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Which Flooring Structure and Air Temperature are Preferred by Fattening Pigs?

The floor characteristics are a decisive factor in assessing the animal welfare in a pig house. Therefore, through selected experiments the flooring types required by fattening pigs in housing systems were to be determined and the possible correlation between the floors selected and house air temperatures checked. Of the floorings investigated the slatted concrete floor was the first choice, followed by the deep-littered floor and the flat littered floor was third.

Fig. 1: Flat littered floor (left), deep littered floor (middle), slatted concrete floor (right)

Pigs spend more than 80 percent of their days lying on the floor, no matter which housing system is used. For this reason, the floor type plays a significant role on the animal appropriateness of a husbandry system. Previous studies on the effects of different floors on animal health, hygiene and air quality showed various advantages and disadvantages of very different flooring, with a relative preference for the slatted concrete floor. In conclusion, the current study shall reveal, which floor is chosen by the pigs most frequently and under which conditions.

Project Description

The studies took place at the FAL testing Station in Brunswick in the Institute for Production Engineering and Building Research's outdoor climate stable. The following will report on a partial evaluation of two fattening periods (summer / winter) with 30 pigs each. The animals had the choice between a slatted concrete floor without litter, a flat littered floor, and a deep litter floor by differing climate conditions but otherwise same stable compartments (*Fig. 1*). The animals could change compartments via a non-littered solid floor. At the rear end of the flat littered floor a damp straw-manure mixture developed due to the processes in the stable. Complete data was documented for all five floor types. Only the results for the three floors types indicated were of particular relevance for this study. An evaluation of the ethological data permitted a hierarchical arrangement of lying behavior.

Frequency of visitation of various floors

In the summer study, the average number of pigs choosing the slatted floor (61 %) was significantly higher as on the other floor types. Much fewer fattening pigs (about 17 %) remained on average on the flat littered floor. But nonetheless, considerably fewer pigs were there as on the other available floors. The deep littered floor as well as the floor area with damp straw-manure mix were visited the least during the summer with an average of between seven and three percent of the animals.

The percentage of pigs sitting on the slatted floor, contrary to the observations of [2], were not necessarily higher than on the littered floor. With an average temperature of 22 °C during the summer run, the number of sitting pigs was significantly lower on the good thermally conductive floor as opposed to the other floors available.

Lying position

Observations by [3], that due to a reduced lying quality on the slatted floor, the frequency of lying on the stomach is higher than on the solid or littered floor could not be confirmed by this study. The research more readily permits the conclusion that lying behaviour is dependent on the temperature as it was also evident in a differentiation of lying behaviour with regard to the position with or without bodily contact. This assumption is supported by the selection trials by [4, 5].

A comparison between the mean values of body positions on the different floor types (*Table 1*) shows that the percentage of body positions observed on a floor area varies significantly.

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Keywords

Flooring types, stable temperature, fattening pigs

A comparison of the relative percentages shows that the body position "lying" was the most frequently observed, regardless of floor type. The relative percentage was 60 %, and on the slatted concrete floor it was significantly higher with 90 %. Also with regard to the relative percent of standing and sitting fattening pigs, with the exception of the area with slatted concrete floor, only minimal differences were found between the floor types.

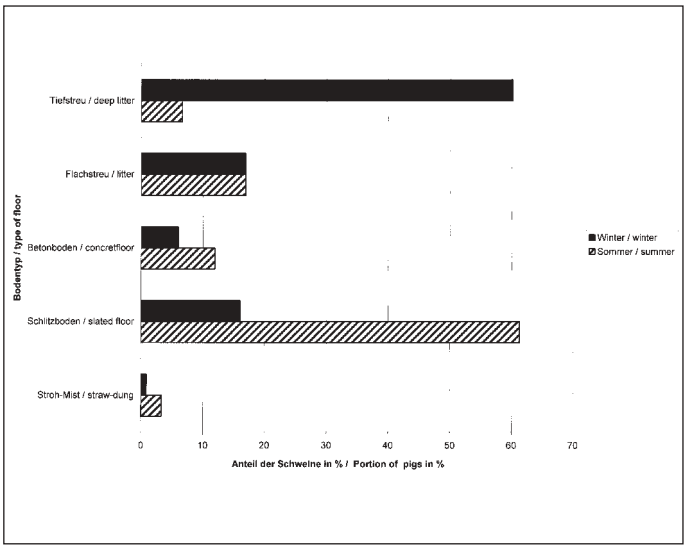

Fig. 2: Percentage of pigs on different floorings in summer and in winter (n = 5425; n = 4256)

Factors of influence on lying behaviour

The results of a covariance analysis show that the portion of standing and sitting pigs is to a great extent determined by the live weight of the pigs and the time of the day and is not significantly influenced by the air temperature in the stable. In contrast, the number of pigs lying on a particular floor type is decisively influenced by the air temperature. Thus, the main requirement is to provide the floor temperature the pigs need.

It also becomes clear that the temperature requirements of the pigs during the fattening period change dramatically and thus the temperature recommendations for fattening pig stables can be differentiated according to the floor form and the stage of fattening.

During summer climate conditions, with an average air temperature of 22 °C, the slatted floor is relatively preferred as a lying area (up to 75 percent), particularly by pigs with a live weight of more than 35 kg. According to [5], a slatted concrete floor is between three and five °C cooler as the solid floor and about seven to eight °C cooler than a 20 to 25 cm manure mattress. For this reason, it offers a suitable lying area in the case of increasing temperatures. The excessive requirements on the thermoregulatory system of the pig, closely linked to its discomfort, are expressed by lying without bodily contact, by lying on the stomach or in sitting [6]. All of these signs could be observed on the deep litter floor and the littered floor rather than on the slatted concrete floor.

In the winter trial, in contrast, with temperatures between three and fifteen °C the deep litter manure mattress was preferred as a lying area by between 40 and 60 percent of the pigs with a live weight of more than 60 kg (*Fig. 2*). In contrast, the thermally insulated area with the slatted floor provided a suitable lying area at above 17 °C for the animals > 80 kg which sought warmth. At temperatures from 22 to 25 °C this floor type was chosen by nearly 40 % of the lying pigs.

All other floor areas offered in the study (damp manure-straw mix, flat littered floor, floor without litter) were not chosen at any air temperature by more than 20 percent of the fattening pigs for lying.

Summary

The slatted floors were most often chosen as lying areas in both test periods. The common opinion that a pig would principally choose a solid, littered or rather soft floor above a non-littered slatted floor is contradicted by this study [7]. According to the current results, it must be assumed that the common deep litter practice with a non-littered solid feeding area and a deep littered manure mattress is not an optimal lying area for the summer months with temperatures of between 18 to 31 °C, and seriously limits the well-being of the pig.

For technical reasons, the air temperatures in the various compartments were varied often during the fattening periods, which does not actually occur in practice. Subsequent studies should be enacted in which the optimal air temperatures found here are simultaneously and constantly implemented during the fattening period.

Summer trials (n = 5425)

		Standing		Sitting		Lying		
	%	X̄	s	X̄	s	X̄	s	t- Test
Straw-Manure	%	0,75	2,14	0,36	1,32	2,24	4,76	***
Slatted concrete	%	2,62	4,94	2,00	3,67	56,7	22,45	***
Concrete	%	3,49	4,68	1,37	2,51	7,09	6,05	***
Flat litter	%	3,26	4,59	1,84	3,11	11,87	12,08	***
Deep litter	%	1,53	3,65	1,14	3,02	3,96	6,99	***

Winter trials (n = 4256)

		Standing		Sitting		Lying		
	%	X̄	s	X̄	s	X̄	s	t- Test
Straw-Manure	%	0,88	3,04	0,02	0,32	0,00	0,10	***
Slatted concrete	%	1,41	3,77	0,67	2,53	13,96	16,96	***
Concrete	%	5,25	6,65	0,14	0,96	0,63	2,45	***
Flat litter	%	6,36	9,02	1,02	2,90	9,54	11,41	***
Deep litter	%	3,31	6,48	4,75	7,06	52,06	21,24	***

signifikant: p < 0,005 = *, p < 0,01 = **, p < 0,001 = ***

Table 1. Average body positions sitting, standing and lying (%) on the five flooring types in the summer and the winter trials as well the significances of comparing average values for a flooring type

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