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REPRODUCTIVE AND PRODUCTIVE TRAITS OF SOWS FROM ALENTEJANO COMPARED TO SOWS LARGE-WHITE X LANDRACE GENOTYPE

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ABSTRACT

This study compared some reproductive (gestation and farrowing length; total born, born alive, stillbirths, mummified, post-natal mortality) and productive traits (piglet and litter weights at birth and at 21 days) between Alentejano swine breed (AL) and a conventional genotype (Large-White x Landrace - C). A total of 90 animals (45 per genotype) reared under 4 production environments were studied along farrowing and lactation (21 days) periods. The AL sows were managed under extensive outdoor whereas the C sows were managed under intensive indoor conditions. Alentejano sows had shorter gestations ($P < 0.01$) and farrowings ($P < 0.01$) compared with C sows. Conventional genotype sows farrowed more total and born alive piglets ($P < 0.001$). Lighter weights were observed both in AL litters and individual AL piglets at birth and d 21 ($P < 0.001$). Average daily gain from birth to 21 days, was higher in C piglets ($P < 0.001$). Mortality rates of born alive piglets (total and during the first 24h) were higher in AL litters ($P < 0.001$, for both). The piglets that died during the nursing period were lighter and gained less weight during the first 24h than the survivor littermates ($P < 0.001$). Overall the lower performance of the AL compared with the C genotype is due to its poorer reproductive and productive traits and a higher mortality rate during the nursing period. Possible explanations for the higher mortality in Al genotype are discussed.
Key words: Alentejano swine breed, Mortality, Piglets performance, Reproduction performance.

ESTUDO COMPARATIVO DE PARÂMETROS REPRODUTIVOS E PRODUTIVOS DE PORCAS DE RAÇA ALENTEJANA E PORCAS LARGE-WHITE X LANDRACE

RESUMO

Neste estudo compararam-se alguns parâmetros reprodutivos (duração da gestação e parto, nascidos totais, nascidos vivos, nascidos mortos e mumificados e mortalidade pós-natal) e produtivos (pesos ao nascimento e aos 21 dias dos leitões e ninhadas) entre a raça suína Alentejana (AL) e um genótipo convencional (Large-White x Landrace, C). Foram estudados durante o parto e um período de lactação de 21 dias, um total de 90 animais (45 por genótipo) produzidos em 4 ambientes produtivos. As porcas AL mantiveram-se em condições extensivas enquanto que as porcas C estiveram estabuladas em condições intensivas. Quando comparadas com as porcas C, as porcas AL apresentaram gestações e partos mais curtos (P <0,01). As porcas C tiveram mais nascidos totais e nascidos vivos (P <0,001). Foram observados pesos mais baixos quer nas ninhadas, quer nos leitões AL, ao nascimento e aos 21 dias (P <0,001). As taxas de mortalidade dos leitões nascidos vivos (total e durante o primeiro dia pós-parto) foram superiores nas ninhadas AL (P <0,001). Os leitões que morreram durante o período de amamentação eram mais leves e ganharam menos peso durante o primeiro dia pós-nascimento que os seus irmãos sobreviventes (P <0,001). Globalmente a menor performance do genótipo AL em comparação com o genótipo C é devida aos seus piores parâmetros reprodutivos e produtivos e uma maior taxa de mortalidade durante o período de amamentação. Foram discutidas possíveis explicações para a maior mortalidade no genótipo AL.
Palavras-chave: Mortalidade, Performance dos leitões, Performance reprodutiva, Raça suína Alentejana.

INTRODUCTION

The Alentejano pig (AL) is an Iberian type breed raised all over the Southwest region of the Iberian Peninsula. It is a primitive unselected breed, raised mainly in an extensive system, particularly under oak canopy (green and cork) in the Alentejo region (Portugal). These Iberian type breeds are considered to be the best profiteers of acorns. Nowadays, these breeds are considered very important taking into account both their role in “Montado/Dehesa” preservation and valorisation, and the added economic value obtained through special meat products such as long dried-cured hams and sausages (Orellana *et al*. 2003) (for a review on the Iberian pig, see Lopez-Bote, 1998). However, compared to conventional modern genotypes both AL and Iberian pig breeds are much less productive in terms of number of piglets weaned per sow and per year (i.e., ~ 12.0; Nunes, 1993; Marques, 2001). Litter size ranges from 7 to 8 total born (Vázquez *et al*., 1994; Marques, 2001) while pre-weaning mortality can be as high as 28-29% (Marques *et al*., 1996; Robledo *et al*., 2008) i.e., a value twice higher than that of the major pig producing countries (IFIP - GTTT, 2008). Further, Alentejano sows are reported to have shorter gestation length than conventional genotypes

(Nunes, 1993).

Despite its increasing importance in the local economy, there is little scientific information on the Alentejano breed, especially on factors that could influence the high post-natal mortality. Although post-natal mortality is the outcome of complex interactions between the sow, the piglet and the environment, there is increasing evidence that the acquisition of adequate passive immunity and sufficient energy from colostrum are of utmost importance for survival (Le Dividich *et al*., 2005). Further, to what extent the shorter length of Alentejano sows has affected the body energy stores and the physiological maturity of the newborn is not known. Therefore for a better understanding of pre-weaning losses causes in AL breed a large study was conducted to determine the body composition and the energy stores of the newborn Alentejano piglet, the colostrum production of the sows and the intake of the piglets, the immune quality of colostrum and the transfer of passive immunity to piglets. Particularly in this paper we aimed to study reproductive and productive AL breed traits that can influence piglets' mortality. All piglet mortality related causes are extensively studied in conventional pig genotypes; therefore we've used these genotype animals as standard.

MATERIAL AND METHODS

Animals

Alentejano (AL) sows and boars were purebred with breeders registered in the Alentejano pig herd book. Conventional genotypes (C) were Large-White x Landrace females mated by Large White boar or inseminated with Piétrain semen. Data were from the Experimental Centre of Mitra (University of Évora) (E) and two private commercial swine farms (Pa and Pm). A total of 90 sows (45 of each genotype) and their litters were compared. In this study, with the exception of the suckling period, AL sows were managed as practised in most of the farms in the Alentejo region.

Management of reproduction and housing

Number of sows, genotype of sows and boars and mating procedures according to site are presented in table 1.

Table 1. Number of sows, genotype of sows and boars and mating procedures according to production site.

Type of facilities	Experimental (E)	Private farm (Pa)	Experimental (E)	Private farm (Pm)
Genotype of the sows	Alentejano		Large-White x Landrace	
Genotype of the boars	Alentejano		Large-White	Piétrain
Mating	Natural, controlled	Natural, non controlled	Natural, controlled	Artificial Insemination
Sows, n	23 (ALE)	22 (ALPa)	24 (CE)	21 (CPm)

C sows: Natural, controlled mating using Large-White boars was performed in E, whereas, in Pm sows were inseminated twice with Piétrain semen with an interval of 24h. All C sows were kept in indoor facilities during the gestation period and maintained in groups of 3 to 4 sows (E) or in individual crates on a concrete slatted floor (Pm site).

AL sows: In E, mating (AL boars) was controlled in indoor facilities. Heat was detected twice a day and sows were mated twice at 24h interval by the same boar. Once gestation was confirmed (d 25 ± 1), sows were moved to an outdoor park (4.5 ha) and grouped (10 to 15 animals) where they stayed until 7 to 10 days before the farrowing date. In Pa, mating was not controlled. It was performed in an outdoor park (~2 ha) where sows were kept in groups of 36 sows, (ratio boar / sows 1 / 5), during ~30 d after which they were moved to another park (~10 ha) and kept in groups. In both sites, sows had access to huts. In addition, in the E site, some sows (7/23) had access to acorns during pregnancy.

Although, in the Alentejo region, the majority of the AL sows farrows in outside huts, in this study farrowing took place in conventional farrowing houses because of experimental purposes (colostrum and milk samples collection and piglets bleeding). However, it should be noticed that AL sows of this study, with the exception of primiparous ones, had experienced farrowing in indoor facilities. On d 105 ±1 of gestation ALE, CE and CPm sows were moved to conventional farrowing houses and placed in farrowing crates with a concrete slatted floor in the sow area and a plastic floor in the piglet area. Mating of ALPa sows was not controlled. However, daily, at feeding time, sows were observed for mating physical signs and/or heat behaviour, observation date was recorder and used as reference for the sow entry in the farrowing house, when achieved an expected gestation time of 105±1 days. Piglets were provided with local heating consisting of one infra-red lamp (175W) suspended above the creep area. Ambient temperature ranged between 20 and 22°C. In all facilities, sows and piglets had access to water from a low-pressure nipple-drinker.

Feeding

C sows: During gestation C sows were fed twice daily on commercial diets ranging from 2.5 to 3.0 kg / d depending on the season**,** until farrowing in the E site or at the rate of 1.5, 2.0 and 2.5 kg / d during the 1st, the 2nd and the 3rd third of gestation in the Pm site. In both cases, no feed was provided during the farrowing day, afterwards feed supply was gradually increased until *ad libitum*.

AL sows: In the E site, pregnant sows were fed twice daily with the same diets as CE sows ranging from 1.5 to 2.0 kg/d (depending on the season) while in the indoor facilities. The amount of feed was lower than those used for C sows because of their lower metabolic body weight ($W^{0.75}$), being at mating 36.7 and 47.3 kg for ALE and CE sows, respectively. Further, we also considered that ALE and ALPa sows do eat some amount of natural feedstuffs in the outdoor park. In the outdoor park they were fed once daily with the same type and amount of feed. However, when they had access to acorns (autumn and winter), feed supply was restricted to 1 kg / day. No feed was provided on the farrowing day, after that, feed allowance was increased until *ad libitum*. In the Pa site, sows were fed once daily with wheat at the rate of 2.0 to 2.5 kg / d during pregnancy. During spring and autumn, they had access to some grass but not to acorns. One week before entrance into the farrowing house the wheat was gradually replaced by a commercial lactation diet. On the farrowing day, feed allowance was restricted to 1kg. Thereafter, feed allowance was gradually increased to 3 kg / d until weaning. Feed was provided once a day.

During both gestation and lactation, individual feed consumption of the sows was not measured. In all facilities, water was available from a low-pressure nipple-drinker. From day 14 of lactation, piglets had access to creep feed. Commercial diets were based on cereals and soybean meal. Depending on the site, gestation diets contained (per kg diet, calculated values) 140 to 160 g CP, 6.2 to 7 g total lysine and 13.0 to 13.4 MJ DE. Corresponding values for the lactation diets were, 160 to 180 g CP, 8.2 to 10.5 g total lysine and 13.6 to 13.8MJ DE. Wheat was produced on farm and was not analysed. Creep feed contained (per kg diet) 180 to 194 g CP, 10.8 to 15.2 g lysine and 14.2 to 15.1 MJ DE.

Procedures and data collection

Gestation lengths were only determined at the E site and in CPm sows. Duration of farrowing was taken as the interval of time between the birth of the first piglet and the birth of the last piglet. Three (3) C sows farrowing durations were abnormally long (> 9h) and were excluded from the analyses. All farrowings were attended. At birth, piglets had their umbilical cords cut at about 10 cm from the navel and clamped after which they were identified, roughly dried and weighed to the nearest 1g using an electronic balance equipped with an integration system. The time of birth was registered. Thereafter, piglets were re-weighed at 24h of age. These weighings were carried out, as the body weight gain of piglets during the first day of life is a good indicator the amount of ingested colostrum (Le Dividich *et al*., 2005).

Piglets which died after birth were weighed as soon as they were found dead, with the time interval between death and weighing ranging from a few minutes to 12h. They were not necropsed. Samples of colostrum were collected at birth of the first piglet, then at 3, 6, 12, 24 and 36 h later to determine the composition of colostrum, and blood samples were taken on piglets by vena cava puncture at 2 d of age to determine the transfer of IgG (data not shown here). Weaning age was dependent on the farm. It ranged from 23±1 days in CPm to ~45 days both in ALE and ALPa. However, all piglets were weighed at 21 d of age, consequently only the weight at 21 d of age is reported in this study.

Statistical analyses

All data were analysed using the SPSS software, version 16.0 (SPSS, 2007). Due to differences in management between ALE and CE sows and although produced in the same farm, ALE and CE sows were considered as being reared in two different sites.

To compare genotypes, gestation length (only for ALE, CE and CPm), farrowing duration, litter size at birth and at 21 d of age, litter weight at birth and at 21 d of age, piglets' mean body weight at birth and at 21 d of age, and piglets' average daily gain (ADG) between birth and 21d days were analysed using the general linear model (GLM) procedure with the one-way analysis of variance (ANOVA) using genotype as a fixed effect. For gestation length and farrowing duration, analyses of covariance were also performed using litter size (total born) as a covariate. For litter and piglet weights at birth analyses of covariance were also performed using litter size (born alive) as covariate. For litter and piglet weights at 21 d and growth from birth to 21d (ADG) analyses of covariance were also performed using mean birth weight and litter size at 21d as covariates.

To study possible differences between experimental and private production sites within a same genotype, all traits were analysed as described above (variance and covariance analyses) for genotype effect study, but using production site as fixed effect.

To determine the effects of parity and season, within each genotype, gilts and sows were grouped as follow: group 1- parities 1 and 2 (AL = 15 sows, C = 20 sows); group 2 - parities 3, 4 and 5 (AL = 17 sows, C = 19 sows); group 3 - parities higher than 5 (AL = 13 sows, C = 6 sows). Season influence on reproductive traits was analysed by allocating each farrowing date into one of the four seasons of the year. Within each genotype, factorial (two-way analyses of variance) was performed, using parity group, season as fixed effects. Tukey tests were used to separate means.

In all analyses, when samples did not follow normal distribution, a non-parametric test of Mann-Whitney was performed. All correlations were performed using the procedure of the software and Pearson or Spearman's correlation coefficients were used according to the presence or absence (respectively) of normal distribution. Differences were considered significant at P < 0.05, whereas values between 0.05 and 0.10 were considered to reflect trends. Unless otherwise mentioned, all presented values are least square means ± standard error of mean.

RESULTS

In this study, within a genotype, there was has no significant effect (P > 0.10) of farm on any trait of sows and litters performance. Therefore, differences between genotypes should be essentially attributed to the genotype + environment.

Performance of reproduction and production

Results of reproductive and productive performance of AL and C genotypes are presented in table 2. Gestation length was shorter (P < 0.001) in AL (n=23) than in C (n=45) sows, (110.9±0.3, vs 115.1±0.2d). The difference remained significant even after adjustment of the data for total born. Alentejano sows had shorter (P < 0.01) duration of parturition than C sows. However, when adjusted to total born, the difference was no longer significant.. In AL sows, duration of parturition was not dependent on litter size (r = - 0.02; P = 0.905) but in C sows, farrowing length was correlated with litter size (r = 0.36; P = 0.02). In C sows, but not in AL sows, farrowing duration was significantly influenced by parity. Depending on the parity group, farrowing duration in C genotype, was 167±23min in group 1 (parities 1 and 2), 143±21min in group 2 sows (parities 3 to 5) and 284±36min in group 3 (parity higher than 5) sows, being group 1 and 2 different (P < 0.05) from group 3, and differences remained significant even after adjustment for total born.

Total number of piglets born and the number of piglets alive were both higher (P < 0.001) in C than in AL sows. In absolute value, the number of stillborn piglets was higher in C litters than in AL litters (P < 0.05) whereas number of mummies was similar. As percentage of total born, C stillborn piglets tended to be higher than AL (P<0.10) but no difference between genotypes were found regarding mummies. However, as a percentage of total born, stillbirths plus mummies were higher in C litters when compared to AL litters (P<0.05). Within C but not AL litters, stillborn piglets were lighter than live born littermates (P < 0.001). Litter size at 21d of age was significantly larger in C litters (P < 0.001). Litter weight and piglet weight at birth were both lower (P < 0.001) in the AL than in the C genotype. The difference remained significant (P < 0.001) after adjustments for litter size (born alive).

During lactation, AL piglets grew at the mean rate of 163 ± 3.4g/d that was lower (P < 0.001) than the 207 ± 2.7g/d recorded in C piglets and the difference remained significant (P< 0.001) after adjustments for birth weight and litter size at 21 d of age. Similarly at 21d, individual AL piglets were 1.2 kg lighter (P < 0.001) than C piglets and AL litters were 50% lighter (P < 0.001) than C litters. For both genotypes, piglet mean body weight at 21 d of age increases with birth weight (r = 0.472; P < 0.001; r = 0.600; P <0.001, for AL and C piglets, respectively). The slope of the regression line relating body weight at 21 d of age to birth weight did not differ between genotypes (P = 0.85). The weight of individual piglets at 21d of age increases by 343 ± 16g per additional 100g observed at birth. In C but not in AL genotype, growth rate between birth and 21d and weight at 21d of age of piglets nursed by sows of parity group 3 were lower than those found in sows from group 1 (P< 0.05) and 2 (P< 0.01).

Table 2. Reproductive and productive traits of sows according to genotype (least square means ± sem)

Genotype	AL (n=45)	C (n=45)	P - value
Total piglets born	8.3 ± 0.4	12.9 ± 0.4	< 0.001
Piglets born alive	8.0 ± 0.4	12.0 ± 0.4	< 0.001
Stillborn (SB), n (%)	0.13 ± 0.1 (1.7)	0.53 ± 0.1 (3.7)	0.028 (0.054)
Mummified (MUM), n (%)	0.16 ± 0.1 (1.7)	0.38 ± 0.1 (2.6)	0.094 (0.130)
SB+MUM %Total born	3.4 ± 1.3	6.3 ± 1.3	0.012
Farrowing duration (min) †	137 ± 13	193±12 (n=42)	0.002
Litter weight at birth (alive piglets) (kg)	8.8 ± 0.5	16.0 ± 0.5	< 0.001
Mean birth weight (g) ††	1106 ± 23	1344 ± 23	< 0.001
Litter size at 21d*	5.8 ± 0.3	9.2 ± 0.3	< 0.001
Litter weight at 21d (kg)	26.34 ± 1.54	52.39 ± 1.54	< 0.001
Mean weight at 21d (kg)	4.58 ± 0.13	5.80 ± 0.13	< 0.001
Daily gain (birth-21d) (g)	163 ± 3.4	207 ± 2.7	< 0.001

*piglets sacrificed or cross-forested not included. † when adjusted to total born, no significant differences were found between genotypes; †† mummies not included

Post-natal mortality

Some piglets (6 AL and 7 C) were sacrificed at birth to determine their body composition. Others (40 C) were cross-fostered to non experimental sows and removed from the study. Slaughtered and cross-forested piglets excluded, of the total 356 AL and 492 C piglets born alive, 96 and 79, respectively, died before d 21.There were marked differences between genotypes in post-natal mortality and its chronology (Figure 1). Post-natal mortality was 68% higher in Al than in C piglets (27.0% vs 16.1%, P < 0.001). Mortality was higher during the first day post-farrowing in AL than in C piglets (13.8% vs 5.5%, P<0.001). On average, total mortality including stillbirths was 28.2% in AL piglets compared with the 20.0% recorded for C piglets (P = 0.006).

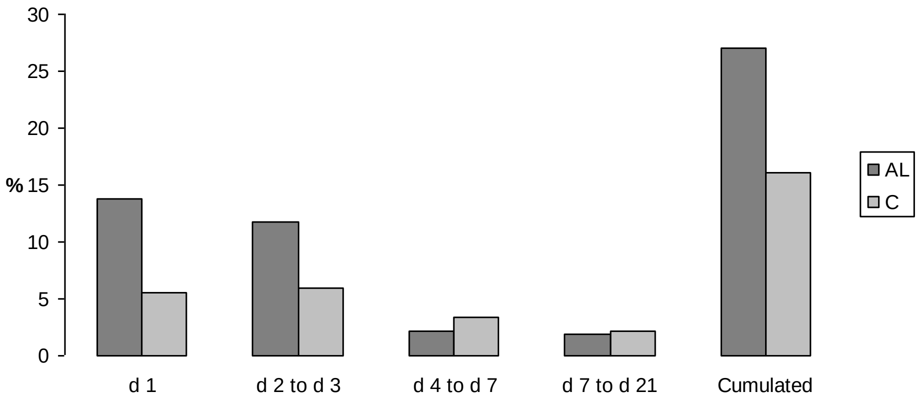

Figure 1. Mortality rates until d 21 (cumulated and per periods of time) in Alentejano (AL) and conventional genotype (C) litters. (Mortality rates are significantly different between genotypes for cumulated mortality (P < 0.001), for d 1 mortality (P < 0.001) and for mortality from d 2 to d 3 (P < 0.01). From d 4 to d 21 there was no difference between genotypes.)

By comparing survivors and waste piglets until 21 days: i), survivors were heavier at birth (P < 0.001); ii) in average survivors' weight gain during the first day of life was also higher (P < 0.001) (Table 3). Besides, among survivors only 10.4% AL and 4.6% C lost weight, during the first 24h, by contrary, among died piglets 61.5% of AL and 54% of C piglets lost or maintained weight during the first 24h or death if occurred before.

Table 3. Characteristics of piglets dying compared to survivors (least square means±sem).

Genotype	AL	C	P Value
Mean age at death (d)	2.0±0.4	3.6±0.4	0.001
Mean birth weights (g)			
Dead piglets	990±29[a]	1157±32[a]	0.002
Survivors	1129±12[b]	1382±14[b]	< 0.001
Weight Gain (g) from birth to 24h[1]			
Piglets dead or dying	-6.4±8.8[a]	6.2±9.8[a]	0.305
Survivors	105±6[b]	133±5[b]	0.001

For the same trait different letters within the same column represent differences for p<0.001;
[1] or to death, if death occurs before 24h.

DISCUSSION

Overall, values for total born and born alive of Alentejano sows are in line with those reported for the AL breed (Monteiro, 1999; Marques, 2001) and for the Iberian breed (Vázquez *et al*., 1994; Fernández *et al*., 2008). Data from Italy indicate that other local Mediterranean pig breeds, including Cinta Senese, Nero Siciliano, Mora Romagnola, Calabrese and Casertana also had a low prolificacy (Gallo and Buttazzoni, 2008). The low prolificacy of Iberian type breeds has been related to their lower ovulation rate (Monteiro, 1999), the absence of genetic improvement (Lopez-Bote, 1998) and the poor rearing conditions of sows (Dobao *et al*., 1988).

Gestation length of C sows is in the range of 114-115 d as reported by Hanenberg *et al*. (2001) and Rydhmer *et al*. (2008). It is remarkable that AL sows had gestation length approximately 4 d shorter than C sows. However, similar results were found by Nunes (1993) on 65 AL which farrowed outdoors. In Iberian breed, a duration of gestation of 111-112 has also been reported by De Juana Sardón (1954). Because gestation length has a high heritability ($h^2 = 0.3$, Rydhmer *et al*., 2008), it is reasonable to state that Iberian type breeds had shorter gestation length than modern genotypes.

Mean farrowing duration of C sows (193min) was between the 200-220min reported for modern sows by Canario *et al*. (2006) and Motsi *et al*. (2006) and the 140 to 180min reported by Fahmy and Flipot (1981) and Le Cozler *et al*. (2002). AL sows had shorter duration of farrowing, likely because of a lower litter size. Indeed, when corrected for litter size, there was no difference between genotypes. A positive relationship between farrowing duration and litter size is reported by De Roth and Downie (1976) and van Rens and van der Lende (2004), whereas others (Motsi *et al*., 2006) found no relation between farrowing duration and litter size. The longer farrowings observed in C sows from parity group 3 (older sows) when compared to sows from groups 1 and 2, could be explained by the decrease in myometrium reactivity to endogenous oxytocin observed in older sows (Pejask, 1984).

The mean birth weight of AL piglets agrees with previous observations of Póvoas Janeiro (1953) and Charneca (2001). Higher mean birth weight (1230g) is reported by Marques (2001) however these piglets were weighed, on average, at 24 h of age. The lower birth weight of AL piglets compared to C piglets has been reported by Charneca, (2001). Growth rate during the suckling period of AL piglets is of the same order as that observed by Charneca (2001) and Marques (2001) in AL genotype and similar to that reported for Iberian piglets

(Prieto *et al.*, 2005), but lower than that reported for C piglets (King *et al*., 1998). Similar results are usually observed when unselected genotypes such as Meishan (Legault and Caritez, 1982; van der Steen and de Groot, 1992) are compared to modern genotypes. The lower growth rate of suckled AL piglets can be attributed to several factors among which their lower birth weight is very important. In this respect, van der Steen and de Groot (1992) convincingly demonstrated that heavy piglets are more able to extract milk from the udder of the sow. In our study, the importance of birth weight on growth rate during the suckling period is illustrated by 0.34 kg increase in the individual weight at 21 d of age for every 100 g increase in birth weight which is consistent with the 0.20 and 0.29 kg reported by Caugant and Gueblez (1993) and Isley *et al*. (2003). There is also a possibility that AL sows produce less milk. Similarly, the lower suckling growth rate of observed for piglets born from C older sows piglets (parity group 3) is likely caused by the lower milk production of theses sows (Étienne *et al.*, 2000). However to our knowledge, there is no available data on milk production of AL sows.

The percentage of stillbirths was lower than the 8% obtained from the French herds according to the French Technical Sow Herd Management System (IFIP – GTTT, 2008) likely because supervision of farrowings had reduced the number of stillbirths (White *et al*., 1996). Pre-weaning mortality of AL piglets is in the range of 20-28% determined by Marques *et al*. (1996) in extensive system production units and similar to that recorded by Robledo *et al.* (2008) for Iberian piglets raised in indoor facilities. Pre-weaning mortality of C piglets agrees well with the 14% recorded from the French herds in 2007 according to the Technical Sow Herd Management System (IFIP – GTTT, 2008). Also, an important part of mortality occurring in the first 24h has been reported (Marchant *et al*., 2000; Casellas *et al*., 2004), as well as, the mortality rates reduction along the nursing period (Dyck and Swierstra, 1987 Marchant *et al*., 2000).

In most studies, the major causes of neonatal mortality have been overlying by the sow and starvation (English and Morrison, 1984), and mothering ability (Lay *et al.*, 2002). In this study, causes of mortality were not determined. However, in both genotypes, piglets dying after birth have in common that they are lighter at birth and gain much less weight from birth to 24h of age than survivors. The occurrence of a higher mortality in the smallest piglets of the litter is well documented (for a review, see Edwards, 2002). They have less energy stores and are less able to thermoregulate. Furthermore, they take longer to achieve the first sucking and within the litter, they are less competitive at the udder than their heavier littermates and therefore are expected to consume less colostrum and milk. In the present study, this is reflected by the fact that a large proportion (62% of AL and 54% of C piglets) which died between birth and 21d had lost or maintained weight during the first day of life indicating that these piglets had consumed very few or no colostrum and hence energy for energy metabolism and immunoglobulins for immune protection.

It is manifest that in this study, there was no significant effect of farm on performance, within genotypes. This absence of difference, particularly in C piglets' growth rate during the evaluation period, could be related to the use of identical dam genotype and it is generally considered that intra-uterine environment and mothering ability (colostrum and milk production and behaviour) have preponderant effects comparing with piglet genotype on pre-weaning growth.

Growth rate of the foetuses (McPherson *et al*., 2004), vital deposition of energy reserves (Okai *et al.*, 1978) and maturation (Hakkarainen, 1975) accelerate markedly during the last few days of gestation. However, to what extent these have been affected by the shorter gestation length of AL sows remained to be determined. Therefore, future research will focus on the body composition and energy stores of newborn AL, the yield and composition of colostrum and milk of AL sows, in order to provide additional scientific information regarding some key traits for piglet survival and growth during the nursing period.

CONCLUSIONS

It is concluded that the Alentejano swine breed has shorter gestation length and is less prolific than the conventional genotype. At birth Alentejano piglets are lighter, are prone to a higher post-natal mortality while survivors perform less than conventional piglets. Alentejano sows and piglets' performance was similar in both experimental and private farm conditions, so far, it seems that genetics influences more studied traits than environmental production systems. The extent to which the shorter gestation length has affected the body energy reserves at birth and the survival of the piglets remain to be determined.

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