EFFECTS OF HOUSING SYSTEMS ON CARCASS CHARACTERISTICS OF FINISHING PIGS

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Background

Production of quality pig meat in conditions that positively affect welfare and health of growing pigs is lately becoming more important. Growing of pigs on straw bedding meets the requirements that are set to producers as far as the pigs' health and welfare is concerned. In that sense, the scientific investigations of such housing system are being intensified. The most obtained results show many advantages of such housing system however, there are also some disadvantages of deep litter housing system in relation to the conventional housing systems. When compared to the conventional housing system, the majority of scientists agree that there is a cost benefit of deep litter housing system (Gentry et al., 2002a, Morrison et al., 2003a), as well as benefits for animal welfare and environment protection (Lyons et al., 1995, De Yong et al., 1998, Beattie et al., 2000, Kelly et al., 2000, Klont et al., 2001, Guy et al., 2002, Morrison et al., 2003b). Investigations of productivity and slaughtering characteristics of pigs point out not only advantages of deep litter housing system (Beattie, 1996; Morgan et al., 1998; Beattie et al., 2000; Spolder et al., 2000; Turner et al., 2000; Klont et al., 2001; Maw et al., 2001; Lombooij et al., 2004), but also some negative aspects that are caused by this way of pig housing (Gentry et al., 2002b; Honeyman and Harmon, 2003; Morrison et al., 2003a, 2003b).

Objectives

Having in mind the opposite results of our previous researches, the aim of this research was to compare productive, slaughtering and economic characteristics of conventional and deep litter housing systems.

Materials and methods

The crossbreeds (GLxLW) x GL, divided into two groups, were used for this research. The first group of pigs was kept on deep litter, while the second group was kept in a conventional way, on cross-barred floor, without straw bed. Pigs in both groups were fed equally. In the first fattening phase (27-60 kg), the pigs were fed with mixture that contained 17.68% of crude proteins and 12.98 MJ/kg ME; in the second phase of fattening (60-110 kg) that mixture contained 14.71% of crude proteins and 13.10 MJ/kg. Throughout the fattening process, the food consumption was controlled, and the average daily weight gain, food conversion and costs of live weight gain were calculated. Throughout slaughtering, the meat portion (M%) in carcasses was obtained by the "two points" method (Rule Book, 1999, 2001), using the following formula:

$$M\% = 47.978 + 26.0429\frac{F}{M} + 4.5154\sqrt{M} - 2.50181\log_{10} F - 8.4212\sqrt{F}$$

F = the minimum thickness of visible fat (including rind) on the midline of the split carcases in millimeters, covering the lumbar muscle (*M. glutaeus medius*), M = the visible thickness of the lumbar muscle on the midline of the split carcases in millimeters, measured at the shortest connection between the front (cranial) end of the lumbar muscle and the upper (dorsal) edge of the vertebral canal.

According to the meat portions, the carcasses were divided into the (S)EUROP commercial classes. Costs of housing, feeding, health protection, as well as other costs that are in relation to specific conditions were taken into consideration in order to determine the economic factors.

Results and discussion

At the beginning of fattening process, live weight of growing pigs in both groups was almost the same (27.50 kg and 26.90 kg, respectively). Fattening of pigs on straw-bedded floor lasted for 117 days, and on cross-barred floor for 114 days. Pigs of both groups had equal average daily weight gains (0.67 kg and 0.66 kg, respectively), but the food consumption per kg of live weight gain was better in pigs that were kept on deep

litter than in pigs of the second group that were kept conventionally (3.15 kg and 3.31 kg, respectively). Food conversion was also better in the first group, kept on deep litter, than in the second group. Data obtained for mortality and waste of pigs did not show results that can differentiate between the two housing systems (Table 1). Throughout the fattening process, it was noticed that the pigs kept on deep litter spent more time moving around and were less aggressive than the pigs on cross-barred floor. Similar conclusions were stated by Lyons et al. (1995) and Morrison et al. (2003a). Positive effects of deep litter on the welfare and behavior of growing pigs was also pointed out by De Jong et al. (1998), Kelly et al. (2000), Turner et al. (2000), as well as Day et al. (2002).

Productive and slaughtering characteristics significantly affect the effectiveness and cost benefits of pig production. Beatie et al. (2000) state that pigs kept on deep litter in their finishing growth phase had better food consumption, less food usage per kg of live weight gain, better weight gain, and thicker back fat when compared to pigs that were kept in a conventional way. Lambooij et al. (2004) found out that the pigs kept on deep litter had significantly higher weight of carcasses and better water holding capacity. Honeyman and Harmon (2003) found out that, in comparison to the pigs kept on half-cross-barred floor, pigs kept on deep litter had higher average weight gain in the summer months, while in the winter months, they had equal average daily gain, but weaker conversion.

Data on the slaughtering traits of carcasses (Table 2) show that pigs kept on deep litter had higher weight of warm carcasses, thinner back fat and higher portion of muscular tissue in carcasses. Therefore, the classification of carcasses proved the advantages of deep litter housing system. The S and E commercial classes had the portion of 77.14% and 66.67%, respectively. Carcasses of the R class were not present in pigs kept on deep litter (Graph 1). The deep litter housing system resulted in better average meatiness of carcasses than the conventional system (58.25% and 57.07% of muscular tissue). Classification of carcasses into commercial classes was also in favor of the deep litter housing system. However, Klont et al. (2001) and Gentry et al. (2002a) did not find differences in meatiness between pigs of two different housing systems.

Analysis of economic aspects of housing systems (Table 3) shows that the deep litter housing system has better financial results. This is in relation to the lowering the costs per finishing pig, and gaining the better market price of the product as well as of the produced fertilizer. Similar conclusions were made by Gentry et al. (2002a) and Morrison et al. (2003a). Lowered costs per finishing pig and satisfactory quality of pork are the main preconditions of productivity and profitability of pig production.

Conclusions

Based on the obtained results, it can be concluded that pigs, which were kept on deep litter had better food consumption than pigs kept conventionally. Analysis of average daily gain values did not show differences related to housing systems of finishing pigs. Slaughtering characteristics show that pigs kept on deep litter had heavier warm carcasses, thinner back fat and greater portion of muscular tissue in carcasses. Moreover, classification of warm carcasses was in favor of deep litter housing system. Lowered costs and higher market price of such finishing pigs proved that deep litter housing system is also financially better than the conventional housing systems.

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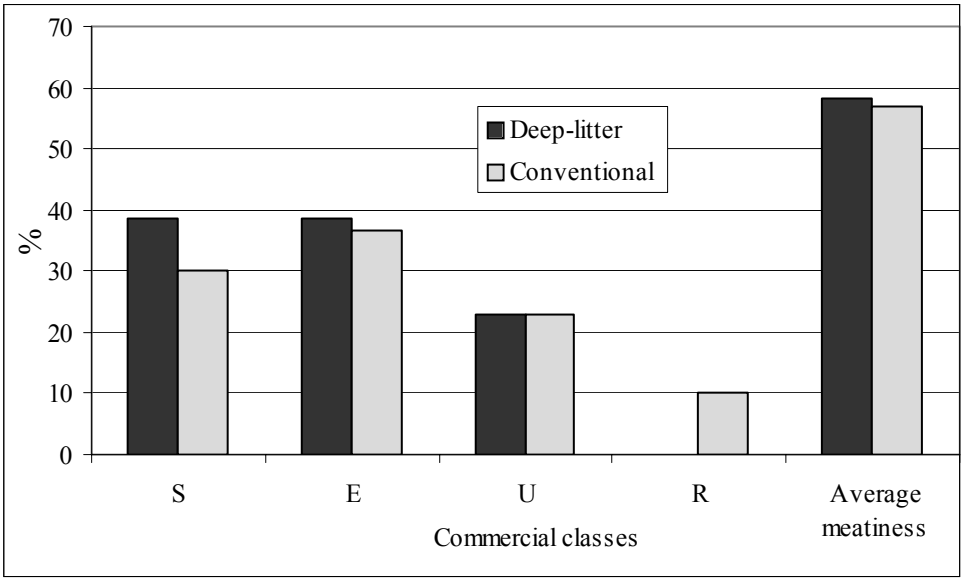
Table 1. Fattening productivity data

Indicators	Housing system	
	Deep litter	Conventional housing
Beginning of fattening, no. of pigs	106	117
End of fattening, no. of pigs	100	110
Fattening period, days	117	114
Starting weight, kg	27.50	26.90
End weight, kg	106.60	104.50
Total weight gain, kg	79.10	77.60
Average weight gain, kg	0.67	0.66
Food/HD, kg	2.10	2.17
Food/kg of gain	3.15	3.31
Food usage, %	47.62	46.08
Mortality, %	3.77	3.42
Waste, %	1.89	2.56

Table 2. Slaughtering traits of carcasses

Commercial classes	%	Weight, kg	Average F (mm)	Average M (mm)	Meatiness %
Deep litter housing system					
S	38.57	79.33	8.63	71.07	62.36
E	38.57	82.00	13.56	72.37	57.44
U	22.86	82.69	18.36	67.06	52.69
Total	100.00	81.13	12.76	70.66	58.25
Conventional housing system					
S	30.00	78.94	8.67	81.94	62.49
E	36.67	80.41	10.18	69.32	57.30
U	23.03	81.36	18.93	71.14	53.02
R	10.00	83.17	24.50	69.17	49.38
Total	100.00	80.47	14.30	70.52	57.07



Graph 1. Division of carcasses according to (S)EUROP classification

Table 3. Cost benefit analysis of two different housing systems

Structure of incomes and expenses	Value of pig (in EUR)	
	Deep litter housing	Conventional housing (without deep litter)
Expenses		
Growing pig	35.85	36.85
Food	41.00	42.30
Veterinary costs	6.00	8.00
Other costs	6.65	6.65
Straw	1.85	-
1. Total expenses	91.35	93.80
Incomes		
Fattened pig	155.20	147.40
Fertilizer	10.50	-
2. Total incomes	165.70	147.40
Profit (2– 1)	**74.35**	**53.60**