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EFFECT OF MANAGEMENT SYSTEM ON BEHAVIOUR AND PRODUCTIVITY OF BROILER CHICKENS

Ewa Sosnowka-Czajka, Renata Muchacka

National Research Institute of Animal Production, 32–083 Balice, Poland

Introduction

Compared to other sectors of animal production, the poultry sector is characterized by rapid genetic, technological and nutritional progress, which enabled breeders to shift from small-scale production to intensive production in specialized commercial farms. The current intensive methods of poultry production, which are aimed to maximize profits, make use of the latest technological solutions that facilitate work and make maximum demands on avian productivity. However, they do not always satisfy the natural needs of animals and result in low welfare levels (Sanotra et al., 2001; Rauw et al., 1998). According to Dawkins (1999) and Duncan (2002) the behaviour of birds is the most important indicator of welfare, although production results also reflect welfare levels. The aim of the present study was to determine the effect of management system on the behaviour and productivity of broiler chickens, and thus on their welfare.

Material and methods

A total of 180 Ross 308 broilers were investigated. After weighing and tagging, chickens were allotted to 2 groups: I – reared in the litter system; II – reared in batteries of cages.

Throughout the rearing period (42 days), chickens of both groups were kept at a stocking density of 15 birds/m^2 under the same thermal conditions, and were fed the same feed with free access to feed and water. The production parameters monitored during the trial were individual body weight of broilers, feed intake, and mortality. Behavioural observations were made twice a week to 21 days of rearing and three times a day once a week in the subsequent period to record eating, drinking, resting, standing or moving behaviour.

The results were analyzed statistically using variance analysis and significant differences were estimated with Duncan's test and using chi-square test for behavioural observations.

Results

From the third week of rearing to 42 days of age, chickens from the litter system were characterized by a highly significantly lower body weight (Tab. 1). In the litter system, feed conversion per kg weight gain was poorer in the first period of management ($p \leq 0.01$) and during the entire rearing period ($p \leq 0.05$) (Tab. 2). There were no statistically significant differences in feed conversion from 22 to 42 days of growth. Mortality for the whole rearing period was the same for both groups (Tab. 3).

Analysis of the behavioural observations indicates that chickens caged in batteries consumed feed more frequently and spent more time drinking that chickens from the litter system (Tab. 4). Broilers from the litter system spent much more time resting, whereas caged chickens showed greater physical activity. Weekly figures for feed intake (Fig. 1), water intake (Fig. 2), resting time (Fig. 3) and movement time (Fig. 4) clearly demonstrate these tendencies except for the first week of rearing, in which the time spent on drinking, resting and moving was quite the reverse. The situation also changed at five weeks of rearing, when caged birds spent more time resting, and chickens on litter were more active.

Discussion

The cage system is the least friendly to birds. The first criticism of the management systems concerned the cage system. Caged birds are very often exposed to stress factors, although the cage system enables breeders to maximize production (Herbut and Sosnowka-Czajka, 2004; Damme, 2004).

Jezierski and Kopowski (1997) report that practical breeders consider production results and survival as the indicators of broiler welfare. Animal welfare levels can be determined based on production results (Kolacz and Bodak, 2002). In our study, the cage system allowed birds to obtain approx. 14% higher body weight and approx. 3% better feed conversion per kg weight gain. It is worth noting that mortality in both management systems was the same. Janiszewska (1998) reports that susceptibility to disease and mortality are used to assess welfare. Tielen (2002) and Sanotra et al. (2001) claim that good health status of animals is the foundation of high welfare levels.

However, many other authors claim that the quality of management systems is best reflected in avian welfare and not in production results, which are often out of keeping with the welfare levels (Linder and Hoy, 1996; Santora et al., 2001).

When analyzing the results of behavioural observations, it was found that caged chickens spent approx. 95% more time on feed intake and approx. 90% more time on drinking

than chickens kept on litter, as reflected in the higher body weight of the former. Broilers from the litter system spent more time resting (approx. 75% on average), which indicates that they felt a sense of comfort compared to caged birds, which spent approx. 64% of their time resting.

Sanotra et al. (2001) report that poor management conditions (e.g. the cage system) increase leg problems and are generally detrimental to health, which has a direct effect on the behaviour of birds. This involves changes in the behaviour associated with locomotion, feed intake, water intake and lying, as a result of which birds are unable to satisfy their basic needs. However, in our study we did not observe any leg problems or decreased mobility of caged birds. We showed, however, that caged chickens were characterized by approx. 30% higher locomotory excitability, which was probably due to birds feeling discomfort despite the fact that both experimental groups were kept under the same stocking density per 1 m^2. This is supported by the study of Murphy and Preston (1988), who showed that broilers aged 39-49 days spend over 73% of their time lying, compared to only approx. 43% lying birds of that age in the cage system and as much as approx. 89% lying birds in the litter system.

Based on the present findings it is safe to assume that in the cage system, better production results (resulting from better hygiene among other things) and poor management comfort are obtained. The litter system provides birds with much higher welfare levels, allowing them to express their innate behaviour and natural impulses.

Tab. 1. Body weight of broilers (g)

Day of growth	Group	
	I	II
1	41.40 ± 0.34	42.44 ± 0.40
21	735.50 ± 9.29 **Aa**	806.07 ± 7.33 **Bb**
35	1823.25 ± 25.13 **Aa**	2113.71 ± 24.49 **Bb**
42	2368.75 ± 36.04 **Aa**	2694.72 ± 36.43 **Bb**

a, b – values in rows with different letters differ significantly ($p<0.05$)
A, B – values in rows with different letters differ highly significantly ($p<0.01$)

Tab. 2. Feed conversion (g) per kg weight gain

Day of growth	Group	
	I	II
1-21	1510.00 ± 3.65 **Aa**	1403.33 ± 13.33 **Bb**
22-42	1970.00 ± 3.65	1936.67 ± 22.31
1-42	1820.00 ± 3.65 **a**	1778.33 ± 14.47 **b**

a, b – values in rows with different letters differ significantly ($p<0.05$)
A, B – values in rows with different letters differ highly significantly ($p<0.01$)

Tab. 3. Chicken mortality (%)

Day of growth	Group	
	I	II
1-21	0	1.11
22-42	1.11	0
1-42	1.11	1.11

Tab. 4. Behaviour of chickens (%)

Day of growth	Feed intake		Drinking		Resting		Standing/Moving	
	Group							
	I	II	I	II	I	II	I	II
2	7.22	3.33	8.89 **a**	1.67 **b**	8.89 **A**	50.00 **B**	75.00 **A**	45.00 **B**
7	2.78	9.44	1.11	4.44	75.55	67.78	20.56	18.34
9	9.44	8.33	1.67	3.39	72.22 **a**	48.89 **b**	16.67 **A**	39.45 **B**
13	2.78 **A**	27.78 **B**	3.89	5.00	88.89 **A**	55.55 **B**	4.44	11.67
16	9.45	6.67	4.44	2.22	40.00	55.55	46.11	35.56
20	6.11 **A**	25.00 **B**	0.56 **a**	7.78 **b**	93.33 **A**	54.44 **B**	0.00 **A**	12.78 **B**
28	2.22	5.00	0.00	5.56	95.00	82.22	2.78	7.22
34	5.56	5.56	0.00	1.67	77.77	90.00	16.67 **A**	2.77 **B**
40	2.22	5.56	1.11	2.22	88.89 **A**	43.33 **B**	7.78 **A**	48.89 **B**

a, b – values in rows with different letters differ significantly ($p<0.05$)
A, B – values in rows with different letters differ highly significantly ($p<0.01$)

Fig. 1. Percentage of eating

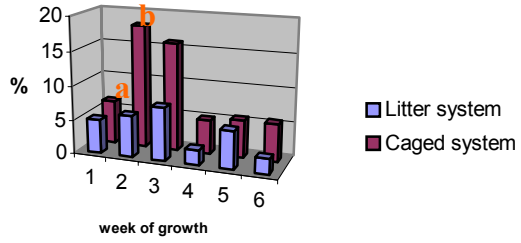


Fig. 2. Percentage of drinking

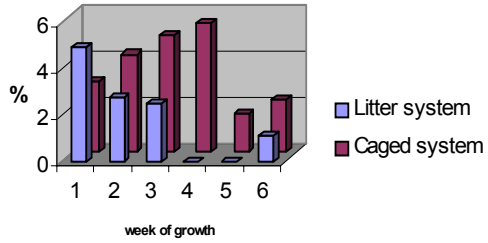


Fig. 3. Percentage of sitting

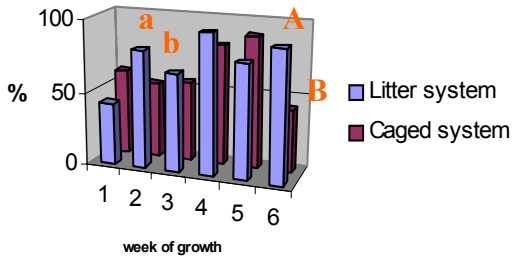
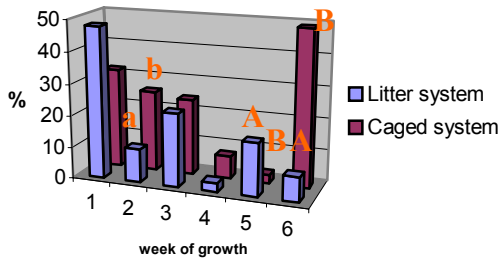


Fig. 4. Percentage of standing or moving behaviour



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