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Effect of litter size on post-weaning growth of Iberian piglets

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Abstract. The current Iberian pig breeding program genetically evaluates sires and dams for 30-day and 90-day weight traits. However, very few studies relating the effect of litter size on piglet weight and growth have been published for this breed. Therefore, this study evaluates the effect of litter size on piglet weight and growth. Data consisted of 6,300 individual weights of piglets from the data-base of the Iberian Pig Association (AECERIBER) and belonging to 4 commercial herds. Weights were standardized to 30, 60, 90 and 120 days, and pre-and post-weaning average daily gains were calculated. The General Linear Model Procedures of SAS were used for data analysis, including the following fixed effects: herd and farrowing season; piglet sex; and litter size at birth, at 24 hours and at weaning. Piglet growth patterns from birth to 120 days were described. Litter size significantly affected these weights, although the effect of the increase in litter size was not constant, except in the case of birth weight. Perinatal mortality was greater in large litter sizes.

Keywords. Iberian piglets – Post-weaning growth – Litter size – Mortality.

Effet de la taille de la portée sur la croissance post-sevrage des porcelets Ibériques

Résumé. *Le schéma actuel de sélection pour la race de porc Ibérique évalue génétiquement les reproducteurs pour les caractères de poids à 60 et 90 jours, mais il n'y a pas beaucoup d'études sur l'effet qu'a la taille de la portée sur la croissance chez les porcelets vivants. Ce travail évalue l'influence de cet effet sur les poids et les croissances post-sevrage des porcelets. On a utilisé 6.300 mesures individuelles de porcelets originaires du schéma de sélection ACERIBER, qui appartenaient à 4 élevages. Les poids ont été classés à 30, 60, 90 et 120 jours et on a calculé les gains de poids pré et post-sevrage. Pour l'analyse on a utilisé la procédure des modèles linéaires SAS, incluant les effets fixes suivants : élevage et époque de la mise bas ; sexe du porcelet ; et taille de la portée à la naissance, à 24 heures et au sevrage. On décrit les tendances de croissance des porcelets depuis leur naissance jusqu'à 120 jours. La taille de la portée a affecté significativement les poids mentionnés, bien que l'effet de l'augmentation de la taille de la portée n'ait pas été constant, sauf pour le poids à la naissance. La mortalité périnatale a augmenté avec la taille de la portée.*

Mots-clés. *Porcelets Ibériques – Croissance – Post-sevrage – Taille de la portée – Mortalité.*

I – Introduction

Litter size and pre- and post-weaning growth are very important factors for the profitability of swine production. In the Iberian pig, for which mean litter size usually do not surpass 7 piglets (Suárez *et al*., 2002), it would be of great value to know how litter size affects the subsequent piglet growth. With this knowledge, producers would be able to determine the maximum liter size that allows for a greater yield without significantly decreasing piglet growth. Most studies on Iberian pig production in this area analyzed pre- and post-weaning traits regardless litter size. However, several studies have been done in white swine breeds determining the effect of litter size on individual piglet growth during lactation (Canario *et al*., 1993). Therefore, litter size could be increased through genetic improvement (Bidanel *et al*., 1994; Johnson *et al*., 1999; Noguera *et al*., 2002), aided by adequate management procedures, up to an optimal degree for maximal

profitability. In consequence, the objective of this study was to determine the effect of litter size traits on the post-weaning growth of Iberian piglets.

II – Materials and methods

The present study analyzed approximately 6,300 individual weighings from purebred Iberian piglets, registered in the breeding selection program of AECERIBER (Spanish Association of Iberian Pig Breeeders) and belonging to four enterprises and to the Valdesequera research farm of the Agricultural Research Center of Extremadura (SW Spain). The management system for the farrowing and pre- and post-weaning phases was the same for all the farms involved in the study. Data obtained from the farrowing and lactation phases were: total number of piglets born (TB); number of piglets born alive (BA, which are calculated as TB minus those born dead or those died within 24 hours post-partum); and number of piglets weaned (W). The average weaning age was 30 days. Individual weighings were performed for each piglet within each litter at birth and between 21 and 140 days of age, and these body weights (BW) were standardized to 30, 60, 90 and 120 days. Data were analyzed with the SAS statistical package using a linear model in which BW were corrected for "farm", "sow age at farrowing", "season", and "piglet sex". For each level of litter size, measured as numbers of TB, BA and W, the following variables were obtained: corrected mean individual piglet weight at birth; and mean individual BW standardized at 30, 60, 90 and 120 days, which were the ages having more BW measurements. The effect of litter size (TB, BA, W) on weight at birth, at 30 days (similar to weaning weight) and at 60, 90 and 120 days of age was determined.

III – Results and discussion

Results for birth weight are depicted in Fig. 1.

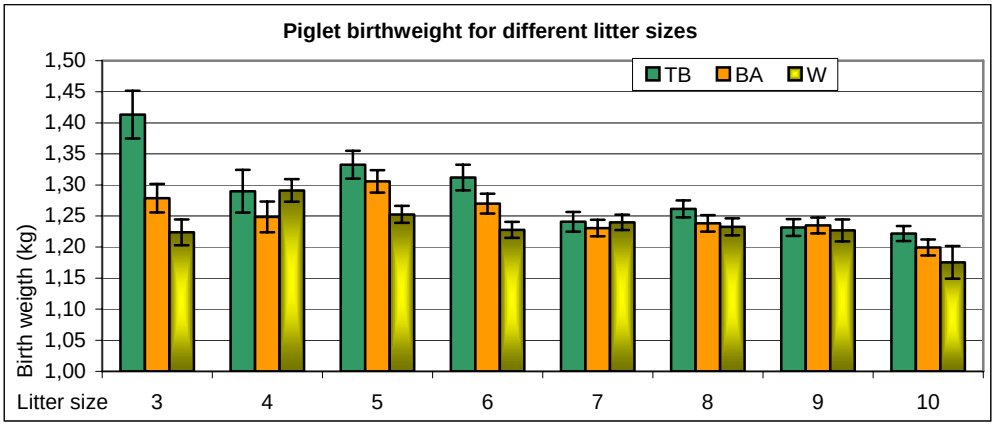

Fig. 1. Effect of litter size, in terms of total born (TB), born alive (BA) or weaned (W) piglet number, on piglet birth weight.

Litters with 3 TB had superior birth weight than litters with more than 6 TB piglets. Also, litters with less than 7 piglets were more heterogeneous than litters with 7 to 10 piglets, as indicated by the greater coefficients of variability of TB classes 1 to 6 (data not shown). Therefore, increasing litter size up to 10 piglets may not affect litter homogeneity. Litters with 3 or 4 BA piglets had birth weights significantly smaller than litters having 5 BA piglets. Birth weight

decreased gradually and significantly from 5 BA to 7 BA piglet litters, but it did not significantly change from 7 to 9 BA-piglet litters. However, it significantly decreased from 9 to 10 BA-piglet litters. Analogously to the above mentioned TB coefficients of variability, litters having 7 to 10 BA piglets were more homogeneous at birth than those containing less BA piglets (data not shown). In contrast, birth weight did not significantly change as the number of W piglets increased, except for the 10 W piglet class, which had a significantly smaller birth weight than the other classes, and also the 4 W piglet class, which had greater birth weight than the rest. Other authors, like Kaufmann *et al*. (2007), found greater differences in birth weight as the number of weaned piglets increased.

Figures 2, 3 and 4 depict the effect of litter size (in terms of TB, BA or W piglet numbers, respectively) on piglet BW at 30 (BW30), 60 (BW60), 90 (BW90) and 120 (BW120) days of age. Figure 2 shows no effect of TB number for BW30, BW60 or BW90, except for the 14 TB class, which corresponded to smaller BW values, although there were few litters belonging to this class. Nevertheless, litters having 11 or 12 TB piglets had smaller BW120 values than the remaining litters.

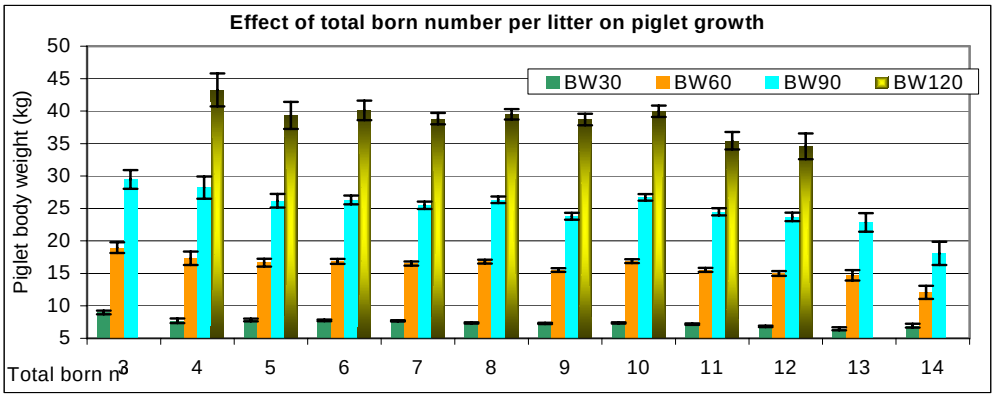

Fig. 2. Effect of number of total born per litter on piglet body weight at 30 (BW30), 60 (BW60), 90 (BW90) and 120 (BW120) days of age.

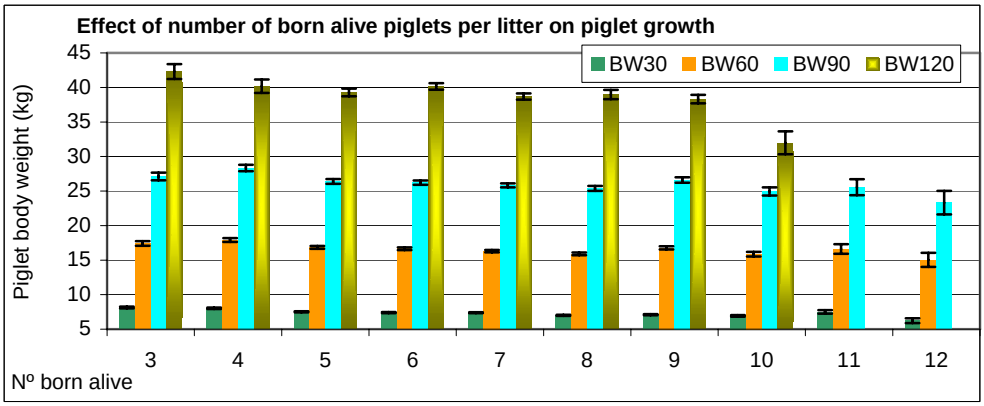

Fig. 3. Effect of number of piglets born alive per litter on piglet body weight at 30 (BW30), 60 (BW60), 90 (BW90) and 120 (BW120) days of age.

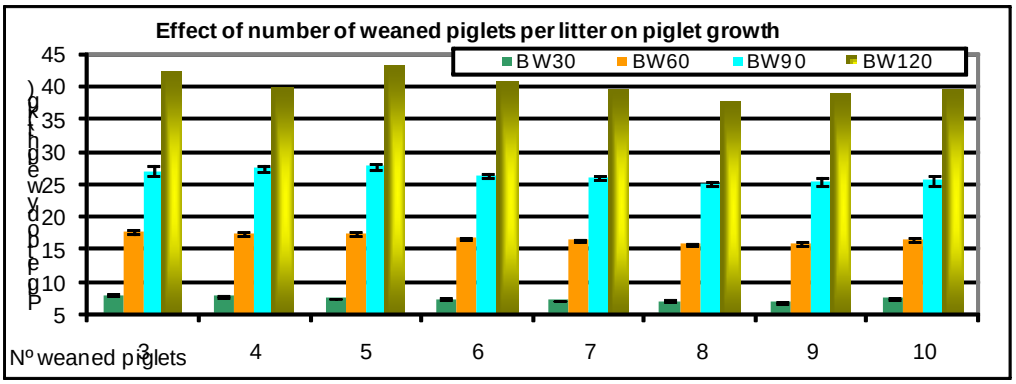

Fig. 4. Effect of number of weaned piglets per litter on piglet body weight at 30 (BW30), 60 (BW60), 90 (BW90) and 120 (BW120) days of age.

Figure 3 represents piglet BW progression depending on BA piglet number. Piglet BW30 was greater in litters containing 3, 4 or 5 BA piglets, decreased from the BA 6 to the BA 11 classes, and was smaller for the BA 12 class. The number of BA piglets did not affect piglet BW60 nor BW90, except for the 12 BA class, for which both weights were smaller. Finally, BW120 was greater when BA number was 3, was constant from the 4 to 9 BA classes, and significantly decreased for BA numbers greater than 9.

Figure 4 depicts the differences in piglet BW at different ages depending on the number of weaned piglets. When the number of weaned piglets was greater than 5, all BW values decreased somewhat, reaching the significance level for BW30, BW90 and BW120.

In conclusion, a possible decrease in piglet weight can be expected as the number of weaned piglets increases, but this decrease should not be detrimental from the economical point of view because it is compensated by the greater number of piglets weaned per litter.

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References

Bidanel J. P., Gruand J. and Legault C., 1994. An overview of twenty years of selection for litter size in pigs using “hyperprolific” schemes. Proc. 5th World Congr. Genet. In: *Appl. Livest*. Prod. 17:512–515.

Canario L., Lundgren H., Haandlykken M. and Rydhmer L., 1993. Genetics of growth in piglets and the association with homogeneity of body weight within litters. Swedish University of Agricultural Sciences, Department of Animal Breeding and Genetics, Box 7023, S-75007 Uppsala, Sweden; and Norsvin, NO-2304 Hamar, Norway

Johnson R. K., Nielsen M. K. and Casey D. S., 1999. Responses in ovulation rate, embryonal survival, and litter traits in swine to 14 generations of selection to increase litter size. In: *J. Anim. Sci.* 77:541–557.

Kaufmann D., Hofer, A., Bidanel, J.P. and Künzi, N., 2000. Genetic parameters for individual birth and weaning weight and for litter size of Large White pigs. In: *Journal of Animal Breeding and Genetics*, 117: 121–128.

Noguera J. L., Varona L., Babot D. and Estany J., 2002. Multivariate analysis of litter size for multiple parities with production raits in pigs: I. Bayesian variance component estimation. In: *J. Anim. Sci.* 80:2540–2547.

Suárez M.V., Barba C., Forero J., Sereno J.R.B., Diéguez E. y Delgado J.V., 2002. Caracterización reproductiva de varias razas porcinas de origen Ibérico. *Archivos de zootecnia,* 51 (193-194). 245-248.