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Comparison between Cinta Senese and Mora Romagnola crossed with Large White pigs

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Abstract. The recovery of the "Prosciutto del Casentino", a typical product of the homonymous area located in the Arezzo province, led to the constitution, during 2007, of the "Consorzio del Prosciutto del Casentino". One of the main rules of the Consortium imposes the use of the cross between both Large White or Landrace with the Cinta Senese or Mora Romagnola autochthonous breeds. This first trial foreseen the comparison between two of the possible types of crossbreeding, in reason to the fact that the crossing between Cinta Senese and Large White is well investigated whereas information on the crossing between Mora Romagnola and Large White is lacking. Two different types of crossbreed have been compared for both *in vivo* and *post mortem* performances. Chemical-physical characteristics of raw meat and fat have been determined whereas the hams are at present during the seasoning period. MRxLW subjects produced fatter carcasses with higher thickness of subcutaneous fat than CSxLW (33.8 *vs* 22.9 mm). Sample joint of MRxLW showed higher fat and lower lean percentage than CSxLW (37.6 *vs* 25.2; 54.4 *vs* 64.7). As regards chemical-physical analyses it emerges that the meat of the CSxLW presented higher percentage of moisture (74.30 *vs* 72.71) and more water losses for pressure (100.05 *vs* 67.74 mm^2) than MRxLW.

Keywords. Ham – Cinta Senese – Mora Romagnola – Crossbreeding.

Comparaison entre Cinta Senese et Mora Romagnola croisés avec Large White

Résumé. *La récupération du Prosciutto Casentino, produit typique de la région homonyme dans la province d'Arezzo, a conduit à la création, en 2007, du Consortium de Prosciutto Casentino. Parmi les contraintes imposées par la réglementation se trouve l'utilisation de la première génération de croisements entre les races améliorées Large White et Landrace et les races indigènes Cinta Senese et Mora Romagnola. L'expérimentation a fourni une comparaison entre les deux types génétiques locaux, alors que, tandis que sont disponibles les données de croisement entre les Cinta Senese et Large White, les résultats de Mora Romagnola x Large White manquent. On a fait l'élevage des deux types de croisés, qui ont été comparés pour leurs performances* in vivo *et* post mortem*. Ensuite, on a déterminé les caractéristiques chimiques et physiques de la viande fraîche et de la graisse tandis que la maturation des jambons n'est pas encore terminée. Les animaux MRxLW ont produit des carcasses plus grasses avec une graisse sous-cutanée plus épaisse que CSxLW (33,8 mm* vs *22,9 mm) et des coupes plus riches en tissu adipeux et plus pauvres en maigre (37,6* vs *25,2, 54,4* vs *64,7). L'analyse physico-chimique montre que la viande de CSxLW a présenté un pourcentage plus élevé d'eau (74,30%* vs *72,71%) et une perte d'eau plus grande avec la méthode de la pression (100.05* vs *67,74 mm2).*

Mots-clés. *Jambon – Cinta Senese – Mora Romagnola – Croisement.*

I – Introduction

The use of the crossbreed between Cinta Senese and Large White pig in Tuscany has its origins early last century and provides the so-called "Bigio" or "Tramacchiato". This type of production was resumed last decade following the recovery of the Cinta Senese even if both the Technical Specifications of production for "Suino Cinto Toscano" and niche market, prefer the purebred. It remains that adequate test recently provided some guidance on the productivity of the cross of Large White with the Cinta Senese pig making possible a characterization, particularly in relation to the two parental breeds (Acciaioli *et al*., 2002; Franci *et al*., 2003, 2005). The characteristics of Mora Romagnola both as purebred or crossed are less known also

because of its limited diffusion, which has hampered the interest of the research that only recently published results of tests and surveys on the breeding area (Fortina *et al*., 2005, 2006; Lo Fiego *et al*., 2007; Zambonelli and Bigi, 2006). The official inclusion of this breed in the Technical Specifications of a traditional production as the Casentino ham, determines the need to clarify the behaviour in relation to farming economy and quality of product. The aim of this study was therefore to assess qualitative differences between the two different crossbreeds Cinta Senese x Large White and Mora Romagnola x Large White.

II – Materials and methods

Eighteen pigs were used, 10 cross between Cinta Senese boars and Large White sows (CSxLW) and 8 cross between Mora Romagnola boars and Large White sows (MRxLW). The two genetic types, balanced by sex, were kept in two separate pens and fed mixtures *ad libitum*. During the period the subjects were weighed on a regular basis every two months. All the animals were slaughtered within two months starting from the heavier ones. At slaughter the carcasses were dissected in commercial cuts which were weighed to determine their percentage. On sample joint (loin from the 2^{nd} to the 5^{th} lumbar vertebrae) thickness of subcutaneous fat and area of the *Longissimus lumborum* were measured. Sample joint was dissected into: subcutaneous fat, divided into inner and outer layer, intermuscular fat, *Longissimus lumborum* and *Psoas major* muscles, other lean (muscle portions not identified) and bone. On *Longissimus lumborum* the following physical analyses were performed: (i) Color by Minolta colorimeter (Boccard *et al*. 1981); (ii) water holding capacity (Free water pressure by the method of Grau and Hamm (1952) modified; cooking loss (Boccard *et al*., 1981), drip loss; and (iii) shear force value by Warner-Bratzler instrument. On *Longissimus lumborum* and *Psoas major* the following chemical determinations were carried out: Moisture, ether extract, crude protein, Ash (AOAC, 1990). Data were processed by GLM procedure of SAS statistical package (2003) using the following models: Weight at slaughter, ADG and age $Y_{ijk} = \mu + R_i + S_j + \varepsilon_{ijk}$; carcass composition, sample joint composition and physical analyses of *L. lumborum* muscle $Y_{ijk} = \mu + + R_i + S_j + b^*(W_{ijk}) + \varepsilon_{ijk}$; Chemical analyses of *L. lumborum* and *Psoas major* muscles $Y_{ijkl} = \mu + R_i + S_j + T_k + b^*(W_{ijkl}) + \varepsilon_{ijkl}$; where R = Breed, S = Gender, T = Type of Muscle, W = weight of right side.

III – Results and discussion

Table 1 shows the in vivo performances of the two genetic types. The most evident result is the difference in slaughter weight, with the group CSxLW heavier at slaughter. This data could be affected by the difference in age between the two groups that is due to the choice of the breeder to slaughter the pig at the reaching of the visual maturity point. The most representative value was the ADG showing how the two groups behaved similarly during the trial period.

Table 1. Weight, ADG and slaughter age

Item	Genetic type		RSD
	CSxLW	MRxLW	
Live weight (kg)	179.3 a	155.4 b	21.6
ADG (kg)	0.352	0.378	0.06
Age (d)	504a	446b	14.2

As regard the carcass composition (Table 2), there was no difference in the dressing percentage but the results also showed that the CSxLW was basically leaner showing a greater proportion of ham and lesser proportion of kidney fat when compared to MRxLW.

Table 2. Composition of the right half side

Item	Genetic type		RSD
	CSxLW	MRxLW	
Dressing percentage	83.57	85.85	3.57
Loin with backfat	23.63 a	25.11 b	0.99
Ham (with feet)	32.17 a	28.94 b	0.93
Shoulder (with feet)	17.79	17.58	0.93
Belly with ribs	15.43	15.97	0.76
Jowl	3.30	3.36	0.46
Kidney fat	2.13 a	4.01 b	0.54
Head	5.55	5.03	0.38

Loin is greater in MRxLW only because this cut included backfat, according to the dissection protocol of the factory. The characteristic of MRxLW to depot more fat is clear also from the analyses of the sample joint (Table 3).

Table 3. Sample joint composition

Item	Genetic type		RSD
	CSxLW	MRxLW	
Sample joint (g)	2318.9	2482.1	3.57
Backfat thickness (mm)	22.98 a	33.84 b	4.14
Fat (%)	25.21 a	37.66 b	5.80
Backfat outer layer	12.19 a	15.75 b	2.05
Backfat inner layer	9.64 a	18.43 b	3.75
Intermuscular	3.70	4.27	1.16
Lean (%)	67.78 a	54.48 b	5.24
L. lumborum	40.12 a	33.80 b	3.25
Psoas major	14.98 a	10.59 b	2.03
Other lean	9.30	9.14	1.95
Bone (%)	10.06 a	8.02 b	1.37
Lean/bone	6.52	6.77	1.09

It is noteworthy that the thickness of subcutaneous fat is much higher in the group MRxLW. This parameter is confirmed by the incidence of subcutaneous fat, both as inner and outer layers. Intermuscular fat shows the same trend, even if not significant. Consequently to this behaviour of adipose tissue, the lean and bone components is more developed in CSxLW. Eliminating the masking effect of fat, however, the two genetic types showed similar lean/bone ratio.

The physical-chemical properties are reported in Table 4. The CSxLW showed moister meat, with lower content of protein and higher content of ash. Again, MRxLW showed higher fat content, even if not significant.

The moisture content also appear to affect the parameter of brightness (L*) which is higher in CSxLW subjects whereas the habit of the MRxLW animals to depot more fat didn't occur, showing how the influence of the genetic type is more evident in adipogenesis of the subcutaneous zone.

Table 4. Chemical analysis of lean

Item	Genetic type		RSD
	CSxLW	MRxLW	
Moisture (%)	74.30 a	72.71 b	1.01
Protein (%)	21.64 a	23.05 b	0.43
Ether extract (%)	2.35	2.91	1.18
Ash (%)	1.18 a	1.08 b	0.04

As regard the physical analyses of the meat (Table 5), CSxLW showed lower capacity of water retention only when measured as free water demonstrating that the three methods used for this analysis does not always agree among themselves as they are based on different physical principles of water removal.

Table 5. Physical analysis of *Longissimus lumborum*

Item	Genetic type		RSD
	CSxLW	MRxLW	
Color			
L*	52.01 a	48.37 b	2.16
a*	12.29	13.37	2.40
b*	5.10	4.90	1.04
Water holding capacity			
Drip loss (%)	6.83	7.18	1.89
Cooking loss (%)	24.20	24.88	4.06
Free water (mm2)	100.05 a	67.74 b	18.55
Shear force (kg)			
Wb fresh	10.08	9.29	2.53
Wb cooked	10.17	9.48	1.55

IV – Conclusions

The results showed that MRxLW crossbreed had greater tendency to depot fat. This trend is very evident in the subcutaneous fat and visceral fat. This could mean that this crossbreed is able to reach the slaughter age earlier, although at lower weights. On the contrary crossbreed including Cinta Senese breed favours lean cuts, especially the ham which is especially important from an economic point of view for the "Prosciutto del Casentino" production.

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