



## Effect of litter size on pre-pubertal body weight and testicular volume in crossbred boars

ASU SINGH GODARA<sup>1</sup>, TRIVENI DUTT<sup>2</sup>, G K GAUR<sup>3</sup>, G K DAS<sup>4</sup>, MUKESH SINGH<sup>5</sup> and N R SAHOO<sup>6</sup>

ICAR-Indian Veterinary Research Institute, Izatnagar, Uttar Pradesh 243 122 India

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There is an increased trend in selection of younger animal for improving reproduction traits in porcine industry. However, the possibility of improving those traits by selection is limited, mainly due to the low heritability. Offsprings derived from large litters are raised in relatively less favourable environmental conditions both during pre- and post-natal periods (Klein 2005, Kawecka *et al.* 2006, Rekiel *et al.* 2010). Rearing of offspring in such a compromised environment conditions may hamper their growth and development of sexual organs. Studies showed that testes size can be used as a predictor of semen production (Ytournal *et al.* 2014, Jacyno *et al.* 2015). Despite the positive effects of selection by testicular size, which determines the volume of semen production, environmental factors such as malnutrition and climatic condition may also have a significant impact on the quality of semen (Klein 2005). The aim of this study was to compare the growth of pre-pubertal boars and their testicular size in relation to the litter size in which they were born and reared.

The present study was conducted at the Swine Production Farm, Livestock Production and Management Section, IVRI, India. The stock consisting of 23 crossbred (Landrace × *Desi*) piglets was utilized for the study and divided into 2 groups based on the litter size in which they were born and reared viz. group 1: 10–13 piglets per litter (average 11.5), n=11; group 2: 6–9 piglets per litter (average 7.45), n=12. Weaning was done on day 42. After weaning, piglets were group housed in a pen with sufficient space. The feeding management was kept identical for all the experimental animals following the similar feeding as followed in the farm. Other management conditions like cleaning, sanitation and disinfection measures as well as health care were kept identical for all the animals during the experimental period.

Data on birth and weaning weight was taken from growth register of farm while weight and testicular size at 14, 18

and 22 weeks of age were recorded during the study. The body weights (BW) of the animals were taken with a sensitive digital scale while the dimensions (length, width) of each testis were measured by using digital vernier calipers. Testicular volume was calculated using following formula (Young *et al.* 1986). Testicular volume =  $\frac{4}{3} \pi \times (\frac{1}{2} \text{length}) \times (\frac{1}{2} \text{width})^2 \times 2$ . The data were analyzed by using the statistical software SPSS version 20.

The average body weights at birth, weaning (6 weeks), 14 weeks, 18 weeks and 22 weeks of age for group 1 and group 2 were  $0.93 \pm 0.03$ ,  $9.69 \pm 0.53$ ,  $40.44 \pm 1.66$ ,  $57.06 \pm 1.89$ ,  $72.86 \pm 2.41$  kg and  $1.06 \pm 0.03$ ,  $9.90 \pm 0.55$ ,  $48.68 \pm 1.73$ ,  $67.25 \pm 1.98$ ,  $82.78 \pm 2.52$  kg, respectively. The mean of birth weight of piglets born in larger litters was significantly lower (130 g) than piglets born with smaller litters. It is well known that the growth of piglets depends on their body weight at birth and access to mother's milk in the first weeks of life. The negative impact of the litter size on the body weight of piglets at birth has long been acknowledged (Kerr and Cameron 1995). Hoya *et al.* (1994) reported that piglets with lower weight at birth have a weaker vitality, delayed access to the first colostrum intake and a reduced ability to compete with stronger siblings for colostrums. With a limited supply of nutrients in an excessive litter size, there is also strong competition for nutrition between the internal organs. However, weight at weaning (6 weeks) was not significantly different between the groups. Although smaller litter had higher weaning weights but statistically non-significant. But in pre pubertal, weights at 14 weeks onwards were significantly higher in group 2 until 22 weeks of age than group 1.

According to Fandrejewski (1998), organs such as the heart, liver and kidneys are selectively better supplied than the reproductive system, which slows down its development and may adversely affect future reproductive performance. It had also been shown that weight gain of young boars and gilts reared in smaller litters was significantly higher in comparison with their peers reared in larger litters (Kawecka *et al.* 2006). Substandard rearing during suckling result in young boars with lower body weight.

The average testicular volume at 14 weeks, 18 weeks and 22 weeks of age for group 1 and group 2 were

Present address: <sup>1</sup>PhD Scholar (drasgodaraivri@gmail.com), Livestock Production and Management; <sup>2</sup>Joint Director (Academics) (triveniduttivri@gmail.com); <sup>3,4,5</sup>Principal Scientist (gyanendrkg@gmail.com, gkdasivri@yahoo.co.in, drmsingh9@gmail.com), Livestock Production and Management; <sup>6</sup>Scientist (vet.nihar@gmail.com), Division of AGB.

154.27±17.89, 468.05±35.95, 579.79±43.35 and 1.99.35±18.68, 603.16±37.55, 760.58±45.28 cm<sup>3</sup>, respectively. Piglets in groups 2 (average litter size 7.45) had higher testicular volume as compared to group 1 at 14, 18 and 22 weeks of age. But the significant difference of testicular volume was observed only at 18 and 22 weeks of age.

There are no beneficial effects of a smaller litter size on the size of the testicles or on semen characteristics (Klein 2005). In contrary, Flowers (2001) and Pietruszka (2009) found that the boars reared in smaller litters had larger testes and a better quality of semen compared to boars reared in larger litters. Those who favours small litter, suggests that animals in smaller litters are not exposed to high competition and uptake a lot more milk, which not only may increase weight gain but also intensify the production of supporting Sertoli cells in testicular tubules. Consequently, after reaching sexual maturity these boars may produce more sperm. According to Flowers (2001), the first three months of life, often ignored during rearing, are an important period that influences semen production in mature individuals. It is well established that daily sperm production of adult boars increases with testicular size (Jacyno *et al.* 2015). The measurements of testicular volume of this study substantiate the finding reported by Kawecka *et al.* (2006). In this study, boars born and reared in smaller litters had a significantly higher body weights as well as higher testicular size.

#### SUMMARY

The objective of this study was to examine the effect of litter size on pre-pubertal body weight and testicular volume in crossbred (Landrace × *Desi*) boars. The body weights of the piglets in small litter were significantly higher than large litter, at all age except weaning. At 22 weeks of age, boar reared in small litter was 10 kg heavier than larger litter. The testicular volume was significantly higher in all the piglets of small litter than piglets of larger litter at 18 and 22 weeks. However, at 14 weeks, piglets of small litter showed a tendency of higher testicular volume than the piglets of larger litter size. The results of this study suggest that piglets born and reared with small litter size are beneficial to obtain higher body weight and testicular volume around puberty. This may be helpful in early

selection of boars for future use in artificial insemination.

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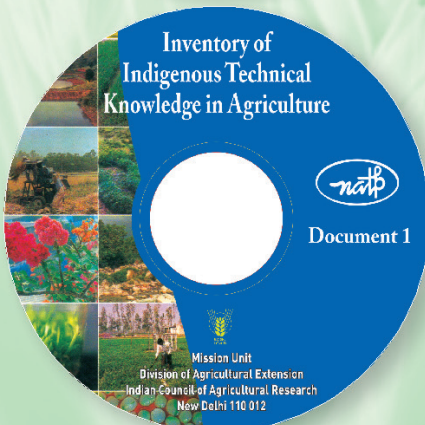
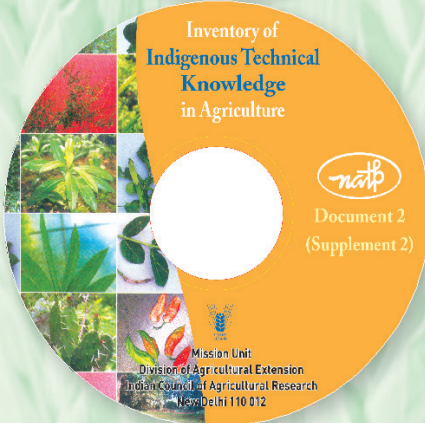
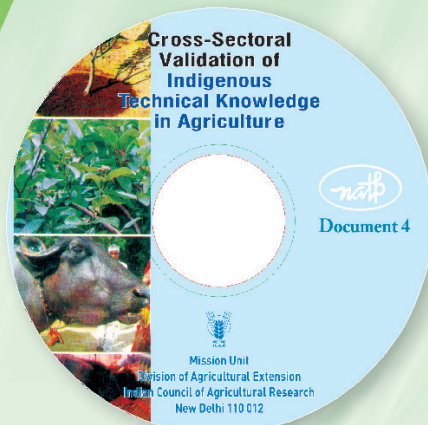
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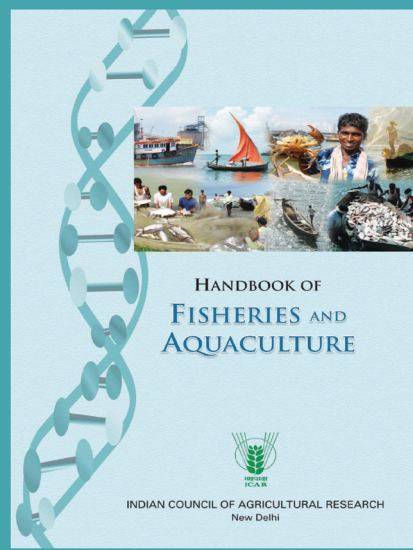
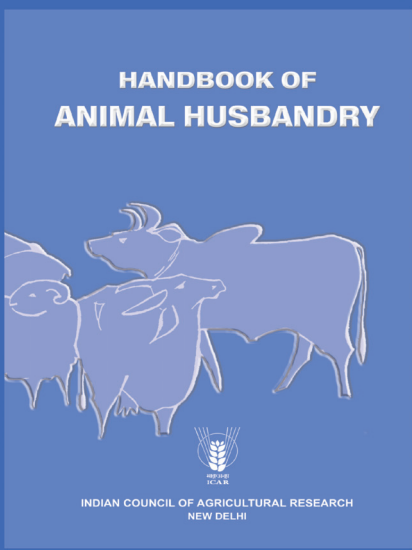
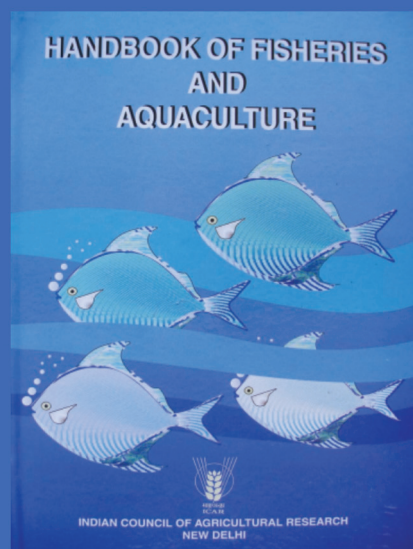
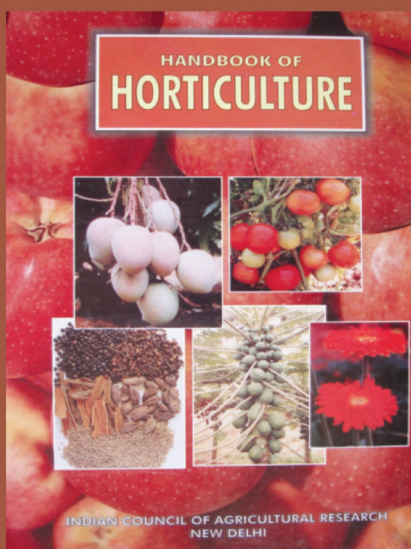
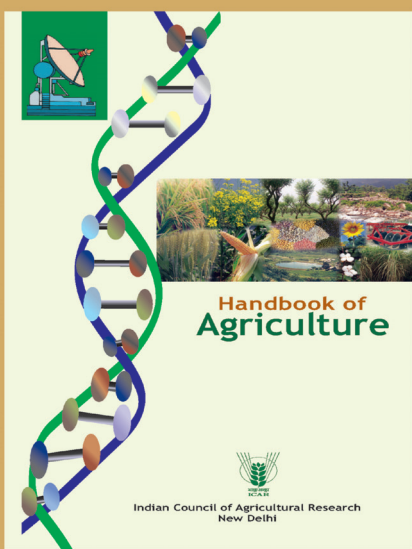


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