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Abstract - The variability in the characteristics of fresh meat and thighs in relationship with genetic type was studied on 22 lots of heavy pigs, comprising 615 female and castrated males, randomly chosen during slaughtering in groups of 20 to 30 animals per lot. Four different genetic types reared for the production of the San Daniele dry-cured ham PDO were considered: two traditionals (Large White or Duroc x (Landrace x Large White) and two industrial hybrids (GOLAND and DANBRED). Fresh meat samples from *longissimus dorsi* muscle were collected to perform chemical and physical analysis. The right trimmed thighs were used to evaluate some morphological parameters along with weight losses during seasoning. The genetic type confirmed its important influence on pig carcass, meat and ham quality. The two industrial types, DANBRED in particular, tended to present a lower back fat values and a leaner carcass than the two Italian genetic types. Within the most important characteristics for the production of dry cured hams (subcutaneous fat thickness and seasoning losses) the highest differences were found among the industrials genetic types, which cannot be simply considered as an undifferentiated homogenous group.

Key words: Genetic type, Fresh Meat Quality, Thigh Quality, San Daniele PDO.

Introduction - The production of Italian heavy pig, focused for many years on "traditional genetic types" such as Large White breed and the products of its crosses, has undergone significant changes in recent years. In fact, the increasing consumers demand for lean meat has oriented the selection towards genetic types with a strong muscular growth and reduced fat deposits (Bosi and Russo, 2004). This selection resulted in some improvement of pork traditional carcasses with a substantial increase in lean cuts and the introduction of new genetic types, generally commercial hybrids, produced by specialized companies. The experiment is a part of a larger project that will lead to the characterization of the San Daniele dry-cured ham, the second PDO in Italy producing more than 2,5 millions of hams/year, characterized by a limited literature. Our aim was to evaluate the performances at slaughter and at seasoning of four pig genetic types, two traditional and two industrial, in terms of fresh meat and thighs characteristics variability.

Material and methods - Twenty-two lots of pigs, produced by different northern Italian breeders, belonging to the San Daniele dry-cured ham PDO chain, were used for the trial considering only one genotype for each pig farm. During slaughtering 20 to 30 animals per lot were randomly selected and examined. Globally 615 pigs, castrated males and females, from four different genetic types were considered. Two traditional genetic types were obtained from Italian selection by using Italian Duroc (ID) or Large White (LW) boars, and two industrials were produced with Goland C21 (GOLAND) or Danline HD (DANBRED) boars. The sows used for the traditional genetic type were Landrace x Large White (LxLW) crossbreeds, while for GOLAND and DANBRED their own selected lines were used. At slaughter the age and the weight of each lot were recorded and carcass evaluation was individually performed. The right thigh of all pigs was identified at slaughter and weighted after 24 hours of air-cooling at 4°C and trimming procedure. Trimmed thighs were then measured and thighs compactness index and globosity were calculated too. Ham weight during seasoning (pre-salting 5±1 days; salting 17±2 days and end of seasoning 392±6 days) was individually recorded and the corresponding losses calculated as a percentage of the cold trimmed weight. The *longissimus dorsi* (LD) muscle pH was measured in triplicate 45 minutes and 24 hours after slaughter by means of a portable pH meter (Hanna Instruments, model HI8424). The LD colour was measured 24 hours after slaughter using a spectrophotometer Minolta mod.CM-2600d (D65 illuminant, 10° angle observation), and expressed through the DIN99 uniform colour space coordinates (specular component included). After carcass preparation, a lumbar sample of the right LD was cut off for analysis and divided into two portions. The first was divided into two slices (approximately 80 g), placed in a nylon net, put in a nylon bag and hung at 4°C for 24 hours for the evaluation of drip loss on fresh weight. From the second portion three 3-cm-thick slices were cut, weighed and cooked in a water bath at 75°C for 45 min, iced for 15 min, chilled at 4°C for 45 min and weighed again for cooking determination. After overnight chilling at 4°C, three cylindrical section (15 mm diameter x 25 mm length) from each cooked sample were cut parallel to the muscle fibres and sheared perpendicularly using a Lloyd TAPlus texture analyser equipped with a Warner-Bratzler shearing device (shearing velocity at 100 mm/min). From the force-deformation curve, the peak force (expressed in N) were obtained. The fixed effect of genotype was analyzed on the between farms variability, using the lot data set, comprising 22 sex-weighed mean values per variable. Data were analyzed with SPSS v.17 software using the univariated General Linear Model.

Results and conclusions - In Table 1 age, weight at slaughter, average daily gain and some carcass characteristics are reported. The dressing percentage was clearly influenced by the genetic type. Indeed DANBRED pigs shown higher dressing values than GOLAND and 75% LW pigs. The two industrial types, DANBRED in particular, tended to present a lower backfat values and a leaner carcass than the two Italian genetic types. However these differences did not reach the level of significance ($P \leq 0.05$) due to the high between farms variability within genetic type, comprised in the error term. Lo Fiego *et al.* (2005) comparing a traditional and an industrial hybrid demonstrated the influence of genetic type on backfat thickness, but they tested this effect on the individual variability, by rearing the pigs in the same farm.

Table 2 shows LD fresh meat characteristics per genetic type. LW x (L x LW) and GOLAND meat presented opposite differences ($P \leq 0.07$) in water losses. LW x (L x LW) meat was characterized by low drip loss and high cooking loss while the GOLAND demonstrate an opposite trend. On the other side, IDx(L x LW) and DANBRED meats differed in terms of tenderness being the latter more tender. GOLAND meat resulted significantly ($P \leq 0.05$) brighter than that of the other genetic types.

Thigh and ham characteristics are reported in Table 3. DANBRED thighs were the heaviest in absolute terms and presented good index of compactness and globosity, however they were the worst

Table 1. Weights, age at slaughter and carcass characteristics per genetic type.

		Genetic type				RSD
		ID x (L x LW)	LW x (L x LW)	GOLAND	DANBRED	
Lots (pigs)	n.	5 (127)	6 (185)	6 (149)	5 (154)	
Live weight	kg	166.6	166.6	170.7	169.9	5.25
Slaughter age	d	307	377	304	326	55.1
Average daily gain	g/d	541	461	561	520	60.8
Dressing percentage	%	81.9 ab	79.7 bc	78.1 c	83.3 a	2.32
Hot carcass weight	kg	136.4	132.7	133.3	141.6	6.57
Backfat thickness	mm	26.4	26.2	24.2	23.6	3.11
Lean	%	49.5	50.1	50.7	51.4	1.65

a,b,c within criterion means different (P≤0.05).

in terms of fat thickness (2.23 mm) and seasoning losses (30.8%). For these parameters DANBRED differs significantly ($P \leq 0.05$) from GOLAND and LW 75%. Even Cilla *et al.* (2006), comparing crosses sired by three types of Duroc, found DANBRED genetic type as a not preferable choice to produce a high quality dry-cured ham. The genetic type - whose effect was evaluated on the actual environmental variability, due to the different farm conditions - confirmed its important influence on pig carcass, meat and ham quality. Within the most important characteristics for the production of dry cured hams the highest differences were found among the so-called industrial genetic types, which cannot be simply considered as an undifferentiated homogenous group.

Table 2. *Longissimus dorsi* (LD) characteristics per genetic type.

		Genetic type				RSD
		ID x (L x LW)	LW x (L x LW)	GOLAND	DANBRED	
pH45		6.14	6.29	6.09	6.22	0.186
pH24		5.60	5.56	5.53	5.54	0.096
drip loss	%	10.0 αβ	8.7 β	10.7 α	10.4 αβ	1.80
cooking loss	%	29.8 αβ	31.3 α	28.0 β	28.9 β	2.09
WBSF	N	45.9 a	44.0 ab	39.7 ab	38.8 b	11.18
L_{99}		41.1 b	42.0 b	44.7 a	42.2 b	1.59

a,b within criterion means different (P≤0.05).
α, β within criterion means different (P ≤0.07).

Table 3. Thigh and ham characteristics per genetic type.

		Genetic type				RSD
		ID x (L x LW)	LW x (L x LW)	GOLAND	DANBRED	
Trimmed thigh weight	kg	14.63 b	14.30 b	14.25 b	15.20 a	0.424
Trimm thigh/hot carcass	%	21.4	21.6	21.4	21.5	0.78
Fat thickness	cm	2.68 ab	2.92 a	2.98 a	2.23 b	0.406
Lenght	cm	68.7 ab	67.5 bc	67.0 c	69.8 a	1.11
Circumference	cm	87.2 ab	84.1 c	85.9 abc	88.2 a	2.25
Thickness	cm	18.0 ab	18.7 a	18.2 ab	17.6 b	0.81
Compactness index*	g/cm	213.2	212.0	213.0	217.8	14.76
Globosity**	cm/kg	1.05	1.12	1.07	1.01	0.083
Ham weights (and seasoning losses as % of trimmed weight)						
Re-salted	kg, (%)	14.34b (1.67)	14.07b (1.62)	14.00b(1.65)	14.96a (1.64)	0.414 (0.297)
After salting	kg, (%)	14.13ab (3.94)	13.80b (4.05)	13.83b(3.53)	14.58a (3.81)	0.414 (0.667)
After seasoning	kg, (%)	10.39 (29.3ab)	10.20 (28.6b)	10.32(27.6b)	10.52 (30.8a)	0.375 (1.42)

*a,b,c within criterion means different (P≤ 0.05); *Compactness index was calculated as (Ham weight*1000)/Ham length*
*** Globosity index was calculated as (Ham thickness - Fat thickness)/Trimmed ham weight.*

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