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Foot dermatitis and productive traits in broiler chickens kept with different stocking densities, litter types and light regimen

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ABSTRACT - The purpose of the research was to study the effects of high and low stocking density of broiler chickens, different types of litter and the adoption of short and long lighting regimen on broiler welfare through the evaluation of their productivity and incidence of foot pad dermatitis. 2,400 male Ross 508 were divided into 8 groups of four replicates each and reared in 32 pens according to a 3 factors experimental design of two levels each: low (LD) or high (HD) stocking density (11 and 14 birds/m² for LD and HD respectively), chopped straw (CS) or wood shaving (WS) litters and short (SL) or long (LL) light regimens (16 h light and 8 h dark or 23 h light and 1 h dark respectively for SL and LL). Broiler growth rate and feed efficiency were positively influenced by a stocking density lower than 30 kg of live weight per m². The adoption of a short light regimen reduced feed intake and improved feed conversion rate without modifying body live weight. Chickens reared on wood shaving litter showed a lower incidence of foot pad dermatitis.

Key words: Stocking density, Litter type, Light regimen, Broiler chicken.

INTRODUCTION - Intensive rearing of broilers in large flocks is highly criticised by animal-welfare associations and is frequently questioned by consumers. At the European level, the welfare related issue is considered a priority and currently a specific proposal for a Council Directive has been preparing with the aim of protecting the chickens kept for meat production. An important parameter taken into account by the European Commission in the proposal is the stocking density since it seems related to the increase of mortality, to the worsening of litter conditions, and to the increase of health problems like leg disorders and contact dermatitis, in particular food pad dermatitis, hock and breast burn. Foot pad dermatitis can lead to a painful condition of the broiler which means a decrease on walking ability and growth rate. The effect of stocking density on the onset of food pad dermatitis, hock and breast lesions is controversial (Martrenchar *et al.*, 2002; Dozier *et al.*, 2005; Bessei, 2006). Moreover poor litter quality and climate conditions exhibit negative effects on the incidence of contact dermatitis (Algers and Berg, 2001; Dozier *et al.*, 2005).

The purpose of the research was to study the effect of high or low stocking density of broiler chickens, different types of litter and the adoption of short or long lighting regimen on broiler welfare through the evaluation of their productivity and incidence of foot pad dermatitis.

MATERIAL AND METHODS - 2,400 males Ross 508 were divided into 8 groups of four replicates each and reared in 32 pens (6 m² each) located in 2 different rooms of the same poultry house. A 3 factors experimental design of two levels each was set up: low (LD) or high (HD) stocking density (11 and 14 birds/m² for LD and HD respectively), chopped straw (CS) or wood shaving (WS) litter and short (SL) or long (LL) light regimen (16 h light and 8 h dark or 23 h light and 1 h dark respectively for SL and LL). The trial was run from the mid of May to the end of June. At 42 days of age the broiler were slaughtered when the theoretic values of 30 and 35 kg of live weight per m² were reached for low and high stocking density respectively. Feed intake, body weight and

Table 1. Productive traits and foot pad dermatitis score of broilers reared at different light regimens, stocking densities and litter types.

	Stocking density (SD)	Light regimen (LR)				Litter type (LT)				P value for main effects								
		High	Low	Long	Short	Chopped straw	Wood shaving	SD	LR	LR	LR	LR	SD	LR	LR	LR		
		g	g/bird/d	kg/kg	%	2,404 ^B	2,511 ^A	2,457	2,458	2,434	2,480	0.01	ns	ns	ns	ns	ns	ns
Live weight	2,404 ^B	2,511 ^A	2,457	2,458	2,434	2,480	0.01	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	26.91
Feed intake	90.7	90.7	92.2 ^A	88.5 ^B	90.5	90.8	ns	0.01	ns	ns	ns	ns	ns	ns	ns	ns	ns	0.78
FCR	1.62 ^A	1.54 ^B	1.62 ^A	1.55 ^B	1.59	1.57	0.01	0.01	ns	ns	ns	ns	ns	ns	ns	ns	ns	0.02
Mortality	2.18	1.32	1.52	1.98	1.93	1.56	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	ns	0.02
Foot pad dermatitis score	10.4	8.9	8.4	10.9	12.0 ^a	7.7 ^b	ns	ns	ns	0.05	ns	ns	ns	ns	ns	ns	ns	1.3

a, b: P<0,05; A, B: P<0,01; ns: not significant.

mortality were recorded and feed conversion ratio was calculated. At slaughtering, chickens were controlled for the incidence of carcass injuries such as skin and hock burn lesions, bruises and bone fractures. Moreover, chicken feet were collected for macroscopic examination and scored in 3 classes: 0=no lesions, 1=mild lesions and 2=severe lesions (Ekstrand *et al.*, 1997). According to the formula reported in the EU proposal COM (2005) 221 final, the foot pad dermatitis score was calculated multiplying the number of feet from class 1 by 0.5, the feet from class 2 by 2 and the scores were added, then divided by the sample size and multiplied by 100. The data were submitted to a 3 ways ANOVA with interactions, considering as main effects stocking density, litter type and light regimen and means separated by the Student Newman Keuls test (SAS, 1989).

RESULTS AND CONCLUSIONS - The chickens of group LD have grown faster than HD reaching a body weight of 2,511 g *vs* 2,404 and a maximum stocking density of 27.3 *vs* 32.9 kg/m². Both LD and HD birds had the same daily feed intake and considering their different live weights the feed efficiency was better for the LD than for HD broilers. These data are consistent with those reported by Meluzzi *et al.* (2003) and Bessei (2006) who observed a reduction of feed intake and body weight with increasing stocking density. The light regimen significantly (P<0.01) affected both feed intake and efficiency. Indeed with a short light regimen the broilers have had less time available to feed themselves and therefore consumed a significant lower amount of feed. The feed conversion rate was better in SL birds since they reached the same live body weight of LL birds (Table 1). The most used litter materials, chopped straw and wood shaving, at the commercial level did not significantly influence, as expected, productive performances of broilers. Light regimen, stocking density and litter type did not statistically affect mortality, but in HD group the value was 1% greater than that of LD one. The incidence of foot pad lesions was generally low and no lesions of score 2 were observed. Either stocking density or light regimen did not exert a clear influence on the onset of foot lesions. These data are in accordance with those of Dawkins *et al.* (2004) who claims that stocking density little influence the foot pad lesions when appropriate environmental conditions (good ventilation and litter quality) are respected. Chickens reared on wood shaving litter showed a lower incidence of foot disorders (P<0.05). Hock burns, skin lesions, bruises and bone fractures were not affected by the different factors considered in the experimental design.

In conclusion, a stocking density lower than 30kg of live weight per m² leads to a better growth rate and feed efficiency. The adoption of a short light regimen similar to that occurring in nature in summer reduce the feed intake without modify the growth rate thus improving

the feed efficiency. Foot pad lesion were not affected neither by stocking densities nor by light regimens whereas wood shavings exerted a favourable effect in preserving foot pad in good condition.

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