

Productive parameters of Iberian pig as affected by genetic line and oleic acid enriched diets

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Feeding.
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SUMMARY

As it is well known, genetic and feeding are two fundamental factors affecting the Iberian pig production, meat and meat product quality. The objective of the present study was to evaluate the effect of genetic and nutrition factors, and their interaction, on productive parameters of Iberian pigs during the final fattening period prior to slaughter. For this purpose, a total of 96 castrated male Iberian pigs were allotted into twelve groups ($n=8$) following a 4×3 factorial design with two Iberian genetic lines (*Retinto*, RR, and *Torbiscal*, TT) and their reciprocal crosses (R×T and T×R) fed in intensive conditions with three different oleic acid enriched diets (low, L, medium, M and high, H levels). The results showed a significant ($P<0.05$) lower daily intake, average daily gain (ADG) and final weight in RR compared to RT, TR and TT Iberian pigs. Related to diet, L pigs exhibited lower ($P<0.05$) daily intake and feed conversion ratio than H and M ones, without differences in ADG and final weight. So, it can be concluded that productive parameters of RetintoxTorbiscal crosses are close to those of pure Torbiscal line, improving those of pure Retinto line.

Efecto de la línea genética y de dietas enriquecidas en ácido oleico sobre los parámetros productivos del cerdo Ibérico

RESUMEN

La genética y la alimentación son dos de los principales factores que afectan a la producción del cerdo Ibérico, así como a la calidad de su carne y de sus productos cárnicos. El objetivo de este estudio fue evaluar el efecto de la línea genética y de la alimentación durante el cebo, así como su interacción, sobre los parámetros productivos del cerdo Ibérico. Para ello, se utilizaron un total de 96 cerdos Ibéricos machos y castrados, que fueron divididos en 12 lotes ($n=8$) siguiendo un diseño factorial 4×3 con dos líneas genéticas (*Retinto*, RR, y *Torbiscal*, TT) y sus cruces recíprocos (R×T and T×R). Los cerdos fueron cebados en intensivo con tres tipos de piensos enriquecidos con tres niveles de ácido oleico (bajo, L, medio, M y alto, H). Los resultados mostraron un menor ($P<0.05$) consumo diario y una menor ganancia media diaria en los cerdos RR que en los RT, TR y TT. Así mismo, se observó un menor peso final en los cerdos RR que en los otros grupos genéticos. No se observaron diferencias en el índice de conversión entre los grupos estudiados. Con respecto al efecto de la dieta, los cerdos del lote L presentaron menor consumo diario e índice de conversión que los H y M. El tipo de dieta no afectó a la ganancia media diaria ni al peso final. Por ello, puede concluirse que los parámetros productivos del cruce RetintoxTorbiscal son similares a los de la línea pura Torbiscal, mejorando significativamente los de la línea pura Retinto.

PALABRAS CLAVE ADICIONALES

Alimentación.
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INFORMATION

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INTRODUCTION

One of the main characteristics of the Iberian pig is its meat quality. Therefore, it is essential to know the factors that have an important effect on the characteristics of the meat and dry-cured Iberian products.

Within the main factors that can be underlined are the genetic structure and the diet (Cava et al. 2000; Ruiz and López Bote, 2002). Related to genetic, the Iberian pig is an autochthonous pig breed with high capacity to accumulate fat, such as intramuscular fat, which is essential to obtain meat and meat products of high

sensorial quality (López-Bote, 1998). Nevertheless, several authors have revealed the low capacity of Iberian pig to lean tissue deposition in the different stages of animal growth (Barea et al. 2007; García-Valverde et al. 2008). Previous studies confirm the practical interest of crosses between sire and dam lines of Iberian pigs to improve the economic efficiency of low and medium input production systems based on purebred Iberian pigs (García-Casco et al. 2012). On the other hand, feeding system seems to be the key one influencing Iberian productive parameters (Daza et al. 2006; Serrano et al. 2009), affecting development of lean and fat tissues and subsequent meat and meat products quality (Carrapiso et al. 2003). The objective of the present study was to evaluate the effect of genetic and nutrition factors, and their interaction, on productive parameters of Iberian pigs during the final fattening period prior to slaughter.

MATERIAL AND METHODS

This study was carried out with ninety-six castrated male Iberian pigs. The pigs were divided in twelve groups of eight animals each (n=8) following a 4×3 factorial according to genotype and diet. Related to genotype, four groups of pigs, involving two varieties (*Retinto* [RR], and *Torbiscal* [T], and their reciprocal crosses (*Retinto* × *Torbiscal* [RT] and *Torbiscal* × *Retinto* [TR]) were studied. The two varieties used in this study are recognized in Spain's official Iberian herd-book (Spanish Association of Iberian Purebred Pig Breeders [AECERIBER]). Regarding diet, three groups of pig, fed in intensive conditions during the fattening phase previous to slaughter, were studied according to the level of oleic acid enrichment of the diet (low [L], medium [M] and high [H], with 0.93, 2.28 and 3.79 g of oleic acid per 100 g of concentrate, respectively). Diets were enriched with high oleic sunflower oil and were isoproteic and isoenergetic. Animals began the fattening phase with an average body weight (BW) of 102.8±6.8 kg and 242±12.0 days of age. They were fattened ad libitum and slaughtered at a commercial abattoir at 299.3±12.1 days of age and 153.5±10.4 kg BW. The data set included individual measures of feed intake, average daily gain (ADG), final body weight and feed conversion ratio (FCR).

For data descriptive analysis, the mean and the standard error of the mean have been used. The pig has been used as the experimental unit. Significance of difference ($P < 0.05$) between genetic line and dietary

treatment was determined by two-way analysis of variance (ANOVA) followed by Tukey multiple comparison test. The General Linear Model procedure of SPSS package (SPSS for Windows Ver. 19.0; SPSS Inc., Chicago, IL, 2004) was used.

RESULTS AND DISCUSSION

Productive parameters traits according to genetic line of Iberian pig and feeding diet supplied to animals during the fattening period are shown in **Tables I** and **II**, respectively. Related to genetic line, *Retinto* (RR) pigs exhibited significant lower ($P < 0.05$) scores for feed intake, ADG and final weight than the other three genetic groups (TT, RT and TR). However, FCR was not affected by genetic pig variety. According to these results, *Retinto* pigs grew less, as evidenced by their lower weight at the end of the fattening period, respect to *Torbiscal* and the reciprocal crosses RT and TR. Several genetic studies (Faubel et al. 2004; Clemente et al. 2008) have reported differences between the four Iberian pig lines recognized as official by the Spanish Ministry of Agriculture, under the Official List of Livestock Breeds (APA/53/2007). Phenotypic differences related to productive pig traits showed the higher scores in *Torbiscal* line compared to *Retinto* line (Clemente, et al. 2008), in agreement with our results. Furthermore, the studies of García-Casco et al. (2012) and Ibáñez-Escriche et al. (2014) on heterosis between Iberian pig lines are confirmed by our results, since the scores of the crosses (R×T and T×R) were higher than the mean values of both parents.

The effect of feeding system, based on oleic acid enriched diets, was only observed in feed intake and FCR traits, with significant higher ($P < 0.05$) values in Iberian pigs fed with medium (M) level of oleic acid enriched diet compared to L and H diets. However, the content of oleic acid in concentrates did not affect the pig growth rate, as evidenced by the ADG in pigs fed on L, M and H diets. Pig performance scores were in agreement with data obtained by other authors (García-Valverde et al. 2008; Ayuso et al. 2015). The higher values for feed intake and FCR were observed in M group, being difficult to explain this effect due to diet. Martins et al. (2015) found higher values in FCR and ADG in *Alentejano* pigs feed with low oleic diets compared to high oleic diets. In contrast, Martín et al. (2008) found no differences in productive parameters of Large White× Landrace pigs due to oleic acid level

Table I. Effect of genetic line on productive parameters of Iberian pigs (Efecto de la línea genética sobre los parámetros productivos de los cerdos Ibéricos).

	RR ¹	TT	RT	TR	SEM	P
	n=24	n=24	n=24	n=24		
Final weight (kg)	145.2 ^a	157.3 ^b	154.2 ^b	157.2 ^b	1.07	0.000
Average daily gain (ADG) (g)	785.5 ^a	922.0 ^b	885.7 ^b	943.7 ^b	11.37	0.001
Feed intake (g/day)	3934.0 ^a	4340.8 ^b	4291.7 ^b	4502.5 ^b	49.34	0.001
Feed conversión ratio (FCR)	5.2	5.0	5.1	5.0	0.04	0.323

¹RR: *Retinto* line; TT: *Torbiscal* line; RT: *Retinto* × *Torbiscal* line; TR: *Torbiscal* × *Retinto* line.

Means in the same row with different letters (^{a, b}) are different ($P < 0.05$).

Table II. Effect of oleic acid enriched diets on productive parameters of Iberian pigs (Efecto de dietas enriquecidas en ácido oleico sobre los parámetros productivos de los cerdos Ibéricos).

	Low	Medium	High	SEM	P
	n=32	n=32	n=32		
Final weight (kg)	153.4	156.4	152.0	1.07	0.284
Average daily gain (ADG) (g)	867.3	923.4	861.6	11.37	0.745
Feed intake (g/day)	4145.9 ^a	4429.2 ^b	4222.0 ^{ab}	49.34	0.029
Feed conversion ratio (FCR)	4.9 ^a	5.2 ^b	5.1 ^{ab}	0.04	0.009

Means in the same row with different letters (^{a,b}) are different (P<0.05).

in diets. Interaction between Iberian genetic line and diet was no significant (data not shown) in this study.

In conclusion, productive parameters of *Retinto*×*Torbiscal* crosses are close to those of pure *Torbiscal* line, improving those of pure *Retinto* line.

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