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Behaviour and performance of lactating sows housed in different types of farrowing rooms during summer

G.M. de Oliveira Júnior [a,*], A.S. Ferreira [a], R.F.M. Oliveira [a], B.A.N. Silva [b], E.M. de Figueiredo [a], M. Santos [c]

[a] Animal Science Department/Departamento de Zootecnia (DZO), Universidade Federal de Viçosa (UFV), Viçosa, MG. 36571–000, Brazil
[b] Institute for Pig Genetics bv (IPG), P.O. Box 43, 6640 AA Beuningen, The Netherlands
[c] Agricultural Engineering Department/Departamento de Engenharia Agrícola (DEA), Universidade Federal de Viçosa (UFV), Viçosa, MG. 36571–000, Brazil

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ABSTRACT

Thirty mixed-parity Landrace × Large White sows were used to evaluate the effects of the type of farrowing room on 28-day lactation behaviour under tropical conditions during summer. The sows were allocated in a completely randomised design with three treatments with 10 replicates according to parity number and body weight, with each animal being considered an experimental unit. The treatments consisted of a conventional farrowing room (T1); a conventional farrowing room with floor cooling under the sow (T2); and a semi-outdoor farrowing room without a cage and with access to a fenced field (T3). The sows from T1 and T2 groups were exposed to mean maximum and minimum environmental temperatures of 25.7 and 21.0 °C, respectively, and the sows from the T3 group to average maximum and minimum environmental temperatures of 26.5 and 20.7 °C, respectively. The feed consumption of T3 sows was numerically higher than the T1 and T2 sows (+9.5% on average). The body-weight loss was influenced at 28 days ($P<0.10$) by treatment, being that the T3 sows gained weight (+4.7 kg) while the T1 and T2 sows lost weight (−11.9 and −3.7 kg, respectively for T1 and T2). The T3 sows showed a higher percentual litter mortality than the T1 and T2 sows (3.2% vs. 0% vs. 7.8%, respectively for T1, T2 and T3 sows). From farrowing until day 28 of lactation, the T2 and T3 sows showed higher lactation efficiency when compared with the T1 sows (72% vs. 87% vs. 88%, respectively for T1, T2 and T3 sows). The T1 sows showed higher ($P<0.01$) frequencies of visits to the feeder and drinker (+38% on average). The T3 sows spent more time ($P<0.01$) at the drinker than T1 and T2 sows (23 vs. 23 vs. 32 min, respectively for T1, T2 and T3 sows). The T3 sows showed a higher ($P<0.10$) frequency of nursing than the other treatments (+15% on average). T1 and T2 sows were found to spend more time ($P<0.01$) performing other postures during 24 h than sows maintained in T3 (50 vs. 51 vs. 22 min/d, respectively for T1, T2 and T3). It is concluded that cooling of the floor under the sow in the conventional farrowing room or the use of semi-outdoor farrowing rooms improves the thermal environment and the lactation efficiency of the sows housed in hot ambient temperatures at 28-day lactation in the summer period, indicating an improved welfare.

1. Introduction

Pig production in tropical and subtropical countries will rapidly increase as a result of increasing human population (Silva et al., 2009a). Although many factors are obviously involved, the combination of high temperatures and high

* Corresponding author at: Animal Science Department/Departamento de Zootecnia (DZO), Universidade Federal de Viçosa (UFV), Viçosa, MG. 36571–000, Brazil. Tel.: +55 31 8812 4887; fax: +55 31 38991236.
E-mail address: gregzootec@yahoo.com.br (G.M. de Oliveira Júnior).

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relative humidity (RH) resulting in heat stress remains one of the major problems that affects the production efficiency and welfare of pigs in these regions (Silva et al., 2009a). In the specific case of the farrowing house, the challenge lies in attending to the different comfort temperatures for the housed animals, as the comfort temperatures for lactating sows, as described by Quiniou and Noblet (1999) and De Bragança et al. (1998) is between 16 and 22 °C, while the comfort temperatures for nursing piglets between 30 and 32 °C soon after the birth second is considered ideal (Black et al., 1993). The increase in environmental temperatures in the farrowing room can lead to a heat stress in the sows according to Renaudeau et al. (2001), and this results in a lower intake of food, which can compromise the performance of the litter.

In addition, heat stress can also cause alterations in lactating sow's behaviour and welfare due to thermal discomfort. These alterations include a reduction in the number and duration of nursing, higher time urinating and defecating and an increase in piglet mortality due to crushing (Martins et al., 2008; Silva et al., 2006). Thus, the lack of welfare may result in serious consequences for the productivity of the sows, compromising their reproductive cycle and piglet performance (Silva et al., 2006, 2009c).

In the attempt to improve performance and welfare under tropical conditions, the use of modified farrowing pens has been evaluated by several authors (Hötzel et al., 2004; Silva et al., 2006, 2009a,b,c). An alternative approach is to increase heat loss using a neck drip-cooling system (McGlone et al., 1988), chilled drinking water (Jeon et al., 2006) or a floor-cooling system (Silva et al., 2006, 2009c).

From a physiological, productive and reproductive perspective, the floor-cooling system has been proven that it can be a feasible strategy to attenuate the effects of heat stress, but there are some doubts about its benefits regarding the sow's welfare from an animal-behavioural perspective.

As an alternative to the conventional farrowing houses, outdoor housing systems or semi-outdoor housing systems (a farrowing room with access to a fenced field) have been suggested. The outdoor pig industry has grown quickly over the last decade, a factor that has been hastened by the high capital costs of indoor pig housing as well as public demand for a less intensive industry. Planning regulations have also made it more difficult to develop indoor pig production. Outdoor pig production is largely concerned with the housing of sows and the rearing of the young piglets for the first few weeks of their lives.

The outdoor farrowing systems have been extensively studied, and they have been proven to show no differences or has been best that concerning productivity in relation to the confined systems (Bracke et al., 2002a,b; Dalla Costa, et al., 1995). It is possible that the access of the lactating sows and their piglets to fields can contribute to improve animal welfare and lead to the reduction of abnormal behaviours. It has been verified that sows in intensive systems tend to develop abnormal behaviours, such as the act of staying longer at the water drinker, than sows in outdoor systems (Johnson et al., 2001).

Hence, based on these considerations, this study was realised to evaluate the behaviour and performance of lactating sows housed in different types of farrowing rooms during a 28-day lactation period in summer under Brazilian climatic conditions.

2. Materials and methods

2.1. Experimental design

The experiment was conducted during the summer period between January and April of 2008 at the farrowing houses of the pig breeding sector of the Department of Animal Science at Federal University of Viçosa, Viçosa, Minas Gerais, Brazil. The municipality is located in a tropical climatic region (20° 45′ 45″S and 4° 52′ 04″W, with an altitude of 657 m). Care and use of animals were performed according to the certificate of authorisation to experiment on living animals issued by the ethics committee of the Federal University of Viçosa.

Thirty multiparous Landrace × Large White crossbred sows were used in this experiment, distributed in a completely randomised design into three treatments (T1= conventional farrowing room; T2=conventional farrowing room with floor cooling under the sow; and T3=semi-outdoor farrowing room without a cage and with access to a fenced field) with 10 sows per treatment, each sow being considered as an experimental unit. The sows were distributed among the treatments according to body weight, backfat thickness (BFT) before farrowing and parity order. The sows remained in the experiment from farrowing to weaning at 28 days of lactation.

2.2. Animal management and installations

The sows from T1 and T2 groups were housed individually in cages with 2.0-m length and 1.60-m width and a floor of solid concrete. Each cage was equipped with a semiautomatic feeder, more a shell drinker for the sows. A juggler with an infrared light to provide supplemental heat for the piglets was attached to the cage. No bedding material was used. For the sows of T2, where the floor was cooled, the temperature of the water circulating in the cooled floors was maintained at 17 °C. A detailed description of the system to realise the floor cooling was previously given (Moreira et al., 2004; Silva et al., 2006).

The semi-outdoor farrowing pens used for T3 sows had 2.2-m length and 2.3-m width and the fenced field a total area of 55 m^2. These farrowing pens were equipped with a semiautomatic feeder and a nipple drinker for the sows and an infrared light to provide supplemental heat for the piglets. No bedding material was used. After the third day post farrowing, everyday in the afternoon for 2 hours, the T3 sows and their piglets were allowed access to the individual fenced fields.

At day 108 of gestation, the sows were moved to the farrowing houses, where they were allocated individually in farrowing housing until weaning. From day 108 until farrowing, sows were fed 3 kg day^{-1}, divided in two daily meals, of a lactation diet containing 17.8% crude protein (CP), 0.99% digestible lysine and 13.83 MJ kg^{-1} metabolizable energy (ME). The diet was formulated with maize, soybean meal and soybean oil and supplemented with synthetic amino acids, minerals and vitamins to achieve the requirements for this