



Improvement of animal welfare in lactating sows reared outdoor in Mediterranean area

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ABSTRACT

The project focused on studying the behaviour of free range sows, to evaluate the level of utilization of different areas inside the paddock (hut, shaded area and wallow) under different climatic conditions. In the study has been also assessed the sows preference towards a certain type of hut. The behaviour of 23 lactating sows, kept outdoors in individual farrowing paddock, were observed in 12 months starting from August in order to monitor it under different climatic conditions. Activities and areas in which these actions were performed were recorded from 8.30 a.m. to 4.30 p.m. for a total of 31 days. Considering the thermal requirements of pigs, the days of observation were divided into three categories: cold (≤ 15 °C), optimal (from 15 to 25 °C) and hot (over 25 °C). The white hut seem to be preferred by the sow even if the inner temperature is not different from one of the gray. This preference could be due to the length of both sides which allow an easier transition from standing to lying down. haded area seems to be under-exploited, also under hot environment and this is likely due to the insufficient protection from sun radiation. The presence of the wallow seems to positively affect the welfare of sows during hot season anyway other systems of cooling such as sprinkler could be tested in order to reduce the heat stress in outdoor sows reared in the mediterranea area.

(Keywords: outdoor, hut, wallow, environmental temperature, lactating sow)

INTRODUCTION

Economic circumstances and concerns about animal welfare in intensive systems led to a rapid increase in outdoor production in North Europe (Edwards, 1994) and, specifically, interest in the production of free-range pigs (McGlone, 2000). Success of outdoor pig systems may depend on the details of the housing design, management, and location, including soil type and climatic conditions (Turner, 2002). Modern, intensive outdoor sows are farrowed in individual huts, and hut design is thought to be a crucial asset in piglets survival. Several farrowing hut designs are currently in commercial use with varying performance success. Research has focused on the shape of the hut (McGlone, 2000), the space requirement needs of the sow and the insulation status (Johnson, 2003). However, none of these studies was conducted in the Mediterranean area, where free-range farming is growing but the same area is characterized by high temperature during spring and summer. Temperatures that exceed 32 °C compromised the welfare status of lactating sows kept outdoors in summer unless they are assisted in thermoregulation (Johnson, 2008). The project focused on studying the behavior of free range sows, to assess the degree of utilization of different areas inside the paddock (hut, shaded area

and wallow) under different climatic conditions. Assessing whether the sows show a preference for different types of hut. The information gathered will be used as technical support for the development of new types of huts and eventually reorganization of spaces available in outdoor rearing system for sows.

MATERIALS AND METHODS

The research has been conducted in a farm belonging to Veneto Agricoltura (extension service of Veneto Region) located in Ceregnano (RO) on a group of 23 lactating sows kept outdoor. Approximately 10 days before the estimated date of the farrowing, sows were moved from the gestation to an individual farrowing paddock fenced by a double electric wire and of the size of about 13×34 m. During the lactation period sows were fed twice a day with a feed formulated to meet the needs of this stage production. The piglets were free to move outside of the paddock, socializing with other litters and making the mixing of groups at the time of weaning less traumatic and stressful. Within each area there were two huts always accessible to the sow, we call them white and gray hut in relation to the color of the structure. The gray one, is widely used in north Europe, is made of wood and galvanized sheet and isn't insulated, while the white one is a prototype designed by engineers Veneto Agricoltura and is made in fiberglass and insulated with the intent to protecting sows from the heat. Both shelters had the same orientation so that the entrance were located downwind. Both were placed directly on the ground without any special floor while the straw was distributed on the floor to ensure more comfort to sow and the piglets. The gray hut was in English style with a form of semi-arch of maximum height of 1.10 m and the base size of 3 m in length and 1.5 m wide with a total area of 4.5 m². Access to the shed was allowed by an opening of 80×90 cm located at the extremity of the wall to avoid the direct exposition of piglets to cold air currents. The opposite side has a small opening to ensure the air flow and to allow the operator to control the litter, especially near the farrowing time and without disturbing the sow (*Figure 1*).

Figure 1

Gray hut, front view on the left and rear view on the right



The white hut was in the shape of a real house and was an insulation structure of fiberglass with a layer of polyurethane foam inside. The basis of this structure measures 2×2 m² with an area available for the sow of 4 m² and this was slightly lower than the

reported for the other kind of hut. Even in this case the passage was not centrally located in the wall and its measure was 70×90 cm. On the back there was a window of 15×25 cm placed at 80 cm from the ground that can be closed by a sliding cover. The nest measure 145×30 cm and 25 cm high, with covered opening on the roof that allows easy inspection of the litter by the operator. A certain level of isolation of the nest can improve the microclimate for the piglets and is also an area protected from the crushing due to the lying down of the sow to breastfeeding (*Figure 2*).

Figure 2

White fiberglass hut view on the left and side view with nest on the right



In each paddock both types of huts had been presented. The sows had also a rest area equipped with shade net and a wallow to make a mud bath possible. In each paddock there was a nipple waterer for drinking water distribution.

The experimental measures had been mainly related to behavioural observations, carried out from 8.30 am to 4.30 pm for a total of 31 days chosen on the basis of the environmental temperature in different seasons, in order to obtain at least 10 days of observation in cold, optimal and hot environment. Each hour every sow had been observed for 15 minutes, using the "*Scan Sampling*" technique, with 1 min of scan interval (*Martin and Bateson, 1993*). For each sow in each sampling interval, the states of the animal (nursing, exploring, rooting, eating, drinking and resting) and area in which these activities were performed (white or gray hut, paddock, wallow, shaded area) had been recorded. Data collected had been processed in order to calculate the percentages of time engaged in this specific activities by each sow. In each day of observation, temperature and humidity inside and outside the huts at 8:30 a.m., at 1:30 p.m. and 5:30 p.m. had also been recorded.

Considering thermal requirements of pigs (*Federation of Animal Science Society, 1999*), the days of observation were divided into three categories: cold (average temperature less than 15 °C), optimal (temperature between 15 and 25 °C) and hot (temperature over 25 °C). The behavioral data collected were submitted with the statistical analysis system *SAS* (2001) to analysis of variance using and adopting a linear model which considered the categories of temperature, parity and their interaction.

RESULTS AND DISCUSSION

The statistical analysis, did not show significant interactions between the main factors therefore this allows a separate discussion on the effect of parity and environmental temperature. In outdoor rearing systems, the presence of a hut dedicated to the protection of the litter is certainly an important element. The presence of the sow inside the hut is however conditioned by the distance from the farrowing (*Figure 3*). The lower use of the hut 1–2 days before farrowing can be related to the considerable locomotion showed by the sow due to the research of material such as straw, grass, twigs needed for the nest building. Unlike the sows increased their presence in the hut in the first week after farrowing, when the piglets require more intensive protection and need to be fed frequently. Considering the type of hut it is possible to observe that the white one is always preferred to the gray one. The use of the gray hut is unaffected by weather conditions while for the white hut it is possible to observe a significant decrease in its use in hot environment (*Figure 4*). Considering into account that temperature and humidity inside the two structures did not show statistically significant differences, the preference towards the white hut leads to the hypothesis that other factors are behind this decision, in particular the shape of the hut and the location of the entrance.

It is likely that the white structure, although the total area available is 50 cm² less than the gray one, allows the sow to lie down on both sides of the hut so she is able to rest and relax more comfortably during breastfeed. At the same time the sow can always keep the head turned outwards. The possibility to see and control what is happening outside the hut is essential for the sow in order to develop all possible defense strategies of the offspring. The size of the white hut is important in determining the preference of sows (*Figure 5*). Multiparous sows usually are heavier than primiparous (250 vs 150 kg) and therefore they prefer white structure because they have more space available, which allows an easy transition from station to recumbent and vice versa. In the gray hut, which has a rectangular plan, the size of the short side seems to be the main constraint to the correct execution of these movements. Climatic conditions have a strong effect on the use of different part of the paddock (*Figure 6*), especially since the pig has some difficulties to implementing the processes of thermoregulation. In particular if we consider the effect of temperature on the activities undertaken by the sow, it can highlight how the wallow has been primarily used in high temperature conditions as a strategy to overcome the heat stress, in agreement with results obtained by *Bull et al.* (1997). Lying down on cooler surfaces can dissipate the heat more efficiently by conduction rather than by convection (ventilation) or by evaporative cooling (During hot days the visiting frequency of the wallow is doubled than those with optimal temperature and 5 times higher than in days with temperatures is defined 'cold'. It should be emphasized that the use of wallow is mainly concentrated in the central phase of the day between 11:30 am and 3:30 pm, time interval in which there were obviously higher temperatures. The exploitation of the shaded area in warm weather has been more limited than the use of the wallow, probably because it is less effective in the control of heat stress.

Regardless of age of the sow, rooting and grazing were mainly performed in the afternoon and they were enhanced by low environmental temperatures (*Figure 7A*). In the same conditions a consequent reduction of the resting time had also been observed (*Figure 7B*).

Figure 3

Frequency of use of the hut in relation to the distance from farrowing

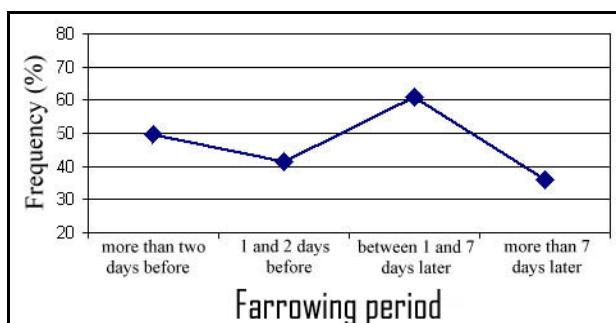


Figure 4

Frequency of use of two types of hut in relation to environmental temperature

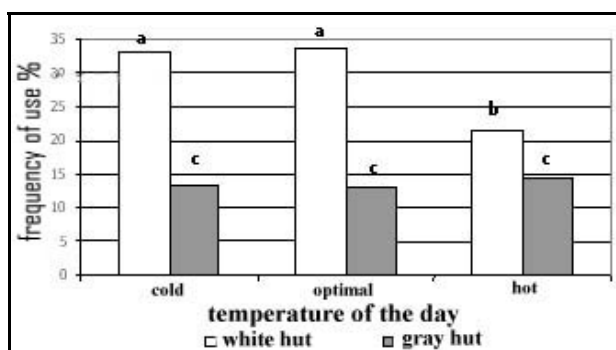


Figure 5

Effect of the sows parity on the use of white or gray hut

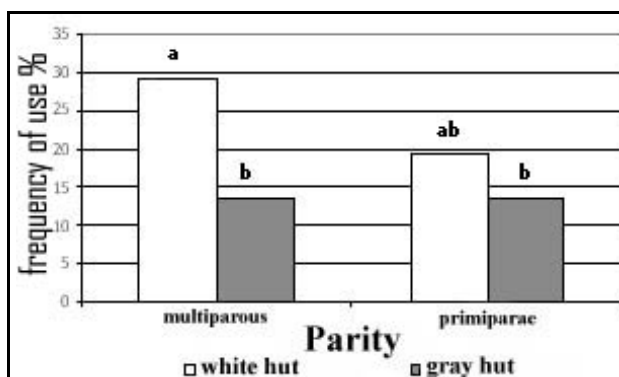


Figure 6

Effect of environmental temperature on the utilization of different part of the paddock

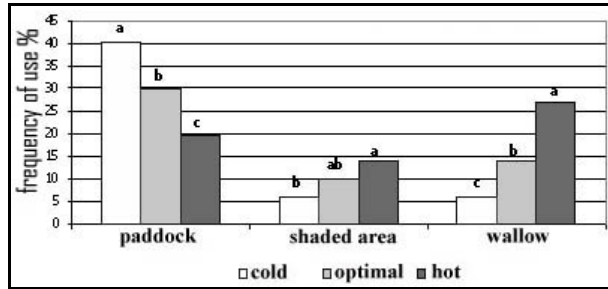
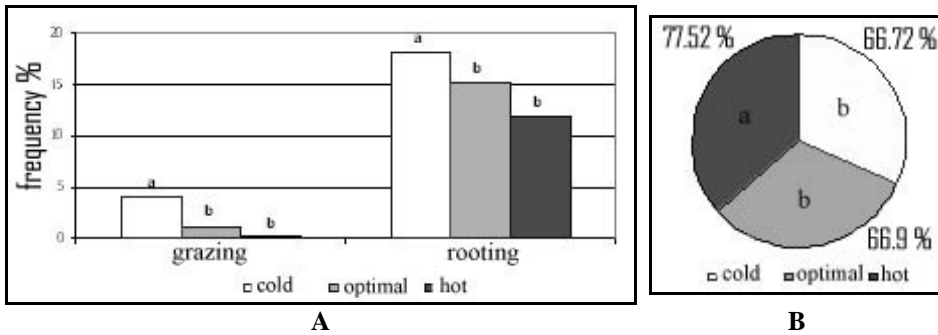


Figure 7

Effect of environmental temperature on activities (A) and rest (B) performed by the sows



CONCLUSIONS

The length of both sides of the white hut should allow an easier transition from standing to lying down and vice versa. In addition, in order to decreasing the stress level of the sow, she should always be able to see what is happening outside. Shaded area seems to be under-exploited, under hot environmental conditions as well and this likely due to the insufficient protection from sun radiations and this required more specific studies aimed to identify the best shading material. The presence of the wallow seems to positively affect the welfare of sows during the hot season, anyway other systems of cooling such as sprinkler could be tested in order to reduce the heating stress in sows reared outdoor in the mediterranea area.

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