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The effect of rubber mats on preference and lying behaviour of group housed sows

This study analyses the preferences, as well as the lying behaviour, of sows with various types of mat in a group housing system lying area. The sows in the trial could choose between six bays with three lying surfaces (concrete, hard or soft rubber matting). The behaviour of the animals was video recorded continually over seven days. The results show that sows preferred malleable floor coverings for lying on. The soft rubber mats were preferred with 53.6 % occupancy over hard rubber mats with 38.1 %. The bare concrete flooring was, with 8.3 % occupancy, relatively seldom used.

Keywords

Rubber mats, preference test, lying behaviour, group housing, sows

Abstract

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■ The type of flooring plays an important role in animal welfare within housing systems [1] and is crucial for the wellbeing of the animals [2]. When kept indoors, pigs spend 80–90% of the daytime lying [3, 4] during which they are in direct skin contact with the floor [2]. Pigs prefer lying surfaces that are dry, soft and free from draughts. The lying areas must be so designed that all the pigs can lie therein at the same time and, where possible, on their sides [5].

The stretched side lying position is a sign of relaxed resting [4]. With warmer temperatures, sows avoid body contact with their group companions and lie in a stretched out side position. Hereby it can be observed that cool and heat dissipating, lying areas are preferred [3] indicating temperature comfort is rated higher than lying comfort by the sows [1].

Animals, materials and methods

The study of sow preferences in relation to different floor surfaces in the lying area was carried out at the Education and Research Centre, Boxberg State Institute for Pig Breeding and Management (LSZ), Baden-Württemberg, Germany as part of a project supported by the Federal Office for Agriculture and Food (BLE) entitled "PigComfort - Development of rubber mats for lying and locomotion areas in housing systems for sows". Made available for the investigation was a closed stable with forced ventilation system on dry sow housing compartment for

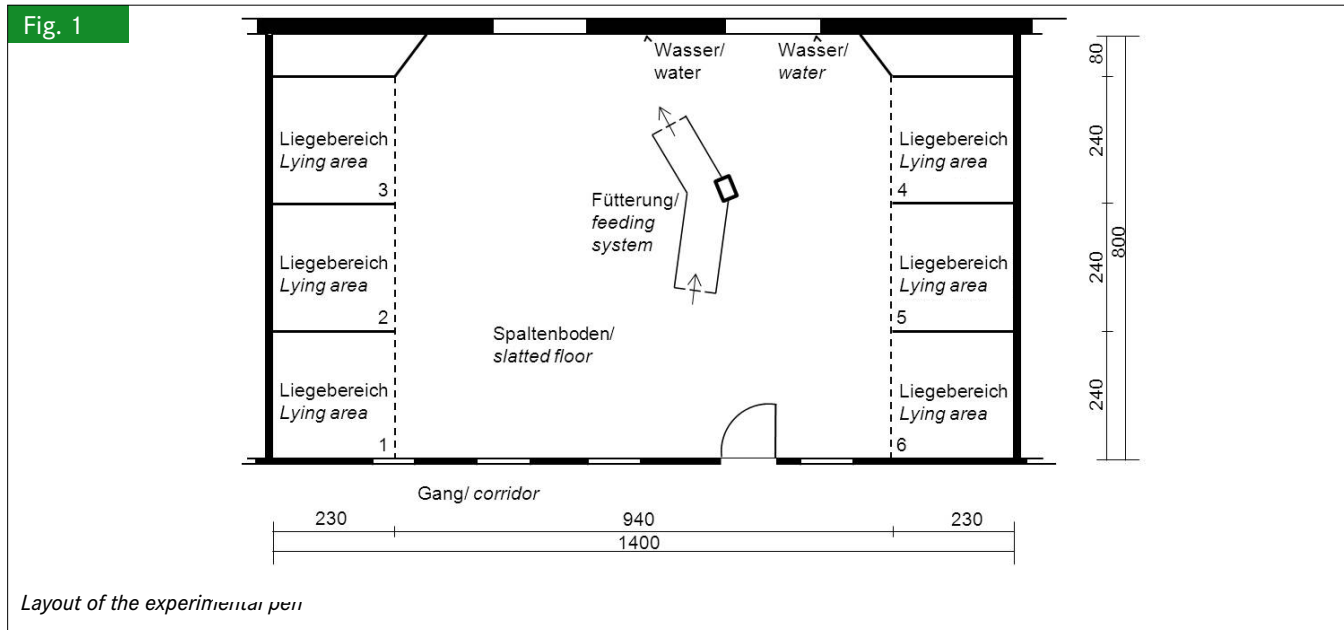
static groups. This included an automatic feeding station, an activity area with concrete slatted flooring and a lying area with six bays of the same size (**Figure 1**). Each lying bay measured 5.5 m² with 3 % gradient solid concrete flooring. For the study, the lying bays were fitted with three different solid surfaces. In each two of the six bays there was concrete flooring, hard rubber mats or soft rubber mats. The positioning of the different lying materials within the bays was random and was rearranged after every three sow batches. In total 18 batches of sows were housed for this study, each with a seven-day observation period. The compartment was washed and disinfected after each batch.

Animals

According to the Protection of Animals Order (farm animals), the lying area for a sow must be a minimum 1.3 m². In order to ensure sufficient floor area for every animal only eight sows per batch could be housed. Gestating sows in the 28th day of pregnancy were selected for all batches. Selection criteria included a positive pregnancy examination, good body condition and healthy feet. Sows were weighed before housing. Per batch, sows were numbered 1 to 8 with the number for each written by livestock black marker on both flanks, on the neck and also the back of the respective sows. After three weeks the sows were rehoused. With 18 batches of eight sows, a total of 144 sows were therefore observed regarding their preference behaviour. Average parity of the sows was 2.3 at an average housing weight of 239.6 kg.

Rubber mats

The hard rubber mat was a solid mat specially developed for use in the lying areas of sow housing. A special rubber compound applied for the surface and the surrounding edges gave a high degree of resistance to bite damage. The mats comprised a



smooth underside with a standard size of 120 cm wide, 200 cm long and 2 cm thick.

The softer rubber mat was a prototype specially developed for this study. Its profile originated with cow mats. The underside comprised a type of honeycombing offering a higher degree of softness (malleability under pressure) than with mats with flat undersides. The surface was coated with a bite-resistant layer while the edges of the mat were not reinforced for stiffness. Mat measurements: 120 cm wide, 200 cm long, 3 cm thick. Mats were attached to the floor with nail rawl plugs and curved under-washers punched every 20 cm around the circumference into a holding frame.

Parameters

The preference behaviour of the sows was recorded by video, a video camera and infrared light (for night vision) being positioned over every lying bay. Continuous recording was carried out over seven days and results were evaluated using scan sampling (15 minute intervals). Every visit by sows to the lying bays was recorded along with sow number and respective lying position. Positions were categorised as side lying, half-side lying, lying on stomach, sitting, standing, getting up and lying down. Empty lying places were not evaluated. Additionally, a data logger recorded compartment temperature at 15 minute intervals. The logger was positioned 1.5 m above the floor and as near as possible to the animal area. Assessed was also the extent of dirtying through dunging within the pens (0 = no dunging through to 4 = marked dunging > 75 %) using the quadrant method.

Results

Preference behaviour

The preference behaviour results (**Figure 2**) show that 53.6 % of the sows preferred the soft rubber mats for lying on. 38.1 % of the sows used the hard rubber mats and, with 8.3 % of sows, the bare concrete flooring was seldom used for lying on.

Over time, within each batch, there was a continuous increase in the selection of soft rubber mats as lying place. This meant that during the first days of each trial 45.6 % of sows selected soft rubber mats, 39.0 % hard rubber mats and 15.4 % lay on the bare concrete flooring. But by the last day of the respective batch (7th day) 61.6 % selected soft rubber mats, 36.1 % hard mats. At 2.3 % only a few sows selected the bare floor for lying on.

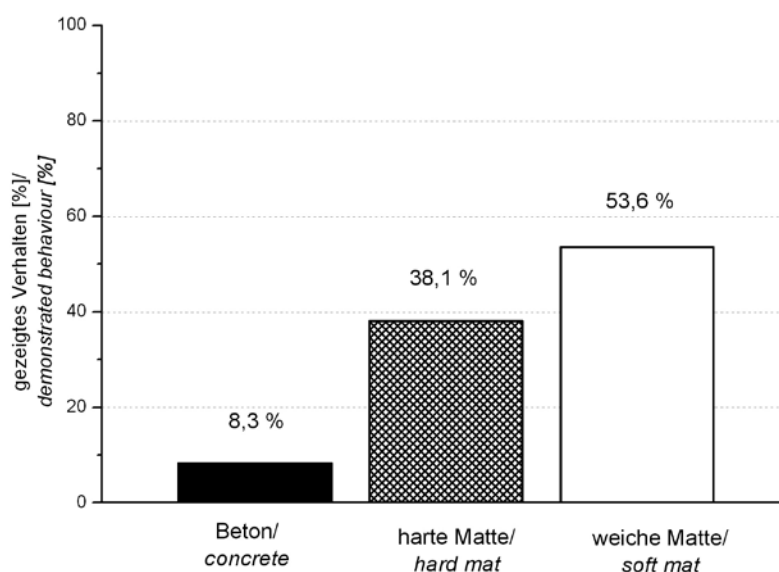
It was also established that, independently of the type of flooring in the lying bays, the bays 4–6 were selected for lying in up to 76.0 % more often. The cleanliness of all lying bays was awarded the mark 1 in 63.4 % of cases representing “no dirtying”. If dunging occurred in the lying areas this only occurred in the lying bays 1–3, whereby usually the concrete flooring and/or the lying bay 3 (independently of the lying place material present) were used as dunging area.

Lying behaviour

The results shown in **Figure 3** indicate the differences with the three lying positions stomach, half-side lying and side lying in relationship to the surfaces being lain on. It was apparent that sows mainly lay in the side position. At 74.1 %, the animals lay most often in the side position on the soft rubber mats. In 72.6 % of cases sows chose the side position on hard rubber mats and on 63.5 % with bare concrete flooring. The half-side position was adopted by sows 10.3 % of the time on soft rubber mats, up to 12 % on the hard mats. The sows could be seen most often in the half-side position on bare flooring (16.4 %). 15.6 % and 15.4 % of sows lay on the soft and hard rubber mats in stomach position, 20.2 % of sows on the bare flooring were observed lying on their stomachs.

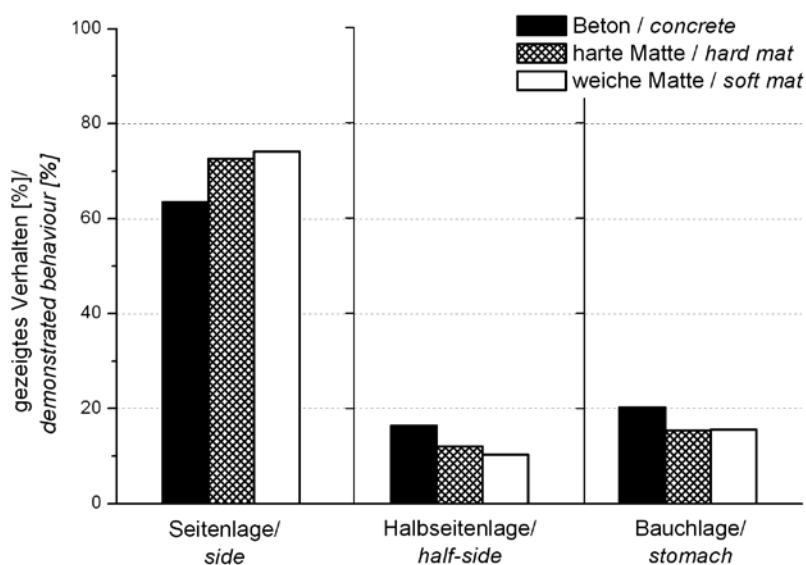
The compartment temperature averaged 20 °C during all 18 batches. With temperatures > 24–28 °C or over 28 °C the sows increasingly rested in the side position (83.6 % or 91.4 %) and less in the half-side position (5.9 % or 5.5 %) and stomach

Fig. 2



Use of different flooring materials in the lying area (Part of lying posture on side, half-side and stomach)

Fig. 3



Frequency of lying posture on the different floors

position (10.4 % or 3.1 %). Where the compartment temperature lay between 16–20 °C, 73.3 % of the sows were observed lying in the side position, 12.0 % in the half-side position and 14.7 % in the stomach position.

Differences in the lying position could also be seen to relate to time of day, reflecting the daily rhythm of the sows. Where the animals mainly slept in the side position during the night and between 1–2 pm. In the morning and afternoon they selected the half-side and stomach positions for resting.

Lifetime of mats

After 54 weeks of investigations very little damage could be established. Because of their special rubber compound on the surface and on the borders the hard rubber mats were not da-

maged during the entire investigation. The soft rubber mats (prototype) suffered only slight damage through biting attempts by the sows on the borders because of the lack of strengthened edges. The affixing of the rubber mats through rawl plugs and nails could prevent greater damage in this respect.

Conclusions

The results of the investigation into preferences show that sows clearly prefer soft, malleable lying areas compared with concrete flooring. With high compartment temperatures the sows could apparently reduce thermal stress to a great extent through lying apart stretched out in side position which meant that rubber mats were once again preferred in this respect. The rubber mats showed good wear resistance which is related to

the special material composition. This meant rubber mats were not only ethologically suitable but also with regard to technical working requirements so that they can offer an important contribution to increasing the animal welfare in straw-less management systems.

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