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Additional Information

Effect of genetic line and oleic acid-enriched mixed diets on the fatty acid composition and sensory characteristics of dry-cured Iberian pork shoulders

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ABSTRACT

The aim of this study was to research the effect of the genetic background (Iberian line and their reciprocal crosses) on the subcutaneous fatty acids and on the sensory characteristics of dry-cured Iberian shoulders, and also to investigate if there is some interaction between genotype and diet composition in an indoor system, to contribute to explore the selection strategies for purebred Iberian pig. The genetic line (*Retinto*, *Torbiscal*, and the reciprocal crosses) has an effect on the subcutaneous fatty acid composition which would affect the quality control tests. Conversely, it has no effect on the sensory characteristics of the dry-cured shoulders. In a similar way, the effect of genotype × diet composition interaction was also weak. Therefore, the subcutaneous fatty acid composition and the sensory traits are not critical for establishing the selection strategies for these Iberian pig lines and their reciprocal crosses.

Keywords: Iberian pig line, diallelic cross, genotype × diet interaction, sensory characteristics, fatty acids.

Highlights: optionals, separate file

- Retinto, Torbiscal and their crosses slightly differ in the subcutaneous fatty acids
- That genetic background does not affect the sensory traits of dry-cured shoulders
- Genotype × diet composition interaction affects weakly the subcutaneous fatty acids
- Genotype × diet composition interaction affects weakly the sensory traits

1. Introduction

Dry-cured Iberian products are very valuable and appreciated because of their sensory quality, which is mainly influenced by the genetic background and the environment (especially diet composition). In the latest decades the requirements to keep the cost down have led Iberian × Duroc pig breeding programs to spread across farms as well as replace the traditional production scheme (based on outdoor systems with acorns and grass available) with outdoor or indoor systems based on concentrates. Regarding quality, large differences have been reported between Iberian pork and pork form the usual industrial crosses (Estévez, Morcuende, & Cava, 2003a,b), and some differences have also been reported between Iberian vs Iberian × Duroc dry-cured hams (Carrapiso, Bonilla, & García, 2003).

In addition, the Iberian breed includes genetic lines or varieties with marked differences in pig production performance and carcass traits (Tejeda, González, & Carrapiso, 2015). Likewise, related to meat quality differences have been reported among some lines (Retinto, Torbiscal and Entrepelado) for intramuscular fat content (IMF) of the raw meat and its composition (González, Carrapiso, Noguera, Ibáñez-Escriche, & Tejeda, 2018; Juárez, Clemente, Polvillo, & Molina, 2009; Muriel, Ruiz, Ventanas, Petrón, & Antequera, 2004b). Further, recently has been showed that this composition is mainly influenced by five genomic regions (Pena et al., 2019). Differences have also been reported in consumer acceptance of dry-cured Iberian ham (Carrapiso, & García, 2008) and in the sensory characteristics of dry-cured shoulders (Asensio et al., 2018).

In the latest years has been explored the potential advantages of line crossbreeding, such as heterosis and line complementarity, to improve Iberian pig production efficiency (García-Casco, Fernández, Rodríguez, & Silió, 2012; García-Casco, Muñoz, Silió, & Rodríguez-Valdovinos, 2014; Ibáñez-Escriche, Varona, Magallon, & Noguera, 2014; Ibáñez-Escriche, Magallon, González, Tejeda, & Noguera, 2016). The inclusion of IMF in the index selection has been advised to avoid the potential negative effect on pork quality of breeding programs focused only on pig production (García-Casco et al., 2014), but it could also be advisable to consider the sensory traits of the pork products.

Otherwise, the environment (mainly diet composition) is closely related to the quality of dry-cured products, and it is currently the main factor that determines the commercial grade of the Iberian pork products (Real Decreto 4/2014). Diet composition is as well the main factor which affects fatty acid composition, so it is usually checked by the Iberian pork industry to classify raw pork before further processing.

It has been suggested that breeding programs for animals which can be fattened in different environment (e.g. outdoors and indoors-based systems, as it happens to Iberian pig) should consider genotype × environment interaction because otherwise animals could be optimal in an environment but not in others, so they could result in poor efficiency (García Casco et al., 2014). That interaction has been researched in several pig breeds (Montaldo, 2001; Mulder, 2007; Wallenbeck, Rydhmer, & Lundeheim, 2009). In Iberian pig, significant interaction between the genetic background and the environment on carcass quality has been reported for Iberian vs Large White×Landrace pigs finished outdoors or indoors (Bressan et al., 2016), and also in the lipogenic and gene expression of Iberian vs Duroc pigs finished indoors using a high oleic enriched diet vs a conventional one (Benítez et al., 2016). Within Iberian pig lines, interaction on carcass traits and IMF has also been reported when pigs from the *Retinto*, *Entrepelado* and *Lampiño* lines were finished in two types of free-range systems (García-Casco et al., 2014). However, no data is available about interaction between the Iberian pig line and diet composition in indoor systems.

The aim of this study was to research the effect of the genetic background (Iberian line and their reciprocal crosses) on the subcutaneous fatty acids and on the sensory characteristics of dry-cured Iberian shoulders, and also to investigate if there is some interaction between genotype and diet composition in an indoor system, to contribute to explore the selection strategies for purebred Iberian pig.

2. Material and Methods

2.1. Animals and experimental design

Ninety-six castrated male Iberian pigs from the *Retinto* (RR) (n = 24) and *Torbiscal* (TT) (n = 24) Iberian pig varieties and their reciprocal crosses *Retinto* × *Torbiscal* (RT) (male × female) (n = 24) and *Torbiscal* × *Retinto* (TR) (n = 24) were used. The two varieties used in this study are recognized in Spain's official Iberian herd book (Spanish Association of Iberian Purebred Pig Breeders, AECERIBER). For the sake of simplicity, the term "variety" will be replaced with "line" within this article. During the experiment, the animals were kept from birth to slaughter under intensive rearing conditions such as those used in commercial farms. All of them were reared in similar conditions up to reach 102.8 ± 6.8 Kg body weight (BW) and 242 ± 12.0 days of age. Then, each line and cross was split into three groups of pigs (n = 8), which were reared indoors *ad libitum* on oleic acid-enriched diets (low, medium and high oleic acid content, with 0.93, 2.28 and 3.79 g of oleic acid per 100 g of concentrate, respectively) for 57 days. Diets were enriched with high oleic sunflower oil and were isocaloric (3,260 Kcal / Kg digestible energy) and isoproteic (12.7% crude protein). After that fattening period, the pigs were slaughtered in a commercial slaughterhouse at 299.3 ± 12.1 days of age and 153.5 ± 10.4 Kg BW. Final weight, average daily gain and feed intake were significantly smaller for the RR pigs compared to the TT, RT and TR ones, whereas the type of diet had no effect on final weight and average daily gain (for more details, see Tejeda, Carrapiso, Noguera, Ibáñez-Escriche, & González, 2018). The RR group had also the smallest weight for carcass, shoulder and ham (Tejeda et al., 2015).

2.2. Sampling

Sampling and cutting were carried out within 24 h after slaughter. Subcutaneous fat samples were taken 10 cm above the tail, vacuum-packaged and kept at -20 ºC until analysis. One shoulder from each carcass was taken (n = 96), and they were processed into dry-cured shoulders in a local company following the traditional method (Carrapiso et al., 2003). Then, the dry-cured shoulders were manually cut using a knife (the traditional way) into thin slices (about 1 mm and 6 × 4 cm). Slices including the *triceps brachii* muscle and subcutaneous fat (about 100 g) were placed on trays avoiding extensive overlapping, vacuum-packaged and kept at -18 ºC until sensory analysis.

2.3. Fatty acid analysis

The subcutaneous fat samples underwent a lipid microwave oven extraction following the method described by De Pedro, Casillas, & Miranda (1997). The fatty acid methyl esters were synthesized according to Sandler & Karo (1992) and then they were injected in an Hewlett-Packard HP-4890 Series II gas chromatograph equipped with a split / splitless injector and a flame ionization detector and a polyethylenglycol capillary column (Carbowax 20M) (30 m × 0.25 mm id × 0.25 μm film thickness) maintained at 200 ºC for 20 min. Injector and detector temperatures were held at 250 ºC. The flow rate of the carrier gas (nitrogen) was 1.8 mL/min. The individual fatty acids were identified by comparison of their retention times with those of reference standard mixtures (Sigma Chemical Co., St. Louis, Missouri, USA). Results were expressed as the percentage of the total fatty acids included in Table 1.

2.4. Sensory analysis

The dry-cured shoulder slices were evaluated by a trained panel of 12 members using a descriptive analysis method (Carrapiso et al., 2003) with 19 traits related to fat and lean appearance, odour, fat and lean texture, taste and flavour (listed in Table 2) using 10 cm unstructured scales, the extremes being ‘‘very low” and ‘‘very high”. Two slices of each dry-cured shoulder were presented on a glass plate to each panellist.

Sessions were done in a 6 booth sensory panel room at 20–22ºC equipped with white lighting. The whole panel participated in each session (each panellist attended to more than 78 % of the sessions). Three samples were successively evaluated in each session, and the sample order was randomised. The mean value from the panel responses for each sensory trait and each dry-cured shoulder was used in the data analyses (Meilgaard, Civille, & Carr, 2006).

2.5. Data analyses

A Multivariate Analysis of Variance (MANOVA) with interaction by using the General Linear Model (GLM) procedure was performed to check the overall effect of the genetic background, the diet composition, and interaction on the subcutaneous fatty acids and also on the sensory characteristics. The Pillai’s trace, Wilk’s Lambda, Hotelling’s trace, and Roy’s largest root parameters were calculated. A two-way analysis of variance (ANOVA) with interaction by using the GLM procedure was carried out to compare means for each variable. The Duncan test was applied when the ANOVA showed a significant effect.

A Principal Component Analysis (PCA) with the Varimax rotation was carried out to explore the overall effect of the genetic background and the diet composition and the multivariate relationships among variables. The Pearson correlation test was performed to evaluate the bivariate relationships between each fatty acid and sensory variable (Hair, Anderson, Tatham, & Black, 1998).

The statistical analyses were performed by using the SPSS software (version 22.0, SPSS Inc., Chicago, USA).

3. Results and discussion

The results from the subcutaneous fatty acid analysis and from the descriptive analysis are shown in Tables 1 and 2, respectively. Values were within the usual ranges for products from Iberian pigs fed on concentrate diets for both the subcutaneous fatty acids (Carrapiso et al., 2003; González, Hernández-Matamoros, & Tejeda, 2012; Ibáñez-Escriche et al., 2016) and the sensory traits (Andrés, Cava, Ventanas, Thovar, & Ruiz, 2004; Carrapiso et al., 2003).

3.1. Effect of genetic background

The Multivariate Analysis of Variance (MANOVA) performed simultaneously on all the individual subcutaneous fatty acids showed a significant effect of the genetic background ($P < 0.008$ for all the statistical parameters). According to the ANOVA results, the effect was significant for four fatty acids (17:0, 17:1 n-7, 18:3 n-3, and 20:0) (Table 1). However, these fatty acids appeared at low percentages (less than 0.6 %), and none of them is important in the quality control procedure currently carried out in the industry. Therefore, in a practical approach, the genetic background slightly influence the subcutaneous fatty acid composition and it would be irrelevant to the usual Iberian pork quality control procedure.

The slight effect shown in Table 1 matches with results from previous studies, which reported no effect of the Iberian pig line on the fatty acids from subcutaneous fat (Carrapiso et al., 2008) and from loin (Muriel et al., 2004b), although some effect on the intramuscular fatty acids from tenderloin (Juárez et al., 2009), the *biceps femoris* (Cava et al., 2004) and *masseter* muscles (Muriel et al., 2004b) and dry-cured shoulder (Caballero, Asensio, Fernández, Martín, & Silva, 2018) was also reported.

Regarding the sensory data, the MANOVA performed simultaneously on all the sensory traits showed no effect of the genetic background ($P > 0.243$ for all the statistical parameters). In fact, the ANOVA revealed that there was no effect on any sensory traits (Table 2). The lowest P-values were found for dryness ($P = 0.166$) and flavour intensity ($P = 0.133$), which do not allow to rule out a slight effect on these traits but reveals the lack of a marked effect, so therefore differences, if any, would be negligible for consumers. The Principal Component Analysis (PCA) performed on the subcutaneous fatty acid and the sensory data confirms that the genetic background does not have a marked effect (Figure 1a).

Otherwise, it should be pointed out that the sensory characteristics did not reflect the differences caused by the genetic background in the subcutaneous fatty acid composition. In fact, the affected fatty acids were among those with the weakest correlation with the sensory traits: 17:0 and 17:1 n-7 did not have any significant correlation and 18:3 n-3 and 20:0 were only correlated to fibrousness (0.211, $P = 0.041$) and rancidity (0.265, $P = 0.010$) respectively.

A previous study focused on the same lines and reciprocal crosses showed that the TR cross was the best for growth, carcass and premium cut traits (Ibáñez-Escriche et al, 2014). In a similar study including an additional Iberian line a significant effect of the genetic background on some pig production parameters was reported (Ibáñez-Escriche et al., 2016). Previous studies on the animals whose shoulder was used in this study also reported some differences, the *Retinto* group having the worst productive parameters (Tejeda et al., 2018) and carcass performance (Tejeda et al., 2015).

Therefore, taking into account that the sensory traits of the dry-cured shoulders are not markedly affected by the genetic background, and that even the traits which could show a really slight effect (dryness and flavor intensity) are not worsened when comparing TR to the *Retinto* and *Torbiscal* samples. It could be concluded that the implementation of a crossbreeding system based on the TR cross or on the *Torbiscal* line would not have any drawback with regard to the sensory characteristics of the dry-cured products.

Most studies about the effect of the Iberian line on the sensory characteristics of dry-cured products have also reported a weak effect. A study showed no sensory differences between dry-cured *Retinto* and *Torbiscal* loins, although the *Lampiño* (another Iberian line) ones were significantly different for marbling and odour intensity (Muriel, Ruiz, Martín, Petrón, & Antequera, 2004a). In the same way, dry-cured hams from *Censyra*, *Torbiscal* and *Entrepelado* Iberian lines were not different in the sensory traits included in Table 1, although differences in the toasted flavor (a minor trait) were reported (Carrapiso et al., 2008). Results also match those by Cava, Ferrer, Estévez, Morcuende, & Toldrá (2004), which reported no differences between the *Retinto* and *Torbiscal* lines in the cathepsin activity of raw meat (although they reported differences between those lines and the *Lampiño* line). However, marked differences were reported in the sensory traits of dry-cured shoulders although little or no differences appeared in the chemical composition and the IMF fatty acid profile (Asensio et al., 2018).Previous studies about the effect of other genetic factors on the sensory characteristics of dry-cured Iberian products are also in line with results in Table 2. Despite the remarkable effect on Iberian pig production parameters (Serrano, Valencia, Nieto, Lázaro, & Mateos, 2008), the genetic factors generally do not cause marked changes in the sensory characteristics of the dry-cured products. For example, crossbreeding with Duroc (50% Iberian×Duroc vs Iberian) slightly affected the sensory traits of dry-cured ham (Carrapiso et al., 2003), and different IGF-II genotypes did not have a significant effect on the odour concentration or the fatty acids of Iberian hams (Sánchez Del Pulgar, Carrapiso, Reina, Biasioli, & García, 2013).

Therefore the lack of a great effect of the researched genetic background not only on the subcutaneous fatty acid but also on the sensory characteristics (and therefore the lack of an effect potentially perceived by consumers) would indicate the convenience of focusing the pig selection strategies mainly on pig production parameters and carcass quality instead of on subcutaneous fatty acids or dry-cured shoulder sensory traits.

3.2. Effect of diet composition and interaction

The MANOVA performed on the subcutaneous fatty acids showed a significant effect of diet composition ($P < 0.001$ for all the statistical parameters). The ANOVA also showed a significant effect of the diet composition on the subcutaneous fatty acids, most of them (8 out of 11 fatty acids) being significantly affected (Table 1). Differences in the subcutaneous fatty acid composition were much smaller than those reported when pigs are fattened on very different diets (Carrapiso et al., 2003; Daza, Menoyo, Olivares, Cordero, & Lopez-Bote, 2007).

The effect of diet composition on the sensory characteristics was slight, the MANOVA performed on the sensory traits showing a weak effect (Pillai's trace, Wilk's Lambda, and Hotelling's trace: $P > 0.118$; Roy's largest root parameters: $P < 0.017$). Only brightness and rancidity were significantly affected, and fat hardness ($P = 0.092$) and cured flavor ($P = 0.207$) reached relatively low *P*-scores (Table 2). Slight sensory differences in dry-cured ham have also been reported when pigs are fattened on diets not very different (Pérez-Palacios et al., 2010).

The Principal Component Analysis (PCA) performed on the subcutaneous fatty acid and the sensory data also shows differences related to diet composition. Figure 1a shows that samples from pigs fed on the high oleic acid-content diet tended to get positive scores in the Principal Component (PC) 1 axis. The variables with higher loadings on the PC1 axis were C18:1 n-9, monounsaturated acids and lean brightness (Figure 1b). On the contrary, medium and low oleic acid-content feedings provided samples with negative scores in that axis. The variables with higher negative loadings on the PC1 were C16:0, C18:0 and saturated fatty acids (Figure 1b).

With regard to the genetics × diet composition (G × D) interaction, a slight effect was found in the subcutaneous fatty acid composition and the sensory traits. Interaction was expected to be weak, taking into account the slight effect of both the genetic background and the diet composition. The MANOVA performed on the subcutaneous fatty acids showed a weak effect of G × D interaction (Pillai's trace, Wilk's Lambda, and Hotelling's trace: $P > 0.349$; Roy's largest root parameters: $P < 0.001$). The G × D interaction only affected 18:3 n-3 ($P = 0.034$), although 6 out of the 11 fatty acids reached *p*-values smaller than 0.200 (Table 1). Two of them (16:0 and 18:2) are taken into account in the current quality control of raw Iberian pork, so interaction could influence, although weakly, the commercial grade of the raw meat and processed products.

With regard to the sensory characteristics, the MANOVA performed on the sensory traits also showed a weak effect of G × D interaction (Pillai's trace, Wilk's Lambda, and

Hotelling’s trace: $P > 0.813$; Roy’s largest root parameters: $P < 0.011$). In fact, the ANOVA revealed that only fat yellowness was affected ($P = 0.020$), although relatively small P-values were found for lean brightness ($P = 0.132$), marbling ($P = 0.212$), and rancidity ($P = 0.224$) (Table 2), which also would indicate that a significant effect of interaction could not be ruled out but as well that the effect would not be marked.

To our knowledge, there is no information about the effect of interaction between the Iberian line or line crosses and diet composition on the fatty acids of Iberian pork or on the sensory characteristics of its products. García-Casco et al. (2014) found that interaction between the Iberian line and the type of free-range system had an effect on some carcass traits and IMF, and they advised to consider interaction in a breeding program focused on free-range production systems (García-Casco et al., 2004). Table 1 and 2 show a significant but weak effect of interaction, which would have little impact on the usual quality control procedure performed on raw pork and on the sensory characteristics of processed meat perceived by consumers. Thus, when pigs are reared indoors the G × D interaction is less noticeable regarding subcutaneous fatty acids and sensory traits than regarding on carcass and IMF using outdoor systems.

In view of the weak effect of the genetic background and the G × D interaction found in this study but their significant effect reported on productive parameters, it could be concluded that the selection strategies for Iberian pig (for *Retinto*, *Torbiscal* or their crosses) for indoor systems should focus mainly on pig production parameters and carcass performance rather than on the subcutaneous fatty acid composition or the sensory characteristics.

4. Conclusions

The genetic line (*Retinto*, *Torbiscal*, and the reciprocal crosses) has an effect on the subcutaneous fatty acid composition which would affect the quality control tests, and has no effect on the sensory characteristics of the dry-cured shoulders. In a similar way, the effect of genotype × diet composition interaction was also weak. Therefore, the subcutaneous fatty acid composition and the sensory traits are not critical for establishing the selection strategies for these Iberian pig lines and their reciprocal crosses.

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Table 1. Means for the fatty acid composition (%) of the subcutaneous fat of Iberian pig from the *Retinto* (RR) and *Torbiscal* (TT) breeds and their reciprocal crosses (TR and RT), finished on high, medium and low oleic acid content feedings, and significance levels from a two-ways analysis of variance with interaction*.

	Genetics				Diet composition				*P*		
	RR	TT	TR	RT	High	Medium	Low	SEM	Genetics	Diet	G×D
C14:0	1.46	1.43	1.45	1.43	1.43	1.44	1.46	0.011	0.749	0.628	0.720
C16:0	23.66	23.76	23.35	23.59	22.86c	23.68b	24.24a	0.104	0.390	**<0.001**	0.163
C16:1 n-7	2.05	1.96	2.15	1.94	1.91b	2.00ab	2.16a	0.039	0.178	**0.037**	0.098
C17:0	0.25c	0.29a	0.28ab	0.27bc	0.26b	0.27ab	0.28a	0.004	**<0.001**	**0.048**	0.269
C17:1n-7	0.24c	0.28a	0.27ab	0.25bc	0.25b	0.25b	0.28a	0.004	**<0.001**	**0.033**	0.160
C18:0	11.54	11.84	11.02	11.79	10.74b	11.77a	12.15a	0.140	0.072	**<0.001**	0.247
C18:1n-9	48.16	47.62	48.71	48.21	49.84a	47.86b	46.79c	0.189	0.051	**<0.001**	0.573
C18:2n-6	10.39	10.67	10.58	10.33	10.53	10.53	10.42	0.060	0.137	0.677	0.129
C18:3 n-3	0.52ab	0.54a	0.53ab	0.51b	0.50c	0.53b	0.56a	0.004	**0.031**	**<0.001**	**0.034**
C20:0	0.23a	0.20b	0.2b	0.22ab	0.20b	0.21ab	0.22a	0.003	**0.005**	**0.032**	0.490
C20:1 n-9	1.51	1.41	1.44	1.47	1.48	1.46	1.44	0.017	0.198	0.695	0.728
Saturated	37.13	37.52	36.31	37.29	35.49c	37.37b	38.35a	0.223	0.096	**<0.001**	0.254
Monounsaturated	51.96ab	51.27b	52.58a	51.87ab	53.48a	51.57b	50.67b	0.198	0.**033**	**<0.001**	0.560
Polyunsaturated	10.91	11.21	11.12	10.84	11.03	11.06	10.98	0.063	0.118	0.859	0.111

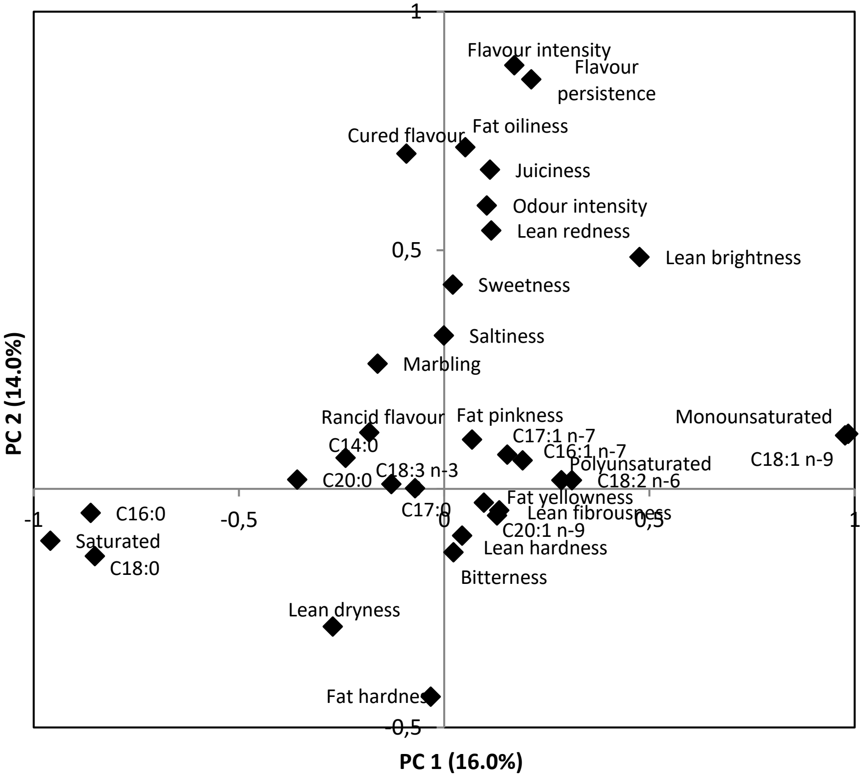
* The effect was significant when $P < 0.05$. Different letters in the same row within Genetics or Diet composition indicate differences at the level $P < 0.05$.

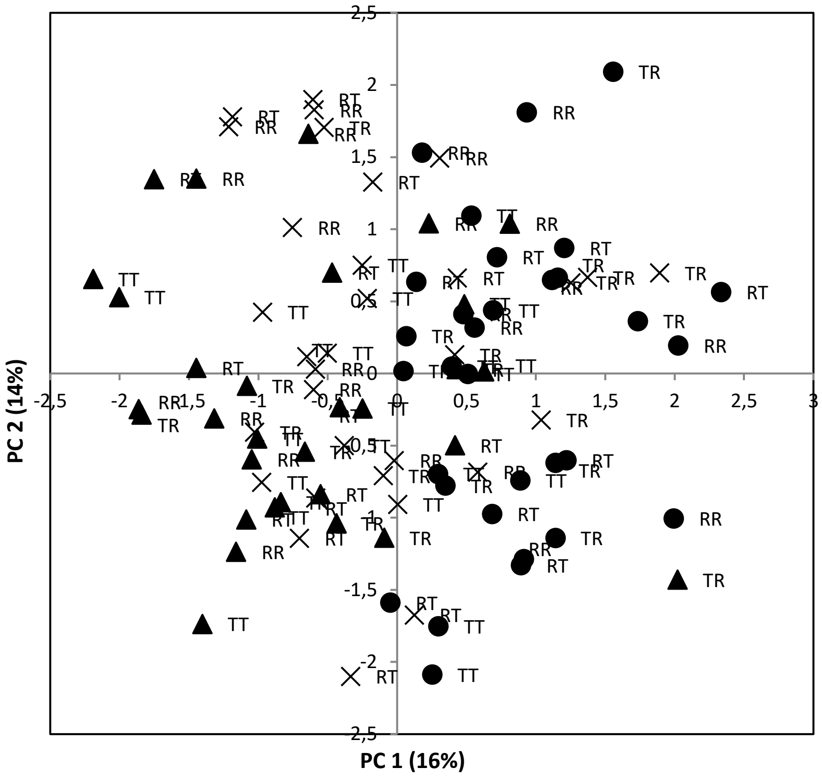
Table 2. Means from the descriptive analysis data of the dry-cured shoulders of Iberian pig from the *Retinto* (RR) and *Torbiscal* (TT) breeds and their reciprocal crosses (TR and RT), finished on high, medium and low oleic acid content feedings, and significance levels from a two-ways analysis of variance with interaction*.

	Genetics				Diet composition				*P*		
	RR	TT	TR	RT	High	Medium	Low	SEM	Genetics	Diet	G×D
Fat yellowness	1.9	1.8	1.8	1.7	1.9	1.8	1.8	0.06	0.625	0.692	**0.020**
Fat pinkness	2.8	3.2	2.8	2.8	3.0	2.8	2.9	0.10	0.430	0.753	0.817
Lean redness	6.2.	6.1	6.0	6.2	6.2	6.2	6.0	0.06	0.798	0.251	0.695
Lean brightness	5.0	4.7	5.0	4.8	5.2b	4.9ab	4.6a	0.09	0.468	**0.024**	0.132
Marbling	3.5	3.5	3.7	3.4	3.4	3.72	3.5	0.09	0.611	0.262	0.212
Odour intensity	6.1	5.9	5.9	6.0	6.1	6.0	5.9	0.05	0.447	0.462	0.794
Fat hardness	2.5	2.6	2.6	2.6	2.7	2.4	2.7	0.06	0.852	0.092	0.600
Fat oiliness	6.3	5.9	6.0	6.0	6.0	6.2	5.9	0.08	0.518	0.269	0.628
Lean hardness	3.0	3.0	3.1	2.8	3.0	2.9	3.1	0.06	0.339	0.368	0.759
Lean dryness	3.1	3.2	2.9	3.2	3.1	3.1	3.1	0.06	0.166	0.861	0.503
Lean fibrousness	3.9	4.0	3.9	3.7	3.9	4.0	3.9	0.07	0.266	0.806	0.273
Juiciness	5.9	5.7	5.9	5.7	5.8	5.8	5.7	0.05	0.626	0.643	0.845
Saltiness	5.0	4.9	4.8	5.0	5.0	4.8	5.0	0.05	0.470	0.266	0.850
Sweetness	2.7	2.6	2.5	2.6	2.6	2.6	2.6	0.04	0.359	0.789	0.676
Bitterness	1.8	1.7	1.9	1.7	1.7	1.8	1.8	0.05	0.341	0.798	0.310
Flavour intensity	6.5	6.1	6.3	6.2	6.3	6.3	6.2	0.06	0.133	0.443	0.863
Flavour persistence	6.4	6.1	6.2	6.1	6.2	6.2	6.0	0.06	0.263	0.310	0.754
Cured flavour	4.5	4.4	4.4	4.5	4.4	4.6	4.4	0.05	0.940	0.207	0.874
Rancid flavour	1.5	1.5	1.4	1.4	1.3b	1.6a	1.5b	0.05	0.802	**0.016**	0.224

* The effect was significant when $P < 0.05$. Different letters in the same row within Genetics or Diet composition indicate differences at the level $P < 0.05$.

Figure 1. Projection of the samples (a) and variables (b) onto the space defined by the first two principal components (PC1/PC2) extracted from the subcutaneous fatty acid and sensory analysis data. Sample groups according to the oleic content of diet: • High; × Medium; ▲ Low.





PC 2 (14%)
PC 1 (16%)
2,5
2
1,5
1
0,5
0
-0,5
-1
-1,5
-2
-2,5
-2,5
-2
-1,5
-1
-0,5
0
0,5
1
1,5
2
2,5
3
RR
RT
TR
TT

a)

b)