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Differences in productive parameters and carcass traits of three sires from Duroc x Iberian cross selected according to their conformation

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Abstract. The aim of this study was to determine the influence of animal selection on production parameters of the offspring from three Duroc (DU) boars selected according to their anatomical conformation. Thus, productive parameters and carcass traits were determined in 29 barrows from the offspring of DU x Iberian, descendants of three DU boars mated with Iberian sows. Sire A came from a DU boar with a low anatomical conformation, sire B from a DU boar with a middle conformation and sire C from a DU boar with a high conformation. All animals were reared on the same farm in intensive regime and fed with three types of feed at different stages of growth. Birth weight and average daily earnings at each stage of growth were determined. Furthermore, carcass, loin and ham weight, and back fat thickness were measured. The sire C showed a greater weight gain in the last phase of growth and total weight gain (weight at slaughter/days of life), this parameter was lower for sire A. Moreover, the carcass weight was higher for sire C and lower for sire A, which also differed by their lower weight of ham. The back fat thickness was higher for sire C, followed by sire B and finally sire A.

Keywords. Duroc x Iberian – Anatomical conformation – Productive parameters – Carcass.

Différences entre les paramètres de production et les caractères de carcasse chez trois lignées croisées Duroc x Ibérique sélectionnées en fonction de leur conformation

Résumé. *L'objectif de cette étude a été de déterminer l'influence de la sélection animale sur les paramètres productifs des premières lignées originaires de trois mâles de la race Duroc sélectionnés selon leur conformation anatomique. Par conséquent, les paramètres productifs et de carcasse ont été déterminés sur 29 mâles castrés provenant du croisement DU x Ibérique, descendants des trois mâles DU et de femelles Ibériques. La lignée A provenait d'un mâle DU de basse conformation anatomique, la lignée B d'un mâle DU de conformation moyenne et la C d'un mâle de conformation élevée. Tous les animaux ont été élevés dans la même ferme dans un régime intensif et nourris de trois types d'aliments selon la phase de croissance. Le poids des animaux à la naissance et les gains moyens quotidiens dans chaque phase de la croissance ont été déterminés. D'autre part, on a analysé le poids de la carcasse, de la longe et du jambon et l'épaisseur du gras dorsal. La lignée C a montré un plus grand gain de poids dans la dernière phase d'alimentation et le plus grand gain de poids total (poids à l'abattage/jours de vie), tandis que ce paramètre a été inférieur pour la lignée A. Enfin, le poids de la carcasse a été supérieur pour la lignée génétique C, et a été le plus faible chez la lignée A, qui s'est distinguée aussi pour avoir un poids plus petit de jambon. La quantité de gras dorsal a été supérieure pour la lignée C, suivie de la lignée B et de la lignée A.*

Mots-clés. *Duroc x Ibérique – Conformation anatomique – Paramètres productifs – Carcasse.*

I – Introduction

Because of consumer preferences and improved productive efficiency, the objective over the past few decades of genetic selection in pigs has been to increase the lean fat percentage of the carcass. This has caused a decrease in dorsal fat content and has led to a decrease in intramuscular fat content. Such changes have had positive organoleptics results (Gispert *et al*.,

1997) but carcasses with extremely high lean fat content can cause technical difficulties during processing and conservation. It would therefore be prudent to perceivably elevate the fat levels of the carcasses.

Iberian pig products, especially ham, are highly regarded in Spain. In recent years, however, the consumption of fresh meat has increased significantly as an alternative to white pig meat because the shelf life is longer, its appearance deteriorates more slowly and it provides improved organoleptics features (Estévez *et al*., 2003).

However, the Iberian pig has a slow growth rate as well as a low reproductive rate. Thus, in order to increase its productivity, it is frequently crossbred with the Duroc white pig at a level of 50% to 75% (B.O.E., 3/11/2007). This raises its reproductive capability, improves the growth rate and increases alimentary efficiency and lean fat content (Dobao *et al*., 1986) without a significant reduction in the quality of the meat, meat products (López-Bote, 1998) or the parts of the pig that are highly regarded and considered of higher quality than others (García-Macías *et al*., 1996).

The overall objective of this study was therefore to determine the influence of the genetic lines of the male Duroc with various anatomical configurations in male pigs from the first descendants by means of the productive parameters and characteristics of the carcass.

II – Materials and methods

1. Animal selection

This study was carried out using pigs from three lines of Iberian pigs of a cross between Duroc and Iberian breeds (50%-50%). Three males Duroc were acquired from a genetic selection company and were of various anatomical configurations: light (A), medium (B) and high (C). These males were crossbred with selected Iberian Retinto females.

In total, 33 mothers were used and two descendants were taken from each in order to minimize the influence of the mother and to highlight the influence the males had on the descendants. To complete this study, 10 castrated males were used from the first descendants of each of the lines.

The artificial insemination and rearing of the animals took place on a farm. The weight and number of pigs corresponding to each mother were controlled during lactation, rearing and feeding.

In order to track each pig individually and to guarantee its traceability from birth to slaughter, the animals were identified utilizing two tags that were placed on each ear.

2. Growth control during lactation and rearing

The pigs were weighed as soon as they were born and at the end of the lactation stage which lasted between 14 and 25 days. The average daily weight gain of the pigs (ADWG) (kg/day) was calculated during lactation by subtracting the weight at birth from the weight after lactation and then dividing by the number of lactation days.

Once the lactation finished, the pigs were given feed at intervals of anywhere between 74 and 92 days. This type of feed is referred to as both “starter” and feed 1. This feed prepared the pigs for the change in food as well as the alteration in the way they were fed during the fattening stage. The ADWG was calculated in this stage during their feeding.

3. Pig growth control during the fattening stage

During this stage, the pigs were given two types of feed. At the beginning of the stage, they were given a type of feed with high protein content, referred to as feed 2. At the end of the stage, they were given a type of feed that had higher energy content, referred to as feed 3. This type of feed was used so that the pigs would develop a higher quantity of fat.

The animals were fed with feed 2 for 110 and 119 days and with feed 3 for 94 and 120 days. The ADWG was calculated for each type of diet.

4. Control during slaughter

Finally, the pigs were weighed before being slaughtered (at approximately 150 kg and 10-11 months) and the total daily weight gain (kg/day) was calculated in the following manner: weight at the moment of slaughter divided by the days of life.

Various quality parameters of the carcass were determined in the abattoir:

- Weight of the carcass before and after being aired out (kg), employing a hanging scale

- Quality of the ham and loin following the carving of the carcass. It was calculated by dividing the weight of the piece by the weight of the carcass after being aired out.

- Dorsal fat thickness in cm measured at the 5^{th} rib.

5. Statistical treatment

An analysis was made on the variance (ANOVA) of a factor to study the influence of the configuration of the animal. When the interaction was significant, the averages were compared using the Student-Newman-Keuls test by means of the SPSS 17.0 for Windows XP (License UCLM 7876875) statistical program.

III – Results

The average values and standard deviation of the productive parameters of the male pig obtained from the cross between the Duroc and Iberian pigs of varying configurations are shown in table 1 (A: light configuration; B: medium configuration; C: high configuration).

Table 1. The average values and standard deviation of the productive parameters of the male pork obtained from the cross between the Duroc and Iberian pigs of various configurations

	A	B	C
Birth weight (kg)	2.11±0.52	1.93±0.21	2.13±0.43
ADWG lactation (kg/day)	0.12±0.08	0.14±0.04	0.16±0.02
ADWG feed 1 (kg/day)	0.40±0.05	0.40±0.05	0.41±0.04
ADWG feed 2 (kg/day)	0.60±0.10	0.64±0.12	0.57±0.07
ADWG feed 3 (kg/day)	0.51^{a}±0.07	0.57^{a}±0.13	0.68^{b}±0.14
ADWG total (kg/day)	0.51^{a}±0.03	$0.53^{a,b}$±0.03	0.55^{b}±0.05
Carcass weight (kg)	119.2^{a}±9.27	$126.6^{a,b}$±8.25	130.5^{b}±13.83
Pork loin weight (kg)	2.98±0.34	2.80±0.44	2.94±0.47
Ham weight (kg)	14.08^{a}±0.89	15.58^{b}±0.90	15.74^{b}±1.58
Dorsal fat thickness (cm)	5.6^{a}±0.51	6.3^{b}±1.24	7.0^{c}±1.74

ADWG: Average daily weight gain; Superscripts (a,b) in any row and for the same factor denote significant differences (P<0.05) according to the Student-Newman-Keuls test; A: light configuration; B: medium configuration; C: high configuration

The genetic line influenced the ADWG in the final feeding stage (feed 3), the weight of the carcass and of the ham, total ADWG and the dorsal fat thickness. These differences were minimally significant ($P<0.05$) for these productive parameters. The male pigs from line C therefore showed the highest ADWG in both the final feeding stage as well as overall. The pigs from genetic line A showed the lowest carcass and ham weight while the dorsal fat thickness at the 5th rib increased significantly as the genetic configuration of the animals rose.

IV – Conclusions

(i) Similar values were found for the birth weight and the weight of the loin, the ADWG during lactation and for the rearing stages and first feeding stage for the three lines of varying configurations that were studied.

(ii) The light configuration line (A) showed the lowest ADWG in feed 3 and the lowest carcass weight overall, the lowest carcass and ham weight and the lowest dorsal fat thickness. The high configuration line (C), on the other hand, had the highest ADWG during the final feeding stage, the highest ham weight and the highest dorsal fat thickness at the 5^{th} rib.

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