of the j^{th} sex; (X_{ijk}) = covariate (trimmed ham weight) expressed as the difference of individual data from the mean of the i^{th} group. Sex effect was obviously not included in the analysis of the sample slice of cured hams.

Results and discussion

Table 1 reports weights and morphological characteristics of ham. Trimmed hams of crossbreed pigs were heavier and had greater measures of length, width and thickness than those of CS. A similar pattern resulted also after the seasoning period. LWxCS produced more compact and better shaped hams because of the greater transversal measure. Indexes of both CS and LWxCS were markedly lower than those reported for dry-cured Parma hams (Sabbioni *et al.*, 2004) and for CSxLW pigs both as fresh or seasoned hams (Franci *et al*., 1994; 1997). Nevertheless it has to be pointed out that hams of this trial included the distal part of the leg that strongly affects the values of the two considered indexes.

Table 1. Weight and morphological characteristics of ham

	Genetic type		Sign.	RSD
	CS (n=27)	LW x CS (n=28)		
Trimmed ham				
Weight (kg)	9.4	12.6	*	9.2
Length (cm)	72.3	76.2	*	4.3
Width (cm)	27.2	30.6	*	1.0
Thickness (cm)	16.2	18.0	*	0.9
Compactness index[a] (g/cm)	129.7	165.7	*	8.6
Conformation index[b]	37.9	40.3	*	3.1
Cured ham				
Length (cm)	68.0	71.0	*	1.9
Width (cm)	27.0	29.9	*	0.9
Thickness (cm)	10.8	12.2	*	0.5
Compactness index[a] (g/cm)	93.9	122.3	*	6.0
Conformation index[b]	39.7	42.1	*	1.6

a Weight/Length.

b (Width/Length) * 100.

No difference between genotypes was found about the technological yields (Table 2) apart of trimming losses, probably due to a greater adiposity of the CS hams according to higher fatness of carcass observed in previous work (Campodoni *et al.*, 2003). Such yields are in agreement with those observed by Franci *et al*. (1997) on CSxLW pigs. Lower weight losses in hams of crossed animals respect to pure breed were found by Guerrero *et al.* (1996), whereas Gou *et al.* (1995) and Oliver *et al.* (1994) reported no difference in ham processing losses between various genotypes but nobody of them used pigs from unimproved breeds.

The weight loss at the end of the seasoning period of the present trial was lower than those related by some authors (Gou *et al.*, 1995; Čandek-Potokar *et al.*, 2002) but higher than those reported for Parma hams by Sabbioni *et al.* (2004).

Table 2. Technological yields (%)

	Genetic type		Sign.	RSD
	CS (n=27)	LW x CS (n=28)		
Trimming	20.4	18.4	*	1.9
Salting†	6.4	5.8	–	2.3
Resting†	10.6	9.6	–	2.5
Seasoning†	17.7	17.9	–	1.4
Total††	31.8	31.1	–	3.0

† Respect to weight at previous phase.

†† Cured weight/trimmed weight *100.

The greater adiposity of Cinta Senese hams is confirmed observing the slice composition (Table 3). In fact CS hams presented an higher incidence of subcutaneous fat whereas no difference between genetic types was found for intermuscular fat. Hams from LWxCS showed more lean tissue than CS due to an higher incidence of *Semitendinosus* and *Biceps femoris* muscles.

Table 3. Tissue composition (%) of sample slice of cured ham

	Genetic type		Sign.	RSD
	CS (n=12)	LW x CS (n=14)		
Trimming	20.4	18.4	*	1.9
Subcutaneous fat	32.6	23.6	*	4.8
Intermuscular fat	1.4	1.7	–	0.6
Lean	66.0	74.7	*	4.7
Biceps femoris (Bf)	23.9	28.8	*	3.8
Semimembranosus (Sm)	30.9	31.7	–	3.6
Semitendinosus (St)	10.5	11.9	*	1.5

As it concerns the chemical analysis (Table 4), the two muscles showed different behaviour: Sm had lower moisture and higher protein and fat contents in LWxCS than in CS which indicates that moisture loss was more important in the former. LW breed affects the chemical traits of Bf muscle only for protein content. WB shear force were similar between genotypes and Sm seems to be more tender than Bf. The higher resistance to cutting that was observed in the Bf was probably due to the lower intramuscular fat content as already observed by Čandek-Potokar *et al.* (2002) whereas the lowest moisture of Bf is related to the fact that this muscle is covered by subcutaneous fat.

Table 4. Chemical-physical traits of *Biceps femoris* and *Semimembranosus* muscles of cured ham

	Genetic type		Sign.	RSD
	CS (n=12)	LW x CS (n=14)		
Semimembranosus				
Moisture (%)	47.2	41.3	*	2.9
Ether extract (%)	5.2	6.9	*	1.8
Protein (%)	39.3	45.0	*	3.6
Ash (%)	8.4	7.7	*	0.4
Warner Bratzler (kg)	20.5	21.4	–	5.2
Biceps femoris				
Moisture (%)	52.6	53.4	–	0.6
Ether extract (%)	4.1	4.1	–	0.6
Protein (%)	32.0	33.0	*	1.3
Ash (%)	11.2	10.6	–	0.7
Warner Bratzler (kg)	24.9	25.5	–	5.2

A similar pattern of chemical and physical traits has been found in Alentejano pigs (Neves *et al.*, 2000) both for the two muscles, but our pigs seem to have lower lipid content regardless of the genotype considered; this aspect seems to influence the toughness of the ham resulted higher in CS or LWxCS pigs when compared to Portuguese breed. As concern Bf muscle, WB shear force is similar to that found for CSxLW whereas moisture is slightly lower (Franci *et al*., 1996). Even when compared with Corsican or Corsican x Large White pigs (Coutron Gambotti *et al.*, 1998) our animals have lower lipid content and this "low" level of lipids placed the Cinta Senese breed between improved an unimproved genotypes.

Conclusions

The use of Large White x Cinta Senese crosses at the aim of *Toscano* dry-cured ham production seems interesting. As a matter of fact dry-cured hams from LWxCS crosses are heavier, with better compactness and conformation indexes and with higher value of total lean of the slice than Cinta Senese purebred, that could be considered as beneficial from a commercial point of view. CS hams were characterised by a greater adiposity that, in many cases, negatively affects consumer acceptability. Therefore, the ban of crossbreed animals in the Denomination of Protected Origin (DOP) of Cinta Senese products must be carefully weighed before any decision will be taken.

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